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Radioactive Waste Isolation in Salt: Peer Review of the Office of Nuclear Waste Isolation's Reports on Preferred Repository Sites within the Palo Duro Basin, Texas

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RADIOACTIVE WASTE ISOLATION IN SALT:
PEER REVIEW OF THE OFFICE OF NUCLEAR WASTE ISOLATION'S REPORTS ON PREFERRED REPOSITORY SITES WITHIN THE PALO DURO BASIN, TEXAS

by

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Energy and Environmental Systems Division
Geoscience and Engineering Group

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FOREWORD

Documents are being submitted to the Salt Repository Project Office (SRPO) of the U.S. Department of Energy (DOE) by Battelle Memorial Institute's Office of Nuclear Waste Isolation (ONWI) to satisfy milestones of the Salt Repository Project of the Civilian Radioactive Waste Management Program. Some of these documents are being reviewed by multidisciplinary groups of peers to ensure DOE of their adequacy and credibility. Adequacy of documents refers to their ability to meet the standards of the U.S. Nuclear Regulatory Commission, as enunciated in 10 CFR 60, and the requirements of the National Environmental Policy Act and the Nuclear Waste Policy Act of 1982. Credibility of documents refers to the validity of the assumptions, methods, and conclusions, as well as to the completeness of coverage.

Since late 1982, Argonne National Laboratory has been under contract to DOE to conduct multidisciplinary peer reviews of program plans and reports covering research and development activities related to siting and constructing a high-level nuclear waste repository in salt. This report summarizes Argonne's review of ONWI's two-volume draft report entitled *Identification of Preferred Sites within the Palo Duro Basin: Vol. 1 — Palo Duro Location A, and Vol. 2 — Palo Duro Location B*, dated January 1984. Argonne was requested by DOE to review these documents on January 17 and 24, 1984 (see App. A). The review procedure involved obtaining written comments on the reports from three members of Argonne's core peer review staff and three extramural experts in related research areas. The peer review panel met at Argonne on February 6, 1984, and reviewer comments were integrated into this report by the review session chairman, with the assistance of Argonne's core peer review staff. All of the peer review panelists concurred in the way in which their comments were represented in this report (see App. B). A letter report and a draft of this report were sent to SRPO on February 10, 1984, and April 17, 1984, respectively.

PREVIOUSLY PUBLISHED REPORTS IN THE SERIES

"RADIOACTIVE WASTE ISOLATION IN SALT"

ANL/EES-TM-242 Peer Review of the Office of Nuclear Waste Isolation's Geochemical Program Plan (Feb. 1984)

ANL/EES-TM-243 Peer Review of the Office of Nuclear Waste Isolation's Socioeconomic Program Plan (Feb. 1984)

ANL/EES-TM-246 Peer Review of the Office of Nuclear Waste Isolation's Plans for Repository Performance Assessment (May 1984)

CONTENTS

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Microfiche copies of the following unpublished reports are attached to the inside back cover of this report:

1. Office of Nuclear Waste Isolation, *Identification of Preferred Sites within the Palo Duro Basin: Vol. 1 — Palo Duro Location A*, Battelle Memorial Institute, Columbus, Ohio (Jan. 1984).

2. Office of Nuclear Waste Isolation, *Identification of Preferred Sites within the Palo Duro Basin: Vol. 2 — Palo Duro Location F*, Battelle Memorial Institute, Columbus, Ohio (Jan. 1984).

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The credentials of panel members are summarized in App. C.

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SUMMARY OF RECOMMENDATIONS

The following recommendations have been abstracted from the body of this report. The two-volume report by Battelle Memorial Institute's Office of Nuclear Waste Isolation (ONWI) entitled *Identification of Preferred Sites within the Palo Duro Basin: Vol. 1 — Palo Duro Location A, and Vol. 2 — Palo Duro Location B*, should:

1. Clarify the decision analysis terminology. Sections 2.0 (Introduction) and Secs. 3.0 (Identification of Discriminating Screening Criteria Descriptors) must be revised to eliminate any semblance of jargon. While the report must be technically correct, it must also be understandable to the general public.

2. Explain clearly the definition and use of the various types of data as descriptors. For example, the text should explain explicitly that given the present level of knowledge of the two sites and the wide spacing between existing wells, potential sites in close proximity to cored boreholes offer a higher degree of certainty with respect to subsurface characterization than those located at some distance from these data points.

3. Use additional available data to illustrate present understanding of subsurface conditions. Cross sections based primarily on coring sponsored by the U.S. Department of Energy (DOE) should be incorporated, along with structure contour maps, into discussions of subsurface descriptors. In addition, the maps or cross sections presented in the report must be consistent with those presented in other DOE or ONWI publications. Any discrepancies must be explained.

4. Incorporate into the text, wherever possible, supporting arguments or explicit explanations for choices of discriminators. A single sentence and references to figures do not necessarily provide strong technical support for, or elucidate the reasoning behind, a particular choice.

5. Provide a clear rationale for ranking discriminators and for assigning them to their priority groups.

6. Provide a more detailed explanation of each step in the site screening process. Both the data and the site selection steps based on those data should be traceable in the salt repository project literature. Discrepancies between reports must be explained. Careful documentation and explanation of value judgments should result in a credible, defensible, and reproducible screening process.

1 INTRODUCTION

Argonne's peer review of the Office of Nuclear Waste Isolation's (ONWI's) two-volume report entitled *Identification of Preferred Sites within the Palo Duro Basin: Vol. 1 — Palo Duro Location A, and Vol. 2 — Palo Duro Location B*, involved obtaining written comments from three extramural panelists: Prof. Patrick Domenico, Prof. Terry Engelder, and Dr. Serge Gonzales, and from three Argonne core peer review staff members: Dr. Dorland Edgar, Mr. David Fenster, and Dr. Wyman Harrison. The peer review panel met at Argonne on February 7, 1984, to consider the comments of all the panelists. In general, comments applied to both volumes. The present report was drafted by the review session chairman, with the assistance of Argonne's core peer review staff.

The ONWI reports are a significant improvement over an earlier draft (Office of Nuclear Waste Isolation, 1983a). Many omissions of data and problems with references have been corrected, and the figures are much improved. The authors have made significant progress toward developing and documenting a credible, defensible, and reproducible screening process. However, the descriptions of the screening methodology must be augmented with clear explanations of the value judgments involved in defining descriptors and descriptions of how the discriminators were selected. In general, the evaluation process must be sufficiently transparent to be accepted by those concerned about responsible site selection.

