ML202

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

July 31, 1979

ACRS Members
ACRS Technical Staff

SUBJECT: MIDLAND 1&2 CONSUMER'S POWER COMPANY REPRESENTATIVES MEETING WITH NRC TO DISCUSS ABNORMAL SETTLEMENT OF FILL AND STRUCTURES ON THE MIDLAND PLANT SITE.(MEETING OF JULY 18, 1979)

Present: Consumer's Power Company
Bechtel
NRC

The problem at the plant involves the sinking of the diesel generator building and other structures at the site. This is due to the site having more sand on it than was initially thought or shown by test bores which were taken. Random fill was also used throughout the site. The presence of sand indicates that liquefaction could take place on the site during an earthquake.

Four solutions were presented to overcome the problems at the site:

1) Putting a surcharge on the diesel generator building
2) Installation of a retaining wall around the site (see attached pages)
3) Site dewatering
4) Underpinning various site structures (see attachments)

The first solution is already complete; the second solution is in progress and is almost complete. The last two have not essentially started.

A discussion of the reasons for these problems took place. The licensee felt that equipment and procedural problems were dominant; while the NRC thought that personnel qualification and quality control were lacking. To alleviate future problems a number of suggestions were made involving tightened testing procedures and more on site inspections by quality control engineers.

The NRC asked Bechtel if they were considering doing a topical report on these problems so that this information could prevent similar occurrences. They said they would consider it.

Dorothy J. Zukor

Dorothy J. Zukor
ACRS Fellow

Attachments: as stated

fld. Midland PLT. ✓

AGENDA

MEETING WITH NRC ON MIDLAND PLANT FILL STATUS AND RESOLUTION

July 18, 1979
9:00 a.m.
NRC, Bethesda, Maryland

1.0 INTRODUCTION (G. Keeley)

2.0 PRESENT STATUS OF SITE INVESTIGATIONS (T. Cooke)

2.1 Meetings with Consultants and Options Discussed (Historical)

2.2 Investigative Program

A. Boring Program
B. Test Pits
C. Crack Monitoring and Strain Gauges
D. Utilities

2.3 Settlement

A. Area Noted
B. Preload
C. Instrumentation

2.4 Recent Revisions

A. Deletion of Chemical Grout
B. Decision for Site Dewatering

3.0 REMEDIAL WORK IN PROGRESS OR PLANNED

3.1 Diesel Generator Structures (T. Thiruvengadam)

3.2 Service Water Pump Structures

3.3 Tank Farm

3.4 Diesel Oil Tanks

3.5 Underground Facilities

3.6 Auxiliary Building and FW Valve Pits (C. Gould)

3.7 Liquefaction Potential (S. Afifi)

3.8 Dewatering (R. Loughney)

4.0 ANALYTICAL INVESTIGATION

- 4.1 Structural Investigation (T. Johnson)
- 4.2 Seismic Analysis (T. Johnson)
- 4.3 Structural Adequacy with Respect to PSAR, FSAR, etc. (T. Johnson)
- 4.4 Soils Summary (S. Afifi)

5.0 CONSULTANT'S STATEMENT (R. Peck)

6.0 SCHEDULE (T. Cooke and G. Keeley)

- 6.1 Preload Removal
- 6.2 Auxiliary Building
- 6.3 Tank Farm
- 6.4 Service Water Building
- 6.5 Site Dewatering
- 6.6 Overall Impact

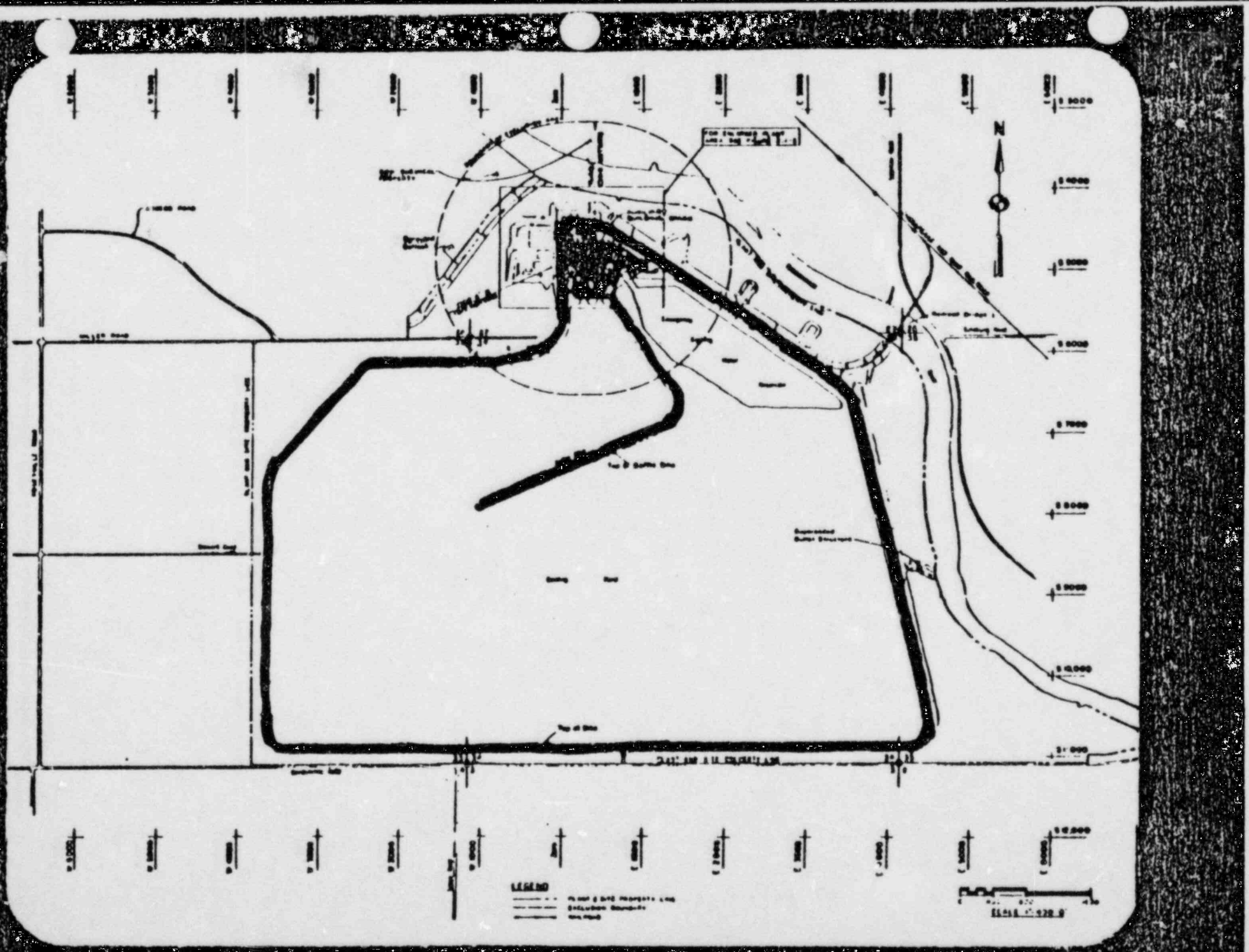
7.0 CAUSE INVESTIGATION (P. Martinez)

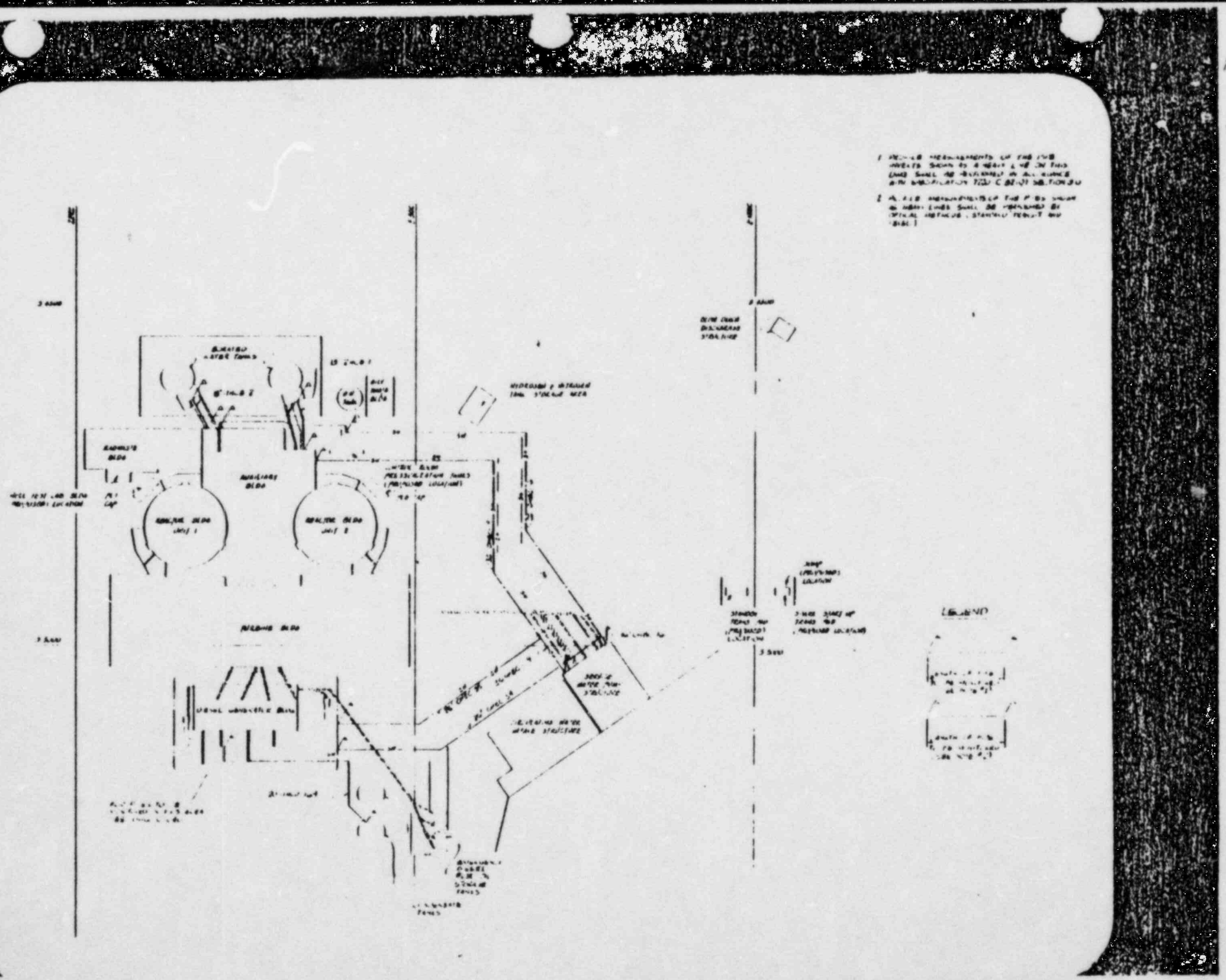
- 7.1 Analysis
- 7.2 Possible Causes
- 7.3 Most Probable Cause

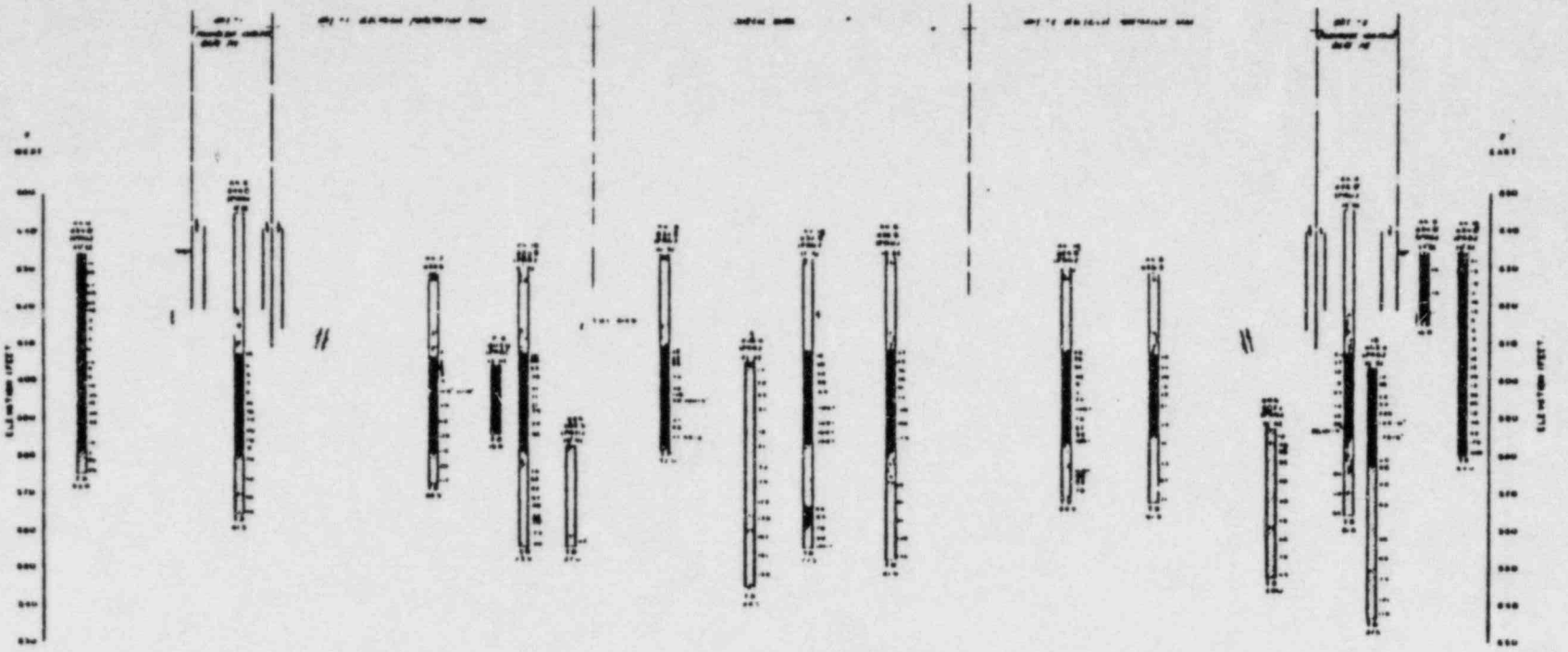
8.0 QA/QC ASPECTS (D. Horn)

- 8.1 Corrective Actions
- 8.2 Q-list Fill Resumption

9.0 LICENSING ACTIVITIES AND CHANGES TO FSAR (G. Keeley)


N
LEGEND





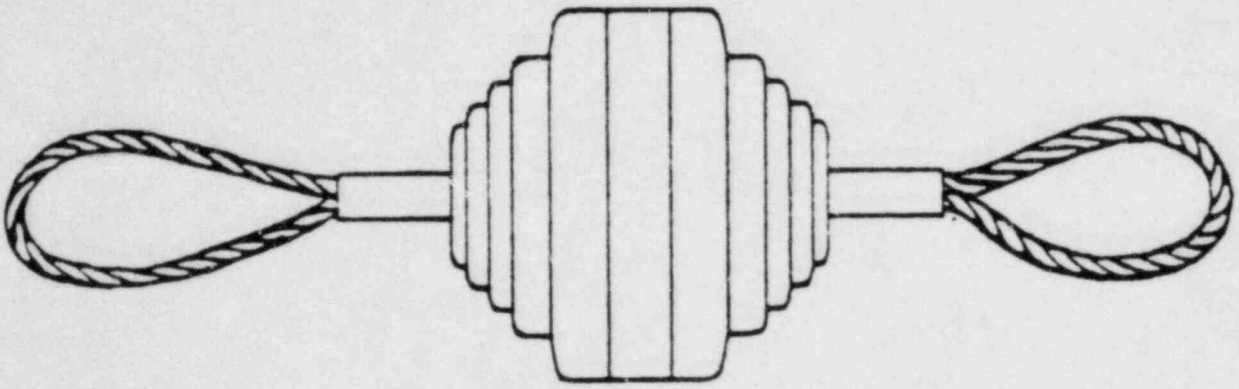
LEGEND

EXPLANATION

NOTES

MIDLAND POWER PLANT

CROSS SECTION c-c'
AUXILIARY BUILDING SOUTH



INSIDE DIAMETER OF CONDUIT = 4¼"
OUTSIDE DIAMETER OF MANDREL = 3¾"

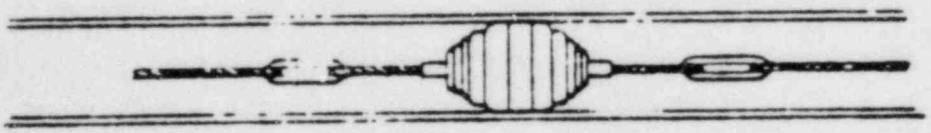
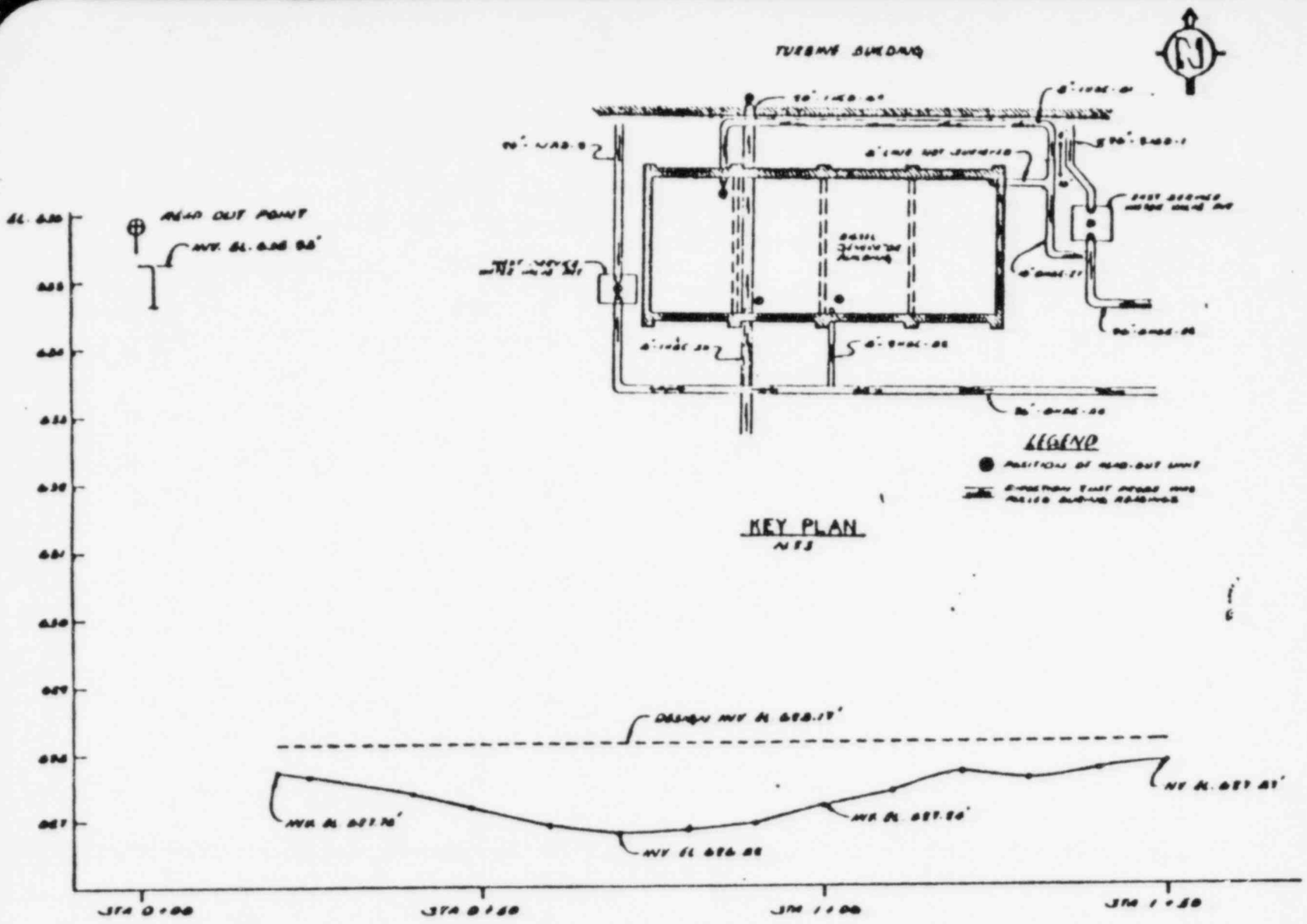


