UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	
Kerr-McGee Chemical Corporation	Docket No. 40-2061-ML ASLBP No. 83-495-01-ML
(West Chicago Rare Earths Facility)	

KERR-McGEE MOTION TO STRIKE
TESTIMONY OF DON L. WARNER RELATING
TO CONTENTION 3(g)(2)

Kerr-McGee Chemical Corporation ("Kerr-McGee") hereby moves to strike the testimony of Don L. Warner relating to contention 3(g)(2). This testimony, which is styled as "Comments", was submitted on behalf of the State and is attached as Exhibit 1.

The contention at issue provides:

> The evaluation of alternative sites was not done on a standard evaluative basis and was otherwise improper in that: . . . . (2) The modified solute transport analysis of the Proposed Action and Alternative D was not benchmarked.

Comments by the Illinois Department of Nuclear Safety ("IDNS") provide an explanation of the contention:

> The computer model used for the solute transport analysis was originally written for modeling saturated zone transport. SFES at 5-26 . . . . The NRC Staff assumed that the West Chicago site and the Alternative D site would have an unsaturated zone directly beneath the disposal cell. The NRC staff modified the compute

> program for unsaturated zone modeling. Id. No discussion of benchmarking of this program was provided in the SFES. IDNS submits that the modified computer model could not accurately model the Proposed Action and Alternative D sites.

State Reply, Attachment A, at 5-6 (June 16, 1989). In short, the thrust of contention 3(g)(2) is that the alternatives analysis in the SFES is inadequate because the staff's model for flow through the unsaturated zone had allegedly not been validated.

The Warner testimony by its own terms does not relate to the State's contention. Dr. Warner criticizes the NRC's vertical infiltration model and lateral transport model because of the use of average properties of the site in the modeling. But Dr. Warner then states:

> Perhaps the averaging processes used in the NRC model are satisfactory for comparison of alternate sites. I will not dispute that possibility, since that is not the issue that I am addressing. In fact, that is the sort of application that originators of both the vertical infiltration model . . . and the lateral flow model . . . state that their models are suitable for. (emphasis added)

Thus, although the contention is explicitly framed as a challenge to the NRC's analysis of alternatives, Dr. Warner has conceded that he does not question the suitability of the NRC modeling for comparing alternatives.

Moreover, the contention is limited to a challenge to the NRC's modification of a standard model to deal with flow through the unsaturated zone. In setting the contention

down for hearing, the Board observed that neither Kerr-McGee nor the staff had validated the equation dealing with flow through the unsaturated zone from first principles or from empirical observations. Memorandum and Order, 7 (Nov. 14, 1989). The testimony of Kerr-McGee's experts shows that the equation can be derived from first principles.[1/] And, Dr. Warner has conceded that "the vertical infiltration model . . . used by the NRC can . . . be derived from first principals [sic]." In short, the very issue on which the State sought a hearing has been rendered moot since even the State's expert has conceded that the challenged equation can and has been validated.

The main thrust of the Warner testimony is to challenge the modeling conducted by the staff and by Kerr-McGee for the characterization of the West Chicago site. Dr. Warner questions the results of the modeling and now suggests that a three-dimensional groundwater model should have been applied. But this testimony extends far beyond the staff's modification of a standard groundwater model to deal with flow in the unsaturated zone. Indeed, on no other occasion until the submission of the Warner testimony has the State suggested that the results of the modeling were suspect because of the failure to use a three-dimensional model or

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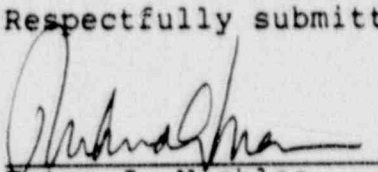
1/ Testimony of Charles W. Fetter, Jr., James L. Grant, and John C. Stauter, Appendix 7 (Nov. 28, 1989).

even that different modeling approaches should have been used. Thus, Dr. Warner now raises issues that do not relate in any fashion to the contention. Moreover, any criticism of the Kerr-McGee groundwater modeling is entirely extraneous because the admitted contention raises no challenge whatsoever to the Kerr-McGee modeling.