2 MAJOR CONCERNS

Argonne peer review panelists were asked to respond to four questions posed by the Salt Repository Project Office of the U.S. Department of Energy (DOE) (see App. A). These questions are addressed in the following paragraphs. (All references to page, table, and figure numbers are for Vol. 1 of the ONWI two-volume report unless specified otherwise.)

1. Have appropriate data been evaluated and used?

Compared with an earlier draft (Office of Nuclear Waste Isolation, 1983a), significant improvement has been made in this regard. Data resulting from studies conducted by the Texas Bureau of Economic Geology, Stone and Webster Engineering Corporation, and NUS Corporation are more effectively integrated than before. However, the term "descriptor" (parameter), as used in the Salt Repository Project, must be carefully defined for the general reader. If the descriptors chosen were to be redefined or if other descriptors were to be identified, the appropriateness of the data would have to be reevaluated. In other words, depending on the descriptors used in the screening process, additional data or different types of data might be required. The particular descriptors chosen, therefore, govern one's response to this question.

Many omissions of data and problems with references in the earlier draft have been remedied. However, appropriate data may not have been evaluated in all cases. For example, in evaluating the present geohydrologic regime (Sec. 3.2.1), ONWI used elevations of potentiometric surfaces as descriptors. If appropriate data are available, a more meaningful evaluation of the geohydrologic regime might have resulted from evaluating areal variations in hydrologic parameters such as hydraulic conductivity or well yield. The authors must demonstrate that all data bases have been considered when selecting or defining discriminators.

Those familiar with the published literature of the salt repository program will realize that a discrepancy exists between these documents and several other technical reports on the Palo Duro Basin (e.g., Office of Nuclear Waste Isolation, 1983a, b; Stone and Webster Engineering Corporation, 1983a, b). Stone and Webster Engineering Corporation (1983a) and Office of Nuclear Waste Isolation (1983a, b) mention the Lower San Andres (LSA) Unit 5 Salt as an alternative repository horizon. The current documents, however, drop all reference to LSA Unit 5 without explanation. As shown on an isopach map of major salt thicknesses within LSA Unit 5, this unit would meet the old 75-ft screening criterion in Deaf Smith County, but does not meet the current 125-ft minimum thickness (Office of Nuclear Waste Isolation, 1983a, pp. 62 and 66). The authors should explain this change. Since "ONWI, 1983a" is an unpublished preliminary draft of the subject documents, it would be appropriate for the authors to cite what appears to be the primary published reference, that is, Stone and Webster Engineering Corporation (1983b, Fig. 8). In addition, the authors must explain why the depth and thickness maps in Figs. 3-2 and 3-4 are not consistent, in terms of contour trend, with the corresponding maps in Stone and Webster Engineering Corporation (1983b, Figs. 11 and 10).

As another example of this type of discrepancy, geologic cross sections based on data obtained from DOE-sponsored borings, supplemented by geophysical logs from oil and gas wells, could have been included to permit evaluation of several site geometry descriptors (e.g., depth to thick salt, thickness of LSA Unit 4 Salt, and lateral extent) and subsurface characterizations.

In summary, when read as stand-alone documents, the reviewed reports can still be criticized for omissions of data and problems with references. When viewed within the context of the Salt Repository Project, certain aspects of the technical content are not traceable through the literature on the screening process. This issue must be addressed for this document to be technically credible and defensible.

2. Are the proper parameters selected for screening purposes?

A major problem with the reviewed reports is the absence of detailed explanations or arguments to support the choice of descriptors and discriminators. The authors can significantly increase the credibility of the reports by revising the texts with this deficiency in mind. For example, Vol. 1 states that depletion rates of the Ogallala aquifer are not useful as a discriminator (p. 36). No supporting arguments or data in the form of maps or tables are provided. This statement could be justified by adding several sentences and by referencing Fig. 3-22.

Also, the "expected Geohydrologic Regime" is discussed on page 41. First, the authors must explain their choice of potentiometric surface elevation as a descriptor in lieu of basic hydrogeologic parameters such as hydraulic conductivity, porosity, or well yield. Second, they must explain in more detail why the thicknesses of the evaporite sequence between the base of the Dockum Group and the top of the LSA Unit 4 Salt, and the thickness of the sequence between the repository and lower aquifer, are not useful as discriminators. Reference to Figs. 3-11 and 3-12 does not provide adequate justification.

Groundwater and radionuclide transport times within the aquitard unit may indeed be so long that the above parameters are not good discriminators. However, this point has not been rigorously demonstrated. The one-sentence discussion hardly justifies the assertion that a longer potential radionuclide travel time from the repository to the accessible environment is preferred. After stating their position that the groundwater travel time from the proposed repository horizon to the accessible environment is sufficiently long across the location given the available data and the results from preliminary numerical modeling, the authors may want to consider using these descriptors as discriminators so as to provide a more conservative approach to this sensitive issue.

Other questions can be raised about using salt-bed thickness as a descriptor, as discussed in Sec. 3.1.2 (Thickness of the Geologic System). The key sentence in this discussion reads:

> While a slight preference could be made for the thickest salt on the basis that greater thickness gives additional flexibility in final

> repository design, and possibly incremental advantages if system performance for more than 10,000 years is required, the thickness variation across the location is not considered significant.

This sentence is confusing at best; a non sequitur at worst. The last clause states that the variation in salt-bed thickness across the location is not significant, and Fig. 3-4 is cited as the evidence for this assertion. Figure 3-4 indicates that the "thick salt bed" in Unit 4 of the Lower San Andres Formation ranges from less than 140 ft (say 135 ft) to more than 180 ft (say 185 ft) in thickness across the area. Thus, for the sake of argument, Unit 4 varies in thickness on the order of 50 ft across the area. The authors must make an ironclad argument for the irrelevance of an additional 50 ft of salt thickness with respect to construction of a repository that must effectively isolate high-level nuclear waste for 10,000 years.

The authors imply that they have made such an analysis by presenting Fig. 3-3. Comparing the vertical dimensions shown in the figure for repository drifts, raises, and waste emplacement holes with the 125-ft figure specified on page 30 as the minimum salt-bed thickness acceptable for a repository indicates that for a salt bed exactly 125 ft thick, the upper and lower repository buffer zones would each be approximately 20 ft thick. Now, if the minimum thickness of Unit 4 is truly 135 ft, then the buffer zones could each be 25 ft thick. And, if the maximum thickness is 185 ft, the buffer zones could each be 50 ft thick. Again, the authors must present a solid argument for their position that upper and lower repository buffer zones that are 25 ft thick are just as good as those 50 ft thick. It is insufficient for them to treat the subject in the one sentence that reads:

> Suitable rock thickness is dependent upon the character of the host unit (i.e., number and type of interbeds), and the dimensions of the repository workings area and surrounding rock mass required to assure structural stability (Figure 3-3).