DIAGRAM OF MANDREL (RABBIT) USED TO CHECK CONDUITS

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

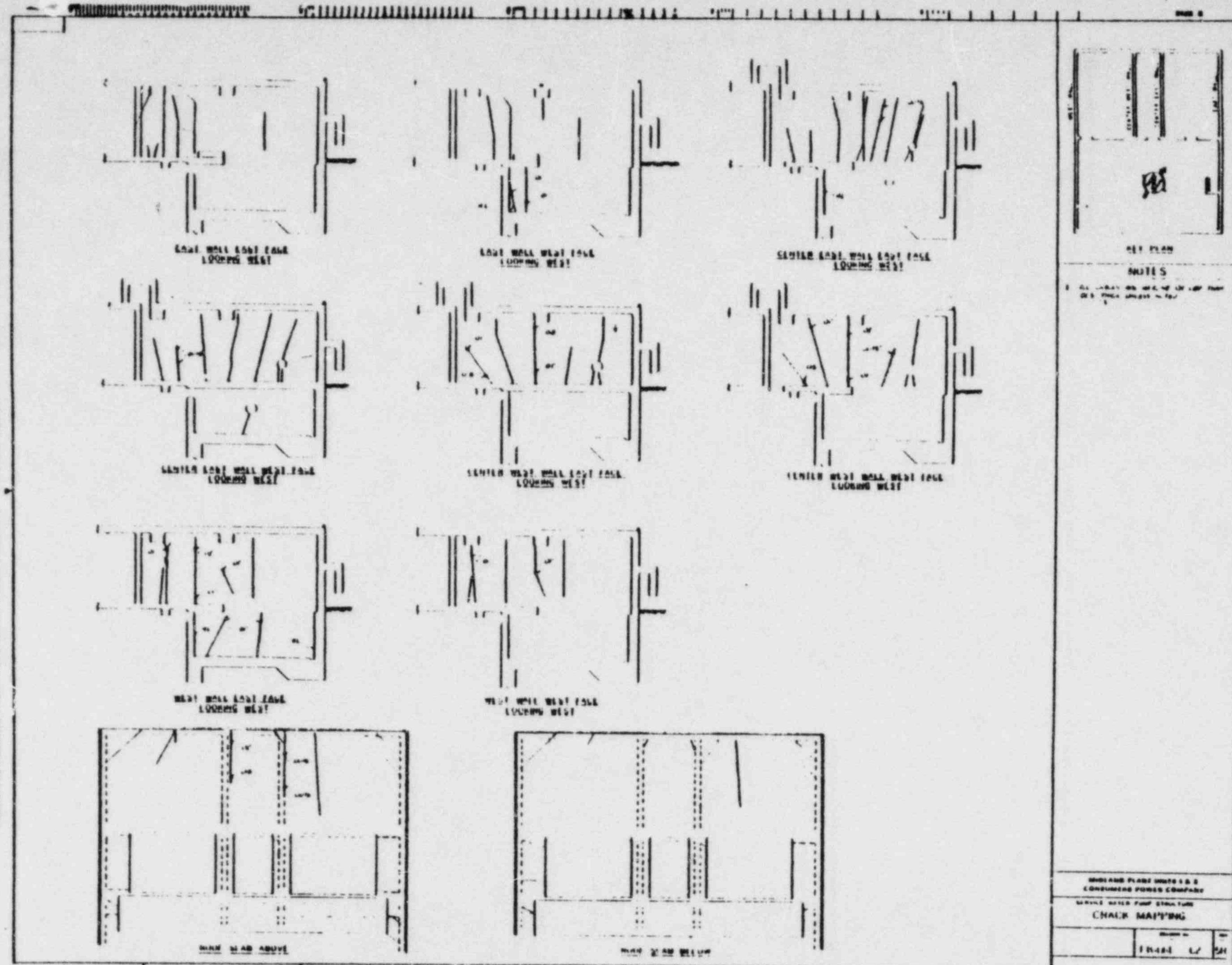
RABBIT
FOR ELECTRICAL DUCT

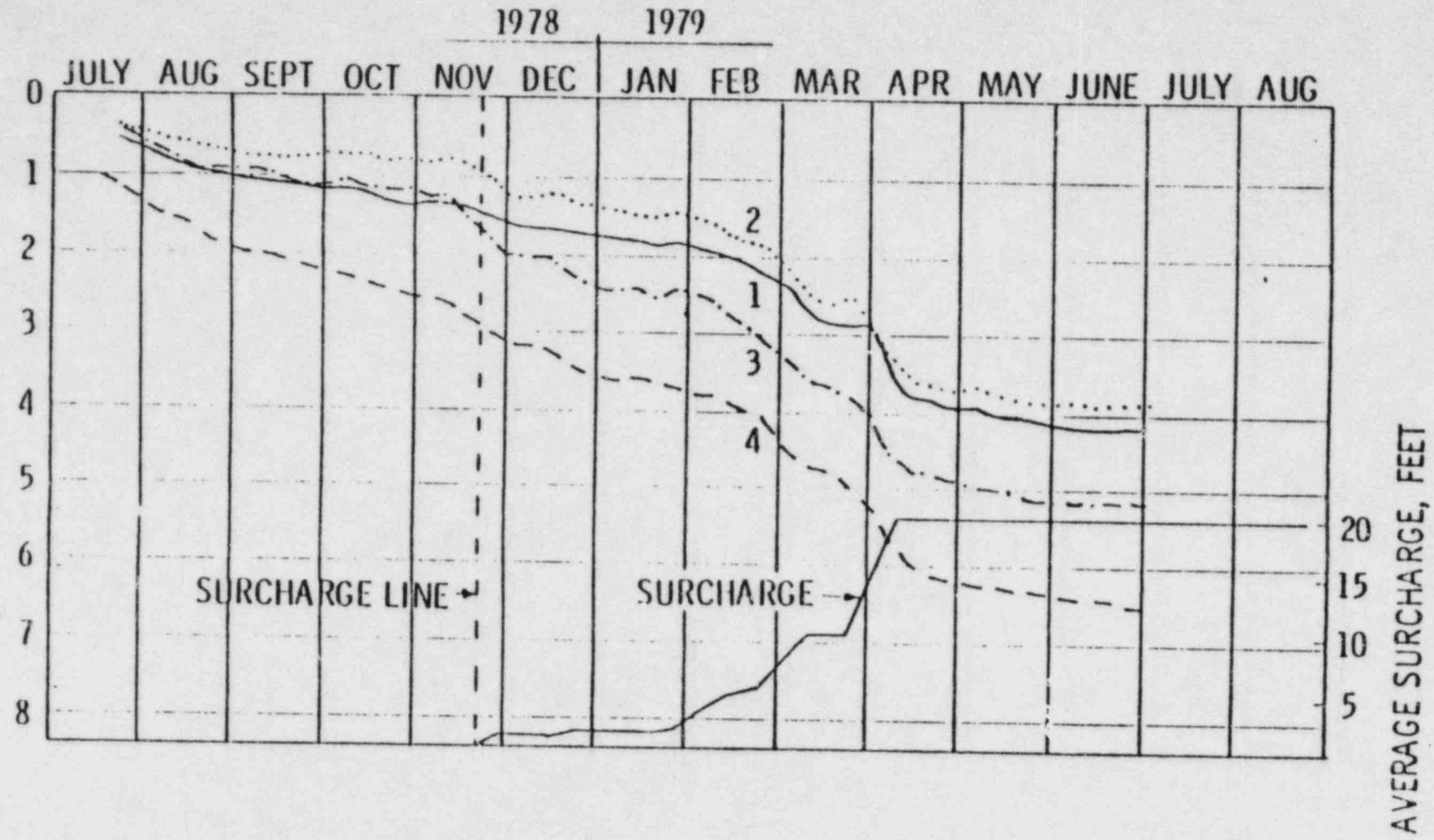
FIGURE 7-3 DATE 4 24 79

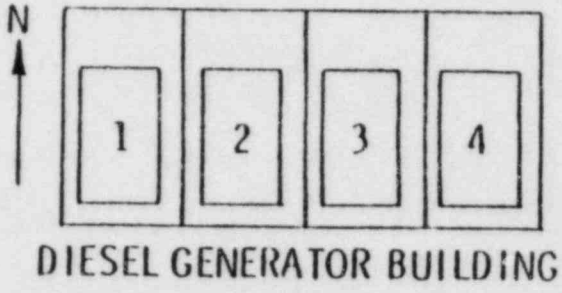


PROFILE 8"-1HBC-01

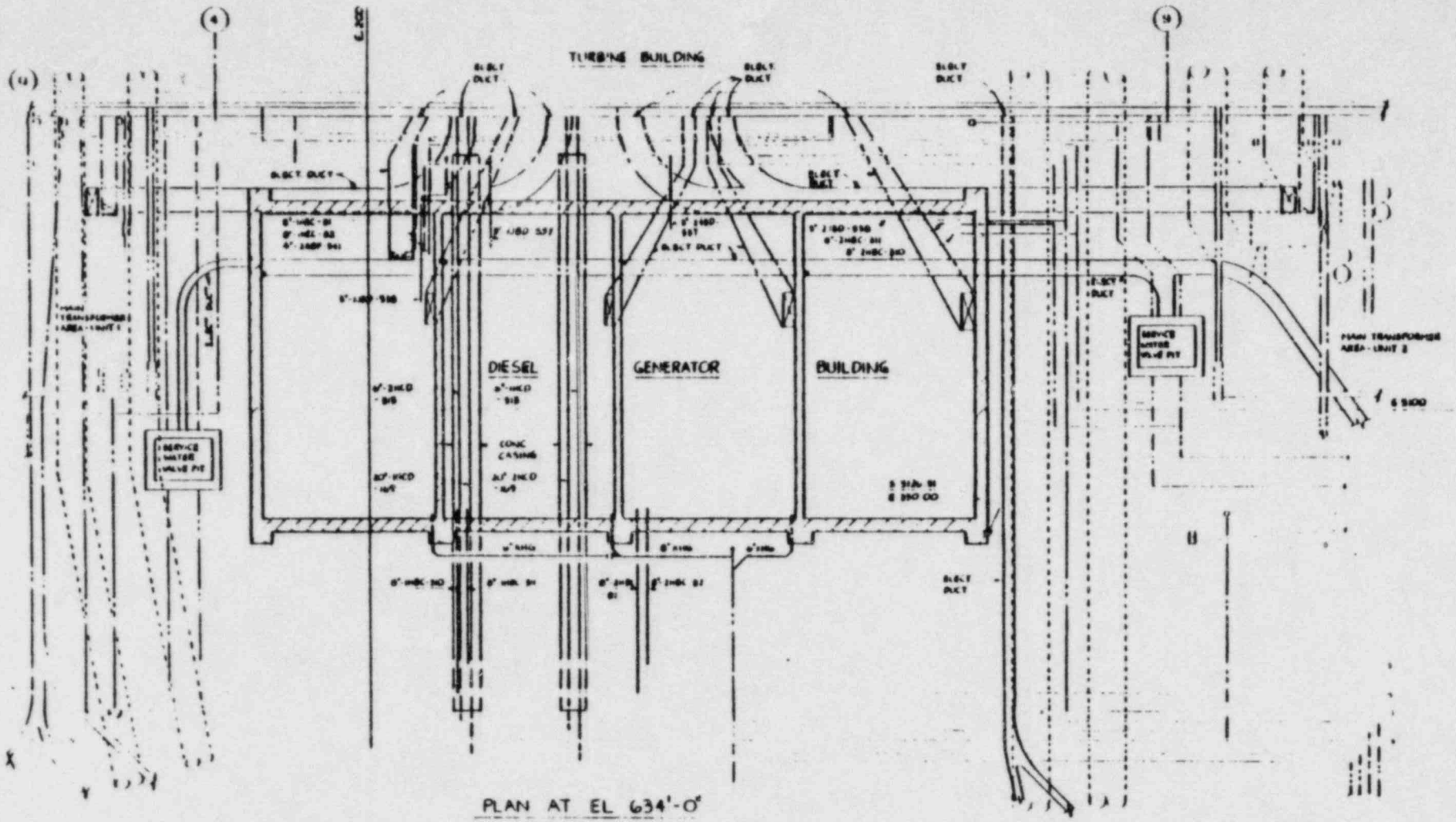
SCALES VERT. 1"=1'
HORIZ. 1"=40'


EAST WALL EAST FACE LOOKING WEST
EAST WALL WEST FACE LOOKING WEST
CENTER EAST WALL EAST FACE LOOKING WEST
CENTER EAST WALL WEST FACE LOOKING WEST
CENTER WEST WALL EAST FACE LOOKING WEST
CENTER WEST WALL WEST FACE LOOKING WEST
WEST WALL EAST FACE LOOKING WEST
WEST WALL WEST FACE LOOKING WEST
KEY PLAN
NOTES
MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY
SERVICE WATER PUMP STRUCTURE
CRACK MAPPING





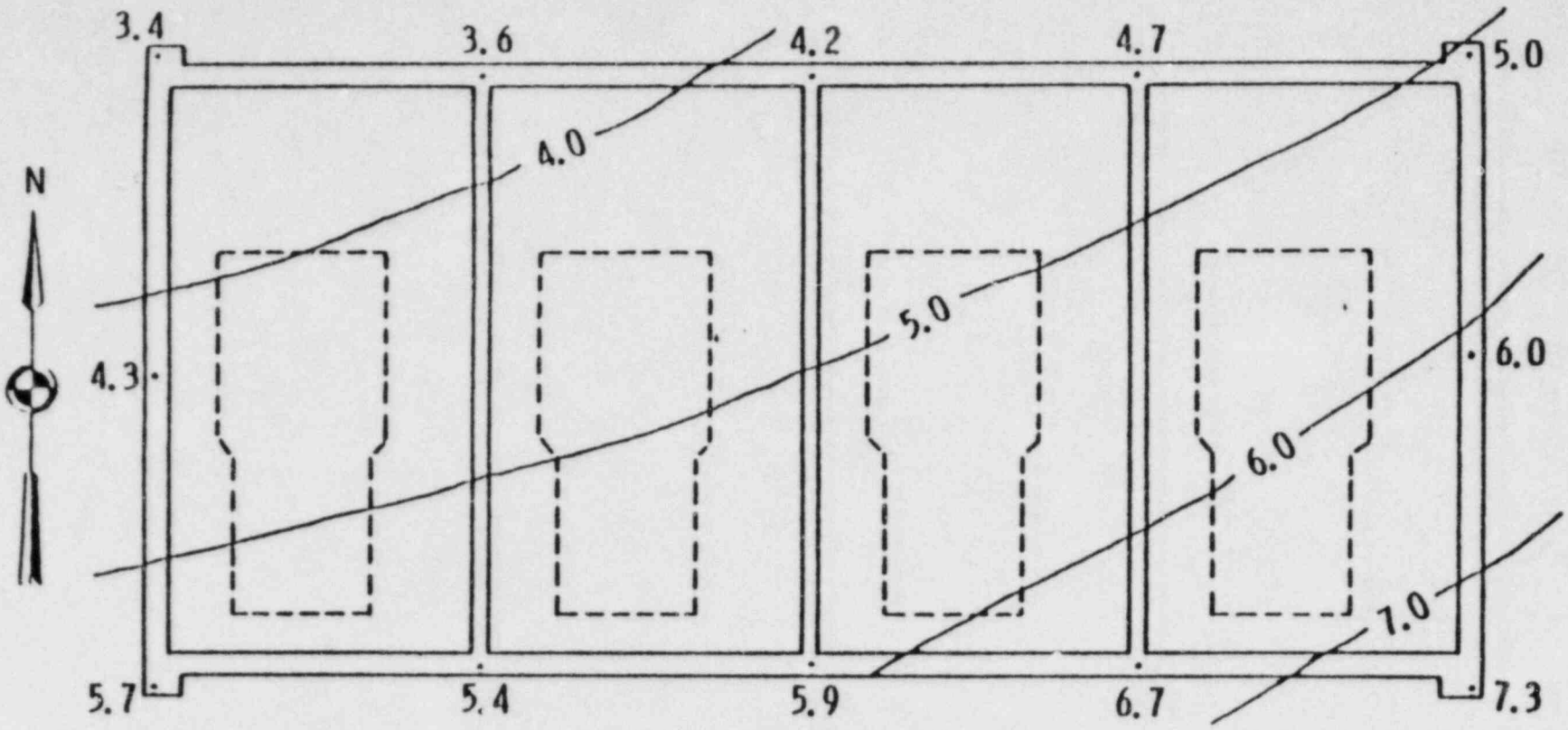
DIESEL GENERATOR BUILDING
AVERAGE PEDESTAL SETTLEMENT VS TIME



PLAN AT EL 634'-0"

Fig. - 9

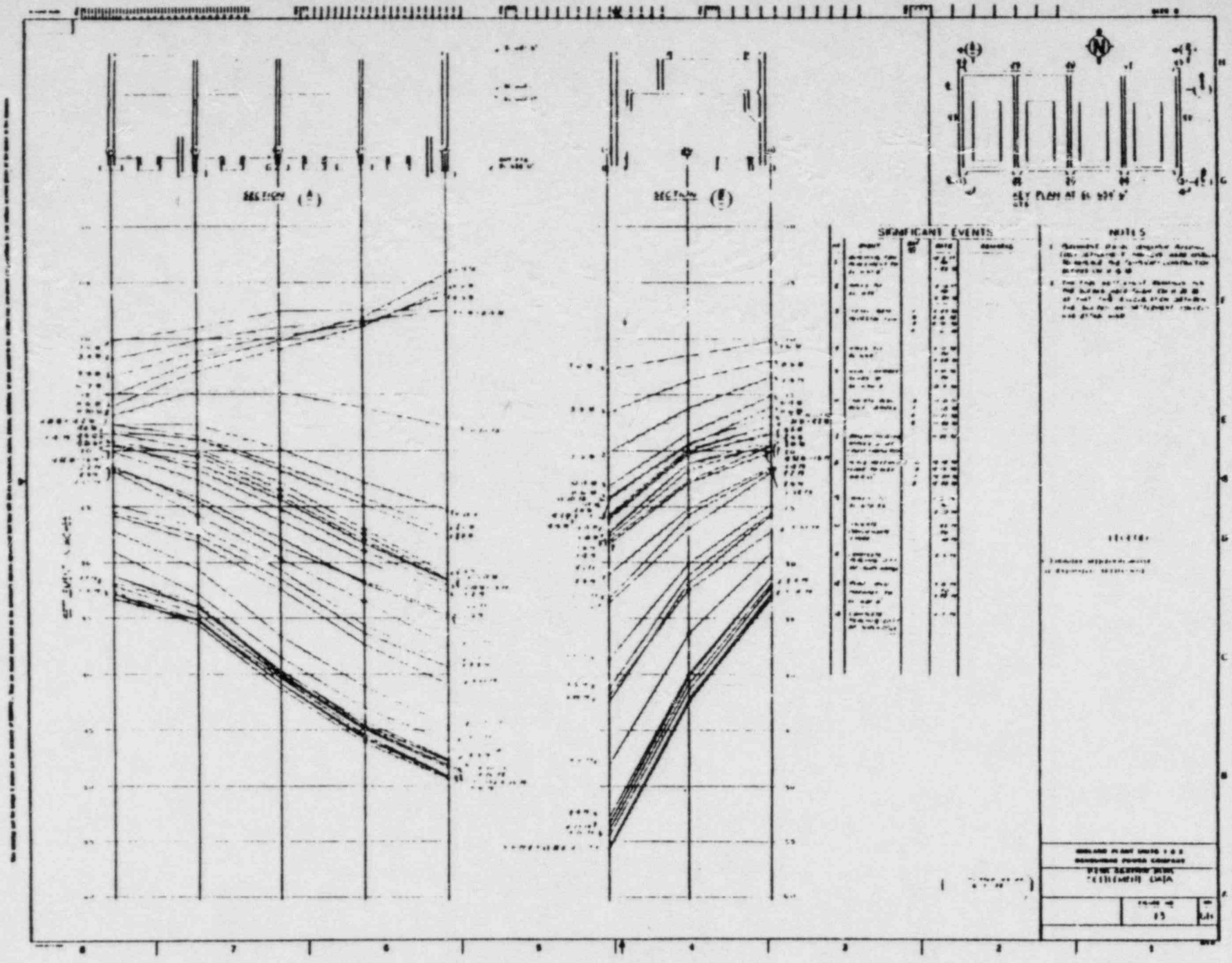
Fig 6

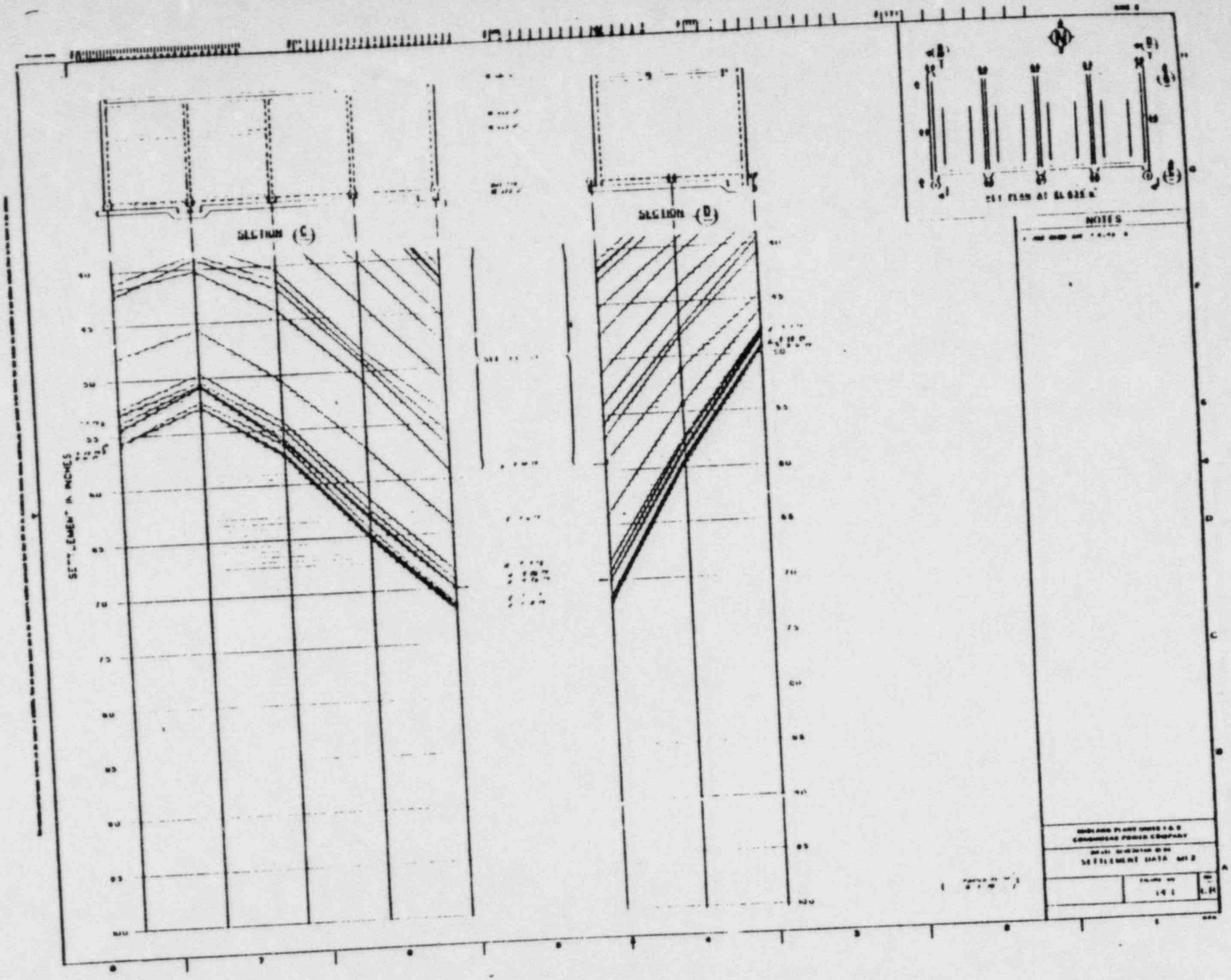


DIESEL GENERATOR BUILDING

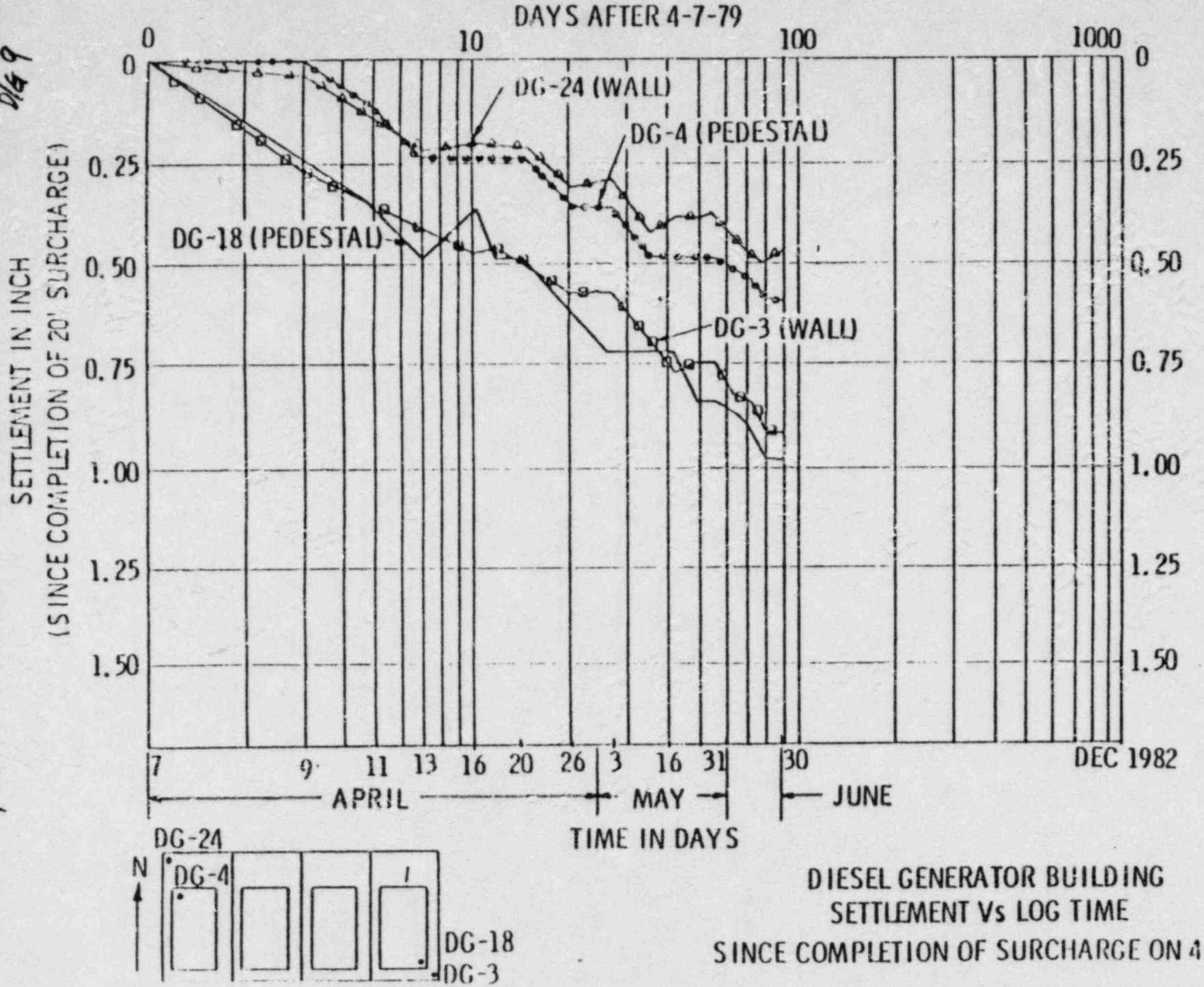
TOTAL SETTLEMENT OF WALLS FROM 7-14-78 TO 6-29-79 IN INCHES

(20 FEET OF SURCHARGE)

