



DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

24 MAR 1980

NCEED-I

SUBJECT: Interagency Agreement No. NRC-03-79-167, Task No. 1 - Midland Plant
Units 1 and 2, Subtask No. 1 - Letter Report (INTERIM)

THRU: Division Engineer, North Central
ATTN: NCEED-2 (James Simpson)

TO: U.S. Nuclear Regulatory Commission
ATTN: Dr. Robert E. Jackson
Division of Systems Safety
Mail Stop P-314
Washington, DC 20555

1. The Detroit District team which provides geotechnical engineering support to the NRC has reviewed most of the available documents concerning plant fill at the Midland Plant. The team met with the NRC staff, the applicant Consumers Power Company (CPCO) and its consultants, participated in a site visit to observe site conditions and discussed the proposed remedial measures planned for Category I structures placed on plant fill. Since final design computations have not yet been provided for remedial measures, we feel it would be most expeditious for all parties to submit this INTERIM letter report to provide our initial evaluation of the remedial measures and recommend procedures to settle any unresolved issues, concerns and questions. The District also feels it is important to accomplish a thorough review which just cannot be done quickly.

2. The District's investigation to date has been centered mainly around the proposed remedial measures or other action for the Category I structures placed on fill materials. The review to date includes at least a preliminary look at all data received through Amendment 74. The initial indication of issues unresolved to date fall under the following four general types with subtopics as noted:

I. Soils

- a. Groundwater
- b. Borings and testing
- c. Settlement/Consolidation
- d. Seismic concerns

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SUBJECT: Interagency Agreement No. NRC-03-79-167, Task No. 1,
Midland Plant Units 1 and 2, Subtask No. 1 - Letter
Report (INTERIM)

DA, North Central Division, Corps of Engineers, 536 South Clark Street,
Chicago, Illinois 60605

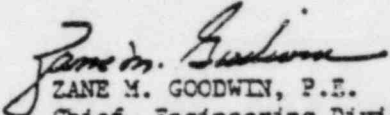
17 APR 1980

TO: District Engineer, Detroit

1. The subject letter report is returned for revisions. See Inclosure 1, recommended changes.
2. Inclosure 2 is a suggested format for this report.

FOR THE DIVISION ENGINEER:

2 Incl
as


ZANE M. GOODWIN, P.E.
Chief, Engineering Division

24 MAR 1980

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SUBJECT: Interagency Agreement No. NRC-03-79-167, Task No. 1 - Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report (INTERIM)

- e. Misc. structures constructed on fill not covered in Paragraph II below
- f. Quality control

II. Remedial Measures for Category I Structures on Fill

- a. Dewatering
- b. Diesel generator building
- c. Service water building
- d. Borated water tanks
- e. Underground diesel fuel tanks
- f. Underground utilities
- g. Aux. building - Feedwater valve pit

III. Geology

- a. Depth to rock
- b. Layer formation
- c. Fault and seismic history
- d. Crustal rebound
- e. Interpretation of borings, test pits, lab tests, etc.

IV. Miscellaneous or General.

3. Questions, uncertainties and unresolved issues are stated in the following pages. These are in addition to the responses anticipated to be received from the applicant concerning additional design support information to the 10 CFR 50.54 (f) questions concerning structures on plant fill. The source of each question, concern or issue is indicated at the end of each item.

I. Soils

b. Borings and testing

(1) Who and what are the qualifications of the persons(s) who classified samples of all borings, driller or geologist? Were samples tested in a lab? Are samples still available? Where are the results, many appear to be missing? Source - site visit, various documents and general concern.

(2) Are final fill elevations available at completion of fill placement and prior to construction? Were additional borings taken prior to start of construction? If so, where are they? Source - Incl to CPCO letter 2 Nov 79.

(3) Have all investigative borings for the plant fill problem been completed? If not, what are the locations of the remaining borings to be taken? Source - site visit 28 Feb 80.

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c. Settlement/Consolidation

(1) Why have allowable soil bearing stresses not been discussed? What are the related soil spring constants so that settlement vs. load is quickly discerned? Source - site visit 27 Feb 80.

(2) Has the bearing value of the glacial till been determined and have settlements been estimated for this bearing stratum based on all building loads, particularly the reactor building? Source - site visit 27 Feb 80.

d. Seismic concerns

(1) New soil properties or new materials used for backfill should be used in the revised seismic analysis for determination of structural adequacy. Has this been accomplished and documented? Source - Question 262-13, Q&R 2.5-22.

e. Misc. structures constructed on fill not covered in Paragraph II below.

(1) Sand pockets have been noted in cooling pond dikes which lead toward the river. What are the adverse impacts (groundwater piping, leading to dike failure)? Was the dike properly compacted? Source - general concern.

(2) Have all structures on fill be investigated for settlement? If not why not? Have all buildings on fill been checked for cracking? Source - interim SER.

(3) The design of the Water Service Building retaining wall is critical and partially category I. This design should be provided for CoFE review. What is the cause of the wall settlements noted during the 27 and 28 Feb 80 site visits? Source - site visit 28 Feb 80.

f. Quality control

(1) Why are there so many shrinkage cracks (assuming these are shrinkage cracks)? Is this simply poor quality control? Will cracks be repaired in same? Source - site visit 28 Feb 80.