In summary, there are undoubtedly many lay as well as technical people who would feel intuitively that "the thicker the salt the better" for long-term repository integrity. And, the difference of 50 ft (an increase from 135 ft to 185 ft) represents a 37% increase in salt-bed thickness. Many people would assume that such an increase in salt thickness would add significantly to repository integrity. Thus, the authors must make a more convincing case as to why salt thickness is not a discriminator for Palo Duro Location A.

3. Is the ranking of the relative importance of screening factors appropriate?

The potential discriminators presented in Table 3-3 are grouped according to whether they relate to conditions that could affect long-term performance, operational performance, or environmental and construction impacts. It appears quite appropriate to rank the long-term performance discriminators as having highest priority, followed by operational performance discriminators and environmental and construction impacts. However, some justification for this ranking should be provided. In addition, the text

does not discuss grouping the discriminators and setting priorities for the discriminators listed under environmental and construction impacts. The rationale for assigning the priorities of individual discriminators must be presented. A revised text should also explain in detail how the descriptors were ranked.

A potentially significant issue is raised by the final choice and grouping of discriminators. Throughout the description of the screening process on pages 7-10, the importance of geotechnical parameters with respect to repository performance is emphasized. At the present stage, when a potential repository site is being proposed, it appears technically and programmatically inconsistent that geotechnical long-term performance discriminators (cf. DOE postclosure siting guidelines) are reduced to one screening factor.

Because postclosure guidelines are very important from the perspective of performance assessment, the current emphasis on 13 surface-related features may elicit criticism. Because subsurface characteristics are of primary concern for site characterization, many readers will believe that such factors should govern the selection of a site. The first paragraph of Sec. 4 (Site Identification) should be revised to include a reiteration of DOE's position that certain key descriptors, while of major importance for site characterization, do not, on the basis of current knowledge, appear to vary significantly across the location.

Finally, revised texts must explain why the screening is stopped before all the groups, or priority categories, of discriminators are used. Stopping the screening process in this way may be perceived as arbitrary and may call into question the reproducibility of the screening process (see the text following question 4). The many necessary value judgments related to the decision-making process are not available to readers of this draft. This situation could be remedied in a revision.

4. *Is the screening logical, defensible, and reproducible by other parties using the same data base?*

In general, the answer to this question is "yes." The screening method is presented in a logical manner, and the screening process progresses logically from step to step. If the descriptors, discriminators, and the ranking and overlay procedures are accepted, the screening process appears to be reproducible. However, the following reservations need to be addressed:

- Additional explanation is needed for the concept that gradational boundaries for continuously variable discriminators are adjustable during the overlay process.

- Enlargement from the resultant screened area to "the desired 9 square miles" of a preferred potential site is not necessarily reproducible and appears to be somewhat arbitrary. Also, in arbitrarily enlarging the screened site to 9 mi^2, the remaining discriminators were ignored.

- Value judgments must be described clearly and concisely and must be supported by data wherever possible.

- Each step in the decision-making process must be adequately explained.

3 PAGE-BY-PAGE COMMENTARY — PALO DURO LOCATION A

Pages	Lines	Comment
7	18-21	The statement that "any portion of the Deaf Smith/Oldham Counties location could potentially serve as a suitable repository site" should be rephrased or deleted. This type of remark seems somewhat premature at this stage and could be construed as a biased position.
13	1-36	The criterion "geohydrology" includes consideration of future geohydrologic regimes. Future conditions are not addressed in any detail in the report and are not being considered extensively in the siting process. The difficulties with this approach are obvious. Also, item (2) is not addressed in the ensuing discussion.
15	2	The word "tectonic" was omitted from the first sentence.
15	19-20	The phrase "anomalous geologic gradients" is confusing and should be explained.
18	2-3	The statement "and resultant flooding that might have impacts as a consequence of repository activities" seems to be incorrect. While those conditions could well exert impacts, neither the conditions nor the impacts are a consequence of repository activities. Rather, the potential impacts on repository activities would be a consequence of the extreme conditions cited.
20	20	Use "descriptor" rather than "parameter."
21	3	The term "parameter groups" is introduced but not defined.
21	29	The phrase "is descriptor measure variable" is awkward.
22		In box 3, "with-in" should be "within."
22		In box 4, "there of" should be "thereof."
23	34	What does the term "performance differentials" mean? Is it the same as or different from the term "potential performance or impact variations" as used on lines 4-5 on page 24?
24	9	What does the term "performance effects" mean? Is it related to the terms discussed immediately above?

Pages	Lines	Comment
25	16-17	A distinction should be made between erosion and denudation. Also, data should be cited to substantiate the statement that surface erosion processes will not compromise repository integrity. A statement of regional or local rates from the literature would be sufficient to demonstrate this conclusion if those rates are adequately supported in the cited publication.
26-28		The caption in Table 3-1 should be changed to eliminate the words "data availability" because the table contains no information on this subject. The correlation between Table 3-1 and Table 1-1 in the executive summary is not clear. Descriptors are identified differently in the two tables. This discrepancy is an obvious point of confusion that should be eliminated. The reader can clearly identify the 10 Nuclear Waste Terminal Storage criteria in both tables and follow the discussion of these in Sec. 2. Because the correlation between the descriptors as indicated in Tables 1-1 and 3-1 is not very clear, the flow of logic is lost.
29		The coordinate system used on the base map of the larger six-county, areal coverage maps (e.g., Figs. 3-2, 3-4, and 3-7) must be defined on the base map or in the notes. It is very useful to include both the six-county and location-scale maps wherever provided (e.g., both Figs. 3-2). However, it is very confusing and not good report style to have two identically numbered and titled figures and a figure with no page number. A Fig. 3-2a and 3-2b figure numbering convention could be used. "Location A" should be added to the end of the title of the large-scale map.
32		Again, there are two figures numbered 3.4, one of them with no page number.
33	30	Actually, the Ogallala aquifer is recharged across the entire location by means of infiltrated precipitation.
34		It would be helpful in Fig. 3-5 to refer to a well location map. The reader cannot determine until seeing Fig. 3-17 where the cross section lies relative to the location being evaluated. The horizontal scale and the vertical exaggeration are not given. Unit 4 is described as halite, when elsewhere in the report it is called the Unit 4 Salt Bed. Also, the note is counter-productive. This illustration should be modified or replaced because it is potentially misleading.