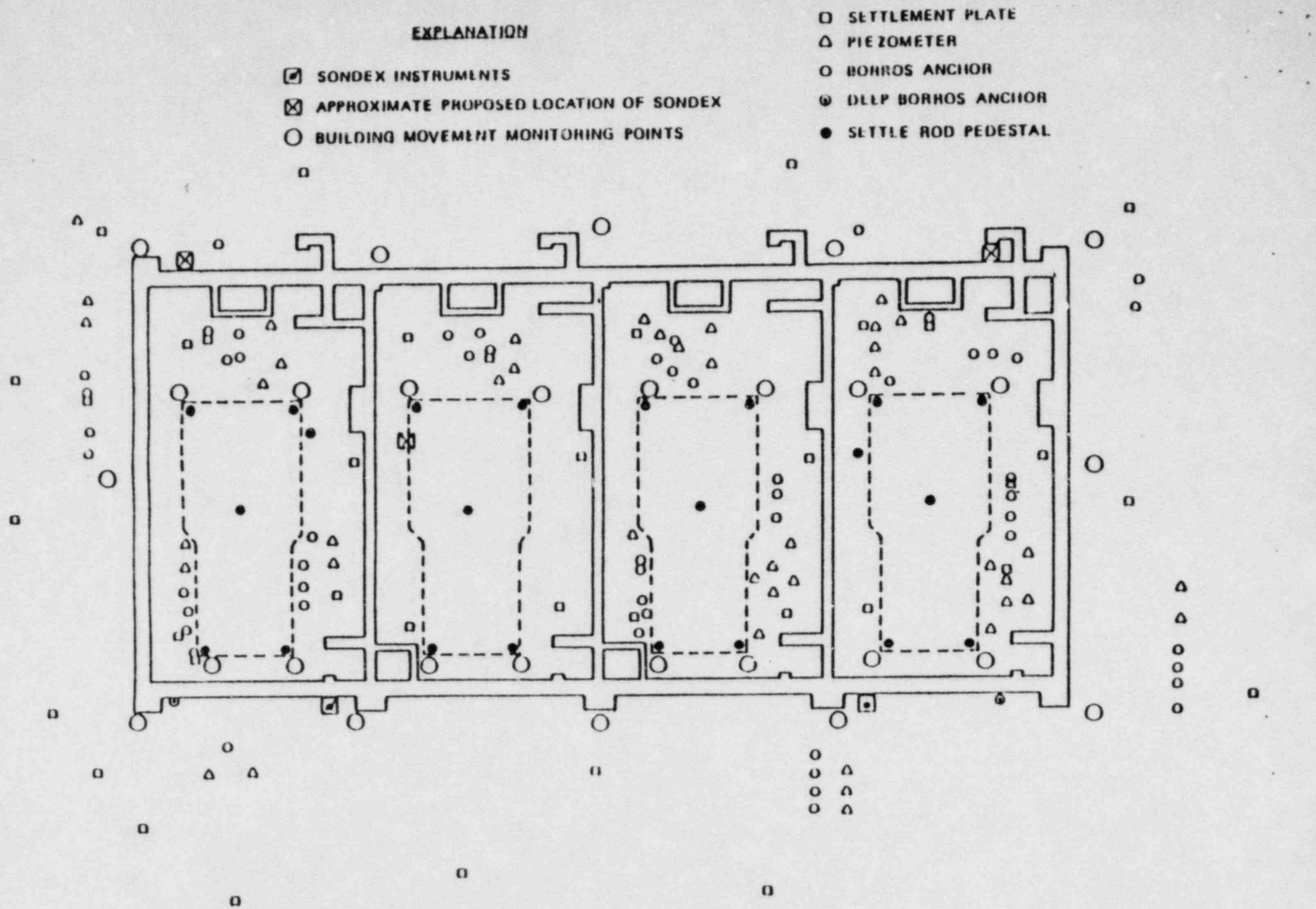

SECTION (A)
SECTION (B)
SIGNIFICANT EVENTS
NOTES

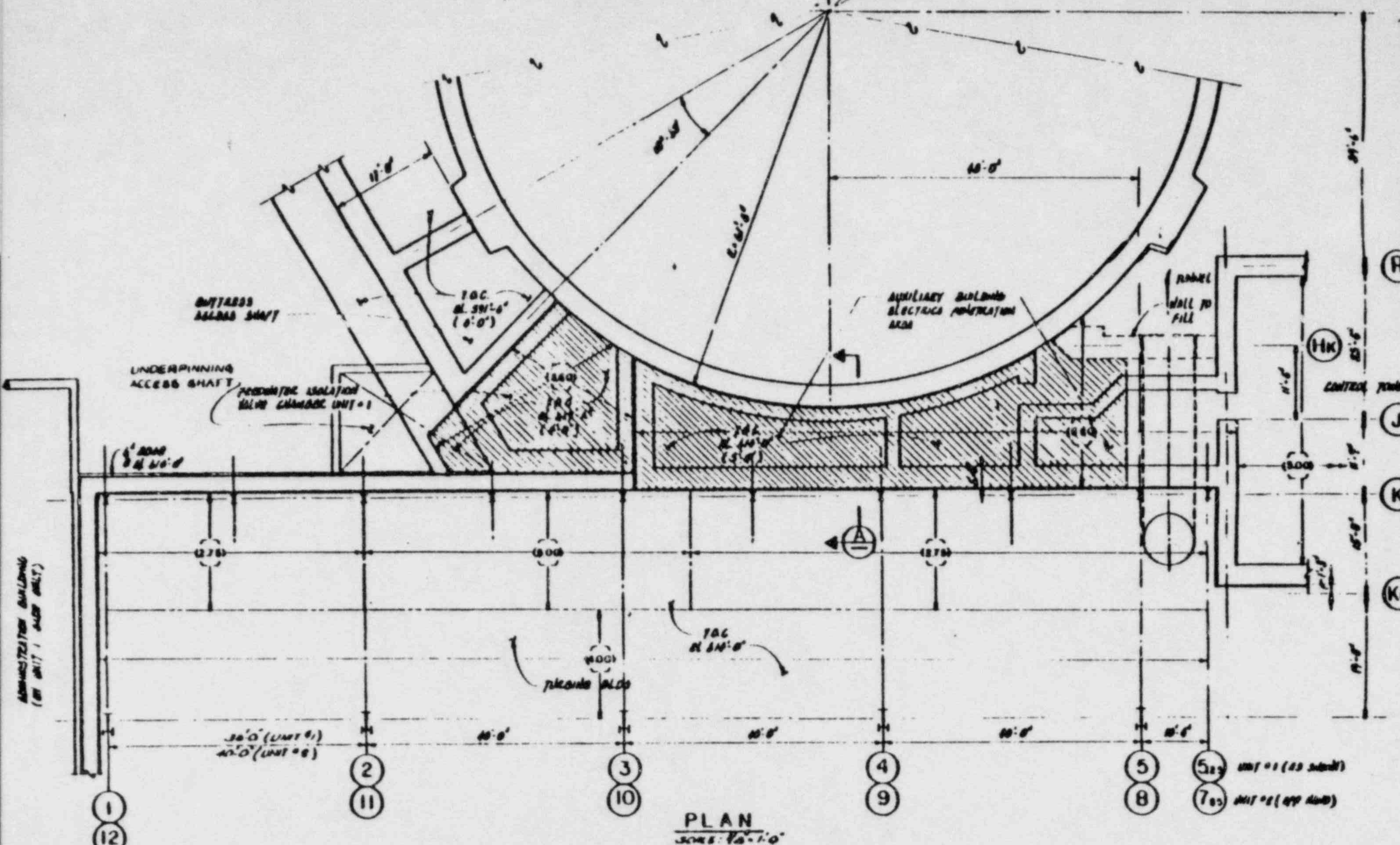

SECTION (C)
SECTION (D)
NOTES

D/G 9

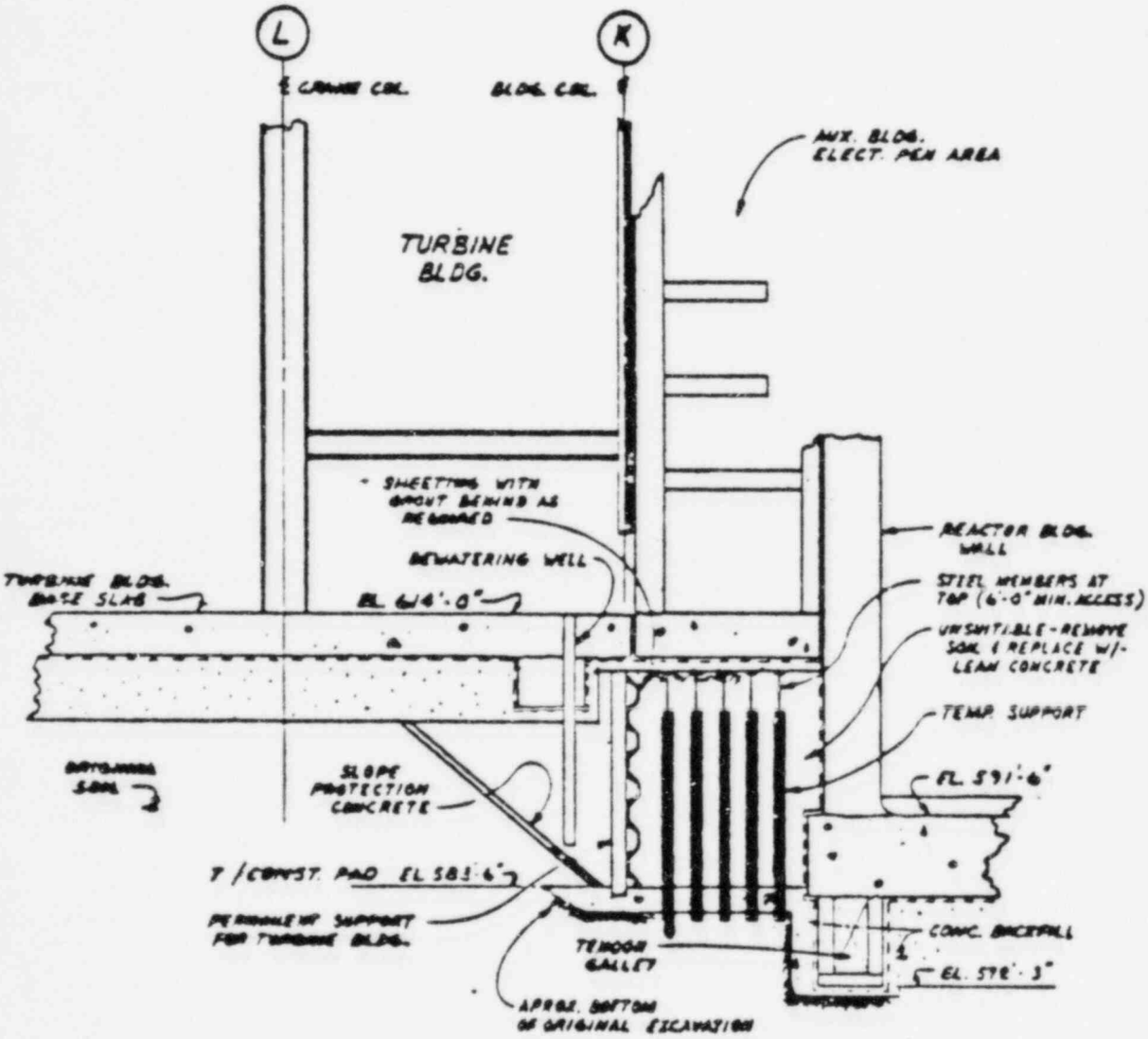


DIESEL GENERATOR BUILDING
SETTLEMENT Vs LOG TIME
SINCE COMPLETION OF SURCHARGE ON 4-6-79

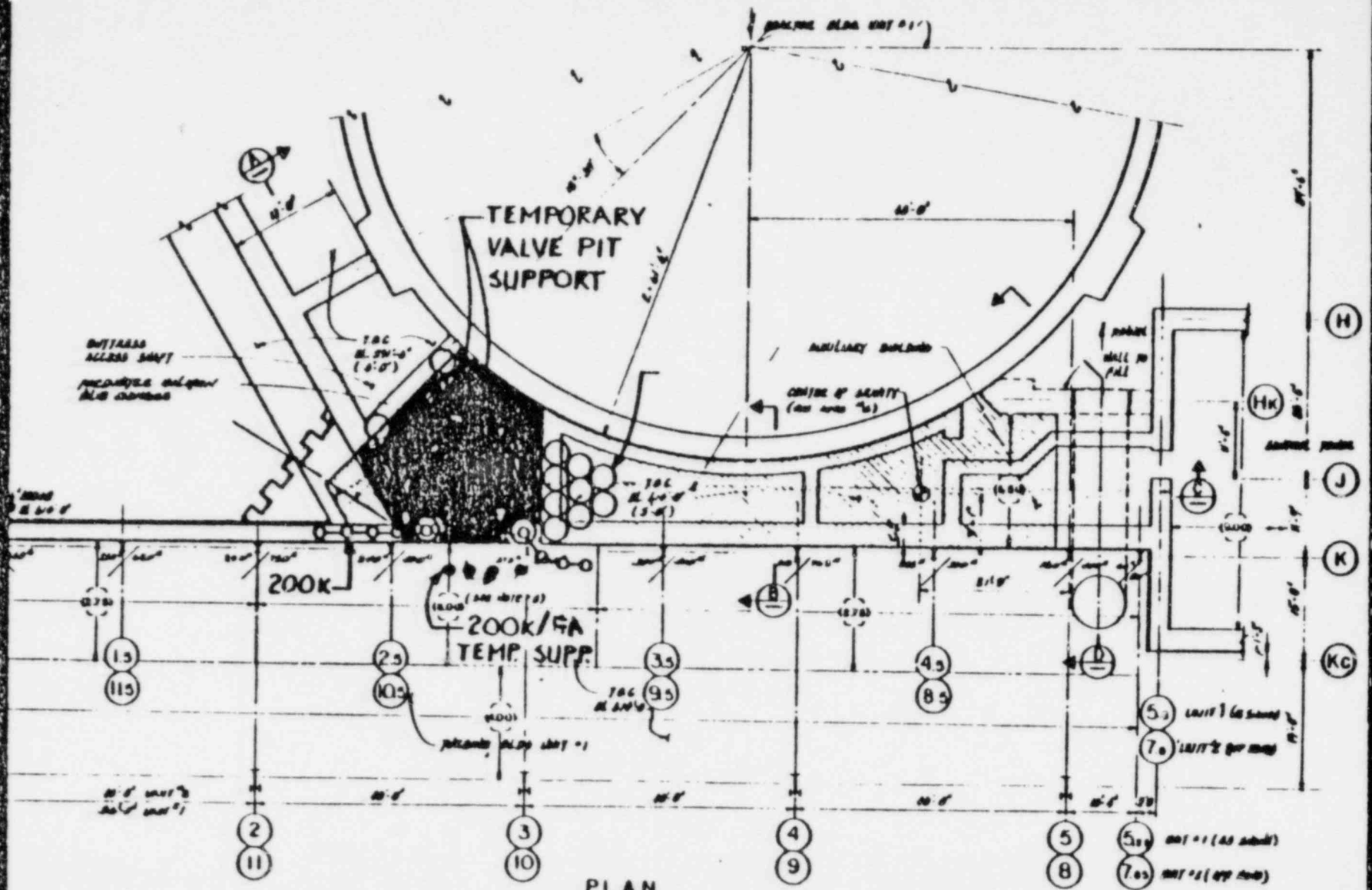

EXPLANATION
SONDEX INSTRUMENTS
APPROXIMATE PROPOSED LOCATION OF SONDEX
BUILDING MOVEMENT MONITORING POINTS
SETTLEMENT PLATE
PIEZOMETER
BORROS ANCHOR
DEEP BORROS ANCHOR
SETTLE ROD PEDESTAL

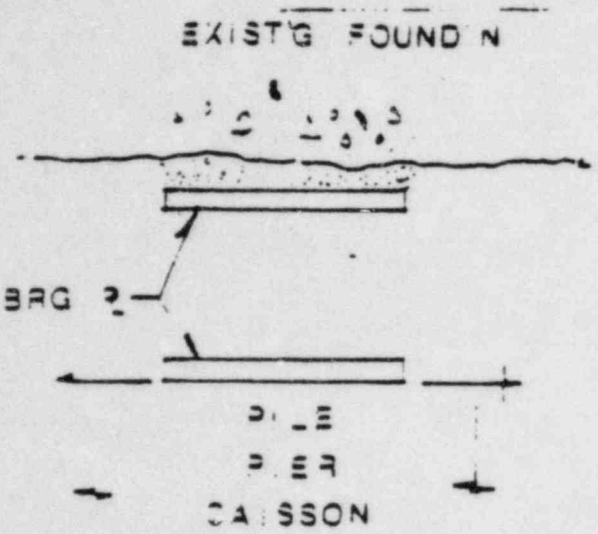


PLAN

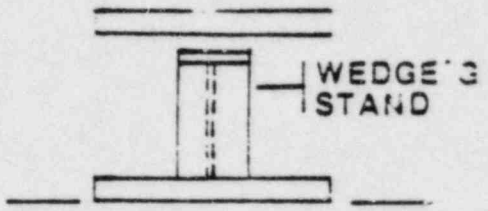


TYPICAL SECT.

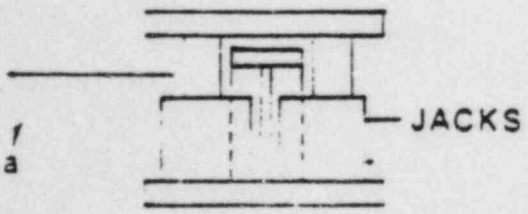

TEMPORARY
VALVE PIT
SUPPORT
200K
200K/FA
TEMP. SUPP.
PLAN



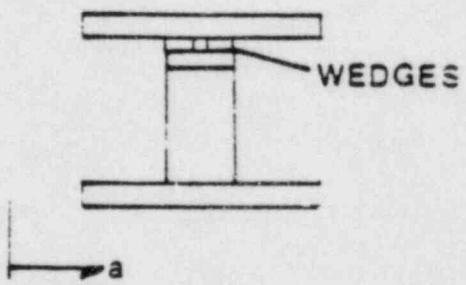
STEP 1



STEP 2



STEP 3



STEP 4

PRESTRESS PROCEDURE

SUBJECT

3M CATALOG N

STRUCTURES	SUPPORTING SOIL TYPE
A. AUXILIARY BUILDING	
1). CONTROL TOWER	Medium dense to very dense sand.
2). UNIT 1 ELECTRICAL PENETRATION AREA	Dense to very dense sand with layers of loose sand and soft clay
3). UNIT 2 ELECTRICAL PENETRATION AREA	Medium dense to dense sand with medium stiff clay layers.
4). RAILROAD BAY	Medium to very dense sand.
B. FEEDWATER ISOLATION VALVE PITS	
1). UNIT 1	Loose to dense sand and medium stiff to very stiff clay.
2). UNIT 2	As UNIT 1.
C. SERVICE WATER PUMP STRUCTURES	Soft to very stiff clay and loose to very dense sand.
D. TANKS	Medium to stiff sandy clay to clay.
E. DIESEL GENERATOR BUILDING	Soft to stiff clay and loose to dense sand.

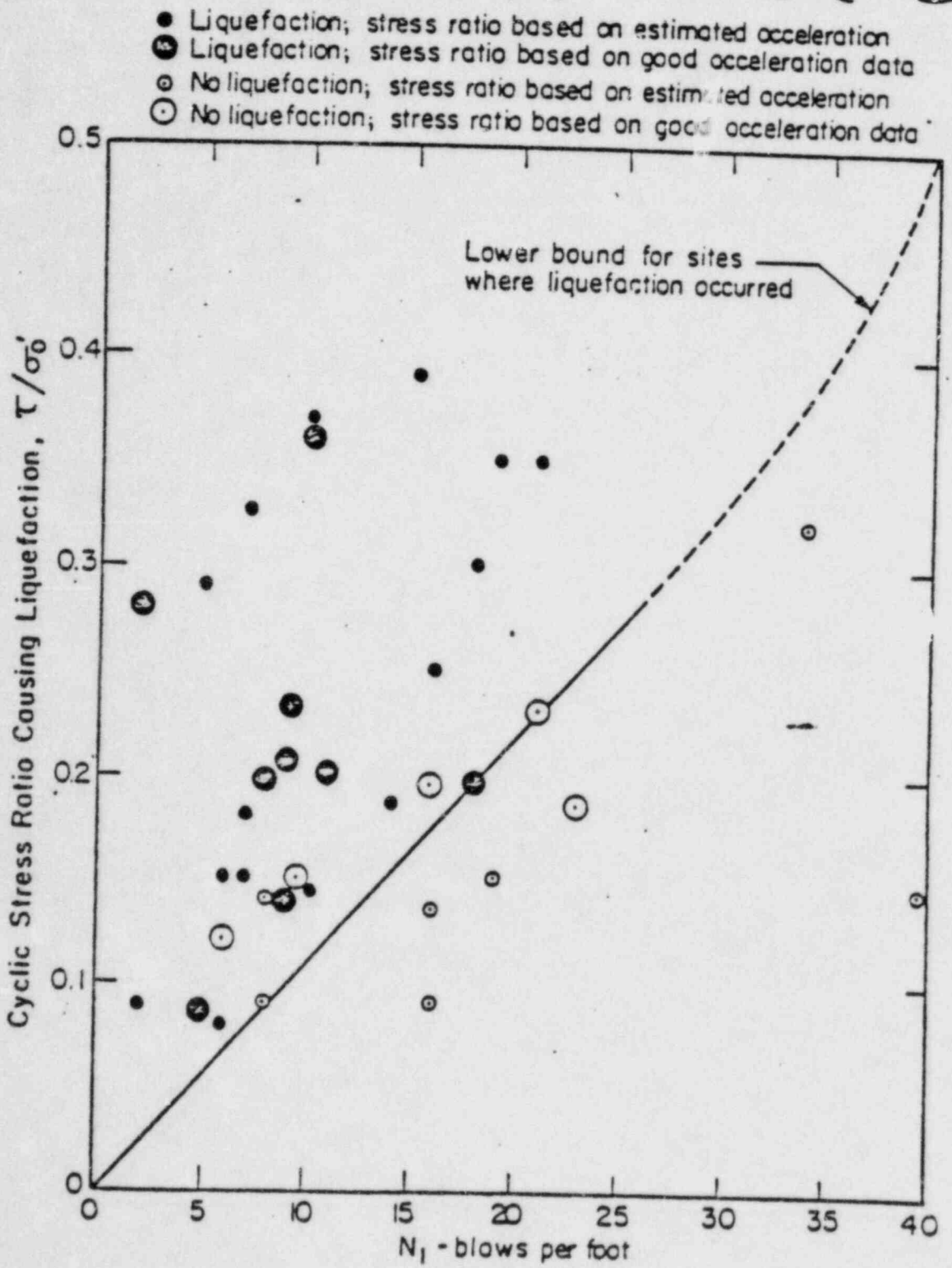
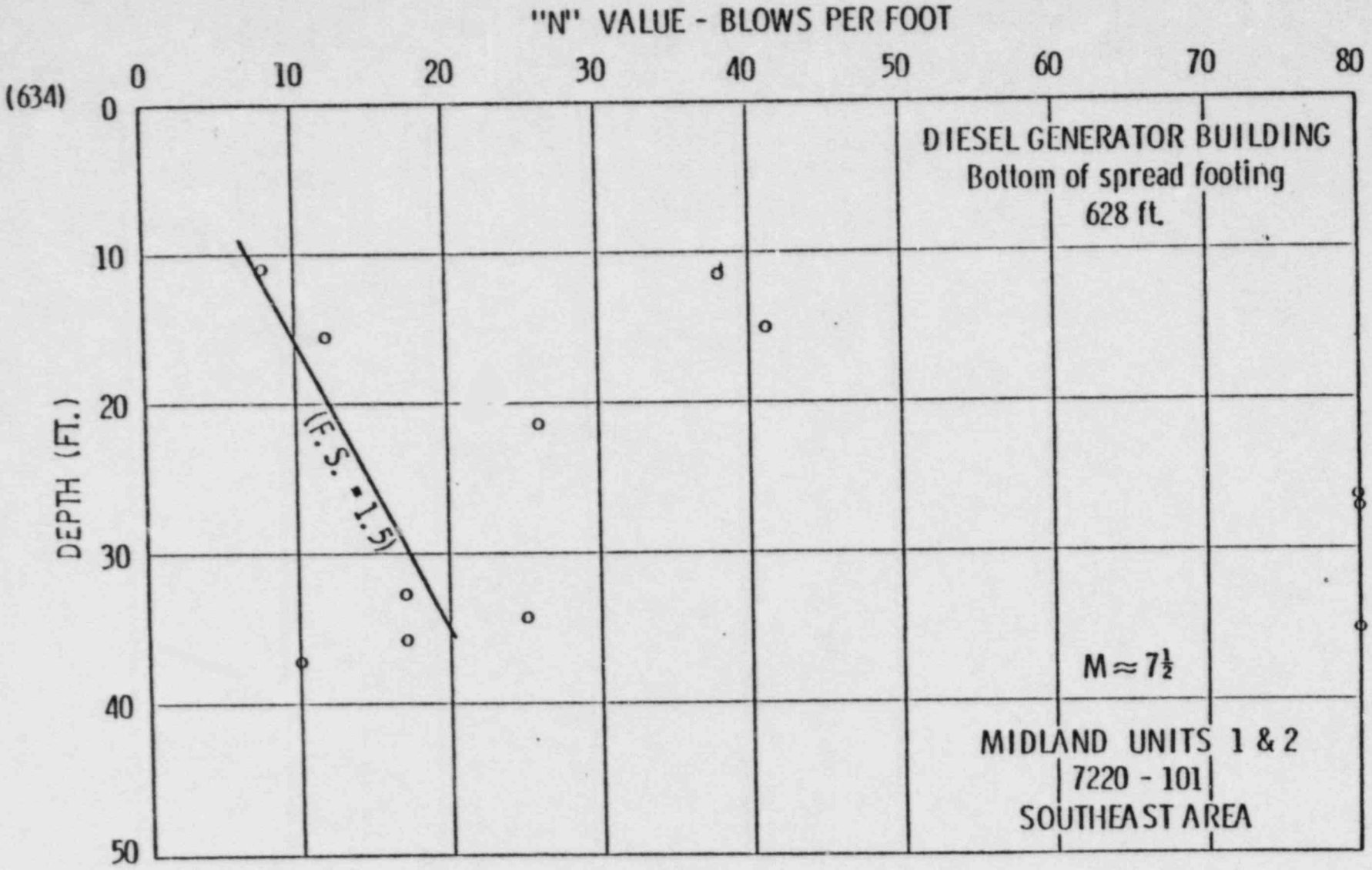
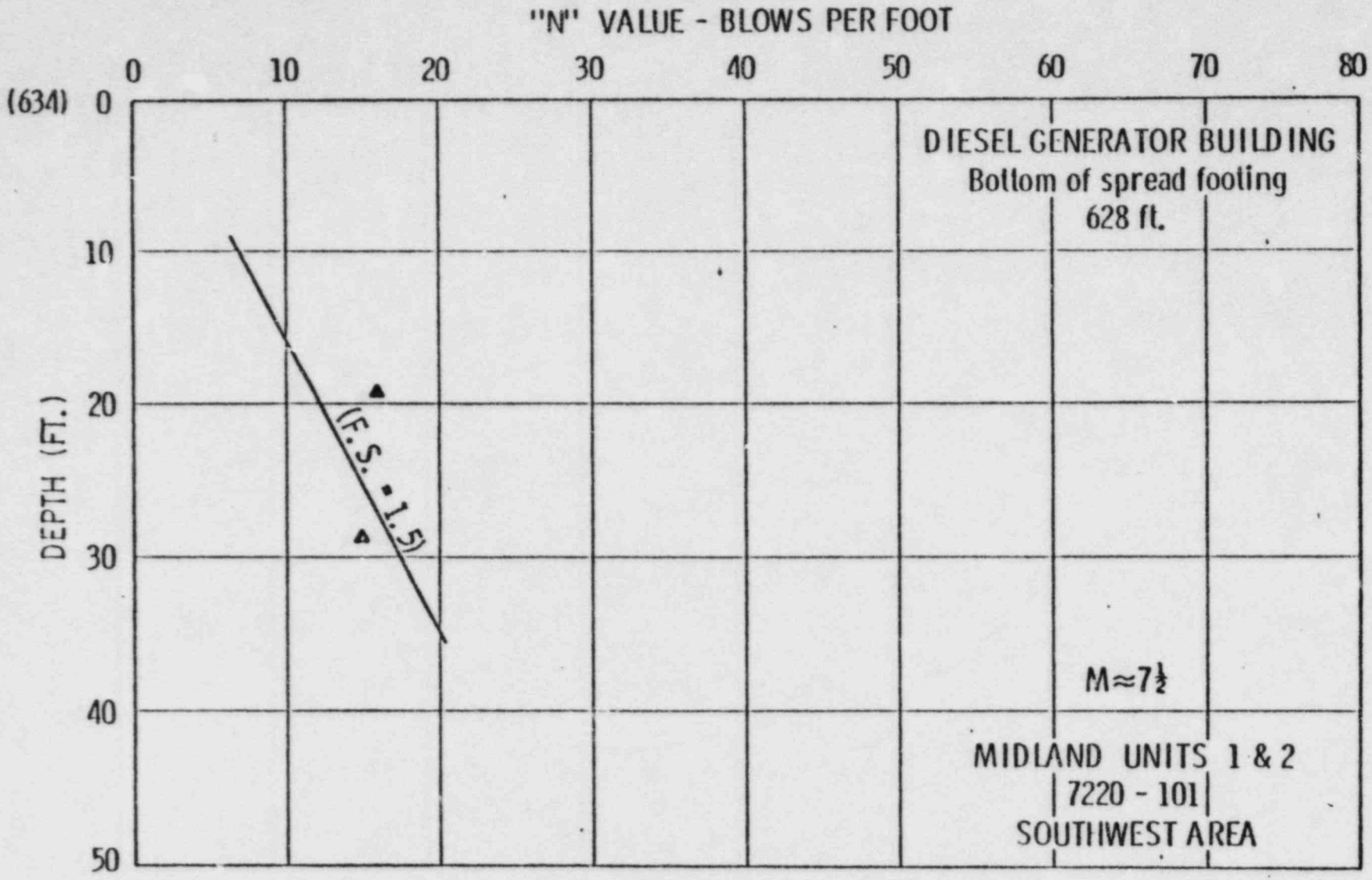
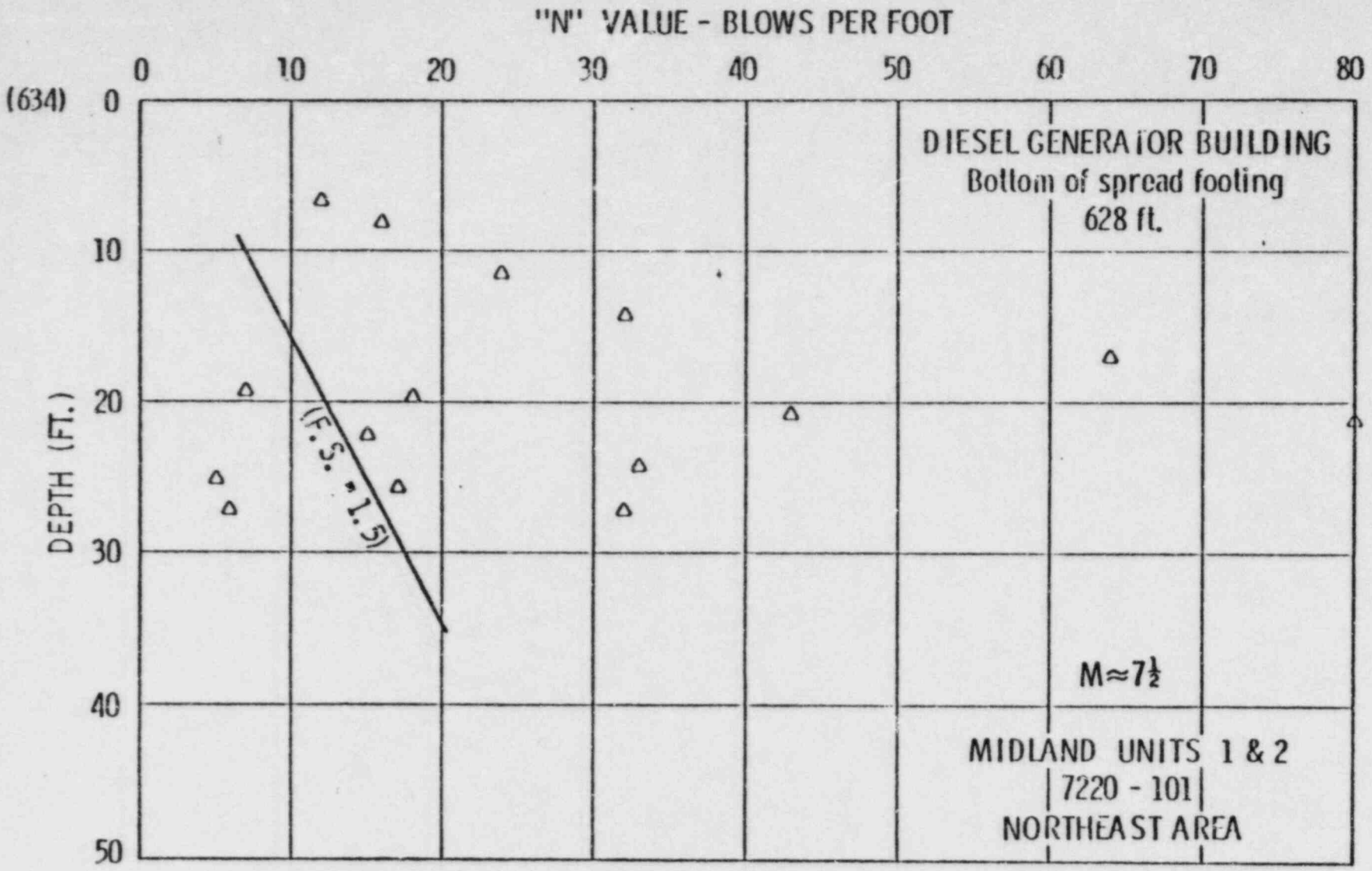
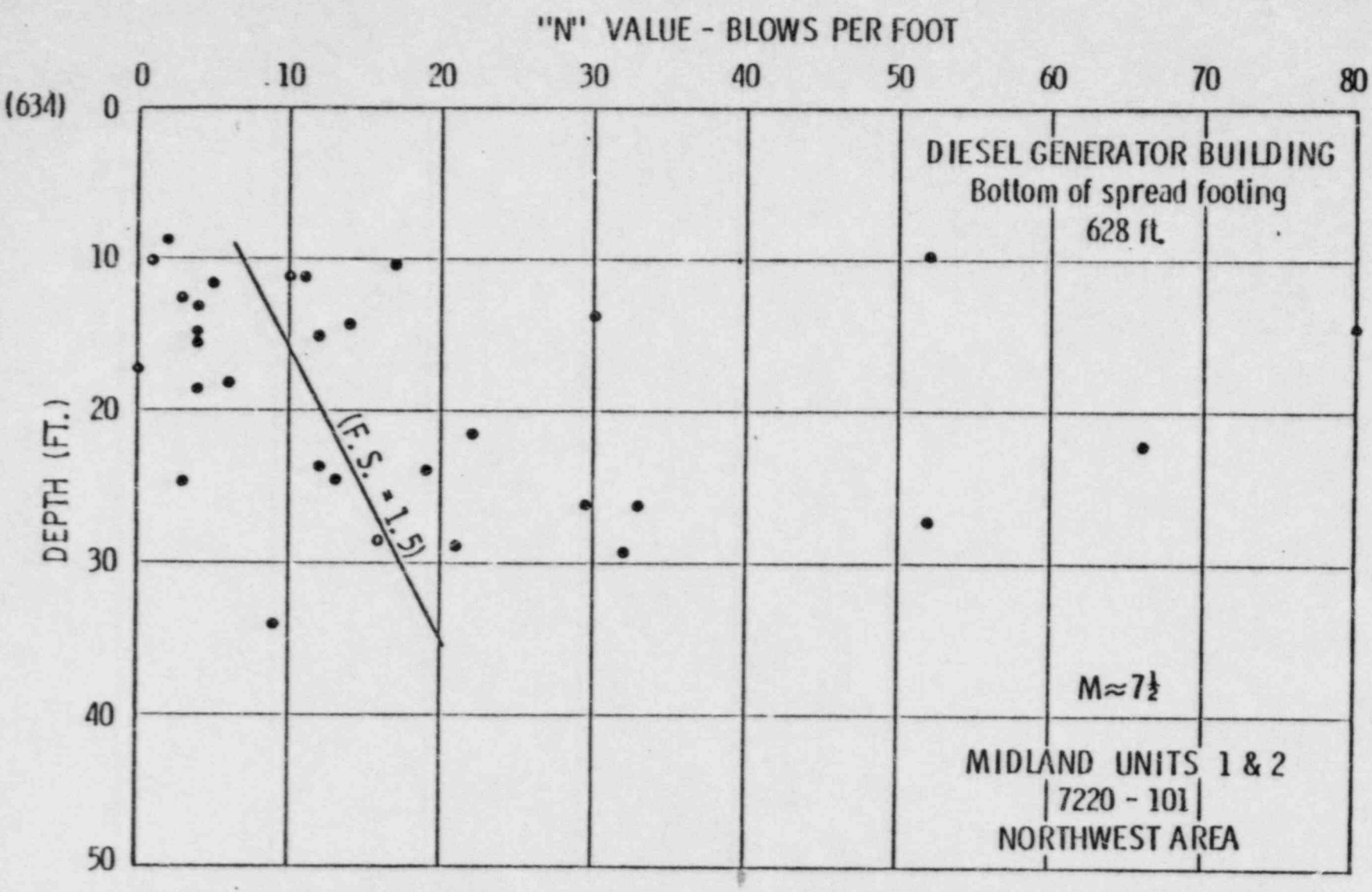


