UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

OCT 2 0 1983

MEMORANDUM FOR: Region III Files

FROM: J. J. Harrison, Chief, Section 2, Midland

SUBJECT: TELEPHONE CONTACT WITH DENNIS SAUNDERS

On October 17, 1983, I was requested by the Regional Administrator to contact Mr. Saunders, as Mr. Keppler was involved in a conference.

At approximately 4:00 p.m. (CDT), I telephoned Mr. Saunders. Mr. F. Hawkins of Region III staff was present to assist in the call.

Mr. Saunders (telephone number (301) 565-3955) made the following statements concerning the Midland Nuclear Plant:

"Tell Jim he is the one who must sign-off on the plant." "In my opinion it's a serious problem. . .the underpinning of the Diesel Generator Building." I corrected this statement. Underpinning is related to the Auxiliary Building and Service Water Pump Structure.

He further stated that, ". . .loads during an earthquake over the nearby salt cavities were analyzed incorrectly as only a static load."

"Absolutely ridiculous to continue work on the Midland Plant, do not have a fix at one million dollars/day while we don't know what the earthquake loads are because of the salt cavities."

He further suggested, "You should stop work until you find out what the loads are during earthquakes with salt cavities below it."

Mr. Saunders stated he had performed some rough calculations showing the significance of his projected loads.

Mr. Saunders inquired as to the involvement of Jim Foster at Midland. I told him Mr. Foster currently was not associated with the Midland Project. He stated "Foster not involved was good."

He asked if I was an engineer, and if I knew the difference between dynamic and static loads.

He also wanted to know if I knew about the $25,000 fine and five years in jail and that I had better think about them and be careful. He further stated the NRC had better think about Article 203, and tell Jim, "...not to expect any help from Denton."

I told Mr. Saunders his concerns would be relayed to Mr. Keppler.

Original signed by
J. J. Harrison

J. J. Harrison, Chief
Section 2, Midland

cc: J. G. Keppler
R. F. Warnick
G. W. Roy

RIII
Harrison/ls
10/20/83

A. Cardone

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 28 1983

MEMORANDUM FOR: Robert E. Jackson, Chief
Geosciences Branch, DE

THRU: SDB Stephan Brocoum, Leader
Geology Section, GSB, DE

LR Leon Reiter, Leader
Seismology Section, GSB, DE

FROM: T. Cardone, Geologist
Geology Section, GSB, DE

J. Kimball, Geophysicist
Seismology Section, GSB, DE

SUBJECT: CONFERENCE CALL TO DENNIS SAUNDERS

In our telephone conference call on Friday, October 14, 1983, between Mr. Dennis Saunder, Mr. V. Stello, S. Brocoum, T. Cardone, and J. Kimball, he expressed the following concerns:

1. Solution Cavities exist under the plant structures.

2. The lack of dynamic analysis of the effect of an earthquake on the solution cavities and the resulting subsidence assuming collapse of the cavities.

3. The role of the cooling pond during cavity collapse.

Discussed below are staff comments that were stated to Mr. Saunders along with clarifications that were put together since the phone call.

Mr. Saunders referenced Table 2.5-24 in the Midland FSAR and a statement in the U. S. Geological Survey report on page 110 of the Construction Permit Safety Evaluation Report to support his first concern. We explained that the distances between wells nos. 10 and 17 and the plant site, and the estimated cavity diameters of these wells given in Table 2.5-24 places the plant structures approximately 200' and 900' outside of the estimated cavity perimeters for wells nos. 10 and 17, respectively. Furthermore, the statement that he quoted on page 110 in the U.S.G.S. report, "The plant site overlies the projected eastern extremity of this brine and salt producing area," only indicates the gross relationship between the brine and salt producing area and the plant site. It does not locate specific solution cavities beneath the power plant structures.

8401190291

OCT 28 1980

Regarding his concern that a dynamic analysis on the effect of an earthquake on the solution cavities was not made, the following reasons are given:

1. Conservatively, the dynamic stress due to the ground motion from the earthquake would be approximately 3 to 5 percent of the static stress and would last for a maximum of 10 to 20 seconds which represents the duration of strong motion vibrations. This represents a very small incremental increase in time and stress magnitude over the long term static stress condition around the solution cavities during the life of the plant.

