

Consumer Exhibit # 7 (Kane)

SETTLEMENT UPDATE
FOR
MIDLAND PLANT UNITS 1 AND 2
CONSUMERS POWER COMPANY
DOCKET NUMBERS 50-329 AND 50-330

Report Date: September 14, 1980

B406070310 840517
PDR FOIA
RICE84-96 PDR

Settlement Update

The information shown on Attachment 1 is the average observed settlement from September 1979 through August 1980 for the buildings shown. For more detailed information, Figures 1 through 28, which include a location plan for settlement markers, are attached. These readings in Figures 1 through 28 are updated for all structures through July 1980.

Settlement Due to Dewatering

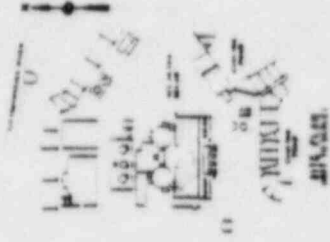
Temporary dewatering to permit future underpinning construction activities was put into operation on August 10, 1980. This will aid in the design of the permanent dewatering system and also will provide data to substantiate predicted settlement due to dewatering. Readings at thirty points are taken twice weekly and at other points weekly if possible.

Readings as of August 31, 1980, show insignificant settlement.

MIDLAND PROJECT
AVERAGE
OBSERVED SETTLEMENTS (INCHES)
OF STRUCTURES
SEPTEMBER 1979 TO AUGUST 1980

1. Diesel generator building (0.0625)
2. Auxiliary building electrical penetration rooms (0.0625)
3. Feedwater isolation pits (0.080)
4. Service water structure (0.120)
5. Service water structure wing wall (0.010)
6. Diesel fuel oil storage tanks (0.010)
- *7. Condensate storage tank (1.625 during load test; 0.060 last 90 days)
- *8. Circulating water wing walls (0.040)
- *9. Cooling pond dike (3 points: 1.875 - since 6/6/78: 0.010)

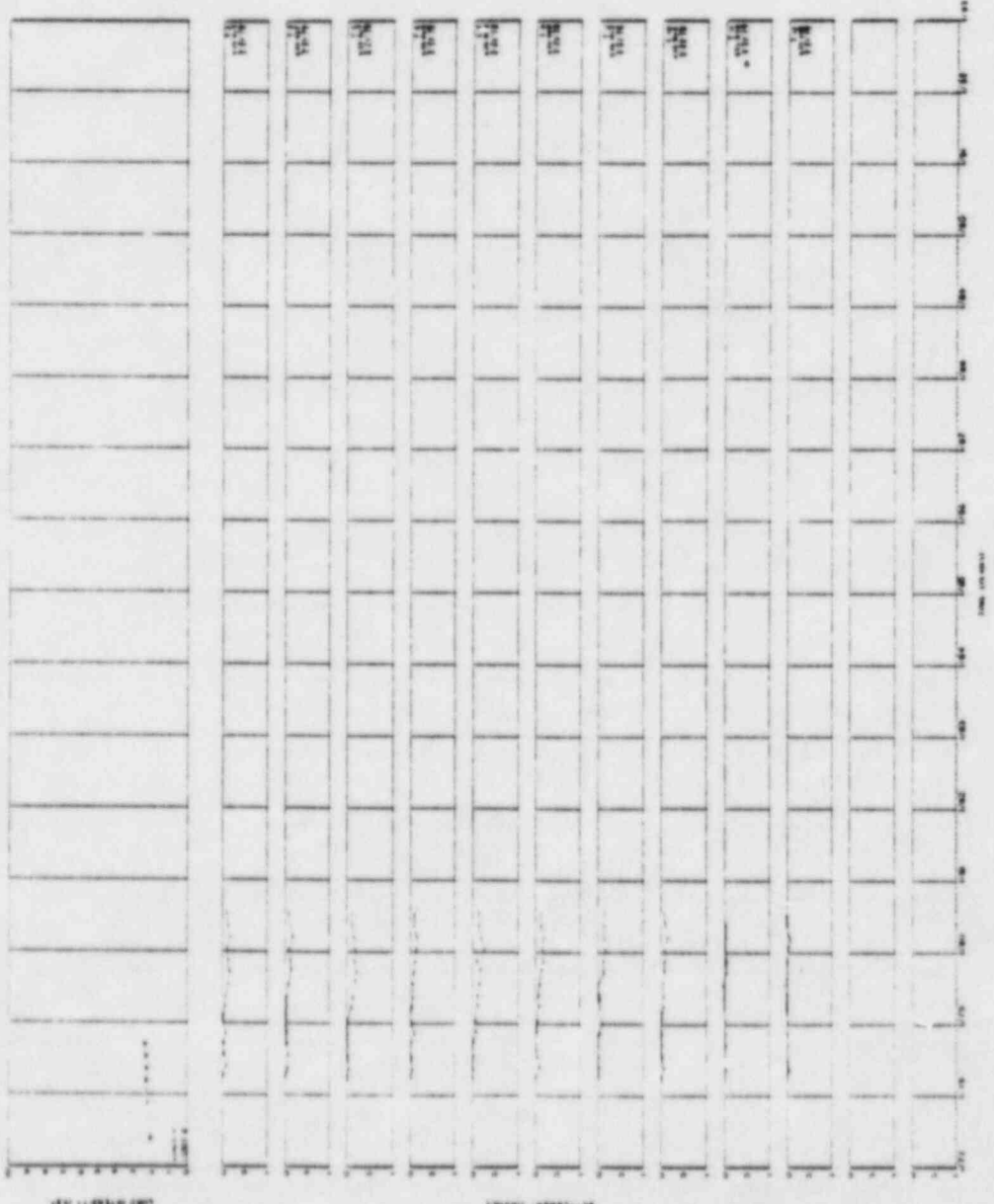
*Non-Category I



SECTION OF TURBINE UNIT
 SHOWN IN PLAN

EXPLANATION
 ALL DIMENSIONS ARE IN
 FEET AND INCHES

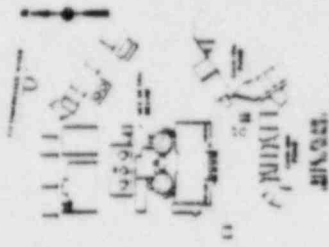
NOTE
 See Page 2 of 2



**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Turbine Building (Sh 1 of 2)
 (SK-G-415, Rev 1)

Figure 2



SECTION OF THE REACTOR BUILDING
AND ISLAND

EXPLANATION

1. REACTOR BUILDING
2. STEAM GENERATOR
3. TURBINE
4. CONDENSER
5. PUMP
6. VALVE

NOTES

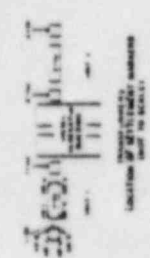
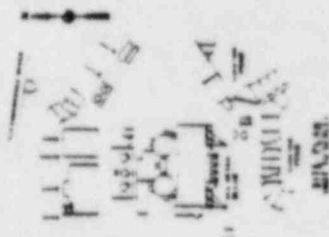
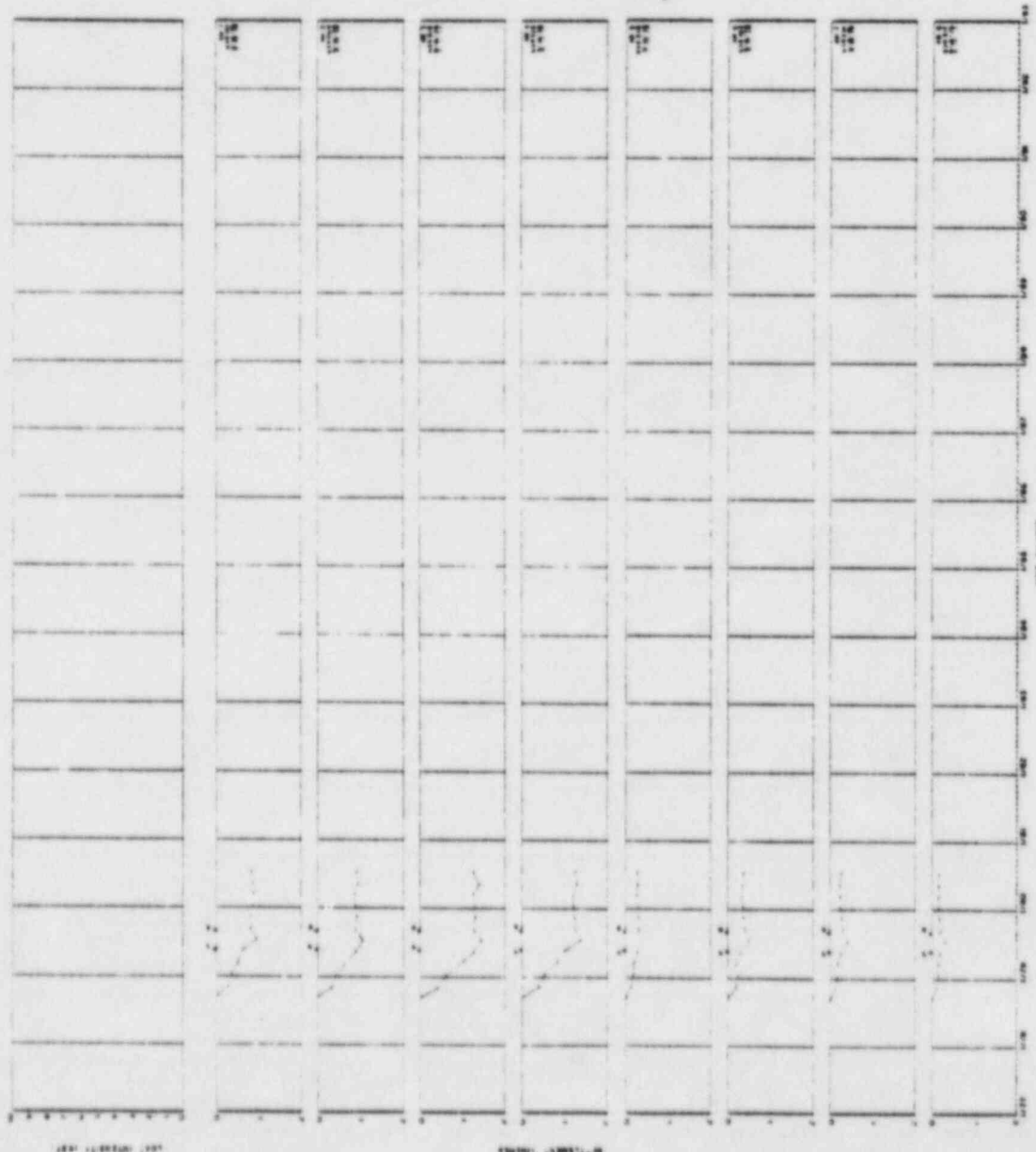
1. The reactor building is a cylindrical structure.
2. The steam generator is a cylindrical structure.
3. The turbine is a cylindrical structure.
4. The condenser is a cylindrical structure.
5. The pump is a cylindrical structure.
6. The valve is a cylindrical structure.

TIME (MIN)	TEMPERATURE (°C)	PRESSURE (PSI)	FLOW (GPM)	LEVEL (%)	STATUS
0	100	100	100	100	Normal
10	100	100	100	100	Normal
20	100	100	100	100	Normal
30	100	100	100	100	Normal
40	100	100	100	100	Normal
50	100	100	100	100	Normal
60	100	100	100	100	Normal
70	100	100	100	100	Normal
80	100	100	100	100	Normal
90	100	100	100	100	Normal
100	100	100	100	100	Normal
110	100	100	100	100	Normal
120	100	100	100	100	Normal
130	100	100	100	100	Normal
140	100	100	100	100	Normal
150	100	100	100	100	Normal
160	100	100	100	100	Normal
170	100	100	100	100	Normal
180	100	100	100	100	Normal
190	100	100	100	100	Normal
200	100	100	100	100	Normal
210	100	100	100	100	Normal
220	100	100	100	100	Normal
230	100	100	100	100	Normal
240	100	100	100	100	Normal
250	100	100	100	100	Normal
260	100	100	100	100	Normal
270	100	100	100	100	Normal
280	100	100	100	100	Normal
290	100	100	100	100	Normal
300	100	100	100	100	Normal

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Reactor Building
(SR-G-414, Rev 1)

Figure 5

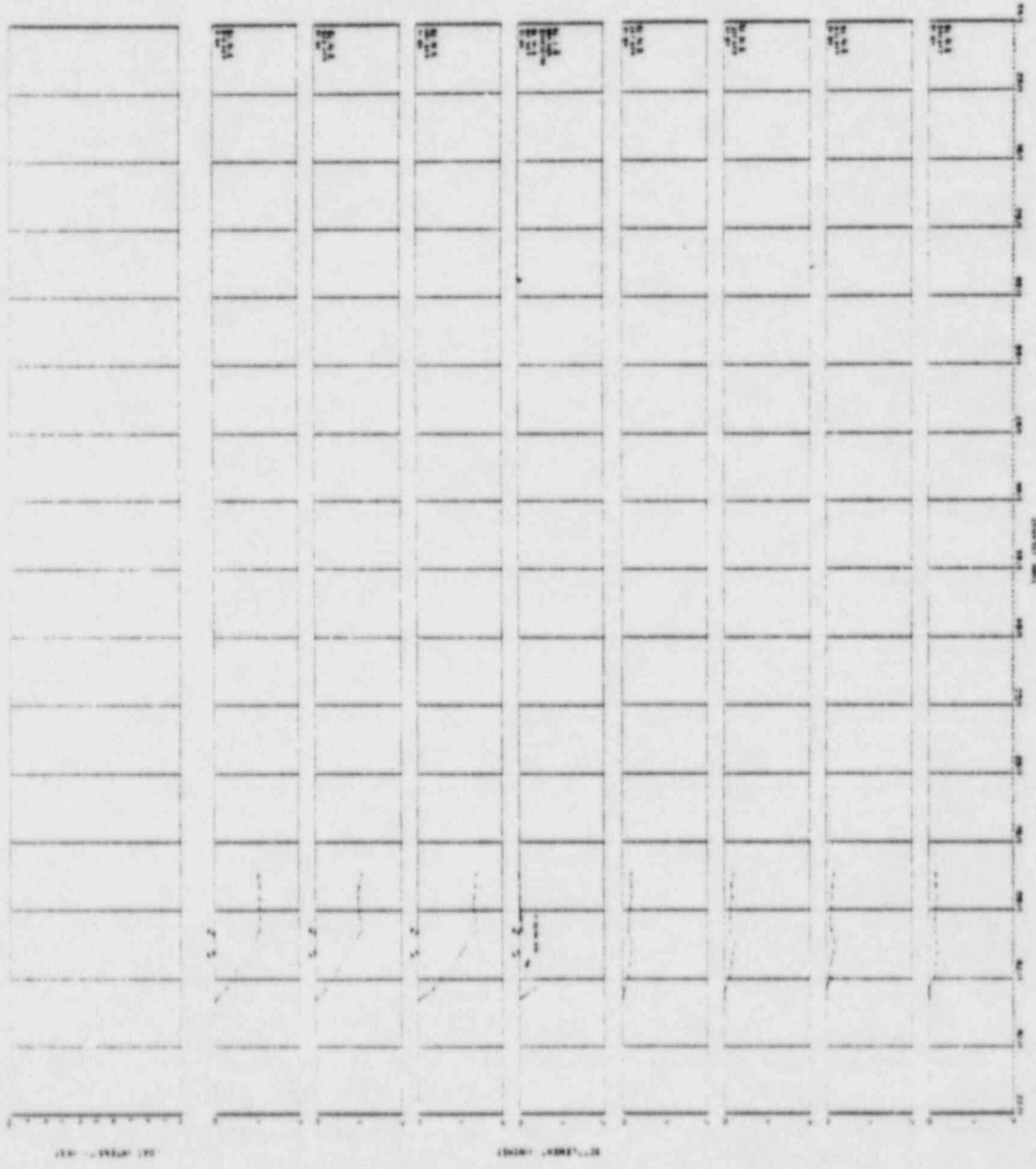


EXPLANATION

- 1. ALL WAVEFORMS WERE TAKEN AT THE SAME TIME.
- 2. THE VOLTAGE SCALE IS 100 VOLTS PER DIVISION.
- 3. THE TIME SCALE IS 100 SECONDS PER DIVISION.
- 4. THE WAVEFORMS WERE TAKEN AT THE MIDPOINT OF THE SECONDARY WINDING.

NOTE: See Figure 1 for details.

CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1 & 2
Settlement vs. Time Transformers (Sb 1 of 3) Unit 1 (SK-G-406, Rev 1)
Figure 6



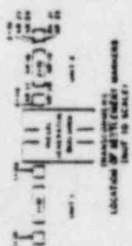
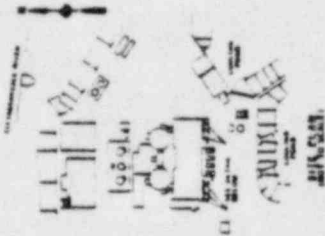
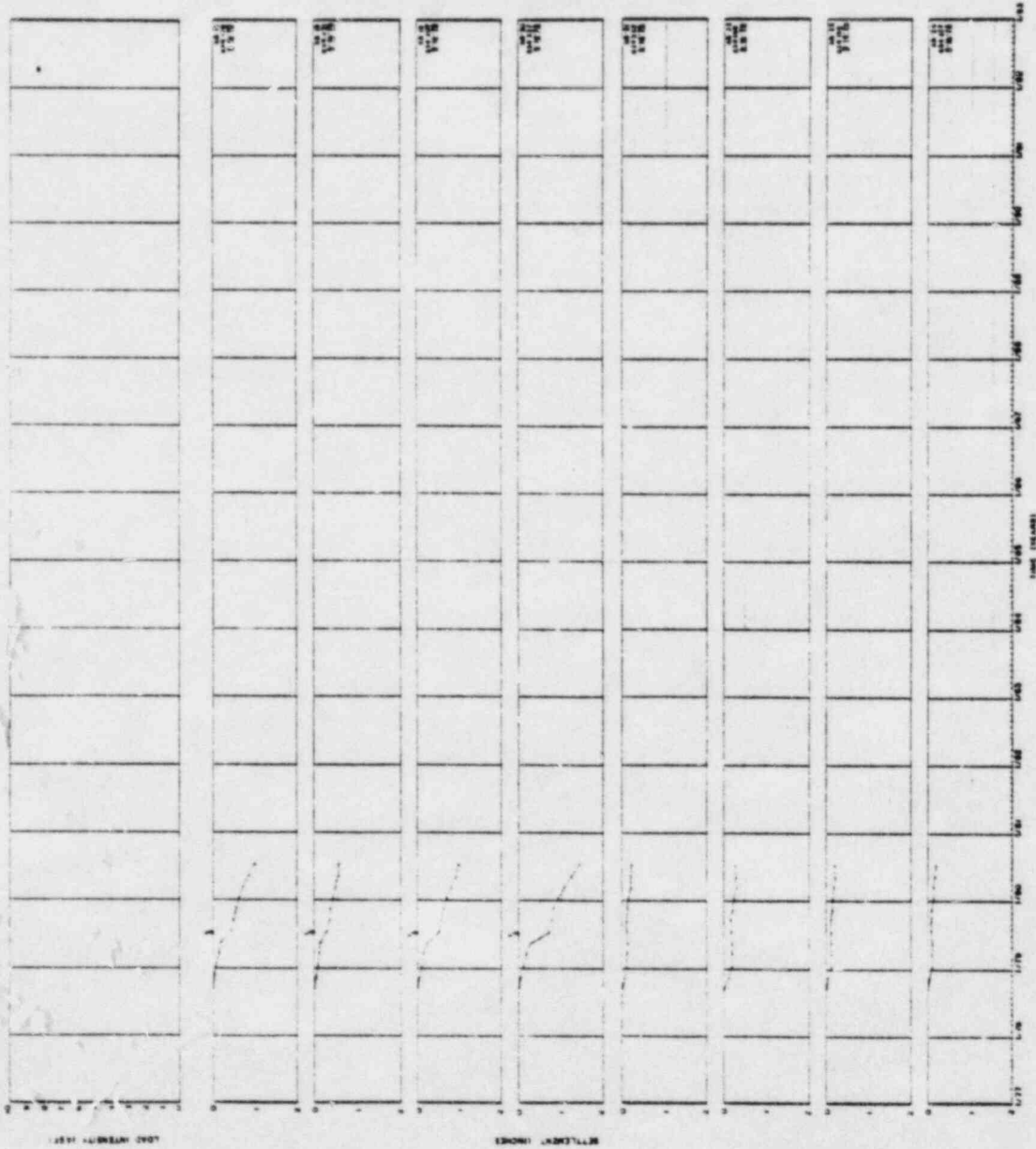
EXPLANATION
 1. 120 VOLT AC SOURCE
 2. TRANSFORMER
 3. LOAD

NOTES
 1. THE WAVEFORMS ARE THE RESULT OF THE TRANSFORMER OPERATION.
 2. THE WAVEFORMS ARE THE RESULT OF THE TRANSFORMER OPERATION.

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Transformers (Sh 2 of 3) Unit 1&2
 (SR-G-407, Rev 1)

Figure 7



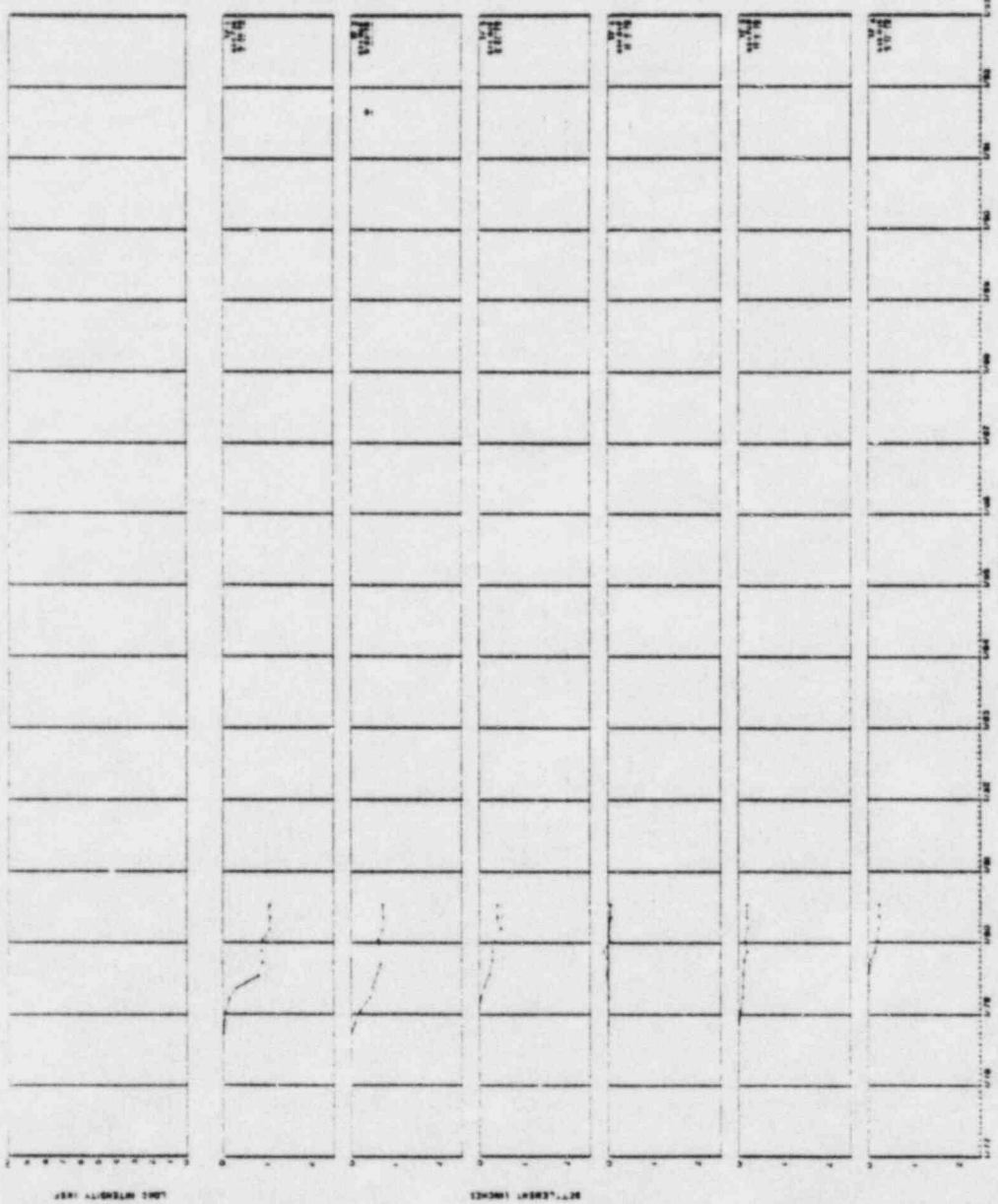
EXPLANATION
 1 - SETTLEMENT NUMBER
 2 - DATE OF MEASUREMENT
 3 - TIME OF MEASUREMENT
 4 - MEASUREMENT NUMBER

NOTE
 1 - See Figure 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Transformers (Sh 3 of 3) Unit 3
 (SK-C-421, Rev 1)

Figure 8



TYPE 1
TYPE 2
TYPE 3

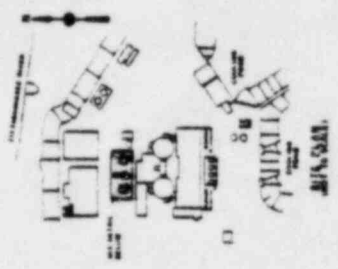
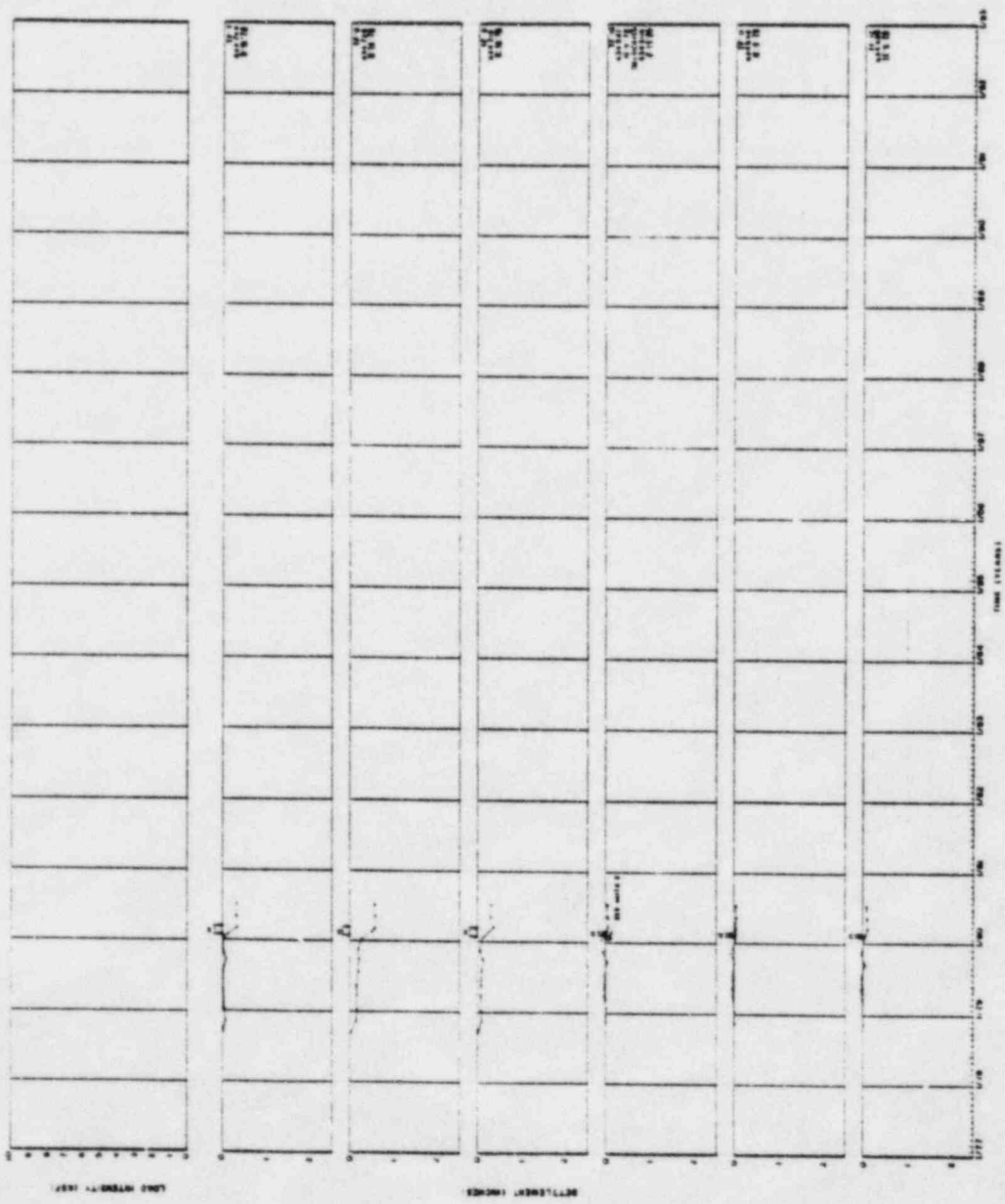
EXPLANATION
1. 1076 - SETTLEMENT TANK
2. 1076 - SETTLEMENT TANK
3. 1076 - SETTLEMENT TANK

NOTE
1. See sketch of settlement measurement apparatus
2. See Types 1, 2 & 3

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Tank Farm (Sh. 1 of 3)
Rotated Meter Storage Tanks
(SK-G-410, Rev. 1)

Figure 9



LOCATION OF SETTLEMENT NUMBER FROM TO SCALE

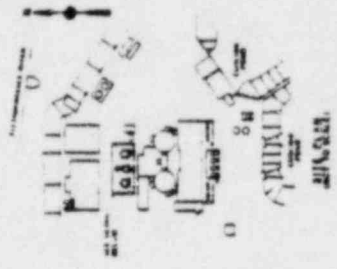
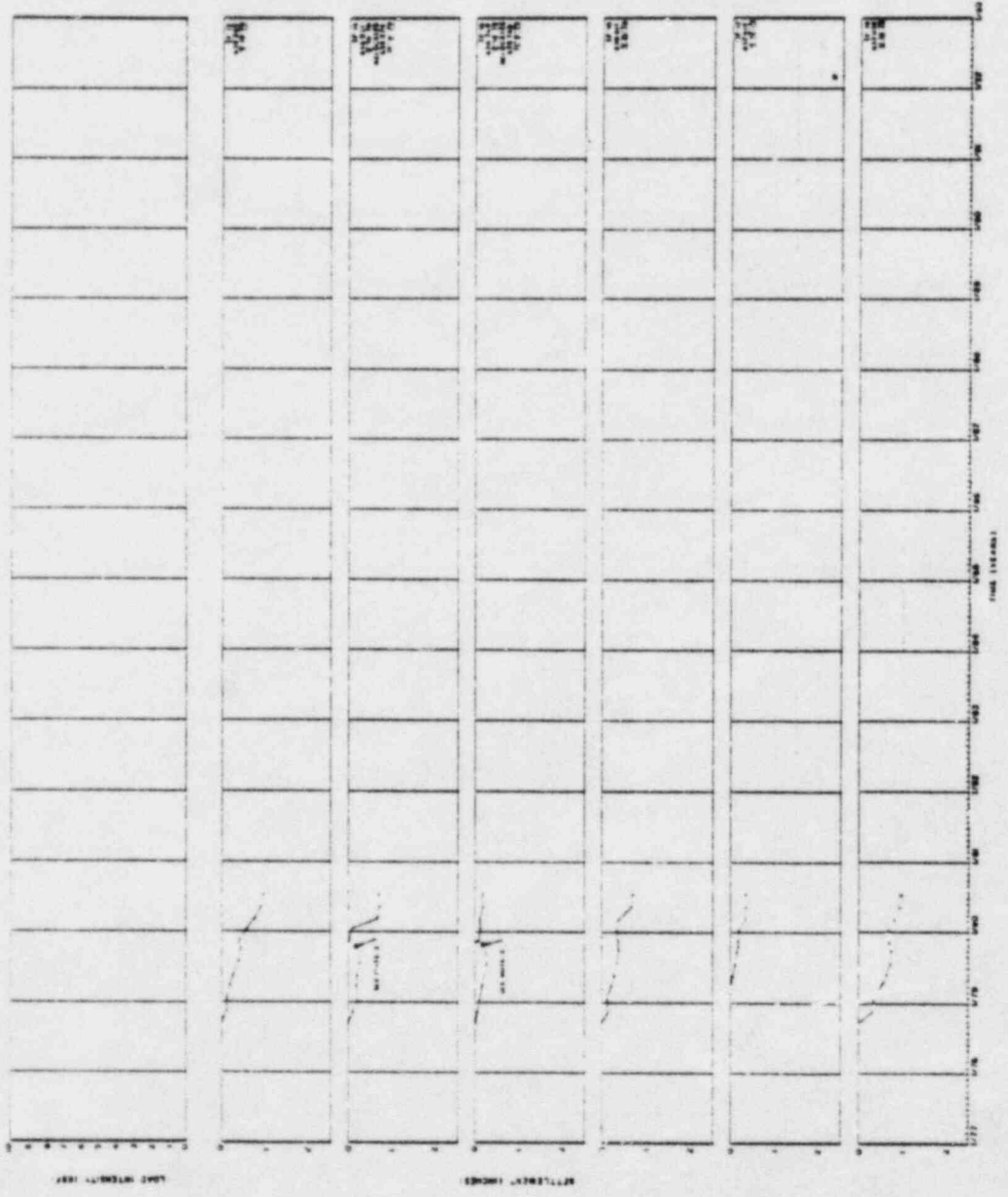
EXPLANATION

- 1. SETTLEMENT NUMBER
- 2. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 3. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 4. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 5. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 6. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 7. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 8. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 9. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE
- 10. LOCATION OF SETTLEMENT NUMBER FROM TO SCALE

NOTE
 1. The Type of Settlement Number
 2. The Type of Settlement Number
 3. The Type of Settlement Number
 4. The Type of Settlement Number
 5. The Type of Settlement Number
 6. The Type of Settlement Number
 7. The Type of Settlement Number
 8. The Type of Settlement Number
 9. The Type of Settlement Number
 10. The Type of Settlement Number

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Tank Farm (Sh 2 of 3)
 Primary & Utility Meter Tanks
 (SK-G-411, Rev 3)
 Figure 10



EXPLANATION

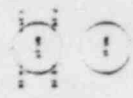
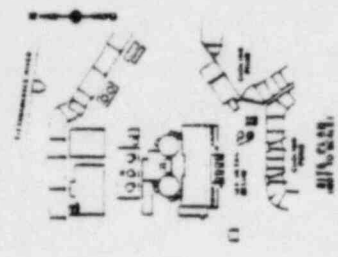
- 1. 100% SETTLEMENT
- 2. 50% SETTLEMENT
- 3. 25% SETTLEMENT
- 4. 12.5% SETTLEMENT
- 5. 6.25% SETTLEMENT

NOTE: Values of percent settlement marked on Figure 3 & 4 are based on maximum settlement as indicated on Figure 1. Values of 100% settlement are based on maximum settlement as indicated on Figure 1.

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Tank Farm (Sh 3 of 3)
Dike Wall
(SK-G-420, Rev 1)

Figure 11



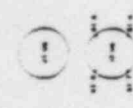
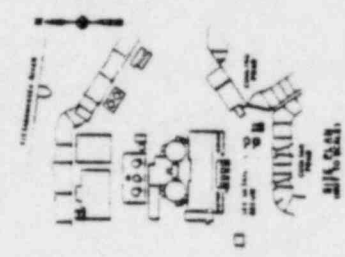
LOCATED BY SETTLING TANKS
(SEE DRAWING)

EXPLANATION

- 1 - SETTLEMENT VELOCITY
- 2 - CONDENSATE STORAGE TANK
- 3 - NORTH TANK
- 4 - CONDENSATE STORAGE TANK
- 5 - NORTH TANK

NOTE: 1 - Direction of velocity measurement is shown by arrow.
2 - See Figure 13 for details.
3 - Direction of flow is shown by arrow in 1 & 2.
4 - The settling velocity is measured at 12 hours.
5 - The settling velocity is measured at 12 hours.

CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1 & 2
Settlement vs. Time Condensate Storage Tanks (Sh 1 of 2) North Tank (SR-G-396, Rev 1)
Figure 13

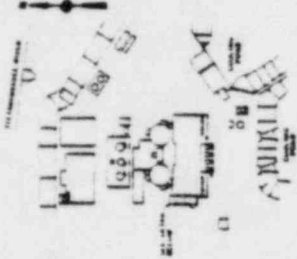


LOCATION OF TANKS, SOUTH TANK

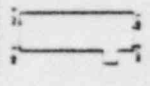
EXPLANATION
 1 - CONDENSATE STORAGE TANK
 2 - SOUTH TANK

NOTES
 1 - See Figure 1 for location of tanks.
 2 - The tanks are located on the site of the old tanks.
 3 - The tanks are located on the site of the old tanks.

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**
 Settlement vs. Time
 Condensate Storage Tanks
 (Sh 2 of 2) South Tank
 (SK-G-422, Rev 1)
 Figure 14



ADMINISTRATION & SERVICE BUILDING



LOCATION OF SETTLEMENT AREAS
INDICATED BY DOTTED LINES

EXPLANATION

--- SETTLEMENT AREAS
--- UTILITY LINES

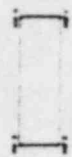
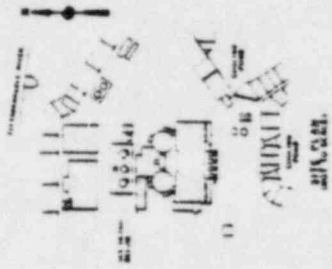
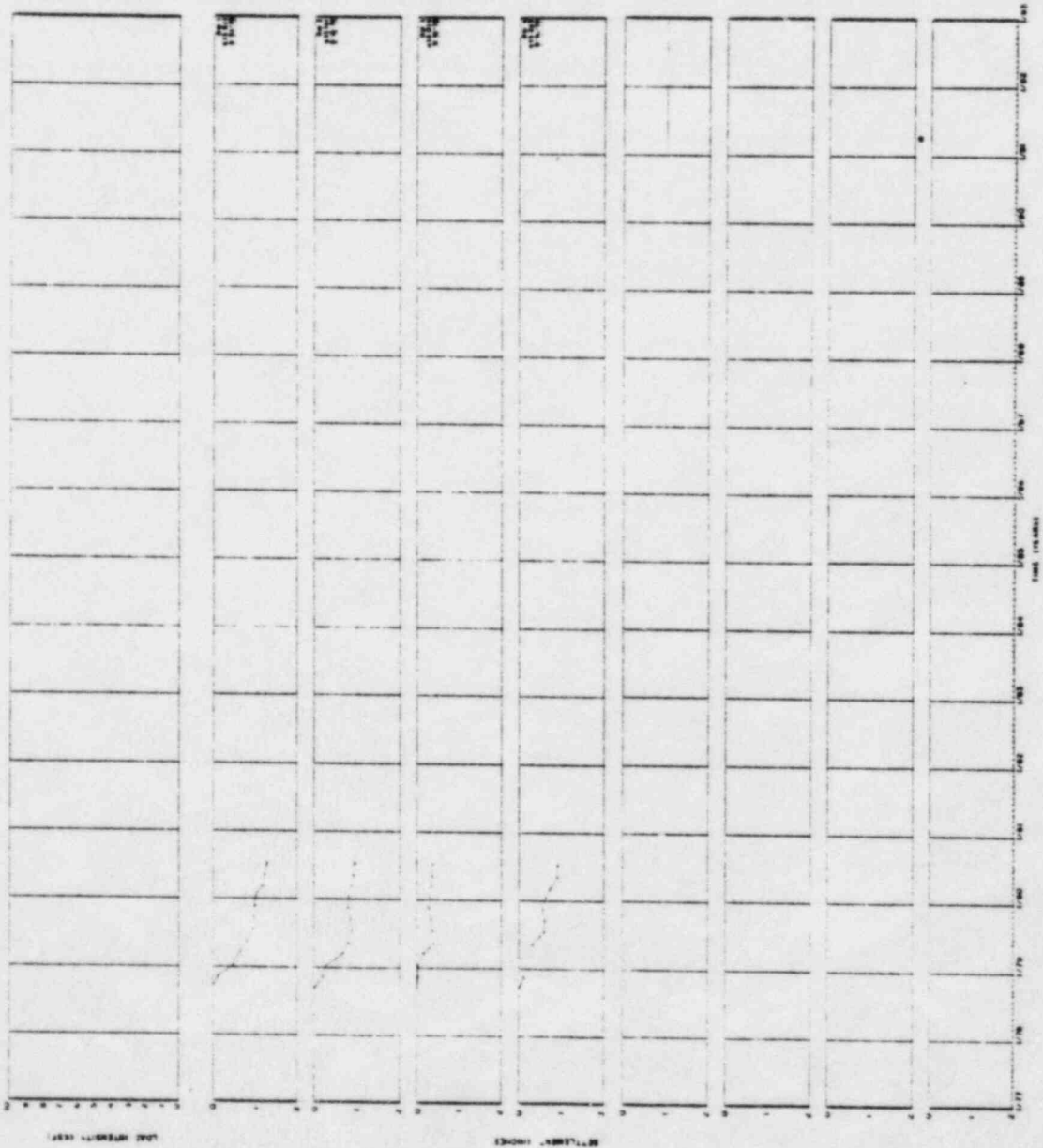
NOTE: See pages 2 & 3 of this report for details.

DATE	TIME (HOURS)	SETTLEMENT AREAS	UTILITY LINES
1/27	1:00		
1/28	1:00		
1/29	1:00		
1/30	1:00		
1/31	1:00		
2/1	1:00		
2/2	1:00		
2/3	1:00		
2/4	1:00		
2/5	1:00		
2/6	1:00		
2/7	1:00		
2/8	1:00		
2/9	1:00		
2/10	1:00		
2/11	1:00		
2/12	1:00		
2/13	1:00		
2/14	1:00		
2/15	1:00		
2/16	1:00		
2/17	1:00		
2/18	1:00		
2/19	1:00		
2/20	1:00		
2/21	1:00		
2/22	1:00		
2/23	1:00		
2/24	1:00		
2/25	1:00		
2/26	1:00		
2/27	1:00		
2/28	1:00		
2/29	1:00		
2/30	1:00		

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Administration & Service Building
(SK-G-417, Rev 1)

Figure 16

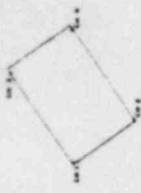
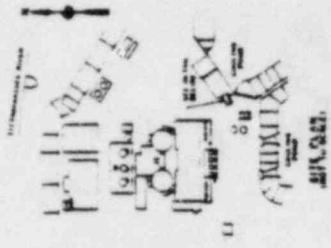


LOCATION OF PLANT COMPONENTS
SHOWN IN MODEL

EXPLANATION
1. ALL DIMENSIONS ARE IN FEET
2. ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE NOTED

NOTE: See Figure 25-400

CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1 & 2
Settlement vs. Time Radwaste Building (SK-G-390, Rev 1)
Figure 17



LOCATION OF CHLORINATION BUILDING
SCALE TO SCALE

EXPLANATION
 1. CHLORINATION BUILDING
 2. MIDLAND PLANT

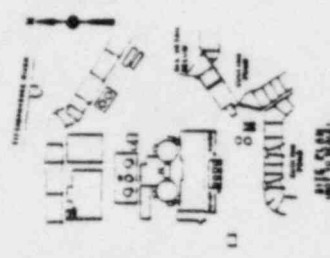
NOTE
 1. This plan is subject to settlement
 2. This plan is subject to settlement
 3. This plan is subject to settlement

Station	1+00	1+10	1+20	1+30	1+40	1+50	1+60	1+70	1+80	1+90	2+00
Settlement											
Chlorination Building											
Midland Plant											
Other											

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Chlorination Building
(SK-G-397, Rev 1)

Figure 18



GENERAL NOTES: SEE DRAWING FOR
 LOCATION OF SERVICE METER
 (SEE FIG. 1)

EXPLANATION
 1. SERVICE METER
 2. SERVICE METER STRUCTURE
 3. SERVICE METER WALL

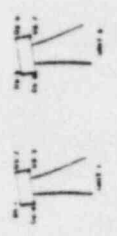
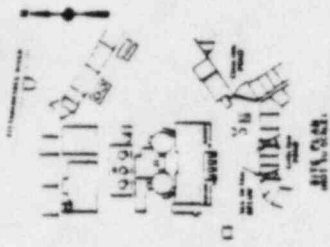
NOTE
 1. SERVICE METER STRUCTURE
 2. SERVICE METER WALL
 3. SERVICE METER

Station	1+00	1+10	1+20	1+30	1+40	1+50	1+60	1+70	1+80	1+90	2+00
Settlement											
vs. Time											
Service Meter Pump Structure											
and Retaining Wall											
(SK-C-413, Rev. 1)											

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Service Meter Pump Structure
 and Retaining Wall
 (SK-C-413, Rev. 1)

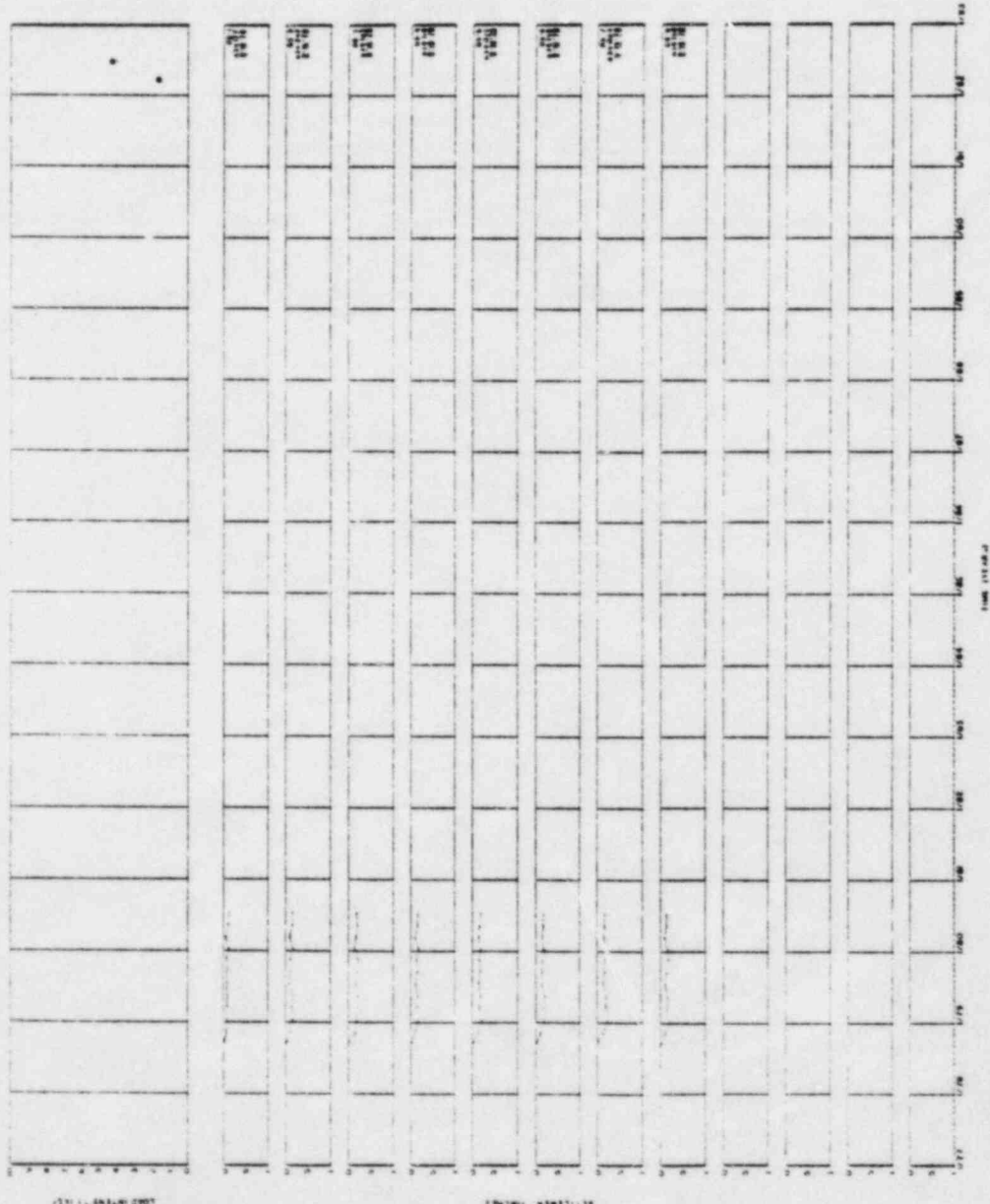
Figure 20



CONCRETE WATER TREATMENT STRUCTURES
 LOCATION MAP TO BE SET.

EXPLANATION
 - - - - - SETTLEMENT MARKS
 - - - - - WATER ELEVATION DATA
 - - - - - DATE OF INITIAL MEASUREMENT

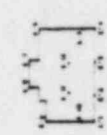
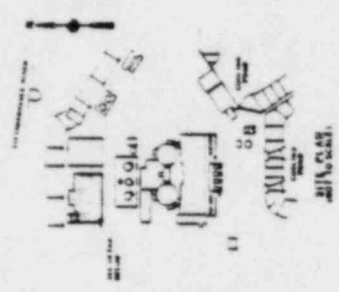
NOTE:
 See Section of Structure Settlement Markers
 and Figure 2 of 1954.



**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Circulating Water Discharge
 Structures
 (SK-G-412, Rev 1)

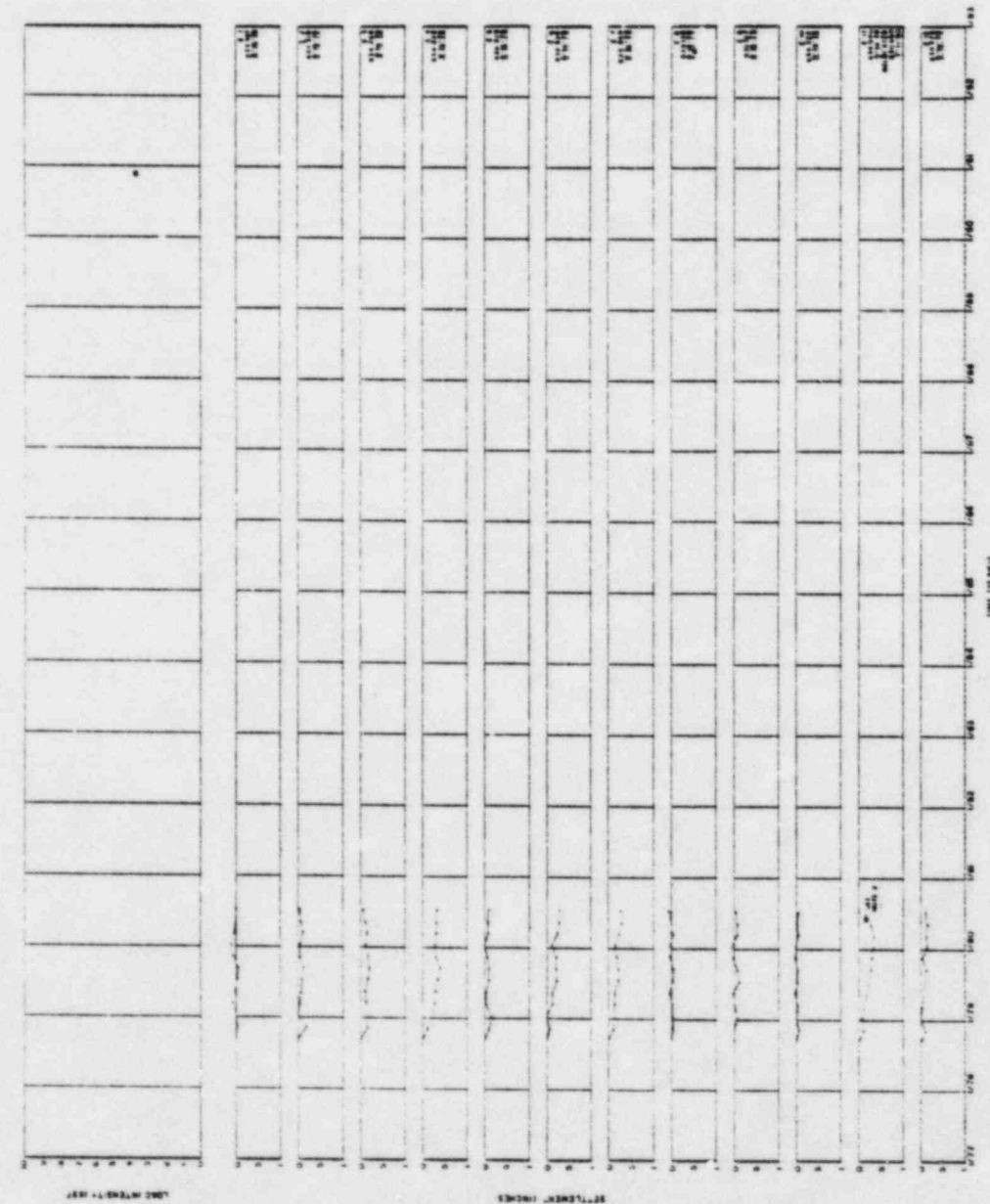
Figure 21



LOCATION OF UNIT, VALVE, PUMP, AND/OR PIPELINE

EXPLANATION
 1. - UNIT 1
 2. - UNIT 2
 3. - UNIT 3
 4. - UNIT 4

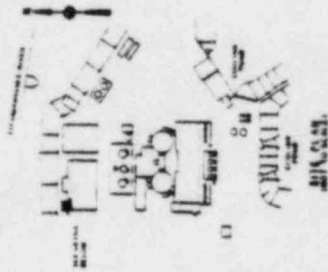
NOTES
 1. The system of electrical interlocking is shown in the Figure 15-100.
 2. The system of interlocking is shown in the Figure 15-100.
 3. The system of interlocking is shown in the Figure 15-100.



