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MEMORANDUM FOR: Robert Johnson, Project Manager
Salt Team
WMRP

FROM: Richard Lee
Geology-Geophysics Section, WMGT

SUBJECT: TRANSMITTAL OF WMGT RESPONSE TO AGREEMENT/OPEN ITEMS
IN NRC/DOE MEETING ON THE STRUCTURE AND TECTONICS OF
THE PALO DURO BASIN, NOVEMBER 18-21, 1985

The first item listed in the Agreements/Open Items of the Summary of NRC/DOE Meeting (Attachment 1) states that both parties agree to respond to suggestions presented by the other party. This is to transmit the Geology-Geophysics Section's response to that first item, DOE's Observations.

WMGT has also responded to Item 2 of the Agreements/Open Items through a December 30, 1985 memorandum from Knapp to Miller and Kennedy requesting a meeting to discuss how Item 2 can be resolved.

These are considered to fulfill WMGT's portion of the obligation to respond to the Agreements/Open Items.

Should you require further information, please contact me or John Trapp directly.

Richard Lee
Geology-Geophysics Section, WMGT

Enclosure:
As Stated

WM Record File
106

WM Project 16
Docket No. _____

PDR
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FC	: WMGT <i>RL</i>	: WMGT <i>RL</i>	: WMGT <i>RL</i>	:	:	:
NAME	: RLee;mt	: JTrapp <i>for</i>	: PSJustus <i>for</i>	:	:	:
DATE	: 85/12/31	: 85/12/31	: 85/12/31	:	:	:

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ATTACHMENT 1

1

In the attached Summary of NRC/DOE Meeting, the first item listed in the Agreements/Open Items section states that both parties agree to respond to suggestions presented by the other party. The following items address DOE's observations in sequence.

- 1) NRC appreciates that the nature of the available data permits conflicting structural interpretations. As NRC pointed out in its Observation 1) however, the data itself is subject to interpretation and, as such, may compound subsequent variations in the interpretation of structural features.
- 2) NRC identified this matter and discussed it in terms of a viable QA program in its Observation 5. NRC recognizes SRP's desire for a uniform approach to data interpretation. NRC notes, however, that a uniform approach to data interpretation is fundamentally different from a uniform approach to the interpretation of structural features resulting from the data (see item 1 above). NRC wishes to emphasize that the ability to be able to trace back the development of interpretations of structural features may be more important than a uniform approach to data interpretation.
- 3) NRC made a similar observation in its Observation 6a.
- 4) NRC considers that exploration industry data may be useful to understanding the structure of the Palo Duro Basin (see NRC Observation 3).
- 5) NRC agrees that, in general, interpretation uncertainties should be explicitly stated. In this way not only can uncertainties be clearly identified, but site characterization activities can then be more readily focused in an effort to resolve those uncertainties considered to be most important to waste isolation.
- 6) NRC made a similar observation in its Observation 4.
- 7) NRC made a similar observation in its Observation 4f.
- 8) NRC agrees that interpretations in hydrogeology and rock mechanics, for example, are limited by uncertainties in other areas (ie. structural geology). Since these interpretations are so interrelated, site characterization activities should be conducted in such a manner as to maximize and prioritize the information that might pertain to the further development of the various conceptual models. The development of issue and information hierarchies and the allocation of performance to the various components, both natural and engineered, should assist in this process.

9) NRC made a similar observation in its Observation 7.

10) The NRC agrees totally with this observation as it is a portion of the basis upon which NRC requested the meeting.

11) NRC made a similar observation in its Observation 6c.

12) NRC made a similar observation in its Observation 4d.

SUMMARY OF NRC/DOE MEETING
ON THE
STRUCTURE AND TECTONICS OF THE PALO DURO BASIN

Date/Location

November 18-21, 1985
Park University Hotel
Columbus, OH

Attendees/Organizational Affiliation

A list of attendees and their organizational affiliations is attached as Enclosure 1.

Background/Facts

The meeting agenda (Enclosure 2) gives the meeting objectives and the topics discussed and the name and affiliation of the presentors. Enclosure 3 consists of all of the handouts and copies of the viewgraphs presented; each package is identified by the person making the presentation and a number which is shown on Enclosure 2. During the course of the meeting proprietary and DOE aquired seismic reflection data were made available for review. Enclosure 4 lists which portions of this data ^{were} reviewed by NRC staff and contractors.