II. Remedial Measures for Category I Structures on Fill

a. Dewatering

(1) Why not utilize a slurry cutoff wall or trench across the primary recharge zone near the service water building in addition to pumped wells planned? Use of clay slurry wall would provide positive cutoff. Source - site visit 27 Feb 80.

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(2) What is the dewatering well gravel pack design? Does it vary with soil layer type? Source - site visit 27 Feb 80 (dewatering).

(3) Will groundwater piping occur from cooling pond to well points over time? Any preventative measures proposed to stop this? What about piping along piles, building foundations or caissons? Source - site visit 27 Feb 80 (dewatering).

(4) Will weep holes in retaining wall at the service water building be plugged since these are no longer necessary with the dewatering planned? This could be a likely source of possible groundwater piping in the future. Source - site visit 27 Feb 80 (dewatering).

(5) What are the test results concerning incrustation of the dewatering system as well as fines removal (additional settlement) concerns? Source - site visit 27 Feb 80 (dewatering).

(6) What is the final dewatering plan; number of wells, spacing, location, depth, diameter, pumping rates, recharge rates, back-up systems, etc? Source - site visit 27 Feb 80 (dewatering).

(7) Are there any known problems of operations of the dewatering system due to presence of gas lockets in the area? What about fire/explosion hazards with the electrical controls? Source - general concern, prior experience.

(8) Has the need for localized dewatering in sand fill lenses been analyzed for structures other than the D.G. building? Source - site visit 27 Feb 80 (dewatering).

(9) Upon reaching a steady state in dewatering, a geophysical survey should be made to confirm the position of the water table and to insure that no perched water tables exist. Source - site visit 27 Feb 80 (dewatering).

b. Diesel generator building

(1) Provide additional verification that surcharge loading has indeed solved the settlement problem. Additional borings, if taken, should indicate higher blow counts when compared to borings taken prior to application of pre-load. Settlement analysis should be made on samples from new borings. The drop in groundwater levels, implying heavier soil unit weights, and diesel plus seismic vibrations should be considered in the settlement and seismic analyses. Source - Q&R 2.5-22 and site visit 27 and 28 Feb 80.

(2) How was sand surcharge placed inside D.G. building? Was it compacted? How was it removed? What was in-place unit weight of sand used?

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Could removal of sand by heavy equipment cause cracking? Source - Q&R 2.5-21, Question 362.1.

(3) Establish cracking history as a function of construction and surcharge activities. Source - site visit 27 Feb 80 (Anal. Investigations).

(4) What is the explanation of the "hump" in the settlement between the two western-most generator bays on the south side of the building? Source - Incl. to CPCO letter 2 Nov 79.

(5) Since certainty that the surcharge provided proper compaction has not yet been satisfactorily demonstrated to the Corps, and as a hedge against liquefaction, confidence in the structure could be established by underpinning. Source - site visit 27 Feb 80.

(6) Are post surcharge borings and related test data available? If so, these should be provided. Source - CPCO letter 2 Nov 79.

(7) Why is there no floor in D.G. building? Will a floating slab be placed later? Source - site visit 28 Feb 80.

(8) Further, explanation of the 1 1/2" of additional settlement (1/2" earthquake, 3/4" static load and 1/4" dewatering) is requested. The 1/2" additional settlement due to earthquake loads must be reviewed by WES. Source - Q&R 2.5-34, Q362.17.

c. Service water building

(1) Corrective piles are to be 100 ton piles. How is this load to be developed and established, by tip elevation or blow count? Discuss the pile load test(s) to be performed. Resolve the problem of possible differential settlement that could occur between the pile supported end and the portion placed on fill. Source - site visit 28 Feb 80 (Davisson presentation).

(2) What computations show that sufficient lateral stability is provided to the proposed underpinning piles by the building? Source - site visit 28 Feb 80 (Davisson presentation).

(3) Would building lateral stability be improved by plugging the retaining wall weep holes and maintaining the dewatered condition? Source - site visit 28 Feb 80 (Davisson presentation).

d. Borated water tanks

(1) The soil test investigation report at the tank farm should be provided for our review. Bearing capacities should be determined from plate load tests. The yield point of the foundation should be determined. Source - site visit 27 Feb 80 (remedial work).

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(2) Why has the ring foundation cracked? Is this crack in the area of the reported broken air line? The diagonal crack did not appear to be a shrinkage crack. Source - site visit 27 and 28 Feb 80.

(3) Why not increase the test load for the tank by a surcharge in addition to filling the tank with water? Source - Interim SER.

(4) Since applicant agreed that broken air line may have degraded the foundation material, the tests taken in this area must be conclusive. Source - NRC 28 Aug 79 Memo.

(5) What are the residual settlement predictions and the consequences thereof? Source - Interim SER.

e. Underground diesel fuel tanks

(1) What are the settlement predictions on these tanks and will these then function properly? Any differential settlement expected? Source - Interim SER.

(2) Does differential settlement reduce the fuel storage capacity? If so, how much? Source - general concern, Interim SER.

(3) Are these tanks designed against "bouyancy?" Source - Interim SER.

f. Underground utilities

(1) Why not inspect the interior of water circulation piping with video camera with sensing devices to show pipe cross-section, infiltration and slops? Source - site visit 27 Feb 80.

(2) Have electrical duct banks at D.G. building been damaged? Have these been inspected after it was shown they were severely loaded? Direct observation of the western-most duct would seem appropriate and easy at this time. Source - site visit 27 and 28 Feb 80.