Pages	Lines	Comment
35		A reference source for Fig. 3-6 should be given. Although the strata are grouped into three hydrostratigraphic units (upper, middle, and lower), the text repeatedly departs from this terminology. Expressions such as "shallow unit," "deep-basin unit," "upper unit," "deep-basin aquifers," "deep-basin aquifer units," and "shallow or deep aquifers" are used instead.
36	4-7	This statement is incorrect. The Ogallala aquifer receives some recharge, albeit minor, from three surface impoundments. These surface sources have a slight but not negligible impact on the geohydrologic regime.
36	12-13	Add "a" or "b" to the "SWEC, 1983" citation.
36	14	Figure 3-7 shows an east-southeast flow direction for the Ogallala aquifer. Line 14, however, refers only to "ground water in the upper unit." The upper hydrostratigraphic unit includes the Dockum aquifer, but its flow direction is not depicted in Fig. 3-7. Either the figure citation or the text needs to be changed.
36	15-16	Flow in the Wolfcamp aquifer is to the north-northeast (see Fig. 3-8); flow in the Pennsylvanian aquifers on a regional basis is to the east-northeast. Thus, the statement "flow within the deep basin aquifers is to the east-northeast" is only partially correct.
36	32-34	There are several errors in this sentence. First, there is no such term as "potentiometric head"; a potentiometric surface, as depicted on a contour map, represents the total head of a groundwater system. Second, it is unclear whether the sentence refers to heads or to potentiometric surfaces. Lastly, if "heads" in the Wolfcamp aquifer is indeed plural, then the word "level" needs to be plural also. This sentence needs to be rewritten for both correctness and clarity.
37		Although the legend for Fig. 3-7 has a large arrow, explained as an indication of groundwater flow direction, there is no arrow on the map proper. Furthermore, the map shows a large area with no contours in eastern Randall and western Armstrong counties. What does the blank represent? Lastly, line 14 on page 36 uses this figure in support of discharge along the Eastern Caprock Escarpment. However, this feature is not labeled on the figure, nor is it possible fr .. the water-level contours to ascertain where the discharge occurs.

Pages	Lines	Comment
39		According to the data shown in Fig. 3-9, this map has been contoured on the basis of two well-control points. If that is the case, how has the anomalous pattern beneath the location been determined, and why is there no discussion of this anomalous pattern in the text on page 36?
40		What is the difference, as noted in the legend of Fig. 3-10, between "well control" and "other wells." If the other wells were not used for control or as a data source, they should not be indicated.
41	15	The phrase "due to their distant position" is awkward. A preferable expression might be "because of their appreciable vertical separation."
44	8-9	"Flow to the east-northeast" is only partially correct as discussed in the comment for page 36, lines 15-16.
46	19	"Interior basin dissolution," either in the Palo Duro or other evaporite-bearing basins, is not necessarily restricted to the "shallowest salt bed."
46	26-28	The Canadian River valley is the stated distance from the location; the margins of the Southern High Plains are appreciably farther removed. It would be useful to cite the actual lateral separation. As written, the impression is given that all three dissolution fronts are some 30 or so miles from the location.
47-48		Two figures carry the number Fig. 3-14, and the second figure does not have a page number.
48		Some discussion of the data used to compile Fig. 3-15 is warranted because dissolution is an important consideration. Furthermore, some presentation of estimated lateral dissolution rates should be presented to substantiate the conclusion that the dissolution front as illustrated would not affect any site within the location for such a long period of time.

Pages	Lines	Comment
49	2-4	The argument is presented that dissolution has no effect on site preference because this phenomenon will not affect system performance. However, if estimates of dissolution rates are in error or if rates were to increase in the future as a result of climatic or other changes, repository performance could indeed be significantly affected. The authors should explain why dissolution is not considered a discriminating factor during this phase of site selection.
49	9	As stated for Fig. 3-5, there is no information as to the location of the two boreholes cited.
49	14	It might be wise to replace the word "vertical" with "downward," because the salts being dissolved lie above the repository horizon. Dogmatic-sounding statements like "of negligible concern" are out of place. Once again, the discussion of dissolution needs to be substantiated with data.
49-52		Section 3.3 presents a rather generalized discussion of three aspects of geochemistry (waste package lifetime, radionuclide solubility, and radionuclide retardation potential). Few specific data are introduced or discussed. However, Sec. 4.2.3 (Preferred Site Geochemistry), on page 119, introduces very specific data. It seems more appropriate for these data on the composition of the host rock and brines to be treated in the earlier section. It is also unclear as to which brines the data on page 119 refer. Are these values of dissolved species (1) from fluid inclusions in the salt, (2) from brines contained within nonsalt interbeds, or (3) from some other brines? In addition, the values for Ca^{++} and K^{+} relative to Na^{+} seem too high. Some additional discussion and clarification of these points appear warranted, and such material should appear before this point in the document.
50		The section line and the well locations in Fig. 3-16 need to be identified. Comparing the county names in this figure with those in Fig. 3-15 indicates that the wells from which this section was compiled are located to the west of the Palo Duro Basin in New Mexico. If this is the case, it cannot be argued that this cross section reflects conditions within the location.
51	3-4	Statements to the effect that the amount of brine in salt is well known should be substantiated. How many data points are available to warrant such a statement?

Pages	Lines	Comment
51	6-7	What is the basis for the statement that the variable "brine content and chemistry" is uniform throughout the location?
52		Section 3.4.1 is generally vague and needs to be rewritten to clarify the descriptor used. It is not clear how the three-bullet definition for subsurface characterization (p. 54) is evaluated with respect to the logic steps noted. Subsurface characterization is a complex descriptor made up of a number of factors. It is confusing and difficult to follow the logic and data involved.
53		A reference source for Fig. 3-17 is needed. Also, borehole No. 29 -- the Hereford oil and gas well -- is located outside the southwestern corner of Location A and would provide additional well control on maps such as Figs. 3-2, 3-4, 3-12, and 3-14. Is this borehole too shallow to provide useful information, or are the data unavailable?
54	27-29	These lines state that "thickness and lateral extent discriminators ensure that sufficient competent salt is available." However, in Secs. 3.2 and 3.1.3, it is argued that these descriptors should not be discriminators. This contradiction needs to be resolved.
55-59		Section 3.5 (Tectonic Environment) is clearly written for the most part and appears to state well why the presence of faults is not a discriminator. However, a more convincing argument would result from showing the various interpretations based on drill-hole and geophysical data and on seismic reflection data. The text should mention that Fig. 3-19 is based primarily on the interpretation of seismic reflection data. The text should also indicate the source of seismic energy used in this survey because different energy sources are preferred for the acquisition of deep, as opposed to shallow, seismic data.
55	21-24	The discussion of volcanic activity in New Mexico and its interpretation needs to be supported with references.
57		The title of Fig. 3-19 should indicate that faults are inferred to affect rocks of Wolfcampian or older age. Also, why are the faults shown in Figs. 3-23 and 3-30 (for Oldham, Potter, and Carson counties) not shown here too? Are the omitted faults known to be present and thus are not "inferred"?
58	1	Change wording to "map of inferred faults."

