

10/29/82

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of )  
  )  
CONSUMERS POWER COMPANY )           Docket Nos. 50-329 OM & OL  
  )  
(Midland Plant, Units 1 and 2) )           50-330 OM & OL

TESTIMONY OF DARL HOOD FOR THE NRC STAFF  
REGARDING LOOSE SANDS BENEATH SERVICE WATER PIPING

- Q.1 Please state your name and position with the NRC.
- A.1 My name is Darl S. Hood. I am the NRC Staff's Project Manager for the Midland Plant application for operating licenses. A statement of my professional qualifications has been filed in this proceeding.
- Q.2 Please state the purpose of this testimony.
- A.2 In its Memorandum and Order (Reopening Record on QA Matters and Establishing Schedule for Prehearing Conference and Discovery), dated July 7, 1982, the Licensing Board asked for additional testimony regarding, in part, a Memorandum from Darl Hood, dated March 16, 1982, entitled, "Notification of Loose Sands Beneath Service Water Piping" (Attachment 1). This testimony discusses related events prior to and after that notification.
- Q.3 When did the NRC Staff first become aware that loose sands existed beneath the service water piping located north of the Service Water Pump Structure (SWPS) and the Circulating Water Intake Structures (CWIS)?

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A.3 By July 1980 the Staff had become aware of loose sands in this area from its review of the applicant's logs of borings drilled in 1979.

Q.4 Was the Staff concerned that the loose sands could impact these service water pipes?

A.4 Yes, because the loose sands under maximum design earthquake loading have the potential to liquify. But it was the Staff's belief, based upon its interpretation of the applicant's response to 10 C.F.R. 50.54(f) Question 47, Parts 1a and 1b that liquefaction potential would be adequately addressed by maintaining this area in a dewatered condition while the plant was in operation. Prior to March 3, 1982, reviews by the Staff and its consultant, the U.S. Army Corps of Engineers, had assumed groundwater levels in the power block area would be controlled to elevation 595 ft. and limited to elevation 610 ft. thus addressing the liquification potential.

On March 3, 1982, the Staff and its consultant met with the applicant to discuss dewatering criteria for the Midland site. Attachment 2 is a partial summary of that meeting (Enclosures 2 & 3 thereto are excluded). At the beginning of the meeting, Mr. Dennis Budzik of Consumers Power Company stated that Bechtel's Geotechnical Engineering Group under Dr. S. Afifi, had reviewed site data and had concluded that groundwater levels, at other than the areas of the diesel generator building (DGB) and the railroad bay (RBA) of the auxiliary building, need not be controlled to elevation 595 ft. nor limited to elevation 610 ft. Mr. Budzik said the

purpose of the meeting was to acquire Staff agreement with dewatering criteria, including the applicant's plan to limit ground water control to these two areas.

Q.5 Did the Staff agree with the applicant that liquefaction potential without groundwater control could be limited to the DGB and RBA?

A.5 No. Dr. Afifi was not present at the meeting and the applicant was unable to answer Staff questions regarding details of the basis for Dr. Afifi's conclusion. Therefore, the Staff requested the applicant to submit to the NRC and its consultant copies of Bechtel's liquefaction analysis for foundation soils above elevation 610 ft., including identification of (1) the water levels assumed in the analysis, (2) the critical blow count ("N") values and (3) location of any points in the foundation soils that failed to provide an acceptable margin of safety against liquefaction type failure. The purpose of this was for the Staff to determine if we agreed with Dr. Afifi's assessment.

Q.6 Subsequently, was information provided to the Staff and its consultant?

A.6 Yes. As noted in Enclosure 1 of the March 12, 1982 telephone summary (Attachment 1), Bechtel's study on liquefaction was provided. It showed loose sands in the plant fill above elevation 610 at locations other than the DGB and RBA, specifically beneath the 26" service water piping just north of the SWPS and CWIS. The telephone call also notified the Staff of the applicant's remedial

plan to replace the loose sand beneath the SWS pipe with stable material.

Q.7 When were the Licensing Board and hearing parties notified of loose sands beneath the SWS piping?

A.7 I described the March 12, 1982 telephone call that same morning during a telephone discussion with the Board and hearing parties.

Q.8 With the correction proposed for the SWS piping, does the Staff now agree that dewatering control during plant operation can be limited to the vicinity of the DGB and RBA?

A.8 Yes. The Staff's conclusion to this end is presented in Section 2.5.4.5.5 of SSER #2.

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

MAR 16 1982

Docket Nos. 50-329/330 OM, OL

APPLICANT: Consumers Power Company  
FACILITY: Midland Plant, Units 1 and 2  
SUBJECT: SUMMARY OF MARCH 3, 1982 MEETING ON DEWATERING CRITERIA

On March, 1982, the NRC staff and consultants met in Bethesda, Maryland with Consumers Power Company (The Applicant) and Bechtel, to discuss site dewatering criteria for Midland Plant, Units 1 and 2. Meeting attendees are listed by Enclosure 1.