Kerr-McGee is severely prejudiced by the State's efforts to introduce an entirely new issue on the eve of the hearing. Because the Warner testimony is not fairly encompassed within the scope of the admitted contention, neither Kerr-McGee nor the staff has had an opportunity to analyze Dr. Warner's claims or to prepare and submit testimony that responds to them. Indeed, the admission of the Warner testimony on contention 3(g)(2) would render pointless the extensive efforts by the parties and the Board to narrow and clarify the issues on which the hearing should focus.

In light of the foregoing, Kerr-McGee urges that the testimony of Dr. Warner relating to contention 3(g)(2) be stricken in its entirety.

Respectfully submitted,



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December 11, 1989

EXHIBIT 1

(3)

Comments of Don L. Warner
with respect to Contention 3(g)(2)

Before further analyzing the issue of validation of the computer model used in the NRC staff's evaluation of the probable future impacts of onsite disposal at West Chicago on groundwater, it would be useful to discuss the reason for my concern with the model.

If one examines the input to the model and the resulting output, it immediately raises the question of what is happening in the modeling process that leads to the results that are presented in the SFES and of how realistic are those results. For example, the NRC staff has predicted an average concentration of lead in solution in the disposal cell leachate of 7.3 mg/l (Table E.1., SFES, p. E-9). In comparison with that value, which is about 150 times the IEPA drinking water standard, the peak concentration predicted at the midpoint of the downgradient waste pile edge is 0.011 mg/l (Table E.7., SFES, p. E-16), a dilution of 664:1. That same dilution ratio is predicted for all other chemical species and for peak concentrations at the site boundary 73m downgradient from the waste pile edge (Table E.7.). Having personally performed or directed considerable such modeling, I have great difficulty in accepting those modeling results, since they seem to be so physically implausible.

The fact that the modeling results presented in the SFES seem to be physically difficult to understand and to accept suggests a need for the comparison of such modeling results with those of other, previously validated, models or with the field data from a site such as West Chicago, where complex hydrogeological circumstances exist.

I do not dispute the fact that the vertical infiltration model and the lateral transport model used by the NRC can each be derived from first principals. That does not, inherently, make them legitimate for use in predicting the long-term performance of a proposed disposal site. For example, the vertical infiltration model requires that waste in the entire disposal cell be incorporated in a uniform rectangular block in which the leachate will have a uniform composition that will be maintained as the block of contaminated water moves uniformly toward the groundwater table. Such a model bears little resemblance to the real physical situation that I understand will exist where wastes with highly variable composition (Table 2.5, SFES, p. 2-15), are distributed nonuniformly, both vertically and horizontally, in the waste disposal cell and where vertical flow rates would be expected to be quite variable from place to place within the cell.

Perhaps the averaging processes used in the NRC model are satisfactory for comparison of alternate sites. I will not dispute that possibility, since that is not the issue that I am addressing. In fact, that is the sort of application that originators of both the vertical infiltration model (Gilbert, et al, 1983) and the lateral flow model (Yeh, 1981) state that their models are suitable for. What both authors also indicate that their models are unsuitable for and for which no evidence of suitability has been documented is the

detailed modeling of a specific and hydrogeologically complex site, such as West Chicago.

It is argued by Kerr-McGee (ASLB Docket No. 40-2061-ML, ASLBP No. 83-495-01-ML) that, because Kerr-McGee carried out sophisticated numerical modeling for the West Chicago Site, it was not necessary for the NRC to do that. The SFES contains no discussion or analysis of Kerr-McGee's modeling results but, rather, relies upon the modeling done by the NRC staff for its conclusions.