**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Evaporator Building
 (SK-G-408, Rev 1)

Figure 22



GENERATOR TANKS
LOCATION OF SETTLEMENT MARKERS
(SEE FIGURE 2)

EXPLANATION

- 1 - SETTLEMENT MARKER
- 2 - SETTLEMENT MARKER
- 3 - SETTLEMENT MARKER
- 4 - SETTLEMENT MARKER
- 5 - SETTLEMENT MARKER
- 6 - SETTLEMENT MARKER
- 7 - SETTLEMENT MARKER
- 8 - SETTLEMENT MARKER
- 9 - SETTLEMENT MARKER
- 10 - SETTLEMENT MARKER
- 11 - SETTLEMENT MARKER
- 12 - SETTLEMENT MARKER
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- 94 - SETTLEMENT MARKER
- 95 - SETTLEMENT MARKER
- 96 - SETTLEMENT MARKER
- 97 - SETTLEMENT MARKER
- 98 - SETTLEMENT MARKER
- 99 - SETTLEMENT MARKER
- 100 - SETTLEMENT MARKER

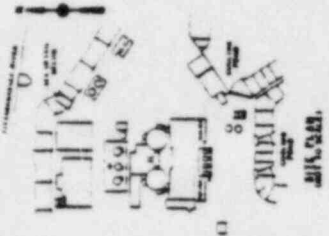
NOTE
1. See sketch of generator settlement markers
in Figure 2 of this report.

MARKER NO.	MARKER TYPE	MARKER LOCATION	MARKER DATE	MARKER TIME	MARKER VALUE	MARKER UNIT	MARKER SCALE	MARKER METHOD	MARKER NOTES
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
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24									
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97									
98									
99									
100									

**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
Deaerator Tanks
(SK-G-404, Rev 1)

Figure 23



DESIGN OF PUMP AND MOTOR ASSEMBLY
 MADE TO ORDER

EXPLANATION
 1. PUMP ASSEMBLY
 2. MOTOR ASSEMBLY
 3. MOTOR WINDINGS
 4. MOTOR FRAME

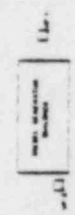
NOTE
 1. SEE FIGURE 2 & 3 FOR
 2. SEE FIGURE 4 & 5 FOR

TIME	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	
INCHES																						
FEET																						
MINUTES																						
SECONDS																						

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Pickup Motor Pump Structure
 (SK-G-403, Rev 1)

Figure 26



SEE FIGURE 26 FOR VALVE ASSEMBLY

EXPLANATION
 A - VALVE SEAT
 B - VALVE STEM
 C - VALVE PLATE
 D - VALVE BODY
 E - VALVE GASKET
 F - VALVE GASKET
 G - VALVE GASKET
 H - VALVE GASKET
 I - VALVE GASKET
 J - VALVE GASKET

NOTE: SEE FIGURE 26 FOR VALVE ASSEMBLY

TIME (MIN)	VALVE 1	VALVE 2	VALVE 3	VALVE 4
0				
10				
20				
30				
40				
50				
60				
70				
80				
90				
100				
110				
120				
130				
140				
150				
160				
170				
180				
190				
200				
210				
220				
230				
240				
250				
260				
270				
280				
290				
300				

**CONSUMERS POWER COMPANY
 MIDLAND PLANT UNITS 1 & 2**

Settlement vs. Time
 Service Water Valve Fits
 (SK-G-400, Rev 1)

Figure 27



QUANTITY SERVICE, PITTSBURGH, PA.
 MADE IN U.S.A.

EXPLANATION
 1. UNIT 1 - SETTLEMENT CHAMBER
 2. UNIT 2 - FEED METER ISOLATION CHAMBER

NOTE: 1. RECORD OF SETTLEMENT CHAMBER READINGS
 2. See Figure 2B

TIME (HOURS)	UNIT 1	UNIT 2
1:18		
1:20		
1:22		
1:24		
1:26		
1:28		
1:30		
1:32		
1:34		
1:36		
1:38		
1:40		
1:42		
1:44		
1:46		
1:48		
1:50		
1:52		
1:54		
1:56		
1:58		
2:00		
2:02		
2:04		
2:06		
2:08		
2:10		
2:12		
2:14		
2:16		
2:18		
2:20		
2:22		
2:24		
2:26		
2:28		
2:30		
2:32		
2:34		
2:36		
2:38		
2:40		
2:42		
2:44		
2:46		
2:48		
2:50		
2:52		
2:54		
2:56		
2:58		
3:00		

SETTLEMENT CHAMBER

CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1 & 2
Settlement vs Time Feed Meter Isolation Chambers (SK-G-395, Rev 1)
Figure 2B

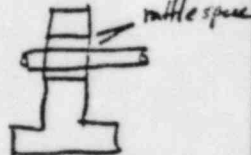
Consumer's Exhibit #10 (Kane)

TELEPHONE OR VERBAL CONVERSATION RECORD		DATE
For use of this form, see AR 340-13; the proponent agency is The Adjutant General's Office.		4 March 80
SUBJECT OF CONVERSATION		
NRC		
INCOMING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
Paul Hadula	WES	8-542-3475
PERSON CALLED	OFFICE	PHONE NUMBER AND EXTENSION
MA Gehring	NCEED-T	6793
OUTGOING CALL		
PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
PERSON CALLED	ADDRESS	PHONE NUMBER AND EXTENSION

SUMMARY OF CONVERSATION

Paul returned my earlier call. He indicated that a trip report will be forthcoming this week on the midland trip. Basically it will ask several questions & identify problem areas as follows:

- 1) He wants to see jacking operation on service water bldg
- 2) we should ask applicant thru NRC to supply dynamic analysis of intake area under SSE loads.
- 3) we should look at the rattle space for the various pipe systems. Rattle space is the area between the large site pipe sleeves coming into buildings that allows settlement to occur w/o damaging the pipe



Paul also indicated that Tom Davison, NRC consultant on Billy is one of the best earthquake experts in the country & that he'll be on our side for Billy. I called to ask him (Dr Hadula) to attend the 10 March 80 Mtg in Champagne-Urbana. He probably will & the situation will be discussed between he & Jim Simpson since they are together at a conference @ WES on another matter.

MA 4 March 80

COE SWT Coring, etc. can be eliminated
VSB also COE-8, COE-13
SW Structure COE-16
Retaining Walls COE-14
Auxiliary Bldg COE 17 & 18

5/27/83
1 cl-4

Consumer's Exhibit # 11 (Kane)

NRC Position -- Diesel Generator Building
Vu No. 1 CPCo Position No. 1

1. Let's look at the preload program completed at Midland:
Plan view of DGB - start w/ Vu No. 1. Stress need to consider time element
- Outline of structure, 4 bays Vu No. 2
- Areal extent surcharge was placed
- Extent of conduits & piping beneath DGB (Service water
enclosing water)
- Location of sectional views A & B

Sectional View A & B Vu No. 3 & 4 Point out depth of fill (30 ±)
Point out level to which we feel
GWT rose during surcharging

2. Discuss uniqueness of preloading program completed at Midland.
- Placed after structure & conduits had been placed. Effects.
(Show working drawings Fig. 14 Settlement Data
Note non-uniform, unusual settlement pattern
Warning Drawing Fig. 60 - Surveyed Pipelines * Stress concern is for
differential settlement & overstressing
of conduits
- Concern of overstressing pipes. Difficulties in monitoring
& evaluating future settlement of safety related piping

3. CPCo Position No. 2 concerning stresses produced in fill under surcharge
Vu No. 5

4. Staff Position - Vu No. 6
Surcharge load apparently just meets DL+LL+
Effect of Deaerating. Does not allow for additional environmental loads.
Normal practice in surcharge programs - Place a surcharge
load that is 1.5 times final load to assure secondary
consolidation is reached.

5. CPCo Position No. 3 **Vu No. 1** - Settlement Data
Vu No. 7 Presented by Dr. Peck at Aug. 29, 1980 meeting
- Shows decrease in rate of settlement after 100 days. Rebound.
 - Time period where surcharge was imposed in secondary consolidation was approximately 90 days.
 - Note that graph conveniently plots only settlement after surcharge was placed.
6. CPCo Position No. 4 **Vu No. 1** - Settlement & Piezometer Data
(Show **Vu No. 8**) Presented by Dr. Peck at Aug. 29, 1980 meeting
- Cover info presented (Settlement - arithmetic scale, pond levels, PZ-30 behavior (particularly after removal) & surcharge load history)
 - Show disagreement with previously submitted data (**Vu No. 9**) at critical time of surcharge removal for PZ-30.
 - Show previously submitted Fig 27-5 (**Vu No. 10**) where PZ-23 behavior at time of surcharge removal has been deleted & replaced w/ PZ-30 data but all other data (Settlement of DG-3, pond & surcharge) remains unchanged. Show how PZ-23 supports our concern that secondary consolidation was not reached by observed behavior. Show other piezometers, PZ-36 **Vu No. 11** and piezometer PZ-47 **Vu No. 12**
7. CPCo Position No. 5 **Vu No. 1** State of the art limitations:
- thin samples - True. However in some respect we have better control to duplicate long term field conditions which did not develop during surcharging period.
 - sample disturbance - Available methods for correction **Vu No. 13**
 - problems in selecting representative samples - a problem that a geotechnical engineer faces in nearly every aspect of our work. Knowing the problem exists should not prevent us from facing it, using experience & best lab data.

8. CPCo Position No. 6 **Vu No. 14**

- Cite NRC experiences - Virgil C. Summer
- Fact that Midland design used the present state-of-the-art approach (undisturbed sampling & consolidation testing) to show that the foundation glacial materials were, in fact, preconsolidated under former glaciers. Here CPCo accepts the state-of-the-art because it does not cause them a problem.
- Show on **Vu No. 5** what we would expect (At depth testing & establishment of preconsolidation pressure).

9. CPCo Position No. 7 **Vu No. 14**

- Effect of temporary dewatering
- Both NRC & COE anxiously await the details of the temporary dewatering now being conducted. The information ^{that has been} submitted to date ^{is conceptual and} does not permit us to reach an agreement on the adequacy of the temporary dewatering scheme. We do not know their specific plans for monitoring for both drawdown ^{of the water table} and for further settlement. The ~~data~~ results from the temporary dewatering could provide additional important settlement data but it is highly unlikely the zone of dewatering influence will resolve all our concerns with the DGB and the additional borings and lab testing will still be required.

10. CPCo Position No. 8 **Vu No. 14**

- Future Monitoring
- Because of the known settlement problem & concern - Midland during plant operation will be required to have strict tech. specs on settlement monitoring ^{in much more detail than} ~~specification~~.
- There are some very serious concerns on the adequacy of monitoring settlement on buried safety related piping & conduits. The requested laboratory testing is viewed by both

J. Kane
4 of 4
9/27/80

the COE & the IDC staff as a necessary approach to accurately predict ^{the range of} future settlements and satisfy ourselves that expected settlements will not exceed tolerable limits. Data and observations from the surcharge program pose questions as to its success because of the time it was imposed and the magnitude of the load. We view the additional testing as a reasonable way to resolve the concerns on the effectiveness of the preload program.

11. Summarize our concerns on the effectiveness of the Preload Program: we have concerns because
- a. Estimated settlement and piezometric levels ^{made} BEFORE the preloading were never reached. ^{settlement u to 16"} We are concerned that
 - b. Not following the usual practice of requiring a surcharge load equal to 1.5 times the final load to assure reaching secondary consolidation
 - c. The behavior of certain piezometers after surcharge removal to cause concern that secondary consolidation was not reached
- Support for our position for testing **Vu No. 15** ^{statement in Peck's testimony}

12. CPCs Position No. 9, 10 & 11 — Bearing Capacity
Vu No. 14

List of Vugraphs for Diesel Generator Building

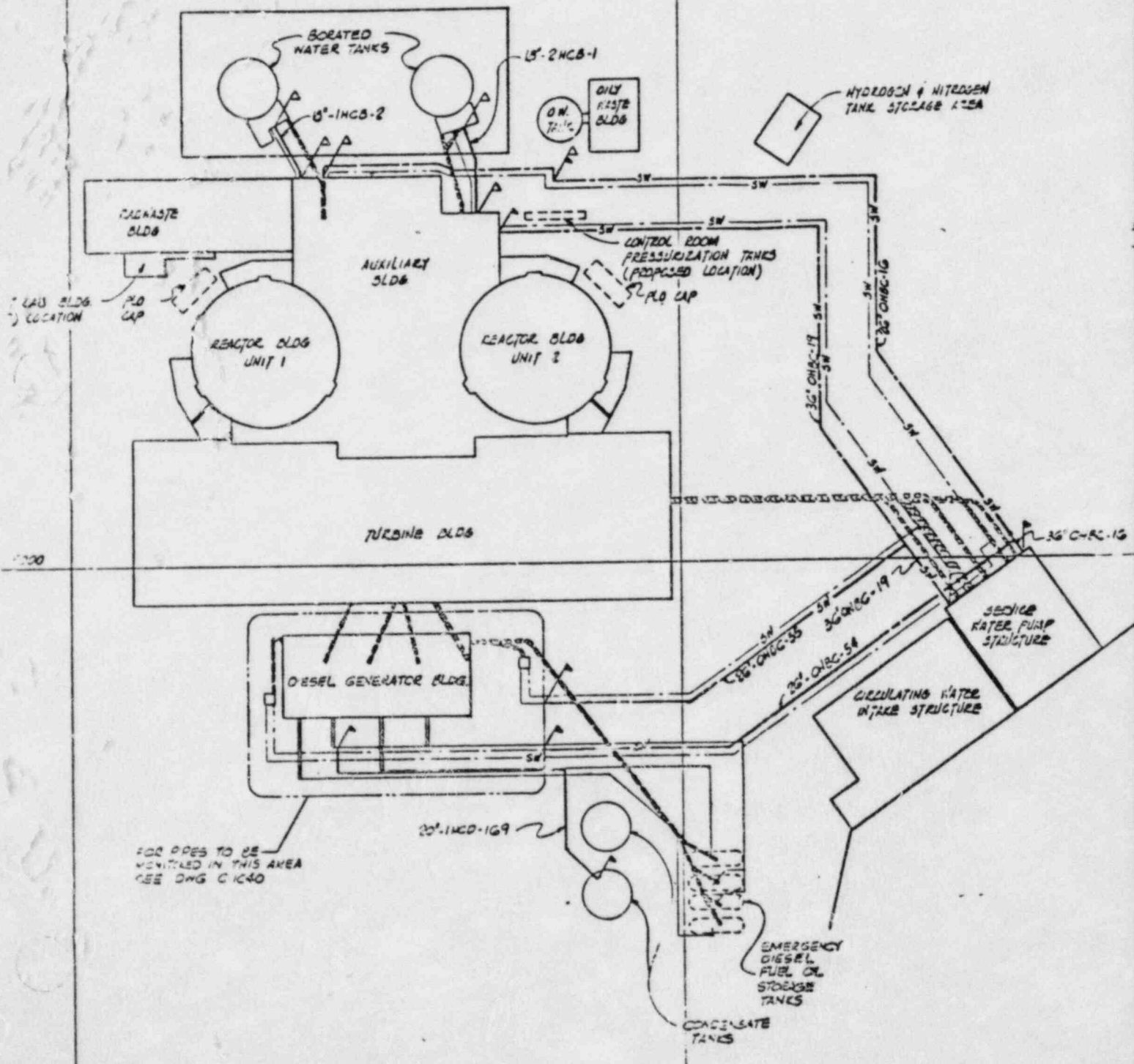
<u>No.</u>	<u>Subject</u>
1	CPCo Position List - DGB
2	Plan - DGB Area
3	Section A - DGB
4	Section B - DGB
5	CPCo graph of stress vs. depth
6	COE graph of stress
7	CPCo Measured & Predicted Settlement
8	CPCo Typical Settlement & Piezometer Data
9	PZ-30 Data (not yet made - Fig. 27-32)
10	Settlement & Piezometer Data (not yet made - Fig. 27-5)
11	PZ-36
12	PZ-47
13	Consolidation Test Report
14	CPCo Position list (cont.)
15	Page from "Foundation Engineering" text book

CPCo Position - Diesel Generator Building

1. Full scale field test is the most reliable technique to predict settlement. The surcharge program allowed for direct measurements of settlement, therefore, no need to rely on sampling & lab testing. NRC Response
Discuss importance of time element
2. Surcharge produced stresses in the fill in excess of stresses to prevail while DGB is operational.
3. Settlement data recorded during surcharge program showed:
 - a. Eventual decrease in rate of settlement.
 - b. Slight rebound after surcharge removal.
 - c. Straight line behavior representative of secondary consolidation.
4. Piezometer data recorded during surcharging showed
 - a. Rapid dissipation of pore water pressure, indicating rapid consolidation.
 - b. Following surcharge removal, a slight drop in piezometric level occurred, and level eventually stabilized with groundwater table.
5. Recognized sampling & lab testing limitations.
 - thin (e.g. $\frac{3}{4}$ " thick) test samples
 - unavoidable sample disturbance
 - problems in selecting representative samples