BACKGROUND

Loose sands with low blowcounts are known to exist in the backfill soils beneath certain structures of the Midland plant. To prevent liquefaction from occurring during an SSE earthquake event, a permanent dewatering system is being provided to maintain groundwater elevations at safe levels. The dewatering system is not designed to seismic Category I requirements and a recharge test was initiated beginning February 4, 1982 to verify that sufficient time would exist for repair or well replacement before water levels causing liquefaction concern would be reached. The Applicant's estimates of the repair times needed for various types of system losses were presented during a previous meeting on February 23, 1982, but are repeated here by Enclosure 2 for convenience.

The dewatering system is described in "Responses to NRC Requests Regarding Plant Fill", questions 24 and 47, except that the 90 days which was estimated by analysis for groundwater levels to rise from operating elevation 595' to the maximum permissible elevation of 610' beneath the Diesel Generator Building (DGB) or the Auxiliary Building Railroad Bay Area (RBA) will be a shorter period. The Applicant now expects the recharge tests to support at least 60 days to reach elevation 610' beneath either of these two structures.

SUMMARY

The Midland permanent dewatering system has been designed on the basis that the foundations of the DGB and the RBA are the Structures where liquefaction is a concern. The meeting opened with the Applicant asking Staff agreement that these are the only critical structures. The Staff's inability to respond to the Applicant's question for agreement is affected by the manner that the Staff and its Consultant conducted their review of the liquefaction problem and their assumptions on what portion of the plant site was to be dewatered to E1.595. The meeting also discussed several non-seismic underground pipes in close proximity to the DGB and the RBA. These are discussed herein.

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The reviews of the dewatering system and liquefaction problem by the NRC Staff to date have been based upon the assumption that the groundwater level for the entire site would be limited to a maximum elevation 610'. The basis for this assumption is the Staff's interpretation of the response to Q.47. However, the applicant explained that levels at other than the DGB and RBA would not be required to be held (by a Tech. Spec.) to E1.595 and 610'. The Applicant will provide a dewatering control plan for the site as previously requested by the NRC Staff which will identify the specific areas to be dewatered to E1.595 and the monitoring wells which will be in operation to assure that this level is being maintained.

The evaluation by Dr. Afifi's geotechnical engineering group from which the Applicant concluded that no liquefaction concern exists for seismic Category I structures other than the DGB and RBA, has not been presented to the Staff. The Staff requested a submittal of Bechtel's liquefaction analysis for foundation soils above elevation 610', including identification of (1) the water levels assumed in the analysis, (2) the critical "N" values (blow count) and (3) location of any points in the foundation soils that failed to provide an acceptable margin of safety against liquefaction type failure.

Boring DF-5 shows that an approximately 3 foot thick layer of loose sand with low blowcounts indicative of potential liquefaction exists beneath the underground diesel fuel oil storage tank. The lateral extent of this loose sand layer, and whether it is hydraulically connected to other areas, is not definitely known. The alternatives available to CPC to address this problem included: Alternative No. 1 - The loose sand layer isolated and localized. An evaluation of all completed borings may demonstrate whether the loose sands in the diesel fuel oil tank area are isolated. Additional borings and piezometers may be needed to reach this conclusion. If found to be isolated and localized, an approximate calculation with conservative assumptions (e.g. zero shear strength for loose layer, horizontal seismic coefficient of 0.19) using a pseudo-static approach could possibly demonstrate a high margin of safety against tank movement during an SSE earthquake event because of available passive resistance against the ends of the fuel tanks. Alternative No. 2 - The loose sand layer is not isolated but is extensive and continuous. For this determined condition, Consumers would have to demonstrate the adequacy of the permanent dewatering system in maintaining the groundwater level of elevation 595.

Several non-seismic, underground circulating water lines are located to the east and west sides of the DGB, about 18' below its base. The lines rest upon the natural sand layer underlying the power block area in which the dewatering wells will normally control the groundwater level to elevation 595'. The Applicant described its analysis of a postulated break of the line nearest the DGB as presented in response to Question 49, "Response to NRC Requests Regarding Plant Fill". The analysis indicates that the predominate flow from the postulated break is downward through the natural sand layer and that the nearest dewatering well would activate at 3.3 days, at which point

the groundwater elevation at the edge of the DGB is at elevation 607'. The lines are capable of being isolated from the cooling pond by butterfly valves at both the inlet and discharge points, drained, and then repaired with the reactor unit in a cold shutdown condition. The Applicant plans to add two monitoring wells (OW-3 and OW-4) near this area, one near the NE corner of the DGB and one near its SE corner.

The Applicant recommended two articles from technical journals for Staff review:

1. "Well Water Design for Earthquake Induced Motions" Journal of the Power Division of American Society of Civil Engineers, pp. 377, Nov. 1973 issue.
2. "Ground Water Studies for Nuclear Power Plant Siting" Geological Society of America, Reviews in Engineering Geology, Vol. IV, 1979.