Pages	Lines	Comment
58	11	Change the phrase "radionuclides will not get to" to "radionuclides will not migrate to."
59	18-20	It is still possible, on the basis of available data, to assess seismic hazard and risk, using both deterministic and probabilistic analyses. However, these parameters do not represent discriminators.
61	21-22	The statement that "the Ogallala aquifer is not being recharged" is incorrect. The aquifer is being recharged, but present-day withdrawals are exceeding the amount of recharge, which accounts for the observed decline in water levels.
61	33	The figure citation should be 3-17, not 3-2.
63		The title of Fig. 3-22 should indicate that the Ogallala aquifer is the water-bearing unit involved. Also, the word "level" in the title should be plural. Although it is in one sense obvious, there is nothing in the legend or the title to indicate that the contoured values represent declines. Differences can be either positive or negative.
64		Comparing Fig. 3-23 with Fig. 3-17, it would appear that the borehole numbered 34 on the previous diagram has been omitted here. The borehole in question is the Mullin Oil Company Woodford No. 1. Also, the legend contains no explanation of the open circles, which obviously represent boreholes, as was done in other figure legends. Are the wells shown all the petroleum boreholes drilled or only those that extend below a certain depth?
68	7-9	The granite wash at Location A is only Pennsylvanian in age (see Fig. 12, p. 19, of Dutton et al., 1982). Granite wash of Early Permian (Wolfcampian) age occurs to the southwest in Parmer County and to the east in Donley County. This paragraph should be reworded to reflect this situation.
68	14-15	The statement "with relatively high hydrocarbons" is not what was stated in the cited reference. The sentence should be reworded to state "to suggest potential hydrocarbon-reservoir trends."

Pages	Lines	Comment
75	3-10	The ownership of and rights to surface and subsurface water are stated as being important in the site screening process. However, it is stated that data of this type have not been evaluated and therefore could not be used as a screening discriminator. This obvious oversight should perhaps be remedied.
75	20	If the quality of Fig. 3-31 were improved, the citation on this line would be more useful.
75	28-29	The text states that the program HEC-2 was used for computing water-surface profiles. However, the way in which peak flood discharge was estimated from the maximum probable precipitation values is not discussed. Clarification is needed.
76		Figure 3-31 is illegible. The topography cannot be seen because the contour lines are so faint.
77		A reference source is needed for Fig. 3-32. Also, it is slightly misleading to include the playa lakes (discussed on p. 78) as part of the probable-maximum-flood zone. Granted, these playa depressions would fill as a result of runoff from the 48-hour probable-maximum-precipitation event, but they technically are not flood zones.
80-81	20-29; 1-3	Section 3.7.6 states that future glaciation would have no effect on long-term repository performance because of geographic location. However, attendant climatic changes associated with glaciation and their potential effects on future hydrologic conditions and how this might relate to waste isolation are never discussed.
82		A reference source for Fig. 3-33 is needed.
84		A reference source for Fig. 3-34 is needed.
89		A reference source for Fig. 3-36 is needed.
91		A reference source for Fig. 3-37 is needed.
95		A reference source for Fig. 3-38 is needed.
98		A reference source for Fig. 3-39 is needed. Also, this illustration shows projected well yield in the Ogallala Formation in the year 2020. The method used to calculate these yields should be presented.

Pages	Lines	Comment
108	25-32	In Sec. 3.7.10 on page 83, proximity to highways is discussed in negative terms (i.e., hazardous conditions from accidents, etc.). In the discussion of Priority 3, a positive tone is conveyed as regards the closeness of highways to the location. This apparent reversal is not discussed in the text. If the original negative sense were followed, the overlaying process cited in Figs. 4-5 and 4-7 would yield different results.
115	6-19	After relying on the terms "descriptors (or parameters)" and "discriminators," this paragraph introduces yet another term "factors." Again, consistency is required. Only one term should be used throughout.
115	22-23	The statement reads "according to the siting performance criteria that were used to select it" (it = preferred site). In fact, while the discussion of the preferred site is structured along such performance criteria, actual selection was based on an overlaying procedure that relied on certain descriptors that have been called discriminators. Again, the report needs to use consistent terminology.
118	10-11	The statement is incorrect, as previously noted. The Ogallala aquifer is recharged within the location by infiltrated precipitation.
118	12	The bullet as written suggests that injection wells (assuming any were present) would be used to inject groundwater. The sentence should be rewritten to say that wells for injecting fluids into groundwater aquifers are not present.
118	16	East-northeast flow is only partially correct for the two lower hydrostratigraphic unit aquifers (see previous comments relative to p. 36 on this point).
118	31-33	On page 41 and in Fig. 3-11, the discussion centers on the aquitards represented by the middle hydrostratigraphic unit. On page 46, the Alibates Formation is briefly discussed relative to the positioning of seals. It would be useful here to expand this last bullet to indicate clearly which aspect is being addressed by the inclusion of these data on the Alibates Formation.

Pages	Lines	Comment
119	20-21	The sentence reads "data for deep ground waters are presently being obtained from the J. Friemel No. 1 borehole." What is meant here by deep groundwaters? Are they waters that are deeper than the repository horizon? Or, are they waters from the lower hydrostratigraphic unit only, from a specific deeper aquifer, or what? Also, the data to be obtained will technically be derived from analyses of water samples collected in the referenced borehole. The borehole itself is not going to supply these data.
119	29	What is meant by "deep" here? Specify either actual depths or depths in relation to some horizon or marker.
121		A reference source for Fig. 4-9 is needed.
135		The following terms are either incorrectly, incompletely, or poorly defined in the glossary: borehole, brine, and caprock. These terms are discussed below. 1. Boreholes are not drilled solely for exploratory purposes; many are drilled to produce subsurface resources (e.g., oil, gas, brines, and artificially dissolved materials). In these cases, the emphasis is clearly on production and not on exploration. However, subsurface data from such production boreholes have exploration value. 2. There are natural brines whose saturation level is defined with respect to materials other than salt (halite), such as trona, $CaCl_2$, etc. Brines are best defined on the basis of total dissolved solids (TDS); various TDS ranges by which different authors or groups define brines have been published. 3. The caprock is a zone consisting of several rock types or associated materials. It is not a rock type, per se. The common constituents (gypsum, calcite, etc.) are also only grossly arranged in discrete intervals. To use the term "layers" suggests that caprock can be stratified, which is not the case. Also, nondomal masses of rock salt can have caprock (see Paradox Basin), and many Gulf Coast salt domes totally lack caprock.
137	1-3	The definition given for dissolution is unacceptable in terms of the geologic connotation relative to evaporitic sequences. The definition reads as though it came out of a chemical engineering handbook.