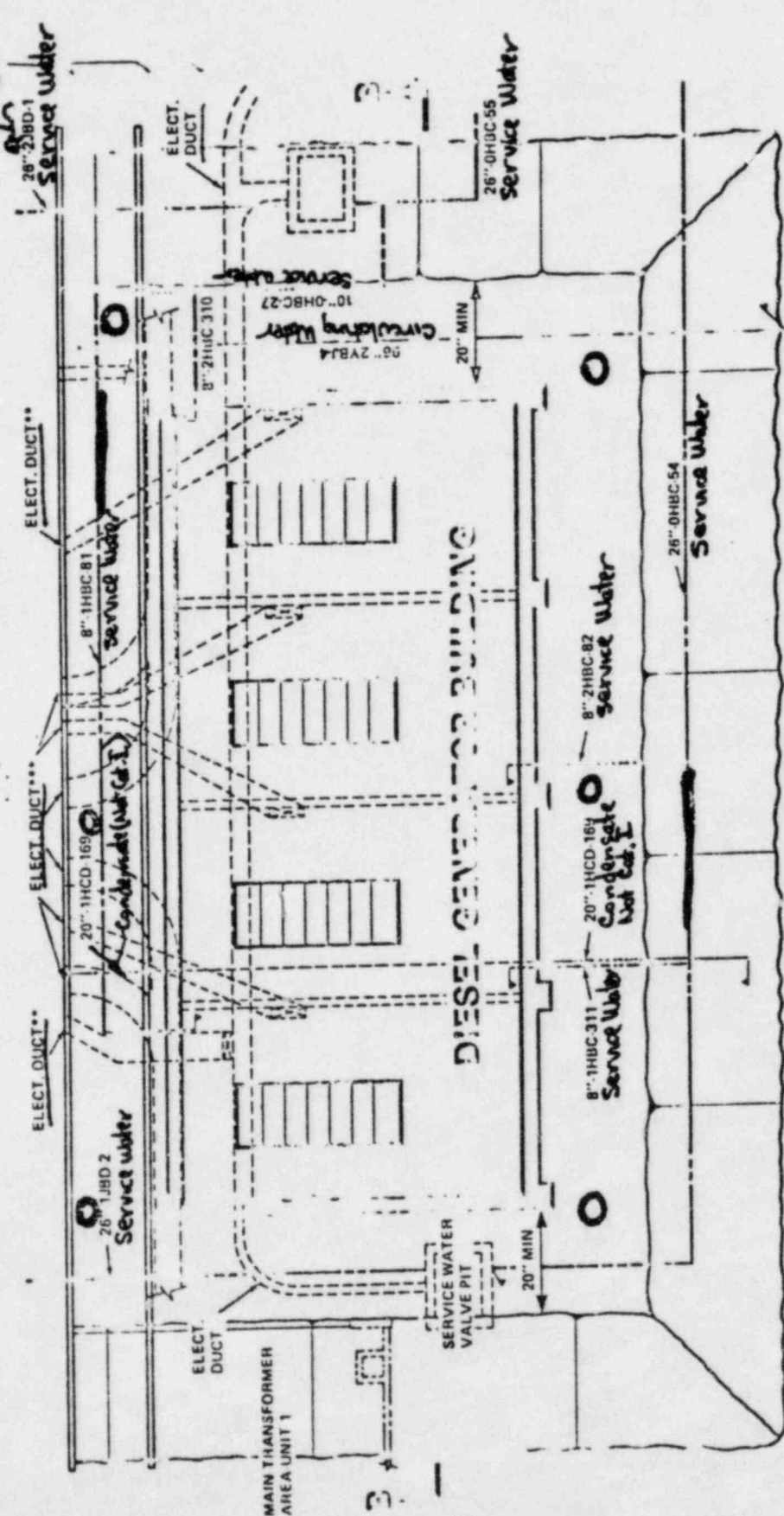
1:4500

E 500



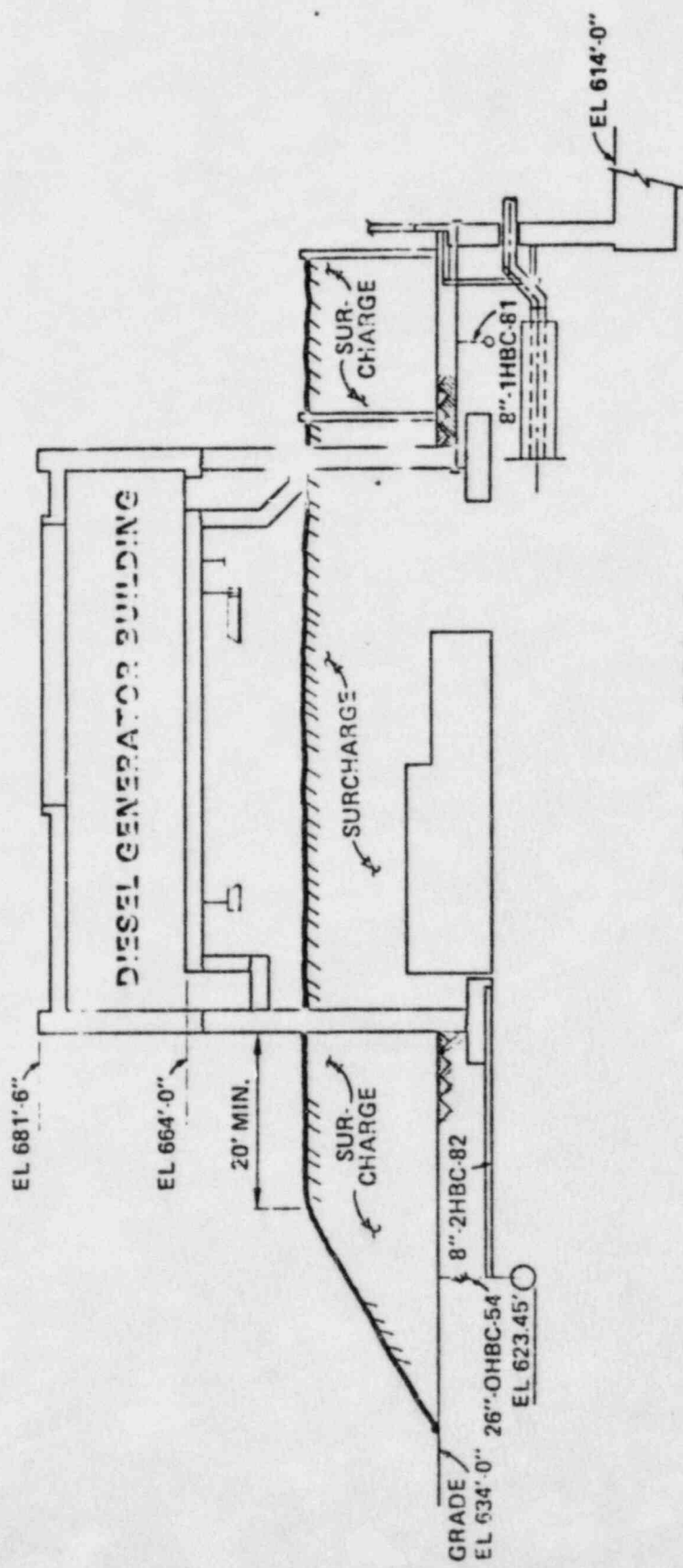
Unit Designation
 Service No
 8" - 1 HBC - 81
 Applicable code e.g. ABWA
 Pressure Rating
 Material
 pipe class

Material
 B = Carbon steel
 C = Stainless steel



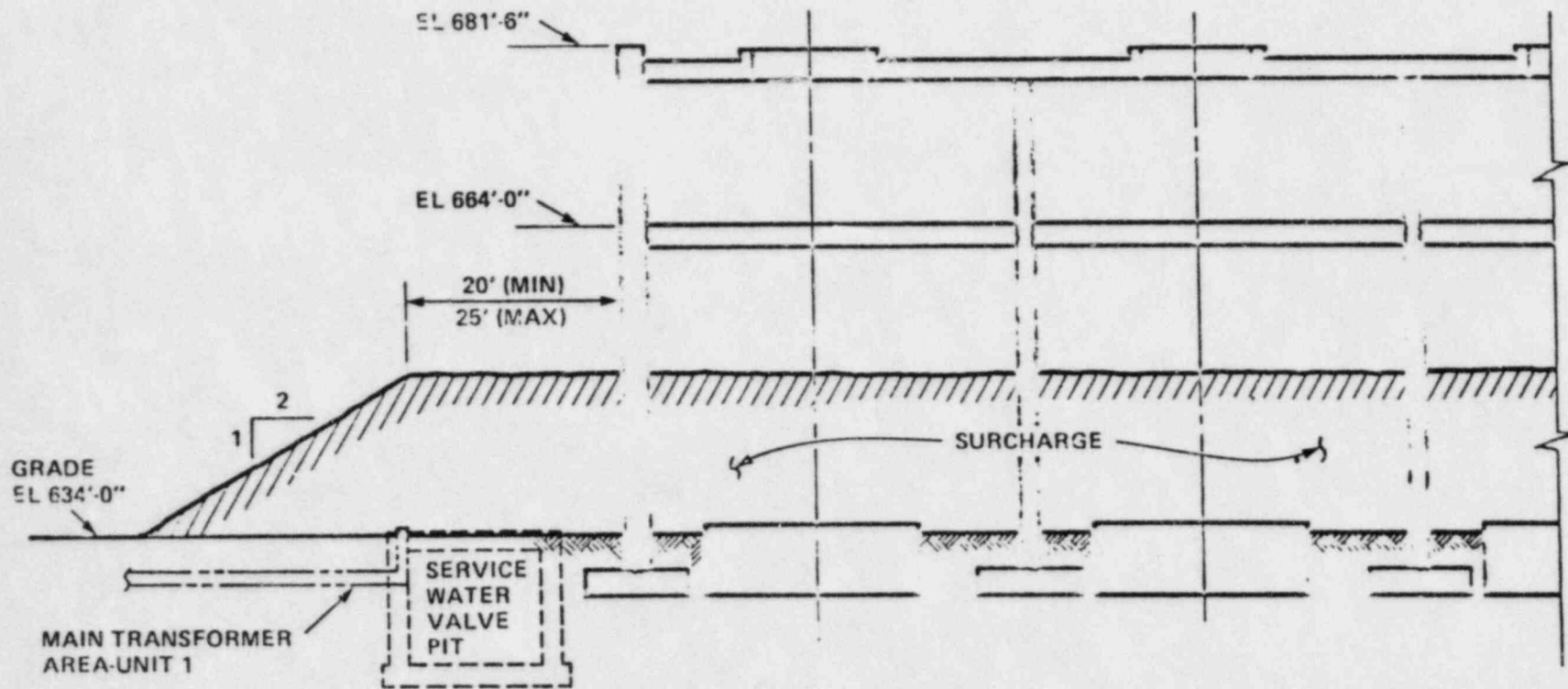
A-A

○ Proposed COE boring locations (Approximate)



SECTION A

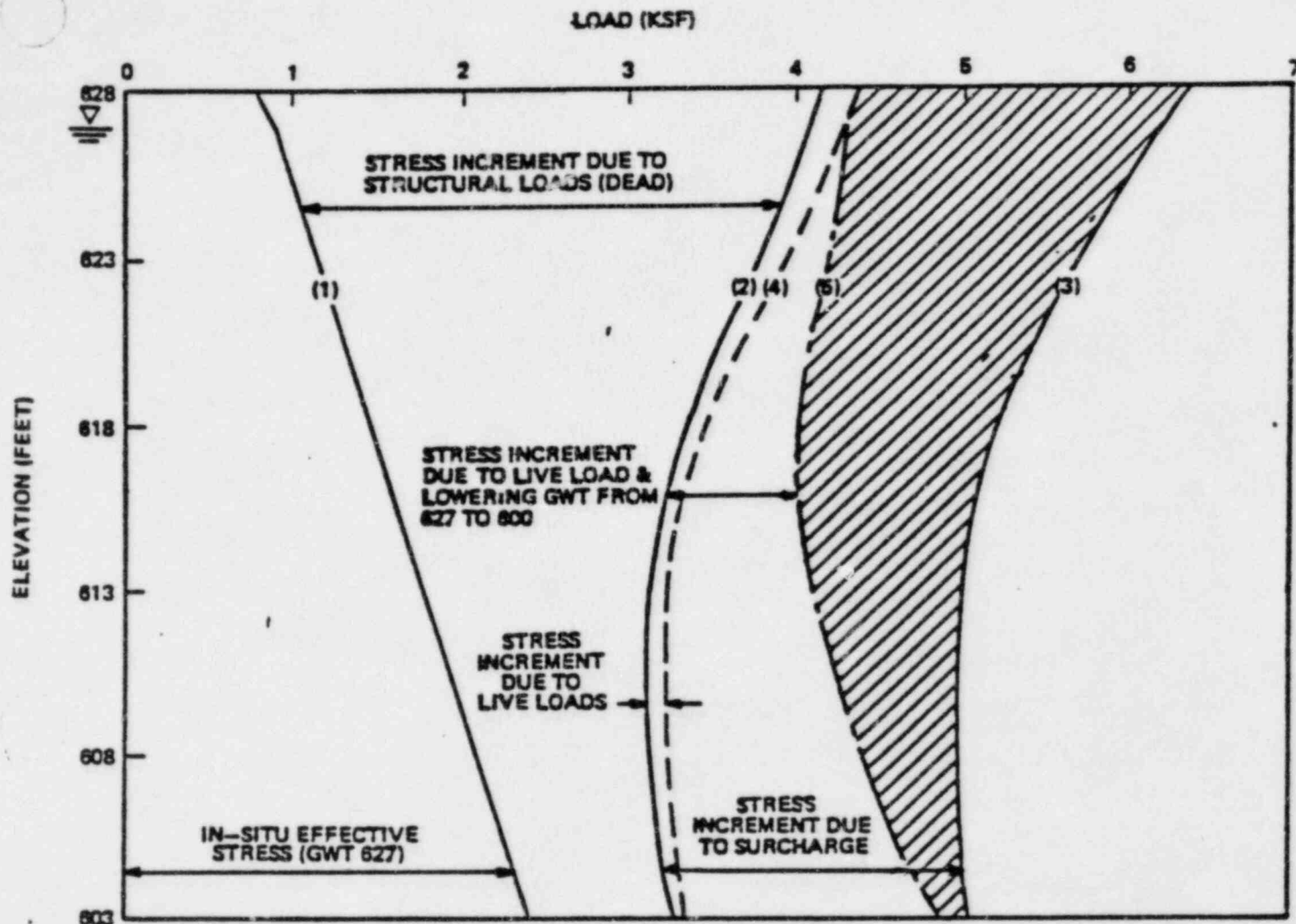
DIESEL GENERATOR BUILDING



SECTION B

Vugra h 4

Figure 2
(See Reference 1)



NOTES:

1. (1) In-situ effective overburden pressure GWT at 627.
2. (2) Total effective pressure due to in-situ effective overburden pressure and structural dead loads.
3. (3) Total effective pressure at the end of surcharge due to in-situ effective overburden pressure, structural dead loads, & surcharge loads.
4. (4) Total effective pressure due to in-situ effective overburden pressure, structural dead loads, & live loads.
5. (5) Total effective pressure during the life of plant operation due to in-situ effective overburden pressure, structural dead loads, dewatering loads, & live loads.

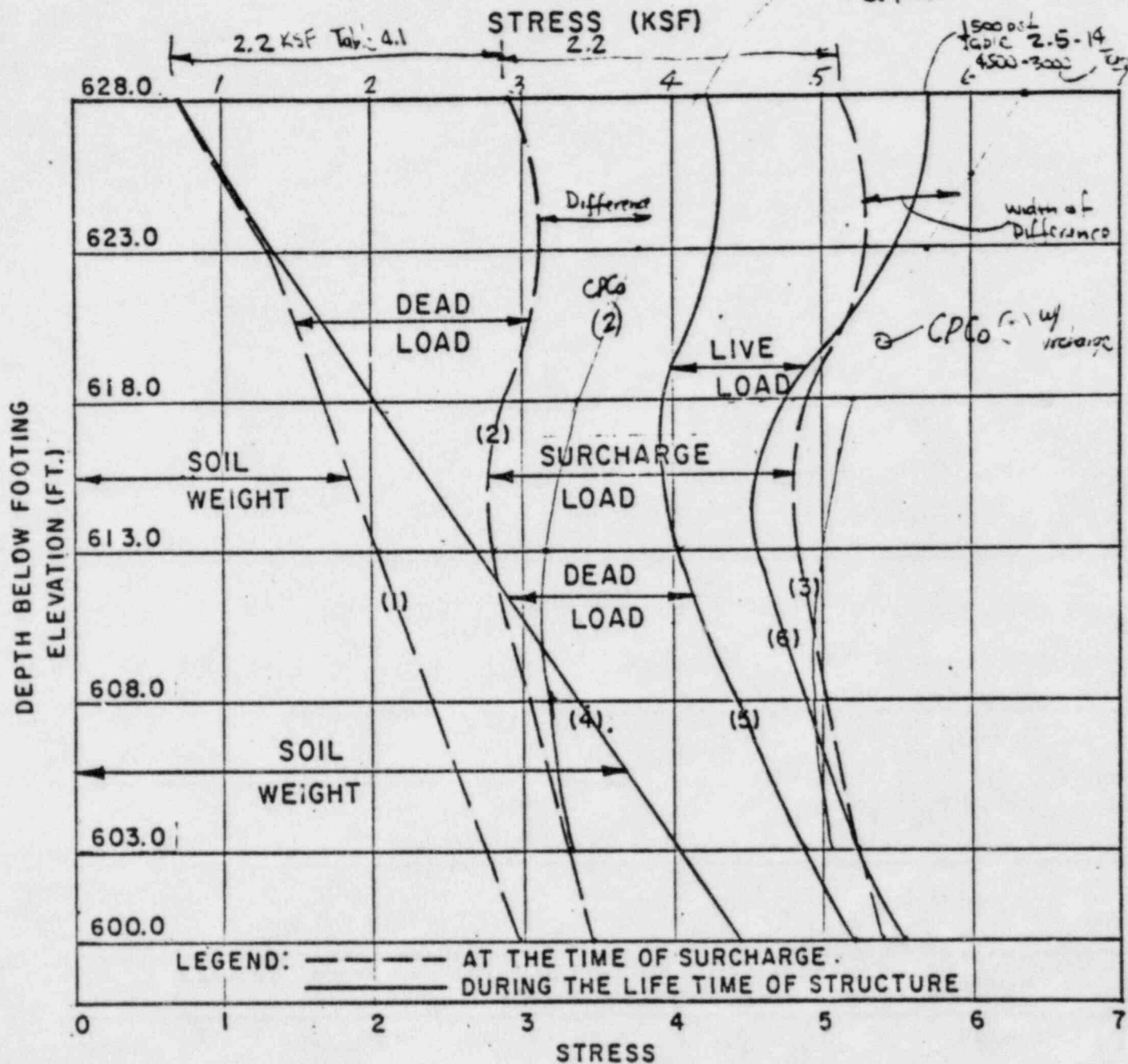
COMPARISON OF EFFECTIVE STRESS AT
1) END OF SURCHARGE AND 2) DURING
LIFE OF PLANT OPERATION

SOUTHWEST CORNER OF DIESEL GENERATOR BUILDING

Vugraph No.5

**DIESEL GENERATOR BUILDING
MIDLAND 182**

D.L. = 3.5 ksf by H. Singh
= 3.4 ksf



COMPARISON OF ~~TOTAL~~ STRESS DISTRIBUTION DURING LIFE OF PLANT OPERATION AND END OF THE SURCHARGE LOAD.