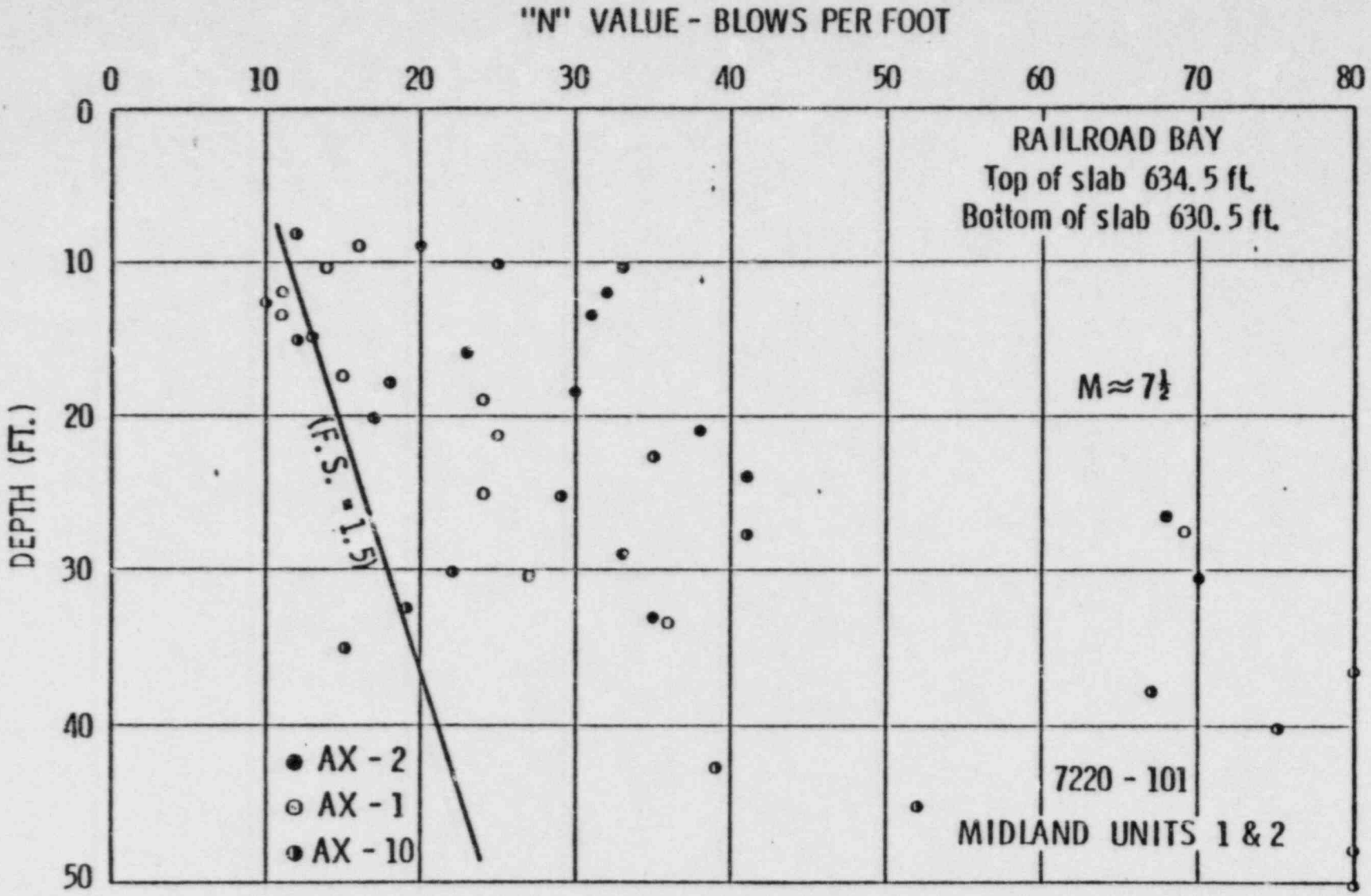
Fig. 2 CORRELATION BETWEEN STRESS RATIO CAUSING LIQUEFACTION IN THE FIELD AND PENETRATION RESISTANCE OF SAND. (after Seed et al)

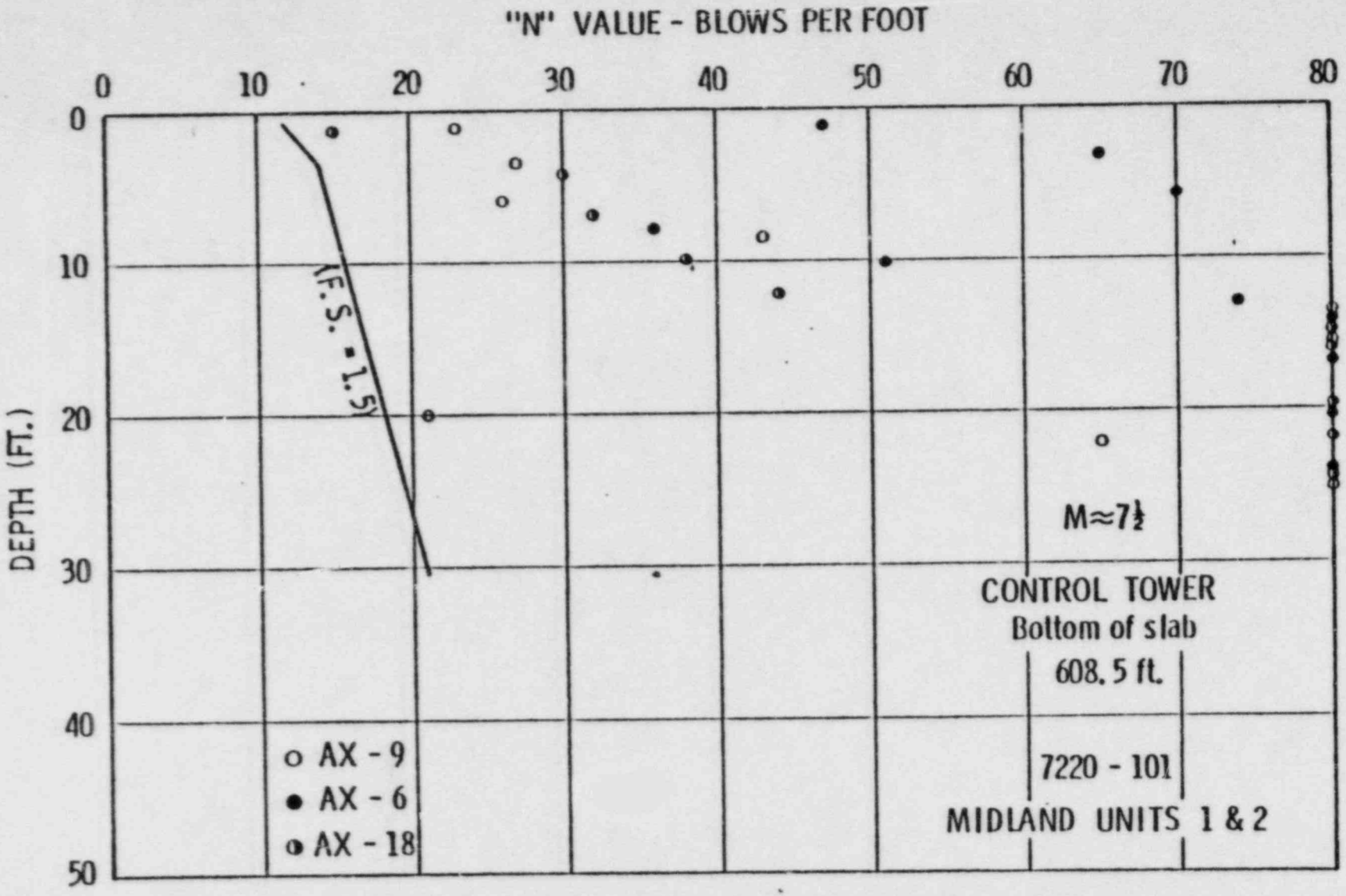

"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
(634)
DEPTH (FT.)
0
10
20
30
40
50
DIESEL GENERATOR BUILDING
Bottom of spread footing
628 ft.
(F.S. = 1.5)
M ≈ 7½
MIDLAND UNITS 1 & 2
7220 - 101
SOUTHEAST AREA

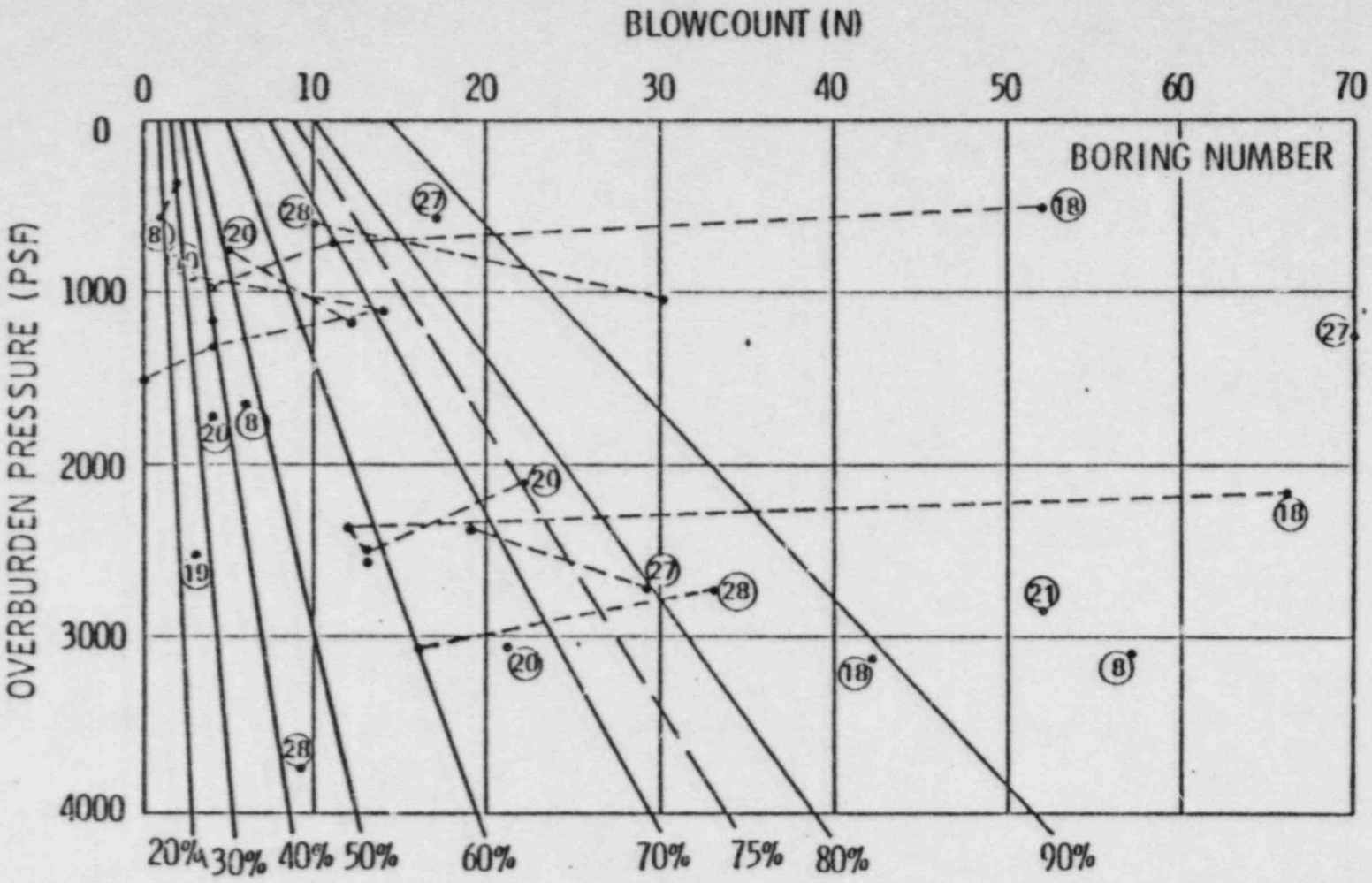

"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
(634)
0
10
20
30
40
50
DEPTH (FT.)
(F.S. = 1.5)
DIESEL GENERATOR BUILDING
Bottom of spread footing
628 ft.
M≈7½
MIDLAND UNITS 1 & 2
7220 - 101
SOUTHWEST AREA


"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
(634)
0
10
20
30
40
50
DEPTH (FT.)
DIESEL GENERATOR BUILDING
Bottom of spread footing
628 ft.
(F.S. = 1.5)
M≈7½
MIDLAND UNITS 1 & 2
7220 - 101
NORTHEAST AREA

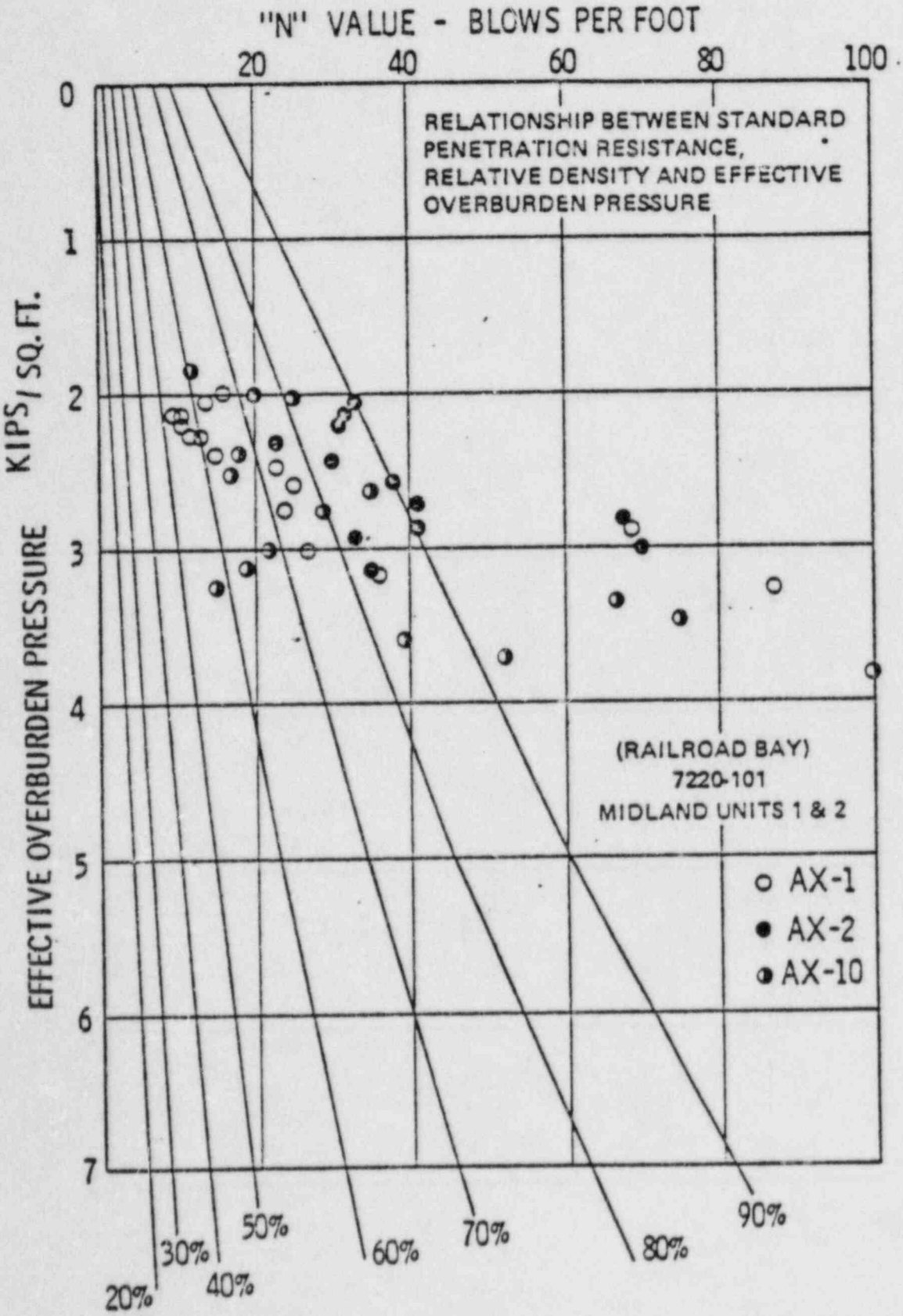

"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
(634)
0
10
20
30
40
50
DEPTH (FT.)
DIESEL GENERATOR BUILDING
Bottom of spread footing
628 ft.
(F.S. = 1.5)
M≈7½
MIDLAND UNITS 1 & 2
7220 - 101
NORTHWEST AREA