(3) Have all Category I underground utilities, ducts, pipes etc. been profiled? This would seem to be the only positive way to be certain no damages to pipes or utilities have been sustained. What about corrosion to buried pipes or chemical attack of concrete pipes underground? What about stress induced by differential settlement? Are all stress levels below allowable and what about added stress due to residual settlement? Source - site visit 27 Feb 80 (evaluation of piping).

(4) Will all utility settlements be monitored throughout the plant lifetime, particularly at connections? Source - site visit 27 Feb 80 (evaluation of piping).

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(5) Passing a "rabbit" through conduits is not a suitable safeguard or insurance that conduits are undamaged. Source - Interim SER.

(6) During our site investigation on 28 February 80 it was noted that the "rattle space" had been reduced at several buildings. How will these defects be corrected? Source - site visit 28 Feb 80.

(7) The category I pipelines (outlets, inlets) for return water at the emergency heat sink could be covered by a slope failure during a seismic event. The applicant should analyze the sideslope to determine if a sufficient factor of safety exists. Source - site visit 27 and 28 Feb 80.

g. Auxiliary building - feedwater valve pits

(1) Seismic analysis of this area is needed concerning change from fill to lean concrete. Source - Questions 362.13 Q&R 2.5-23.

II. Geology

c. Fault and seismic history

(1) Canadian faulting of major magnitude exists at Sault Ste. Marie and Sudbury, Ontario. Why were these not considered in the FSAR? Source - FSAR Figure 2.5-27.

e. Interpretation of borings, test pits, Lab tests, etc.

(1) Many undisturbed soil samples were taken, yet no test results or reports are available for many of these. Why not? Source - general review of documents.

IV. Miscellaneous or General

(1) Why are there so many shrinkage cracks, especially in plant area structures placed on fill? This appears to be more than a coincidence. Source - site visit 28 Feb 80.

(2) Will C.P.Co. consultants Peck, Davison, Gould & Hendron submit summary statements to NRC concerning their presentations at the 28 Feb 80 site visit? Source - site visit 28 Feb 80.

(3) Cooling pond dikes have been repaired due to erosion. This dike design should be provided for CofE review. Source - site visit 28 Feb 80.

(4) Will the applicant provide minutes of the 27 and 28 Feb 80 meeting?

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(5) The entrance road to the plant appeared to be below cooling pond elevation. Would access to the plant be impaired for emergency vehicles in the event of a dike failure? Source - site visit 27 and 28 Feb 80.

(6) What provisions will be made to insure the dewatering system will be maintained in proper operating condition? Source - site visit 27 Feb 80 (dewatering).

(7) Some of the cracks noted appear to be enlarging with time. The width of these cracks would be already in excess of a shrinkage crack. Source - site visit 27 and 28 Feb 80.

4. The District's recommendations concerning questions, uncertainties and unresolved issues presented above are given when possible and appropriate below in a like numbered paragraph:

I. Soils

e. Miscellaneous structures constructed on fill not covered in Paragraph II below.

(2) All structures, including utilities should be checked for settlement and cracking.

f. Quality control

(1) Undertake a comprehensive analysis on cracked structure. Statements that all cracks are due to shrinkage or do not effect structural integrity are not sufficient.

II. Remedial Measures for Category I Structures on Fill.

a. Dewatering

(1) Consider benefits of using clay slurry cutoff wall in conjunction with pumped dewatering.

(3) Analyze possible groundwater piping along the paths indicated.

(4) Analyze pros and cons of plugging weepholes.

(5) Consider a control panel in control tower area to indicate plant groundwater level in the critical plant areas so that monitoring can be easily accomplished.

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b. Diesel generator building

(1) Take additional borings and tests to prove surcharge worked.

f. Underground utilities

(2) Conduct an visual inspection of at least one (the westernmost) electrical duct bank at the D.G. building.

(3) Investigate any category I utilities not investigated.

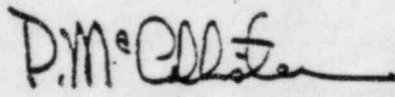
(5) Provide additional assurance the category I utilities have not been over stressed.

(6) Establish minimum rattle space criteria and restore as necessary.

(7) Analyze outlet pipes located in heat sink pit side slopes for seismic event (SSE & OBE).

5. If you have any questions concerning this interim letter report, please contact Mr. N.A. Gehring at FTS 226-6793.

FOR THE DISTRICT ENGINEER:


P. McCALLISTER
Chief, Engineering Division

NORTH CENTRAL DIVISION
John F. Norton

Branch/Office NCDED-G

Reviewer JAMES W. SIMPSON

Ext. No. 35734

SUBJECT:

DATE 10 Apr 80

SEC No.	CYT. No.	DWG. or Para. No.	COMMENT
	1.		<p>General</p> <p>a. It is our understanding that the purpose of this letter report is to partially complete the last sentence in Subtask No. 1, "Prepare a letter report identifying any unresolved issues with recommendations on a course of action to be taken during construction to resolve these issues."</p> <p>It is our opinion that we are not doing this by asking questions. We should change the format of the report by identifying issues and then request the additional information to resolve these problems. We, as consultants, are supposed to answer questions, not ask them. See the included example report prepared by this office.</p> <p>b. A report of this nature should not have inked in corrections.</p>
	2.	Page 2, Para <u>2</u> .	Delete groundwater. Add under geology.
	3.	Page 2, Para III.	<p>(1) Faulting, seismic history and crustal rebound are of no concern to us. It is our understanding that NRC will furnish earthquake design data based upon this and other information. We should not question NRC's information.</p> <p>(2) Interpretation of borings etc. should be under soils, Para I.</p>
	4.	Page 2, Para 3Ia.	No statement is made about item "a". Groundwater.
	5.	Page 2, Para 3Ib, (1), (2), and (3).	<p>Reword these paragraphs so as to be a request for information. Identify specific borings and tests necessary for each building.</p> <p>Inclosure 1</p>