Non-seismic lines from the Condensate Storage Tanks pass directly beneath the DGB and through the sand backfills beneath the DGB. These lines are enclosed by a concrete sleeve for the length of pipe directly beneath the DGB. However, because the sand backfills are hydraulically connected to the deeper natural sand layer, and because of the limited volume of the Condensate Storage Tank (300,000 gallons), these pipes are not considered to pose a potential liquefaction concern. Similarly, the lines from the Primary Water Tank and from the Utility Water Tank pose no concern for liquefaction of the backfill sands beneath the RBA.

The Applicant discussed the current results of the recharge tests. Enclosure 3 is a handout of the ground water levels measured for 22 wells. The Applicant feels that extrapolation from these data will show that the criteria of 60 days provided for repair is being met for the DGB area. No increase in level has been measured in the RBA and these wells are still dry. The Applicant plans to acquire at least 40 days of recharge test data, and on March 15, 1982 will consider terminating the test. Continued testing is of concern to the construction schedule since excavation of access shafts for the Auxiliary Building underpinning is in progress and activation of the freezeway is planned. Mr. Brunner of the Applicant's legal staff stated it is Consumers plan to advise the Staff of its March 15 decision, but that the Company's position is that Staff concurrence is not needed to stop the recharge test since the test is not a remedial action, per se. The Staff replied that no assurance of extrapolation capability could be provided at present and the technical specification requiring achievement of cold shutdown might be based upon the actual measurements of recharge period rather than an extrapolation of the measured rate to elevation 610'. The Applicant stated that its proposed technical specification would be based upon a normal shutdown period (about 7 days) prior to reaching the groundwater elevation 610' at the DGB or RBA. Since the recharge test duration already exceeds the proposed repair periods at this location, the Applicant considers that extension of the recharge test beyond 40 days to be an economic issue, rather than a safety issue. The Staff also expressed concern that the need for groundwater level control and associated criteria for areas other than the DGB and RBA should be determined prior to termination of the recharge test.

The Applicant identified 10 temporary dewatering wells located along the underground west plant dike near the Administrative Building and some mop up wells nearer the structure. These are shown on Drawing 7220-C-1311 Rev. 1, "Yardwork - Freezeway Plan and Profile - Sheet 2". A copy of this drawing was provided Mr. J. Kane.

*Darl Hood*

Darl S. Hood, Project Manager  
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Enclosure(s):  
As stated

cc: See next page



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ENCLOSURE 1

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March 3, 1982

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ATTACHMENT 1  
UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

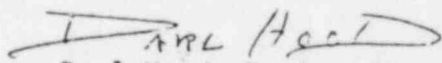
MAR 16 1982

Docket Nos: 50-329/330 OM, OL

APPLICANT: Consumers Power Company  
FACILITY: Midland Plant, Units 1 and 2  
SUBJECT: Notification of Loose Sands Beneath Service Water Piping

On March 12, 1982, the NRC was notified of loose sands located in the plant fill, north of the Service Water Structure and Circulating Water Intake Structure, at Midland Plant, Units 1 and 2. The sand extends to Elevation 610 and is located beneath about 500 feet of seismic Category I pipe.

Enclosure 1 is a record of the telephone conversation which provided this notification. Enclosure 1 also indicates the Applicant's decision to remove this material to avoid potential liquefaction problems.

  
Darl Hood, Project Manager  
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Enclosure:  
As stated

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NOS 11/4/82

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RECORD OF TELEPHONE CONVERSATION

DATE: March 12, 1982 9:45 a.m.

PROJECT: Midland

RECORDED BY: Joseph Kane

CLIENT: \_\_\_\_\_

TALKED WITH: James Meisenheimer OF

Consumers Power Co.

ROUTE TO:

INFORMATION

ACTION

G. Lear  
L. Heller  
✓D. Hood  
M. Hartzman  
H. Singh  
P. Hadala  
J. Kane

MAIN SUBJECT OF CALL: CPC future submittal of information on results of  
liquefaction studies

ITEMS DISCUSSED:

J. Meisenheimer indicated that CPC has mailed the results of Dr. Afifi's evaluation of liquefaction to Dr. Hadala and that he will have this same information for me to review during next week's design audit. This information was identified as being required for Staff review at the March 3, 1982 meeting in Bethesda on permanent dewatering. The results of Bechtel's study on liquefaction do show loose sands in the plant fill above elev. 610 at locations other than the Diesel Generator Building and Railroad Bay.

J. Meisenheimer indicated the loose sands located in the plant fill north of the Service Water Structure and Circulating Water Intake Structure within the foundation area of the 26" diameter service water lines will be removed and replaced with either lean concrete or stabilized soils. This is the first notification to NRC of this intended replacement work and involves approximately a 500 foot length of Cat. I pipe (26"Ø) and will extend in depth to El 610. The replacement option has been selected by CPC in this area rather than relying on the permanent dewatering system to maintain the water level at elevation 595.