Pages	Lines	Comment
137	17-20	In the definition of floodplain, it seems inappropriate to include the words "including flood-prone areas of offshore islands" when this glossary is in a report about an area in West Texas.
139	21-22	It should be added that as defined the potentiometric surface described is applicable only to confined aquifers, not to any "given aquifer."
140	9-10	Why limit definitions of geologic time terms to the Quaternary? The report discusses five others: Precambrian, Triassic, Permian, Pennsylvanian, and Tertiary. Why not define all of them?
146		In Fig. A-1, "DSN" should be changed to "DSW."

4 PAGE-BY-PAGE COMMENTARY — PALO DURO LOCATION B

Pages	Lines	Comment
30	12-13	Even though the aspect of a minimum thickness of 125 ft is discussed here, it is not mentioned in the following locations: page 29, Fig. 3-1; page 32, Fig. 3-4; page 116, Sec. 4.2.1; and page 142, glossary. The fact that the thickness of LSA Unit 4 thick salt decreases to less than 125 ft in the southern one-third of the location permits this descriptor to serve as a discriminator. However, the amount of variation is less than 60 ft, which is similar to the amount of variation in Location A. Some rationale should be presented for deciding what variation in thickness is acceptable.
32		The legend for Fig. 3-4 should give the contour interval, as should the legends for all other illustrations containing contoured information.
36	14	Figure 3-7 shows an east-southeast flow direction for the Ogallala aquifer. Line 14, however, refers to "ground water in the upper unit." The upper hydrostratigraphic unit also includes the Dockum aquifer, whose flow direction is apparently not indicated in Fig. 3-7. Either the title of Fig. 3-7 or the text should be revised.
36	15-16	Figures 3-8 and 3-9 indicate that the flow in both of these aquifers is to the northeast, not east-northeast as stated in the text.
42		The relatively more complex contour pattern in the northeast quarter of the location should be explained.
53		The values for depth are not listed for wells 6 and 20 in Fig. 3-17. Were they omitted or are the data unavailable?
57	2-4	With respect to Fig. 3-19, the wording here is more precise than that in Vol. 1. Revise in Vol. 1.
64		Why are boreholes 17, 18, 20, and 21 omitted from Fig. 3-17?
71		Add contour values to Fig. 3-27, and label the location of the shelf margin. Why is a fault symbol shown in the explanation when no faults are shown on the map?
76-77		Label the location of Tule Lake in Figs. 3-31 and 3-32.

Pages	Lines	Comment
83-87		Clarify the discussion of population density in Sec. 3.8. Is the town of Tulia included or excluded from consideration in the descriptor? Explain the significance of the national average population density in the context of the extreme range in density from population centers to rural areas.
102-106		Some serious problems are apparent with the analysis of the operational performance factor in Sec. 4.1. As in Vol. 1, this term should be defined at the beginning of Sec. 4. The discriminators that contribute to this factor are population risk and population density. The text indicates that the risk decreases toward the south but does not explain how this discriminator is weighed against the relatively high population density in Tulia, which is also located toward the south. The operational performance factor mapped in Fig. 4-2 appears to ignore the population density discriminator, the location of Tulia. Lines 9-11 on page 106 state that Tulia is excluded from consideration as a site, but this statement does not explain the discrepancy mentioned above.
106	24	Although the text states that the western half of the location is "more preferred," both Figs. 3-35 and 4-2 indicate a more preferred area toward the south. This inconsistency should be corrected.
114	21-30	A defensible justification is needed for stopping the overlay procedure before all discriminators are incorporated in the overlay process. Also, although the text states that this process results in a site of about 2 mi^2, the subsequent expansion of the screened site up to 9 mi^2 is not necessarily reproducible.

REFERENCES

Dutton, S.P., et al., *Petroleum Potential of the Palo Duro Basin, Texas Panhandle*, Texas Bureau of Economic Geology Report of Investigations No. 123 (1982).

Office of Nuclear Waste Isolation, *Identification of Preferred Sites in Palo Duro Locations*, Battelle Memorial Institute, Columbus, Ohio, preliminary draft (1983a).

Office of Nuclear Waste Isolation, Battelle Memorial Institute, *Permian Basin Location Recommendation Report*, U.S. Department of Energy Technical Report DOE/CH/10140-2 (1983b).

Stone and Webster Engineering Corp., *Area Geological Characterization Report for the Palo Duro and Dalhart Basins, Texas*, U.S. Department of Energy Technical Report DOE/CH/10140-1 (1983a).

Stone and Webster Engineering Corp., *Major Salt Beds of the Palo Duro and Dalhart Basins, Texas*, prepared for the Office of Nuclear Waste Isolation, Battelle Memorial Institute, Columbus, Ohio, Technical Report BMI/ONWI-518 (1983b).

APPENDIX A

U.S. DEPARTMENT OF ENERGY LETTERS REQUESTING PEER REVIEW

25/26

Department of Energy
National Waste Terminal
Storage Program Office
505 King Avenue
Columbus, Ohio 43201

January 17, 1984

Dave Fenster
EES - 362
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Fenster:

Enclosed for your review are copies of the screening document, ~~Identification~~ of Preferred Sites Within the Palo Duro Basin Volume I: Palo Duro Locaton A. We would again appreciate your assistance in completing the review quickly.

In performing this review, please consider the following:

- Have appropriate data been evaluated and used?
- Are the proper parameters selected for screening purposes?
- Is the ranking of relative importance of screening factors appropriate?
- In summary, is the screening logical, defensible, and reproducible by other parties.

When formulating your comments, we would also appreciate constructive suggestions for revisions.

Volume II of this report will probably be available within a month, and will be forwarded. However, please proceed with reviewing Volume I. We would like to compile all comments by January 31.

Thank you for your prompt attention.

Sincerely,

Thomas A. Baillieul

Thomas A. Baillieul
Acting Director
Site Exploration Office
NWTS Program Office

NPO:LKM:ksw

Enclosure: ~~One (1)~~ SIX Copies copy - "Identification of Preferred Sites Within the Palo Duro Basin Volume I: Palo Duro Location A

GS# 258-84

27/28

Department of Energy
National Waste Terminal
Storage Program Office
505 King Avenue
Columbus, Ohio 43201

January 24, 1984

Dave Fenster
EES - 362
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Fenster:

Enclosed is Volume II of Identification of Preferred Sites Within the Palo Duro Basin for your review. We ask that you consider the same points listed in my January 17, 1984 letter in conducting your review. We would very much appreciate receiving your comments within 2 weeks of receipt of this letter.