NORTH CENTRAL DIVISION
 JOHN F. NORTON
 Reviewer JAMES W. SIMPSON

Branch/Office NCDED-G

Ext. No. 35734

SUBJECT:

DATE 10 Apr 80

SEC No.	QTY. No.	Dwg. or Para. No.	COMMENT
	6.	Page 3, Para C(1)	The soil spring constants, alluded to here, is a poor choice of words. The spring constant concept is a method of computing deflections only when the deflections are in the elastic range. Settlement versus load can not be discerned with only elastic properties of the foundations in question here because strains are well into the plastic range. Elastic moduli used in design calculations should be requested only for design information and evaluation. E (Youngs Modulus) and U (Poisson's Ratio) are the moduli required.
	7.	Page 3, Para C(2)	Request this design information for each building that you don't have it for.
	8.	Page 3, Para d(1)	Request these properties and computations.
	9.	Para 3, Para e(1)	Piping could possibly be a concern here, but not likely. Request complete embankment design criteria. This should include material types, placement densities, stability analysis, embankment and foundation drainage systems (if any), under and through seepage determinations, slope protection measures, etc. The design can then be reviewed and appropriate facets evaluated and addressed.
	10.	Page 3, Para e(2)	Ask this data for each specific building where missing.
	11.	Page 3, Para e(3)	Don't ask the designers why the wall settled. Request appropriate information and computations so a determination of the reason can be made.
	12.	Page 3, Para f(1)	The designers have answered this several times in meetings. C of E should make their own decisions regarding cause and ramifications of cracking.
	13.	Page 3, Para a(1)	Do not recommend design changes. Evaluate the existing design and approve or disapprove. If it's not acceptable, let the designer provide appropriate modifications.

NORTH CENTRAL DIVISION

Branch/Office NCDED-G

Reviewer JOHN F. NORTON
JAMES W. SIMPSON

Ext. No. 35734

SUBJECT:

DATE 10 Apr 80

SEC No.	CMT. No.	Dwg. or Para. No.	COMMENT
	14.	Page 4, Para a(2)	Request the complete well design instead of details.
	15.	Page 4, Para a(3)	If well gravel packs are properly designed, piping is not a concern. Piping along piles, building foundations and caissons are not a concern, unless information has come to light that the Division is not familiar with. Recommend deleting this sentence if it can't be data-supported.
	16.	Page 4, Para a(7)	The possibilities of this seem very remote. Delete this paragraph.
	17.	Page 4, Para a(8)	Request plan for localized dewatering.
	18.	Page 4, Para b(1)	<p>(1) It is not appropriate to request more split spoon sampling. Sampling should be continuous push so undisturbed samples for density, consolidation, (and perhaps strength tests for bearing capacity) can be obtained. Obtaining densities by blow count is a rough approximation and not commensurate with the degree of accuracy and reliability desired for settlement calculations for these structures.</p> <p>(2) Load-settlement curves indicate primary consolidation due to surcharge was essentially complete when surcharge was removed. However, a word of caution is in order regarding future foundation consolidation potential. Stresses induced by the surcharge loading were considerably dissipated with depth. In the lower areas of the fill zone (say 20 to 34 feet below grade), vertical stresses were much less than surcharges contact stresses, which were probably about 2400 psf. The groundwater level at that time was about elevation 627. When the groundwater is drawn down to 600, this will increase existing stress levels $27(62.4) = 1685$ psf at the elevation 600 level. The significant thing is it will be directly applied (without dissipation) at the lower fill levels. If soft layers exist near the bottom of the fill area, significant consolidation potential exists due to this different loading condition. This foundation loading condition will also be applied to the other structures.</p>

NORTH CENTRAL DIVISION

Branch/Office NCEDE-G

Reviewer JOHN F. NORTON
JAMES W. SIMPSON

Ext. No. 35734

SUBJECT:

DATE 10 Apr 80

Seq. No.	Chg. No.	Div. or Para. No.	COMMENT
	19.	Page 4, Para b(2)	How the surcharge was placed, compacted and removed are irrelevant questions. Regarding cracking cause, see Comment No. 12.
	20.	Page 5, Para b(3)	Request this information.
	21.	Page 5, Para b(5)	Change "Compaction" to consolidation. Underpinning this building would be a very costly hedge. Recommend deleting this statement until such time it is determined that liquefaction is indeed a possible failure mechanism.
	22.	Page 5, Para b(6)	Request specific boring at desired location and identify purpose.
	23.	Page 5, Para b(7)	Omit this question. It does not pertain to foundations.
	24.	Page 5, Para b(8)	Request this data for each specific building where desired.
	25.	Page 5, Para c(1)	Ask for complete underpinning analysis including this information.
	26.	Page 5, Para c(3)	Request a study of consequences of plugging the weep holes.
	27.	Page 5, Para d(1)	Delete sentence requesting use of plate load tests to determine bearing capacity of foundation. Bearing capacity should be determined with appropriate bearing capacity equations. Elastic properties could be checked from existing plate load data, taking scale factors into consideration.
	28.	Page 6, Para d(2)	Ask for a study of this cracking including a foundation settlement and bearing capacity analysis.
	29.	Page 6, Para d(3)	Outline load test you want and give backup reasons.