With respect the Kerr-McGee modeling, I will agree that the two dimensional numerical flow and contaminant transport model used is an improvement over the AT123D model used by the NRC for analysis of lateral flow at the West Chicago site. However, the model used by Kerr-McGee does not consider vertical flow through the disposal cell at all and is not capable of incorporating the vertical components of flow into the saturated-zone modeling. In commenting on this latter model limitation, Kerr-McGee states that "Another limitation is the two-dimensional nature of the model. Because it is two-dimensional complete mixing in the vertical dimension is implicitly assumed to occur. The E Stratum at the disposal site is relatively thin, and so this assumption is not critical" (Kerr-McGee, Vol II, p. 2-73). In fact, the E Stratum varies in thickness from ne[illegible]ro to 43 feet or possibly more (Schubert, ASLB Docket No. 40-2061-ML, ASLBP No. 83-495-01-ML). I do not know what the result would be of using a three dimensional model that would incorporate the vertical site properties; but I do not understand why that was not done, since three-dimensional models are readily available. Such three-dimensional modeling would have also allowed specific consideration of potential impacts upon the Silurian dolomite aquifer.

The results of the Kerr-McGee modeling should also be examined from the overall view of what they reveal or do not reveal. The dilution ratios predicted by the Kerr-McGee modeling to occur during flow through the saturated zone range from 21:1 to 5,882:1 (Kerr-McGee, Table 4, ASLB Docket No. 40-2061-ML, ASLBP No. 83-495-01-ML), a difference of about 300 times. Since a difference of 500 times would result from the range of assumed infiltration rates alone, (0.01-5 inches/year) it would seem that parameter was the most influential one in establishing the dilution ratios. Low infiltration rates resulted in relatively large dilutions, while high infiltration rates resulted in relatively smaller dilutions. The dilutions are for concentrations at the site boundary. Values are not given for concentrations (or dilutions) at the waste pile edge. In all cases, the predicted concentrations at the site boundary relate directly to the original concentrations assumed for the various chemicals in the disposal cell leachate. It is probable that dilution ratios would also relate directly to the rate of groundwater volumetric flow beneath the site as used in the model. In calibrating the Kerr-McGee model, a volumetric flow rate was established that would require infiltration of 9.5 inches/year (Kerr-McGee, Vol. II, p. 2-76) as compared with the most generally agreed up infiltration rate of about 3.6 inches/year (SFES, p. 4-91). This would, probably, result in a proportionally greater dilution ratio than would be predicted using a volumetric flow rate based upon infiltration of 3.6 inches/year.

If one were to take the lowest dilution ratio reported by Kerr-McGee (21:1) to reduce that by the ratio of infiltration rates discussed above (3.6 in/yr vs 9.5 in/yr) then to multiply that dilution ratio by the concentration of lead in cell leachate proposed by the NRC staff (7.3 mg/ℓ) the following result would be obtained:

(1/21)(9.5 in/3.6 in)(7.3 mg/ℓ) = 0.92 mg/ℓ (of lead in groundwater at the site boundary)

This calculation is intended only to show the result of analyzing and combining selected facts relating to modeling obtained from the Kerr-McGee report (Vol. II) and the SFES, and extrapolating them to a seemingly logical conclusion quite different than any contained in either of those documents. This analysis would suggest the need to carefully examine the methodology and results of the two modeling efforts to determine the extent to which they each may be satisfactory or unsatisfactory and to then provide such additional documentation, including further modeling, as may be necessary to reconcile the differences and deficiencies that seem to exist.

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CERTIFICATE OF SERVICE

I hereby certify that I have caused copies of the foregoing Kerr-McGee Motion to Strike Testimony of Don L. Warner Relating to Contention 3(g)(2) to be served as indicated on this 11th day of December, 1989, as follows:

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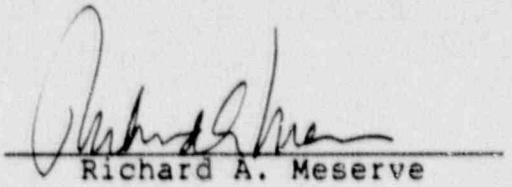

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