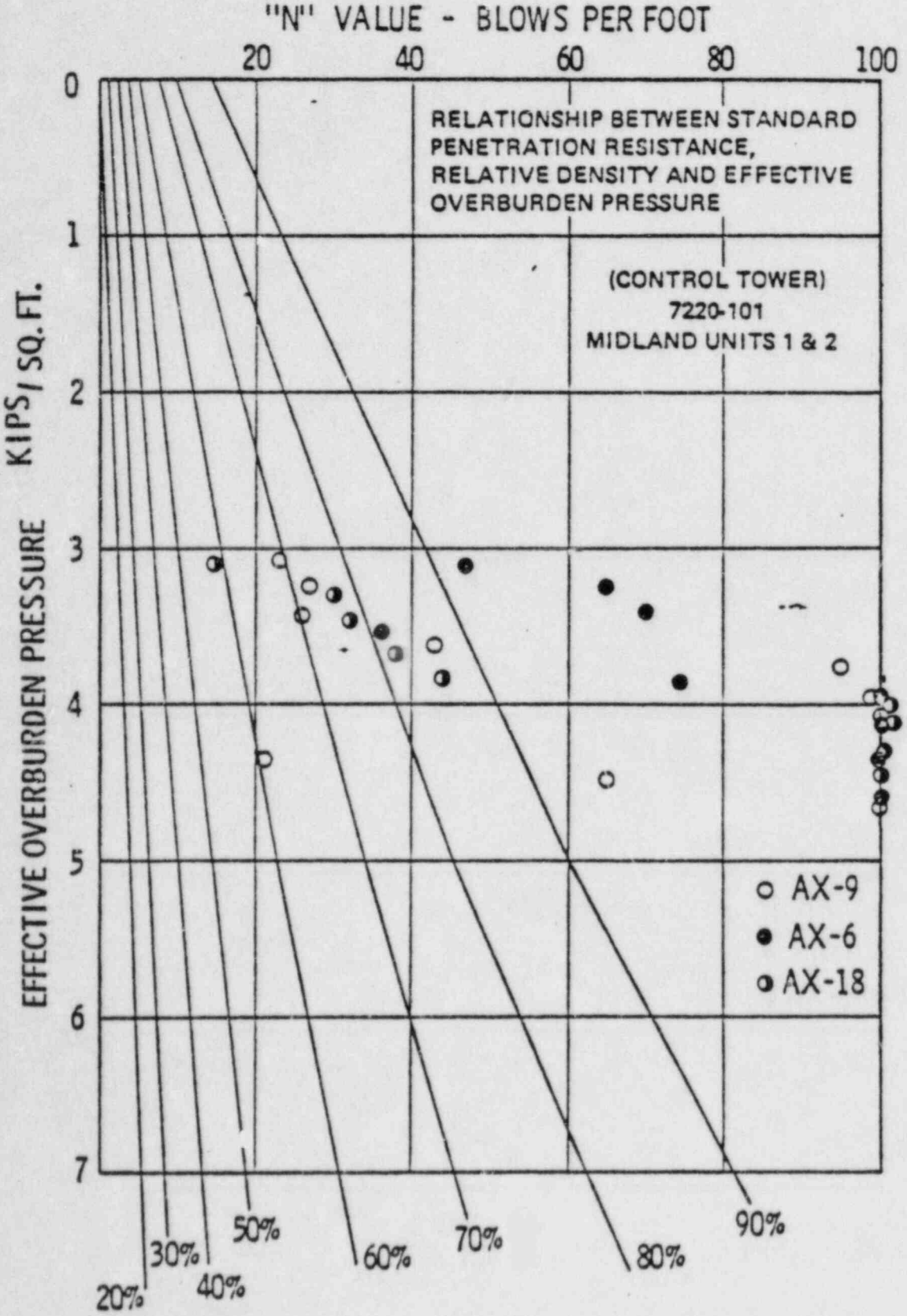

"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
DEPTH (FT.)
0
10
20
30
40
50
RAILROAD BAY
Top of slab 634.5 ft.
Bottom of slab 630.5 ft.
M≈7½
(F.S. = 1.5)
AX - 2
AX - 1
AX - 10
7220 - 101
MIDLAND UNITS 1 & 2

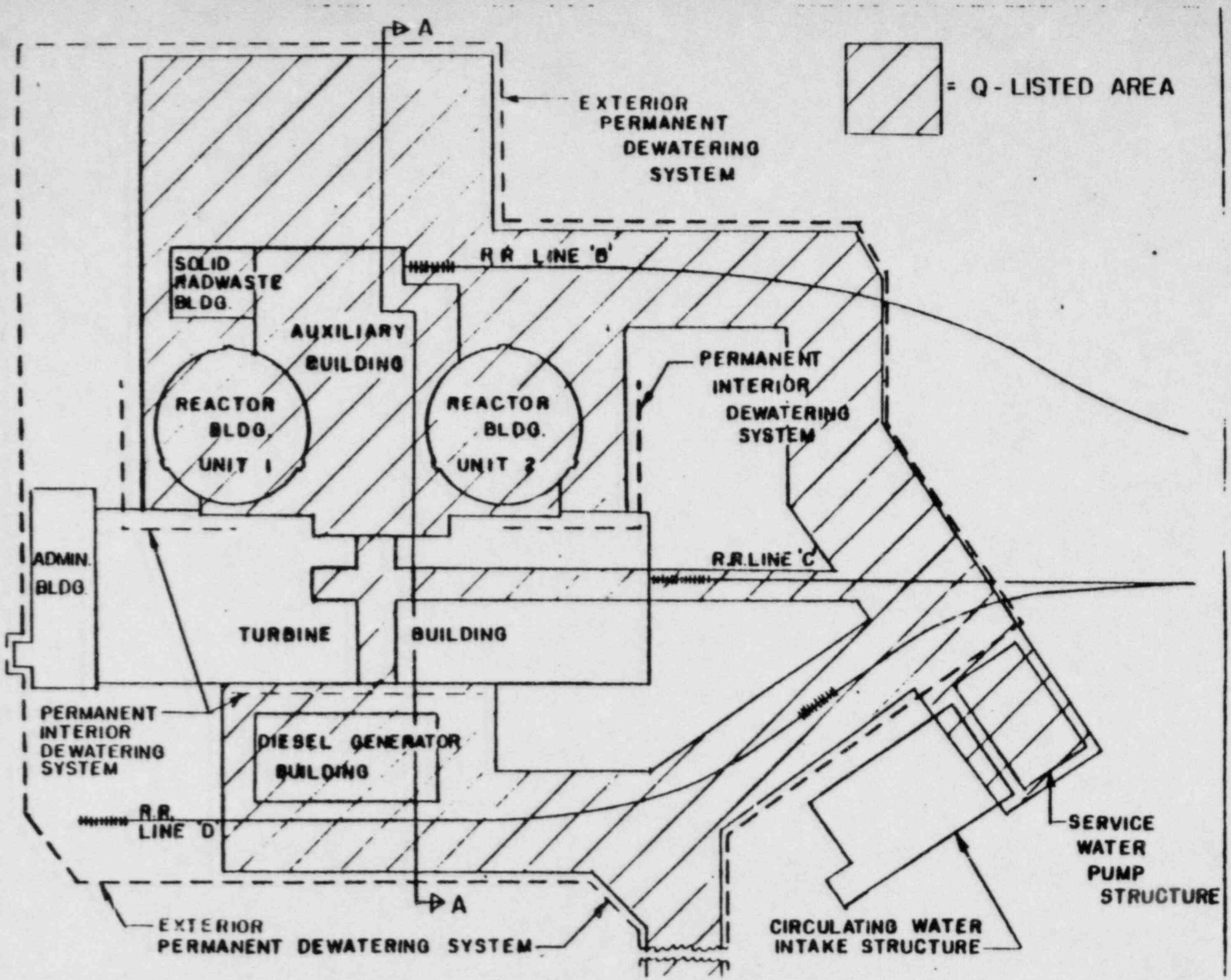

"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
DEPTH (FT.)
0
10
20
30
40
50
F.S. = 1.5
M≈7½
CONTROL TOWER
Bottom of slab
608.5 ft.
7220 - 101
MIDLAND UNITS 1 & 2
AX - 9
AX - 6
AX - 18

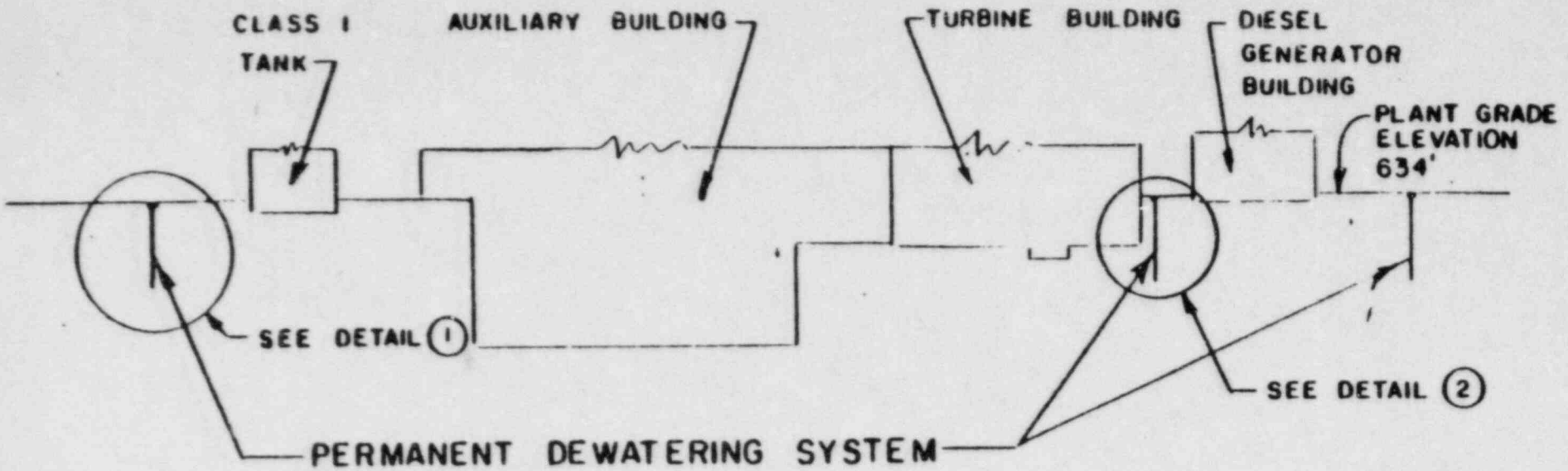


MIDLAND - DIESEL GENERATOR BUILDING

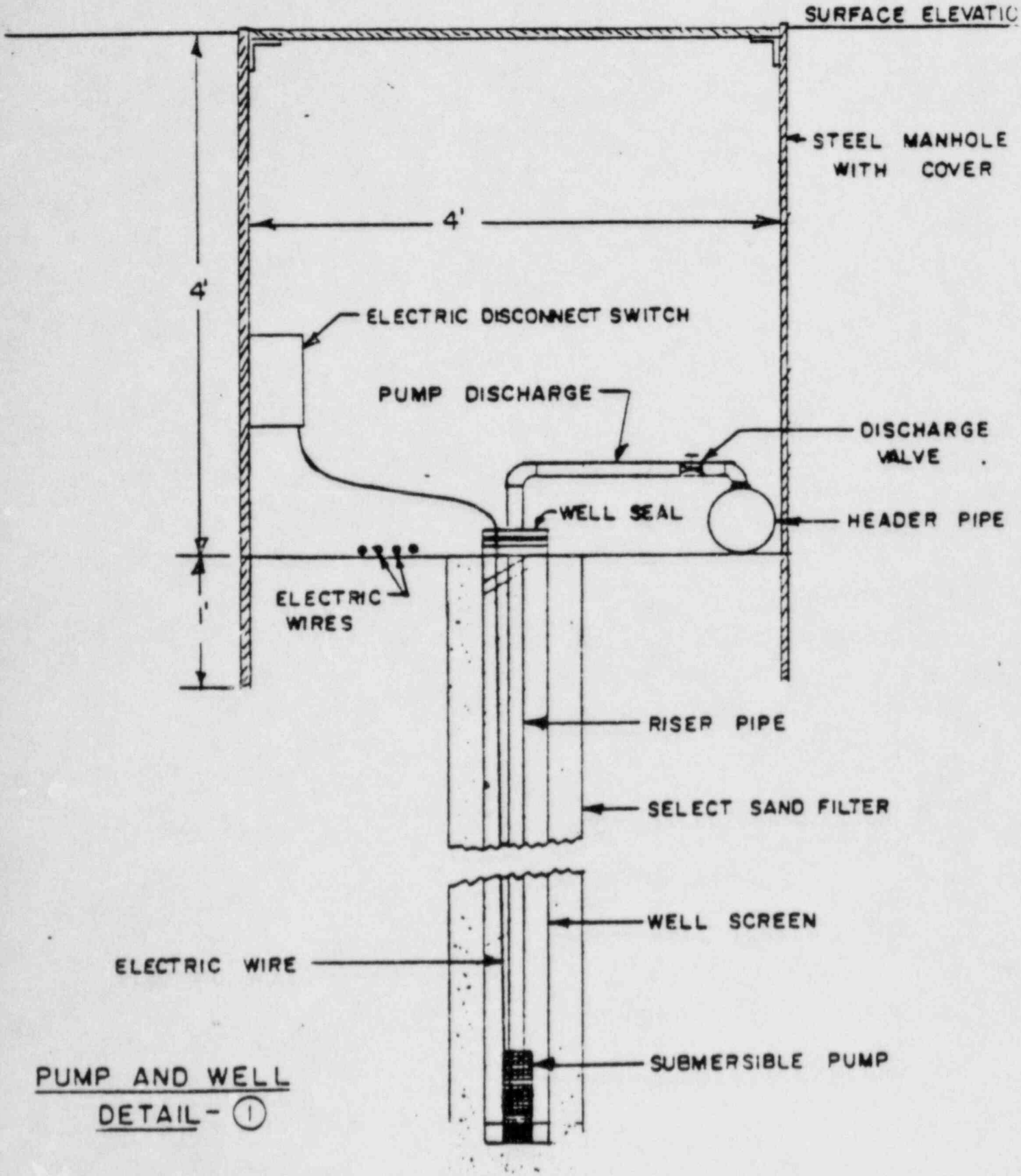

"N" VALUE - BLOWS PER FOOT
20
40
60
80
100
0
1
2
3
4
5
6
7
EFFECTIVE OVERBURDEN PRESSURE KIPS/SQ.FT.
RELATIONSHIP BETWEEN STANDARD PENETRATION RESISTANCE, RELATIVE DENSITY AND EFFECTIVE OVERBURDEN PRESSURE
(RAILROAD BAY)
7220-101
MIDLAND UNITS 1 & 2
AX-1
AX-2
AX-10
20%
30%
40%
50%
60%
70%
80%
90%


"N" VALUE - BLOWS PER FOOT
20
40
60
80
100
0
1
2
3
4
5
6
7
EFFECTIVE OVERBURDEN PRESSURE KIPS/ SQ. FT.
RELATIONSHIP BETWEEN STANDARD PENETRATION RESISTANCE, RELATIVE DENSITY AND EFFECTIVE OVERBURDEN PRESSURE
(CONTROL TOWER)
7220-101
MIDLAND UNITS 1 & 2
AX-9
AX-6
AX-18
20%
30%
40%
50%
60%
70%
80%
90%


A
EXTERIOR PERMANENT DEWATERING SYSTEM
= Q - LISTED AREA
SOLID RADWASTE BLDG.
R.R. LINE 'B'
AUXILIARY BUILDING
REACTOR BLDG. UNIT 1
REACTOR BLDG. UNIT 2
PERMANENT INTERIOR DEWATERING SYSTEM
ADMIN. BLDG.
R.R. LINE 'C'
TURBINE BUILDING
PERMANENT INTERIOR DEWATERING SYSTEM
DIESEL GENERATOR BUILDING
R.R. LINE 'D'
SERVICE WATER PUMP STRUCTURE
A
EXTERIOR PERMANENT DEWATERING SYSTEM
CIRCULATING WATER INTAKE STRUCTURE


CLASS I TANK
AUXILIARY BUILDING
TURBINE BUILDING
DIESEL GENERATOR BUILDING
PLANT GRADE ELEVATION 634'
SEE DETAIL (1)
SEE DETAIL (2)
PERMANENT DEWATERING SYSTEM

SECTION A-A



PUMP AND WELL DETAIL - (1)

Monitor SNAPPY®

PITLESS ADAPTERS FOR SUBMERSIBLE PUMPS—4" & LARGER WELLS

In a Snappy submersible pump installation, the well casing is extended above ground, an excavation is made around the casing and a hole is cut in the casing below the frostline. The Snappy *casing fitting* is then attached to the casing around the hole to provide a delivery pipe. The pump, suspended from the Snappy *drop pipe fitting*, is lowered into the well with the neck of the drop pipe fitting pointed toward the casing fitting. When the neck reaches the level of the casing fitting, the Snappy *actuator* automatically inserts the neck with an O-ring seal into a *socket* in the casing fitting and locks it there thus providing both a support for drop pipe and pump within the well and a fluid tight conduit between the drop pipe and the discharge pipe. To remove the pump, the drop pipe fitting is first supported with a hoist. Then the neck of the drop pipe fitting is unlocked and withdrawn from the socket by a manual pull on the *control cable* thus releasing the drop pipe fitting from the casing fitting so that the pump can be lifted out with the hoist.

Snappy pitless adapters with weld-on casing fitting are approved by the Boards of Health of Michigan and Wisconsin. However, Wisconsin approval requires factory welding of the casing fitting to the well casing except for residential water systems serving no more than three families.

Snappy pitless adapters are certified water-tight under the standards of the Pitless Adapter Division of the Water Systems Council (PAS-1).

Snappy pitless adapters are available for well sizes from 4 to 8 inches I.D. and for drop and delivery pipe sizes of 1 and 1-1/4 inches I.D. with either clamp-on or weld-on casing fittings.

FEATURES

FROSTPROOF---No heating required. All water conduits are buried below frostline.

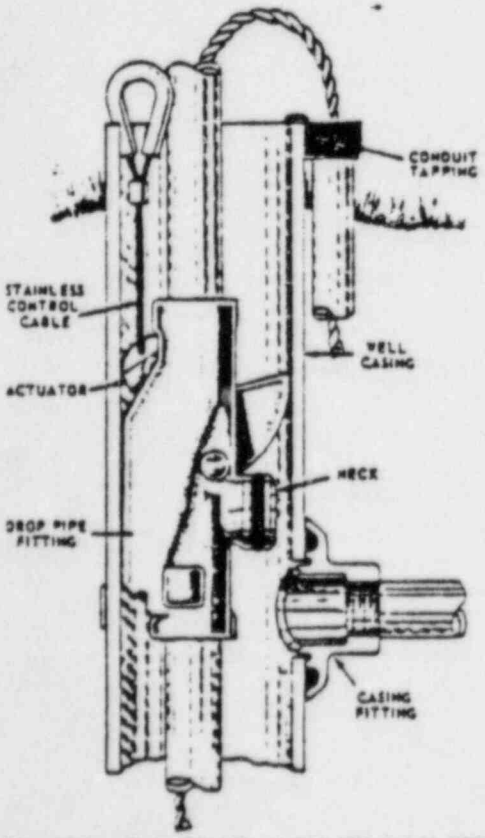
PUMP IS EASILY SET --- by simply lowering pump into well suspended from drop pipe fitting with neck of the latter pointed in the casing fitting direction.

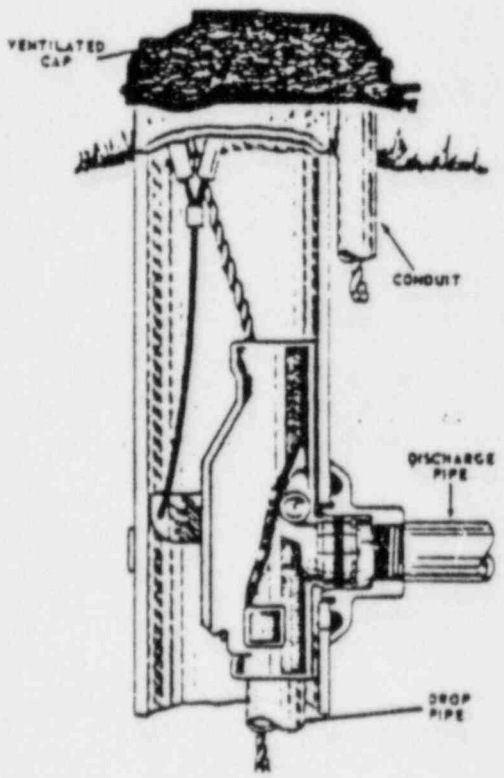
PUMP IS EASILY PULLED --- by first supporting drop pipe with hoist, and then manually pulling control cable to free pump.

LOW COST --- Regular well casing is used all the way. Extra cost of larger upper well casing used with spool-type units and expensive pit or well house construction are eliminated.

CORROSION PROTECTION --- Clamp-on and weld-on casing fittings are galvanized gray iron and stainless steel respectively. All parts within the well casing are either hot-dipped galvanized or constructed of corrosion resistant materials.

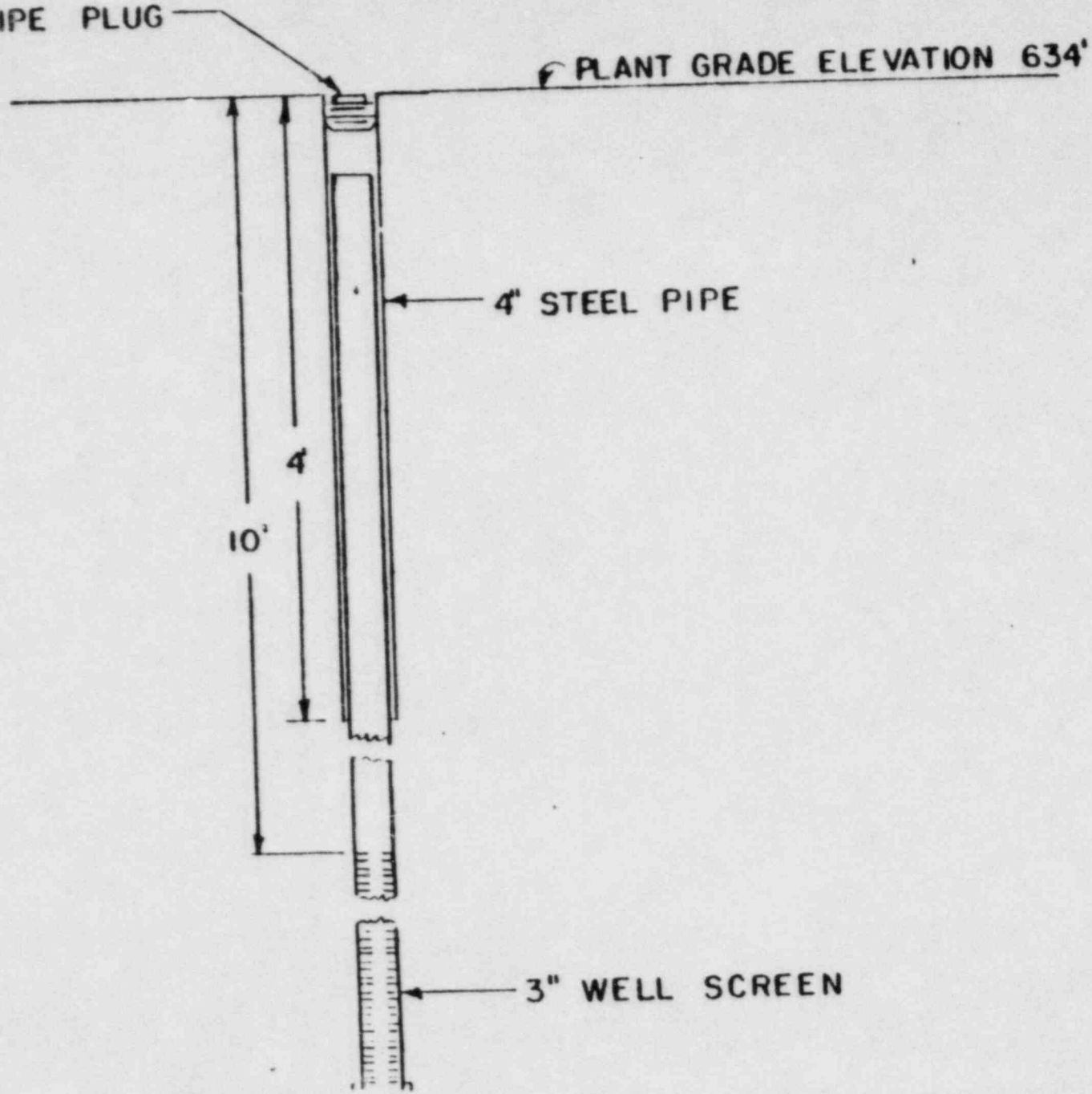
Continued





RELATED U.S. PATENTS: 3,035,732 3,054,022 3,123,689 3,136,362 3,165,070 3,239,007 3,473,573 3,722,586 3,902,632

BAKER monitor division
EVANSVILLE, WISCONSIN 53536
PHONE: (608) 882-5100


4" PIPE PLUG
PLANT GRADE ELEVATION 634'
4" STEEL PIPE
4'
10'
3" WELL SCREEN

DETAIL (2)

STRUCTURAL INVESTIGATION

(1) ORIGINAL DESIGN

(2) SEISMIC RESPONSE

(3) NEW ANALYSES

SEISMIC ANALYSIS

GENERAL

(1) RESPONSE SPECTRA PRESENTED IN FSAR

(2) STICK MASS MODELS WITH FOUNDATION SPRINGS

(3) MATERIAL DAMPING VALUES PRESENTED IN FSAR (MODAL DAMPING LIMITED TO 10% EXCEPT RIGID BODY MODES)

(4) SPECTRUM RESPONSE AND TIME HISTORY MODAL ANALYSES

DIESEL GENERATOR BUILDING

(1) ORIGINAL (V_s = 1360 FPS) - ONE ANALYSIS EQUIPMENT SPECTRA WIDENED BY ± 15%

(2) NEW (V_s = 500 FPS) - NEW SPECTRA WILL ENVELOP BOTH V_s = 500 FPS AND 1360 FPS

SEISMIC ANALYSIS

SERVICE WATER BUILDING

(1) ORIGINAL (V_s = 1360 FPS BASE CASE) THEN G VARIED BY ± 50% - EQUIPMENT SPECTRA ENVELOP

(2) NEW (V_s = 1360 FPS) - PILING IS MODELED FOR VERTICAL DIRECTION AND TORSION IS CONSIDERED

AUXILIARY BUILDING (INCLUDE CONTROL TOWER AND ELECTRICAL PENETRATION APEAS

(1) ORIGINAL - ONE ANALYSIS USING COMPOSITE FOUNDATION SPRINGS WITH EQUIPMENT RESPONSE SPECTRA WIDENED BY ± 15%

(2) NEW - ONE ANALYSIS INCLUDING CAISSONS UNDER ELECTRICAL PENETRATION AREAS, EQUIPMENT RESPONSE SPECTRA WIDENED BY ± 15%

