

ORIGINAL *ACAWT-0032*

OFFICIAL TRANSCRIPT OF PROCEEDINGS

Agency: Nuclear Regulatory Commission
Advisory Committee on Nuclear Waste

Title: 26th ACNW General Meeting

Docket No.

LOCATION: Bethesda, Maryland

DATE: Thursday, December 13, 1990 PAGES: 84 - 189

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Thanks! *lyw*
Barbara Jo White
27288

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PUBLIC NOTICE BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON NUCLEAR WASTE

DATE: December 13, 1990

The contents of this transcript of the
proceedings of the United States Nuclear Regulatory
Commission's Advisory Committee on Nuclear Waste,
(date) December 13, 1990,

as reported herein, are a record of the discussions recorded at
the meeting held on the above date.

This transcript has not been reviewed, corrected
or edited, and it may contain inaccuracies.

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

3 ***

4 ADVISORY COMMITTEE ON NUCLEAR WASTE
5 26TH ACNW GENERAL MEETING
6

7 Nuclear Regulatory Commission
8 Room P-110
9 7920 Norfolk Avenue
10 Bethesda, Maryland
11

12 Thursday, December 13, 1990
13

14 The above-entitled proceedings commenced at 12:30
15 o'clock p.m., pursuant to notice, Dade W. Moeller, Committee
16 Chairman, presiding.

17 PRESENT FOR THE ACNW SUBCOMMITTEE:

18 Martin J. Steindler, Vice Chairman

19 William J. Hinze, Member

20 Paul W. Pomeroy, Member

21 Eugene E. Voiland, Consultant

22 Donald Orth, Consultant

23 David Okrent, Consultant

24 Charlotte Abrams, Designated Federal Official
25

1 PARTICIPANTS:

2

3

R. Fraley

H. Schofer

4

J. Linehan

D. Brooks

5

K. Stablein

P. Justice

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J. Bradbury

D. Dobson

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P R O C E E D I N G S

[12:30 p.m.]

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3 MR. MOELLER: The meeting will now come to order.
4 This is the second day of the 26th meeting of the Advisory
5 Committee on Nuclear Waste. We introduced everyone
6 yesterday morning at the beginning of the meeting, so I will
7 just move right into what we are doing today.

8 We had at 8:30 this morning a meeting with the
9 four NRC Commissicners. We are now moving into the
10 afternoon session of our agenda. We have two formal items
11 on the agenda. The first one is to discuss with the NRC
12 staff their plans for reviewing DOE study plans and DOE site
13 characterization progress reports, and then we are going to
14 hear a briefing by the NRC staff on the results of the their
15 review of the DOE study plans and site characterization
16 project reports for the proposed Yucca Mountain high level
17 waste repository.

18 Then the Committee will go into Executive Session
19 and wrap up final items prior to the adjournment of the
20 meeting. This meeting is being conducted in accordance with
21 the provisions of the Federal Advisory Committee Act and the
22 Government in the Sunshine Act. Charlotte Abrams is the
23 designated Federal official for the initial portion of this
24 meeting.

25 The rules for participation in the meeting have

1 been announced as part of the notice published in the
2 Federal Register. We have received no written statements
3 nor have we received any requests from members of the public
4 to make oral statements at the meeting. However, as is our
5 established policy, if there is any person here in the
6 audience that, after a subject has been discussed believe
7 that they have something to contribute or useful information
8 to share with the Committee, simply check with us and we
9 will provide time for you to offer your comments.

10 A transcript of the formal presentations is being
11 kept, and it is requested that each speaker first go to one
12 of the microphones, identify yourself and speak with
13 sufficient clarity and volume so that you can be heard.

14 We will move on then. The first item is as
15 announced a few minutes ago. Bill, do you have any comments
16 before we call on King Stablein?

17 MR. HINZE: Yes, I do have a few comments Dade.
18 It is suggestions really and concerns. First of all, with
19 regard to the review plan for the staff review of the study
20 plans, I would hope that we could minimize the repetition of
21 the material that King so ably directed to us last February.
22 I think we have that in mind. We are interested in the
23 document and what changes have been made in it.

24 As a result of that February meeting we did have a
25 number of items that were left open, questions that were

1 left open. We would hope that in your presentation King,
2 that you would direct yourself to those. We may have to
3 remind you of some of those again.

4 I also note that in the discussions we have had
5 previously that originally it was assumed that the NRC would
6 be receiving some 50 study plans during 1990. There has
7 been a very significant shortfall on that, and it would be
8 interesting and helpful for us to learn what impact that has
9 had. We would also hope that you would review the general
10 study plan situation with us.

11 I also would be remiss if I did not mention that
12 we have only just within hours received this document. The
13 MOU with the EDO says that we will receive these documents
14 in a timely fashion. I note that in the transcript of the
15 meeting of last February that there was a discussion here by
16 King about intending to get these items to us far enough in
17 advance so that we would have an opportunity to review them
18 in some detail. I want to encourage King and his colleagues
19 to follow out with the MOU from the EDO as much as possible.

20 Looking onto the study plans, there is a great
21 deal that could be covered in those. I think we are
22 interested in your concerns about the study plans. With
23 respect to the transport pathways study plan in particular,
24 I think that one of the items that we would like to have you
25 direct yourself to as much as possible is the sampling

1 problem, the representativeness problem, and this discussion
2 -- I don't believe we have seen before -- the prototype
3 testing to develop a sampling plan. It would be helpful if
4 we could learn something about that.

5 Speaking for myself, I feel that is extremely
6 important. With that, unless there are further comments by
7 the Committee, I would suggest that we would ask King to
8 proceed.

9 MR. STABLEIN: Good afternoon. My name is King
10 Stablein, representing the Division of High Level Waste
11 Management. As Dr. Moeller and Dr. Hinze have indicated, I
12 am here to discuss the study plan, review plan, and the SCP
13 progress report review plan with the Committee. Does
14 everyone have a copy of the briefing charts, because there
15 won't be any viewgraphs. I am just going to sit at the table
16 and discuss these with the Committee.

17 MR. MOELLER: Fine, that's good.

18 MR. STABLEIN: I took note of Dr. Hinze's opening
19 remarks and tried to jot down as many as I could. I was
20 concerned about his saying that he didn't receive the
21 documents except just hours ago. I am going to leave with
22 that to the Committee to discuss internally, but I know that
23 we had some of these documents to our contact more than a
24 few hours ago. We may need to work on some back and forth
25 on the correspondence. The reason why I bring this up

1 specifically is that Dr. Hinze and I did discuss this in the
2 February meeting. I did say that we intended to get
3 documents down here in a timely manner. We made a strong
4 attempt this time, and although the comments and questions
5 on the study plans were not down too far in advance of the
6 meeting, the review plans should have been in people's hands
7 in time to review.

8 We will continue to work on this problem and get
9 the materials to you. It is still our intention to do that
10 in accord with the MOU. I have read the MOU, and we will
11 attempt to abide by it.

12 With regard to Dr. Hinze's first suggestion which
13 is to -- he put this very kindly -- minimize the repetition
14 on the study plan, review plan. I think that's an excellent
15 idea, and I think the briefing charts indicate that I intend
16 to minimize repetition. I will probably move rather rapidly
17 through them. However, whenever you all have questions you
18 stop me and I will dwell on those particular points. My
19 intention is not to spend too much time in either review
20 plan, but especially the study plan review plan which we
21 went over last February.

22 Unless there are any questions of me at this time,
23 I am going to move into the briefing package, starting again
24 with the background on study plans and study plan reviews.
25 This is material that we covered before. We all know that

1 the study plans are detailed plans for implementing the
2 investigations which were laid out for us by DOE in the SCP.
3 DOE is still planning to put out 106 study plans, of which
4 we have received 14 officially at this time. I will come
5 back and address specifically the status of the study plans
6 we have received and the impact of that, as Dr. Hinze
7 mentioned, later on.

8 The study plans are being done based upon the
9 agreements that were reached during a level of detail
10 agreement meeting between NRC and DOE in 1986. We have
11 agreements pertaining to the review of study plans, that DOE
12 will provide them to NRC six months in advance of start of
13 work when possible. NRC will provide major concerns back to
14 DOE within three months and other concerns within six
15 months. We hope to do better than that, as you have
16 probably already observed in reading the revised study plan
17 review plan.

18 We issued the draft study plan review plan in
19 December of 1987, and we have just issued the study plan
20 review plan that we are talking about today. The purpose of
21 study plan reviews remain the same as they were before. The
22 identification of concerns with DOE's plans to gather
23 information needed to resolve licensing issues and, as well,
24 auditing the process by which DOE develops its plans for
25 characterizing the site.

1 We get to where the changes have occurred in the
2 study plan review plan. On page four you will see that we
3 now have the two phase approach to review of study plans.
4 Before it was the three phase approach. We had the
5 acceptance review, the start work review, and the detailed
6 technical review. We have attempted to streamline this
7 process based on our experiences in reviewing study plans
8 over the past year, and we now have a phase one review and
9 detail technical review.

10 The phase one review is a combination of the
11 acceptance and start work reviews and modification of those
12 reviews to some extent. In the phase one review we will
13 review every study plan that is issued by DOE. That was the
14 case for the acceptance start work reviews before. We will
15 review them, first of all, for consistency with the NRC/DOE
16 study plan content agreement, the availability of study plan
17 references, and whether the study plan was developed under
18 an acceptable QA program.

19 Assuming that the study plan is satisfactory in
20 those regards, the phase one review is conducted to identify
21 any objections with the study plan related to potential
22 adverse effects on waste isolation, potential adverse
23 effects on the ability to characterize the site, or an
24 acceptable QA program not being in place for the activities
25 to be performed. The nature of objections is there would be

1 irreparable and unmitigable damage to the site or to the
2 site characterization program or to the eventual usability
3 of the data for licensing if DOE were to proceed with the
4 activities described in the study. Therefore, NRC
5 recommends that DOE not proceed with the work until
6 objections are resolved.

7 This is the same definition which we have used
8 consistently in the review of the site characterization plan
9 and the study plans.

10 In addition, if DOE has proposed in the letter
11 transmitting a study plan to the NRC that certain NRC items
12 be closed and these open items are the ones that have
13 resulted from past reviews of documents such as the site
14 characterization plan or other study plans, or other open
15 items that have been identified and documented from NRC/DOE
16 interactions, then the staff in the phase one review
17 evaluates the material provided to see if in fact the open
18 items should be closed.

19 MR. HINZE: Excuse me, King. Has that actually
20 happened; have they asked to close out any items?

21 MR. STABLEIN: That hasn't happened to date.

22 MR. HINZE: Do you take the initiative as part of
23 this, do you take the initiative to see if there is
24 something in the study plan that might close out one of your
25 SCA comments?

1 MR. STABLEIN: Specifically in the detailed
2 technical review which we will be talking about, we would be
3 taking the initiative to review the material for progress
4 toward resolution of open items. However, the phase one
5 review does not cause us to take that initiative.

6 MR. MOELLER: Once again, I didn't follow the
7 answer. You depend upon DOE to request the closing out of
8 an open item?

9 MR. STABLEIN: That's correct. Finally, the last
10 part of the phase one review is the determination by the
11 staff reviewing the document whether there is a need to do a
12 detailed technical review. When we move to the next phase
13 of the review of study plans, the detailed technical review,
14 you will note that we are not going to review all study
15 plans at that level. The staff makes a determination
16 whether a need exists to do a detail technical review.

17 Before I move on to the criteria for that --

18 MR. POMEROY: Excuse me, King. Clarify that for
19 me, perhaps. How is that determination -- what elements go
20 into that determination?

21 MR. STABLEIN: Why don't we move to page five then
22 and take up that topic.

23 MR. POMEROY: If you would prefer to do it later,
24 that's fine with me.

25 MR. STABLEIN: That's fine. I was going to first

1 take on any questions regarding the phase one review itself
2 prior to going into the criteria. If there are no questions
3 right now on the phase one review other than that, I will
4 just move into how the staff determines that there is a need
5 for the detailed technical review.

6 Page five shows the items that are taken into
7 consideration as we decide to recommend to management that a
8 detailed technical review needs to be done. If the material
9 is related to key site issues that have been identified,
10 then the study plan is a candidate for detailed technical
11 review. Or, if it relates to SCA or other NRC open items,
12 if unique or non-standard or controversial tests or analysis
13 methods are contained within the study plan there will be
14 sometimes the desire just to pick a study plan and do a
15 detailed technical review as kind of an audit of the process
16 by which they are developing the study plans to see how well
17 DOE is progressing in this area.

18 Finally, there may be selected procedures, again,
19 ones that are usually non-standard or unique that we may
20 choose to do a detailed technical review of.

21 There has to be something significant about the
22 study plan that calls for us to do a detailed technical
23 review. We could review all of them. The staff would be
24 more than happy to. Technically they are very interested in
25 getting into the material. However, due to budget and

1 resource constraints with 106 of these plus the other
2 documents that we have to look at and the proactive work
3 that is going on, we know that we cannot. So, we have to
4 make some distinctions and choose to do some detailed
5 technical reviews.

6 MR. ORTH: All study plans are not quite equal.
7 The 14 that you have out of the 106 or so that you expect in
8 terms of volume or work, can you make an estimate of how far
9 into that business you are? I should say how far DOE is
10 into turning study plans over to you.

11 MR. STABLEIN: I want to make sure that I
12 understand the question. We have received 14 out of the
13 106.

14 MR. ORTH: They are not all equal in the volume
15 and amount of work to generate them or answer them.

16 MR. STABLEIN: Right, that is true.

17 MR. ORTH: So, how far are we into them
18 percentage-wise, as a guess.

19 MR. STABLEIN: We sent DOE a letter on November
20 27th in which we summarized the status of our reviews of DOE
21 study plans. It lists the 14 and it shows how many we have
22 completed phase one reviews on, and how many we have done
23 detailed reviews on or are in the process of completing. As
24 far as the phase one reviews, we have completed four and we
25 have four in progress.

1 We have completed or virtually completed --
2 counting the two that you will hear today -- four detailed
3 technical reviews. Some of the reviews are being deferred
4 because the study plans we have relate to the exploratory
5 shaft facility, and DOE is currently undergoing an
6 exploratory shaft facility analysis of alternatives. When
7 they choose an alternative it may change the content of the
8 study plan. So, we are not engaging in reviews of all of
9 these right now.

10 Did that address your question?

11 MR. LINEHAN: If I could just respond further to
12 that. Out of the 14 study plans there were five related to
13 exploratory shaft construction, which is up in the air right
14 now exactly what the method is going to be for the
15 exploratory shaft. I would say that they are not very far
16 along at all in the study plans that they have submitted to
17 us.

18 As you will see in the presentations today using
19 the volcanism as an example, I believe it is just one of
20 many study plans that deal with volcanism. They are really
21 just starting the process right now.

22 MR. MOELLER: That was what I saw Don's question
23 as asking. If there are 14 in and let's say instead of 106
24 there are only going to be 100 -- do these 14 represent 14
25 percent of what you anticipate or only five percent or do

1 they represent one-half of what you really anticipate, or is
2 there really no way to tell?

3 MR. STABLEIN: They don't represent half of what
4 we anticipate. I can't give an exact percentage, but I
5 would say that based on what we have received they would be
6 14 percent or less of what we anticipate. A couple of them
7 have been pretty media and a couple of them have been fairly
8 narrow focus. It is roughly at that level.

9 Going on with the detailed technical review, the
10 purpose of the review is to judge the adequacy of the study
11 to provide the information needed for licensing and also,
12 progress toward resolution of SCA or other NRC open items.
13 Here, we do take the initiative to examine the document
14 ourselves to see whether the DOE has started to address open
15 items that the study plan relates to.

16 That is all I was going to say about study plan
17 review plan, except to look at Dr. Hinze's question. Let's
18 see what we haven't talked about. How many study plans did
19 you receive and what impact it will have, we have received
20 the 14.