MIDDLE OF EAST WALL OF D.G. BUILDING

NOTE - EARTHQUAKE LOAD NOT INCLUDED

Vugraph No. 6

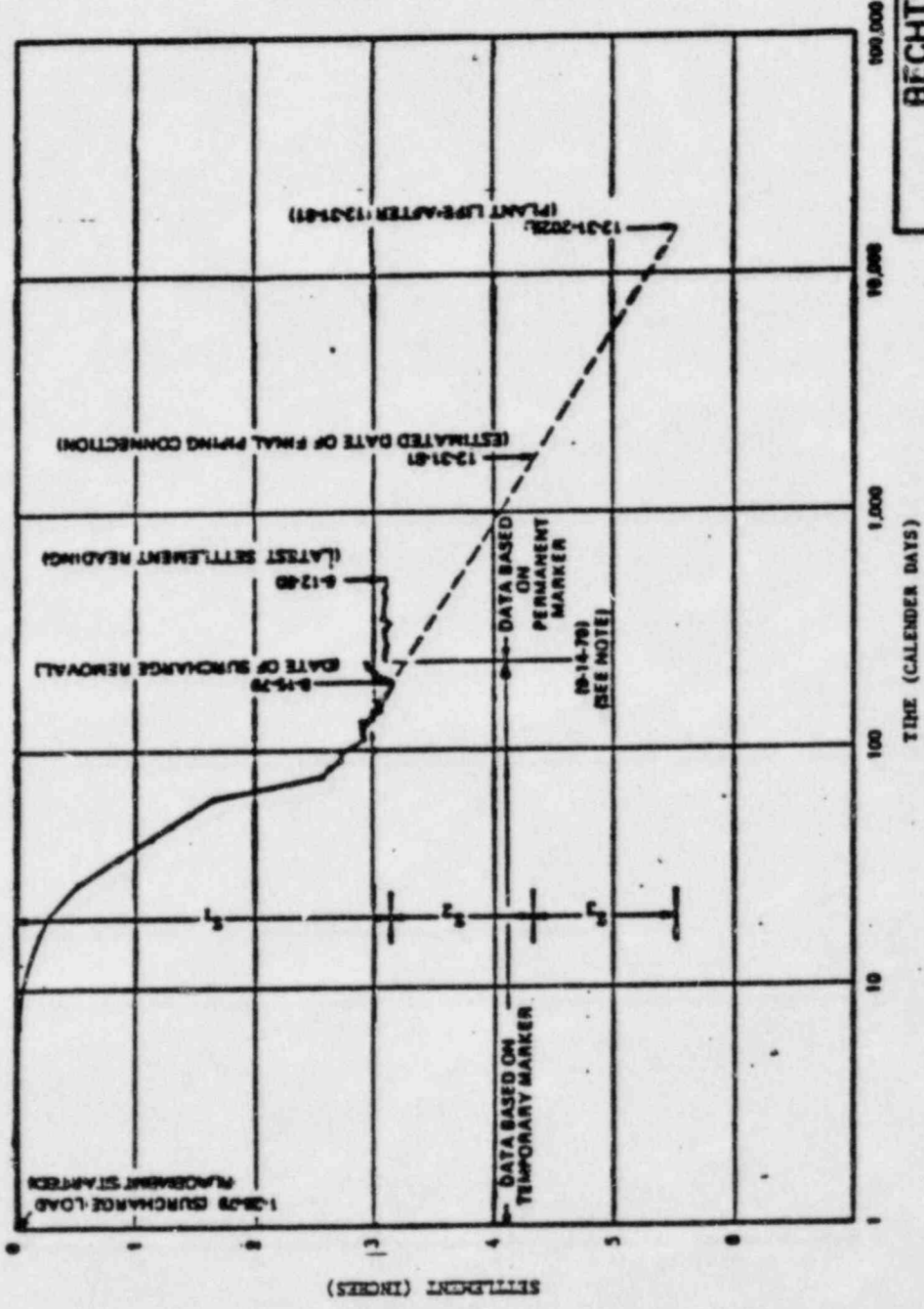


Figure 3
(See Reference 1)

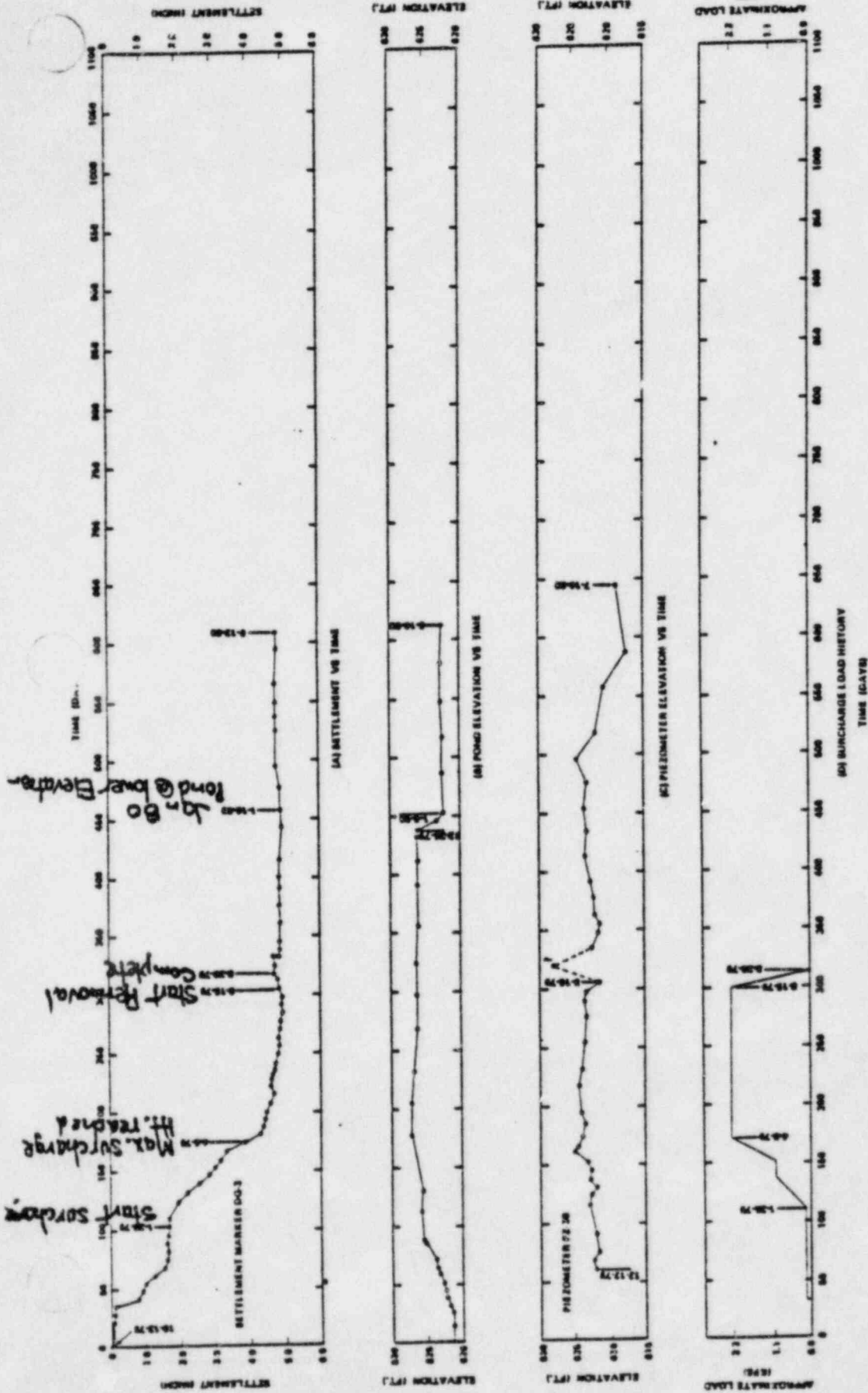
BCHTEL ANN ARBOR	
MIDLAND POWER PLANT	
MEASURED AND PREDICTED SETTLEMENT VS LOG OF TIME (DAYS)	
7220	FIGURE

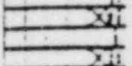
NOTE:
The permanent marker could not be monitored from 3-22-79 to 9-14-79 due to surcharge. Temporary markers at elevation 66'-0" were used during this period to estimate the settlement of the permanent markers. On 9-14-79 the settlement was again based directly upon the permanent markers.

LEGEND
 — MEASURED SETTLEMENT
 --- PREDICTED SECONDARY COMPRESSION SETTLEMENT ASSUMING SURCHARGE REMAINS

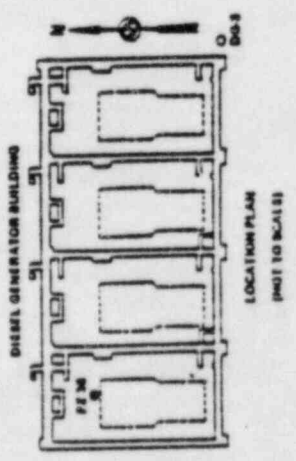
Yugraph No. 7

Figure 1
(See Reference 1)

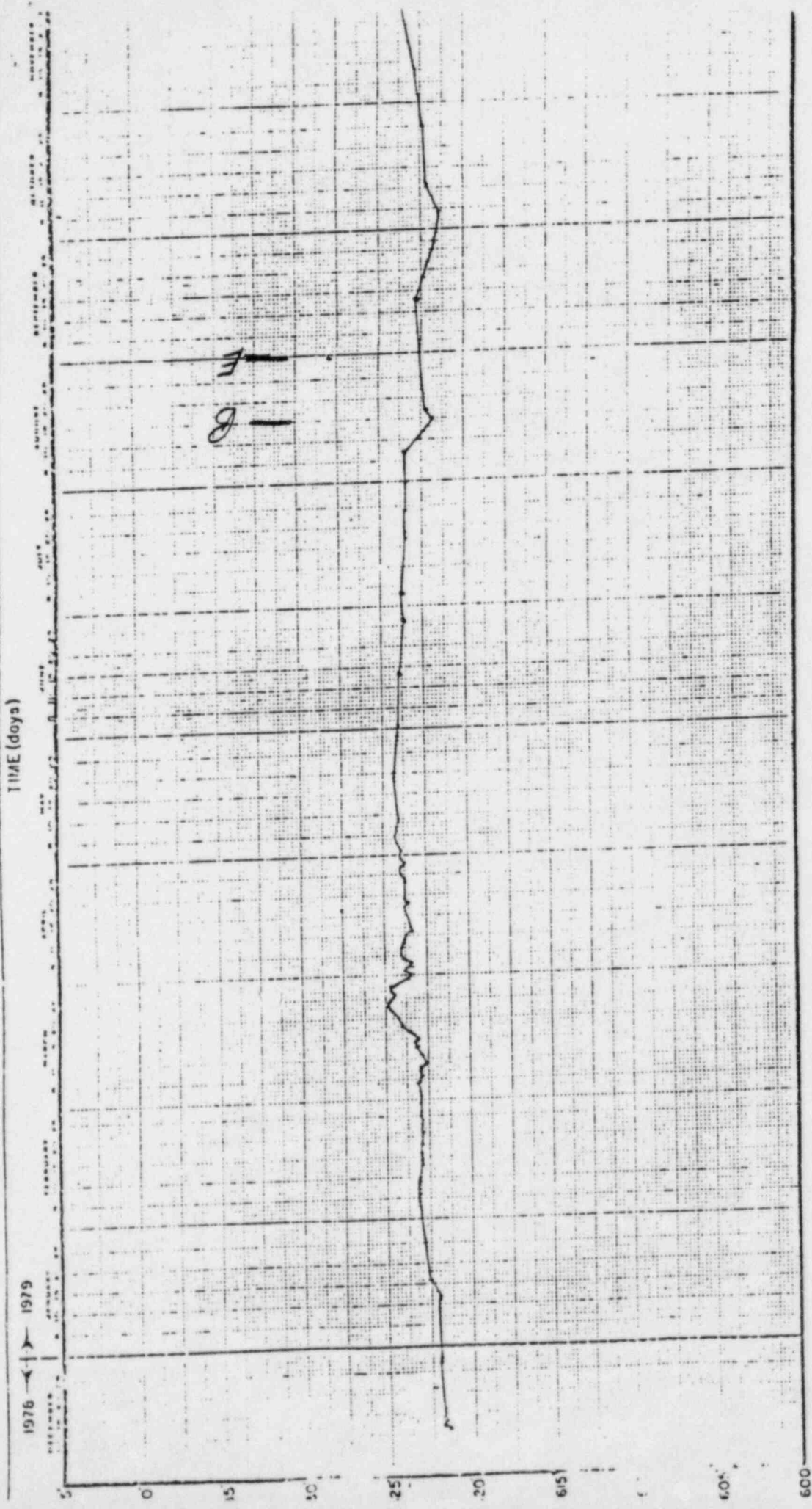


		7220 FIGURE 179
MIDLAND POWER PLANT		
DISSEL GENERATOR BUILDING TYPICAL WATER SHEET, LOCK HOLES, POND LEVELS PIEZOMETER LEVELS AND BURCHARGE LOAD HISTORY		

NOTE:
On 10-13-72 the measured settlement of marker DG-3 was 2.082 inch.



Vugraph 8



MIDLAND PLANT DIESEL GENERATOR BUILDING

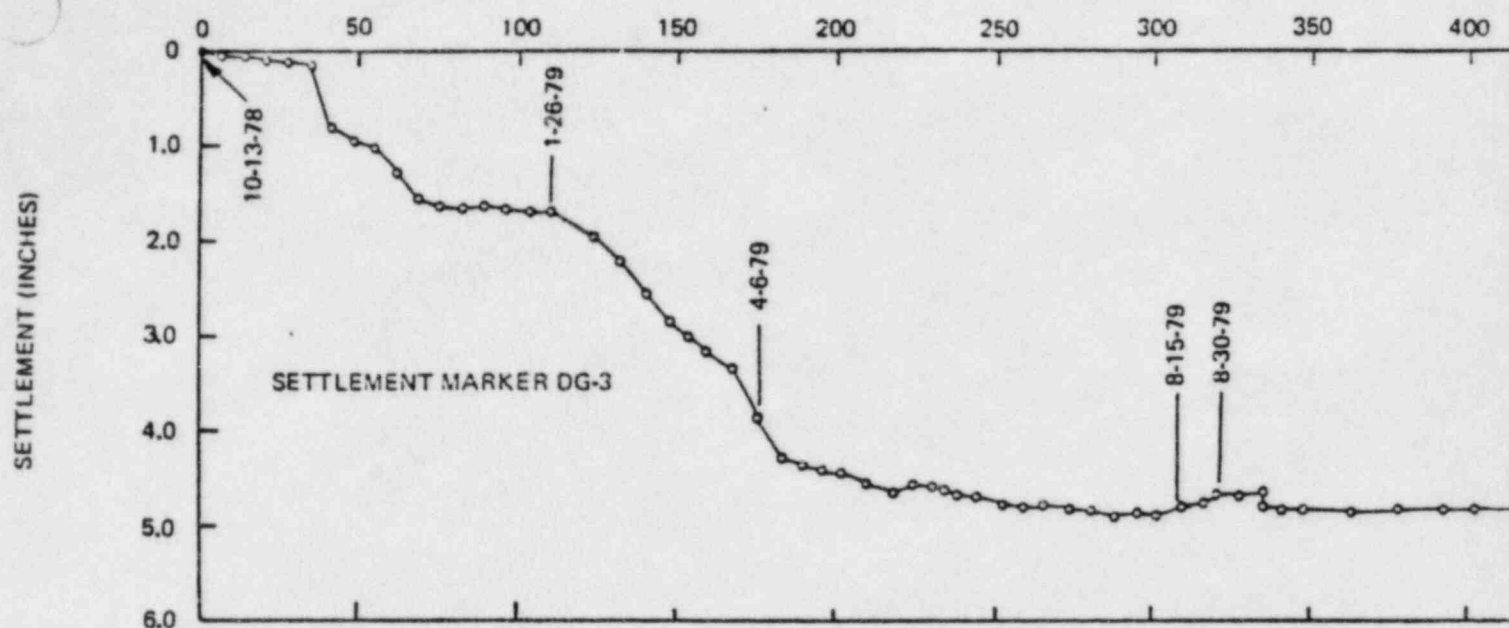
— PIEZOMETRIC ELEVATION VS TIME —

PIEZOMETER No. 30

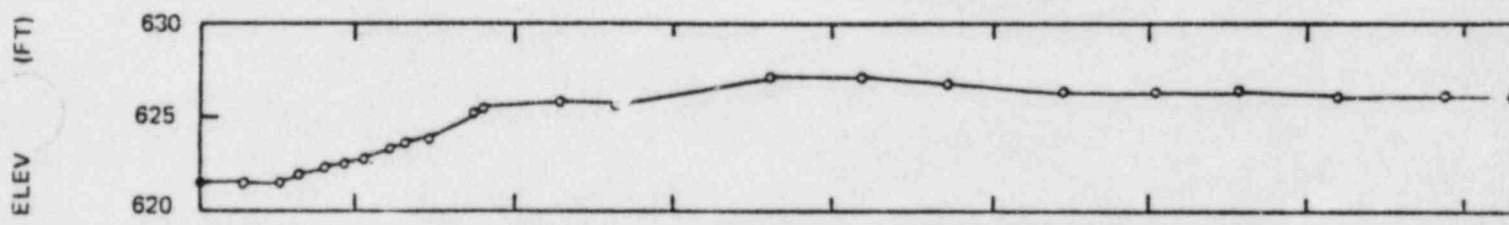
TIP ELEVATION (ft) 602

Reading may be less accurate than normal.
See Table 3.