TYPES OF LOADS

PRIMARY

1. MECHANICAL (DEADLOAD, PRESSURE, WIND, ETC.)
2. SEISMIC INERTIA (BUT SHORT DURATION)
3. MISSILE IMPACT & PIPE RUPTURE (LIMITED ENERGY)

SECONDARY

1. INTERNAL SELF CONTRAINT
   - (A) SEISMIC DISPLACEMENT (CYCLIC)
   - (B) THERMAL (CYCLIC)
2. SETTLEMENT (1/2 CYCLE)
3. FORMING (1/2 CYCLE)

MIDLAND DESIGN CRITERIA

FSAR

(A) $1.4D + 1.7L$

(B) $1.4 (D + L + E_O) + \ldots$

(C) $1.25 (D + L + W) + \ldots$

(D) $1.0D + 1.0L + 1.0E_{SS} + \ldots$

(E) $1.0D + 1.0L + 1.0W_T + \ldots$

ADDITIONAL CRITERIA

(A) $1.05D + 1.28L + 1.05$ SET

(B) $1.4D + 1.4$ SET

(C) $1.0D + 1.0L + 1.0W + 1.0$ SET

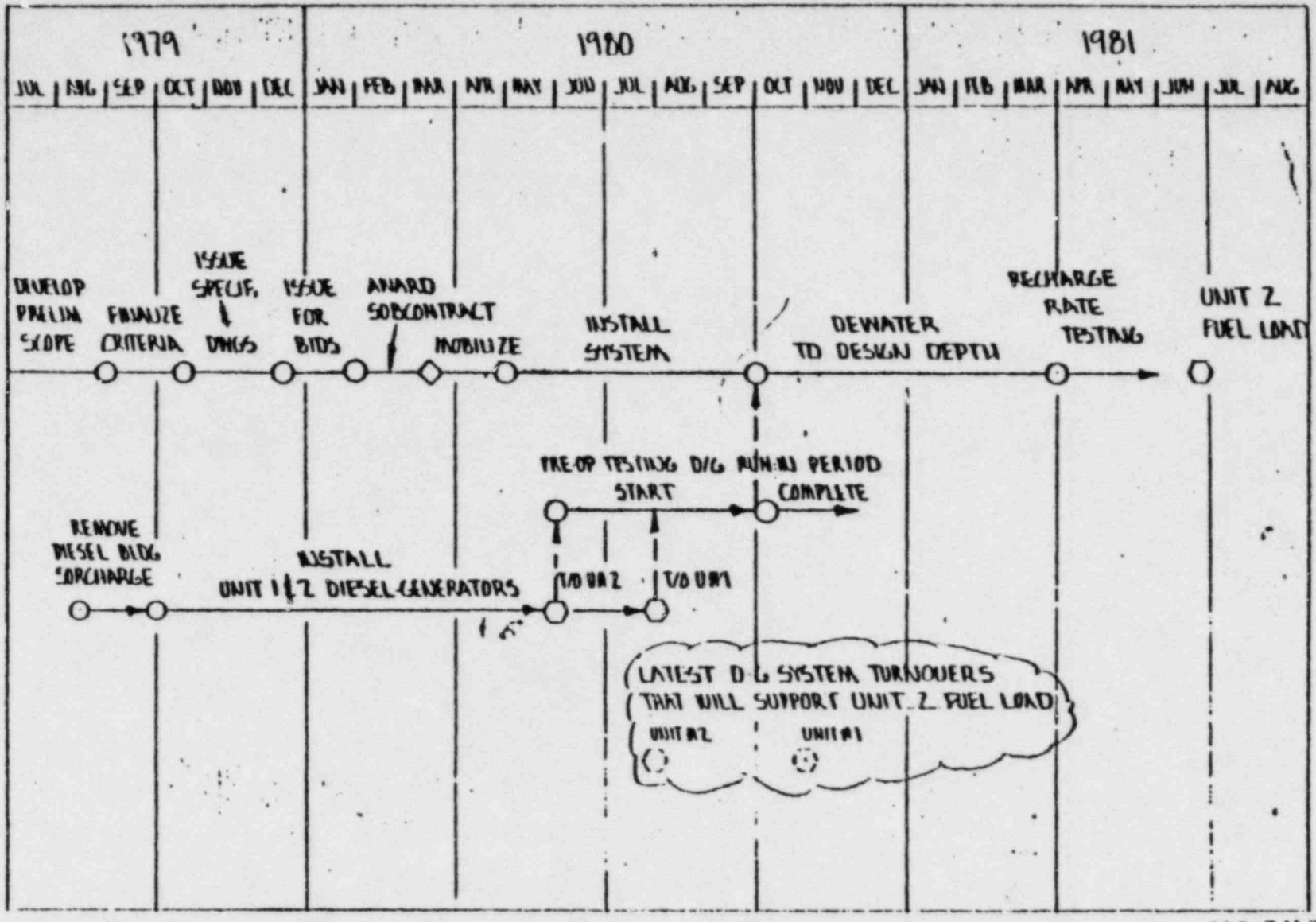
(D) $1.0D + 1.0L + 1.0E_O + 1.0$ SET

D:	DEAD LOAD	E_{SS}:	(SSE) EARTHQUAKE
L:	LIVE LOAD	W_T:	TORNADO
E_O:	(OBE) EARTHQUAKE	SET:	SETTLEMENT
W:	DESIGN WIND		

STRUCTURE	NO. of BORINGS	SUPPORTING SOIL TYPE	PLANNED REMEDIAL MEASURES
A. AUXILIARY BUILDING			
1). CONTROL TOWER	3	SAND	NONE
2). UNIT 1 ELECTRICAL PENETRATION AREA	2	SAND & CLAY	UNDERPINNING
3). UNIT 2 ELECTRICAL PENETRATION AREA	2	SAND & CLAY	UNDERPINNING
4). RAILROAD BAY	3	SAND	NONE
B. FEEDWATER ISOLATION VALVE PITS			
1). UNIT 1	2	SAND & CLAY	UNDERPINNING
2). UNIT 2	3	SAND & CLAY	UNDERPINNING
C. SERVICE WATER PUMP STRUCTURE - PORTION ON FILL	9	CLAY & SAND	UNDERPINNING

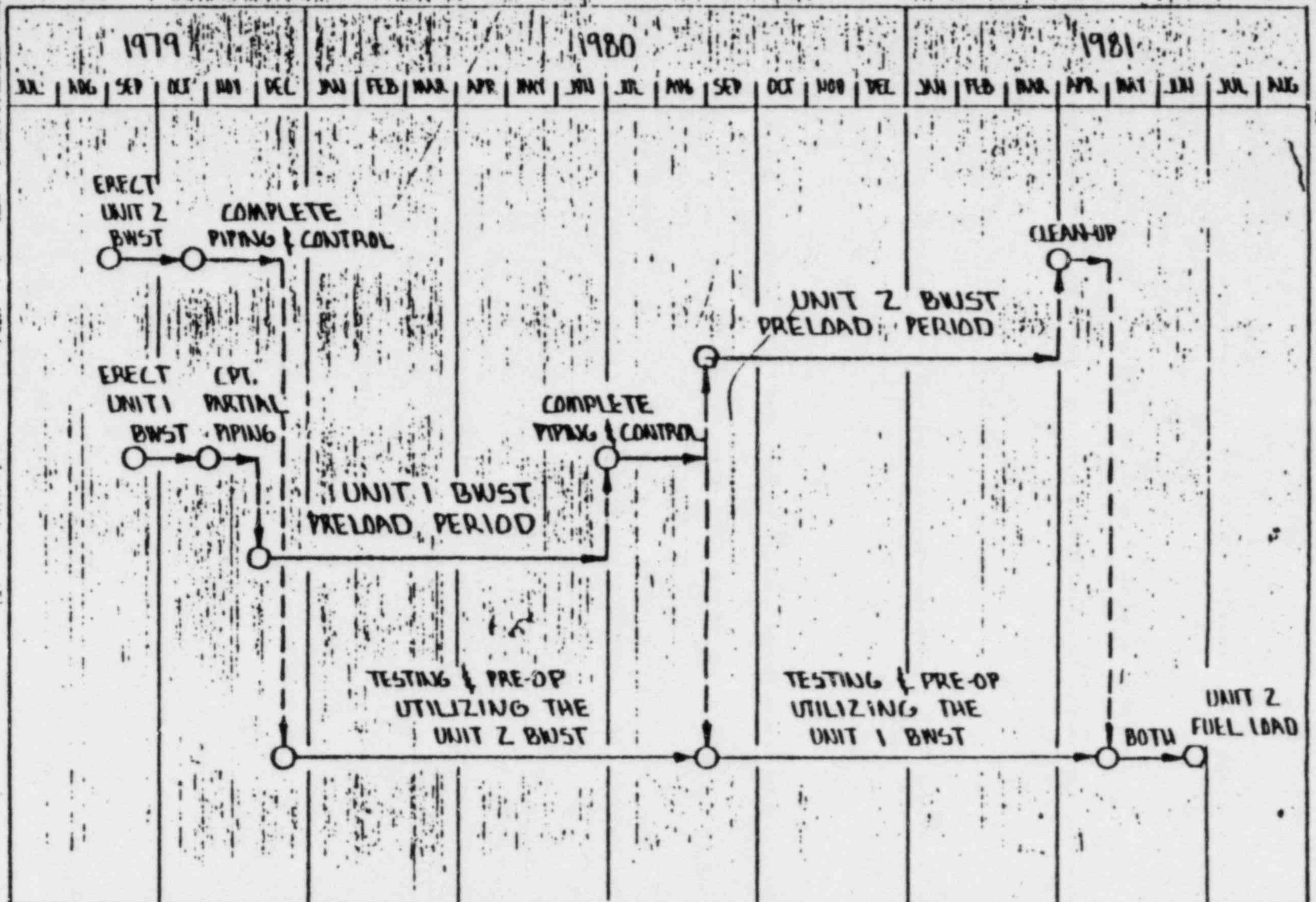
STRUCTURE	NO. of BORINGS	SUPPORTING SOIL TYPE	PLANNED REMEDIAL MEASURES
D. TANKS			
1). DIESEL FUEL OIL STORAGE TANKS	7	CLAY	NONE
2). BORATED WATER STORAGE TANKS	6	CLAY	NONE
E. DIESEL GENERATOR BUILDING	32	SAND & CLAY	SURCHARGE
F. UTILITIES			
1). PIPING	50	SAND & CLAY	NONE
2). DUCT BANKS	38	SAND & CLAY	NONE
3). VALVE PITS	2	SAND & CLAY	NONE

PERMANENT PLANT DEWATERING SYSTEM



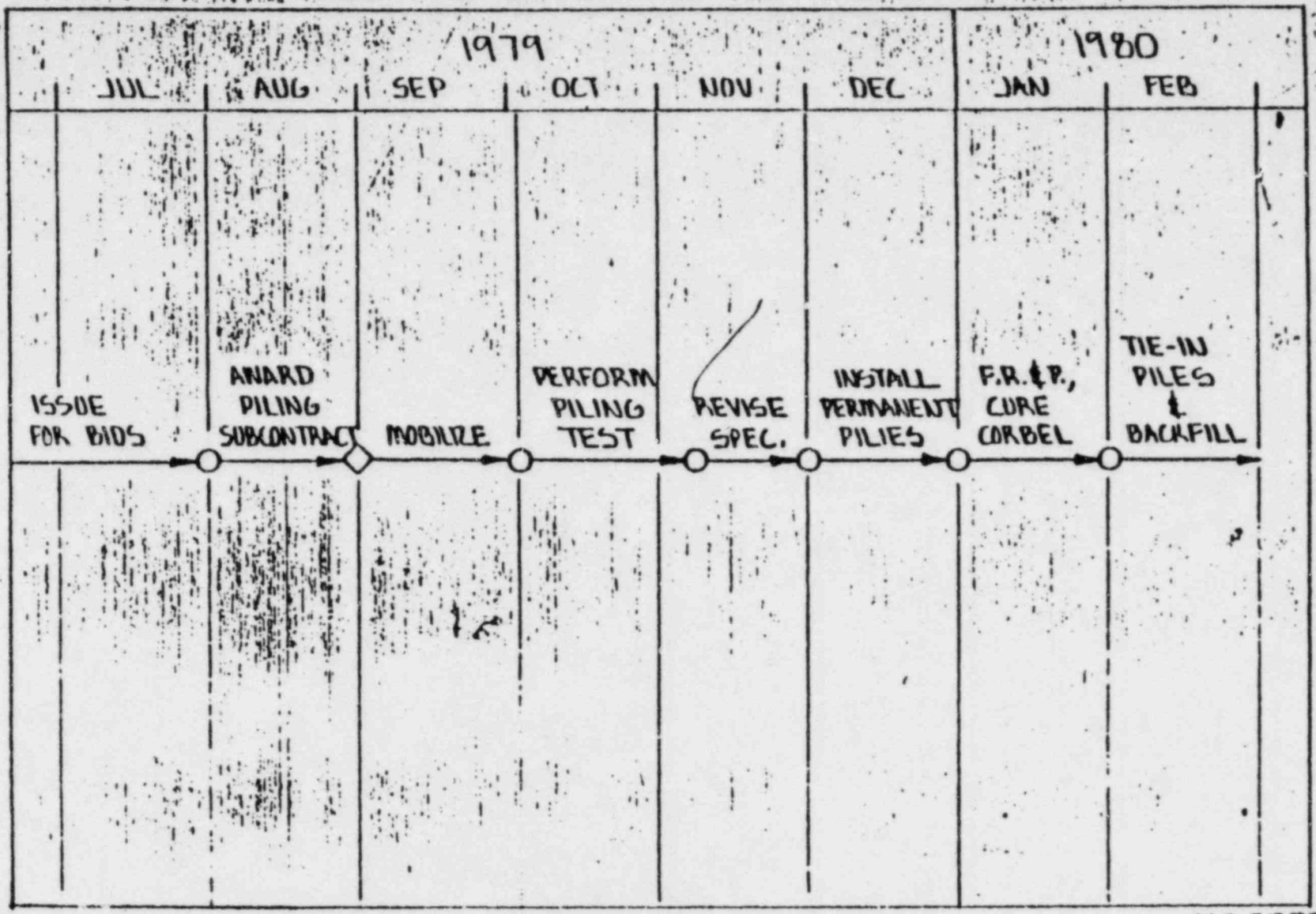
AAO 7-12-79

BORATED WATER STORAGE TANKS



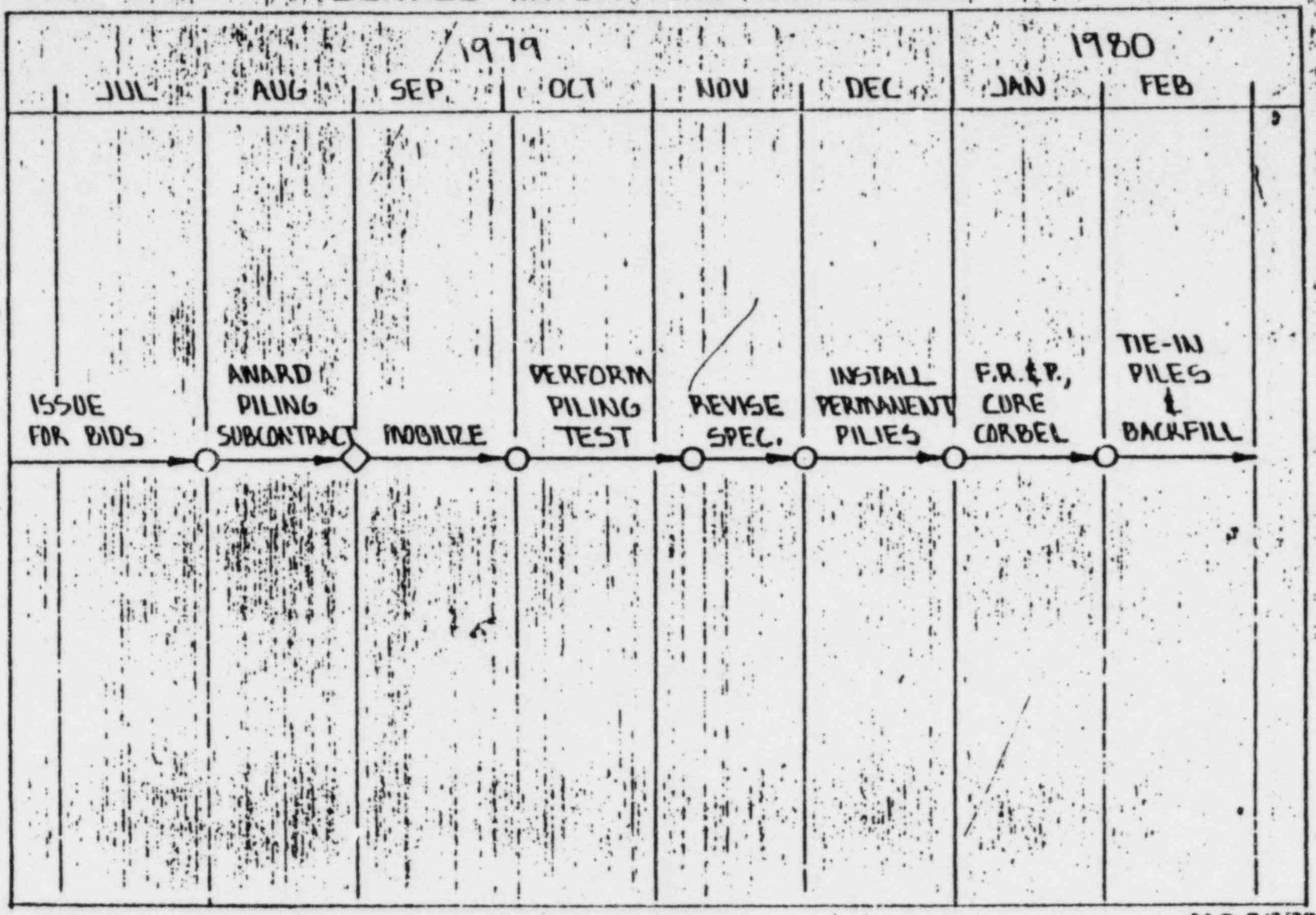
AHD 7-12-79

BEARING PILES FOR SERVICE WATER PUMP STRUCTURE



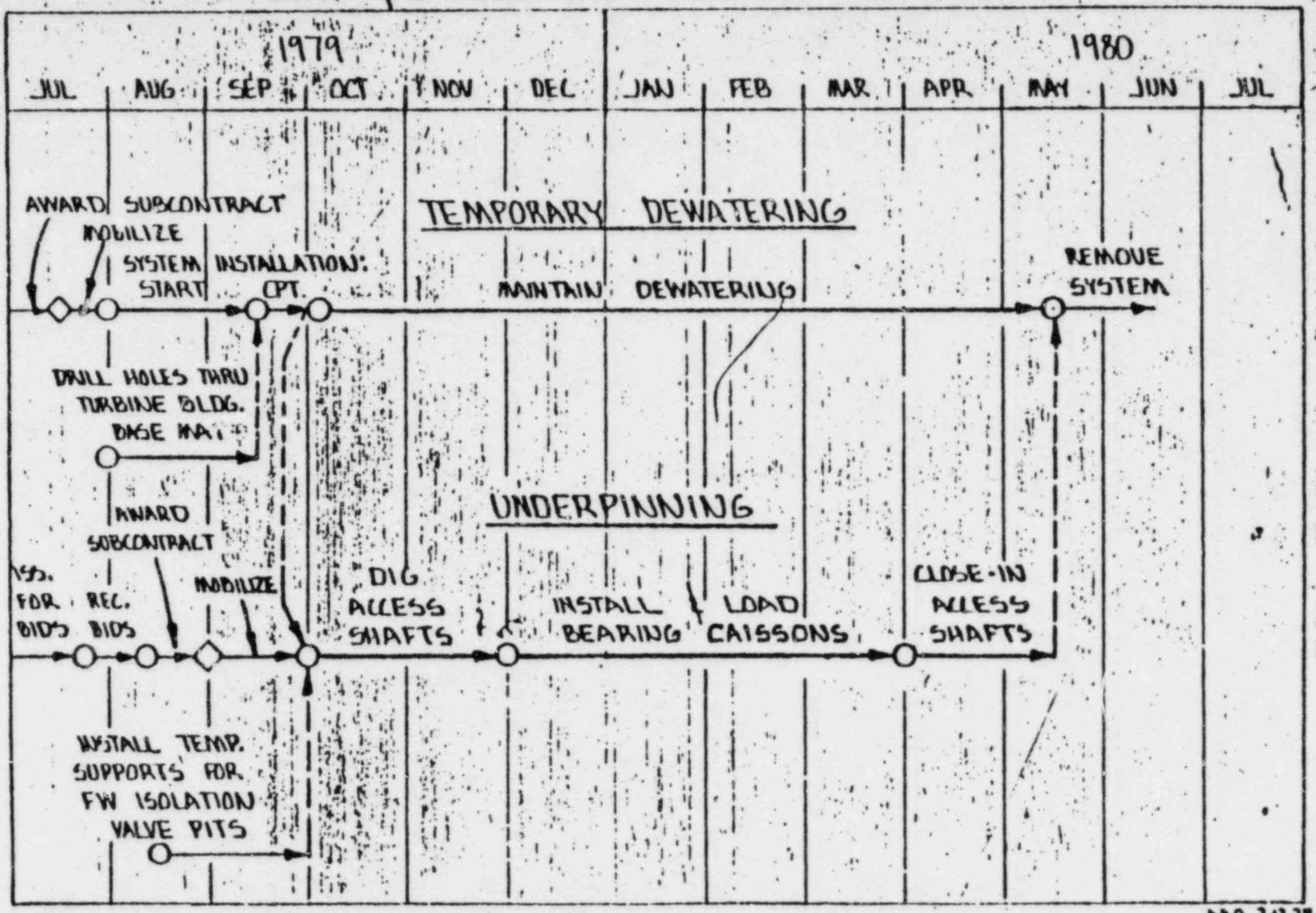
AAD 7-12-79

BEARING PILES
FOR
SERVICE WATER PUMP STRUCTURE



AAD 7-12-79

UNIT 1 & 2 AUXILIARY BLDG. ELECTRICAL PENETRATION AREAS
AND
UNIT 1 & 2 FEEDWATER ISOLATION VALVE PITS



AAO 7-12-79

CRITERIA FOR INSUFFICIENTLY COMPACTED PLANT AREA FILL (On a "To Date" Basis)

- SETTLEMENT GREATER THAN EXPECTED
- RESULTS OF SOILS INVESTIGATION

G-0695-23

SEISMIC CATEGORY I STRUCTURES ON FILL

- AUXILIARY BUILDING (Part)
- SERVICE WATER PUMP STRUCTURE (Part)
- RETAINING WALL AT SERVICE WATER PUMP STRUCTURE
- BORATED WATER TANKS
- EMERGENCY DIESEL GENERATOR FUEL OIL STORAGE TANKS
- SERVICE WATER PIPE LINES AND VALVE PITS
- FW ISOLATION VALVE PITS
- DIESEL GENERATOR BUILDING
- ELECTRICAL DUCT BANKS (Part)
- EMERGENCY DIESEL FUEL OIL & BORATED WATER LINES

INSUFFICIENTLY COMPACTED PLANT AREA FILL
WHAT

Is	Is Not	Distinctions	Changes
DG Bldg	Aux Bldg Control Tower	Time Differential between Placement of Fill and Constr of Facility	
Diesel Tank Area	Plant Area Dikes	Plant Fill Not Dike	Placement Method Controlled
Borated Storage Tank Area			Compaction Results
		Specification C-211	Lift Thickness
SW Pipelines			
Aux Bldg Elec Pen Areas			Moisture Control
FW Isolation Vlv Pits			
SW Pump Structure (Part)			Frost Protection
Aux Bldg RR Bay		Materials	Structural Backfill Introduced (Spec C-211)
Emerg Diesel Fuel Lines Borated Water Lines			
Elect Duct Banks (Part)			
SW Vlv Pits		Acceptance Criteria	Relied on Testing

G 0695 05

INSUFFICIENTLY COMPACTED PLANT AREA FILL WHERE AND EXTENT

Is	Is Not	Distinctions	Changes
Plant Fill Area	Plant Dike	Small Areas	Increased Test Frequency and Location
			Different Contractor (Bechtel)
			Struct Backfill Introduced
			Hand-Held Equipment
			Nonuniform Compaction Methods
		Open to Cooling Pond	Moisture Intrusion in Ground

G 0695-07

INSUFFICIENTLY COMPACTED PLANT AREA FILL WHEN

Is	Is Not	Distinctions	Changes
During Placement of Plant Fill		Pond Filled 3/78	Moisture Intrusion
		Used Stockpile for Borrow after 3/77	Weathered Material
			Initial Moisture Content
			Material In Stockpile?
		1977 Dry Year	Final Moisture Content
		Late in Backfill Operation	Own Weight Settlement (Calcs)

G-0695-08

INSUFFICIENTLY COMPACTED PLANT AREA FILL (Cont.) WHEN

Is	Is Not	Distinctions	Changes
During Placement of Plant Fill		QC Changed to Surveillance In Summer 1976	Inspection Procedures Personnel Qualifications
		Canonie QC Program Discontinued 9/77	
		Canonie Worked 8/77 - 9/77	
		Changed Moisture Control Method 8/77 - 3/78	
		1974-75 Slowdown	Personnel Mobilization Bechtel U. S. Testing
		Spec C-211 Issued & Revised to Include Clay Materials	

G 0695-06

POSSIBLE CAUSES

Distinction or Change	Possible Cause	Comments
1. TIME DIFFERENCE BETWEEN PLACEMEMT OF FILL AND CONSTRUCTION OF FACILITY	NO	Cannot Cause Insufficient Compaction
2. PLACEMENT METHOD		
Lift Thickness/Compactive Effort	YES	Equipment Capability Exceeded in Certain Areas
Compaction Equipment	YES	Equipment Capability Exceeded in Certain Areas
Type of Materials	NO	Compatibility Confirmed
Moisture Control	NO	Period of Inadequate Moisture Control Occurred after All but Top Few Feet Compacted
Compaction by Flooding	NO	Problem Occurs in Clays Also
3. ACCEPTANCE CRITERIA: THEORETICAL COMPARISON OF BMP COMPACTION VERSUS SETTLEMENT	NO	Testing to Confirm

G-0895-05

POSSIBLE CAUSES (Cont.)