2. The geosciences staff has experience in evaluating seismic ground motion at depth for the Division of Waste Management, Office of Nuclear Material Safety. Findings of this review were that underground tunnels, mines and openings suffer less damage than surface structures during strong motion shaking. A list of some references on this subject is attached. Subsurface ground shaking at the Safe Shutdown Earthquake (SSE) level would be well below that which is required to cause significant damage. In fact only minor damage is likely to occur at shaking two to three times the SSE. As discussed in the subsequent points, the bulking of any failed rock due to seismic shaking would be the same as that for the static condition.

   Very severe damage to underground openings mainly occurs when a fault actually intersects the openings. As discussed in the Staff's SER for Midland, there is no known faulting within 5 miles of the plant thus precluding this possibility.

   In addition to the above discussion, one should also take into account the likelihood of the SSE. The staff has stated that the SSE has a probability on the order of 10^{-3} to 10^{-4} per year, with the actual value probably being closer to 10^{-4}. The Midland site is located in one of the more quiet regions, in terms of seismicity, in the Central United States. The chance of ground motion of any significance is remote.

3. In the event of cavity failure during an earthquake, the bulking of failed rock would be the same as that for the static condition. The bulking phenomenon would result from failure of the roof rock overlying the cavity. That is, the volume of broken rock would be 1.3 to 1.4 times the volume of in-place rock overlying the cavity that fails. Compaction under the pressure or weight of the overlying rock strata reduces this somewhat but still results in a significant volume increase.

The amount of subsidence after compaction that could occur was estimated from empirical data obtained from coal fields, although observations of surface bench marks in the brine and salt producing area over a ten year period indicated that no significant subsidence has occurred. Applying

the empirical data on trough type subsidence resulting from the failure of the cavities produced by wells 10 and 17, the maximum estimated superimposed subsidence is 0.23 inches. Very conservatively, the subsidence resulting from the failure of wells 9, 10, 17, 19 and 20 which are closest to the plant site, results in a maximum estimated superimposed subsidence of 0.36 inches. This amount of subsidence should not adversely affect the plant structures.

Regarding his third concern of the role of the cooling pond during cavity failure, since there would be no connection or connecting conduit between the cavity and the cooling pond 4200' above, the cooling pond should have no effect on the collapse of the cavities or any subsequent subsidence.

We stated to Mr. Saunders that his calculations were based on an incorrect definition of what bulking is. Bulking is the increase in volume of a material due to manipulation. Rock bulks upon being excavated or broken up due to collapse. In this case volume will increase by 30-40% due to collapse.

It is our opinion that the above comments fully respond to Mr. Saunders concerns, and that no further action need be taken by the staff in this regard.

Stephen Brocoum for

A. T. Cardone, Geologist
Geology Section, GSB, DE

Jeff Kimball

Jeff Kimball, Geophysicist
Seismology Section, GSB, DE

cc: J. Knight
S. Brocoum
L. Reiter
J. Kimball
A. Cardone
V. Stello
D. Hood

REFERENCES

Dowding, C.H. and A. Rozen, 1978, "Damage to Rock Tunnels from Earthquake Shaking," J. Geotechnical Eng. Div., Am. Assoc. Civil Eng., vol. 104, no. GT2, p. 175-191.

Iwasaki, T., S. Wakabayashi, and F. Tatsuoka, 1977, "Characteristics of Underground Seismic Motions at Four Sites around Tokyo Bay." Wind and Seismic Effects, Proceedings of the Eighth Joint Panel Conference of the U. S. Japan Cooperative Program in Natural Resources, NBS Special Bulletin 477, pp. III-41-III-56.

McClure, C.R., 1981, Damage to Underground Structures During Earthquakes, Proceedings Seismic Performance of Underground Facilities, E.I. du Pont de Nemours & Co., p. 75, R. K., 1974.

McGuire, Seismic Structural Response Risk Analysis, Incorporating Peak Response Regression on Earthquake Magnitude and Distance. PH.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA.

Pratt, H.R., 1981, Earthquake Damage to Underground Facilities and Earthquake Related Displacement Fields, Proceedings Seismic Performance of Underground Facilities, E.I. du Pont de Newmours & Co., p. 43.

Stevens, P.R. (1977), "A Review of the Effects of Earthquakes on Underground Mines." U. S. Geol. Survy. Open-File Rept. 77-313, 47 pp.

Vortman, L.J., and J. W. Long, 1982, Effects of Repository Depth on Ground Motion - The Pahute Mesa Data, Sandia National Laboratories, SAN082, 0174.

Woodward Clyde Consultants, 1981, Effective Peak Acceleration for Nuclear Power Plant Design, Technical proposal on Engineering Characteristics of Ground Motion, submitted to the U. S. Nuclear Regulatory Commission.