Thank you for your assistance.

Sincerely,

Thomas A. Baillieul

Thomas A. Baillieul
Acting Director
Site Exploration Office
Salt Repository Project Office

SRPO:LKM:ksw

Enclosure:
Six (6) copies - Identification of Preferred Sites Within the Palo Duro Basin

GS# 277-84

APPENDIX B

CONCURRENCE SHEET

APPENDIX B

CONCURRENCE SHEET

I concur that the Argonne National Laboratory report on ONWI's draft manuscript, entitled "Identification of Preferred Sites within the Palo Duro Basin: Vol. 1 -- Palo Duro Location A, and Vol. 2 -- Palo Duro Location B," fairly represents my comments, where incorporated, to the peer re panel.

Patrick A. Domenico

Patrick A. Domenico

Dorland Edgar

Dorland E. Edgar

Terry Engelder

Terry Engelder

David F. Fenster

David F. Fenster

Serge Gonzales

Serge Gonzales

Wyman Harrison

Wyman Harrison

APPENDIX C

CREDENTIALS OF PEER REVIEW PANEL MEMBERS

Patrick A. Domenico

Syracuse University: B.S., Geology (1959)
Syracuse University: M.S., Engineering Geology (1963)
University of Nevada: Ph.D., Hydrology (1967)

From September 1982 to the present, Dr. Domenico has been Professor of Geology at Texas A&M University, where he has specialized in groundwater hydrology. For the 14 years prior to 1982, he was Professor of Geology at the University of Illinois. His teaching and research during this 16-year period has focused on groundwater hydrology, with emphasis on simulation and optimization, and mass and energy transport in porous media.

Earlier positions include six years as a Research Associate Professor in Hydrology at the Desert Research Institute, University of Nevada, and one year as an Engineering Geologist for the Department of Water Resources, State of California, working on dam sites, power plants, and other engineering structures.

Dr. Domenico has been active as a consultant and has received several awards, including the Birdsall Distinguished Lecturer in Hydrogeology Award (1981-1982); the Alexander Winchell Distinguished Alumni Award, Syracuse University (1980); and the O.E. Meinzer Award for distinguished contribution to hydrogeology (1979).

Dr. Domenico has authored numerous consulting reports and has published approximately 30 journal articles and conference papers.

Dorland E. Edgar

Central Missouri State University: B.S., Geology (1968)
Colorado State University: M.S., Geology (1973)
Purdue University: Ph.D., Geology (1976)

Dr. Edgar joined the Geoscience and Engineering Group of the Energy and Environmental Systems Division of Argonne National Laboratory in 1978. Since that time he has worked as a geologist and hydrologist on programs related to waste management and energy and mineral resources development. From 1981 through 1983, he participated in studies of the geologic setting of crystalline rocks of the northeastern and Lake Superior regions of the United States for the purpose of assessing their suitability as sites for a high-level radioactive waste repository. His primary areas of responsibility on this project were surface-water and groundwater hydrology, geomorphology, and surficial geology.

From 1978 to 1981, Dr. Edgar was affiliated with Argonne's Land Reclamation Program and Environmental Control Technology Program, where he studied the relationships between surface mining and reclamation activities, and geomorphic processes, hydrology, water quality, and erosion and sedimentation. Dr. Edgar also served as a U.S. Department of Energy representative to an interagency group that reviewed comments and drafted revised regulatory guidelines for the U.S. Office of Surface Mining.

Before coming to Argonne, Dr. Edgar was employed at Oak Ridge National Laboratory, where he conducted research on surface and subsurface hydrologic and geologic conditions, and their relationship to the shallow land disposal of low-level radioactive waste. One project involved the study of the hydrologic and geomorphic processes involved in transporting radionuclides from burial sites through an instrumented watershed. Dr. Edgar's graduate research was directed primarily toward the relationships between hydrology and the geomorphic processes operating within alluvial stream channels and drainage basins.

Dr. Edgar has authored approximately 25 scientific and technical publications, and is a member of two professional societies.

Terry Engelder

Pennsylvania State University: B.S., Geology (1968)
Yale University: M.S., Geology (1972)
Texas A&M University: Ph.D., Geology (1973)

Since 1973, Dr. Engelder has been associated with Lamont-Doherty Geological Observatory of Columbia University, most recently (1979 to the present) as a Senior Research Associate. From 1970 to 1973, he was a Research Assistant at the Center for Tectonophysics at Texas A&M University.

Dr. Engelder's laboratory research has focused on (1) frictional properties of rock, with emphasis on the effect of fault gouge; (2) dilatancy of rocks; (3) mechanical properties of rocks affecting strain relaxation; (4) fluid transport properties of rocks; (5) geochemistry of rock-water interactions; and (6) rock parameters affecting pressure solution. His field studies have dealt with fault zones, strain relaxation, in situ stress measurements, solution cleavage, in situ ultrasonic properties of rock, and propagation of joints.

A member of three professional societies and past associate editor of two journals, Dr. Engelder has been an author or coauthor of 50 scientific papers.

David F. Fenster

City College of the City University of New York: B.A., History (1967)
University of Illinois: M.A., History (1968)
Queens College of the City University of New York: M.S., Geology (1975)
Certified Professional Geologist (No. 4668), American Institute of Professional Geologists
Certified Professional Geologist (No. 85), State of Indiana

Mr. Fenster joined the staff of the Geoscience and Engineering Group of the Energy and Environmental Systems Division of Argonne National Laboratory in 1982. He is currently Technical Project Manager and member of the multidisciplinary core peer review panel of the technical data base for the salt host-rock portion of the National Waste Terminal Storage program. He also served as a technical reviewer for parts of Argonne's Lake Superior regional report related to siting high-level radioactive waste repositories in crystalline rocks.

Prior to coming to Argonne, Mr. Fenster was a Project Geologist with Dames & Moore, Park Ridge, Ill. He had been with Dames & Moore since joining the staff of the Cranford, N.J., office in 1974. During his tenure with Dames & Moore, Mr. Fenster acquired extensive experience in seismotectonics, structural geology, radioactive and hazardous waste disposal, regional geology, engineering geology, hydrogeology, and general geologic field mapping. For example, Mr. Fenster was Principal Investigator for Stratigraphy for the Generic Environmental Impact Statement concerning disposal of radioactive waste in bedded salt, granitic rocks, and argillaceous formations for Oak Ridge National Laboratory. He also worked on a revised draft (unpublished) of a national-screening-level, site-selection investigation for high-level radioactive waste isolation in crystalline rocks.