21 MR. HINZE: Let me explain.

22 MR. STABLEIN: Go ahead.

23 MR. HINZE: It must be very difficult to manage
24 personnel when you anticipate 50 and receive 14, and some of
25 those you aren't reviewing. What is the impact of this?

1 Have you focused more closely upon some of these, or does
2 this result in more detailed review? I notice that several
3 of these study plans have taken over six months to review,
4 and does this mean that as a result you have spent more time
5 on them than you would have anticipated at the beginning of
6 the year?

7 MR. STABLEIN: First of all, it does get a bit
8 tricky when you anticipate perhaps on the order of 50 and
9 you get 10 or 15. On the other hand, if they do continue to
10 be spread out and we receive them in small numbers per
11 month, we can adjust our resources to a certain extent to
12 accommodate those.

13 MR. HINZE: There is also a technical aspect to
14 that. One of the statements on page four 2.3, in addition a
15 study plan is to be examined relative to other available
16 study plans which are designed to acquire complementary
17 information. The key word there perhaps is available. One
18 would hope that you would have a fairly appropriate
19 synthesis of a problem with a series of study plans, and if
20 they are not available does this make it more difficult to
21 evaluate a specific study plan where you don't have the
22 complementary study plans? How much of a problem is this?

23 MR. STABLEIN: I think this might be an
24 interesting question for you also to get into with the
25 technical folks who will be presenting the reviews of the

1 two study plans later today. It appears to me that one of
2 the most difficult aspects of reviewing the study plans -
3 these early study plans -- is that we don't have the context
4 of the body of study plans in which to review them. You
5 will especially notice this in the case of the volcanism
6 study plan that we just finished reviewing.

7 MR. HINZE: Is there in this review process, a
8 caveat which permits you to go back and to look at a study
9 plan that you have already started work for and see that
10 actually as you have seen them in context that there is a
11 whole in the acquisition of the data that is required for
12 licensing?

13 MR. STABLEIN: It is not written specifically into
14 the review plan, but what I would anticipate happening is
15 that at the time that we review the later study plans, that
16 the hole that you are talking about if it exists and can
17 only then be identified, would be picked up in the review of
18 that study plan and would be captured either in comments or
19 questions or in the cover letter to DOE.

20 MR. HINZE: I have a few other questions.

21 MR. STEINDLER: Can I pursue that particular point
22 for one shot?

23 MR. HINZE: Go ahead, please.

24 MR. STEINDLER: How does the review and acceptance
25 of the study plan relate to information that is expected to

1 be obtained from sources, say the literature, but
2 nonetheless anticipated to be used in licensing? Is it the
3 staff's intent to provide not only a test of quality
4 assurance in some fashion or another according to your
5 technical position which we have commented on before, but
6 also the format and content of a comparable study plan as a
7 test of acceptance of literature that you haul out of the
8 published journals or that DOE would haul out of the
9 published journals?

10 Do I make myself clear?

11 MR. STABLEIN: I didn't follow you, no.

12 MR. STEINDLER: Let me try it once more.

13 Unfortunately, I don't have a concrete example for you.
14 Supposing you in fact review and accept a study plan on
15 Topic A, a portion of the information provided in the
16 license application by DOE on Topic A and its enlargement is
17 obtained as is likely out of printed scientific technical
18 literature. Is the staff anticipating that they are going
19 to provide as a test of acceptability for the licensing
20 process of that literature reference, the comparability
21 between what appears in the literature and how it was done
22 to the study plan that you approve?

23 MR. STABLEIN: I believe I understand the question
24 now. John Linehan may wish to help me out with this. Any
25 data that DOE would use in the license application which was

1 acquired from the scientific literature would have to be
2 qualified by a QA process. If it's qualified by a QA
3 process then I don't believe it would require some other
4 test of comparability --

5 MR. STEINDLER: No further test is required, thank
6 you. That's not a potentially trivial issue if you want to
7 argue about how much litigation is going to get involved in
8 this process. Thank you.

9 MR. HINZE: King, I find myself in one of the
10 duties that has been assigned to me as an ACNW member,
11 chairman of the QA working group. That is an interesting
12 task. In view of that, I would appreciate some feeling in
13 terms of the percentage of time that the staff puts in on
14 the QA aspects in this two-step process in contrast to what
15 I would call technical aspects. Is this five percent, 50
16 percent, and do you have enough of a sample to really make a
17 respectable conclusion to that.

18 MR. STABLEIN: We do have enough of a sample I
19 think, to make a respectable conclusion. On the study plan
20 review itself during the phase one review, probably five to
21 ten percent of the time devoted to it would be the QA
22 review. I would say ten percent at the most.

23 What we want to remember is that a lot of the QA
24 examination of study plans can be done by QA audits as well,
25 and I am not counting that time in, and I don't think that's

1 what you intended.

2 MR. HINZE: Right.

3 MR. STABLEIN: In the straight phase one review,
4 it would be no more than ten percent.

5 MR. HINZE: Is there any on phase two?

6 MR. STABLEIN: I don't believe there is any in
7 phase two. It is strictly detailed technical review.

8 MR. HINZE: I have some additional questions. On
9 page five, the second paragraph, you understand that we have
10 only has this for hours. What I do -- the fact of the
11 matter is that we only received it on arriving to
12 Washington.

13 The last sentence of that paragraph states,
14 results of the detailed technical review are to be
15 transmitted to DOE ordinarily within four months of NRC
16 receipt of the study plan. And -- that's the question I
17 want to get to -- and, any procedures requested by NRC. I
18 presume these are not technical procedures. I learned early
19 in the game that NRC can't tell DOE what to do technically
20 but can only respond, if I understand correctly.

21 What procedures are alluded to here, and perhaps
22 some clarification in this document might be helpful.

23 MR. STABLEIN: They are technical procedures. NRC
24 can request of DOE any technical procedures referenced in
25 the study plan.

1 MR. HINZE: Once the item has been opened in the
2 study plan --

3 MR. STABLEIN: That is also something that DOE is
4 required to list in the study plan, are the procedures
5 supporting the study plan.

6 MR. HINZE: It might be worthwhile to consider
7 making that point very clear that this is not a procedure in
8 terms of the valuation of the review, but that this is
9 really a technical procedure.

10 MR. STABLEIN: Thank you.

11 MR. HINZE: Moving on to page 14 which goes to
12 section eight on the Advisory Committee interactions, again,
13 the last statement. It appears that I have been selective
14 in my perusal of this. It says a briefing will then be
15 scheduled for an appropriate time. Is that prior to the
16 time that this is submitted to DOE? What does appropriate
17 time there mean?

18 MR. STABLEIN: An appropriate time was left open
19 to allow flexibility for both the Committee and for the
20 staff on a time that fits your agenda, needs that you might
21 express, in terms of the interest level that you have in the
22 document compared with what other agenda items exist, and
23 when we can get down here to give you the briefing.

24 It wasn't meant to relate to before or after
25 completion of the review or sending the letter to DOE in

1 which we communicate either phase one or detailed technical
2 review results. The briefing could be either before or
3 after either of those two events. Again, it depends on --
4 we are available to brief you on our reviews when the ACNW
5 expresses an interest in a particular study plan and the
6 review of it.

7 I feel almost like I am avoiding the question, but
8 that is not my intent. It is merely to say that at an
9 appropriate time does not designate before or after the
10 letters to DOE at all. It is just left wide open at this
11 point. It was meant to be -- this paragraph was meant to be
12 in accord with the ACNW/EDO/MOU. I trust that it is.

13 MR. HINZE: Thank you. As far as I am concerned,
14 unless there are more questions, we would ask that you
15 proceed then to the next item.

16 MR. STABLEIN: Very well.

17 The next item is something that you haven't heard
18 about before. It's the SCP progress report review plan.
19 Even so, I don't plan to dwell on it at great length except
20 for those areas where you have special interest and
21 questions. The SCP progress reports are required by NWPA
22 and Part 60 to be issued at a minimum of six month
23 intervals. They are required to cover progress results and
24 changes related to the site characterization program.

25 They include site investigations, repository and

1 waste package designs, and performance assessments. We
2 received the first progress report in March of 1990. We
3 sent comments to DOE in June, and we subsequently issued the
4 progress report review plan in August of 1990. The purpose
5 of our progress report reviews, first of all, we have an
6 NWPA and Part 60 responsibility to review those progress
7 reports. We plan to continue the pre-license application
8 review and consultation process for early identification and
9 resolution of potential licensing issues which is always the
10 role that we are playing during this pre-licensing
11 application phase.

12 The approach to the review of SCP progress reports
13 is to look at and focus on three items; the progress
14 reported, the changes to the SCP study plans, and evaluation
15 of resolution of NRC open items. In looking at the
16 evaluation of the progress reported by DOE in the progress
17 report, they can report progress in the resolution of DOE's
18 own issues which make up the issues hierarchy that is the
19 backbone of the SCP. They can report on work that they have
20 completed, and they can also report on ongoing work.

21 We will be examining all of those. We feel no
22 need to comment on those however, unless for example we
23 would disagree with the resolution of DOE issues or if we
24 disagree with the work that they have completed, that it has
25 been satisfactorily completed or that it has yielded the

1 results for licensing that it was intended to obtain, or if
2 we have some problem identified with the work that is
3 ongoing.

4 In terms of the evaluation of changes to the SCP
5 and study plans, DOE is supposed to keep NRC up to date on
6 significant changes to the SCP or study plans. One way they
7 may choose to do that would be in the progress reports,
8 although we would anticipate knowing about it through other
9 mechanisms perhaps prior to the progress reports. Again,
10 there is not automatically a need to comment. If they have
11 not exacerbated some concern, raised a new concern or
12 resolved some NRC concern, we may have nothing to say in
13 this regard.

14 One point that I wish to emphasize that doesn't
15 come across clearly in the progress report review plan is
16 that we will also be looking to see whether on the basis of
17 the progress that DOE has reported and the information they
18 have obtained, whether there are some changes that perhaps
19 should be made to the SCP or the study plans which have not
20 been made. We would then call those to DOE's attention too.

21 You recall that the site characterization program
22 is an iterative, ongoing process, and it is anticipated that
23 DOE will make changes to that program as they go along. If
24 we identify changes that we think they need to make and they
25 haven't made as reflected in the progress report, then we

1 would find it necessary to identify that for DOE as well.

2 MR. STEINDLER: Do you anticipate re-review of a
3 study plan that has been modified because of progress?

4 MR. STABLEIN: DOE has committed to informing us
5 of significant changes to any study plan, and sending those
6 to us. We will at least look those over. I am not
7 committing to going through an entire study plan review
8 again, but we would expect to evaluate that material to see
9 if it causes us concern.

10 MR. HINZE: I have a couple of questions that are
11 not specifically on the review plan but that are tangential
12 to the whole problem or to the whole concern. You have only
13 received one of the progress reports.

14 MR. STABLEIN: That is correct.

15 MR. HINZE: Is there anything built into the
16 review plan or any other documents by which you can express
17 your concern to DOE for the lack of timeliness and the
18 receipt of these documents because progress is going on. Is
19 there any mechanism by which you are getting that point
20 across?

21 MR. STABLEIN: There are mechanisms for that.
22 They would probably be handled at the management level
23 verbally or in writing. John Linehan could better comment
24 on that.

25 MR. LINEHAN: While I agree with you that there is

1 work going on, one of the reasons we haven't made this an
2 issue with DOE is that there is not a lot of site activity
3 going on right now. In addition, they have recently gone
4 through a reorganization and they are changing a lot of the
5 things they are doing, their management, how they report
6 things. We haven't seen it being a major issue, a lack of
7 access to data at this point in time.

8 Once they start doing more work, once they get
9 that structure working smoothly, it would indeed be a
10 significant management issue if they don't come in, in a
11 timely manner every six months.

12 MR. HINZE: To the best of my knowledge, we have
13 received no information from DOE that would indicate that
14 they have changed their schedule which includes the start of
15 surface activities at Yucca Mountain after January 1. That
16 certainly also involves the prioritization study that is
17 going on for the surface base studies.

18 Where are you people in terms of reviewing that
19 document, how is that interfacing with this progress report,
20 how is all of this interfacing? Certainly, if they are
21 going to stick even reasonably to the first of January which
22 I guess we can all assume that they are not going to do but
23 we have no formal notification of that, certainly one has to
24 be concerned about having a progress report that you can
25 really make some comments to.

1 MR. LINEHAN: With respect to the first of
2 January, there are two activities DOE has focused in on for
3 both of which we have completed detailed study plan reviews.
4 It is the calcite silica and the trenching in Midway Valley.
5 With respect to those two activities DOE is conducting
6 readiness review to make sure that all of the quality
7 assurance technical issues that need to be resolved before
8 they start those activities are taken care of or, if they
9 are in progress that they are not an obstacle to starting
10 those activities.

11 We are going to be taking part in those readiness
12 reviews. The Midway Valley is next week, and the one on the
13 calcite silica is I believe the second or third week of
14 January. With respect to the surface based prioritization
15 this is just my understanding. I am not sure what the
16 department's position is. That is an activity they are
17 working on. They did give us a briefing as part of a
18 technical exchange on another topic.

19 We haven't seen much of anything to date. They
20 are still working on it themselves, whatever this plan is
21 and how they are going to go about doing it. They have
22 indicated that they will consult with us as they get further
23 along in development. I think what is happening I think is
24 similar to a lot of the initiatives that Dr. Bartlett is
25 taking at DOE, that they take some time to develop these

1 things and get them up and running. In the interim, DOE is
2 giving priority to these two particular activities that I
3 mentioned earlier.

4 I am not sure when the whole thing is going to
5 come together.

6 MR. HINZE: The prioritization plan is de facto a
7 progress report, if you will. It's an iteration on the SCP.
8 It really fits within this broad category of progress
9 reports, if you will, and that's why I thought it was
10 germane to this discussion to try to bring out what is going
11 on in that area. As I understand you, you do not know at
12 this point when you will be receiving that. Will you be
13 receiving that -- will that be handled like a progress
14 report, or will this be handled like the SCA, or what is the
15 mechanism that you will use to respond to the prioritization
16 plan?

17 MR. LINEHAN: I can't give you a good answer on
18 that, because it is not totally clear in our mind exactly
19 what that report or that plan is going to do. If it simply
20 changes the schedule for some activities we will look at it.
21 I am not sure it would be a major concern to us. If it
22 makes changes to the investigations in the SCP study plans
23 that we have looked at, then we would indeed review it like
24 we have some of the other documents to see what the effect
25 was.

1 As you said, it is a type of progress report.

2 MR. HINZE: You would not have to have any request
3 from DOE to review that, since it really --

4 MR. LINEHAN: No, not at all. In fact, on our own
5 initiative through the onsite representatives that we have
6 located in Las Vegas we kept abreast of DOE's initial
7 efforts to scope and plan out what was going to be done with
8 respect to this prioritization.

9 They do keep us abreast of the activities that are
10 going on. DOE is very good as keeping us informed. We will
11 have some opportunity -- I am not sure what it is -- before
12 they finalize that to be briefed on it or something. I am
13 not sure what the plan will be.

14 MR. HINZE: John, if I may, I would like to ask
15 that you keep the Committee informed in terms of what DOE is
16 reporting to you in terms of when it might be expected and
17 so forth. We would very much appreciate that.

18 MR. LINEHAN: We would be glad to.

19 MR. HINZE: Mr. Bartlett's schedule called for the
20 testing in the surface base testing to begin on the first of
21 the year, and as you say they keep you well informed and so
22 forth. What is your learned opinion about when we might
23 expect to find that there would be -- although you can't
24 predict what the courts are going to do of course -- do you
25 have any feeling, is there anything coming down the pike

1 that would give us any indication?

2 MR. LINEHAN: We really don't have any sense. Dr.
3 Bartlett, I think it was Admiral Watkins did write to
4 Congress and expressed his concern and indicated that some
5 initiative was needed from them. We just have no sense of
6 what is going to happen. DOE is proceeding, as I said, with
7 the readiness reviews so that if something does happen
8 whereby they get a permit or Congress takes some action they
9 are ready to start.