NORTH CENTRAL DIVISION

JOHN F. NORTON

Branch/Office NCDED-G

Reviewer JAMES W. SIMPSON

Ext. No. 35734

SUBJECT:

DATE 10 Apr 80

SEC No.	COM. No.	Dwg. or Para. No.	COMMENT
	30.	Page 6, Para d(4) and d(5).	Omit these paragraphs. They should be answered in Comment No. 28.
	31.	Page 6, Para e(1) and e(3).	Ask for a bearing capacity, bouyancy and settlement analysis.
	32.	Page 6, Para e(2)	Omit this. It has nothing to do with our mission.
	33.	Page 6, Para f(1)	Request such an inspection.
	34.	Page 6, Para f(2)	Request a visual inspection for damage.
	35.	Page 6, Para f(3)	Ask for profile study. Corrosion is not our business. Request stress analysis of pipes where bending is significant.
	36.	Page 6, Para f(4)	Probably not necessary since settlement will be 90 to 100 percent complete. Omit this question.
	37.	Page 7, Para f(5)	Omit since a profile study has been requested.
	38.	Page 7, Page f(6)	Request study to determine necessary rattle space.
	39.	Page 7, Para f(7)	Good comment.
	40.	Page 7, Para g(1)	Request a complete settlement and bearing capacity analysis.
	41.	Page 7, Para c(1)	It is our understanding that the NRC does this study and furnishes coefficients and design parameters.

NORTH CENTRAL DIVISION

Branch/Office NCEED-G

Reviewer JOHN F. NORTON
JAMES W. SIMPSON

Ext. No. 1572

SUBJECT:

DATE 10 Apr 80

SEC. No.	CHG. No.	Dwg. or Para. No.	COMMENT
	42.	Page 7, Para e(1)	Request specific borings and tests necessary for review of each separate building. We should have, or be able to construct, a profile both lengthwise and crosswise.
	43.	Page 7, Para IV(1)	Reword this paragraph to request a crack study for each building desired.
	44.	Page 7, Para IV(2) and (4)	Request these papers and/or minutes.
	45.	Page 7, Para IV(3)	Good request.
	46.	Page 8, Para IV(5)	Ask for a study of a pond dike failure and access.
	47.	Page 8, Para IV(6)	Request a maintenance study.
	48.	Page 8, Para IV(7)	Omit. This was asked for already. See Comment No. 43.
	49.	Page 8, Para 4.	Omit this paragraph. These points should be covered in prior requests. We will cover this in detail in the full letter report.

NCEED-I

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Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report
(INTERIM)

THRU: Division Engineer, North Central
ATTN: NCEED-G (James Simpson)

TO: U.S. Nuclear Regulatory Commission
ATTN: Dr. Robert E. Jackson
Division of Systems Safety
Mail Stop P-314
Washington, DC 20555

1. The Detroit District hereby submits this INTERIM letter report with regard to partial compliance with subtask No. 1 of the subject Interagency agreement concerning the Midland Nuclear Plant Units 1 and 2. The purpose of this report is to identify unresolved issues and make recommendations on a course of action and/or cite additional information necessary to settle these matters prior to preparation of the SER report.
2. The Detroit District's team providing geotechnical engineering support to the agreement to date has made a preliminary review of furnished documents concerning foundations for structures, has jointly participated in briefing meetings with the NRC staff, Consumers Power Company (the applicant) and personnel from NCD and has made a detailed site inspection visit. The data reviewed includes all documents received through Amendment 7.4. Generally each building within the complex was studied as a separate entity.
3. A preliminary listing of unresolved issues is presented in paragraphs 4 (Roman numerals I to XII). Initial recommendations following the listed issues mostly concern limited and/or missing information in the following categories:

(1) Inadequate presentation of subsurface profiles due to lack of borings. The number and spacing of borings should be sufficient for construction of at least two detailed orthogonal profiles for each structure.

Inclosure 2

NCEED-T

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Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report
(INTERIM)

- (2) Lack of proper soil testing information to support the design.
- (3) Incomplete or non-existent bearing capacity data.
- (4) Incomplete settlement computations.
- (5) Missing detailed foundation design data.
- (6) Insufficient data presentation regarding remedial measures for structures undergoing distress.
- (7) Seismic problem information.
- (8) Other miscellaneous or general concerns.

4. A listing of issues and information necessary to resolve these problems for each separate structure and/or appurtenance are as follows:

I. Reactor Building Foundation Adequacy

a. Subsurface information

(1) Two borings, one for each building, are needed to better define the complete soil profile to bedrock.

(2) R triaxial tests and consolidation test data from _____ layers are needed to _____.

b. Settlement/Consolidation

Furnish settlement computations using both elastic and plastic soil deformation properties.

c. Bearing Capacity

Bearing capacity computations, including factors of safety and foundation design assumptions regarding soil properties, spring constants (if used), etc. should be presented for review.

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(INTERIM)

d. Seismic Concerns

(1) Show that these buildings will withstand the design seismic event.

(2) Discuss liquefaction possibilities.

