

San Onofre Nuclear Generating Station Units 2 and 3



H&CF Geology

REPORT ON EXPLORATION/ GROUTING PROGRAM DEWATERING WELL NO. 7

VOLUME I

June 1979

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REPORT ON
EXPLORATION/GROUTING PROGRAM
DEWATERING WELL NO. 7
(VOLUME I)

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SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
BECHTEL JOB 10079-003

JUNE 1979

VOLUME I
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Well No. 7

REPORT ON
EXPLORATION/GROUTING PROGRAM
DEWATERING WELL NO. 7

SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 & 3
BECHTEL JOB 10079-003

1.0 INTRODUCTION

Discovery of a cavity at Dewatering Well No. 6 during demobilization operations prompted investigation of the balance of the other wells in the Dewatering Well System. Results of this investigation revealed the existence of a similar cavity at Well No. 7.

This report presents details of the Exploration/Grouting Program completed at Dewatering Well No. 7. It describes the procedures used in the program and the subsurface conditions at Well No. 7 after completion.

Geotechnical personnel carried out the technical tasks in two steps. Step 1 consisted of drilling 142 Stage 1 and 2 holes to determine the extent of the cavity and to determine the characteristics of the cavity infill materials. Step 2 consisted of pressure grouting the holes drilled in Step 1 to fill all possible areas of open cavity and penetrate loose sands. Check holes were drilled during the latter period of Stage 2 drilling to verify the completeness of the program.

2.0 BACKGROUND

Dewatering Well No. 7 is located adjacent to the Unit 3 Auxiliary Building as shown on Figure 1. In February 1975, following approximately seven months of operation, Well No. 7 became inoperable due to sand and gravel clogging the pump bowl. An investigation of the well indicated that the lower 96 feet of the casing was filled with sand and gravel and that the casing was corroded. The data available at the time implied that this situation was limited to Well No. 7, and therefore, the decision was made to put the well back into service. The well was cleaned and a new 10-inch diameter casing was placed inside the existing 14-inch diameter casing. The well was then put back into operation.

Demobilization procedures were established for the dewatering wells early in the operational phase of the system. By April 1977, demobilization had been completed on Wells No. 4, 5 and 8. During demobilization of Well No. 6 in May 1977, the gravel pack around the annulus of well casing subsided when attempts were made to compact the sand backfill prior to capping the well. This prompted an investigation of the other wells to determine if similar conditions existed at these wells.

Investigation at Well No. 7 included attempts to clean out the well casing. Removal of sand from the well was discontinued due to the caving conditions encountered in the hole. A video scan of the casing was made and a total of 30 auger holes were drilled to explore the region around the well bore. A cavity around Well No. 7 was identified from this investigation. Initial results of this investigation showed that the cavity extended in a north-west-southeast orientation. The upper portion had been emptied by the air-lift operations, including an area above the water table northwest of the well. This open area extended to within a few feet of the surface and prevented further work in this area until the cavity could be stabilized. The results of these initial investigations have been discussed with the NRC and described in monthly status reports.

In April 1978, sand was placed around the well casing and a total of 48.5 cubic yards of grout (site batch plant mix G-3) were placed by tremie method in six auger holes (five drilled as grout access holes and one drilled prior to grout emplacement), in order to fill the open portion at the top of the cavity, and to stabilize the area prior to further investigative work. Two auger holes were drilled after grout placement on the east side of the well to check the extent of the grout travel. The cavity adjacent to the Auxiliary Building was then removed and the cavity backfilled with sand. This was followed by seven additional grout check holes east of the well bore.

A total of ten additional exploratory holes were rotary drilled adjacent to and under the Auxiliary Building. The purpose of these holes was to determine the extent of the cavity adjacent to and under the Auxiliary Building, and for grouting purposes. Six of these holes were pressure grouted with a total of 356 bags of cement placed.

A deep boring program similar to that done at Wells No. 6 and 8 followed this initial work. A total of 37 holes were drilled, of which 26 provided the information necessary to establish the extent of the cavity near the well. The remaining holes were terminated at depths of less than 20 feet due to drilling difficulties or obstructions encountered during drilling. On completion of drilling of each hole, grout backfill was placed by tremie method. A total of 811 bags of cement were placed during the Deep Exploration Drilling Program.

Data from these holes and the data from the auger drilling established the maximum drilling depths for the initial exploration/grout holes. The details of the deep boring program are documented in a separate report entitled Deep Exploration Drilling Program - Dewatering Well No. 7.

3.0 SUMMARY

The objectives of the Exploration/Grouting Program were to define the limits of the cavity around the well, to fill any existing areas of open cavity with grout and to inject grout into the loose sand. A total of 142 holes were drilled and 1305 bags of cement was placed during the program. The results of the drilling and sampling indicate that the cavity is a linear feature trending northwest-southeast, becoming deeper toward the well bore. It is filled with loose to dense sand and grout; no open cavity was encountered by any boring during the program. A series of angle holes drilled under the Auxiliary Building and three vertical holes drilled inside the Auxiliary Building defined in-place San Mateo Formation directly under the building, and a very narrow zone of disturbed material a short distance below the structure. The top of the zone is located from 9 feet (Elevation -8 feet) to 26 feet (Elevation -25 feet) vertically below the base of the structure and extends no more than 9 feet beneath the edge. It becomes narrower with depth beneath the structure, from a width of 4 feet at Elevation -10 feet to less than 1 foot at Elevation -30 feet.

4.0 CONCLUSIONS

The following conclusions can be drawn from results of the Exploration/Grouting Program:

- A. The sand filled cavity is a northwest-southeast trending feature extending out from the well bore. It varies from a maximum of 18 feet

- wide at foundation grade (Elevation 0) to less than 2 feet wide at maximum depth of 90 feet below foundation grade (Elevation -90).
- B. Data obtained from angle holes drilled beneath the Auxiliary Building revealed the existence of a very narrow finger of disturbed sand under the edge of the structure. Vertical holes drilled inside the building, placed to intersect the projection of the disturbed zone, encountered only native San Mateo Formation.
 - C. The cavity is filled with loose to dense sand and grout and contains no areas of open cavity. This conclusion is based on 139 borings within a small area of about 1000 square feet.
 - D. Significant grout takes and extensive grout travel and communication between holes demonstrated good grout penetration through the cavity region.
 - E. The pressure grouting injected lenses and dikes of grout and resulted in a slight densification of the loose sand.

5.0 DRILLING AND GROUTING

Prior to starting the drilling operations, excavation was done to expose and locate the numerous buried utility lines existing in the area around the well bore, and to accommodate placement of a surface grout cap. Excavation depths varied from approximately 3 feet to 12 feet. After locating the buried utilities, 4-inch diameter PVC pipes extending from the bottom of the excavation to the ground surface were placed to permit access for later drilling. The excavation was then filled with a sand-cement-pozzolan slurry mix (Fillcrete) which served as a grout cap to reduce surface leakage.

The Exploration/Grouting Program consisted of two drilling and grouting stages. Stage 1 holes were drilled in and around the existing cavity to determine its depth and lateral extent. Stage 2 holes were drilled after most adjacent Stage 1 holes were completed to close out the grouting program and to check completeness of the grouting. Holes were drilled on a grid system set up parallel to the plant grid system. The original Stage 1 hole locations, shown on Figure 2, were based on the cavity as defined by prior exploration and were designed to confirm the cavity boundary. Hole locations were also dictated by the underground utilities. Locations of Stage 2 holes were based on the configuration of the cavity interpreted

from the Stage 1 borings. Modification of the Stage 1 pattern was made as more information was obtained during the Exploration/Grouting Program. From prior exploration, it was assumed that a zone of disturbed sand might extend under the Auxiliary Building. In order to investigate the area under the building, a series of Stage 1 angle holes were drilled under the building and three vertical holes were located inside the building. All holes were pressure grouted with a cement grout mixture.

5.1 Drilling Methods and Materials

A Simco 4000 hydraulic rotary track-mounted rig was used to drill both vertical and angle holes. A CME modified hydraulic rotary drill was used to drill vertical holes. Inside the Auxiliary Building, a CP-65 air rotary drill was used to drill the vertical holes.

Exploration/grout holes were drilled using rotary drilling with Revert as a drilling fluid. Holes were advanced either by tricone bit, drag bit, or by carbide bit attached to BX or NX casing. Where sampling of grout was required, a diamond core barrel was occasionally used. Holes were advanced through the concrete base slab inside the Auxiliary Building using a diamond core barrel. Hole size varied from BX to approximately 4-1/4-inch diameter. Several holes, stopped prematurely due to drilling difficulties, were backfilled with sand or tremie grouted and a replacement hole drilled.