Observations

The NRC had the following observations:

1. A significant amount of data available for structural interpretations of the Palo Duro Basin consists of boring logs of oil exploration wells and seismic surveys conducted for oil exploration. As part of site screening activities of the entire basin, project specific seismic data were obtained utilizing acquisition parameters which emphasize resolution in the approximate 2000 to 6000 ft. depth range. As such, the inherent uncertainty and limitations of these data for detailed structural analysis are recognized particularly with respect to near-surface strata.
2. The nature and distribution of the seismic and boring data are such that some variations in interpretations are possible for both the data and the resultant structural features.
3. Some available seismic data and remote sensing imagery, such as landsat and aerial photographs, do not appear to have been fully utilized. Much seismic data are proprietary in nature, and when approached by DOE contractors, the oil companies have refused to release the data. Other seismic data are known by DOE to be available from brokers; however, the quality and usefulness of this data is not well known. DOE should consider evaluating the availability and usefulness of all seismic data to determine if they can be obtained and if they are worth obtaining to assist in structural interpretations. It should be recognized that NRC has defined procedures for dealing with proprietary data. DOE may also wish to consider obtaining and evaluating other available remote sensing data such as various types and scales of aerial photography and radar imagery.

4. In the development of their site characterization plans DOE should consider developing a comprehensive integration of the available data. The following data elements have been addressed to some degree; however, NRC considers the integration effort should include:
 - a. Development of a conceptual regional tectonic model(s) to evaluate various structural interpretations.
 - b. Evaluations of the possible effects of strike-slip faulting including both the ability to recognize such features and their effect on structural interpretations.
 - c. Evaluations of the role of the Matador Arch and Oldham Nose in the regional tectonic setting.
 - d. Evaluations of the relationship between fracture patterns observed in boreholes, outcrops, and remote sensing data including the limitations of the various methods in recognizing these features.
 - e. Modelling of gravity and magnetic data.
 - f. Evaluations of potential reactivation of structural features through geologic time including the upward change in structural expression such as progression from faulting to folding to fracturing which may be expected and variations in fracture density and orientations over areas of deep faults in comparison with unfaulted areas.
 - g. Providing more emphasis on evaluating the presence or absence of folds and their role in the tectonic history of the area.
 - h. Resolving difficulties in identifying basement.
 - i. Reevaluation of the boundaries and the resultant effect of the regional stress field between the approximately N 70° E maximum horizontal stress field of the mid continent to the approximately N-S stress field of the Rio Grande rift.
5. It appears that DOE's contractors have made significant progress in developing and implementing a viable QA program; however, NRC questions if traceability of information from study to study can yet be demonstrated. From the meeting presentations, it is NRC's impression that each study is providing some checks and documentation; however, there appears to be little to no effort to cross-check from one study to another. Examples that arose during the meeting include: criteria used to identify faults on seismic lines, criteria used to eliminate or modify faults presented in the published literature and subcontractor reports and criteria to select stratigraphic "picks" from borehole logs. DOE may wish to have its QA personnel consider this concern.

6. When planning for seismic reflection surveys NRC believes that:
 - a. Expanded coverage with seismic refraction profiling may provide much useful information concerning lateral and vertical variations of velocity values. Such information could be useful for 1) drill hole location optimization, 2) geohydrology characterization, and 3) planning of seismic reflections lines and evaluation of shallow reflection anomalies.
 - b. Dual programs may be desirable in certain areas to provide both shallow and deep structural data.
 - c. Shallow (less than 2000 feet) surveys should be considered in selected areas where the Alibates Fm is known to be faulted.
7. DOE should consider the usefulness and applicability of electrical and electromagnetic surveys in resolving structural and geohydrologic concerns.
8. Based on the DOE presentations of general types of planned site characterization studies, it appears to the NRC that current planning is focusing on developing site specific studies. It is not as apparent that the same attention has been given to also developing regional investigations important to understanding site performance. During future meetings in which proposed studies are discussed this subject needs additional clarification. This subject should be evaluated in light of the performance objectives of 10 CFR 60.
9. The NRC staff appreciates the effort of DOE in making available at this meeting the key personnel involved in the structural evaluation of the Palo Duro Basin. The knowledge and candor of the presentors helped assure the success of the meeting in accomplishing its objectives. The NRC staff wishes to thank all DOE participants for their effort.

The DOE had the following observations:

1. A common data base has been available to all SRP investigators for use in structural and stratigraphic interpretation; each study has utilized selected portions of the data base. The regional nature of the currently available borehole information and seismic surveys permit conflicting structural interpretations.
2. SRP recognizes a need to develop a uniform approach to evaluation and interpretation of geotechnical data (i.e., criteria for (1) picking formation "tops" from geophysical logs, (2) picking faults on Palo Duro seismic sections, (3) assigning geologic horizons to seismic data, and (4) "time to depth" conversions.)

