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State Geological Survey Division

ENR

Illinois Department of Energy and Natural Resources

Natural Resources Building
615 East Peabody Drive
Champaign, IL 61820
217/344-1481

July 29, 1982

U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Uranium Fuel Licensing Branch

REFERENCE: NUREG-0904
Draft Environmental Statement
Kerr-McGee Chemical Corporation
Docket No-40-2061

Gentlemen:

This letter summarizes the comments of the Illinois State Geological Survey on the Draft Environmental Statement related to the Kerr-McGee Chemical Corporation facility in West Chicago, Illinois.

The alternative disposal sites selected by Kerr-McGee, which are discussed in the Draft Environmental Statement, were chosen primarily on the basis that the land in each case had been disturbed by mining operations.

Although geologic conditions at several of the proposed alternative sites appear to be suitable for waste disposal, there are large areas of the state potentially suitable for locating a site. The restriction of the search for alternative sites to pre-existing excavations unnecessarily limited the possible alternatives and resulted in locations often very far removed from West Chicago. If the search for alternative sites had concentrated on identifying areas with geologic conditions potentialiy suitable for waste disposal, it is very likely that several areas could have been found for further exploration. The location of a particular site then is related to suitability for disposal and availability of land.

The descriptions of geologic and groundwater conditions in the Environmental Statement for each site are generally adequate. However, Section 5.6.2.1 (page 5-9), which describes the environmental impacts of the alternative plans on groundwater at the West Chicago site, states that "The perched, shallow water table in the glacial aquifer will be most affected...." This statement is not technically correct. The term "water table" refers to the top of the zone of saturation; below that depth, all pores are filled with water. Although a "perched water table" may exist under certain conditions, such is not the case at West Chicago. It is not the "water table" which is affected by contaminants, it is groundwater below the water table in the shallow sand and gravel that is affected by contaminants. I previously addressed this matter on page 2 of our letter of September 28, 1979 to Dr. Sanguinsin in response to a request for comments on the proposed Kerr-McGee Stabilization Plan. A copy of that letter is attached.

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The proposed cover design to limit infiltration into the disposal area should minimize percolation, perhaps the most important factor in limiting groundwater contamination. However, the calculations of predicted percolations may not accurately predict actual infiltration especially if the cover develops cracks due to unavoidable settlement of the waste or if it is affected by erosion.

Section 5.6.2.1 on page 5-10 describes the results of modeling of groundwater flow and contaminant migration at the West Chicago site. It should be realized, however, that the model upon which the calculated concentrations of contaminants in groundwater are based is a very simplified representation of conditions at the actual site. Since the model in this case is not very sophisticated and has not been calibrated with observations at the site, the results must be viewed as conjectural.

Section 5.6.2.2 (page 5-11) of the Environmental Statement states that because groundwater is close to the land surface "any seepage of contaminants through the pit bottom and sides is likely to affect water quality in the shallow aquifer....." Although groundwater may be quite shallow at several alternative sites, this does not necessarily mean that water quality in surrounding materials will be significantly affected. Most of the alternative sites with shallow groundwater conditions are situated in very fine-grained materials of low hydraulic conductivity which do not in any way constitute an aquifer. Thus, although groundwater may be present at shallow depths, the low permeability of the fine-grained geologic materials limits contaminant migration and may be highly suitable for waste disposal.

In Section 5.10.6.2 the term "perched water table" should be replaced by "groundwater in the glacial drift aquifer." The report also states that "the source(s)..... will be.....essentially and effectively removed from groundwater recharge zones." The proposed cover design, if effective, should limit infiltration into the disposal area; however, the net vertical gradient of groundwater beneath the site remains downward, indicative of a recharge area. It should be recognized that "zero-discharge" is not realistically achievable; some migration of contaminants will occur from the site, albeit hopefully very limited.

In Section 7.2.1.2 (page 7-2), which describes monitoring programs for groundwater, inference is made that "little, if any, impact is expected to the dolomite aquifer since the permeabilities of subsurface material at the site is low." It is obvious that subsurface materials are "permeable" enough to have permitted extensive contamination of the dolomite aquifer from previous disposal operations at the site.

The cessation of liquid waste disposal and the proper disposal of wastes at the site should reduce the likelihood of additional adverse effects on groundwater quality in the dolomite; however, history has shown that permeable zones are present beneath the site and that the glacial drift is in hydraulic connection with the underlying dolomite. The groundwater monitoring program discussed in the same section is proposed to continue for three years after implementation of Alternatives I and II for six shallow onsite wells and five years for offsite wells in the dolomite. In light of the proposed USEPA regulations requiring groundwater monitoring for 20 years

after site closure, it is somewhat ludicrous to limit post-closure groundwater monitoring to five years at the Kerr-McGee site which contains both chemical and radioactive wastes. Long-term monitoring should be considered essential to any closure plan.