5.1.1 Stage 1 Holes - East of Auxiliary Building In and Around the Cavity Region

A total of 115 Stage 1 holes were drilled in the cavity region and adjacent to the Auxiliary Building to determine the lateral and vertical extent of the disturbed sand surrounding Dewatering Well No. 7, and to grout any areas of open cavity or loose sand encountered.

Several of these Stage 1 holes were angled to drill under utilities and to determine the extent of disturbed sand east of the roadway where access for vertical drilling was limited. Locations of the holes drilled in the Exploration/Grouting Program are shown on Figure 3.

5.1.2 Stage 1 Angle Holes - Adjacent To and Under Auxiliary Building

A total of 24 Stage 1 angle holes were drilled and grouted adjacent to and beneath the structure. Angles ranged from 58 to 87 degrees from horizontal. The purpose of these holes was to define the limits of disturbed sand beneath the Auxiliary Building. Gyroscopic surveys were performed on all completed angle holes to check hole drift (refer to Appendix A). Three of these holes were stopped prior to reaching planned depth because of obstacles encountered while drilling.

5.1.3 Stage 1 Vertical Holes - Inside the Auxiliary Building

Three holes were drilled through the concrete base slab inside the Auxiliary Building to further define the limits of the disturbed sand beneath the building structure as projected from angle hole data. These holes are from 2.3 to 7 feet from the interior wall, measured along a perpendicular to the east wall. A gyroscopic survey was performed on one of these holes to check hole drift, and results are shown in Appendix A. The three holes drilled encountered San Mateo Formation.

5.1.4 Stage 2 Holes

A total of 24 Stage 2 holes were drilled and grouted following completion of adjacent Stage 1 holes. These were done to complete closure of the grouting program and to check the completeness of the program. Locations and depths were determined from the previously drilled grout holes. Several of these holes were angled to avoid utilities.

5.2 Sampling

Sampling was done to differentiate disturbed sand from native San Mateo Formation. Standard Penetration Tests (SPT's) using a 2-inch O.D. split-spoon drive sampler were performed according to ASTM D 1586 (74) at 5-foot intervals in most Stage 1 holes and all Stage 2 holes. Several Stage 1 holes were sampled at 10-foot intervals. Sampling of holes angled at less than 60 degrees consisted only of visual inspection of drill cuttings and observation of drilling characteristics and penetration rates, because the angle was too shallow to allow free fall of the drive hammer. Therefore, no SPT's could be conducted.

A log of each hole was made by the geologist supervising the drilling. Data recorded included: depths and blow counts of SPT's; descriptions of subsurface materials; drilling characteristics; rate of penetration; circulation loss; and any unusual difficulties encountered during the drilling. Samples were inspected and classified as soon as they were recovered from the sampler, and were placed in plastic bags for storage.

Graphic logs of all holes are shown in Volume II, Appendix B. SPT results (Figure 4) for all samples in disturbed sand in the cavity area illustrate that the materials encountered varied from loose to dense sand.

5.3 Grouting Method and Materials

Upon completion of the drilling, each hole was pressure grouted. Equipment used in the grouting program consisted of a Moyno 3-L-10 pump, a horizontal paddle-type mixer, and an 11 cubic foot capacity hold-over tank with vertical center shaft paddle. The grouting system provided continuous circulation of grout from the mixer tanks to the hole. A pressure gauge was located at the top of the hole to monitor grout pressure at the hole, and was frequently checked for accuracy.

The grout mixes varied from 3:1 to 3/4:1 water-cement ratio by volume. Intraplast-N was used as an additive at a quantity of one percent by weight of cement to increase flowability and decrease shrinkage of the grout. Sand was not used in the grout program.

Grouting pressures measured at the top of the hole ranged from 10 to 60 psi. Most holes were grouted at 45 to 50 psi maximum pressure. Pressures were kept in this range to prevent damage to adjacent structures and also to help minimize surface leakage.

The grouting procedure for holes outside the Auxiliary Building involved several steps. After completion of the drilling of each hole, 1-1/2-inch diameter PVC was installed to the bottom of each hole. Slotted PVC was used to within 10 or 20 feet of the top of each hole and solid PVC used to the top of the hole. A 10-foot length of 3-inch diameter PVC was then placed in the top of the hole and sealed at the surface with grout. Holes

along the electrical ducts where 4-inch PVC pipe had been installed required no 3-inch PVC. The grout connection was made directly to a threaded coupling. An example of a typical exploration/grout hole is shown on Figure 5.

Grouting of the holes inside the Auxiliary Building involved placing 1-1/2- or 2-inch diameter slotted PVC in each hole from the bottom of the hole to the bottom of the concrete base slab. A 3-inch diameter threaded pipe nipple was sealed and bolted to the concrete base slab and the grout connection was made directly to the threaded pipe (see Figure 6).

Immediately prior to grouting, the hole was washed of Revert by placing a hose to the bottom and flushing with water and Fast-Break, an additive used to break down the Revert drilling fluid. The hole was then pressure grouted to refusal from the top in one stage. Refusal was determined to occur when the hole accepted one-half cubic foot of grout or less in five minutes with a steady pressure maintained on the gauge. In some holes where surface leakage occurred, the grouting was stopped prior to reaching refusal and the hole backfilled with 1:1 grout. A replacement hole was added where this occurred.

6.0 RESULTS OF THE EXPLORATION/GROUTING PROGRAM

The configuration of the cavity and characteristics of the cavity fill materials were determined from the 142 exploration/grouting borings and the 80 exploration borings previously completed at Well No. 7.

6.1 Cavity Definition

The cavity is a northwest-southeast trending feature extending approximately 42 feet northwest and 34 feet southeast of the well bore. West of the well, it varies from a maximum of approximately 16 feet wide at foundation grade (Elevation 0) to less than 2 feet wide at its deepest point, Elevation -90 feet.

Disturbed sand was found to extend beneath the Auxiliary Building. The limits of the disturbed sand were defined by angle and vertical drill holes. It consists of a narrow, steep-sided feature extending approximately 9 feet beyond the east wall of the Auxiliary Building. The maximum width

of the disturbed sand under the building is approximately 4 feet, about 10 feet below building foundation grade (Elevation 0). The disturbed sand is less than one foot wide at its deepest point, Elevation -30 feet. The only samples of disturbed sand found under the structure were obtained in angle holes. The three vertical holes drilled within the building structure encountered no disturbed sand, which supports the conclusion that the feature is of extremely limited dimensions. An isometric drawing (Figure 7) displays the area adjacent to and under the Auxiliary Building.

East of the well bore, the cavity width varies from a maximum of approximately 16 feet at foundation grade (Elevation 0) to less than 2 feet at its deepest point, located close to the well at Elevation -90 feet.

Dimensions of the cavity as shown above were determined from a contour map of the top of native San Mateo Formation (Figure 8) constructed from the deep boring and exploration/grout hole drilling data. They reflect the deepest extent of disturbed sand found in the borings. In several holes, undisturbed San Mateo Formation was encountered between zones of disturbed sand, an effect caused by the drill hole passing through the irregular, undulating walls of the cavity. Therefore, the contours show the total zone as disturbed. Cross-sections (Figure 11) and isometric drawings (Figure 9) have been prepared to show the cavity definition. Figure 10 shows the locations of all section lines. Except for the immediate area surrounding the well bore, and several small, isolated patches of disturbed sand encountered in several drill holes, the average maximum depth of disturbed sand is approximately 30 to 40 feet below foundation grade (Elevation 0). This is displayed on the geologic Section A-A' (refer to Figure 11).

A stick model of the Deep Exploration Drilling Program and the Exploration/Grouting Program was constructed to illustrate the cavity in a three-dimensional view. Photographs of this model are included in Volume II, Appendix D.

6.2 Materials in the Cavity

The cavity around Well No. 7 is filled with disturbed sand, sanded grout (G-3) placed by tremie method, Portland cement grout placed during the initial pressure grout program, Portland cement grout placed during the

Deep Exploration Drilling Program and Portland cement grout placed during the Exploration/Grouting Program.

No areas of open cavity were encountered during the Exploration/Grouting Program. This was determined by observation of drill rates, drilling fluid circulation, SPT's and inspection of samples. Only grout and disturbed sand was encountered in the cavity. The sand fill in the cavity varied in density from loose to dense.

6.3 Grouting

During the Exploration/Grouting Program, a total of 1305 bags of cement were placed. Data relating to the Exploration/Grouting Program and grout logs are shown in Volume II, Appendix C.

Prior to the Exploration/Grouting Program, a total of 356 bags of cement were placed in six grout holes drilled adjacent to and under the Auxiliary Building and a total of 811 bags of cement were placed during the Deep Exploration Drilling Program.