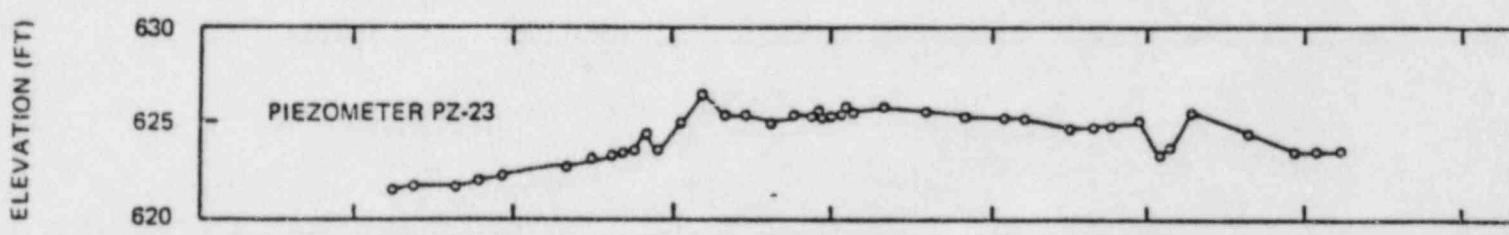
NOTE: PIEZOMETER ELEVATIONS ARE INITIAL ELEVATION OF CENTER OF DIAPHRAGM SAND 20'-7"



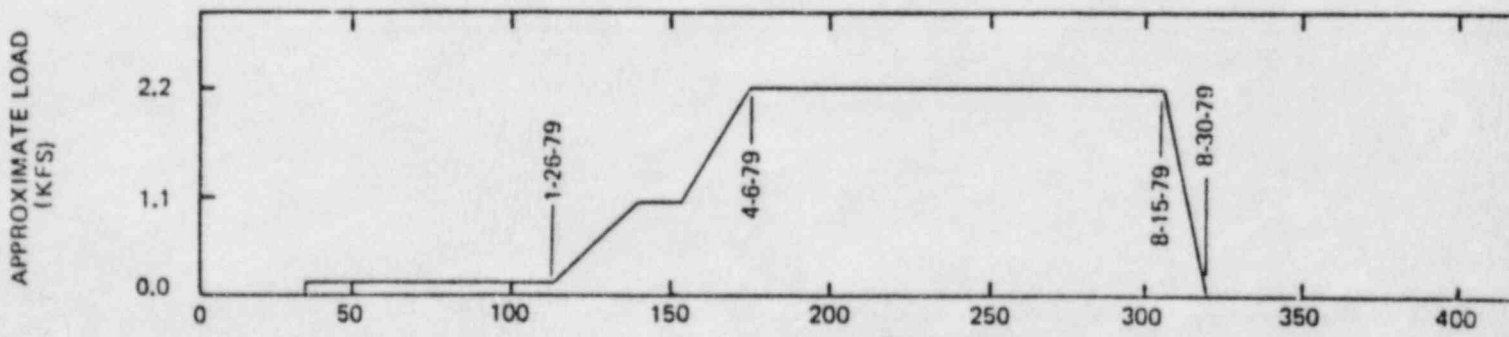
(A) SETTLEMENT VS TIME



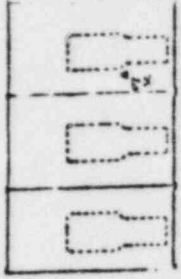
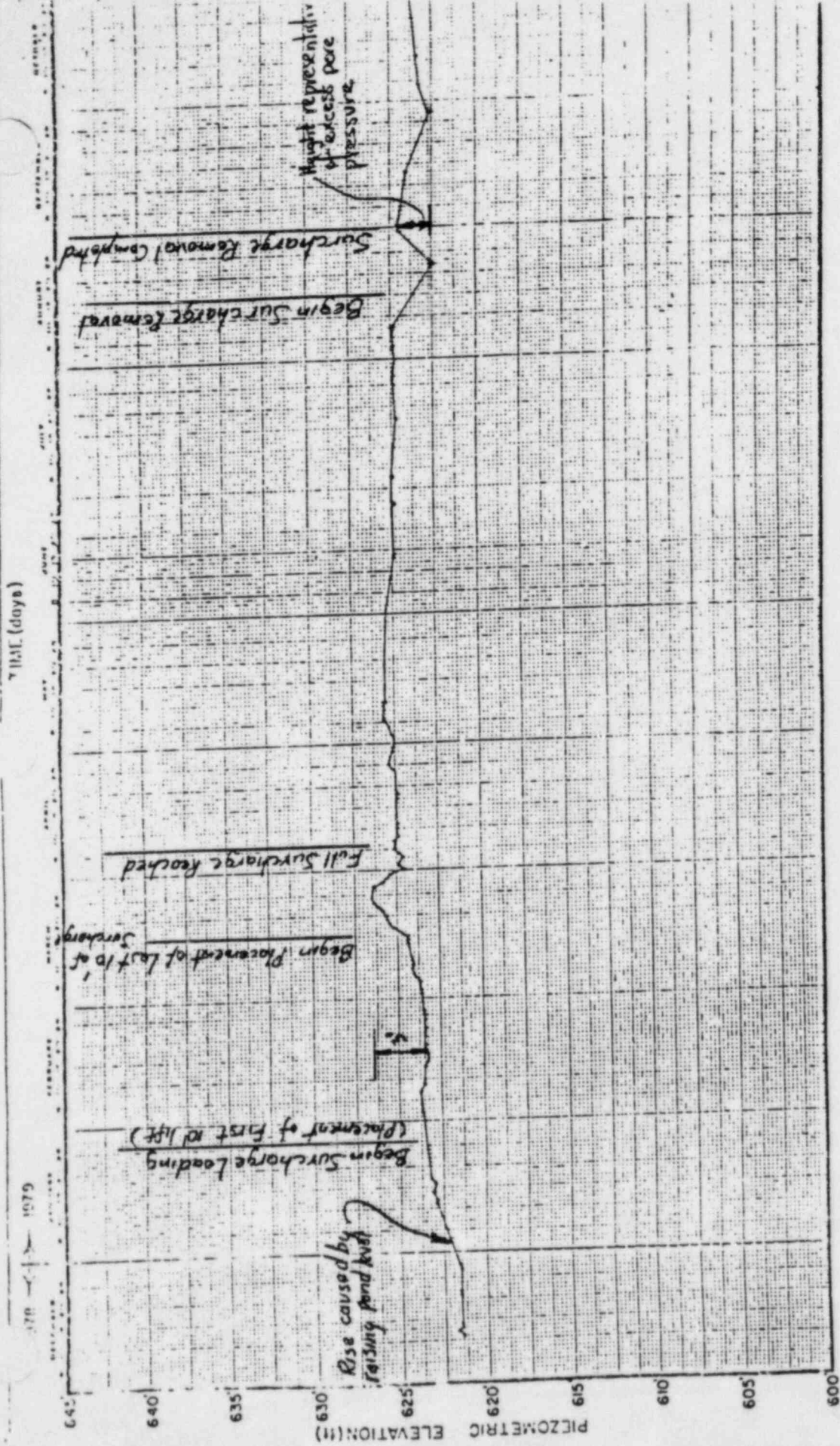
(B) POND ELEVATION VS TIME



(C) PIEZOMETER ELEVATION VS TIME



(D) SURCHARGE LOAD HISTORY



— LOCUS PLAN —

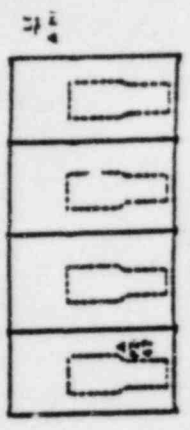
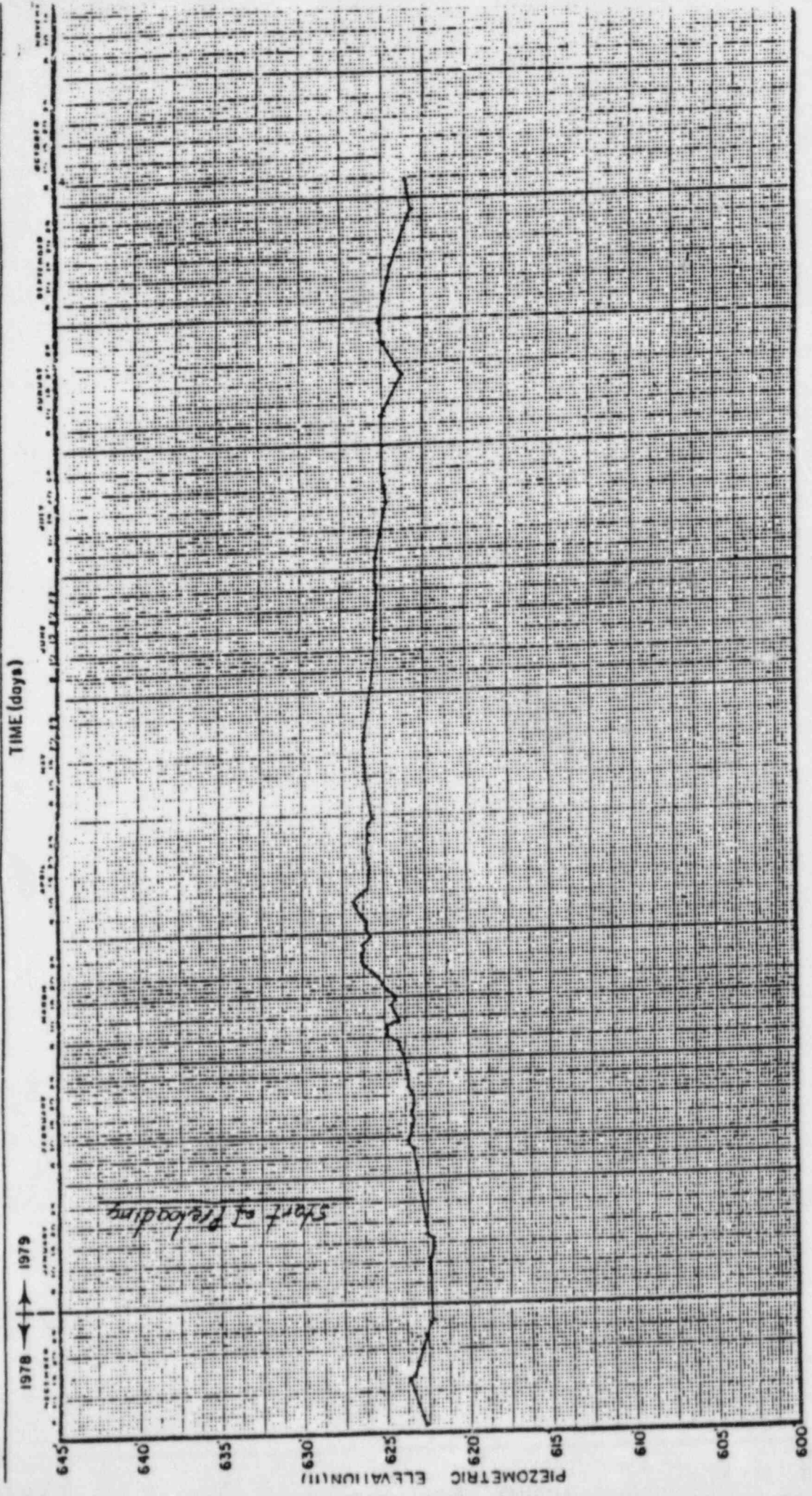
MIDLAND PLANT DIESEL GENERATOR BUILDING

— PIEZOMETRIC ELEVATION VS TIME —

PIEZOMETER No. 36
TIP ELEVATION (ft) 603.2

NOTE: PIEZOMETER ELEVATIONS ARE MEASURED TO CENTER OF FIRST LIFT (DOT)

Fig. 11



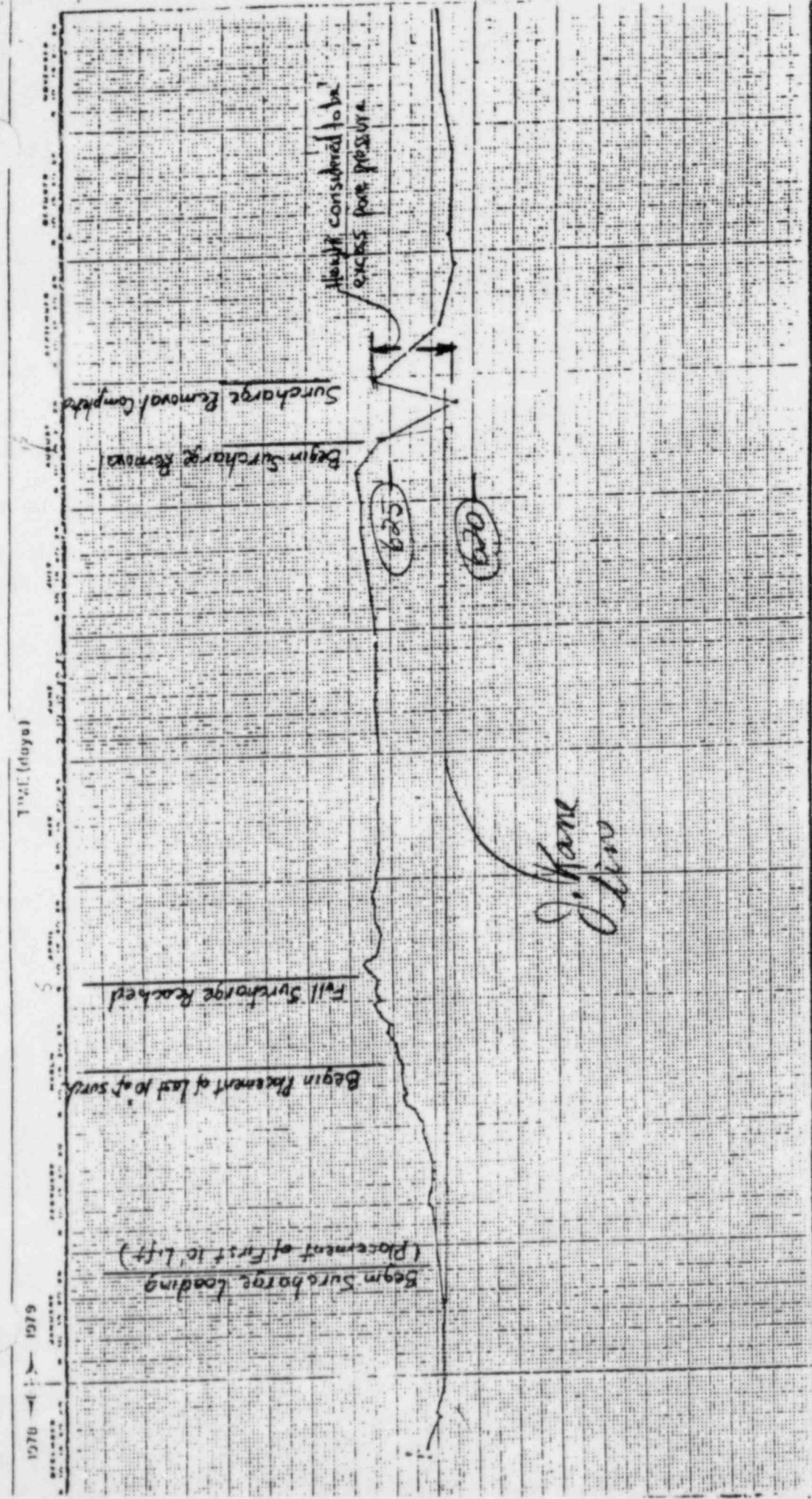
MIDLAND PLANT DIESEL GENERATOR BUILDING

—PIEZOMETRIC ELEVATION vs TIME—

PIEZOMETER No. 47
 TIP ELEVATION (ft.) 621

NOTE: PIEZOMETER ELEVATIONS ARE WITHIN ELEVATION OF CENTER OF STEEL SHAPES

Graph No. 12



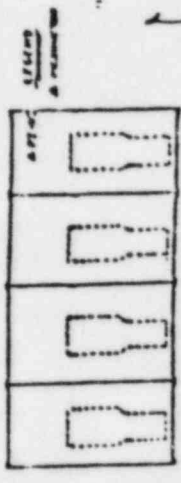
from
 Vol. 2
 Figure
 27-42

NO. 1 AND PLANT DIESEL GENERATOR BUILDING

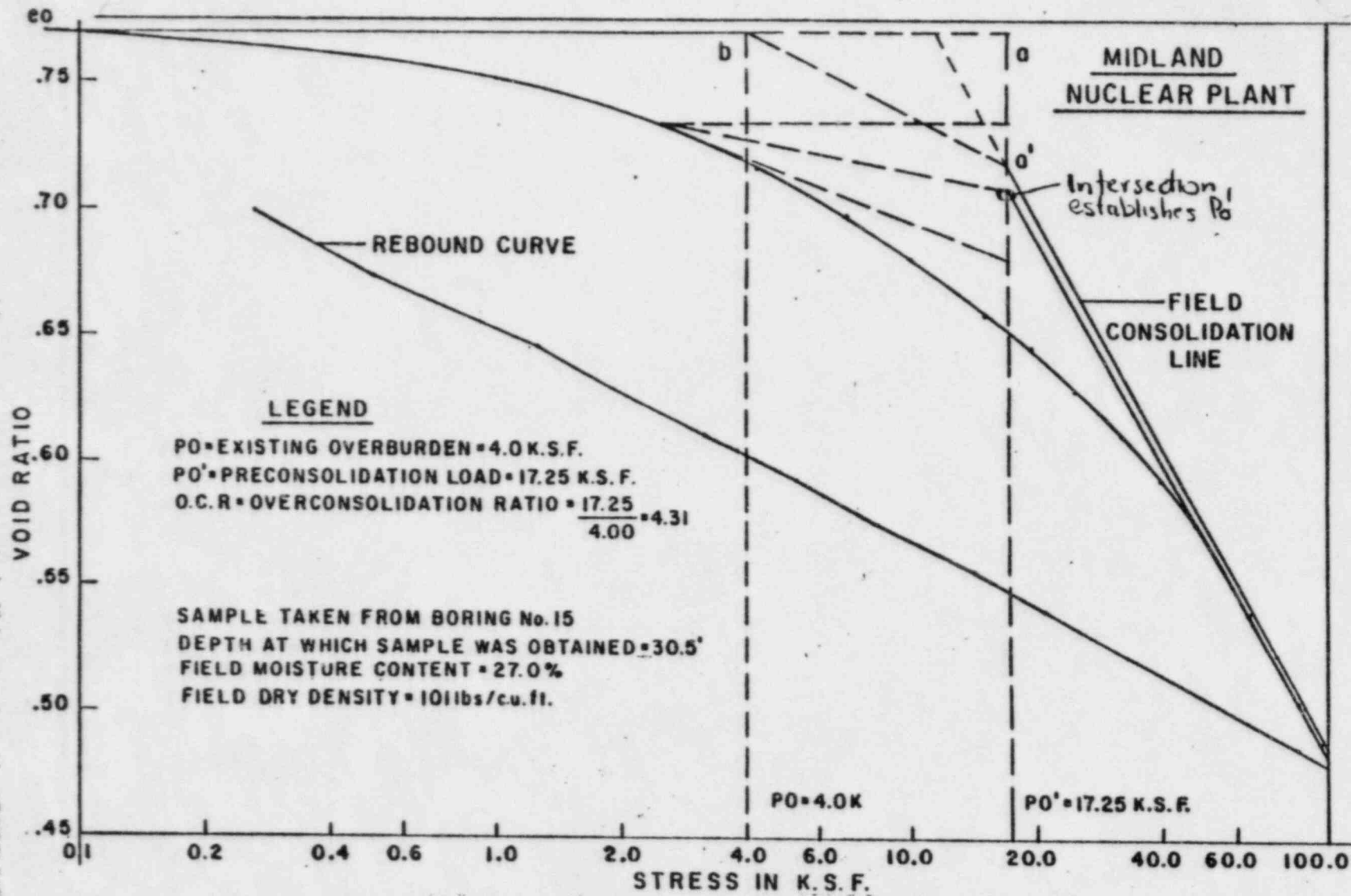
—PIEZOMETRIC ELEVATION VS TIME—

PIEZOMETER No. 40
 TIP ELEVATION (ft) 609.5

plot



NOTE: PIEZOMETER ELEVATIONS ARE UNTIL ELEVATION OF CENTER OF GRAVITY 1.00' DIA.