Finally, some comments are in order regarding Appendix A, Applicant's Methodology for Selection of Candidate Alternative Sites. Several comments relative to this subject were made previously relative to Kerr-McGee's proposed Stabilization Plan in the enclosed letter to Dr. Sanguinsin. However, several statements regarding the "preliminary field investigation" on page A-3 of the Environmental Statement merit comment. The abandoned surface coal mines were determined to be "not suitable..... because of ponded water....and fracture permeability....in all coal beds." As our letter to Dr. Sanguinsin indicated, there are large areas in Illinois of strip-mined land without extensive ponded water. The presence of ponded water may indicate shallow groundwater; however, it also is commonly indicative of fine-grained materials of very low hydraulic conductivity suitable for waste disposal. Although coal beds frequently are fractured, in strip-mined areas the near-surface coal is <u>not</u> present; it has been removed during mining. The resultant mine spoil material is frequently a mixture of fine-grained material of low permeability. On the same page the report states that "Groundwater presence and <u>low</u>....permeability might result in a saturated burial zone resulting in a higher probability of migration." As I indicated previously, shallow groundwater conditions do not necessarily result in greater contaminant migration; and it is unclear to me how "low permeability" could possibly result in a "greater probability of migration."

Lastly, in Appendix A (also on page A-3), the report indicates that where excavation in clay / shale quarries reaches "unweathered, fractured shale.....the desired permeability might not be present." It should be noted that fracturing of shale bedrock is most commonly a weathering phenomenon. Deeply weathered shale frequently resembles a homogenous clay; while below that relatively thin, highly weathered zone, the less-weathered shale is likely to be somewhat fractured to some depth. However, thick deposits of unweathered, unfractured shale in Illinois have been found to be very effective barriers to groundwater movement.

Please contact me if you have any questions concerning the review.

Very truly yours,

Thomas M. Johnson

Thomas M. Johnson
Associate Geologist
Hydrogeology and Geophysics Section

Enclosure

Illinois Institute of Natural Resources

State Geological Survey Division

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Urbana, IL 61801
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September 28, 1979

Mr. Jose Luis S. Saguinsin
Argonne National Laboratory
Building 11
Argonne, IL 60439

Dear Mr. Saguinsin:

This letter summarizes the comments of the Illinois State Geological Survey on the Kerr-McGee Stabilization Plan for the West Chicago site as requested by the US-NRC. Also included is a copy of a letter from the State Geological Survey to the Illinois Department of Public Health which summarized a review of a former site stabilization plan. Although additional work has satisfied some of our earlier concerns, such as the installation of monitoring wells, many other questions remain unanswered.

This is particularly true with regard to the installation of a clay liner and large mound of earth fill and the potential for the creation of a ground-water mound and the potential for the development of leachate springs. The remainder of the review deals with the chemical aspects of waste disposal.

Page	Paragraph	
i	(3)	The report states that "little material has migrated from the property...and no measureable radioactivity is escaping to the ground water."

Comment: Substantial migration of chemical wastes has occurred from the site into both shallow ground water and the underlying dolomite aquifer. Measure-able radioactivity has been consistently found in well B-2 as well as in soil samples from beneath the site.

v	(3)	The rationale for eliminating open-pit coal mines in Illinois was that they "tend to fill with water and are extensively used for recreational activities; and, there-fore, they are generally unsuitable for waste disposal."

Comment: Many strip mines have large areas which do not fill with water and, except for local clubs, only two areas owned by the state are being developed for recreational activities.

1.2 (3)
Comment: The existing monitoring wells are all finished in shallow sand and gravel (less than 35 feet). Perhaps a monitoring well sealed in the upper dolomite bedrock should be found nearby or installed.

Page Paragraph
2.18 (3)
Comment: Monitoring well B-5 which was drilled to the top of the dolomite aquifer and reportedly plugged back so a shallow well could be installed may not have been sufficiently sealed. This may allow for transport of contaminated ground water directly into the underlying bedrock down the borehole.

2.18 (5) The report states: "The original static water level for the aquifer was close to that for the glacial drift ...a "perched" water table aquifer in the glacial drift overlying a bedrock aquifer with a significantly lower fluid level...and an unsaturated upper section exists in the bedrock aquifer."