Grout communication frequently occurred between holes during the Exploration/Grouting Program. Grout travel between holes ranged from several feet to over 40 feet. The number of holes communicating together at any one time during grouting ranged from 2 to 13 holes. A list of communicating holes is included in Volume II, Appendix C. Some surface leakage also occurred during grouting. Figure 13 shows surface leakage and the paths of communication among holes.

Cummulative grout take versus total holes grouted has been plotted on Figure 14. This does not include the three holes drilled inside the Auxiliary Building. As shown, grout take for the last 30 holes, which represents approximately the last two weeks of grouting, is very low. An appreciable decrease in grout take is indicative of the effectiveness of the earlier grouting.

No areas of open cavity were encountered in any of the exploration/grout holes. Some lenses of Portland cement grout were found in several of the

holes. After all grouting was completed, an excavation adjacent to the Auxiliary Building was made to remove uncompacted sand fill which had been placed prior to the grouting and Deep Drilling Program. The excavation extended to about one foot above the water table (Elevation +6 feet). The side slopes of the excavation were carefully inspected, mapped and photographed by a Bechtel geologist prior to backfilling the excavation with 192 yards of Fillcrete. During the mapping, Portland cement grout seams 1 to 3 inches wide were found scattered through the sand. Locations of these grout seams are shown on Figure 15.

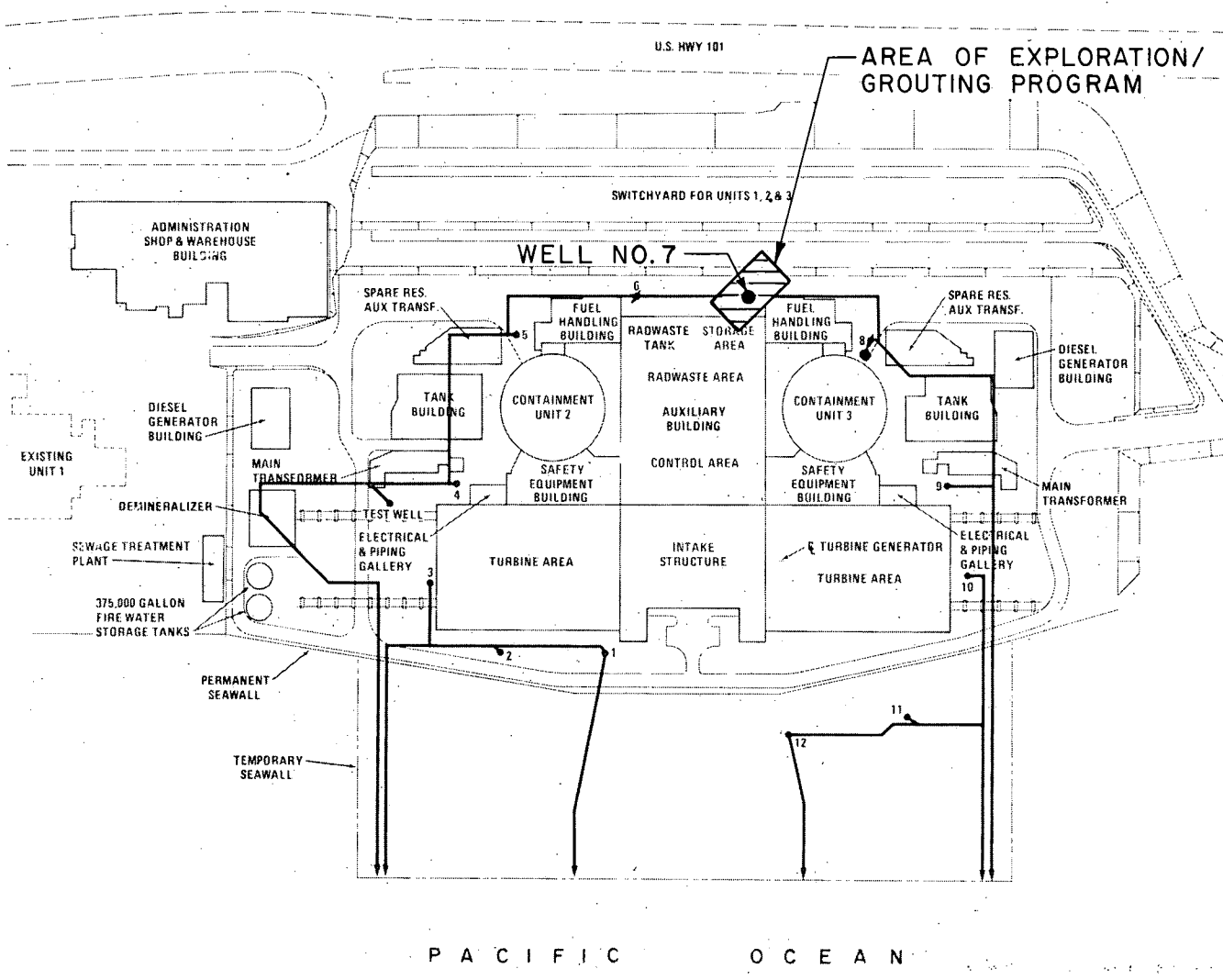
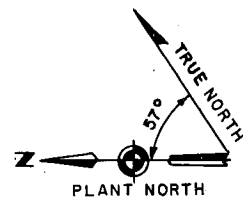
An isopach map (Figure 12) defining the thickness of G-3 and Portland cement grout placed in the cavity and an isopach map (Figure 16) defining the thickness of disturbed sand below Elevation +30 feet was constructed. A planimeter measurement was made of these maps and also of the contour map of the top of the San Mateo Formation. A total of 115 cubic yards of grout was determined from the grout isopach map. The total amount of disturbed sand calculated from the disturbed sand isopach map was 406 cubic yards.

7.0 SUMMARY OF FOUNDATION CONDITIONS

Results of the Exploration/Grouting Program show the total amount of disturbed sand remaining at the conclusion of the program below ground surface (Elevation +30 feet) is less than 310 cubic yards.

The cavity is confined to a narrow linear zone trending northwest-southeast from the well. A very narrow zone of disturbed sand extends under the edge of the Auxiliary Building. Vertical holes drilled from 2.3 to 7 feet from the interior wall of the building and encircling the indicated cavity region did not encounter any disturbed material.

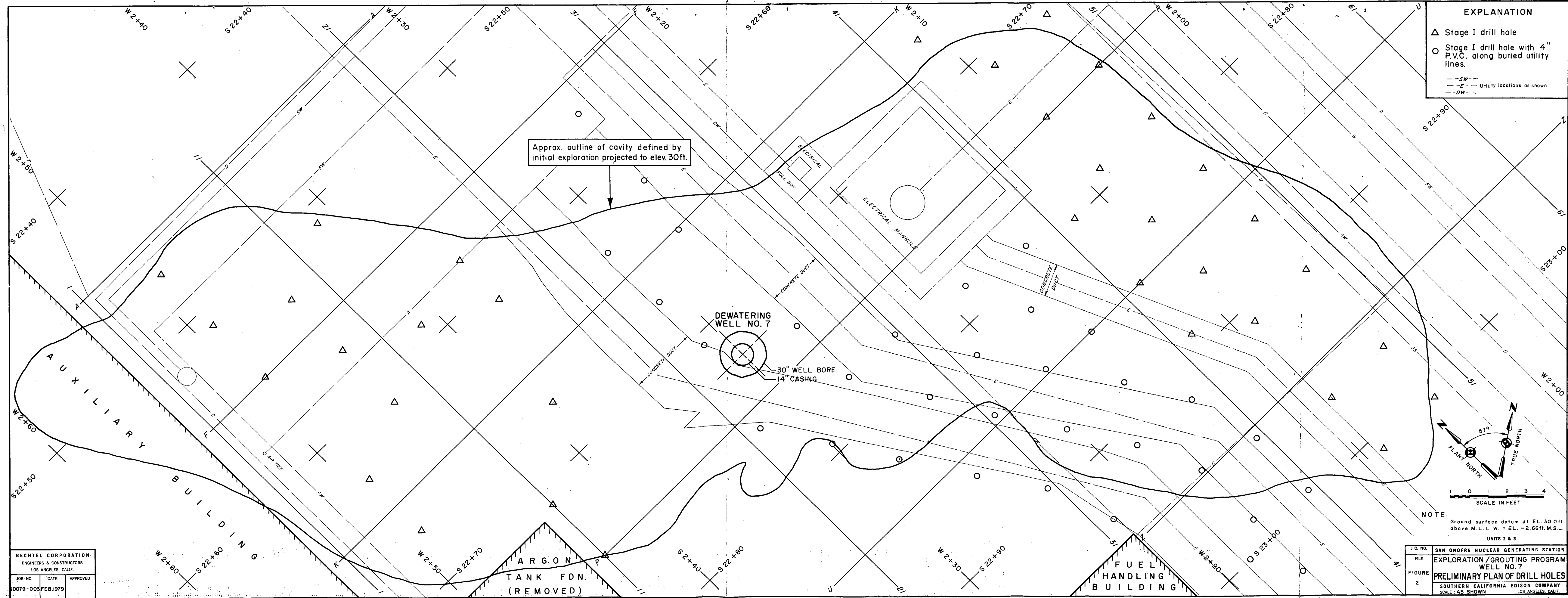
The drilling encountered no areas of open cavity. The cavity fill materials consist of loose to dense sand, G-3 grout or Portland cement grout.



UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	MAR. 1979	

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL NO. 7
1	LOCATION MAP
SOUTHERN CALIFORNIA EDISON COMPANY	
SCALE N.T.S. LOS ANGELES, CALIF.	



EXPLANATION

- △ Stage I drill hole
- Stage I drill hole with 4" P.V.C. along buried utility lines.
- SW--- Utility locations as shown
- E---
- DW---

Approx. outline of cavity defined by initial exploration projected to elev. 30ft.

DEWATERING WELL NO. 7
30" WELL BORE
14" CASING

57°
PLANT NORTH
TRUE NORTH

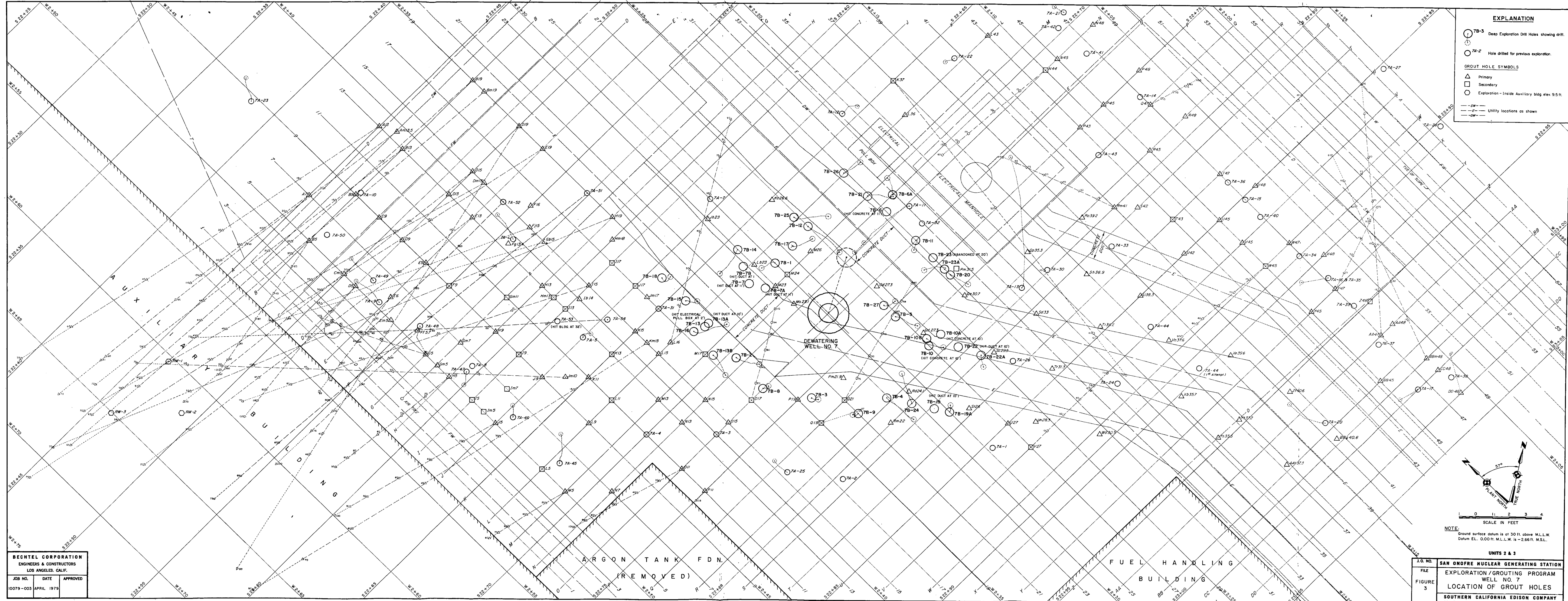
0 1 2 3 4
SCALE IN FEET

NOTE:
Ground surface datum at EL. 30.0ft.
above M.L.L.W. = EL. -2.66ft. M.S.L.
UNITS 2 & 3

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
0079-003	FEB. 1979	

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL NO. 7
2	PRELIMINARY PLAN OF DRILL HOLES
	SOUTHERN CALIFORNIA EDISON COMPANY
	SCALE: AS SHOWN LOS ANGELES, CALIF.



EXPLANATION

○ TB-3 Deep Exploration Drill Holes showing drift.

○ 7A-2 Hole drilled for previous exploration.

GROUT HOLE SYMBOLS

△ Primary

□ Secondary

○ Exploration - inside Auxiliary bldg. elev. 9.5 ft.

--- SW --- Utility locations as shown

Scale in feet: 0 1 2 3 4

NOTE: Ground surface datum is at 30 ft. above M.L.L.W. Datum EL. 0.00 ft. M.L.L.W. is -2.66 ft. M.S.L.

UNITS 2 & 3

TRUE NORTH

PLANT NORTH

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10079-003	APRIL 1979	

J.O. NO. 3

FILE 3

FIGURE 3

SAN ONOFRE NUCLEAR GENERATING STATION

EXPLORATION/GROUTING PROGRAM

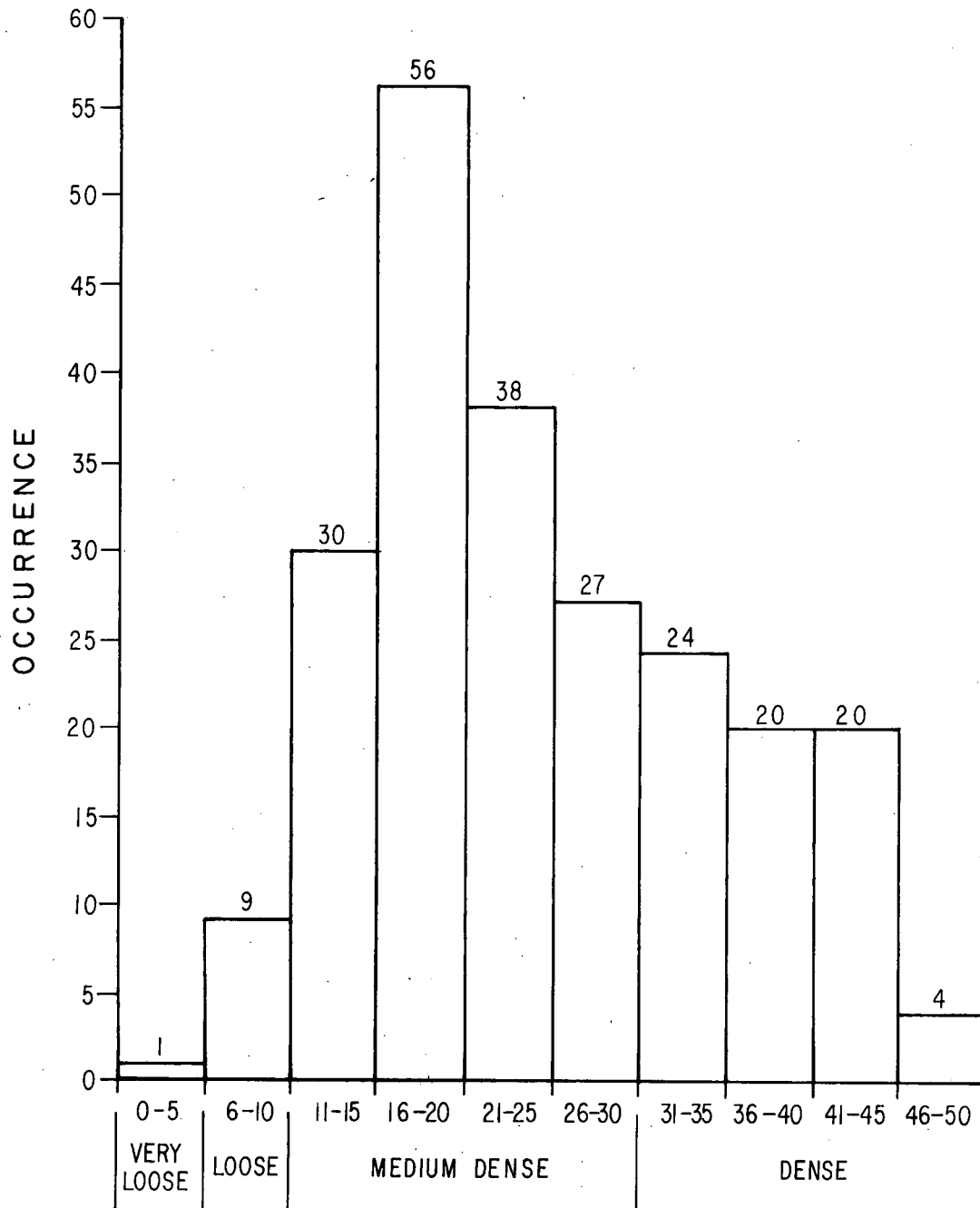
WELL NO. 7

LOCATION OF GROUT HOLES

SOUTHERN CALIFORNIA Edison COMPANY

SCALE AS SHOWN

NOTE: Data taken from original drill logs.
Excludes top 10 feet of each hole.