**GRAPHICAL METHOD FOR FIELD RELATION BETWEEN
 VOID RATIO AND PRESSURE FOR PRECOMPRESSED CLAY**
 (Schmertmann 1953)

CPCo Position - DGB (cont.)

6. Other nuclear power plants (Kewanee-Quanicassee) have utilized evidence other than lab test results because of unrealistic settlement predictions based on lab data.

7. Temporary dewatering now being conducted will provide additional settlement data. Consider this future data to be more accurate in predicting settlement than COE-NRC requested sampling & testing.

8. Because settlement is a slow process - CPCo has the ability to directly measure settlement during plant operation & compare with predicted values. This monitoring can provide a positive & verifiable resolution of the safety question involved

→ Summary of COE-NRC Position on Additional Borings
- BEARING CAPACITY

9. Adopted reasonable soil parameters in design (e.g. unit weights, shear strength) Based on test results of samples as far as 500 ft away

10. Used state-of-the-art method for determining net ultimate bearing capacity

11. Bearing capacity analysis indicates ample margin of safety

ture. The field curve from which the settlements can be estimated should then be sketched by starting at point a and continuing parallel to the reloading curve $n'g$ to a point about halfway to p_u' . The curve should then be directed toward point f in such a manner as to follow the shape of K_u . This procedure does not eliminate the judgment of the interpreter, but it leads to reasonable results. The settlement corresponding to a pressure between the present overburden pressure and the preconsolidation pressure can be computed by means of eq. 3.3, but the value of Δe must be determined from the sketched field e - $\log p$ curve K (Fig. 3.6).

If we fail to recognize that the clay is preloaded and base a settlement computation on af , the computed settlement will be far too great. The change Δe_c in void ratio computed for an increase Δp in pressure is likely to be 4 to 10 times as great as the real change Δe_r , provided Δp is not greater than about half of $p_u' - p_0$. As Δp approaches $p_u' - p_0$, the error becomes smaller.

In connection with practical problems, the most important consideration is to be able to recognize whether or not a clay is preloaded. It almost certainly is if the water content is closer to the plastic limit than to the liquid limit. Moreover, by performing a consolidation test on a very carefully taken sample, one can often obtain the data required to make the decision. In Fig. 3.4 it may be noticed that the upward projection of the straight part of K_u intersects the line $e = e_c$ at point b , which is located on the left of point a . This is always true of a normally loaded clay of ordinary sensitivity. On the other hand, in Fig. 3.6, which refers to a preloaded clay of ordinary sensitivity, b is located on the right side of a . Unfortunately, the influence of disturbance tends, by displacing b to the left, to destroy the evidence of preloading. Hence, if it is probable that a clay deposit may be preloaded and samples are to be obtained for consolidation tests, the best possible techniques for sampling should be used. An additional procedure for investigating the state of pre-

From "Foundation Engineering"

Ralph Peck

Walter Hanson

Thomas Thornburn

Second Edition 1973

CPCo. Position - Cooling Pond Dike

1. Design & construction adequacy is NOT a subject of the Dec. 6, 1979 Order.

2. NOT safety related. ^{is this saying that the cooling pond structure does not have to demonstrate its ability to withstand seismicity?} NOT a Q-listed structure.

- NRC SER @ CP stage concludes that cooling pond dikes had a design criterion that was adequate to assure slope stability during the design basis earthquake.

3. Dike is well constructed because:

a. Accessible to heavy equipment for compacting

b. Fill placed in thin (12" lifts) layers

c. Fill conditioned for moisture

d. Full time inspection during construction. Completed two walkdown inspections since construction completion.

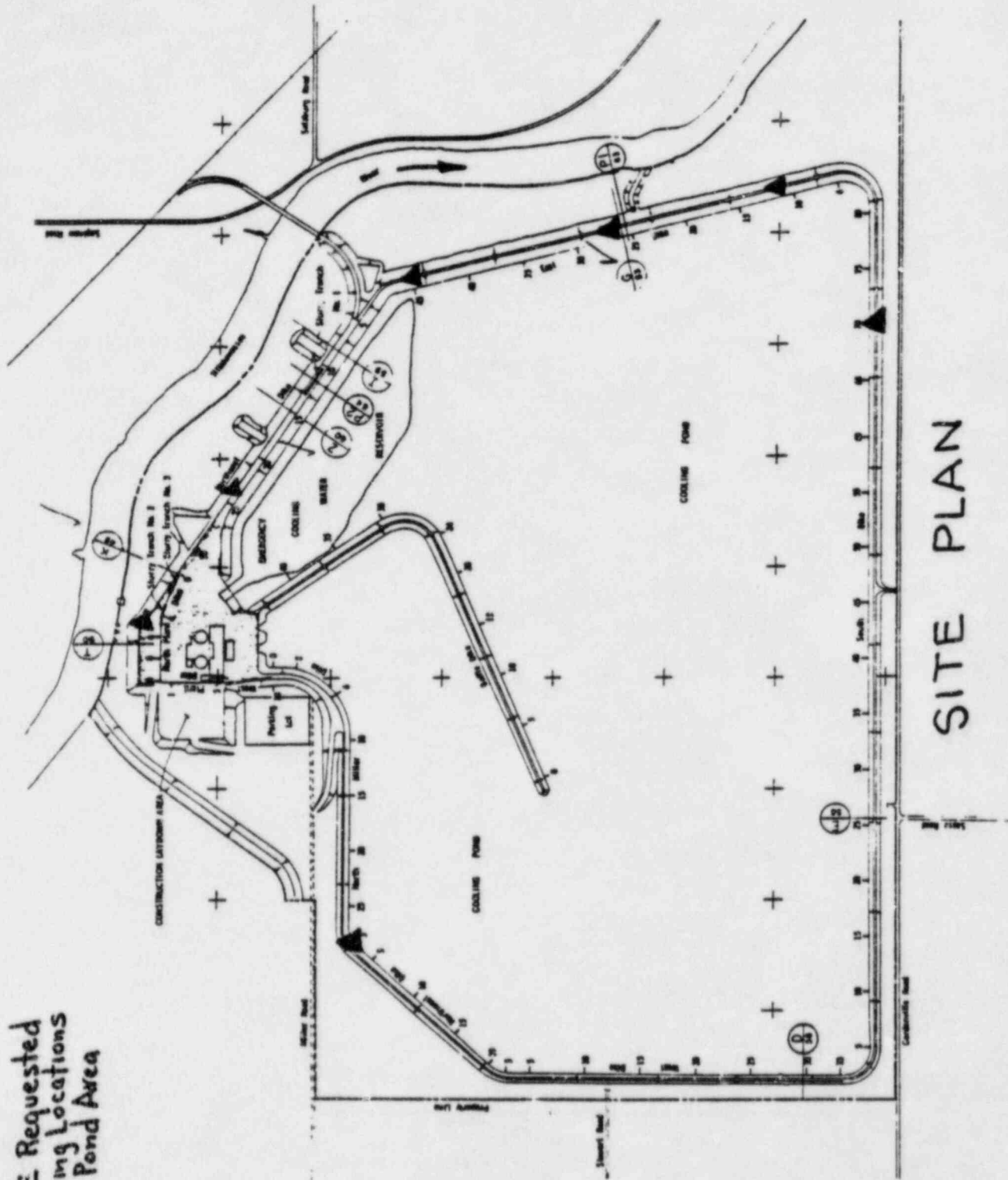
4. No significant settlement problem. ^{Similar statement has been made for Aux Bldg. & SW Ringh. - but being informative.}

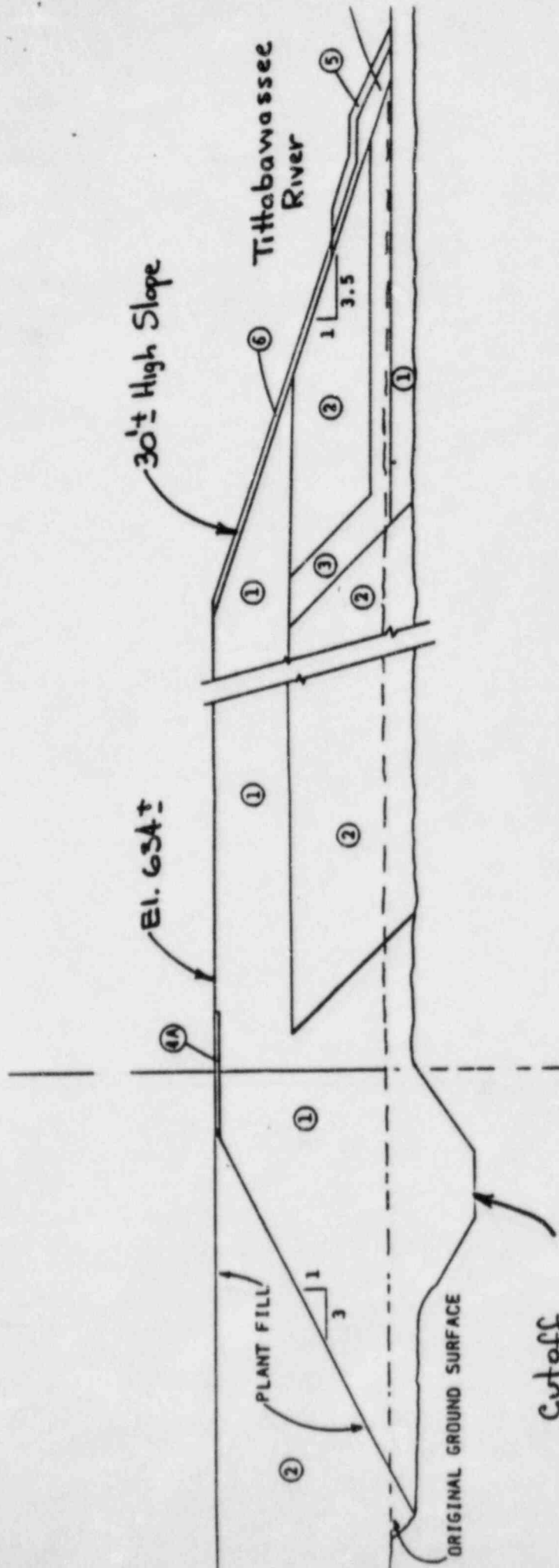
Settlement of dike can be an issue if construction of cracking & low oil free bases - but this is not the concern at Midway

5. Borings (not yet furnished to NRC) w/ SPT completed for power poles & piezometer installations indicate stiff clay fill.

6. Possible damage to dike because of requested borings now that pond is filled.

▲ COE Requested
Boring Locations
for Pond Area

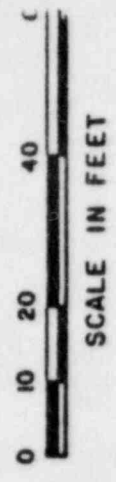


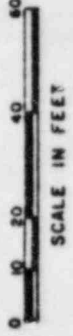
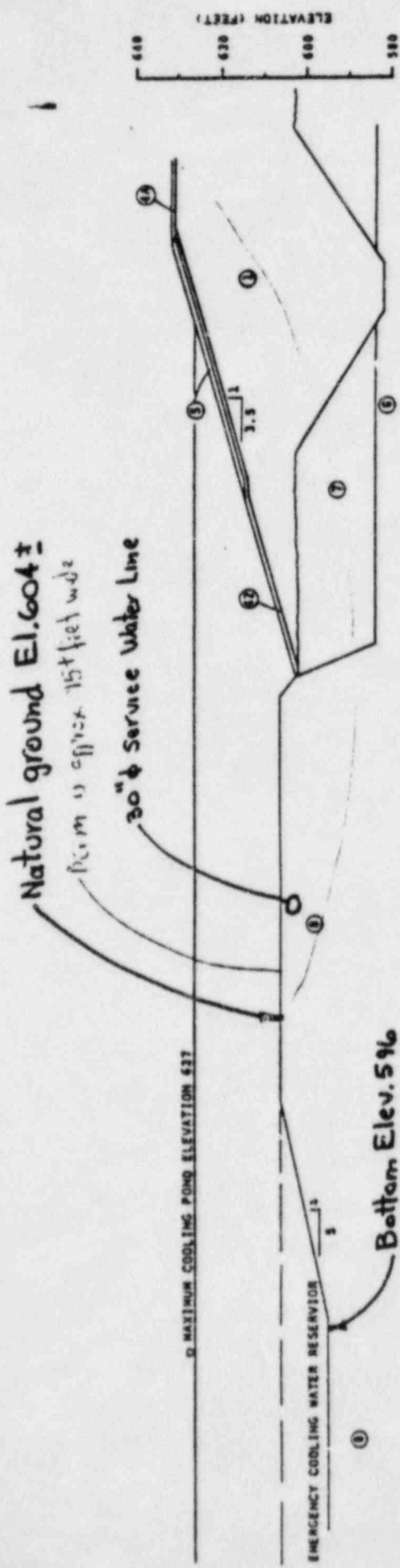


EXPLANATION

ZONE	MATERIAL
①	IMPERVIOUS FILL (>20% passing 200 sieve)
②	RANDOM FILL (all materials except organic)
③	SAND DRAIN
④ ④A	GRAVEL (CRUSHED ROCK)
⑤	RIPRAP 18"
⑥	TOPSOIL & SEEDING

DIKE SECTION K





Adopted Shear Strengths

- $\phi = 29^\circ$
- $\phi = 37^\circ$
- $\phi = 37^\circ$
- $\phi = 32^\circ$
- $\phi = 37^\circ$ or $c = 7000 \text{ psf}$

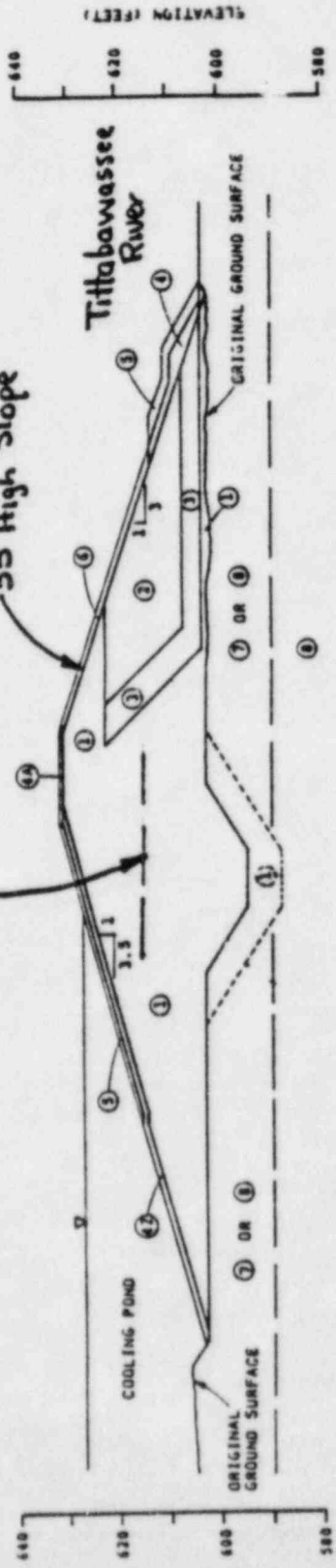
ZONE	EXPLANATION MATERIAL
①	IMPERVIOUS FILL
② ③ ④	GRAVEL
⑤	RIPRAP
⑥	LOOSE SAND
⑦	FOUNDATION (GLACIAL TILL)

DIKE SECTION 5

ZONE	EXPLAN.	MATERIAL
① (1)		IMPERVIOUS FILL
②		RANDOM FILL
③		SAND DRAIN
④ (4)		GRAVEL
⑤		RIPRAP
⑥		TOPSOIL & SEEDING
⑦		FOUNDATION (LOOSE SAND, SILT AND FIRM CLAY)
⑧		FOUNDATION (GLACIAL TILL)

El. 615 (Apparent level for testing dike material)

55' High Slope



DIKE SECTION G
(Section of Max. Emb. Height)

Consumers Exhibit # 14 (Kane)

TELEPHONE OR VERBAL CONVERSATION RECORD		DATE
For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.		6/25/80
SUBJECT OF CONVERSATION		
Midland Nuclear Plant - Letter Report		
INCOMING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
Joe Kane	NRC Washington D.C.	8-492-8661
PERSON CALLED	OFFICE	PHONE NUMBER AND EXTENSION
H.N. Singh. Ron Ericson	Geotechnical Sec. C of E., Detroit.	226-6789
OUTGOING CALL		
PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
PERSON CALLED	ADDRESS	PHONE NUMBER AND EXTENSION
SUMMARY OF CONVERSATION		
<p>Mr. Joe Kane of NRC called us, and conveyed his comments on the subject report forwarded to his office on 25 June through telecopy. (Mailed to WRC on 20 June 80 and not rec'd OIA 25 June) was</p> <p>Mr. Kane advised us that report is very comprehensive covering all the problem areas, and all the questions have been spelled out explicitly. Mr. Kane suggested some corrections in form of rephrasing some questions. These changes did not alter the intents of the questions. He further advised us to separate the questions pertaining to the Cooling Pond in two groups:</p> <ul style="list-style-type: none"> (a) questions on Emergency Cooling Pond (cat. I. strud) (b) questions on operating Cooling Pond (non cat. I strud) <p>There have been some differences of opinions, whether or not we have authority to ask questions as to the stability of the diking system of the cooling pond, because the cooling pond is not diking has not been classified as cat. I. structure. Mr. Kane advised us that safety of the diking system is very vital to the public health and safety, and the environment, therefore its stability must be insured, and such we can ask questions on the diking system.</p> <p style="text-align: right;">H.N. Singh</p>		

Consumers Exhibit #15 (Kane)

NCDED-G (24 Mar 80) 1st Ind

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

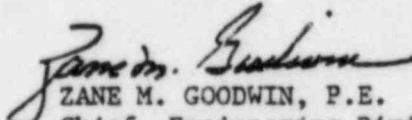
11 APR 1980

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