10 From the NRC standpoint, we have a few issues with
11 them. We assume these can be resolved in a very timely
12 manner -- they are not major issues -- before they start
13 those two activities. Hopefully, those will be resolved
14 during the two readiness reviews.

15 MR. HINZE: It is my understanding that there are
16 a number of investigations which could be conducted over
17 Yucca Mountain at this point without a permit from the
18 state. Are there any plans -- there are a lot of
19 geophysical types of measurements that one can make without
20 disturbing the soil and so forth. Is there any indication
21 that these will be started up even without the permitting to
22 try to maintain a schedule?

23 MR. LINEHAN: It is my understanding that the
24 permitting just doesn't relate to punching holes in the
25 ground, something evasive. Anything where you might --

1 where you have to drive a truck down a road that creates
2 dust or off of a road -- I think it is things of that nature
3 that the state is also has concerns on. I don't believe DOE
4 can proceed with anything. If you can add to that Phil,
5 of if there is anyone from DOE that would be comfortable
6 addressing that.

7 MR. JUSTUS: There is work going on now that is
8 geological in nature. For example, mapping of fractures on
9 pavements that have already been cleared, it is my
10 understanding that there is some mapping of volcanic terrain
11 going on and samples are being collected. There is, of
12 course, some longstanding ongoing operations such as the
13 continuation of various monitoring network such as the
14 seismic monitoring.

15 MR. HINZE: Thank you.

16 MR. MOELLER: I just had a question. I gather the
17 SCP progress reports will be a major form of written
18 communication between DOE and the NRC; am I correct?

19 MR. STABLEIN: They could be, right. They could
20 be a summary of the progress over that six month period,
21 they could inform not only the NRC but the public as well of
22 issues that have been resolved, work that has been completed
23 and they could be a very powerful instrument of
24 communication.

25 MR. MOELLER: Are the ongoing meetings and

1 exchanges between the NRC and DOE staff's at such a level
2 that you would anticipate very few surprises in any of these
3 progress reports? In other words, wouldn't you anticipate
4 that most of what is in the progress report you would have
5 already heard, or am I wrong on that?

6 MR. STABLEIN: At this stage in the program that
7 is certainly the case. If DOE once swung into full site
8 characterization and had tens to hundreds of activities
9 going on, it is conceivable that there would be some that we
10 would not be as on top of as we would like to be over any
11 six month period. In general, we would not anticipate many
12 surprises.

13 MR. MOELLER: Thank you.

14 MR. POMEROY: I have a couple of unrelated
15 questions. Going back to the surface based testing
16 prioritization task force report, I think I heard it said
17 that if there were simply a rearrangement of tests within
18 that report that you might not review it in great detail. I
19 am concerned that at least in some aspects of that report
20 that people are using expert judgment in making decisions
21 with regard to that testing prioritization.

22 I wonder if you have any plans to look at the
23 methodology which is used to rearrange that testing at all?

24 MR. LINEHAN: At the present time we have no plans
25 to look at these of expert judgment if they are just talking

1 about rearranging the sequencing of the testing, the
2 prioritization. If they get into the use of expert judgment
3 to determine whether or not they have to collect data,
4 additional data versus using a group of experts to come to
5 some decision based on the existing data, we would indeed
6 get involved in that type of review.

7 We are concerned about the prioritization. We
8 indicated that in the transmittal letter on the SCA. It is
9 not a primary regulatory responsibility that we have. It is
10 up to DOE to run the program. We are encouraging them
11 though to try to look at the major issues first, and we will
12 continue to do that. It won't be in the formal sense that
13 we review a progress report if the office director takes
14 issue with something that DOE is doing.

15 MR. POMEROY: Thank you. The other question has
16 to do with the review process itself or progress reports or
17 study plans. Do you do all of this review work in-house, or
18 do you utilize the center for some of that review process,
19 do you use outside contractors? I suspect the answer may be
20 different for different purposes, so could you elaborate on
21 that a little bit?

22 MR. STABLEIN: For the study plan reviews to date,
23 we do the phase one reviews in-house. We don't use the
24 center. For detailed technical reviews we can use the
25 center, we can use the office of research or any other

1 segment of the NRC that might provide expertise to us that
2 we don't have in high level waste management. When we go to
3 outside contractors it is the center that we would go to.

4 MR. POMEROY: You used the word can. I would like
5 to ask to date have you done that?

6 MR. STABLEIN: I am thinking back. I think Phil
7 Justus may be able to help me. It seems to me that we did
8 involve the center and/or research in some of the detailed
9 technical reviews. We did use someone from the Office of
10 Research on one of the detail technical reviews you will
11 hear about today.

12 It seems to me that we went to the center on one
13 detail technical review, but my memory is a little foggy on
14 that.

15 MR. BROOKS: I can help you. We used the Center
16 and Research on the Mineralogy -- that's not true -- on the
17 regional hydrology review. We used the office of research
18 in the volcanic review. We did the mineralogy petrology
19 more or less in-house. It is basically looking at staff
20 availability and expertise needed.

21 MR. JUSTUS: May I add something to that?

22 MR. HINZE: Please.

23 MR. JUSTUS: I will correct a little bit of
24 detail. I think the question was getting at why we might or
25 not utilize outside help or help from the center. We had

1 some very specific technical activities that needed to be
2 reviewed in the Quaternary hydrology study plan for which we
3 had little or no in-house expertise. For example, there was
4 a section on the dating of ostricods in plialake deposits
5 that was a method of conducting stratigraphic analyses to
6 determine the relative age and environment of various
7 deposits.

8 The NRC does not have such specialty in the
9 organization, and it is customary for us to utilize
10 contractors for things like that. There are some other
11 cases like that. Another one that comes to mind is in the
12 area of some aspect of remote sense imagery interpretation
13 for which the center did have an expert that we called upon
14 to help us.

15 MR. POMEROY: Did they also have an expert on
16 dating of -- using ostricods?

17 MR. JUSTUS: They did subcontract that.

18 MR. POMEROY: Thank you.

19 MR. HINZE: Are there any more questions?

20 MR. OKRENT: There was a response earlier that if
21 expert judgment were used inside whether or not more data
22 were needed, staff would review this aspect of the work. I
23 am curious in what form the staff review would take and how
24 you would proceed if either your own experts or your
25 external experts gave you an opinion somewhat differing?

1 How would you view which experts are right or wrong or what?

2 MR. LINEHAN: The main thing we would focus on is
3 the process that DOE would be using. There are certain
4 criteria laid out in various places as to an acceptable way
5 of pulling together a panel to come up with expert
6 judgments, the qualifications of the people, their
7 backgrounds, individuals that are independent of the project
8 and things of that nature. We would look at the process.

9 We wouldn't try to second-guess them unless we
10 felt very, very strongly on a major issue. If we had
11 technical experts that vehemently disagreed with them, it
12 would be mainly the process that we would be focusing on.
13 We would also be trying to make a determination as to
14 whether or not it was reasonable to obtain additional data.

15 One of the concerns that we had in reviewing the
16 SCP was that in certain areas it could be read that DOE,
17 rather than going out and collecting data that they could
18 have easily obtained, might have deferred to pulling a group
19 of experts together to make a determination as opposed to
20 getting some of the basic data that we felt might be needed.

21 MR. OKRENT: Is that good or bad to use experts if
22 you think they can provide you a meaningful answer?

23 MR. LINEHAN: We feel that if there is data there
24 that can be obtained reasonably that in general it may vary
25 case by case, but in general you should go after that data

1 to obtain your basic understanding of the site and what is
2 going on there or what may go on.

3 MR. OKRENT: Do you think more data will always
4 improve understanding and reduce uncertainty?

5 MR. LINEHAN: No. You reach a point where you
6 don't continue collecting data. Our concern was areas where
7 they felt they were not going to get some of the basic data.
8 As you collect the data I think you have to do analysis.
9 That is why we are encouraging the capability of performance
10 assessments. You can do sensitivity analyses, you can make
11 determinations as to whether or not it is going to be
12 meaningful to go after more data.

13 I think we recognize in some cases you are going
14 to reach that point where you are not going to reduce
15 uncertainty with more data. It is obtaining data that will
16 give you a good basic understanding, having looked at all
17 the reasonable ways of obtaining data before you throw it to
18 a group of experts for this expert judgment call.

19 MR. OKRENT: How do you judge when it is
20 reasonable to go and get more data? It seems to me itself
21 to be a judgmental call.

22 MR. LINEHAN: I think it is judgmental, and I
23 think the use of sensitivity analysis and other mechanisms,
24 I think there is a lot of judgment involved. I can't give
25 you a clear cut answer. It is going to -- from the NRC

1 standpoint it is going to be reviewing what DOE has done to
2 make the case where it is not worthwhile getting data even
3 though they have residual uncertainties.

4 They will have to make a case that it is not
5 worthwhile getting more data, they will have to look at it
6 in terms of what that uncertainty will mean to the overall
7 performance of the or determining the overall performance of
8 the site. I think it's a very complex type of activity. As
9 I said originally, I think basically we are going to try to
10 focus on the process DOE is using when they invoke this
11 expert judgment.

12 MR. OKRENT: You mention that there existed a
13 formal process for selection of expert panels and so forth.
14 Is this something that is written down and validated, or
15 whatever is the proper term?

16 MR. LINEHAN: I can't answer you. It is written
17 down. I don't know how well validated it is. I am not an
18 expert in that area. We have taken initiatives ourselves
19 when the program was still looking at three sites. There
20 were activities going on at the Hanford site where they were
21 using groups of experts. I forget the methodologies they
22 referenced for pulling a group together like this. There
23 were criteria that were laid out, procedures that had been
24 developed, and accepted by various segments of the technical
25 community at that point in time. I don't know what the

1 specific methods were.

2 I can't give you the answer to it, I just don't
3 understand it.

4 MR. OKRENT: Somewhere in the NRC staff is there a
5 definition of what constitutes an acceptable procedure for
6 constituting an expert panel and eliciting information?

7 MR. LINEHAN: We have developed some information
8 on that, yes.

9 MR. OKRENT: That is a vague answer, some
10 information.

11 MR. JUSTUS: I can give you an answer to complete
12 that particular question.

13 MR. OKRENT: All right, but I was asking a general
14 question.

15 MR. LINEHAN: Dr. Okrent, there is a Sandia report
16 that we had Sandia develop when they were our contractor on
17 the use of expert judgment. That was to lay out criteria,
18 acceptable methodologies for doing it.

19 MR. OKRENT: You endorsed that report? I am
20 trying to understand where the staff now stand --

21 MR. LINEHAN: I don't know whether we have
22 endorsed it. We don't have the people here that deal with
23 that. I was trying to respond to a question that was
24 raised.

25 MR. OKRENT: There is another group within NMSS?

1 MR. LINEHAN: It's the performance assessment
2 group that Seth Copeland heads up, the group working on the
3 iterative performance assessment. Unfortunately, we don't
4 have any of those people here with us today.

5 MR. OKRENT: I have read and probably heard it
6 said that the procedures used for assessing expert opinion
7 in connection with NUREG-1150, also an NRC document, would
8 and maybe should never be repeated. I am trying to
9 understand whether those are the things that you have in
10 mind or something less. It is not clear to me how you are
11 going --

12 MR. LINEHAN: I don't feel comfortable -- I don't
13 have the people here that are working on that that
14 understand it.

15 MR. OKRENT: There is somebody you think that is
16 able to answer that.

17 MR. LINEHAN: Yes. Seth Copeland, either he or
18 one of his staff. We would be happy to get back with you
19 folks on that with respect to where we stand on the Sandia
20 document. I am not sure how new it is, I don't know if we
21 have reviewed it and developed an independent position on
22 its adequacy. I just don't know. I know there are
23 activities in that area, but we would be glad to get back to
24 you on that.

25 MR. HINZE: Let's give Dr. Justus a chance to

1 respond to the question.

2 MR. JUSTUS: The example that I was going to
3 utilize to point out that the staff has taken a position on
4 existing methods of utilizing expert judgment to arrive at
5 conclusions for which there are no determinative answers are
6 in fact in NUREG-1150. The so-called Livermore and EPRI
7 methods for the valuation of probabilistic seismic hazard
8 are two methodologies that the staff have evaluated.

9 In the high level waste program in our seismology
10 group, we have also evaluated these two methodologies for
11 possible use for seismic hazard analyses in the high level
12 waste program, and we have tentatively concluded that either
13 method would be acceptable. Because they both have
14 attributes of acceptable methods, we are eliciting expert
15 opinions in the absence of real data that we would likely
16 find acceptable.

17 That is a draft position that we have right now.
18 However, it was expressed to the technical review board as
19 well.

20 MR. OKRENT: Neither of those are like what was
21 used to obtain expert opinion on a subject like the
22 likelihood of direct containment heating or various PRA
23 level two phenomena. In fact, you might almost say the EPRI
24 work and the Livermore work on seismic was something done
25 aside from NUREG-1150 which hardly touched seismic and only

1 chose not to differentiate them on the results of these two.
2 I must say that I don't feel quite satisfied certainly in a
3 sense by the example.

4 MR. LINEHAN: One of the things that we are
5 planning to do is, I believe January 25th or sometime at the
6 end of January you are holding a workshop on expert
7 judgment. At that time we will be prepared, and we have
8 committed already to go over what we have done in this area,
9 what our contractors have done, what our positions are on
10 those reports.

11 We will have the people there to field the types
12 of questions that you have.

13 MR. OKRENT: I was exploring a specific answer to
14 a specific question by Dr. Pomeroy. I think it is a very
15 hard question, and I thought perhaps it was answered almost
16 too quickly. The implication was that there might exist
17 methods of evaluating how DOE was doing it, and one could
18 decide this was okay and this was not. Let me leave it at
19 that.

20 MR. HINZE: Paul, did you want to comment?

21 MR. POMEROY: I just wanted to say that I do
22 appreciate that the staff will be here on the 25th of
23 January, and I do think we can explore this question at that
24 point in time.

25 MR. HINZE: With that, King, I believe we have

1 completed the discussion regarding the two documents.
2 Should we move now to the study plan reviews?

3 MR. STABLEIN: That would be fine with us, if
4 there are no more questions. Did you want to move to them
5 now?

6 MR. HINZE: Let's do it.

7 MR. STABLEIN: I would like to introduce the staff
8 member who reviewed the Mineralogy, Petrology and Chemistry
9 pathway study plan, did the detailed technical review.
10 Primarily this was an in-house review. John Bradbury has
11 appeared before you before to talk about study plan reviews.
12 As we hear from John, you can see how the detailed technical
13 reviews have gone of study plans because the detailed
14 technical review hasn't changed much from the other review
15 plan to this one.

16 MR. HINZE: It will be very useful to us. Thank
17 you. John, if you would, please.

18 MR. BRADBURY: I will present the results of the
19 detailed technical review on the mineralogy, petrology and
20 chemistry transport pathway study plan.

21 The objective of the study plan is -- there are
22 two objectives. One, to determine the three dimensional
23 distribution of mineral types, compositions, abundances, and
24 petrographic textures within the potential host rock; that
25 is, the Topopah Spring. The second objective is to

1 determine the three dimensional distribution of mineral
2 types, compositions, abundances in rocks beyond the host
3 rock that provide pathways to the accessible environment.

4 This information will be coupled with information
5 collected from the sorption study plans to yield information
6 on retardation of the radionuclides. It will also be used
7 in the context of determining where in the geologic
8 framework where we are.

9 There are five activities involved in this study
10 plan, and on the next page they are listed. The first
11 activity is the quantitative mineralogy of the host rock and
12 along transport pathways. This activity essentially will be
13 using x-ray diffraction techniques. That means that the
14 samples will be ground and an internal standard will be
15 added to the samples, and the area under the x-ray peaks
16 will be evaluated compared to the areas under the internal
17 standard peaks to yield information in terms of the
18 percentages of minerals present in the bulk samples.