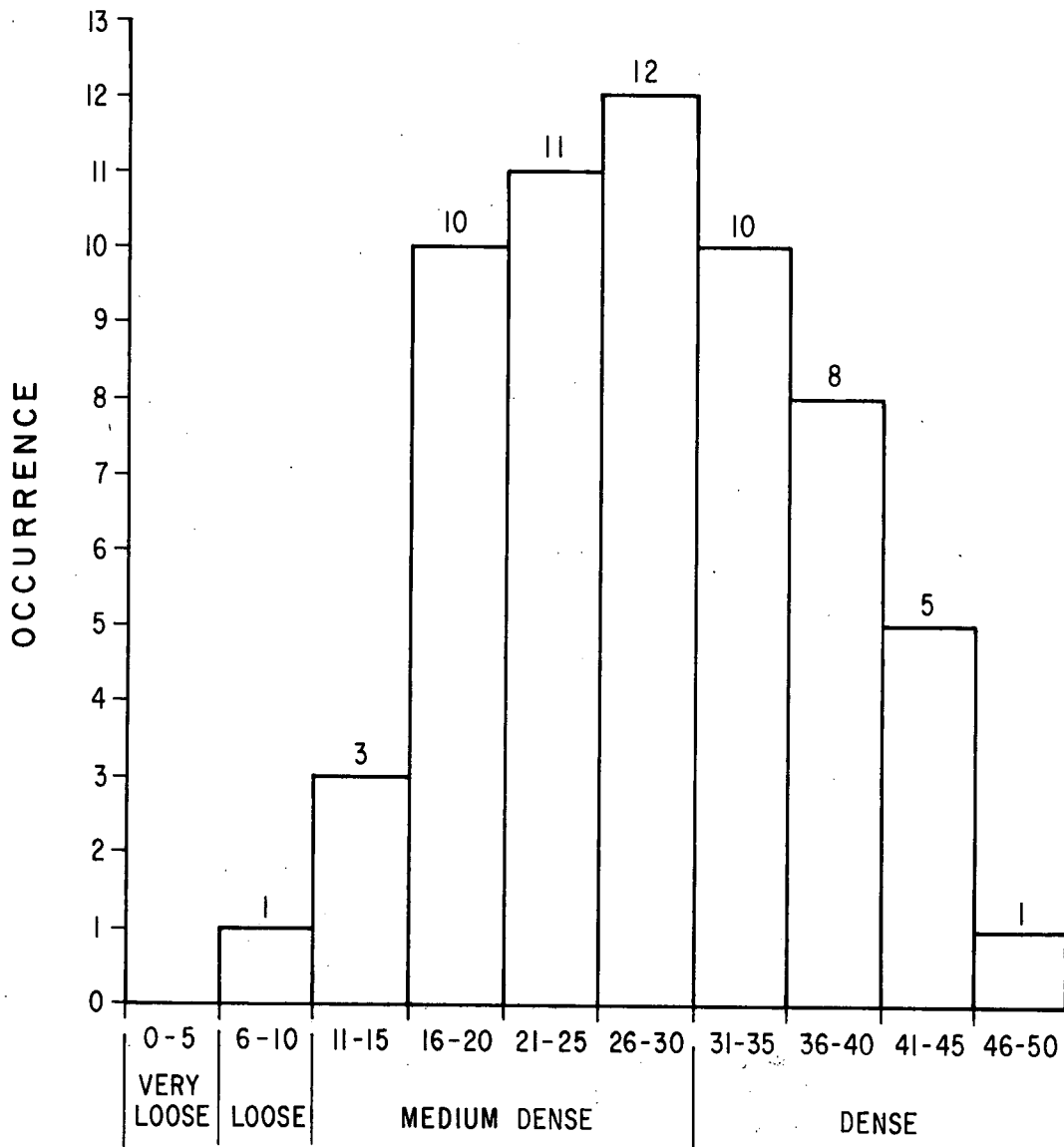
STANDARD PENETRATION TEST RESULTS IN DISTURBED SAND
FOR STAGE I HOLES

UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO. 10079-003	DATE FEB. 1979	APPROVED

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL NO.7
4	DISTRIBUTION OF SPT RESULTS
SHEET	SOUTHERN CALIFORNIA EDISON COMPANY
1 OF 2	SCALE N.T.S. LOS ANGELES, CALIF.

NOTE: Data taken from original drill logs.
Excludes top 10 feet of each hole.

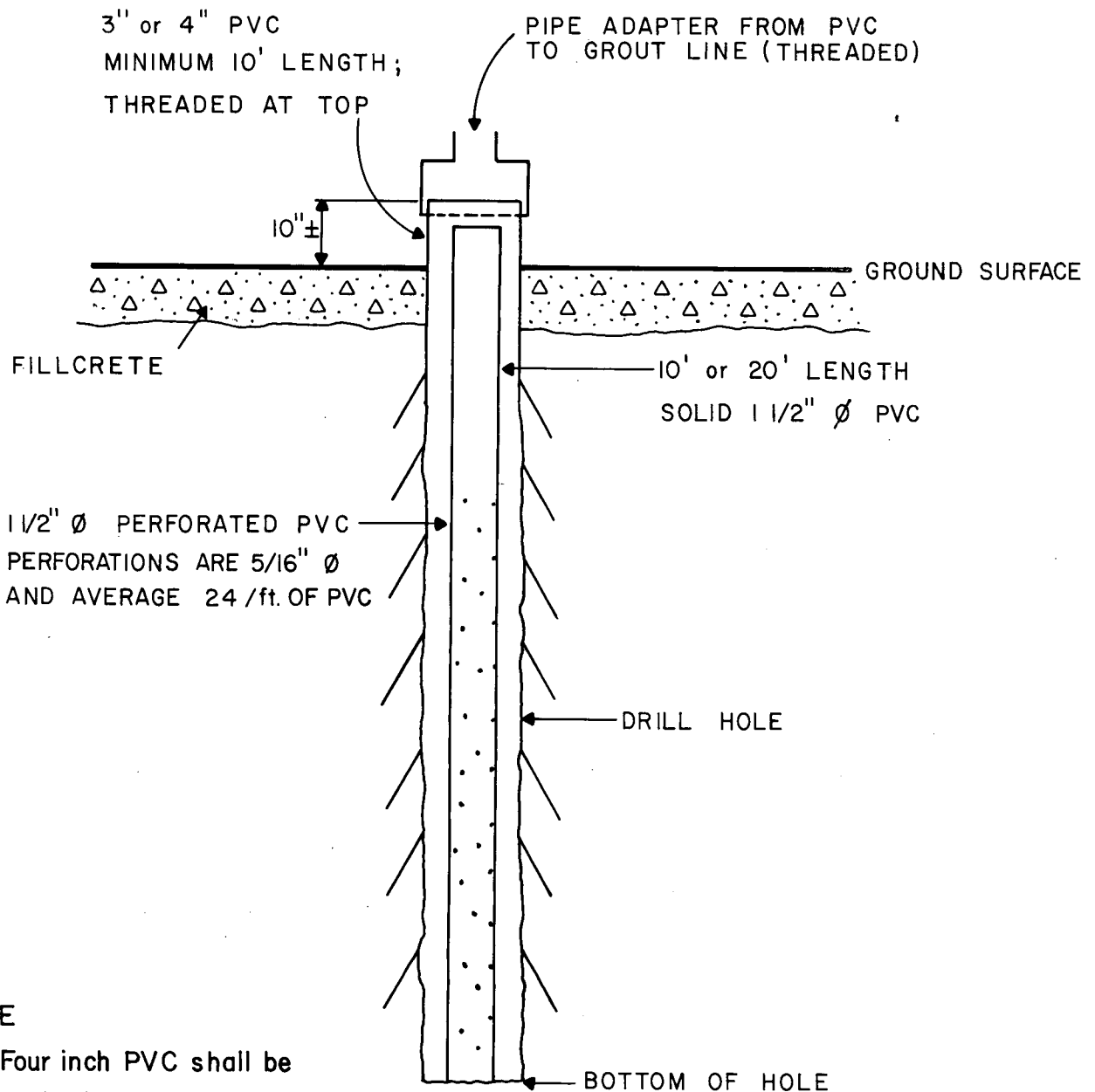


STANDARD PENETRATION TEST RESULTS IN DISTURBED SAND FOR STAGE II HOLES

UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	FEB. 1979	

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL NO.7
4	DISTRIBUTION OF SPT RESULTS
SHEET	SOUTHERN CALIFORNIA EDISON COMPANY
2 OF 2	SCALE N.T.S. LOS ANGELES, CALIF.