Mr. Fenster also worked on geologic investigations related to nuclear power plant siting and licensing. He is familiar with U.S. Nuclear Regulatory Commission review and licensing procedures, having worked on early site reviews, preliminary safety analysis reports, final safety analysis reports, and detailed fault investigations.

Mr. Fenster has published on high-level radioactive waste repository siting, midcontinent tectonics, and structural geology in the Northeast, and has worked on over 30 consulting reports. He is a member of five professional societies, including the Association of Engineering Geologists.

Serge Gonzales

Duke University: A.B., Geology (1958)
Miami University: M.S., Geology (1960)
Cornell University: Ph.D., Stratigraphy (1963)
Certified Professional Geologist (No. 1914), American Institute of Professional Geologists
Registered Geologist (No. 110), State of Georgia Board of Registration

Since 1982, Dr. Gonzales has been a full-time consultant, serving as President of Earth Resource Associates, Inc. From 1978 through 1981, he was Associate Director of the Institute of Natural Resources at the University of Georgia, where he also was an Associate Professor of Geology. From 1971 to 1978, he was Staff Geologist at the Institute of Community and Area Development, also at the University of Georgia, with a joint appointment as Assistant Professor of Geology. While Assistant Professor for the Department of Geology at Miami University (Oxford, Ohio) from 1966 to 1971, Dr. Gonzales worked part time as a consulting geologist for Earth Science Laboratories, Inc. Working as a petroleum geologist for EXXON Company from 1963 to 1966, Dr. Gonzales specialized in offshore exploration and development geology.

Dr. Gonzales has had extensive experience in the areas of applied geology and mineral resources. In particular, he has expertise in mined-land reclamation, subsurface storage of hydrocarbons, and land-burial and subsurface disposal of hazardous and radioactive wastes. He has assessed various evaporite deposits as sources of salt and other minerals, and as sites for waste disposal, with particular emphasis on natural dissolution phenomena.

Dr. Gonzales is a member of six professional societies and has published more than 100 articles and reports, many of which relate to the geologic disposal of radioactive waste and related regional and rock-type assessments.

Wyman Harrison

University of Chicago: S.B., Geology (1953), after three years of undergraduate work at Stanford University
University of Chicago: S.M., Geology (1954)
University of Chicago: Ph.D., Geology (1956)
Registered Geologist (No. 2476), State of California
Certified Professional Geologist (No. 134), American Institute of Professional Geologists

Dr. Harrison is Associate Director for Geoscience and Engineering at Argonne National Laboratory's Energy and Environmental Systems Division. He directs a 25-person group that performs analytical and experimental studies related to management of energy and mineral resources and to development and deployment of related technologies. Major activities of the group include (1) acquisition of geophysical and geotechnical data bases, (2) analysis of the data of geoscience to support the design and deployment of energy technologies, and (3) development of physical and mathematical models of geophysical/ geotechnical systems.

Dr. Harrison's group recently completed comprehensive surveys of the geoscience data on crystalline rock complexes in the northeastern and Lake Superior regions of the United States to help assess their potential as possible sites for repositories for high-level radioactive waste. Dr. Harrison has conducted numerous other geological and geotechnical studies at Argonne, ranging from estimating petroleum resources of the Soviet Union to determining near-shore circulation in Lake Michigan.

From 1971 to 1975, Dr. Harrison was Professor of Geography (Associate Department Chairman) at the University of Toronto, where he specialized in geophysical studies related to the siting of supertanker ports and slope stability in sedimentary terrains. Prior to that, he was Associate Director for Physical, Chemical, and Geological Oceanography at the Virginia Institute of Marine Science and a Professor of Marine Science at the University of Virginia. Dr. Harrison was Director of Environmental/Science Services Administration's (now National Oceanic and Atmospheric Administration's) Land and Sea Interaction Laboratory from 1964 to 1968. Before that he was on the faculty of Dartmouth College's Department of Geology and a geologist with the Indiana Geological Survey.

An author of over 100 papers, reports, reviews, and books, Dr. Harrison was made Senior Scientist at Argonne in 1976.

Mary W. Tisue

Beloit College: B.S., Geology (1961)
Yale University: M.S., Geology (1963)

Ms. Tisue has been employed since 1979 as a technical editor for the Energy and Environmental Systems Division of Argonne National Laboratory. From 1981 through 1983, she was part of a research team that gathered geologic information on the crystalline rocks of the northeastern and north-central United States, with a view to assessing their suitability as sites for repositories for high-level radioactive waste. Other projects have involved the editing of reports, journal articles, conference papers, and proposals on such topics as transportation, decision analysis, particulate control, industrial process energy conservation, economics of gasohol, chemistry of synthetic fuel process waters, environmental studies of ocean thermal electric conversion, recycling, petroleum geology and resource assessment, and socioeconomic impact of energy development.

Prior to accepting a position at Argonne, Ms. Tisue worked as a technical writer and marketing assistant for an instrument company and as an editor for the Metals Research Laboratory of what was then the Olin-Mathieson Chemical Corporation.

Ms. Tisue is a member of the Society for Technical Communication and the Association of Earth Science Editors.

Department of Energy
Chicago Operations Office
Salt Repository Project Office
505 King Avenue
Columbus, Ohio 43201-2693

July 9, 1984

NOTICE TO READERS

At the request of the Salt Repository Project Office (SRPO), Argonne National Laboratory (ANL) conducted a peer review of the Office of Nuclear Waste Isolation's (ONWI's) draft reports entitled "Identification of Preferred Sites within the Palo Duro Basin: Volumes 1 and 2." (A microfiche copy of the two volumes is attached to the inside back cover of this report.) Argonne reviewers were asked to consider whether appropriate data were evaluated and used; whether proper parameters were selected for screening purposes; if the ranking of the relative importance of the screening factors was appropriate; and if the screening was logical, defensible, and reproducible. The ONWI volumes recommend nine-square-mile sites in Deaf Smith and Swisher counties, Texas as warranting further study as part of the process of selecting a site for the nation's first high-level radioactive waste repository. Such recommendations represent the culmination of screening in the Permian Basin from a regional scale first to areas, then to locations, and, as presented in this report, finally to sites.

Upon completing revisions based on ANL's review, ONWI formally transmitted the volumes to SRPO, which forwarded them to the State of Texas for a 45-day review. After considering state comments and making appropriate revisions, DOE will decide whether to accept the recommendations proposed in the ONWI document.

Jo Ann Sherwin
Chief
Site Evaluation
Salt Repository Project Office

IN# 358-84