19 The second activity is the internal stratigraphy
20 for the candidate host rock along with the x-ray diffraction
21 technique. There will also be petrographic work done. Thin
22 sections will be made because thin sections will provide
23 textural information and textural information can be used to
24 determine where one is in the stratigraphic column.

25 Apparently, it is important to determine or ascertain where

1 the repository horizon is placed in this host rock for
2 engineering reasons, stability of the facility.

3 MR. HINZE: John, if I may interrupt you on that
4 point. Isn't it very difficult to evaluate the study plan
5 without knowing what the exploration shaft facility
6 alternatives are going to be?

7 MR. BRADBURY: Evaluation of the study plan on the
8 one hand, it is difficult and on another hand --

9 MR. HINZE: It simplifies it.

10 MR. BRADBURY: Let me give you what I am trying to
11 say there. I am going to give you some of the conclusions
12 of the --

13 MR. HINZE: If I am getting ahead --

14 MR. BRADBURY: It's okay. First of all, these are
15 methods listed for characterizing the solids in Yucca
16 Mountain, not liquids -- they are not being characterized in
17 this study plan. The term chemistry along transport
18 pathways only has to do with the chemistry of the solids.

19 The methods that have been proposed here are
20 conventional methods and reasonably selected methods. These
21 methods will meet or should meet the objectives of the study
22 plan. How the information is used to ascertain how the site
23 will perform is beyond my review. It remains an open item.
24 That is to say, the types of minerals present and their
25 amounts and compositions may, in the long run, not be

1 important to how the site performs.

2 I don't know the answer to that, and I don't think
3 at this point anybody knows the answer to that.

4 MR. STEINDLER: You carefully chose the words that
5 the methods can meet -- should meet and I have forgotten
6 precisely how you stated it. I have two questions. Are the
7 objectives well enough defined in the quantitative way to
8 determine whether the methods chosen will meet that
9 objective?

10 Let me tell you where I am coming from. I don't
11 sense anything in the study plans that I have seen that
12 determine for the reader that there is knowledge about how
13 good the answers have to be in order to be useful. If that
14 is missing, then I don't see how you can make a
15 determination that the methods selected are adequate.

16 MR. BRADBURY: That's actually one of our
17 questions, has to do with that point exactly. There is a
18 statement made in this study plan that says the accuracy
19 needed for doing transport -- the accuracy of the results
20 from this study plan needed for transport modeling have yet
21 to be determined. Therefore, they won't be defined -- the
22 accuracy won't be defined here.

23 We asked the question, how can you do any work if
24 you don't know how accurate the results to be. How do you
25 establish the methods of characterizing the solids.

1 MR. STEINDLER: My problem is that I couldn't see
2 you carry that to its logical conclusion, namely you can't
3 in a sense approve until you have an answer to the prior
4 question. You have apparently already made up your mind
5 that the methods that are conventional as you say, and they
6 indeed are, are adequate to meet the objectives. How did
7 you get there?

8 I have a conceptual problem that you are going to
9 have to help me with.

10 MR. BRADBURY: We asked the question --

11 MR. HINZE: Can you tell us what page you are on
12 here?

13 MR. BRADBURY: This is not in your packet. This
14 is one of the questions that will be sent to DOE. I do
15 believe you have the packet.

16 MR. STEINDLER: I thought I read that someplace.

17 MR. BRADBURY: This is question number one. It is
18 the second page of the packet that you have.

19 MR. HINZE: Is it comment number one?

20 MR. BRADBURY: No, it's question number one,
21 second page. It says that given that the accuracy of the
22 data from this study needed for transport modeling is yet to
23 be determined, how are the methods of characterization
24 selected.

25 MR. STEINDLER: Let me back you up another notch.

1 You indicate the approval process starts out with a review
2 of the QA acceptability. Somewhere in the QA plan, unless
3 they are doing it more strangely than I am aware of, there
4 is a requirement that says you have to know where you are
5 going before you start.

6 If you guys bought off on the QA plan and you
7 still have these open questions, then I have even more
8 confusion as to what the process is that you folks are using
9 to approve these things. Am I missing something?

10 MR. LINEHAN: If I could just add something. One
11 of the things that we have recognized is this whole process
12 of site characterization is an iterative process. We are
13 not approving a study plan. We are doing a review of it
14 based on goals that DOE had laid out in the SCP with respect
15 to certain types of information and certain types of data.
16 We try to determine whether the study plan is going to get
17 you that basic information.

18 In a lot of areas the accuracy you are going to
19 need isn't really going to be defined until you get a better
20 understanding of the site, you get a better understanding of
21 what credit you are going to have to take for certain
22 components of the site, where there are unfavorable
23 conditions how those would have to be compensated for. A
24 lot of those various factors are going to determine how much
25 data you need in a particular area, the accuracy you need.

1 We see that going on over a period of time as you
2 collect the data, as you do the performance assessments, and
3 as you go through sensitivity analysis.

4 MR. STEINDLER: Your review of study plans is not
5 related to license ability of the data, is that what you are
6 telling me?

7 MR. LINEHAN: It is related to license ability of
8 the data.

9 MR. STEINDLER: You can't have it both ways.

10 MR. LINEHAN: It is not making a final decision
11 that if you go -- if you conduct the study we are talking
12 about here, you are going to get all the data that you need
13 to the level of accuracy you need. Most of these things
14 what we are saying is the approach you are following is
15 reasonable. It appears based on what your goal is on the
16 SCP that you are going to get the data you need. There is
17 no final answer right now. I don't think DOE could give you
18 anything better as to the level of accuracy you are going to
19 finally need on some of these things.

20 I think the whole process that is laid out in the
21 SCP that the NRC has accepted for dealing with issues as you
22 collect data, you go back and you revisit the performance
23 allocation, the goals you have as you collect data in
24 various areas. You revisit a lot of these things. That is
25 why I was concerned with the term approve, and I think that

1 is implying more than we are able to do at this point in
2 time.

3 MR. STEINDLER: I guess my personal view is that,
4 that is not a particularly satisfactory situation. I come
5 down on the side that says why are you going through this
6 exercise at all. Why doesn't DOE just go ahead and do its
7 preliminary studies without you guys getting involved at
8 all? I mean, they are smart enough to know that x-ray
9 diffraction is a good way to determine what it is that they
10 are after.

11 Then when they are finally ready to say to you we
12 know the accuracy and precision required in order to make
13 our models work, we have done the sensitivity studies, we
14 have a pretty good idea of what we need and here is how we
15 intend to get that data, then they can come to you and say
16 how does that fly in relation to licenseability of the
17 results.

18 It strikes me, this is a preliminary exercise and
19 I am not sure I understand why it is being done.

20 MR. LINEHAN: I don't mean to imply that we don't
21 have an idea in various areas as to what data is needed. We
22 have some idea as to the accuracy. The thing I believe John
23 was focusing in on here that we are going to run into a
24 number of study plans is that the exact level of accuracy
25 that you are going to have to develop to factor into the

1 various assessments that you have to do for any particular
2 parameter, I am not sure that can be defined at this point
3 in time.

4 What DOE has laid out in the SCP on the
5 performance allocation and their goals. It is explained in
6 the sense -- and we agree -- that these things are probably
7 going to change over time. When we look at a study plan we
8 look at the general methodology that is being used, whether
9 we agree with it. We look at the locations where they are
10 doing studies, the parameters that they are looking at and a
11 number of those things.

12 I think we have a real good feel for a number of
13 these things. It's a question of how much data and the
14 accuracy you are actually going to need is going to vary
15 once you get out there, once you start collecting data
16 depending on the picture of the site that you develop. If
17 you have a number of locations that you are looking at and
18 it appears that you are dealing with something that is
19 fairly stable, homogeneous, that is one situation. If you
20 go into a number of holes and you find a very different
21 situation, the thing becomes much more complicated.

22 It is just this question of the final accuracy
23 that we were trying to fix on and point out, and we wanted
24 to know. We are not trying to imply that DOE has to have
25 that answer right now, but if you don't have that answer DOE

1 what are your plans, how are you going about being
2 conservative in developing the initial testing and what are
3 your plans for evaluating the data to make sure that you do
4 get the amount of data and accuracy that you are going to
5 need to do your performance analysis.

6 MR. STEINDLER: I don't want to go around once
7 more on the same thing. I think most everybody understands
8 what I was driving at. It just isn't very clear to me that
9 the review that you have just gone through is either
10 incisive or particularly useful in the long haul. While it
11 may be necessary from a bureaucratic standpoint, on a
12 technical basis I don't see it making a tremendous
13 contribution. That is a private judgement. I will return
14 the floor to whoever.

15 MR. HINZE: John, since you have brought us back
16 to the objectives of the study, the objective is really to
17 get a three dimensional distribution of many of the
18 geological parameters of the host rock and the adjacent
19 area. There are two aspects of this. One is the methods of
20 study of the rock and the other is the sampling.

21 My question previously in relationship to the
22 manner in which one tunnels into the host rock horizon is
23 going to have a large impact upon the sampling aspect of it.
24 I warned you about this -- I didn't warn you but I noted my
25 strong interest in the sampling aspect of this whole

1 problem. Can you tell us what your evaluation is of the
2 distribution so that we truly get a three dimensional view
3 of these parameters.

4 MR. BRADBURY: This study plan discusses the issue
5 of representativeness and mentions that prototype testing is
6 currently being carried out to address the issue. That is
7 as far as the study plan goes in describing sampling other
8 than they have proposed an approach where there will be a
9 set of drill holes early on that will be characterized, and
10 statistical analysis of those characterizations will be used
11 to come up with conclusions in terms of where they should
12 put other drill holes. So, it's kind of an iterative
13 process of sampling.

14 MR. HINZE: Is there is a definition of
15 representativeness that is acceptable to the NRC?

16 MR. BRADBURY: I don't know.

17 MR. HINZE: Sorry about that question. I know
18 that Dr. Justus and several of us have discussed this rather
19 at length. As I understood it, there might well be a small
20 study conducted to try to resolve the problem of
21 representativeness, and I am wondering if that has ever come
22 to fruition?

23 MR. PRADBURY: I am not able to --

24 MR. HINZE: Let the record indicate that the
25 answer to that is no.

1 MR. BRADBURY: Right.

2 MR. HINZE: Since you have referred to these
3 prototype tests on page 16 for my colleagues, their section
4 3.1.5 representativeness of the tests and limitations and
5 uncertainties -- can you give us any further information on
6 the prototype tests for the collection of samples that are
7 underway? Is this part of another study plan? This is in
8 the study plan, page 16.

9 MR. BRADBURY: Dr. Hinze, also on page 11 there is
10 a statement that says sampling procedures for exploratory
11 shaft samples are being developed as part of the prototype
12 test plan and are not part of this test plan.

13 MR. HINZE: There are no criteria listed.

14 MR. BRADBURY: Right.

15 MR. HINZE: I have noted that. Is there a study
16 plan that is coming down to us on that topic?

17 MR. BRADBURY: I don't know the answer to that.

18 MR. HINZE: Is it appropriate that there be a
19 study plan, let me ask someone that?

20 MR. STABLEIN: What is the study plan that you are
21 asking about, prototype testing --

22 MR. HINZE: Yes. This looks like a study that the
23 DOE is currently conducting to determine the
24 representativeness issue of core shaft in samples. My
25 question is, is that within the study plan framework or is

1 that exterior to the SCP?

2 MR. STABLEIN: We have people in the audience from
3 DOE that may be able to answer that question. I am not
4 sure. Prototype testing in general is not part of the study
5 plan process.

6 MR. HINZE: The question of representativeness of
7 samples certainly is a critical element to the SCP.

8 MR. STABLEIN: Yes, it is, and we have made
9 comments on that.

10 MR. HINZE: Do we have any takers?

11 MR. DOBSON: For those of you who don't know me,
12 my name is Dave Dobson from the Department of Energy. For
13 the specific question that you just asked, is there some
14 ongoing study that is aimed at determining representatives
15 of samples, the answer to that question so far as I know is
16 no. There are lots of ongoing studies in fact for example
17 this week or last week actually, we just have kind of freed
18 up the sample systems so that we are doing scoping studies
19 on existing core.

20 A lot of those samples are being analyzed along
21 the way of attempting to address the question of what
22 constitutes representativeness. The bigger question, how do
23 you achieve a representative sample of the repository block
24 of Yucca Mountain and the area is a question that is covered
25 in a number of areas in the SCP. It is not a separate

1 prototype study or anything like that.

2 What you have to do is read the study plans in
3 effect. One significant place would be in the underground
4 mapping a program. The sampling strategies for the
5 underground mapping program are described in that activity
6 actually in the study plan, such that for example as you are
7 mapping in the underground you take samples of virtually
8 every kind of alteration that you might find in the
9 underground. You also take bulk samples. We are basically
10 planning to take a 55 gallon drum of sample from every
11 round, at least given that we would be using a drill and
12 blast method. If we were continuous mining we would be
13 taking continuous bulk samples and making those available.

14 Of course, we have a rather extensive program that
15 is described under what is called the systematic drilling
16 program to acquire statistically representative samples
17 mainly focused in that case on matrix properties. As
18 everybody is aware, the systematic drilling program is
19 primarily a vertical drilling program.

20 The question of representativeness is addressed in
21 several different areas in the SCP, and the overall scope of
22 the entire program is intended to provide an answer to the
23 question of what constitutes representativeness.

24 MR. HINZE: If I understand correctly then, this
25 will be incorporated into the several study plans including

1 the underground mapping, the mapping if there is a shaft of
2 the --

3 MR. DOBSON: Or ramp, or both.

4 MR. HINZE: That will be incorporated into this
5 prototype test that is discussed here and this study plan,
6 prototype test for the collection of samples are presently
7 underway to address the representativeness -- that is these
8 tests that you were --

9 MR. DOBSON: I apologize, because it has been a
10 while since I read that study plan. I am not sure what that
11 reference is to. I could find that out, but I don't know
12 what they are referring to when they talk about it. We have
13 in the past done various kinds of prototype tests when the
14 G-tunnel facility was operating for taking samples in
15 effect, cutting blocks out of walls and tests of that
16 nature, just essentially how to take a sample using various
17 drilling techniques for sidewall sampling and things like
18 that.

19 Unfortunately, I don't know the specific reference
20 that the authors were making when they referred to --

21 MR. HINZE: You would agree that the manner in
22 which those tests are conducted are very important to the
23 study plan, the results are?

24 MR. DOBSON: I would agree, absolutely. I think
25 that this is one study that attempts to address quite

1 carefully the overall question of how you achieve a
2 representative sample of the mountain. The methods for
3 taking the sample are a little bit different than the
4 question of whether you have representative samples. I
5 think they spent a fair amount of time on the study plan as
6 John alluded to, describing what kinds of techniques they
7 will use to ensure that they have a statistically valid
8 sample in terms of the rocks that they are sampling and
9 structural zones and things like that.

10 Of course, you always have the problem that your
11 sample is limited to the access that you have. The current
12 program relying on vertical drilling and the drifting and
13 the exploratory shaft has some possible vulnerable spots
14 that have been pointed out by various people in terms of the
15 lack of lateral exposures. We are trying to address that
16 both in the ESF studies which are ongoing now and the
17 evaluation of possibilities of drilling in the future.

18 MR. HINZE: Are there any further questions that
19 we might pose to Dave Dobson?

20 [No response.]

21 MR. HINZE: Thank you very much, Dave. That was
22 helpful. I hope you know where we are.

23 MR. BRADBURY: I can carry on. There is one
24 viewgraph here that is headed activities in the study plan,
25 and I got part way down that viewgraph. In the middle there

1 ic talks about chemical variability in the host rock and
2 along transport pathways.

3 The techniques proposed are x-ray fluorescence.
4 Again, this is a bulk rock procedure where you grind the
5 rock up. You can also use electron microprobe to probe
6 individual minerals. There are some other methods also
7 discussed, such as atomic absorption that actually is a
8 titrometric technique for iron.