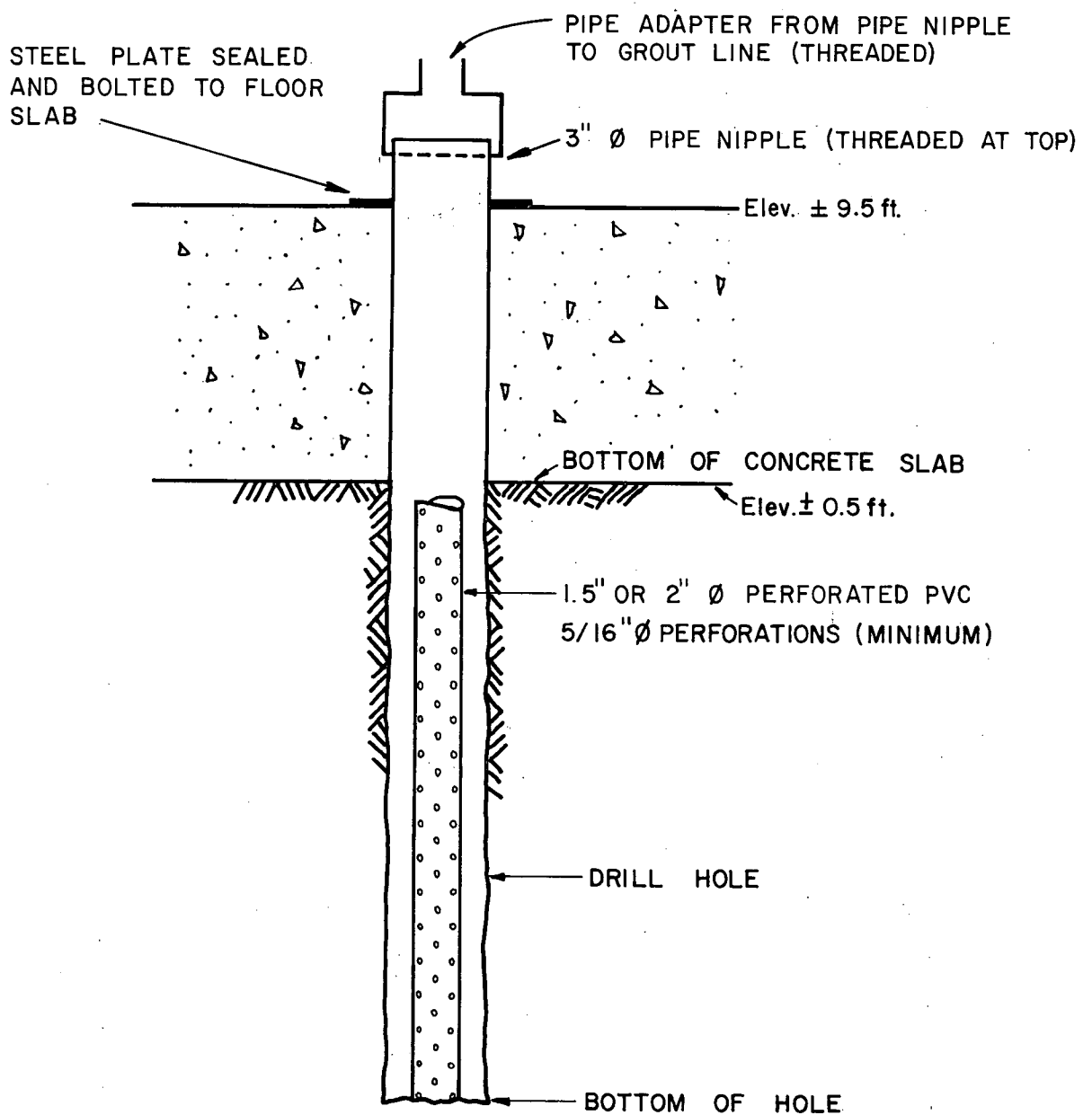
NOTE

1. Four inch PVC shall be embedded in Fillcrete
2. Three inch PVC shall be sealed with Five-Star grout after hole has been drilled.

UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO. 10079-003	DATE FEB 1979	APPROVED

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM WELL NO. 7
FIGURE 5	TYPICAL EXPLORATION GROUT HOLE
	SOUTHERN CALIFORNIA EDISON COMPANY SCALE N.T.S. LOS ANGELES, CALIF.