	Distinction or Change	Possible Cause	Comments
4.	SPECIFICATIONS	NO	
5.	SOILS TESTING	YES	Investigation In Process
	Methods		
	Equipment		
	Results/Reports		
	Retests		
	Reviews/Evaluations		
	Personnel		
6.	TEST FREQUENCY FOR SMALL AREAS	NO	Problem not Confined to Small Areas
7.	DIFFERENT CONTRACTORS		
	Personnel Qualifications	NO	See #16
	Different Inspection Methods	YES	See #15
	Placement Methods	YES	See #2

POSSIBLE CAUSES (Cont.)

	Distinction or Change	Possible Cause	Comments
8.	EXTENSIVELY REEXCAVATED AREA	NO	Similar Problems In Areas Where Reexcavation Was Not Done
9.	MOISTURE INTRUSION IN GROUND	NO	Not a Cause for Poor Compaction Possible Increase In Settlement If Compaction was Poor
10.	LEAN CONCRETE FILL	NO	
11.	POND FILLED MARCH 1978	NO	See #9 Above
12.	STOCKPILED MATERIAL Weathering Drying Out	NO	See #13 Below

POSSIBLE CAUSES (Cont.)

	Distinction or Change	Possible Cause	Comments
13.	DRY YEAR 1977	NO	1977 Not a Dry Year
14.	OWN WEIGHT SETTLEMENT (Calculations)	NO	Cannot Cause Poor Compaction
15.	INSPECTION PROCEDURES	YES	Bechtel Quality Control Method Relied on the Test Results
16.	PERSONNEL	NO	Review of Qualifications of Bechtel and U.S. Testing. Personnel Shows Sufficient Education, Experience and Training to Carry Out Tasks Assigned
17.	EFFECTS OF 1974-75 SLOWDOWN	NO	

G 0695-22

MOST PROBABLE CAUSES

- LIFT THICKNESS/COMPACTIVE EFFORT
- COMPACTION EQUIPMENT/QUALIFICATION
- TEST PROCEDURES AND RESULTS
- INSPECTION PROCEDURES
- RELIANCE ON TEST RESULTS

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL

Item No.	Prerequisites	79-10
1.	IDENTIFY CONFLICTS WITHIN FSAR	●
2.	IDENTIFY INCONSISTENCIES BETWEEN PSAR/ AND SPECIFICATIONS OR DRAWINGS	●
3.	IDENTIFY INCONSISTENCIES OR OMISSIONS WITHIN SPECIFICATIONS	
4.	RE-EVALUATE CONTINUED USE OF "RANDOM FILL" IN ZONE 2 AREAS	●

● = Located In Indicated Document

G 0095 24

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL (Cont.)

Item No.	Prerequisites	79-10

5. **PROVIDE:**

   Flow Diagram of Necessary Steps for Quality Control and Assurance of Soil Work

   Specific Organization Responsible

   Specific Procedure Used

   Specific Acceptance Criteria

6. **ASSURE THAT ALL "CLARIFICATIONS" AND "INTERPRETATIONS" ARE RESOLVED VIA OFFICIAL SPECIFICATION CHANGE NOTICES**

● = Located in Indicated Document

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL (Cont.)

Item No.	Prerequisites	79-10
7.	APPOINT SINGLE INDIVIDUAL RESPONSIBLE FOR EACH OF THE FOLLOWING:	●
	Directing Construction Aspects of Soils Work	
	Directing Design Aspects	
	Directing Quality Control Aspects	
8.	INSTITUTE 100% INSPECTION OF SOILS PLACEMENT WITH CORRESPONDING INSPECTION RECORD DOCUMENTATION OF SPECIFIC CHARACTERISTICS INSPECTED IN EACH CASE	

● – Located in Indicated Document

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL (Cont.)

Item No.	Prerequisites	79-10
9.	RE-EVALUATE CAPABILITY OF EQUIPMENT BEING USED IN RELATION TO MAXIMUM ALLOWABLE LIFT THICKNESS AND COMPACTION REQUIREMENTS	●
10.	RE-EVALUATE APPROPRIATENESS OF CONTINUED USE OF NUCLEAR DENSOMETER, WITH ITS MEASUREMENT ACCURACY BEING QUESTIONABLE RELATIVE TO MOISTURE CONTENT SPECIFICATION LIMITS OF "PLUS OR MINUS TWO PERCENT OF OPTIMUM"	

● = Located in Indicated Document

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL (Cont.)

Item No.	Prerequisites	79-10
11.	RE-EVALUATE SARs, SPECIFICATIONS AND PROCEDURES RELATIVE TO THEIR ADEQUACY IN SPECIFYING:	
	Points in Process at which Measurements or Test are to be made	●
	Frequencies of these Measurements or Tests	●
	Conditions under which New Laboratory Standards Must Be Acquired	●
12.	ASSURE THAT METHOD EXISTS THREE DIMENSIONAL AND VOLUMETRIC FOR IDENTIFYING SPECIFIC LIFTS WHICH ARE INSPECTED AND TESTED	●

● = Located in Indicated Document

CPCo PREREQUISITES PRIOR TO RESUMPTION OF Q-LIST BACKFILL (Cont.)

Item No.	Prerequisites	79-10
13.	ASSURE NONCONFORMANCE REPORTS ARE DISPOSITIONED	●
14.	ASSURE THAT FIELD DENSITY/MOISTURE TEST THAT PLOT TO RIGHT OF ZERO AIR VOID CURVE ARE UNDERSTOOD	

● = Located in Indicated Document

Q 0695 20

STATUS ATTACHMENT
OF 14 PREREQUISITES

Consumers Power Company Item Number*	Action(s) and Status
1. Identify all conflicts within PSAR, within the FSAR, or between the PSAR and the FSAR, and correct these inconsistencies via official changes to the appropriate documents.	Project Engineering and Geo Tech performed a review of subsections FSAR section 2.5 pertainin to backfill operations to eliminate inconsistencies, etc. Project Engineering and Geo Tech performed a review of the Dames & Moore Soil Report. Resolved CPCo-PMO comments on FSAR Section 2.5. Completed via Rev 7 to Spec C-211.
2. Identify any inconsistencies between the PSAR/FSAR and the detailed specifications or drawings, and correct these inconsistencies via official changes to the appropriate documents.	Resolved CPCo-QA comments on Specifications C-210 and C-211. Completed via Rev 7 to Spec C-211.
3. Identify any inconsistencies or omissions within the specifications and correct these inconsistencies via official Specification Change Notices.	Same as Item #2 Above
4. Re-evaluate the appropriateness of the continued use of "random fill" in Zone 2 areas.	Specification C-211 revised to redefine random fill with special emphasis on soils supporting structure. Completed via Rev 7 to Spec C-211. This will be accomplished through overview by the On-Site Geo-Technical Soils Engineer.
5. Provide a flow diagram of the steps which are needed for the quality control and assurance of soils work and assure that for each step there is a designation as to the specific organization primarily responsible for the action; a designation of the specific procedure to be used; and a designation of the specific acceptance criteria for the step.	A combined flow chart has been prepared illustrating the backfill process and the responsibilities of the On-Site Geo-Technical Soils Engineer, Geo-Tech Soils Engineer, Soils Quality Control Engineer and US Testing. This flow chart has been placed in Field Instruction FIC-1.100 "Q-Listed Soils Placement Job Responsibilities Matrix".

*Per: (1) Meeting minutes from the April 24, 1979 Bechtel/CPCo meeting on resumption of Q-listed backfill
(2) Added action items at the April 26, 1979 Diesel Generator Task Group Meetin
(3) JFNewgen letter to TCCooke BCCC-3995 dated May 4, 1979

Consumers Power Company Item Number*	Action(s) and Status
6. Assure that all "clarifications" and "interpretations" are resolved via official Specification Change Notices.	EDPI 4.49.1 has been revised to incorporate clarifications and instructions for use of Specification Change Notices.
7. Establish a single individual at the site to be responsible for each of the following: directing the construction aspects of the soil work; directing the design aspects; and directing the quality control aspects.	The following positions have been established: a) On-Site Geo-Technical Soils Engineer. b) Geo-Tech Soils Engineer. c) Soils QC Engineer. Their responsibilities are defined in the flow chart described in '5' above.
8. Institute 100 percent inspection of each lift placement with a corresponding Inspection Record documentation of the specific characteristics inspected in each case.	Bechtel QC has revised the Project Quality Control Instruction PQCI/QCIR for backfill placement. Revised PQCI/QCIR calls for inspection of backfill work by a full time Soils QC Engineer with generation of a daily report for each area of backfill worked.
9. Re-evaluate the capability of the equipment being used in relation to the maximum allowable lift thickness and the compaction requirements.	Hand held equipment has been qualified for the two sands to be used. Equipment to be used on cohesive materials are still in progress. All equipment will be qualified in specific soils prior to its use.
10. Re-evaluate the appropriateness of the continued use of the nuclear densometer, with its measurement accuracy being questionable relative to the moisture content specification limits of "plus or minus two percent of optimum".	The use of the nuclear densometer has been discontinued for record inspection use.
11. Re-evaluate the SAR's specifications and procedures relative to their adequacy in specifying the points in the process at which the measurements of tests are to be made, the frequencies of these measurements or tests, and the conditions under which new laboratory standards must be acquired.	Geo Tech has performed this review. An audit has been performed on U.S. Testing by Bechtel to determine the adequacy of their soils testing procedures. The Audit was performed on 4/25 - 26/79. Two findings on administrative policies were found. One against Subcontracts and one against U.S. Testing. Corrective action will be taken prior to starting backfill.

*Per: (1) Meeting minutes from the April 24, 1979 Bechtel/CPCo meeting on resumption of Q-listed backfill
(2) Added action items at the April 26, 1979 Diesel Generator Task Group Meetin
(3) JFNewgen letter to TCCooke BCCC-3995 dated May 4, 1979

Consumers Power Company Item Number*	Action(s) and Status
12. Assure that there is a method, on a three dimensional and volumetric basis, for identifying the specific lifts which are inspected and tested.	Bechtel QC has revised the Project Quality Control Instruction PQCI/QCIR C-1.02 to cover this.
13. Assure that each nonconformance report (regardless of the type of report) is dispositioned.	For each Q-listed area all Discrepancy Reports and NCR's (Bechtel and CPCo) will be fully dispositioned and closed out prior to placement of backfill. Additionally, P.E. will release areas for backfill which are listed in MCAR 24 as questionable areas on a case by case basis by memo or TWX. This will be covered on case by case basis prior to backfill starting in a particular area.
14. Understanding the field density/moisture test in the Oily Waste Area that plotted to the right of the zero-air-void curve.	Bechtel has directed U.S. Testing to check all field density tests for cohesive material agains a zero-air-void curve. Any field test result which plots on, or to the right of the zero-air-voids curve, shall be regarded as suspect and cause for retest. Bechtel Geo-Tech has re-emphasized to U.S. Testing the importance of taking accurate tests.

*Per: (1) Meeting minutes from the April 24, 1979 Bechtel/CPCo meeting on resumption of Q-listed backfill
(2) Added action items at the April 26, 1979 Diesel Generator Task Group Meetin
(3) JFNewgen letter to TCCooke BCCC-3995 dated May 4, 1979

(Items Concern)

Item No	Deficiency Description (Items of Concern)	Location in 50.54(f) Page No (Item)	Location in 78-20 Page No	Location in 78-12 Page No (Item)
1.	Inconsistency between specifications and the D&M Report.	I - 1, 3 A & B (1)	9, 10, 16, 17	8
2.	Lack of formal revisions of Specs to reflect clarification of Spec requirements.	I - 1-3 A & B (2)	9-14	7-8 (4)
3.	Inconsistency of information within the FSAR relating to Diesel Generator Bldg fill material and settlement.	I - 2, 4 A & B (3)	6-8	6-7 (3)
4.	Inconsistency between basis for settlement calcuations for Diesel Generator Bldg & design basis.	I - 2-4 A & B (4)	20-21	--
5.	Inadequate design coordination in the design of the duct bank.	I - 3-5 A & B (5)	23-24	10 (8)
6.	Insufficient compactive effort used in backfill operation.	I - 10 A & B (1)	--	--
7.	Insufficient technical direction in the field.	I - 10 & 11 A & B (2)	24-26	--
8.	Inadequate Quality Control inspection of placement of fill.	I - 13, 14 A & B (1)	25-29	--
9.	Inadequate soil moisture testing.	I - 13, 15 A & B (2)	14-16	8 (4)
10.	Incorrect soil test results.	I - 13, 15 A & B (3)	--	--
11.	Inadequate subcontractor test procedures.	I - 13, 14 & 16 A & B (4)	--	--
12.	Inadequate corrective action for repetitive conditions.	I - 21 & 22 A & B (1)	17-20	--
13.	The Bechtel Quality Assurance Audit and Monitor Program failed to identify the problems relating to the settlement.	I - 21 & 22 A & B (2)	17-20	--

Item No	Deficiency Description (Items of Concern)	Location In 78-20 Page No	Location In 78-12 Page No (Item)	Location In 79-10 Page No (Para)
14.	Effect of ground water on DGB settlement - unresolved.	9	7 10 (3d) (8)	
15.	Inadequate subgrade preparation after winter freeze -	16-17		
16.	(NRC Question No 362.2 on FSAR Section 2.5.4.5.1)	--	8-9 (5)	
17.	(Cracks in concrete structural wall & footing in the DG Bldg)		9 (6)	
18.	(Air bubbles in Tank Farm Area and lack of action)	--	--	6-7 (5)

Deficiency Description
(Items of Concern)

50.54(f)

Item No	Deficiency Description (Items of Concern)	Discussion Items Located on Page No (Item)	Action Status
1.	Inconsistency between specifications and the D&M Report.	I - 6-8 C & D (1)	a. The review of the Dames & Moore Report is complete. Specification C-211 revised accordingly. b. Resolution of the audit findings on the Design Requirement Verification Checklist Audit continues.
2.	Lack of formal revisions of Specs to reflect clarification of Spec requirements.	I - 6, 8 C & D (2)	a. EDP 4.49.1 has been revised to incorporate clarifications and instructions for use of Specification Change Notices. b. Reviewing specifications for specificity completed.
3.	Inconsistency of information within the FSAR relating to Diesel Generator Bldg fill material and settlement.	I - 6, 8 C & D (3)	Complete review of pertinent portions of the FSAR Section 2.5 and 3.8 have been completed.
4.	Inconsistency between basis for settlement calculations for Diesel Generator Bldg and design basis.	I - 6-9 C & D (4)	a. Correct settlement calculations are to be made subsequent to Diesel Generator Building surcharge removal. b. Scheduled audits will be performed on Geo-Tech section on a six month basis. The first audit is scheduled for July 27, 1979. c. Also, audits are scheduled for each design disciplines calculations on a yearly basis.
5.	Inadequate design coordination in the design of the duct bank.	I - 7,9 C & D (5)	Drawings have been reviewed for possible effect of vertical duct bank restrictions in other areas.
6.	Insufficient compactive effort used in backfill operation.	I - 11 C & D (1)	a. Re-evaluation of construction equipment used for compaction is still in process.

50.54(f)

Item No	Deficiency Description (Items of Concern)	Discussion Items Located in Page No (Item)	Action Status
6.	(Contd)		b. The review of other construction specifications and procedures to identify equipment requiring qualifications is still under way.
7.	Insufficient technical direction in the field.	I - 11, 12 C & D (2)	a. An onsite Geo-Tech Soils Engineer and Geo-Tech Soils Engineer have been assigned to the job. b. Field Procedure FPG-3.000 has been reviewed to assure clarity and completeness. c. Consumers Power Company to implement overinspection for soils placement and US Testing activities in the soils area.
8.	Inadequate Quality Control inspection of placement of fill.	I - 16, 18-20 C & D (1), D (5)	a. Project Quality Control Instruction C-1.02 has been revised to provide inspection rather than surveillance and to record daily inspection reports. b. All active PQCI's have been reviewed for surveillance vs inspection call-outs and are now being evaluated. c. Bechtel is working to incorporate scientific sampling plans for inspection areas instead of using percentage sampling (being used now). d. Consumers Power Company to implement overinspection for soils placement and US Testing activities in the soil area on a sampling basis.
9.	Inadequate soil moisture testing.	I - 16-20 C & D (2), D (5)	The use of the nuclear densometer has been discontinued.

50.54(f)

Item No	Deficiency Description (items of Concern)	Discussion Items Located in Page No (Item)	Action Status
10.	Incorrect soil test results.	I - 17-20 C & D (3), D (5)	a. The Project Quality Control Instruction C-1.02 has been revised from surveillance to inspection of the testing operation. b. The in-depth review of soil test results is still in process. c. The in-depth audit of US Testing has been completed. Two findings were a result of this audit. One, administrative problem by US Testing, the other by Bechtel Subcontracts. These audit findings will be closed prior to soil placement. d. PQCI's have been reviewed for adequacy of documentation callouts and are being resolved. e. Consumers Power Company will implement an overinspection of US Testing activities in the soils area. f. Bechtel has directed US Testing to check all field density tests for cohesive material against a zero-air-voids curve. Any field test results which plots on or to the right of the zero-air-voids curve shall be regarded as suspect and cause for re-test. g. Bechtel Geo-Tech has re-emphasized to US Testing the importance of taking accurate tests.
11.	Inadequate subcontractor test procedures.	I - 17-20 C & D (4), D (5)	An in-depth audit of US Testing has been completed with no problems found in the area of the test procedures.

50.54(f)

Item No	Deficiency Description (Items of Concern)	Discussion Items Located in Page No (Item)	Action Status
12.	Inadequate corrective action for repetitive conditions.	I, - 22 C & D (1)	a. An in-depth review of the Bechtel Trend Program Data has been performed by Bechtel QA Management with no items indicating trends found. b. Training sessions have been held in Ann Arbor, Jackson, and Midland site to all Consumers and Bechtel QA Engineers and auditors to increase their awareness of the settlement problem and discuss auditing and monitoring techniques to increase audit effectiveness.
13.	The Bechtel Quality Assurance Audit and Monitor Program failed to identify the problems relating to the settlement.	I - 22 C & D (2)	Same as 12 above.
14.	Effect of ground water on DGB settlement - unresolved.	--	As discussed in the K-T Analysis the effect of ground water on the Diesel Generator Building settlement would be insignificant had the compaction of the material been to the proper density.
15.	Inadequate subgrade preparation after winter freeze -	--	This also has been discussed in the K-T Analysis and has been eliminated as a cause to the Diesel Generator Building Settlement.
16.	(NRC Question NO 362.2 on FSAR Section 2.5.4.5.1)	--	This has been addressed.
17	(Cracks in concrete structural wall & footing in the DG Bldg)	--	This has been addressed by B Dahr in a previous presentation.
18.	(Air bubbles in Tank Farm Area and lack of action)	--	This has been addressed by T. Thiruvengadam in a previous presentation.

Item No	Possible Causes Per K-T Analysis	Corrective Action
1.	Placement method	
	a. Lift thickness/compactive effort	Specification C-211 has been revised such that the uncompacted lift thickness of the backfill material shall be determined by the onsite Geo-Technical Soils Engineer after evaluation of the proposed compaction equipment. However, in no case shall the uncompacted lift thickness exceed 8" for heavy self-propelled equipment and 4" for hand operated equipment. This specification has also been revised to read, "The onsite Geo-Technical Soils Engineer shall verify that the equipment used for compacting the backfill materials be capable of obtaining the desired results and obtaining the same acceptable compaction effort achieved in the test pad area". This verification shall include, but not be limited to, the following: number of passes, speed, revolutions per minute (frequency), overlap per pass, lift thickness requirements and uniformity.
	b. Compaction equipment	Specification C-211 states, "Selection and approval of all the proposed compaction equipment shall be on the basis of demonstrated ability to accomplish adequate compaction without damage to, or overstressing of, the adjacent structural members".
2.	Testing	
	a. Methods	The nuclear densometer will not be used.
	b. Equipment	The nuclear densometer will not be used.
	c. Results/reports	The onsite Geo-Technical Soils Engineer will review and approve each soil test report. This will include, but not be limited to, gradation, moisture and density tests. US Testing will be checking all field density tests for cohesive material against a zero-air-voids curve. Any field test result which plots on or to the right of the zero-air-voids curve shall be regarded as suspect and cause for retest. The onsite Geo-Technical Soils Engineer shall determine all density test locations.

Item No	Possible Causes Per K-T Analysis	Corrective Action
2.	d. Retests	All material represented by failing tests is to be re-worked until the specified density and/or moisture is obtained. No material will be placed on any known failing material until satisfactory tests are obtained.
	e. Reviews/evaluations	See Item c above.
	f. Personnel	An onsite Geo-Technical Soils Engineer and Geo-Tech Soils Engineer have been added at the site. The onsite Geo-Technical Soils Engineer coordinates with craft superintendents and notifies QC of selected areas to be backfilled, monitors subgrade quality and preparation, calling for testing as required. He evaluates size of fill area to determine testing frequency, monitors material and lift thickness placement. Calls for tests in borrow areas for cohesive fill. Monitors compaction process including moisture control for clay. Calls for tests at proper frequency and designates location. Works with craft superintendents and QC to obtain effective remedial action on failing tests. The Geo-Technical Soils Engineer provides overview and inputs technical assistance as required.
3.	Different contractors	
	a. Different inspection methods	The Project Quality Control Instruction has been revised to include a daily soil placement report which is used for each area where soils work is being performed. This report includes sketch showing areas of soil placement, identification of equipment being used, identification of supporting personnel, recording lift thickness measurements which are representative of the fill being placed, compactive effort used, location by grid coordinates and elevation of all tests taken and testing frequencies, types of material placed (cohesive/cohesionless), a Quality Control Engineer will be assigned 100% of his time to soil placement. Consumers Power Company will perform overinspection on a sampling basis of the soil placements. Also see Item 2.f. above.
	b. Placement methods	See Item 1 above.

Item No	Possible Causes Per K-T Analysis	Corrective Action
4.	Inspection procedures	See Item 3.a.

4

September 22, 1982

Docket Nos: 50-329 OM, OL
and 50-330 OM, OL

PRINCIPAL STAFF			
RA		DI	
D/RA			
A/RA			
DRPP			
DEPROS		SLO	
DESTP			
ML			
OL		FILE	

orig 3

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 and 2

SUBJECT: SUMMARY OF SEPTEMBER 8, 1982, MEETING ON SOILS-RELATED QUALITY ASSURANCE IMPROVEMENTS

On September 8, 1982, the NRC staff met in Bethesda, Maryland with Mr. J. Mooney of Consumers Power Company (the Applicant) to discuss measures being considered to assure successful implementation of the quality plan for the Midland soils remedial work. Meeting attendees are listed in Enclosure 1.

During a September 2, 1982, meeting between NRC management and CPCo management and during an earlier SALP meeting, the NRC indicated that implementation of the quality assurance program needs to be improved, especially in the soils remedial areas. Mr. Mooney noted that in response to these NRC concerns, he is preparing a letter to address measures which will be taken to gauge and assure the successful implementation of the quality program, with particular emphasis in the soils areas. The purpose of the meeting was to discuss a preliminary draft of the letter (Enclosure 2) in the soils areas. Another letter covering the total Midland Quality Program implementation is also being drafted by Mr. Mooney.

Mr. Mooney expects to issue his letters in about a week.