9 MR. HINZE: John, I think I am developing a broken
10 record here. Let me raise another concern that I have
11 regarding this. That is, getting to the transport pathway,
12 the depaleozoic pathway. We do have in the SCP as I recall
13 -- it's a long time, but as I recall -- some specification
14 of deep drill holes to investigate the depaleozoic pathway
15 for the fluids.

16 In your view, is that covered adequately in this
17 study plan, or do you feel that this is going to be studied
18 in more detail for example in the Quaternary hydrology and
19 so forth?

20 MR. BRADBURY: I am going to try and answer that.
21 I am not sure whether this will get the right answer. The
22 study plan recognizes that in terms of modeling they have to
23 know what the mineralogy is at all points from the
24 repository horizon down to -- to the accessible environment
25 in their calculations. They also recognize that that's an

1 impossible task to sample all the points.

2 So, they instead are choosing the approach to look
3 at the types of pathways that groundwater and groundwater
4 containing radionuclides might travel from the repository
5 horizon to the accessible environments. The types of
6 pathways are in the unsaturated zone, there is both matrix
7 flow and fracture flow, and in a saturated zone there is
8 the same, matrix flow and fracture flow.

9 They are going to be looking at types of these
10 pathways. Again, this gets back to your representative
11 question. If you look at the bottom of this activities
12 handout here, they will be using statistical evaluations of
13 the samples to try to determine whether they have collected
14 enough samples and where might they collect more samples to
15 get more information. I am not sure that answered your
16 question.

17 MR. STEINDLER: Is that statistical analysis a
18 reasonably well recognized technique? Were you happy with
19 that?

20 MR. BRADBURY: Yes, it is a reasonably well
21 recognized technique. We did have a concern about a
22 statement made in the study plan with regard to -- if you
23 will hold on a second I will get the right quote. It is
24 with regard to how many additional holes might be necessary
25 after you do some statistical analysis, and the statement

1 talks about within hole variance and compares it to the
2 variability between holes.

3 Because -- this is my impression -- the rocks,
4 they are essentially layer-caked with extreme variability in
5 a vertical direction, there may be -- the assumption I think
6 with the statement is that the Yucca Mountain is isotopic.
7 Thus, the statement would be suspect if one didn't recognize
8 that.

9 Statistical analysis is the way they are going to
10 have to go about finding -- determining points that they
11 haven't actually sampled.

12 The fourth activity is the role of fractures and
13 faults as past transport pathways and evidence for paleo-
14 water tables. This is an exercise where the investigator
15 looks at core material and finds fractures in the material,
16 and examines the minerals that line the fractures for their
17 identity, their relative -- when they formed, their genesis,
18 when and how they formed and also physical things like are
19 there slickened sides, is there indication of movement along
20 these features. And, do these minerals at all -- are they
21 evidence for paleo-water tables.

22 The techniques to be used in this activity are, by
23 using binocular microscopy -- SEM for the very fine grain
24 minerals that are found there, electron microprobe and x-ray
25 diffraction. There are actually other techniques.

1 Cathodoilluminescence -- I probably mispronounced that but
2 it's close enough. I think that's it as far as I remember.

3 MR. HINZE: When you speak of timing, you are
4 speaking of relatively timing only, I assume.

5 MR. BRADBURY: That's right.

6 MR. HINZE: You are really talking about the
7 paragenesis. What about in terms of absolute age, are there
8 techniques that will be applied to these same samples that
9 are being investigated by various photographic techniques
10 and microscopic techniques; will those same samples be
11 studied in terms of absolute age and in what study plan?

12 MR. BRADBURY: I believe that there is essentially
13 an integration between the work being done at Los Alamos and
14 the work done at the USGS. I believe samples that --

15 MR. HINZE: Excuse me, John. That doesn't mean
16 anything to me -- state the context of that sampling.

17 MR. BRADBURY: Let me say it again. The work done
18 under this study plan and the samples collected in this
19 study plan will be also examined in the Quaternary regional
20 hydrology study plan. In that study plan they will be using
21 dating techniques to determine the absolute age of the
22 minerals present.

23 MR. HINZE: I think you would agree that it would
24 be useful to have some type of correlation here between
25 those samples that are studied petrographically and

1 microscopically as well as --

2 MR. BRADBURY: Yes.

3 MR. HINZE: If I understand correctly, the DOE
4 representative Dave Dobson, would like to interject.

5 MR. DOBSON: I would just like to agree with what
6 John said and expand on it a little bit. The Los Alamos
7 investigators who were responsible for this team are also
8 part of the USGS/Los Alamos team which is responsible for
9 Quaternary regional hydrology. The way that we have broken
10 out scopes of work is the USGS basically does most of all
11 the age dating techniques in this task.

12 The simple answer to your first question, are
13 these samples being studied, is yes. In fact, if you
14 notice, GSA bulletin this month you may have noticed a paper
15 by Zebu and Kaiser that addresses the ages of calcite
16 deposits.

17 MR. HINZE: I have not looked at my GSA.

18 MR. DOBSON: That is an example of our intent to
19 gather all the age information that we can off them.

20 MR. HINZE: Thank you, Dave.

21 MR. MOELLER: To help me on that item a little
22 more now, the role of fractures and faults is past transport
23 pathways. How well they have served in the past would tell
24 us whether they might serve as pathways in the future?

25 MR. BRADBURY: Actually the title is a little

1 strange.

2 MR. MOELLER: Or is it primarily to tell whether
3 there was water there in the past?

4 MR. BRADBURY: Yes, it has to do with the water.
5 I don't think we are talking about transport of
6 radionuclides.

7 MR. MOELLER: That is helpful, thank you.

8 MR. BRADBURY: The results of the review, if we
9 turn to the next page. First of all, as I had mentioned
10 earlier, in general these are conventional methods for
11 characterizing solids. They are reasonably chosen. They
12 are review generated. First of all, progress toward
13 resolution of one open item, that is an open item on
14 determination of the paleo-water table elevation. This open
15 item resulted from the review of the Quaternary regional
16 hydrology study plan in which we noted that it appeared that
17 the emphasis of work was near surface and that there didn't
18 appear to be much emphasis looking at samples at depth.

19 Here, they seem to have covered that aspect. So,
20 we think that this is a progress toward resolution of the
21 open item. It doesn't close the open item in my view,
22 because the concern is still what is and how does one
23 determine the evidence for paleo-water tables. What does
24 one look for is still to be determined.

25 This detailed review generated one comment and

1 five new questions. They are listed on the next page.

2 MR. MOELLER: Again now, the progress toward
3 resolution of the open item, what was that again? What was
4 the nature of the progress?

5 MR. BRADBURY: The nature of the progress is the
6 indication that they are looking at samples at depth to find
7 where paleo-water tables --

8 MR. MOELLER: Fine. That's the progress.

9 MR. BRADBURY: That is the progress, yes.
10 Recognizing too, that this study plan probably existed
11 somewhere in the review process when we made the -- when we
12 generated this open item. It gives an example of what
13 happens when in the early stages of reviewing the study
14 plans a lot of these questions and comments are things that
15 will be answered quickly when they come up with -- when we
16 see the new study plans.

17 MR. BROOKS: Let me just add one thing. If you
18 remember, it was in the Quaternary hydrology study plan that
19 they were more or less focusing on the calcite silica type
20 of deposits and trench 14 and that. We commented that while
21 looking at the surface deposits was good, they needed to
22 focus also at subsurface.

23 MR. BRADBURY: The comment has --

24 MR. STEINDLER: Keep going. I have a question at
25 the end, so to speak.

1 MR. BRADBURY: The comment has to do with the fact
2 that the study plan calls for gathering of textural
3 relations of minerals in the Topopah Spring, but we don't
4 see the same --we don't see this analysis from the Topopah
5 Spring to the accessible environment. This is important or
6 could be important because using some of the reasons that
7 are stated in this study plan, textural relations establish
8 stratigraphic locations and they also can be used to
9 determine the accessibility of potentially sorption phases
10 to radionuclides.

11 MR. STEINDLER: I am not a geologist. What do you
12 mean by textural?

13 MR. BRADBURY: When you look at a thin section you
14 have minerals next to each other. Sometimes minerals
15 enclose other minerals. How the pore space relates to where
16 the minerals are, the sizes.

17 MR. STEINDLER: That is a structural or geometric
18 issue and not a chemical --

19 MR. BRADBURY: Yes, except that now we are
20 thinking about water percolating through this solid
21 material, and can that water which is carrying radionuclides
22 get to this mineral and that mineral.

23 We have recommended that they include textural
24 relations -- determining textural relations outside of the
25 Topopah Spring also. We do recognize that there are other

1 study plans out there that will be coming in, and maybe this
2 will be covered elsewhere. We don't know.

3 In terms of the questions, we have already
4 discussed that first question about the accuracy of the
5 data, what is needed and how does one go about doing the
6 work if you don't know how accurate you need to do that
7 work. A recommendation along those lines is that we ask
8 that they explain how the methods of characterization were
9 selected and are their contingent plans that if the
10 requirements for accuracy for transport modeling are not
11 met.

12 MR. OKRENT: Are there issues of site suitability
13 related to all of the topics --

14 MR. HINZE: Dave, use your microphone, please.

15 MR. OKRENT: Are there issues of suitability
16 related to all of the topics that you have discussed, some,
17 one or two, or none?

18 MR. BRADBURY: I guess I don't see -- site
19 suitability, is that what you are asking? I don't see right
20 now how it relates. If you can expand on it a little bit.

21 MR. OKRENT: If what you learn is crude or very
22 accurate, in either case will it influence the decision on
23 the acceptability of the site?

24 MR. BROOKS: Let me take a shot at that one, John.
25 In general what we are talking about is site

1 characterization. All of these could come together with
2 respect to site suitability through a performance
3 assessment. With respect to site suitability per se, there
4 are no site suitability up or down issues that the NRC has.

5 MR. OKRENT: It seems to me that in spite of what
6 my esteemed Dr. Steindler has talked about, do they know how
7 accurately they need to measure something, that in the back
8 of one's mind when one is looking at things related to
9 characterization of the site, one should have present
10 certain scenarios that follow certain pathways and go one
11 way or another depending on certain characteristics of the
12 site.

13 Then, it is these characteristics that you would
14 like to measure if they are measurable in a practical way.
15 There is lots of other information that you could get. It
16 is not going to in the end in an important way affect the
17 evaluation. I may be wrong in my picture, but it has been
18 true in every other kind of technology or risk related
19 bencher in which I participated. Some information is less
20 important than others.

21 I am trying to understand the reason for the
22 question of whether the staff comes in with some such
23 orientation or in fact have you -- it is a fair question to
24 ask. At the moment the staff is at bat.

25 MR. BROOKS: I would say that in that context,

1 yes, the mineralogy petrology of the site is related to site
2 suitability as you look at performance.

3 MR. OKRENT: That is too weak a correlation for my
4 purposes, but I am not going to pursue it any further at
5 this time.

6 MR. LINEHAN: I would just like to add to that.
7 What DOE did in the SCP was lay out the basic types of
8 investigation studies they felt they needed to characterize
9 the site, to understand the site, make a determination on
10 what scenarios might actually be there, look at alternative
11 hypotheses. All of the data needs that they felt that they
12 are going to make those determinations are going to be
13 covered in the investigations and study plans that they have
14 laid out.

15 As you get into studying the site, I think there
16 is indeed a possibility that you are going to find that you
17 may not need to get some of the information you originally
18 assumed. What we asked DOE to do and I think they did a
19 pretty good job on, was take a very conservative position at
20 the beginning with respect to what data you did need to make
21 sure that as you went through site characterization you got
22 as much as you would need to do the performance assessments,
23 to make a call on licenseability.

24 The iterative performance assessments I mentioned
25 before, we see as a mechanism as you obtain data to

1 determine not only whether you have enough data in a
2 particular area but it can tell you that you may not need to
3 pursue gathering data in a particular area because it is
4 just not important to site performance. I think that is
5 where the final determination will be made on whether a
6 particular study or particular data that is to be obtained
7 is really a key factor in the licenseability of the site.

8 MR. HINZE: I think it is also helpful to note
9 that these samples that will be QA'd and will be available
10 for additional investigation not only at higher accuracy
11 which I doubt is going to happen, but for additional
12 studies. I think that is the critical aspect of it, and
13 that's the beautiful part of having these geological samples
14 adequately placed in a repository.

15 We obviously are looking at data for licensing.
16 As I think the staff has pointed out very well, the
17 conservative approach on this had led to a lot of
18 investigations. But that doesn't mean that there aren't
19 going to be additional investigations coming down the pike
20 at a later time.

21 MR. OKRENT: I must say that I am still uneasy --
22 as a non-geologist or hydrologist et cetera, but as someone
23 who has looked at a lot of different research programs and
24 looked at a lot of risk assessment and so forth, I am still
25 uneasy that much earlier on there is not a stronger

1 identification than I perceive of the information that is
2 really important to note if you can note it.

3 In fact, also a perception of even if you know
4 that will it be overriding or might not something else --
5 let me just give you one thing that is in the back of my
6 mind. Right now there is discussion about various kinds of
7 measurements. When one comes to climatology and if the --
8 in fact I think the staff has already said it is -- the
9 conditions are unexpected or anticipated conditions. There
10 is going to be some guessing or difference of opinion --
11 make your choice - as to how much, how much. That may in
12 fact end up being important with regard to other aspects of
13 the ground and so forth.

14 The ones you are paying very deep attention to
15 now, I don't know.

16 MR. HINZE: Dave, I think you have hit a point
17 that we are all concerned with, and I think the NRC is
18 concerned with, and that is this whole integrative nature of
19 the study plans. I am certainly with you 100 percent that
20 one has to be concerned about the ability to evaluate a
21 study plan when you don't have all the rest of them
22 available to you that impact upon them. I think we have
23 discussed this, and we have heard that there will be some if
24 not revisiting of specific study plans, that there will
25 certainly be a search for the holes and some kind of

1 tracking of what is being done in each of these study plans
2 so that deficiencies can be identified.

3 I think you are right.

4 MR. BRADBURY: Let me go on. For question number
5 two, the question is, could the exclusive sampling of core
6 in the vertical sense bias the results. This question has
7 changed since I wrote the question. First of all the way
8 the meaning of the question is, the core is vertical, the
9 long axis of the thin section is cut from the core are also
10 vertical. My thought was that given the layer-cake type of
11 arrangement of this solid strata, wouldn't water tend to
12 make some rather -- wouldn't it move in a lateral direction.
13 If people start determining materials just in the vertical
14 sense they may just estimate incorrectly what actually the
15 water and radionuclide are going to be seeing as they move
16 to the accessible environment.

17 Since this question was written -- well, last week
18 we received a packet of information including a couple of
19 detailed procedures you were talking about earlier. Does
20 one detailed procedure -- is the procedure for the
21 determination of volume constituents in thin sections of
22 rocks -- this detailed procedure describes in detail how
23 they will cut the thin sections in three dimensions.

24 It is true that most of the time they will be
25 cutting a thin section parallel to the core axis. There are

1 other times when they will -- I am going to use my hands
2 here -- they will also be cutting a thin section
3 perpendicular to that first vertical section but also in a
4 vertical sense. In rare occasions they will also cut one in
5 a horizontal sense.

6 MR. HINZE: Doesn't that bother you as a
7 geologist, that it will be rare?

8 MR. BRADBURY: Maybe I ought to use the exact
9 terms. Not necessarily, okay. Let me say why. I envision
10 -- because it's a layer-cake type situation that they will
11 very quickly determine if I cut it in horizontal -- in the
12 horizontal direction it's monotonous. I don't have to do
13 this very often and determine that it is that way.

14 MR. HINZE: You have made a decision then or
15 someone has made a decision that there are not vertical
16 fracture transport pathways.

17 MR. BRADBURY: No, I haven't made that decision.
18 I am putting my own conceptual model with what it looks like
19 down there. The exact words are that the third section may,
20 under exceptional circumstances, be cut horizontally
21 perpendicular to the other two but must carefully avoid any
22 large pumice which might not be representative of the ground
23 mass.