II. Diesel Generator Building Foundation

a. Subsurface information

(1) Four additional borings, one at each building corner, are necessary to verify that surcharge loadings have indeed solved the settlement problem. Borings should be continuous to _____ feet below the foundation.

(2) Sampling for tests should be _____.

(3) Testing of cohesive and non-cohesive samples should be as follows:

b. Settlement/Consolidation

A settlement analysis should be submitted based on consolidation tests from new borings. The drop in groundwater levels, implying heavier soil unit weights and diesel plus seismic vibrations should be considered in the total settlement picture.

c. Bearing Capacity

Furnish allowable soil bearing capacity of fill soil using information from new borings. Factors of safety should be presented.

d. Seismic Concerns

(1) Properties of insitu backfill material should be acquired from tests and used in the revised seismic analysis. Present this analysis.

(2) Discuss liquefaction.

e. Miscellaneous Concerns

(1) Furnish final fill elevations at completion of fill placement prior to building construction.

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- (2) Submit all computations on sand surcharge for review.
- (3) Present chronological cracking history.
- (4) Study and present a post-mortem of settlement differential especially that between two western bays on the south side of building.
- (5) All existing pre and post surcharge borings and related test data should be provided for review.
- (6) Discuss significance of cracks to the safe operation of the building and the repair of the cracks.

III. Service Water Building Foundation

a. Subsurface Information

Borings and tests?

b. Settlement

Present computations regarding the problem of possible differential settlement that could occur between the pile supported end and that portion placed on fill.

c. Bearing Capacity

Provide bearing capacity computations for both sections of this building.

d. Seismic problem

(1) Present computations showing how this building and fix up measures will withstand a seismic event.

(2) Discuss liquefaction.

e. Remedial measures for structure undergoing distress

(1) Submit complete design of corrective piles including data regarding load tests to be performed and lateral stability.

(2) Discuss construction procedures in detail.

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f. Other Concerns

Explain reasons for cracks, their significance to the safe operation of the building and the repair of the cracks.

IV. Auxillary Building Foundation

a. Subsurface Information

Borings and tests?

b. Bearing Capacity

Provide bearing capacity of insitu fill using data developed as the fill now exists. This would particularly apply to the adjacent control tower footing area.

c. Settlement

Submit theoretical settlement computations for this building as modified.

d. Seismic Concerns

(1) Develop seismic computations for this building.

(2) Discuss liquefaction possibilities.

e. Other Concerns

(1) Explain fully the reasons for cracking.

(2) Discuss the significance of cracks to the safe operation of the building.

(3) Describe repair of cracks.

(4) Present full computations of proposed fix up design.

V. Borated Water Tanks Foundations

a. Subsurface Information

The subsurface investigation report at the tank farm should be provided for review. New borings and tests are needed as follows:

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b. Bearing Capacity

Furnish foundation design computations. This should include bearing capacity determinations, and foundation moduli if elastic analysis was used. The factor of safety should be presented using the most severe tank loadings.

c. Settlement

Submit tank settlement analysis.

d. Seismic Concerns

(1) Discuss liquefaction.

(2) Explain seismic design considerations.

e. Other Concerns

Explain fully the reason for cracking, their significance concerning safe operation and the proposed repair of cracks.

VI. Underground Diesel Fuel Tank Foundation Design

a. Subsurface Information

b. Bearing Capacity

Provide bearing capacity and foundation design computations.

c. Settlement

Submit tank settlement analysis.

d. Seismic Concerns

(1) Discuss liquefaction.

(2) Explain seismic design considerations.

e. Other Concerns

Submit uplift calculations for the tanks.

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VII. Underground Utility Deficiencies

a. Settlement

(1) The settlement of underground piping could be in question because of the unknown amount of fill settlement. Present a profile of major pipe flowline elevations.

(2) Compute and submit pipe stresses in areas where bends are the most critical.

(3) Submit proposed corrective measures where the rattle space has been reduced.

(4) Inspect visually electrical duct banks at the D.G. building where they have been severely loaded.

b. Seismic Analysis

(1) Show computations for stress in pipes and minimum rattle space necessary at building connections.

(2) Explain seismic design considerations.

VIII. Feedwater Valve Pit Foundations (Aux. building)

(1) Provide computations for fix up including bearing capacity and new settlement analysis.

(2) Explain seismic considerations.

IX. Cooling Pond Stability

(1) Cooling pond dike design should be submitted for review including stability, seepage and seismic considerations.

(2) Borings and tests?

(3) Check outlet pipes located in the heat sink pit for nearby slope stability failures that could block entry of water.

(4) Show that a cooling pond failure would not impair the plant entry road for emergency vehicle access.

(5) Provide design for slope protection measures.

NCRD-1

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I. Water Service Building Retaining Wall Stability

- (1) Borings and tests?
- (2) Submit the design of this wall including stability computations.
- (3) Discuss the settlement of this wall and its significance to safe operation.
- (4) Discuss seismic considerations.

II. Site Dewatering Adequacy

- (1) Furnish complete report including computations on site dewatering design.
- (2) Furnish typical well design including gravel pack.
- (3) Submit groundwater chemical analysis data related to possible encrustation and/or corrosion problems.
- (4) Present computations and explanation of significance of weep holes in retaining wall with regard to dewatering.
- (5) Discuss in detail the maintenance plan for the dewatering system.