/s/

Darl S. Hood, Project Manager
Licensing Branch No. 4
Division of Licensing

Enclosures:
As stated

cc: See next page

8209270014

SEP 27 1982

OFFICE	DL:LB #4	LA:DL:LB #4	DL:LB #4	AD/L:DL			
SURNAME	DHood/hmc	MDuncan	EAdensam	TNovak			
DATE	9/16/82	9/ /82	9/17/82	9/19/82			

MIDLAND

Mr. J. W. Cook
Vice President
Consumers Power Company
1945 West Parnall Road
Jackson, Michigan 49201

cc: Michael I. Miller, Esq.
Ronald G. Zamarin, Esq.
Alan S. Farnell, Esq.
Isham, Lincoln & Beale
Three First National Plaza,
51st floor
Chicago, Illinois 60602

James E. Brunner, Esq.
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Ms. Mary Sinclair
5711 Summerset Drive
Midland, Michigan 48640

Stewart H. Freeman
Assistant Attorney General
State of Michigan Environmental
Protection Division
720 Law Building
Lansing, Michigan 48913

Mr. Wendell Marshall
Route 10
Midland, Michigan 48640

Mr. Roger W. Huston
Suite 220
7910 Woodmont Avenue
Bethesda, Maryland 20814

Mr. R. B. Borsum
Nuclear Power Generation Division
Babcock & Wilcox
7910 Woodmont Avenue, Suite 220
Bethesda, Maryland 20814

Cherry & Flynn
Suite 3700
Three First National Plaza
Chicago, Illinois 60602

Mr. Paul Rau
Midland Daily News
124 McDonald Street
Midland, Michigan 48640

Lee L. Bishop
Harmon & Weiss
1725 I Street, N.W., Suite 506
Washington, D. C. 20006

Mr. Don van Farrowe, Chief
Division of Radiological Health
Department of Public Health
P.O. Box 33035
Lansing, Michigan 48909

Mr. Steve Gadler
2120 Carter Avenue
St. Paul, Minnesota 55108

U.S. Nuclear Regulatory Commission
Resident Inspectors Office
Route 7
Midland, Michigan 48640

Ms. Barbara Stamiris
5795 N. River
Freeland, Michigan 48623

Mr. Paul A. Perry, Secretary
Consumers Power Company
212 W. Michigan Avenue
Jackson, Michigan 49201

Mr. Walt Apley
c/o Mr. Max Clausen
Battelle Pacific North West Labs (PNWL)
Battelle Blvd.
SIGMA IV Building
Richland, Washington 99352

Mr. I. Charak, Manager
NRC Assistance Project
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

James G. Keppler, Regional Administrator
U.S. Nuclear Regulatory Commission,
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Mr. Ron Callen
Michigan Public Service Commission
6545 Mercantile Way
P.O. Box 30221
Lansing, Michigan 48909

cc: Commander, Naval Surface Weapons Center
ATTN: P. C. Huang
White Oak
Silver Spring, Maryland 20910

Mr. L. J. Auge, Manager
Facility Design Engineering
Energy Technology Engineering Center
P.O. Box 1449
Canoga Park, California 91304

Mr. Neil Gehring
U.S. Corps of Engineers
NCEED - T
7th Floor
477 Michigan Avenue
Detroit, Michigan 48226

Charles Bechhoefer, Esq.
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Frederick P. Cowan
Apt. B-125
6125 N. Verde Trail
Boca Raton, Florida 33433

Jerry Harbour, Esq.
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Geotechnical Engineers, Inc.
ATTN: Dr. Steve J. Poulos
1017 Main Street
Winchester, Massachusetts 01890

ENCLOSURE 1

ATTENDEES

September 8, 1982

NRC

T. Novak
D. Hood
W. Shafer (RIII)

CPCo

J. Mooney
J. Cook (part time via telephone)

OFFICE ▶							
SURNAME ▶							
DATE ▶							

Enclosure 2

Consumers Power Company

James W Cook
Vice President - Projects, Engineering and Construction

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0453

Received during Meeting of September 8, 1982

September 7, 1982

Harold R Denton, Director
Office of Nuclear Reactor Regulation
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND NUCLEAR COGENERATION PLANT
MIDLAND DOCKET NOS 50-329, 50-330
RESPONSE TO OPEN ITEMS OF DRAFT SER
FILE 0485.16 SERIAL 19158

DRAFT

This letter summarizes Consumers Power Company's discussions with the NRC management regarding our mutual desire to implement a successful quality program for the Midland soils remedial work.

The 1980/1981 SALP Report, presented to Consumers in late April of this year, indicated that activities in the soils area should receive more inspection effort on the part of both the NRC and CP Co. Follow-up discussions with the NRR staff and Region III Inspectors led to the conclusion that the Quality Program and its definition was adequate; however, there was concern that certain aspects were not being or might not be satisfactorily implemented. This was corroborated by the fact that the majority of the NRCs recent inspection findings at the Midland Site were in the soils area.

DRAFT

Consumers Power has performed an in-depth review of all aspects of the implementation plans for the Midland Soils work activities. This review included the areas of design and construction requirements and plans, organization and personnel, project controls and management involvement. The results of this review and the proposed steps for the successful implementation of the Quality Program were discussed with the NRC management in a meeting held in Chicago on September 2, 1982. In addition, because of the expanded underpinning activities scheduled to begin shortly, Consumers proposes to retain a qualified third party for an assessment of the initial phase of the implementation of these work activities. The highlights of the September 2 discussions are presented in the following paragraphs.

The design for the required remedial activities is in an advanced state; design details and adequacy have been reviewed by numerous organizations. A special ACRS Subcommittee reviewed the soils activities and concluded that there were no open items, while commenting favorably on the thoroughness and conservatism of the review and remedial approaches. Numerous submittals to the NRC have been presented to clarify the design intent. The NRC Staff has subsequently completed its detailed review of all design aspects, has reached the conclusion that no open issues remain, and is in the process of issuing an SSER. Following-up on design activities, Bechtel has assigned to the site a design team comprised of experienced structural and geotechnical engineers under the Resident Engineer. This team will monitor and review the field implementation, resolve on a timely basis routine construction questions requiring engineering response and immediately administer contingency plans immediately if any problem should arise during the underpinning work.

Following coupled with an effective design process, the next step in quality performance of the soils remedial work involves a system to assure that all design requirements and commitments are properly reflected in the final product. To this end, all soils activites covered by the ASLB Order of April 30, 1982 are "Q-listed" and are covered under soils-specific QA plans. These require that appropriate procedures are in place to accomplish the work in a quality manner successfully and that detailed inspection plans and over-inspection plans have been developed and are utilized. Additionally, the Work Authorization Procedure and Work Permit System insure the NRC and CP Co have specifically approved and released the work.

To assure that all commitments made to the NRC are properly accounted for in design documents, Consumers reviews written records of commitments and incorporates them in design detail. The Project is also undertaking a review of past correspondence to create a computer listing of all commitments not already placed in construction documents. This computer list will be periodically reviewed to insure that commitments are incorporated in design or construction documents in a timely fashion.

Another aspect of the Company's quality implementation program calls for an efficient, integrated quality organization staffed by qualified, experienced personnel. The present project organization provides single-point accountability, dedicated personnel, minimum interfaces - particularly at the working level, and a quality organization integrating quality assurance and quality control. This organization is staffed by personnel with the experence

necessary to successfully accomplish the work. (The qualifications of key personnel were discussed in more detail in our recent meeting.)

To enhance the performance of key project organizations, the Company will maintain day-to-day control over scheduling, both through the construction approval process and by frequent meetings with the involved contractors and subcontractors. Each week, underpinning subcontractors will present proposed construction work to the Company. In addition, to reduce schedule pressures on involved subcontrators, all subcontracts were entered into on a time-material basis. This should improve subcontractor attention to detail in performance of specific construction activities.

Another important element of the proposed soils implementation plan involves employee training. The training program, which includes all organization and personnel, covers both general training in quality and specific training relative to the construction procedures. More specifically, all personnel associated with Remedial Soils work have attended a special Quality Assurance Indoctrination Session. This includes Bechtel Remedial Soils Group, Bechtel QC, MPQAD, Mergentime and Spencer, White and Prentis (SW&P) personnel down to the craft foreman level. This training consits of one three-hour session covering Federal Nuclear Regulations, the NRC, Quality Programs in general, and the Remedial Soils Quality Plan in detail. In addition to the forementioned training, both Mergentime and SW&P Procedures for Quality Related Training require specific training prior to initiating any quality related construction activity. The extent of this training, and identification of individuals to receive it, are spelled out in

the each separate procedures governing quality related activities. Training requirements are listed in the prerequisites section of each procedure, and are QC and QA Hold Points, which must be signed by a QC and QA representative prior to the beginning of relevant activities.

Beyond training, an additional measure to improve performance involves the creation of a new Quality Improvement Program (QIP) for the soils project. To launch their effort, an indoctrination program will be presented to all individuals, stressing the absolutes of Quality and the concept of "Doing it right the first time." Measures specific to soils will be developed for those critical areas which are indicative of a "quality product". Tracking these activities will provide an indication of the effectiveness of the program. The QIP will provide mechanisms for individual "feedback" and will enhance existing QIP programs.

In addition to embracing well-defined design and implementation requirements, a qualified organization and strict performance standards, the soils remedial work will include a high level of senior management involvement. Towards this end, project senior management will conduct weekly in-depth reviews on site of all aspects of the work including quality and implementation of commitments. The Company's CEO is briefed on a regular basis and schedules bi-monthly briefings on all aspects of the project including soils. During the bi-monthly briefings the CEO tours the Midland site.

Complementing the enhanced CP Co management role, NRC Region Management overview of the construction process will be assured by monthly meeting, agreed upon by the Region, to overview the results of the quality program and the progress of the soils project. These meetings will cover any or all aspects of the project of general or special interest to the NRC management.

A final element of the Company's of quality implementation effort is the establishing of an independent appraisal program. This program is independent of the design and construction effort and will assess implementation during the initial three months of the underpinning of the auxiliary building or longer if circumstance warrant. This independent appraisal program implementation will be in place prior to starting Phase 3, which is defined as starting with the removal of soil for the grillage beams at Piers East and West #8 (Piers E/W8 are installed as Phase 2).

The independent appraisal will be conducted by a team of nuclear plant construction and quality assurance experts. This team will be supplemented by the addition of an underpinning consultant who will review the design documents, construction plans and construction itself to assure not only that the design intent is being implemented but also that the construction is consistent with industry standards. The assesment will further assure that the QC program is being implemented satisfactorily and that the construction itself is being implemented in accordance with the construction documents. Contract negotiations are in process with Stone and Webster to assume the lead role in this appraisal. They will be assisted by Parsons, Brinkerhoff, Quade and Douglas, Inc who will provide technical expertise.

Based on the discussion outlined above, CP Co believes that the soils program has been thoroughly and critically evaluated, and that all prerequisites for successful implementation have been or are being accomplished. The Company's program, with the initial overview from the independent implementation assessment, and the continuing overview by the NRC staff and management should provide proper assurance that the remedial soils activities will be successfully completed.

JWC/JAM/cl

CC Atomic Safety and Licensing Appeal Board
CBechhoefer, ASLB, w/o
MMCherry, Esq, w/o
FPCowan, ASLB, w/o
RJCook, Midland Resident Inspector, w/o
SGadler, w/o
JHarbour, ASLB, w/o
GHarstead, Harstead Engineering, w/a
DSHood, NRC, w/a (2)
DFJudd, B&W, w/o
JDKane, NRC, w/a
FJKelley, Ewq, w/o
RBLandsman, NRC Region III, w/a
WHMarshall, w/o
JPMatra, Naval Surface Weapons Center, w/a
WOtto, Army Corps of Engineers, w/o
WDPaton, Esq, w/o
SJPoulos, Geotechnical Engineers, w/a
FRinaldi, NRC, w/a
HSingh, Army Corps of Engineers, w/a
BStamiris, w/o

DRAFT

oc0982-2607a102

CONSUMERS POWER COMPANY

Midland Units 1 and 2
Docket No 50-329, 50-330

Letter Serial Dated

At the request of the Commission and pursuant to the Atomic Energy Act of 1954, and the Energy Reorganization Act of 1974, as amended and the Commission's Rules and Regulations thereunder, Consumers Power Company submits

CONSUMERS POWER COMPANY

By

J W Cook, Vice President
Projects, Engineering and Construction

Sworn and subscribed before me this ____ day of _____.

Notary Public
Jackson County, Michigan

My Commission Expires _____

oc0982-2607a102

DRAFT

CONSUMERS POWER COMPANY

Midland Units 1 and 2
Docket No 50-329, 50-330

Letter Serial Dated

At the request of the Commission and pursuant to the Atomic Energy Act of 1954, and the Energy Reorganization Act of 1974, as amended and the Commission's Rules and Regulations thereunder, Consumers Power Company submits

CONSUMERS POWER COMPANY

By /s/ J W Cook

J W Cook, Vice President
Projects, Engineering and Construction

Sworn and subscribed before me this ____ day of _____.

/s/ Barbara P Townsend

Notary Public
Jackson County, Michigan

My Commission Expires _____

DRAFT

oc0982-2607a102

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

DEC 21 1982

Docket Nos: 50-329
and 50-330

4.a

PRINCIPAL STAFF			
RA		OI	
D/RA		ENF	
A/RA		SPC	
DRPRP		PAO	
DEP&OS		SLO	
DESTP			
ML			
OL		FILE	

MEMORANDUM FOR: T. M. Novak, Assistant Director for Licensing
Division of Licensing

THRU: E. G. Adensam, Chief
Licensing Branch No.
Division of Licensing

FROM: R. W. Hernan, Project Manager
Licensing Branch No. 4
Division of Licensing

SUBJECT: DECEMBER 7, 1982 MEETING ON MIDLAND QA IMPLEMENTATION

The purpose of this memo is to document my understanding of the conclusions reached at the meeting held in Bethesda on December 7, 1982 among Region III, Division of Licensing and Inspection and Enforcement (HQ). The purpose of the meeting was to discuss (a) Midland's QA implementation history, (b) the recent Region III inspection of the Midland Diesel Generator Building, (c) the recent decision by Consumers Power to stop certain safety-related work being performed by Bechtel, and (d) discuss the staff's position and approach regarding the QA implementation programs (including IDVP) which have been proposed by Consumers Power over the past three months.

BACKGROUND

By letter dated September 16, 1982, the staff (Region III W/NRR concurrence) approved two "quality assurance plans" for the Midland Plant. Those plans were MPQP-1, Revision 3 (for the overall Midland work scope) and MPQP-2, Revision 0 (for the soils remedial work only). Since that time, the following submittals have been received from Consumers Power Company:

1. September 17, 1982 - CPCo letter #18845 proposing a QA "implementation plan" for the soils remedial work QA plan. This proposal followed a September 2 meeting in Chicago between CPCo, RIII and NRR and contained the following elements:
   a) A third-party assessment (by Stone and Webster) of the auxiliary building underpinning implementation.
   b) Integrating all QA/QC functions into one organization under the control of Consumers Power.
   c) Creating a "soils project organization" with single-point accountability and dedicated employees.
   d) Upgrading training of workers and supervisors involved in the soils remedial work.

8212300076

DEC 23 1982

e) Developing a quality improvement program specifically for soils remedial work.
f) Increasing senior management involvement in the soils work.
g) Developing an administrative system for tracking design commitments.

2. September 17, 1982 - CPCo letter #18850 proposing QA "implementation plan "for the total Midland work scope (vs soils only). This plan documented two significant new commitments by CPCo with details of the second commitment (IDVP) to be supplied at a later date. Those commitments were:
   a) Placing all QA/QC functions under the direct control of Consumers Power (such as was done for the soils remedial work). This entailed requalifying Bechtel QA/QC personnel to Consumers Power procedures.
   b) Initiating a "total project independent verification program" consisting of a "horizontal" type review using INPO quidelines and a "vertical slice" evaluation of a critical plant system. At the time of this letter, contractors had not been selected to carry out these programs.

3. October 5, 1982 - CPCo letter #18879 which supplied details regarding the independent review program committed to in letter #18850. This letter proposed a 3-part program consisting of:
   a) Biennial QA audit by MAC
   b) INPO type review by MAC
   c) Independent Design Review of the AFW system by Tera Corporation.

4. December 3, 1982 - CPCo letter #19750 modifying the program proposed in the October 5 letter as the result of two meetings (10/25 and 11/5) with (and verbal feedback from) the staff. The modifications and additional commitments were:
   a) To not have MAC coordinate the results of Tera's independent review as originally proposed.
   b) To maintain the MAC and Tera evaluations completely separate in terms of personnel involved.
   c) A second system will be included in the Tera IDV. The staff was given three candidate systems to choose from on the basis of the PRA. Those systems are the electric power system (diesel generator), the safeguards chilled water system, and the containment isolation system.
   d) To expand the Tera IDV to include more in-depth review of construction activities.
   e) To ensure any discussion between Tera and CPCo personnel regarding confirmed findings would take place in open meetings of which the NRC would be notified.
   f) The INPO evaluation final report would be sent to the NRC at the same time it is sent to INPO.

5. December 6, 1982 - CPCo letter #20262 requests staff (Region III) concurrence to proceed with remedial work on piers 12 east and 12 west and provides an update of the status of the seven commitments made in letter #18845 (Item #1 above).

SUMMARY OF MEETING

After detailed discussion of the topics on the meeting agenda, it is my understanding that the following general agreements were made:

1. Region III intends to document the results of the DGB inspection in a formal report to be issued mid-to-late December, 1982.
2. On the basis of the December 6 CPCo letter, Region III would issue a letter in the near future to authorize the start of work on pier 12.
3. Region III would prepare a letter to Consumers Power (w/NRR concurrence) requesting them to consolidate their various proposals on QA implementation plans and independent review/assessments into one single document.
4. After a revised, consolidated proposal is received from CPCo, the staff would schedule two meetings in Midland to present the staff's position to CPCo and to interested members of the public. Tentatively, this meeting was planned for the first week in January 1983.
5. The letter jointly prepared by Region III and NRR in response to CPCo letter #18845 (QA implementation for the soils remedial work) would not be issued.
6. The Division of Engineering has the technical responsibility for choosing which of the three systems proposed in the December 3 CPCo letter should be added to the scope of the independent design verification to be conducted by Tera Corporation.

We conclude that, as a result of this meeting, the only licensing action for NRR is completion of Item No. 6 above. LB#4 will be coordinating with DE toward timely completion.

Ronald W. Hernan

Ronald W. Hernan, Project Manager
Licensing Branch No. 4
Division of Licensing

cc: J. Keppler, RIII
D. Eisenhut
R. Warnick, RIII
W. Shafer, RIII
R. Cook, Midland Resident Inspector
R. Vollmer
E. Sullivan
D. Hood
R. DeYoung, IE
E. Adensam

Consumers
Power
Company

Midland Project: PO Box 1963, Midland, MI 48640 • (517) 631-8650

February 4, 1983

Mr. W. D. Shafer, Chief
Midland Project Section
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND PROJECT GWO 7020
AUTHORIZATION FOR AUXILIARY BUILDING UNDERPINNING PIER 9
File: 0485.16 UFI: 43*05*22*04 Serial: CSC-6537
12*32

We have completed our review of the documents for Pier 9 E&W. Based on our review, we have concluded that we are ready to start the work.

According to the NRC/CPCo Work Authorization Procedure, we request authorization for the following activities:

165052010 - Drift from Access Shaft Under FIVP to Pier 9W

165053005 - Excavate Pier 9W

165054005 - Install and load Pier 9W

155052010 - Drift from Access Shaft under FIVP to Pier 9E

150053005 - Excavate Pier 9E

155054005 - Install and load Pier 9E

Please note that the activities listed above are similar to the corresponding activities for Pier 12 which have previously been authorized.

D. B. Miller
Site Manager

DBM/GBJ/lrb

8302170508

MIDLAND PLANT UNITS 1 AND 2

SOILS REMEDIAL CONSTRUCTION

INDEPENDENT ASSESSMENT

OF AUXILIARY BUILDING UNDERPINNING

CONSUMERS POWER COMPANY
DESIGN PRODUCTION DEPARTMENT
MIDLAND PROJECT

SPEC NO CC-100

REV 0 DATE Sept 20, 1982

PREPARED BY K L B Razdan

APPROVED BY R C Bauman
Design Production Depart

APPROVED BY [signature]
MPQAD

mi0982-2624a141

8406120015

MIDLAND PLANT
SOILS REMEDIAL CONSTRUCTION
INDEPENDENT ASSESSMENT
OF AUXILIARY BUILDING UNDERPINNING

CONTENTS

MIDLAND PLANT

SOILS REMEDIAL CONSTRUCTION

INDEPENDENT ASSESSMENT

OF AUXILIARY BUILDING UNDERPINNING

1.0 GENERAL

1.1 Background

Owner (Consumers Power Co) is engaged in a comprehensive program to resolve soils-related issues identified during plant construction.

Excessive settlement of the diesel generator building (DGB), resulting from inadequately compacted plant fill, was identified in July 1978. Since then, extensive exploratory tests and studies have been conducted to determine the exact cause and extent of this problem. Subsequently, other soils related problems have been identified.

In addition to the soils related issues, remedial actions are necessary to correct a design problem affecting the two borated water storage tank (BWST) foundations.

On April 30, 1982 the ASLB issued an order further defining the total scope of the soils project.

1.2 Remedial Action

The following remedial actions of soils related issues are being implemented at the plant site.

a. The settlement problem of the DGB has been essentially resolved by preloading the area in and around the building to achieve accelerated consolidation of plant fill which supports the building.

b. Inadequately compacted fill under portions of the auxiliary building and feedwater isolation valve pit (FIVP) will be resolved by constructing underpinning under the auxiliary building and replacing the existing backfill under the FIVP. When completed, the new foundations will carry the loads to the undisturbed natural soils underlying the site. These new foundations will meet newly established seismic design criteria promulgated by the NRC.

c. Inadequately compacted fill under the overhang portion of the service water pump structure will be resolved by constructing underpinning similar to that under the auxiliary building.

d. Design problems associated with the BWST foundation will be resolved by the preload of the valve pit, which has been completed, reinforcing the old ring beam with a new concentric ring beam, and releveling the tank for Unit 1.

e. Potential liquefiable pockets of backfill supporting some Seismic Category I structures and utilities will be resolved by providing a permanent plant dewatering system.

f. The adequacy of all underground Seismic Category I utilities will be ensured by a variety of actions ranging from acceptance of existing facilities to complete replacement.

1.3 Identification of Contractors

Bechtel Power Corporation (BPC) is under contract to the Owner for construction of the total plant including the soils remedial work. BPC has subcontracted the underpinning of the auxiliary building to Mergentime Corporation. The design and operation of the underpinning instrumentation for the auxiliary building and the service water pump structure has been subcontracted to Wiss, Jenney, Estener and Associates. The service water pump structure underpinning and some associated underground pipe work has been subcontracted to Spencer White and Prentiss. Remaining soils remedial construction will be performed by BPC and others.

2.0 SCOPE OF WORK

2.1 Consultant's Scope

The Consultant shall perform an independent assessment of construction activities related to the auxiliary building and feedwater isolation valve pit remedial work at the Midland site. The diesel generator building, borated water storage tank, service

water pump structure, permanent dewatering system and buried piping remedial work is excluded.

The scope of work involved in this independent assessment consists of the following.

a. Development of an assessment program and preparation of a Project Quality Plan.

b. Overview of the design and construction documents to gain familiarity with the work.

c. Evaluation of the adequacy of technical and related administrative construction and quality procedures.

d. Evaluation of the degree of compliance with technical and administrative construction and quality procedures.

e. Daily reviews with the Owner and his contractor to obtain any clarifying information and project documents that are needed to carry out this assessment. The Owner and the consultant will establish a specific communication plan at the start of the assessment.

f. Submittal of any nonconformance reports to the NRC with a copy to the Owner.

g. Submittal of brief weekly progress reports and a final report to the NRC with a copy to the Owner.

h. The final report shall be overviewed by a senior level Consultant management and technical team.

i. The Consultant and its subcontractors shall not be responsible for implementation of corrective action, however their professional opinion may be requested.

2.2 Owner's Scope

To support the independent assessment, the following information and facilities will be made available by the Owner.

a. Design and construction drawings, specifications, and procedures.

b. Building and pier monitoring data.

c. Test results.

d. Construction schedules.

e. Any and all other information and access to facilities needed by the Consultant and it's approved subcontractors.

f. On-site office facilities.

2.3 Schedule

The duration of the assessment will be determined by the assessment team.

The Owner's commitment to the NRC is that the program will cover, at a minimum, the next three months of the auxiliary building underpinning work as authorized by the NRC. The assessment shall continue until the assessment team concludes that not only is the design intent being implemented but, also that the construction is consistent with industry standards. The assessment will further assure that the QA Program is being implemented in accordance with the construction documents.

Mobilization of the Consultant is required to start during the week of September 20, 1982.

3.0 ORGANIZATION

The Consultant shall provide overall management of the program. The Site Leader ~~Project Manager~~ and other key individuals shall be assigned on a full time basis.

The Consultant shall hire Parsons, Brinkerhoff, Quade and Douglas, Inc as a subcontractor to assist in the assessment and to provide specialized technical expertise for the underground and underpinning work. The Consultant shall provide technical and on-site office personnel as required. Prior to their assignment to the work, the resumes of all technical persons shall be submitted to the Owner to document the professional competence of the assessment team. If additional subcontractors are needed, advance permission from the Owner is required.

4.0 QUALITY ASSURANCE REQUIREMENTS

4.0 Quality Assurance Requirements

4.1 Quality Assurance Program

Stone & Webster shall have a QA Topical Report which is approved by the NRC and which complies with the requirements of ANSI N45.2 as endorsed by USNRC Regulatory Guide 1.28 (6/72). As applicable to the scope of this contract, Stone & Webster shall implement this Topical Report.

4.2 Access to Facilities and Records

At anytime throughout the contract period, Stone & Webster shall provide access to the Owner, the Owner's representatives and the NRC, to all facilities and work records related to the scope of this contract.

4.3 Project Quality Plan

Stone & Webster shall prepare a Project Quality Plan which will be implemented for this contract. The Plan shall address, at a minimum, the following:

a. The project organization and authorities and responsibilities of each organizational element;

b. The control of suppliers;

c. The qualification of personnel performing assessment;

d. The reporting of non-conformances to the Owner and the NRC.

4.4 Document Submittals

4.4.1 Stone & Webster shall submit the QA Topical Report and the Project Quality Plan for Consumers Power review and approval.

Written Consumers Power concurrence shall be obtained prior to the start of any appraisal activities. In addition, any revisions to the Project Quality Plan shall be submitted for CP Co concurrence prior to implementation.

The above submittals, plus those identified in Section 2.1 shall be submitted to:

Consumers Power Company

1945 West Parnall Road

Jackson, MI 49201

Attention: J A Mooney

5.0 INDEPENDENCE CRITERIA

The following independence criteria shall apply to the Consultant's, its subcontractors and all its employees assigned to this task.

a. The companies or individuals shall not have had any direct previous involvement with the Midland activities that they will be reviewing.

b. The companies or individuals shall not have been previously hired by the Owner to perform design, construction or quality work relative to the soils remedial program.

c. The individuals shall not have been previously employed by the Owner within the last three years.

d. The individual shall not have present household members employed by the Owner.

e. The individuals shall not have any relatives employed by the Owner in a management capacity.

f. The individuals shall not own or control significant amounts of Owner stock.

In addition to the above considerations, the following procedural guidelines will be used to assure independence:

An auditable record will be provided of all Owner comments on draft or final reports, procedures or other documents, any changes made as result of such comments, and the reasons for such changes.

The Consultant shall include these criteria in all subcontracts with certification of compliance provided to the Owner.