24 As a result of reading this I would --

25 MR. STEINDLER: You want to go with that last

1 phrase again? It must carefully avoid --

2 MR. BRADBURY: Avoid a big chunk of something that
3 is not representative.

4 MR. STEINDLER: You have already agreed that this
5 is a fairly -- on a small scale it's a pretty heterogeneous
6 system. Now you are going to select material out of there
7 and then describe it?

8 MR. BRADBURY: That's a good point.

9 MR. STEINDLER: I am not a geologist.

10 MR. BRADBURY: The question is right, let's not
11 close our eyes to things like that. The fact that there is
12 information in the detailed procedures about -- that address
13 this question means that I probably eliminate this question
14 from the package.

15 MR. HINZE: As an aside, I would hope you
16 wouldn't.

17 MR. BRADBURY: I wouldn't?

18 MR. HINZE: That you wouldn't.

19 MR. BRADBURY: For what reason?

20 MR. HINZE: Because I think one should be looking
21 for vertical pathways and the only way you are going to get
22 at that is through horizontal sections, and it seems to me
23 that those could be the very critical pathways. If you are
24 not looking for those -- what you are looking for also is
25 past pathways. I really find it very difficult to believe

1 that while you are chomping up the rock that you don't look
2 at it with the horizontal.

3 MR. BRADBURY: Let me retract that and say I would
4 adjust this question to reflect more information that they
5 provide.

6 MR. POMEROY: I would still take exception to the
7 rare core sampling once in a while in that horizontal -- I
8 think that should be done at least equally with the vertical
9 sections.

10 MR. BRADBURY: Question three, how do the
11 parameters characterizing the rocks and minerals determined
12 in this study correlate with parameters that are important
13 to sorption. This study is going to determine the minerals
14 present, the compositions of those present. The question
15 essentially is, is that information important or is
16 information such as the surface area, site density, are
17 those really the parameters that are important for sorption
18 and ultimately retardation in the radionuclides.

19 Anyway, the question becomes how do these things
20 correlate. For example are all clinoptilolites, do they all
21 have the same surface area or site density or are they
22 different. Does it mean that every sample that is collected
23 and studied in this study plan, will it also have to be done
24 in the batch sorption study plan or study. I guess we will
25 find that out when we see that study plan.

1 Question four has to do with --

2 MR. STEINDLER: Excuse me. Are you saying that
3 you will simply wait for the answer to the question until
4 the batch sorption study plan is laid in front of you? If
5 the answer is yes, do you think that the combination of that
6 batch sorption plan as well as your plan will tell you
7 anything about the question you just asked, for example,
8 surface area, chemical reactivity and the other things that
9 are fairly important to sorption.

10 Batch sorption studies -- I don't know what they
11 are planning on doing -- we have significant history in the
12 literature of past sorption studies done on a batch scale.
13 If that is the judgment that is now going to be added onto
14 this question, are you happy with that?

15 MR. BRADBURY: Let me try. I believe these
16 questions -- these parameters will be determined in the
17 batch tests. I am wondering how many tests they will run to
18 determine these parameters, and whether they will say
19 essentially let me take one clinoptilolite or five
20 clinoptilolites and do some experiments, determine the
21 parameters on them and use that for all clinoptilolite --

22 MR. STEINDLER: I am not making myself clear. Let
23 me give you my answer and maybe that will give you a clue.
24 What I guess I would have done is, I would have said to
25 whoever -- I must say sometimes I am not sure who your

1 audience is -- please explain how the present studies, when
2 combined with batch sorption studies, fold into performance
3 assessment. I think there is a hole there, unless --

4 MR. BRADBURY: That's right.

5 MR. STEINDLER: You are anticipating that hole is
6 going to be blocked up by your batch sorption studies. I
7 don't know whether that is --

8 MR. BRADBURY: That is the hole that we have been
9 wrestling with constantly. The detailed technical review is
10 looking at this particular piece of information but our main
11 concerns are down the road, how is it going to be used.

12 MR. STEINDLER: You can ask that question. You
13 may not get the answer at this point, because I don't know
14 whether the batch sorption study plan exists and whether
15 they have thought about -- whatever. At least if you asked
16 the question then that's the focus of their answer; that is,
17 performance assessment will be the focus of their answer
18 rather than the much more narrow and probably insufficient
19 issue addressed only in the batch sorption study plan.

20 MR. ORTH: I have an observation. I think I want
21 to reinforce what Marty has said. There are both flow
22 sorption which is a lot more significant for migration in
23 the saturated zone and batch sorption, experiments have been
24 done on most of the various things that can be in the waste
25 and essentially the models for the kind of work that can be

1 done and presumably would be.

2 The question is, how do you take any of that data
3 and apply it to migration of the vaduz zone. You do not
4 have a saturated system. The question, as Marty posed is,
5 when you get all of this data what are you going to do with
6 it. What is DOE going to do with it, and how are you going
7 to judge whether that is any good and what it means.

8 MR. BRADBURY: I will express a concern of mine.
9 I believe in reading the SCP, the batch sorption experiments
10 will look at these parameters on single minerals along with
11 then doing batch tests on crushed up rock. The concern is
12 that putting together the single minerals and proportioning
13 them may not yield the rock -- how do I say that -- mixing
14 the end members you may not come up with a linear
15 relationship. There are examples of that in the literature,
16 where taking two end members you don't get the same result
17 as drawing a straight line between them.

18 Question four has to deal with a statement they
19 made concerning sampling and determining changes in
20 lithology. The statement is that analyses will be performed
21 on samples from core and from the exploratory shaft samples
22 whenever changes in lithology are apparent. They don't
23 describe what that means, how they determine an apparent
24 change in lithology, and we would just like for them to
25 explain.

1 The last question has to do with a statement made
2 in there concerning software validation. We are not
3 familiar with the term software validation. We are with the
4 term model validation. We recognize it as being somewhat of
5 a contentious term at this time. We would like some
6 clarification on what actually is meant by software
7 validation, model verification and validation.

8 MR. STEINDLER: Have you looked into the software
9 QA plan to see whether or not it will give you any
10 enlightenment?

11 MR. BRADBURY: I haven't personally.

12 MR. STEINDLER: I think you might have found it
13 useful.

14 MR. STABLEIN: Which QA plan was that, Dr.
15 Steindler?

16 MR. STEINDLER: Software.

17 MR. STABLEIN: We don't have the Los Alamos
18 software QA plan.

19 MR. STEINDLER: You don't?

20 MR. STABLEIN: No.

21 MR. STEINDLER: It was issued, as far as I can
22 vaguely recall. Did you ask for it?

23 MR. STABLEIN: We talked to our QA folks who
24 follow Los Alamos, and they said we don't have it. We will
25 continue to pursue it.

1 MR. STEINDLER: I would think that would be
2 useful.

3 MR. HINZE: In view of the fact -- does that
4 conclude your presentation?

5 MR. BRADBURY: I am done.

6 MR. HINZE: In view of the fact that we are not
7 interested in looking at this in a substantive way, I use
8 that advisedly but only as a procedure. The question that I
9 have is, you have this comment and you have the four or five
10 questions, DOE and its contractors are moving ahead with the
11 study plan. What do you expect to get back from DOE
12 regarding these, and what kind of timeframe?

13 MR. STABLEIN: We will be sending a cover letter
14 with the comment and questions to DOE shortly. These will
15 become open items as we are tracking the other NRC open
16 items. We would expect reaction from DOE after they have
17 had a chance to look at them and see if they want a
18 technical exchange, if they want a conference call, if they
19 want to write us a response.

20 They may wait until readiness review. We expect
21 that they will address these at some point, either prior to
22 starting the work or early on in the work. They don't have
23 to, of course, they can proceed at their own risk. There is
24 no set timetable on which DOE has to respond. We don't have
25 objections here that we are dealing with.

1 MR. STEINDLER: I hear my colleague on the left
2 that we are not looking at this in a substantive way, and I
3 am at a loss to know how to begin my next question
4 therefore. Let me try it. The transport of material
5 fission products, reactive chemicals, is governed to a very
6 significant extent by glass phases that it encounters on its
7 path. As I look through this, both structure and chemistry
8 is focused very sharply on things that are easily determined
9 for example by x-ray diffraction where glass is not a very
10 useful tool. In fact, it is fundamentally useless.

11 There is mention threaded throughout the study
12 plan of the obvious recognition that the Los Alamos folks
13 have that there is a glass issue somewhere. My question to
14 you, however, is somewhat different. From what you clearly
15 must know about the importance of glasses and their chemical
16 reactivity and their often strange distribution, did you not
17 find that there was a posity of data that showed that
18 glasses will be properly identified in this whole exercise
19 of determining where the chemical paths might be. Perhaps
20 things like sampling, especially sampling to maintain
21 chemical reactivity is fundamentally absent from this thing.

22 Were you concerned about that issue at all?
23 Scabille crystalline material, even though you have for
24 example a ferrous ferric problem when you take it out in the
25 air, your ratios get to be a little bit strange if you are

1 not careful. Glasses go to pot on the surface very fast,
2 and I don't see anything in here that shows they are going
3 to pay attention to it. I am sure they are smart enough to
4 know the difference, but there is nothing in here.

5 Unless you extrapolate from what you think you
6 know about the people who are going to do the work, it seems
7 to me that I would have been looking for some kind of
8 comments on that score. You didn't make any comments.

9 MR. BRADBURY: Right, we didn't make any comments,
10 but we are concerned about glass and the fact that x-ray
11 diffraction is not -- I always thought it was of no use.

12 MR. STEINDLER: That's an overstatement.

13 MR. BRADBURY: That definitely is an
14 overstatement. They can determine it, but not to the
15 precision that they can with the crystalline phases. The
16 concern, again, -- I am agreeing with what you are saying --
17 -- where it exists, does it -- I am thinking more along the
18 lines of glass as being a less sorptive material than the
19 clays and zeolites.

20 MR. STEINDLER: Sorption is not the only process
21 that goes on, however. It is extremely reactive.

22 MR. BRADBURY: My own bias is that -- yes, it is
23 reactive, but I don't see glasses altering in the timeframes
24 of site characterization using the techniques that we are
25 using.

1 MR. STEINDLER: Okay. At some other forum over a
2 coke or something, you and I can talk about that. I guess
3 the concern I have is that I would assume that the technical
4 review of a study plan is really a comparison between what
5 these folks are going to do and how they are going to do it,
6 in comparison to how they are going to use the data.

7 Go back and look at the carefully prepared -- I
8 assume -- 17 or 18 items into which the data from this work
9 has to fit. Glass would clearly represent an important
10 role. If then the glass characterization is missing, my
11 next logical question is going to be how can they possibly
12 carry out the application of these data in a comprehensive
13 way, et cetera.

14 MR. BRADBURY: You jogged my memory here. They
15 will be doing electron microprobe analyses which means that
16 they can probe the glass.

17 MR. STEINDLER: Okay. It's a good start, but it
18 seems to me to be an insufficient attention to what I guess
19 I viewed as an important issue. The implication is that you
20 didn't think it was that important or you thought that the
21 electron probe was going to be sufficient.

22 MR. BRADBURY: We have the --

23 MR. STEINDLER: Let me tell you what I am groping
24 for. I am trying to find out whether or not this was a
25 conscious effort concerned with this relationship between

1 the data they are going to get out of this and how they are
2 going to apply it. If that connection -- we have been using
3 the word nexus all day -- if that connection is not there,
4 then I have a fundamental difficulty with what kind of
5 technical review you guys are carrying out.

6 If the connection is there, then it is a matter of
7 judgment between your view of the sufficiency of their
8 electron probe work and my view of the importance. I am
9 willing to let that slide, if you follow what I am saying.
10 Can you ensure me that in fact you guys looked at the
11 application of these data as the target against which the
12 sufficiency of what they are planning to do has been judged?

13 MR. BRADBURY: The application of the data is --
14 what they plan to do is look at sorption -- this is one
15 example -- sorption as a function of whole rock analyses. I
16 still don't know whether that is the important aspect of
17 sorption in terms of solids. Until the studies are done, I
18 don't think anybody knows that.

19 MR. STEINDLER: Let me get off that and ask one
20 other question. How much effort was expended in doing this
21 analysis that you just went through?

22 MR. BRADBURY: My own?

23 MR. STEINDLER: One FTE, give me a rough idea of
24 how long these things take.

25 MR. BRADBURY: The detailed technical review was

1 about a month. That was on and off type.

2 MR. STEINDLER: By one person?

3 MR. BRADBURY: By me.

4 MR. HINZE: Is there a summary statement? I see
5 you were reaching for the microphone, King.

6 MR. STABLEIN: No. I was just going to mention
7 that I think that we can assure Dr. Steindler that these are
8 bumped against what the data will be used for in every case.
9 John is a little too modest to admit that he does in fact do
10 that routinely. Not only does he do it, but his section
11 leader, Dave Brooks, has been working with him on this study
12 plan review and has discussed these issues extensively.

13 MR. STEINDLER: Thank you.

14 MR. HINZE: Thank you. Are there further
15 questions?

16 [No response.]

17 MR. HINZE: Time is fleeting. We do have another
18 study plan to hear about.

19 MR. STABLEIN: Thank you very much, John, for you
20 presentation. We do have one more presentation on the
21 volcanic features study plan. The work on this -- the
22 detailed technical review was done by three people.
23 Unfortunately, John Trapp, who headed up the review couldn't
24 be with us today. But his section leader, Phil Justus, will
25 be giving the presentation.

1 Working with John Trapp, who did head up this
2 review was again, John Bradbury and Linda Kovach, who is
3 with the Office of Research and may be with us in the
4 audience today. If she is, she is welcome to come up here
5 and be nearby for any questions that might come her way as
6 well. I would ask John Bradbury to stick around too.

7 As I said, John Trapp led this review. He
8 couldn't be with us today, and Phil Justus, the section
9 leader, will be the one presenting the results.

10 MR. JUSTUS: This is a presentation on the results
11 of a detailed technical review of study plan 8.3.1.8.5.1.
12 That is the characterization of volcanic features.

13 On the next page I have abbreviated the study
14 plan. It is primarily to group various volcanic data
15 gathering activities into one single plan, principally to
16 provide information that will be used to decipher the
17 volcanic history of the volcanic activity in the Yucca
18 Mountain area. That is to be used as a basis for assessing
19 future volcanic activity at the site.

20 DOE has a two-phased process for assessing the
21 volcanic hazard and risk at the site. This particular study
22 plan addresses phase one. Phase one is essentially gather
23 the data that is needed for future work or subsequent
24 analysis. So that, this plan is not the plan that will give
25 us all clues directly as to what the nature of the volcanic

1 hazards for the future conditions of the repository are.
2 This is the plan to gather data, and I will explain in
3 detail more what kinds of data, DOE thinks is necessary to
4 make that assessment of the volcanic picture.

5 In particular, we do want to point out for your
6 reference that there are two principal studies that this
7 study plan information feeds. They are listed as
8 8.3.1.8.1.1. and 8.3.1.8.1.2. The first one, for your
9 information, that is the study of the probability of
10 magmatic disruption of the repository. Eight one two, that
11 deals with the effects of magmatic disruption of the
12 repository.

13 Most of us are interested in the results of those
14 in addition to how these inputs are developed. It will be
15 important I think, as I gather than you are interested in a
16 broader perspective than just the study plan of this study.
17 Let me remind everyone what the results of this particular
18 study plan activities will be used for.

19 In the area of assessing probability, DOE needs to
20 know the location and timing of volcanic events. They need
21 to know what structures may control volcanism, and they need
22 to know if there are magmabodies present in and around Yucca
23 Mountain, and they need to have methods of calculating the
24 probabilities even if those items are known. With regard to
25 understanding the effects of volcanism if any on the site in

1 the future.