III. General Information Desired

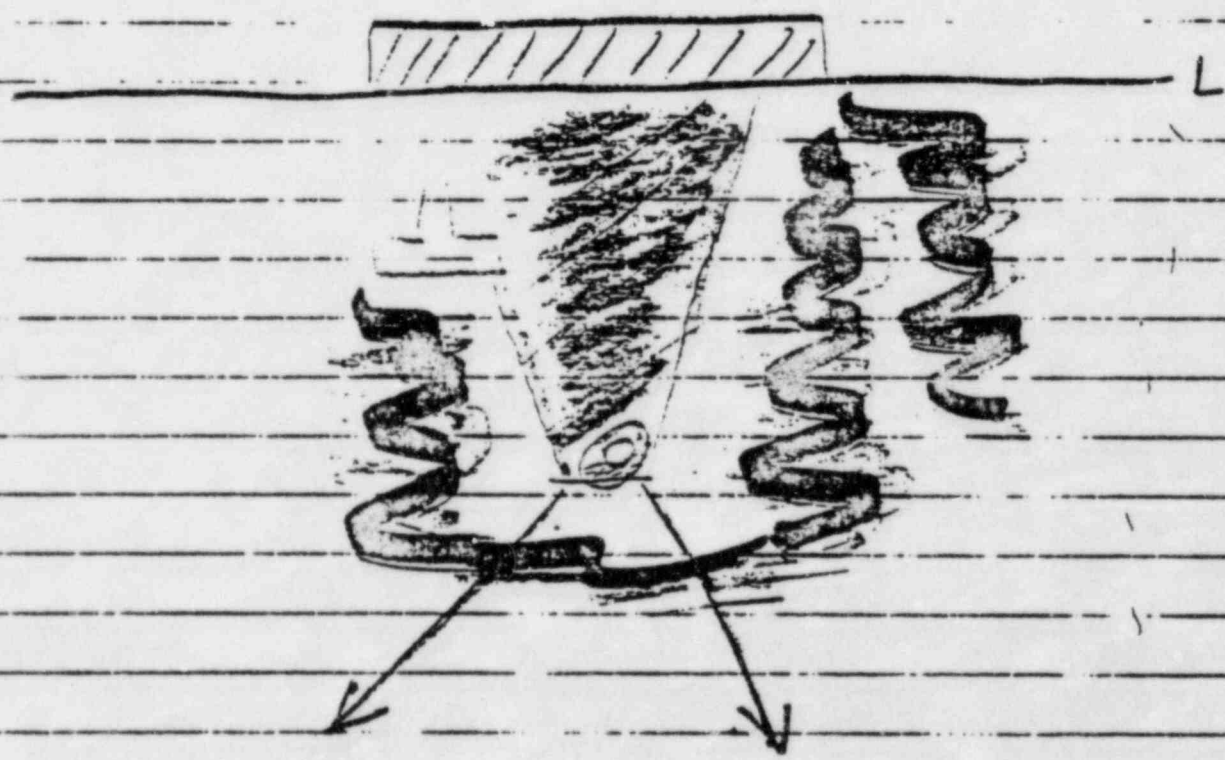
a. Consultants Peck, Davisson, Gould and Hindron should submit summary statements concerning their presentations at the 28 Feb 80 site visit for review.

b. Provide minutes of meeting 28 Feb 80.

c. Submit a list of people involved in field and laboratory classifications and testing and briefly list their qualifications.

5. Resolution of issues and concerns stated herein will depend on the expeditious receipt of data mentioned above. Contact Mr. Neal Gehring at FTS 226-6793 regarding questions.

Consumer Exorbit #16: 9
10/15/80 (Kane)



Consumers Exhibit # 17 (Line)

J. Kane

Rec'd. 2/22/80
From L. Heller

NCCED-T

TRIP REPORT
SUBJECT: Trip Report of Meeting at NRC Offices Concerning
Midland & Bailly Plants, on 15 January 1980

TO THRU: Chief, Eng. Div.

FROM: Asst. Ch, Tech Br.

DATE: 11 February 1980 CMT 1
LAWHEAD/ml/66781

TO: Files

1. PURPOSE: To meet with Nuclear Regulatory Commission Personnel and jointly review administrative policy, manpower, technical aspects, and the pending 16 January 1980 meeting with NRC applicant Consumers Power of Michigan concerning the Midland, Michigan Project.

2. PLACE AND DATE: NRC Offices in the Phillips Building, Bethesda, Maryland on 15 January 1980.

3. PARTICIPANTS: The participants in this meeting varied as the topics changed from policy to manpower to technical aspects to pending 16 January 1980 meeting. The group included the following:

1. Rixby Hardy, OCE/Corp
2. Jim Simpson, NCD/Corp
3. John Norton, NCD/Corp
4. William Lawhead, NCE/Corp
5. Joe Kubinski, NCE/Corp
6. Carol Hood, NRC
7. Lyman Heller, NRC
8. Joe Kane, NRC
9. Robert Jackson, NRC
10. William Olmstead, NRC attorney

4. SIGNIFICANT EVENTS: The meeting pointed out that the Midland Project geotechnical problems had been apparent to NRC for the past 1½ years. We were told that NRC had recently issued a Show Cause to Consumers Power concerning geotechnical aspects of the Midland construction. We were advised by NRC that all Corp spaces provided for NRC work should be filled with Geotechnical Engineers considering the assignment scope and possible testifying requirements. However, our personnel choice was up to us. It was requested that all non-Corp and non-NRC requests for project information be forwarded to NRC for reply. NCD should be kept informed of such requests. We also learned that the Detroit District assignment was a new concept due to its extensive length and responsibility. Finally, NRC concurred that NRC Agreement activity schedules would be uniformly slipped two months.