Comment: Although it is likely that water levels in the dolomite aquifer have declined as a result of pumping, it is highly improbable that geologically recent water levels in the dolomite were ever close to that for the glacial drift. The condition that exists is a natural result of the downward infiliation of precipitation and ground water through the fine grained glacial materials which overlie the bedrock. This is not a "perched" water table condition. The glacial aquifer is not isolated from the bedrock aquifer as evidenced by the extent of chemical pollution of ground water in the dolomite. The potential is definitely there for the downward flow of ground water and thus, contaminants; however, as the report concludes, the thick sequence of fine-grained materials probably restricts the total flux of ground water.

2.19 (1)
Comment: Although deteriorated or even open well casings probably exist in the vicinity of the site it is not likel y that this is the sole cause of ground-water contamination in the bedrock. The extent of pollutant loading undoubtedly allowed for natural migration of contaminants through permeable zones in the glacial drift to the bedrock.

2.19 (2);(Fig. 2.6.2)
Comment: The water levels used to construct Fig. 2.6.2 do not represent data from 1976 as stated. They were from well log records, which span more than 30 years, collected by the Illinois EPA.

2.21 (2)
Comment: Are there data to prove that the water table since 1975 has dropped below the elevation of the storm sewer? Since the storm sewer has continued to discharge water it is likely that it intersects the water table prior to discharging into Kress Creek.
Secondly, the report states that the analyses in Table 2.6.3b may reflect ground-water discharge to the sewer rather than surface runoff from the site. However, the ground water directly beneath the site which has discharged into the sewer has derived most of its contaminant load directly from the wastes on the site during infiltration.

Page Paragraph
2.22 (3)
Comment: The natural movement of ground water may help "flush out" dissolved solids; however, natural infiltration continues to leach wastes contributing additional contaminants to the ground-water system. Also, measureable radio-isotopes have been found in ground water in the glacial drift.

3.23 (3)
Comment: The leachability and the hazardous nature of the 11,000 cubic feet of rare earth compounds stored in Building 19 should be addressed prior to final disposal.

3.24 (2)
Comment: Long-term leaching by infiltrating rain water has already resulted in both radioactive and metal contamination of shallow ground water. (See comments on leaching tests in attached material).

3.24 (3)
Comment: The data in Table 3.2.3a. do not indicate that ground-water quality is acceptable. Extensive chemical contamination is evident.

3.24 (4)
Comment: As subsequent analyses prove radioactive contamination in well B-2 was not "accidental;" and if it were, their methods would not prove it so.

4.2 (4)
Comment: Monitoring well B-2 should be overdrilled and plugged to ensure sealing.

4.22 (1)
Comment: Any permanent cover over the disposal areas will require periodic maintenance as a result of unavoidable settlement of the fill.

4.36 (2)
Comment: Although the use of montmorillonite based clays with a high exchange capacity for pollutant containment may be recognized, the clayey soils in the vicinity of West Chicago are not montmorillonite based; they are illite based with quite low exchange capacity.

4.38
Comment: Although the specifications call for a clay liner and cover with a permeability of less than 10^{-8}cm/sec, the results of the laboratory tests on samples of clay from the vicinity indicate that all have coefficients of permeability greater than 10^{-8}cm/sec, as much as 10 times greater (and these results are apparently for highly compacted samples).

4.41 (2)
Comment: The suitability for disposal of the radioactive wastes from Reed-Keppler Park in the unlined disposal area #3 should be addressed.

5.7 (2)
Comment: Ground-water quality may be gradually improving, but how does this imply that a stable condition has been established? Liquid discharges have ceased, but undoubtedly leaching has continued with a corresponding decrease in the pollutant ~~land~~ load on the ground-water system.

5.7 (3)
Comment: The purpose of the cover and stabilization effort is to reduce, not prevent, potential impacts on ground-water quality. It should be recognized that infiltration will continue to slowly leach the waste materials although theoretically at lower rates.

7.2 (4)
Comment: Monitoring wells should monitor the shallowest sand and gravel aquifer if saturated.

7.3 (5)
Comment: The installation of a cover will reduce, not prevent, infiltration so the appearance of water in the encapsulated area may not indicate the failure of a specific portion of the cover. The quality of shallow ground water will also not serve as a good indicator of cover integrity. Continued leaching is to be expected even from the encapsulated area; however, the degree of contamination of shallow ground water precludes the recognizance of anything but very large additional releases of pollutants from the disposal area.

12.2 (5)
Comment: The Illinois State Geological Survey did not "look" for suitable alternative disposal sites.

If we can be of any further assistance please let us know.

Sincerely yours,

Thomas M. Johnson

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