2 DOE is concerned with the deposition of volcanic
3 ash during the operational phase which may alter operation
4 and surface drainage, and they need to understand what may
5 happen if magma were to intrude the repository in the
6 future. If that happens it is considerations that there
7 will be alterations of the hydrologic regime, the
8 geochemical regime, the rock characteristics themselves, and
9 there may even be direct dispersal to the accessible
10 environment.

11 Those are a future studies into which these
12 activities will feed. That is an important perspective.

13 Page two.

14 I would like to summarize the results of this
15 review. In our opinion this is a reasonable well thought
16 out study plan describing necessary activities to feed into
17 those higher study plans. There are five general activities
18 covered in this study plan.

19 Exploratory drilling of aeromagnetic anomalies to
20 seek buried volcanic centers or buried intrusions is one
21 activity covered in this study. Anecdotally, DOE has
22 recognized that not all of the evidence for volcanism at the
23 site are exposed at the surface, and in order to develop
24 accurate calculations of past activities they have to go
25 below the surface and see what evidence is buried.

1 MR. HINZE: Are those slant holes?

2 MR. JUSTUS: No. They are intended to be vertical
3 at this point -- as presented in the study plan.

4 MR. HINZE: It might be good to look at what is
5 being planned for Katmai. It really points out the very
6 significant importance of slant holes in volcanic studies.

7 MR. JUSTUS: I would expect DOE to read the
8 transcript and pick up on that comment. The second activity
9 described refers to the calculation of the timing of
10 volcanic events in and around Yucca Mountain. In other
11 words, the geochronology of volcanism in this region. DOE
12 plans on using a variety of techniques, isotopic,
13 radiometric and geomorphic. They need to pin down the
14 timing of the past volcanic activities to get a firm basis
15 on making extrapolations.

16 The third activity covered deals with field
17 relations and eruptive history of Quaternary basaltic
18 centers in and around Yucca Mountain. DOE recognizes the
19 need to find structural controls for the basaltic volcanoes
20 that exist such as in creator flat. DOE recognizes the need
21 to understand the past multiple eruption history of these
22 nearby volcanic centers, so called polycyclic nature of
23 basaltic volcanism can be developed by field relations at
24 least initially.

25 The fourth activity is geochemical investigations

1 of these eruptive sequences. Principally, to evaluate their
2 origin and to assess any chemical evolutionary signatures
3 that may be present. For example, volcanic ash is found in
4 alluvium in and around Yucca. In fact, it is also found in
5 some fractures. DOE needs to ascertain the source of that
6 volcanic ash. I say need. Actually, it would be ideal to
7 know the source of that ash because they may be able to
8 determine the age of that ash, and therefore, the age of the
9 fracture that it encompasses or encompasses it or alluvium
10 in and around the ash beds.

11 The fifth category of activities here is the
12 assessment of evolutionary patterns of basaltic volcanic
13 fields in the Southwestern United States. I can summarize
14 this important activity in this way. Is the crater flat,
15 Lothrop Wells Volcanic field in a waxing or waning stage of
16 volcanism. DOE, while they hadn't posed the question that
17 way, that is certainly the kind of question they are seeking
18 to answer.

19 Principally the results are this. While we have
20 some comments and some concerns I should say, there are no
21 new objections and no new comments. We do have three
22 questions, and I might add some commentary.

23 On page three is our commentary. We have several
24 open items outstanding with DOE in the area of integration
25 and quality assurance. We have some concerns about this

1 study plan that fit into those open item categories.
2 Therefore, we don't have any new comments or questions -- we
3 are covered. Here is the commentary. You have already
4 anticipated this, I think, in the area of integration at
5 least.

6 We have a concern that is readily apparent in
7 volcanism with regard to the number of integrated or I
8 should say not integrated yet -- interrelated study plans
9 which must be reviewed to understand the overall DOE
10 volcanism program. We have reviewed the SCP and find 22
11 study plans that bear in one way or another on volcanism.
12 Some of them are enumerated in this particular study plan.
13 There are many others.

14 We have a recommendation along this area of
15 concern. That is very simply, we would ask DOE to develop a
16 document that clearly or simply shows the interrelationship
17 and the fact of integration of these various study plans
18 with regard to the volcanism effort. I might add that when
19 we posed a similar question several years ago or a concern
20 with regard to integrating the geophysics program, DOE
21 responded with a geophysics white paper now in draft, which
22 is a first step in showing how the myriad of geophysical
23 approaches tied together. We would ask that something
24 similar be done for the volcanism studies.

25 MR. HINZE: Dr. Justus, could I interrupt you for

1 just one moment. I want to understand what we are listening
2 to. This is not an objection, it is not a comment, and it's
3 not a question. This is a commentary. Is this a new --
4 will all the study plan detailed reviews, detailed technical
5 reviews include a commentary and where does this fit into
6 this? I don't recall seeing that in the review process.

7 MR. STABLEIN: There are two things to say about
8 that, Dr. Hinze. First of all in our transmittal of
9 detailed technical reviews to DOE we always have a cover
10 letter which includes discussion that is more general than
11 the specific comments and questions which are to be tracked
12 as open items. Some of what Phil is going over now will be
13 in that cover letter.

14 Secondly, these would be open items, probably
15 comments. Except as he pointed out, although it doesn't
16 come across too clearly on the sheet, they already exist as
17 open items from the --

18 MR. HINZE: From the SCA.

19 MR. STABLEIN: From the SCA.

20 MR. HINZE: Okay, thank you.

21 MR. JUSTUS: That also applies to what we listed
22 as the next item, multi-purpose geophysical studies. I just
23 reflected on that. In the same area of integration there is
24 a new effort, initial effort, called the SOBART or Southern
25 Basin and Range Transect program. We just want to interject

1 here that -- actually words of encouragement for DOE who has
2 expressed an interest in joining the various groups engaged
3 in this regional NSF sponsored multi-organization sponsored
4 program. It does involve evaluating programs or evaluating
5 situations that bear on the volcanism evaluations in and
6 around Yucca Mountain. This is a non-project operation.

7 If DOE does get continuous activities there, we
8 would be interested to see how they wish to integrate this
9 non-project venture into the Yucca Mountain program.

10 We have an open item existing and various sub-
11 items on quality assurance. With regard to this study plan,
12 some of the procedures transmitted to NRC for our use in
13 reviewing this study plan were -- as recognized by DOE and
14 prepared at various times under various conditions -- there
15 is a possibility of inconsistent application of QA
16 procedures. DOE has indicated that they will be reviewing
17 these procedures with the variegated history. We have a
18 recommendation then that they continue to give this
19 commitment priority attention.

20 On the matter shown as acceptance criteria in
21 procedures as being insufficient, we find that procedures
22 submitted either do not contain acceptance criteria or they
23 do seem to lack sufficient acceptance criteria. This
24 concern has already been raised by DOE auditors and NRC
25 observation auditors.

1 We would here simply recant this, and ask that DOE
2 continue to resolve this concern by preparing acceptance
3 criteria which clearly identify the basis for acceptance or
4 rejection of data. We are not dissatisfied with DOE's
5 activities that are addressing these open items. We have no
6 major new emphasis there.

7 The activities in the study plan have led to some
8 questions, however. With regard to the activity concerning
9 volcanism drill holes to sampled buried volcanic, our
10 question one here relates to what we think is an omission
11 that DOE should consider. They appear to exclude the taking
12 of oriented core from the drill holes. We have just a
13 fundamental question as to why that is so. We think that
14 oriented core may be utilized for other investigations such
15 as paleo-magnetic studies.

16 MR. HINZE: Is there any indication that there is
17 a sufficiently stable viscous remnant magnetization that you
18 could use for orientations, as you know is used in some
19 cases, has that been shown in this?

20 MR. JUSTUS: These are just anomalies right now
21 that have a magnetic signature.

22 MR. HINZE: In the Yucca Mountain rock types.

23 MR. JUSTUS: Oh, yes. Actually I say yes, but
24 that refers to the soliscus. There has been extensive
25 paleo-magnetic work there.

1 MR. HINZE: I was getting at whether there was a
2 sufficiently stable viscous that you can use sometimes for
3 orienting the core. I don't know that there has been any
4 study to prove that that is the case.

5 MR. JUSTUS: I don't either.

6 MR. HINZE: Your point is very good, but they may
7 be assuming that we already know that it is --

8 MR. JUSTUS: That's why we phrase it as a
9 question. The answer could be a very simple one. We can
10 address our concern in other ways.

11 With regard to geochronology, we asked the
12 question, since there are so many methods used or proposed
13 to be used and these methods have varying degrees of
14 resolution -- the uranium series and in this case potassium
15 Argonne, the helium ratio, thermal luminescence. We asked
16 DOE to explain why they have selected the particular array
17 of suite of methods, given the various degrees of
18 uncertainty, explain it a little bit better than we could
19 satisfy ourselves that there was an adequate base for the
20 selection.

21 Field geology offered us no new concerns or even
22 questions. It was basic methods to determine things like
23 magma volumes, the geometry of deposits to collect samples
24 for the geochronology and geochemistry studies and to
25 evaluate structures that may control volcanism.

1 Similarly, for the fourth activity, geochemistry
2 of various sequences, we found that to be satisfactory as
3 described. They are attempting to determine polycyclic
4 relationships, correlations with the various units and
5 potential sources of volcanic ash.

6 We do have a question regarding their evolutionary
7 cycles activity. As I pointed out earlier, is the current
8 basaltic phase in a waxing or waning stage or whatever. DOE
9 acknowledges that the answer may lie in analogs, in volcanic
10 fields in the basis in range in particular that are
11 recognized to be in one stage or another. To study those
12 analogs may provide clues then as to where to place the
13 crater flat lothrop wells volcanic material or any other
14 buried material found.

15 We were not satisfied with the basis for their
16 selection of analogs that were mentioned too briefly in
17 their description of that particular activity, and we
18 question then the basis for the analog studies that were too
19 briefly proposed.

20 I have summarized these questions on page five,
21 and I would like to mention then two summary points. We
22 find that this plan is adequate to provide information
23 sought for each of the activities described. The overall
24 DOE program appears to contain all necessary components to
25 address various concerns about volcanism; however, a final

1 determination cannot be made at this time.

2 Thank you.

3 MR. HINZE: Are there questions?

4 MR. ORTH: Yes. It is sort of following on the
5 line that I think Dave Okrent and others have asked before.
6 You made a comment on geochronology, and wanted to know why
7 DOE selected this suite of chronology methods that they
8 used. What about the answer to the question, are the ones
9 that they selected, would they be adequate?

10 MR. JUSTUS: Obviously, DOE thinks so. The
11 question is do we think so.

12 MR. ORTH: If they are adequate it doesn't make
13 any difference in terms of justifying in great detail why
14 they picked the ones that they did, which is why I asked the
15 question. That gets to this whole root of Dave's and
16 other's questions.

17 MR. BRADBURY: Right now the potassium argonne
18 technique, it was my impression that that technique was
19 being emphasized in this study plan. It is recognized that
20 potassium argonne technique has great uncertainties
21 associated with it. The reason why it isn't a detail, we
22 don't know all the details yet. The potassium argonne --
23 let me find it.

24 There has been a study by Senick and Easterling on
25 potassium argonne dating of the salts in which they took the

1 same samples or very close samples and sent them to three
2 different labs and got the results back. The results, there
3 was quite a spread. Actually, the spread -- the detail
4 something like they have 90 percent confidence that they can
5 get an age within a million years.

6 If we are trying to do Quaternary dating -- and a
7 Quaternary is two million years old -- it means that this
8 technique has some problems differentiating between one
9 basalt and another. With that then, they say we will do the
10 best that we can with potassium argonne, we will be able to
11 say this is not Quaternary and this is. At least that is
12 what I think.

13 They will try and use these other techniques,
14 comparing them the best they can -- my view on this is that
15 this is more detailed than the other study plan in terms of
16 the prototype testing.

17 MR. ORTH: One reason that I asked the question
18 the way that I did was then, the question to them is not why
19 did you pick what you did, but can you defend it as being
20 adequate. That is not quite the same question. I am just
21 trying to get at what it is that you are trying to get out
22 of DOE. Even a detailed discussion on why they picked what
23 they did may not satisfy you, in which case you ought to ask
24 the question that needs asking. Maybe you did, but it's
25 just that --

1 MR. HINZE: Are there further questions?

2 MR. STABLEIN: I might just add that at this time
3 we were interested in more information on how they came to
4 the conclusion that the suite they had selected was
5 adequate. We put it in question form at this time and it
6 could become a comment, depending on the information that we
7 receive.

8 We do take your point about if what we really want
9 to ask is and we want to challenge them on the adequacy,
10 then we can challenge that more strongly.

11 MR. ORTH: Sort of following up, that is sort of
12 the generic kind of question to ask yourselves in all the
13 questions that you ask them.

14 MR. MOELLER: I had just a couple of questions to
15 help me with perspective. If 22 out of the 106 study plans
16 pertain to volcanic activity or assessments, does that mean
17 - can I interpret that as an indication of the magnitude of
18 the concern over this particular topic, almost 20 percent of
19 them?

20 MR. JUSTUS: Let me clarify what I said. I did
21 indicate that 22 study plans in one way or another, one
22 manner or another, did relate to a volcanic concern. It
23 could be for example that a geophysical investigation to
24 determine the depth to a particular unit was also to
25 determine -- was in the area of conducting geophysical

1 survey for some other means.

2 One of the results of the geophysical survey would
3 be to bear on the presence of some volcanic feature or
4 anomaly. For purposes of discussion say a magma body. That
5 study - the study to do geophysical investigations for a
6 variety of reasons is cited in the volcanic investigation as
7 input to understanding the volcanism, but it is not certain
8 whether the results of the various -- some of the other
9 study plans will actually lead to results that are directly
10 applicable to volcanism.

11 On the other hand some of them very much are. For
12 example, the study to develop an understanding of the heat
13 flow regime in and around Yucca Mountain. This is one,
14 while it bears on issues other than volcanism, certainly
15 relates to whether there is residual heat from earlier
16 volcanic episodes or not. So, the 22 study plans that I
17 refer to are a mixed bag, and they are not all 100 percent
18 volcanism oriented.

19 With that in mind, I can say that these 22 or more
20 study plans do not represent something like 22 percent of
21 the activities nor the target of the whole program of
22 volcanism. It does not necessarily represent 22 percent of
23 the whole effort.

24 MR. MOELLER: I have a couple of other items.
25 You said, and I can see that it is important, whether

1 volcanic activity is waxing or waning. How long would it
2 take to determine that? I would assume that is already
3 known; am I just naive that we don't know that?

4 MR. JUSTUS: We commented on this in our SCA. We
5 felt that DOE had a bias towards the conceptual volcanic
6 model of waning nature of the basaltic volcanic centers in
7 and around Yucca Mountain. We asked that alternative models
8 of volcanism be considered.

9 It is not known at this point in our opinion
10 whether the --

11 MR. HINZE: I think it can --

12 MR. JUSTUS: The regime in and around Yucca
13 Mountain is in a waxing, waning or some other stage of
14 volcanism.

15 MR. HINZE: I think it might help, Dr. Moeller, in
16 terms of your question that this isn't just a matter of the
17 observations of the physical volcanism but often times
18 geochemical signatures will permit you to determine whether
19 you are in a waxing and waning mode. That is wherein this
20 is being studied. It isn't a matter of having a window that
21 you observe this, but looking at more the geochemical
22 aspects.

23 MR. JUSTUS: I did make a note of how long DOE
24 expected to take with regard to these various activities.
25 You asked how long the studies may take to ascertain,

1 whether this is waxing, waning or something else. DOE
2 expects this activity to be completed four years after it
3 starts.

4 MR. MOELLER: I have a couple more. Again, in
5 terms of perspective -- you have a much better idea
6 obviously than I do on why we are interested in volcanism
7 and its potential impacts. How close would the volcano have
8 to be for me to be concerned about molten lava flowing at
9 Yucca Mountain, and how close would it have to be for me to
10 concerned about the deposition of ash? Can you ballpark?