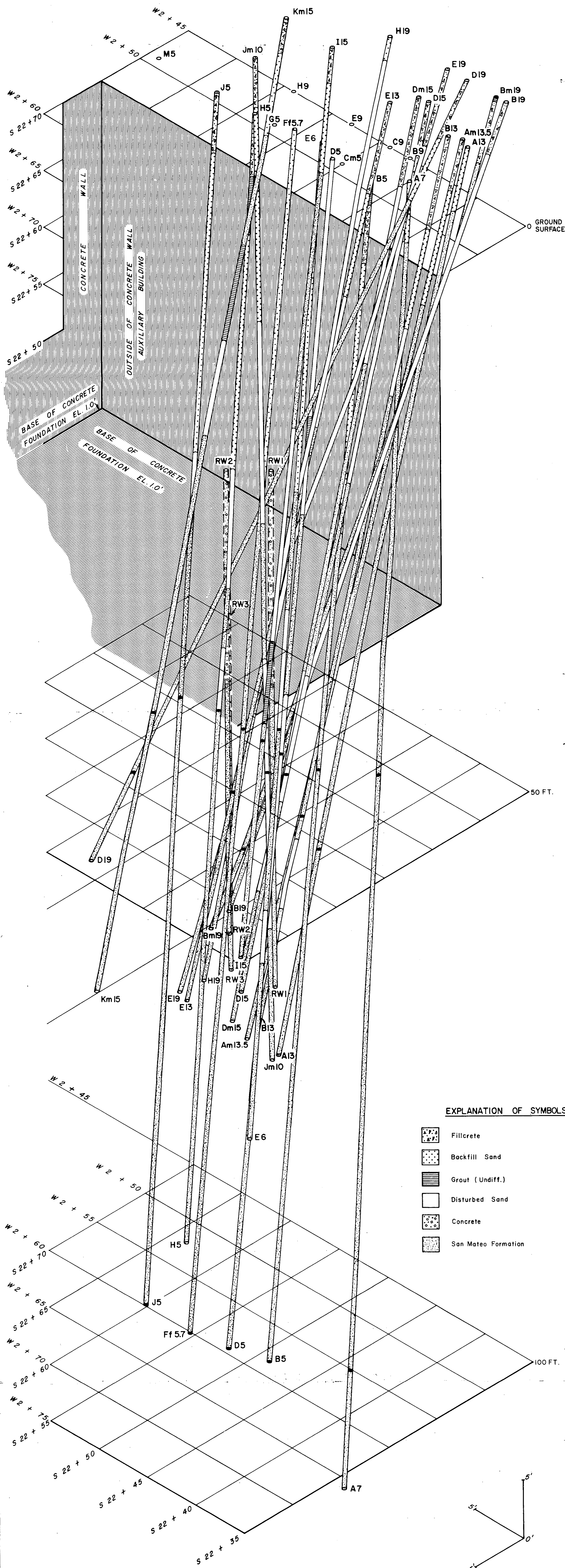


EXPLORATION GROUT HOLE AUXILIARY BUILDING UNIT 3

UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	FEB. 1979	

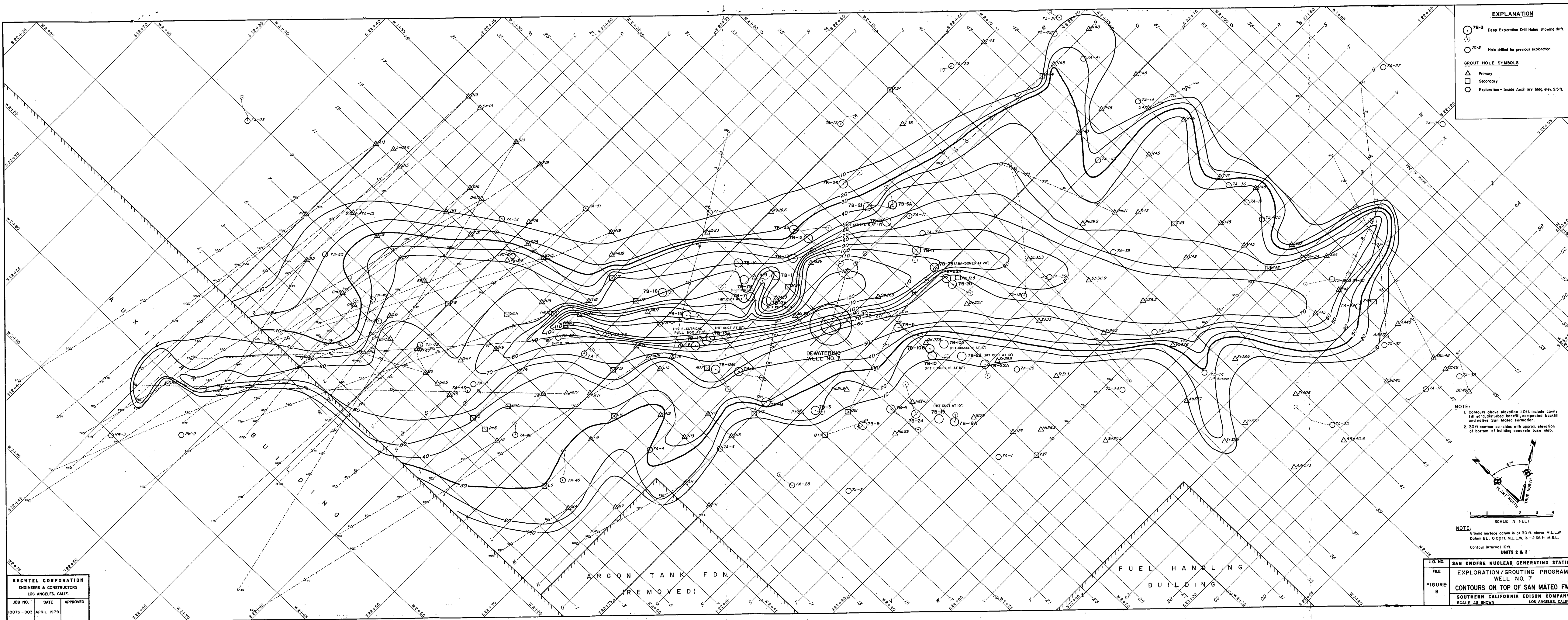
I.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM WELL NO. 7
FIGURE	GROUT HOLE-AUXILIARY BUILDING
6	SOUTHERN CALIFORNIA EDISON COMPANY SCALE N.T.S. LOS ANGELES, CALIF.

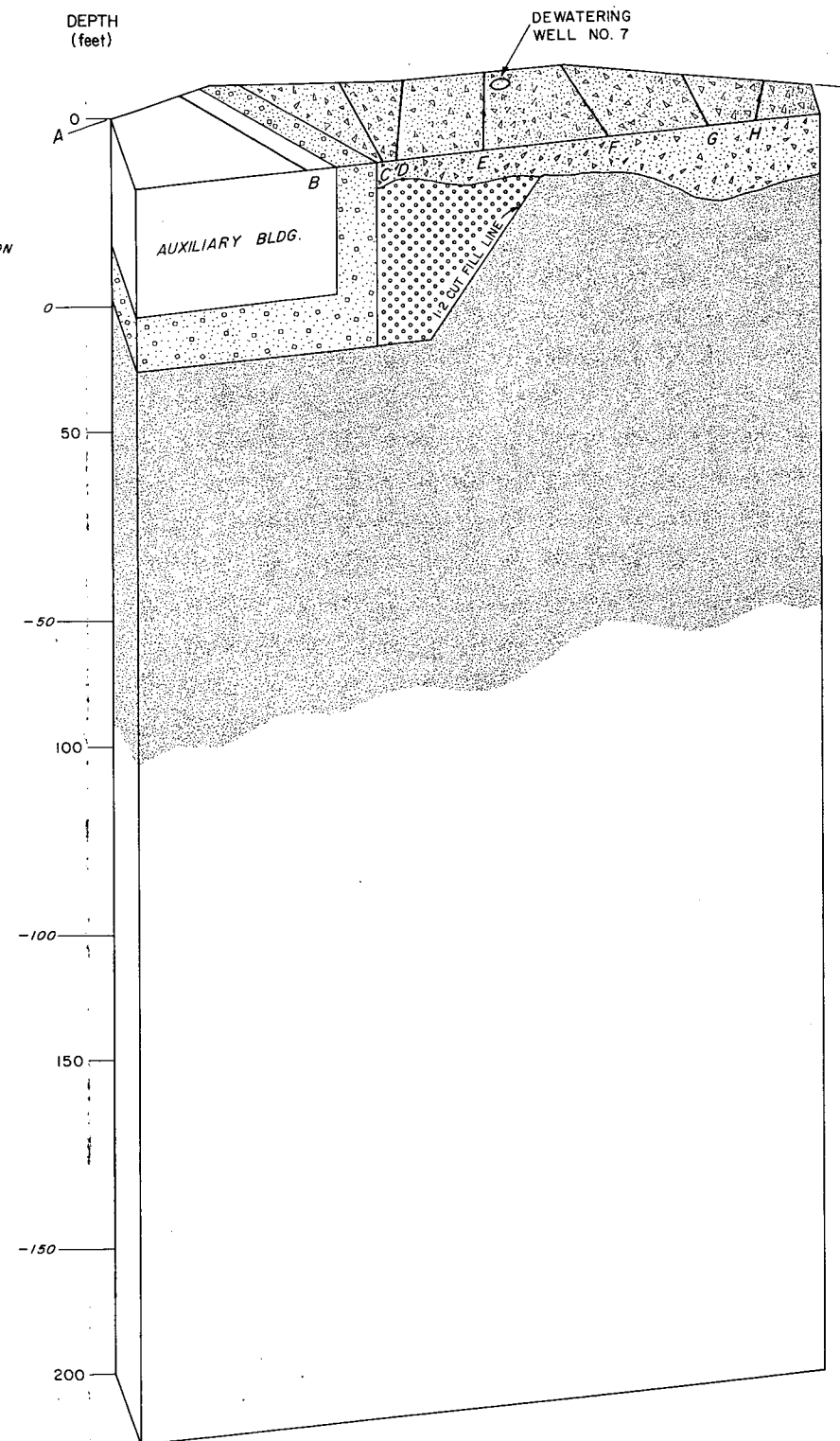
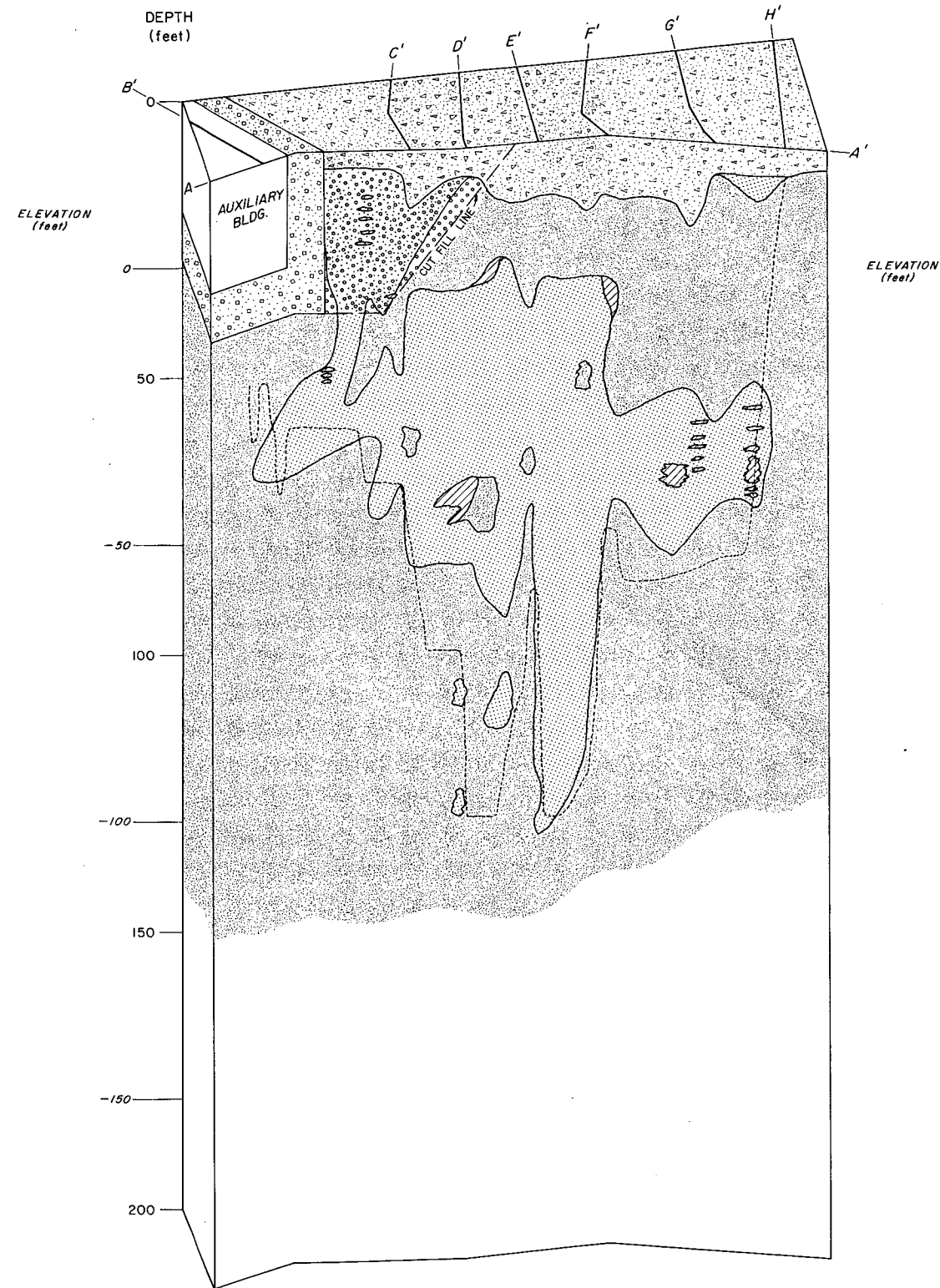