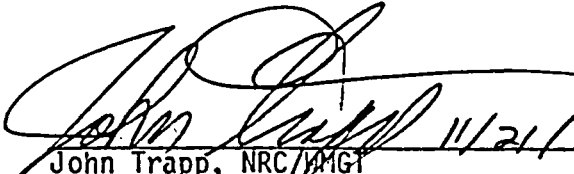
3. It is important to obtain seismic data optimized for both basement structure and shallow structures (repository horizon and above). These two needs lead to conflicting requirements for data acquisition parameters if a single seismic survey is to be used. Consideration should be given to separate surveys for deep and shallow data.
4. The exploration geophysics industry (particularly seismic), is needed by the program because of their expertise, capital equipment, and software. However, the industry's procedures and software are largely proprietary and do not fully comply with the program's general requirements for QA. Nor can the industry be expected to comply by revealing their proprietary programs. Some agreement between NRC and SRP is desirable before site characterization activities to identify the acceptable applications of industry data.
5. The uncertainty in structural maps should be explicitly stated rather than relying solely on the indicated distribution of data points to suggest areas of greater or lesser control.
6. DOE needs to resolve the level of detail needed in structural tectonic models necessary at different phases prior of pre-licensing studies. Specifically, the interpretation of structures within the tectonic framework and the evaluation of performance objectives must be related to uncertainties inherent in the model.
7. There is the need to clearly define the implications to site performance of tectonism during various geologic periods.
8. Site studies require integration to achieve consistent conceptual models of geology, structure, and hydrology (e.g., structural control of geomorphic processes and depositional patterns, and interrelationship of the geologic framework to hydrogeologic processes.
9. Available remote sensing data have not been utilized and completely evaluated.
10. This meeting demonstrates the desirability of early technical interchanges between DOE and NRC to discuss existing data and uncertainties in interpretations. Such discussions are valuable to expedite the later review of the SCP.
11. It was noted that relatively little information exists concerning the Dockum Formation across the entire panhandle. Some approaches to enhancing our understanding of this unit include geological and structural mapping in areas of exposure (e.g., Canadian River Valley), and shallow reflection/refraction seismic surveys.

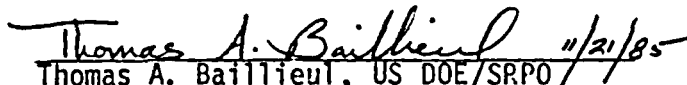
12. With the exception of Fracture Identification Logs, joint information is currently restricted to the periphery of the Southern High Plains. Considerable discussion centered on the implication and meaning of Fracture Identification Logs relative to regional structural interpretations. The nature of the data sets does not permit unambiguous conclusions.

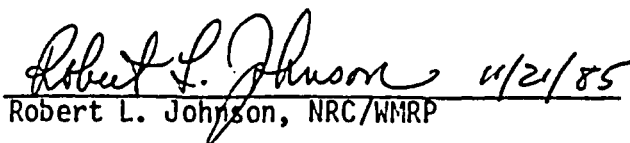
The representative of the Texas Water Commission and the State of Utah did not make observations for the record.

AGREEMENTS/OPEN ITEMS

1. Both parties agree to provide a response to suggestions presented by each other in this set of meeting notes.
2. DOE expressed concern over the QA requirements necessary to validate and verify proprietary procedures utilized for geophysical data acquisition and processing by the exploration industry. It was agreed to bring this concern to the attention of the NRC QA staff for eventual resolution.
3. DOE offered to make available to NRC existing computer listings of the SWEC borehole data base. NRC would like to receive this listing to help in identifying specific borehole information that might be requested for future review.
4. DOE will provide NRC with 10 paper copies of the 35mm slides presented during the meeting and correlate them to the speakers name and number shown on the agenda (Enclosure 2).
5. SRPO and ONWI summarized site characterization studies described in Chapter 4 of the final EA. These summaries indicated numerous geologic, hydrogeologic, and geophysical studies that may be initiated and conducted before SCP release. Both NRC and SRPO agree that consultation will be needed before these studies begin. In order to support mutual planning for SRPO/NRC interactions NRC would like to receive from SRPO an identification of pre-SCP activities and related milestones and schedules.


John Trapp, NRC/WMG 11/21/85


Thomas A. Baillieul, US DOE/SRPO 11/21/85


Robert L. Johnson, NRC/WMRP 11/21/85


P. Michael Ferrigan, US DOE/SRPO 11/21/85

Seismic Reflection Survey Data
Reviewed by NRC

Seismic survey data of a proprietary nature were reviewed by the NRC staff and contractors. These consisted of the following lines designated on SWEC drawing "Sketch No. 13697-44-A-1":

STM-PD-10
STM-PD-11
STM-PD-9
GEO-E
W-95