5. NARRATIVE: The initial meeting was opened at 0830 by Lyman Heller of NRC. Rixby Hardy (OCE) asked why the Corp of Engineers was requested to take part in

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the two NRC projects (Midland and Bailly). Joe Kane (NRC) informed us that NRC lacked the in-house geotechnical manpower to handle the projects. Rixby Hardy related that the Detroit District assignment with NRC was a new concept. Other District assignments were very short termed, around two months, and simple in nature. Lyman Heller concurred.

Rixby Hardy asked about present availability of Detroit personnel for the NRC work. We informed Rixby of Detroit's F&M Section make-up. In light of our reply, Rixby indicated that the following options should be considered:

- a. Detroit with W.E.S.*Support
- b. Detroit with Consultant Assistance**
- c. Turn work over to another Corp Division.

*W.E.S. has assisted in 34 such projects since 1973.

* Hardy, Simpson, and Heller would prefer to avoid this.

Rixby Hardy further stated that to hire new employees and get up to speed would probably take too long. Rixby said he would discuss the above options within OCE with the intent of stressing required W.E.S. support.

Bob Jackson (NRC) suggested that Joe Kubinski (NCE) spend one or two weeks at NRC to help get all concerned up to speed. Joe Kubinski agreed. I concurred with this, based on past statements made by Joe Kubinski concerning work interferences. Bob Jackson indicated that this approach had worked for others in the past.

Lyman Heller (NRC) estimated that of the four manyears provided by Detroit, three would be spent on the Midland Project and one would be spent on the Bailly Project. Lyman Heller questioned Corp personnel concerning estimated progress and concurred that the NRC Agreement activity schedule would be uniformly slipped two months. Lyman Heller suggested that perhaps the U.S.G.S. could provide assistance to Detroit on the NRC Projects.

Lyman Heller indicated that NRC had issued Consumers Power of Michigan a construction Show Cause, ie; Show why NRC should not stop construction because of geotechnical considerations.

The present construction permit for Midland, as described by William Olmstead (NRC), does not include foundation techniques (underpinning) proposed by Bechtel and Consumers Power. Further, the design of the changed foundation techniques has not been provided to and reviewed by NRC appropriately. Additionally, a new Safety Evaluation Report (SER) review must be conducted in light of the changed design. William Olmstead stated that Consumers Power may request, during the board hearing covering the Show Cause, that the board additionally consider the project Operating

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License. The project initial Operating License application was made in 1969. A board pre-hearing will probably occur in March 1980 with the actual hearing occurring in June and July 1980. Two interveners (Attorney Myron Cherry and Mary Sinclair) would probably take part in the Show Cause hearing. At present, the State of Michigan appears to take a neutral official position concerning the project. William Olmstead was told about letters received from non-Corp and non-NRC interests requesting information from the Detroit District concerning the Bailly Project. The requests were not specific ie; copies of all information was requested. William Olmstead requested that all such requests, non-Corp and non-NRC, be forwarded to NRC for reply or appropriate action.

We were informed that the A/E Firm (Bechtel) for Consumers Power covering the Midland Project was also performing the Midland construction work (turn-key arrangement). We discussed the settlement of the Midland Diesel Generator Building (apparent major settlement problem) and apparent settlement problems at other buildings and facilities (Borated Water Tanks, Service Water Pump Building, a portion of the Auxiliary Building, and the Fuel Oil Storage Tanks).

The Corp of Engineers would be expected to play a major part in obtaining ~~acceptable~~ remedial measures by raising related issues for Bechtel to answer or by establishing requirements of information to satisfy the Show Cause.

All settlement problems apparently arose from approximately 30 feet of "Clay Fill" placed on the Midland Project site.

Lyman Heller (NRC) indicated Detroit personnel should visit the two projects when construction activities of interest are taking place. Coordination of appropriate times would be made through NRC inspectors.

Joe Kane (NRC) and Lyman Heller (NRC) stated that requests for information by the Detroit District from project contractor/A-E must be made in writing through NRC in order to become part of the records. Requests should be signed by the Chief of the Engineering Division, Detroit with copies to NCD.

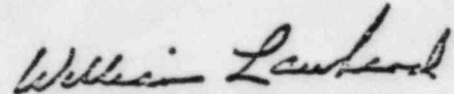
Joe Kane (NRC) stated that NRC would provide Detroit ^{local} Seismology data concerning the Midland Project. Seismic Analysis is an important consideration in both NRC Projects.

6. RECOMMENDATIONS AND ACTIONS: It is recommended that (1) the Detroit District make immediate arrangements with W.E.S. through NCD for W.E.S. to review and comment on the Midland Project Seismic Analysis as related to liquefaction and other seismic

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geotechnical problems including affects on underpinning piles, (2) that the Detroit District take immediate action to establish validation of the existing soil data base of the Midland Project, (3) that the Detroit District follow above mentioned NRC recommendations concerning requests and manpower, (4) that the Detroit District continue to review available geotechnical data and schedule work to meet deadlines (as modified) established in NRC Agreement.



W. LAWHEAD
Assistant Chief, Tech Branch