11 MR. JUSTUS: I can answer that hypothetically.

12 MR. MOELLER: Okay.

13 MR. JUSTUS: Because I assume you would like me to
14 use Yucca Mountain type of volcanoes as a basis for
15 answering. As DOE points out rightly so, there is years of
16 work to be done to further characterize what we know about
17 these volcanic codes. But let me perhaps summarize a little
18 bit of what is known to try to answer your question. Please
19 consider it in the hypothetical.

20 MR. MOELLER: Sure.

21 MR. JUSTUS: The basaltic volcanos are classified
22 as strombolian type volcanoes. That means in a qualitative
23 classification based on evidence from type volcanoes mainly
24 in Europe and the Caribbean, that these basaltic volcanoes
25 spew out some scoriaceous material or say volcanic ash and

1 rock fragments. They also produce lava flows. The lava
2 flows of strombolian type of volcanoes are generally fairly
3 viscous, they do not travel more than a few kilometers from
4 the smaller cones.

5 Of course, that is a gross generalization and says
6 nothing about the great variability of strombolian
7 volcanoes. Some of them are quite large. Pera Cuatean in
8 Mexico is one that is several thousand feet high. There is
9 a variation in ratio of volcanic fragments to lava flows at
10 these strombolian volcanoes.

11 So, to get a sense of how far away is safe or not
12 safe with regard to -- let me answer in the qualitative here
13 --with regard to scaping lava flows from strombolian cones,
14 I think we are talking about several kilometers. With
15 regard to scaping inundation from volcanic ash, generalizing
16 on wind patterns, directions and volumes and so forth, we
17 are probably talking tens if not hundreds of kilometers.
18 For larger volcanoes of the Mount St. Helen type, actually
19 thousands of kilometers.

20 MR. MOELLER: That is helpful. Of course, my last
21 question is, of course, I realize if we are still in the
22 operational phase and still placing high level waste in the
23 repository then a lava flow would be rather inconvenient.
24 Say it has been finished and sealed up, is what importance
25 is either ash or lava flow?

1 MR. JUSTUS: With regard to the surface effects of
2 the lava flow, let me speculate that upon closure of the
3 repository there should be little adverse effect that I
4 could think of off hand. Let me take the liberty of getting
5 at a point that I think you may be wanting me to get at.

6 That is not necessarily so much of what is there
7 to fear from surface hazards of volcanism --

8 MR. MOELLER: As hazards.

9 MR. JUSTUS: With regard to say the repository at
10 depth, what hazards exist with regard to such volcanism.
11 That gets at the nature of the plumbing system of these
12 volcanoes. That is a bigger unknown. This is a very
13 important part of DOE's characterization program. DOE
14 addresses this matter of plumbing system geometry extent,
15 structural control in this study plan.

16 It is not necessary for a volcano to intersect the
17 repository to influence the repository conditions. This is
18 a matter of heat, indirect influence on the groundwater
19 systems and so forth.

20 MR. MOELLER: That is very helpful, thank you.

21 MR. HINZE: Gene.

22 MR. VOILAND: In both of these study plans,
23 apparently both groups that are undertaking these studies
24 are drilling holes. I suppose in many of the others there
25 are bore holes dug, drilled or however you make them. At

1 the same time there has been a decided interest in
2 minimizing the number of holes. Is there some overall
3 integrated plan to be sure that the number of these holes is
4 minimized and that various studies can ride piggyback, one
5 on another?

6 I can see problems with that because not everybody
7 schedules their stuff to happen at the same time. Is there
8 a study plan for managing bore holes?

9 MR. JUSTUS: Thank you for asking that question,
10 because it gives me a chance to reiterate one of our
11 principal comments in the SCA. That is this matter of a
12 lack of integration or need to demonstrate integration to do
13 just as you say, to maximize the program, minimize the
14 puncturing of the repository, piggyback one test on another
15 and so forth.

16 We don't have the answer to this very question
17 that you ask me that we have already asked DOE. We are
18 anxiously awaiting DOE's response to our SCA. Then, I will
19 be able to answer the question of what is in the study plan.
20 Yes, there are actually several study plans that DOE has
21 proposed with regard to drilling, systematic drilling,
22 drilling for particular purposes. We have asked them to
23 show integration of those.

24 MR. HINZE: Are there further questions?

25 [No response.]

1 MR. HINZE: If not, I would like to thank you
2 Phil, for a very lucid presentation. Carry back to your
3 staff a job well done. At this point Dr. Moeller, I will
4 pass it back to you, unless Dr. Stablein has further
5 remarks?

6 MR. MOELLER: Do you have any further remarks?

7 MR. STABLEIN: No. Thank you for the opportunity
8 to discuss the two plans and the reviews that we have done.

9 MR. MOELLER: Thank you again. With that, I
10 believe it brings the formal portion of our 26th meeting to
11 a close. Let me thank once again everyone today for being
12 here with us and sharing your thoughts in a very profitable
13 exchange.

14 Let me thank our Reporter for sticking with us and
15 hearing everything that was said. With that, I will declare
16 that the meeting will be adjourned. Let me mention to the
17 public though, that the Committee probably will remain in
18 Executive Session for no more than one-half hour at the
19 most, just to clean up a few more loose ends.

20 Thank you again. The meeting is adjourned.

21 [Whereupon, at 3:49 p.m., the transcribed portion
22 of the meeting concluded.]

23

24

25

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: 26th ACNW Meeting

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mary C. Larkin

Official Reporter
Ann Riley & Associates, Ltd.

PRESENTATION TO THE ACNW

DECEMBER 13, 1990

NRC STAFF REVIEW OF DOE STUDY PLANS
AND SITE CHARACTERIZATION PLAN PROGRESS REPORTS
RELATED TO CHARACTERIZATION OF THE PROPOSED
HIGH-LEVEL WASTE REPOSITORY SITE AT YUCCA MOUNTAIN, NEVADA

KING STABLEIN

SENIOR PROJECT MANAGER

DIVISION OF HIGH-LEVEL WASTE MANAGEMENT

BACKGROUND--STUDY PLANS

- o STUDY PLANS ARE DETAILED PLANS FOR IMPLEMENTING INVESTIGATIONS PRESENTED IN THE SCP
- o 106 STUDY PLANS ARE BEING PLANNED
- o NRC AND DOE HAVE AGREED UPON STUDY PLAN CONTENT
- o NRC AND DOE HAVE AGREEMENTS PERTAINING TO REVIEW OF STUDY PLANS
 - DOE WILL PROVIDE STUDY PLANS TO NRC SIX MONTHS BEFORE WORK IS TO BEGIN (WHEN POSSIBLE)
 - NRC WILL PROVIDE MAJOR CONCERNS TO DOE WITHIN THREE MONTHS
 - NRC WILL PROVIDE OTHER CONCERNS TO DOE WITHIN SIX MONTHS
- o NRC ISSUED DRAFT STUDY PLAN REVIEW PLAN IN DECEMBER 1987
- o NRC ISSUED STUDY PLAN REVIEW PLAN (REVISION 1) IN DECEMBER 1990

PURPOSE OF STUDY PLAN REVIEWS

0 IDENTIFICATION OF CONCERNS WITH DOE'S PLANS TO
GATHER INFORMATION NEEDED TO RESOLVE LICENSING
ISSUES

0 AUDIT OF PROCESS BY WHICH DOE DEVELOPS ITS PLANS
FOR CHARACTERIZING THE SITE

TWO-PHASE APPROACH TO REVIEW OF STUDY PLANS

- o PHASE I REVIEW
 - REVIEW ALL STUDY PLANS ISSUED BY DOE
 - REVIEW INITIALLY FOR:
 - o CONSISTENCY WITH NRC/DOE STUDY PLAN CONTENT AGREEMENT
 - o AVAILABILITY OF STUDY PLAN REFERENCES
 - o DEVELOPMENT OF STUDY PLAN UNDER ACCEPTABLE QA PROGRAM
 - REVIEW FOR OBJECTIONS RELATED TO:
 - o POTENTIAL ADVERSE EFFECTS ON WASTE ISOLATION
 - o POTENTIAL ADVERSE EFFECTS ON ABILITY TO CHARACTERIZE THE SITE
 - o ACCEPTABLE QA PROGRAM NOT IN PLACE FOR ACTIVITIES TO BE PERFORMED
 - REVIEW FOR CLOSURE OF NRC OPEN ITEMS
 - DETERMINE NEED FOR ADDITIONAL REVIEW

TWO-PHASE APPROACH TO REVIEW OF STUDY PLANS (CONTINUE))

- o DETAILED TECHNICAL REVIEW
 - REVIEW SELECTED STUDY PLANS
 - o RELATED TO KEY SITE ISSUES
 - o RELATED TO SCA OR OTHER NRC OPEN ITEMS
 - o UNIQUE, NON-STANDARD, OR CONTROVERSIAL TEST OR ANALYSIS METHODS
 - o OTHERS UNSPECIFIED
 - o SELECTED PROCEDURES
 - REVIEW FOR:
 - o ADEQUACY OF STUDY TO PROVIDE INFORMATION NEEDED FOR LICENSING
 - o PROGRESS TOWARD RESOLUTION OF SCA OR OTHER NRC OPEN ITEMS

BACKGROUND--SCP PROGRESS REPORTS

- o REQUIRED BY NWPA AND 10 CFR PART 60
- o REQUIRED TO BE ISSUED AT SIX-MONTH INTERVALS
- o REQUIRED TO COVER PROGRESS, RESULTS, AND CHANGES
RELATED TO SITE CHARACTERIZATION PROGRAM
 - SITE INVESTIGATIONS
 - REPOSITORY AND WASTE PACKAGE DESIGNS
 - PERFORMANCE ASSESSMENT
- o FIRST REPORT TRANSMITTE. TO NRC IN MARCH 1990
- o NRC COMMENTS PROVIDED TO DOE IN JUNE 1990
- o SCP PROGRESS REPORT REVIEW PLAN ISSUED IN AUGUST 1990

PURPOSE OF SCP PROGRESS REPORT REVIEWS

- o FULFILL NWPA AND 10 CFR PART 60 RESPONSIBILITIES
TO REVIEW SCP PROGRESS REPORTS

- o CONTINUE PRELICENSE APPLICATION REVIEW AND CONSULTATION
PROCESS FOR EARLY IDENTIFICATION AND RESOLUTION OF POTENTIAL
LICENSING ISSUES

APPROACH TO REVIEW OF SCP PROGRESS REPORTS

- o EVALUATION OF PROGRESS REPORTED
 - RESOLUTION OF DOE ISSUES
 - WORK COMPLETED
 - ONGOING WORK

- o EVALUATION OF CHANGES TO SCP AND STUDY PLANS

- o EVALUATION OF RESOLUTION OF NRC OPEN ITEMS

PRESENTATION TO ACNW

RESULTS OF DETAILED TECHNICAL
REVIEW OF STUDY PLAN 8.3.1.3.2.1

MINERALOGY, PETROLOGY, AND CHEMISTRY
OF TRANSPORT PATHWAYS

J. W. BRADBURY

DIVISION OF HIGH-LEVEL WASTE MANAGEMENT

DECEMBER 13, 1990

OBJECTIVE OF STUDY PLAN 8.3.1.3.2.1

TO DETERMINE 3-D DISTRIBUTION OF MINERAL TYPES, COMPOSITIONS, ABUNDANCES, AND PETROGRAPHIC TEXTURES WITHIN THE POTENTIAL HOST ROCK

TO DETERMINE 3-D DISTRIBUTION OF MINERAL TYPES, COMPOSITIONS, AND ABUNDANCES IN ROCKS BEYOND THE HOST ROCK THAT PROVIDE PATHWAYS TO THE ACCESSIBLE ENVIRONMENT.

ACTIVITIES IN STUDY PLAN 8.3.1.3.2.1

QUANTITATIVE MINERALOGY OF THE HOST ROCK AND
ALONG TRANSPORT PATHWAYS

INTERNAL STRATIGRAPHY FOR THE CANDIDATE HOST
ROCK

CHEMICAL VARIABILITY IN THE HOST ROCK AND ALONG
TRANSPORT PATHWAYS

ROLE OF FRACTURES AND FAULTS AS PAST TRANSPORT
PATHWAYS AND EVIDENCE FOR PALEO-WATER TABLE(S)

STATISTICAL EVALUATION OF MINERALOGIC,
PETROGRAPHIC, AND CHEMICAL DATA

RESULTS OF REVIEW

CONVENTIONAL METHODS FOR CHARACTERIZING SOLIDS

REVIEW GENERATED

- PROGRESS TOWARD RESOLUTION OF OPEN ITEM
ON PALEO-WATER TABLE ELEVATION
- 1 NEW COMMENT
- 5 NEW QUESTIONS

RESULTS OF REVIEW

COMMENT

ONLY THE HOST ROCK WILL UNDERGO PETROGRAPHIC ANALYSIS

QUESTIONS

LACKING INFORMATION ON THE ACCURACY OF DATA NEEDED FOR TRANSPORT MODELING, HOW WERE METHODS OF CHARACTERIZATION SELECTED?

COULD THE EXCLUSIVE SAMPLING OF CORE IN THE VERTICAL SENSE BIAS THE RESULTS?

HOW DO THE PARAMETERS COLLECTED IN THIS STUDY CORRELATE WITH PARAMETERS IMPORTANT TO SORPTION?

WHAT IS THE METHOD FOR DETERMINING CHANGES IN LITHOLOGY?

WHAT IS THE DIFFERENCE BETWEEN SOFTWARE VERIFICATION AND VALIDATION AND MODEL VERIFICATION AND VALIDATION?

3

PRESENTATION TO ACNW

**RESULTS OF DETAILED TECHNICAL
REVIEW OF STUDY PLAN 8.3.1.8.5.1**

CHARACTERIZATION OF VOLCANIC FEATURES

P. S. JUSTUS

DIVISION OF HIGH-LEVEL WASTE MANAGEMENT

DECEMBER 13, 1990

OBJECTIVE OF STUDY PLAN 8.3.1.8.5.1

**TO GROUP PRIMARY VOLCANIC DATA GATHERING
ACTIVITIES INTO A SINGLE PLAN:**

- TO PROVIDE INFORMATION**

**THIS PLAN NOT INTENDED TO DIRECTLY ADDRESS
VOLCANIC CONCERNS.**

- SEE, FOR EXAMPLE, 8.3.1.8.1.1, 8.3.1.8.1.2**

RESULTS OF REVIEW - GENERAL

ACTIVITIES COVERED IN STUDY PLAN APPEAR

- REASONABLE**
- WELL THOUGHT OUT**
- NECESSARY**

REVIEW GENERATED

- NO NEW OBJECTIONS**
- NO NEW COMMENTS**
- 3 NEW QUESTIONS**

RESULTS OF REVIEW - OPEN ITEMS

INTEGRATION

- 22+ DOE STUDY PLANS PROVIDE INFORMATION NECESSARY TO RESOLVE VOLCANISM CONCERNS
- MULTI-PURPOSE GEOPHYSICAL STUDIES
- SOUTHERN BASIN & RANGE TRANSECT (SOBART)

QUALITY ASSURANCE

- RECONCILE PROCEDURES PREPARED AT VARIOUS TIMES UNDER VARIOUS REQUIREMENTS
- ACCEPTANCE CRITERIA IN PROCEDURES INSUFFICIENT

ACTIVITIES IN STUDY PLAN 8.3.1.8.5.1

VOLCANISM DRILL HOLES

GEOCHRONOLOGY

FIELD GEOLOGY

GEOCHEMISTRY OF ERUPTIVE SEQUENCIES

EVOLUTIONARY CYCLES

ROCK-VARNISH DATING

RESULTS OF REVIEW - NEW QUESTIONS

- WHY DOES PLAN EXCLUDE COLLECTING ORIENTED CORE FROM DRILL HOLES?
- WHY WERE CERTAIN GEOCHRONOLOGY METHODS CHOSEN AND OTHERS EXCLUDED?
- WHAT IS BASIS FOR SELECTION OF ANALOG STUDIES?