DRILL HOLES ADJACENT AND UNDER AUXILIARY BUILDING

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10075-003	APRIL 1979	

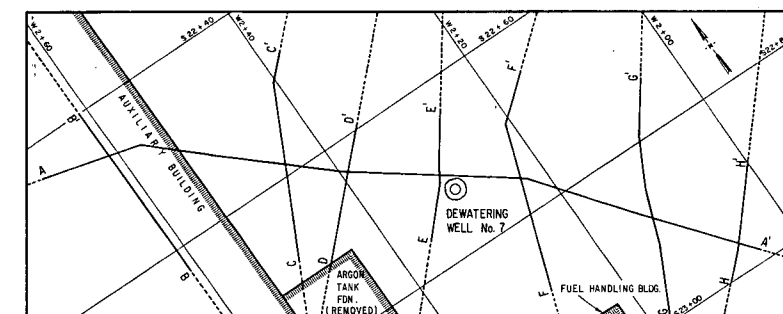




EXPLANATION OF SYMBOLS

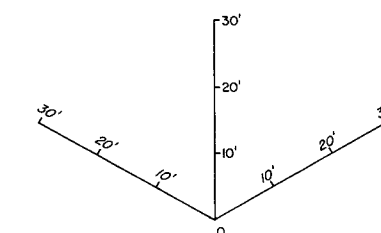
- Fillcrete
- Backfill sand
- Grout (undiff.)
- Concrete
- Disturbed sand
- Disturbed backfill
- San Mateo Formation

Top of San Mateo Formation as shown on contour map (figure 8)



INDEX MAP

SCALE IN FEET

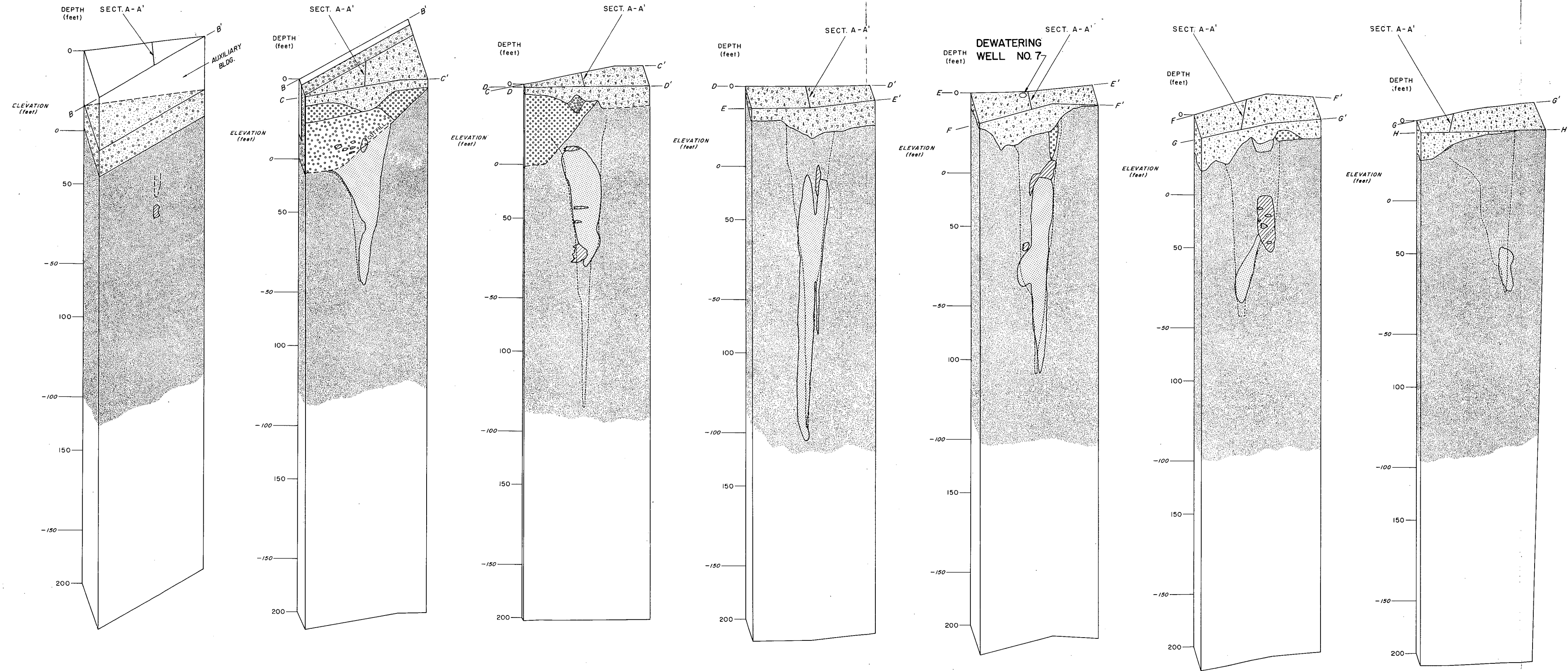


GRAPHIC SCALE

UNITS 2 & 3

BECHTEL CORPORATION		
ENGINEERS & CONSTRUCTORS		
LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	APR. 1978	

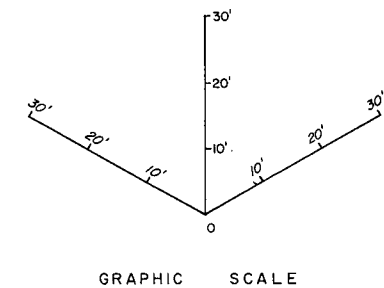
J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION /GROUTING PROGRAM
FIGURE	WELL No. 7
9	ISOMETRIC OF CAVITY
SHEET	SOUTHERN CALIFORNIA EDISON COMPANY
1 OF 2	SCALE AS SHOWN LOS ANGELES, CALIF.



EXPLANATION OF SYMBOLS

- Fillcrete
- Backfill sand
- Grout (undiff.)
- Concrete
- Disturbed sand
- San Mateo Formation
- Disturbed backfill
- Top of San Mateo Formation according to the contour map (figure 8)

NOTE: For location of section blocks, see Fig. 9 sheet 1.

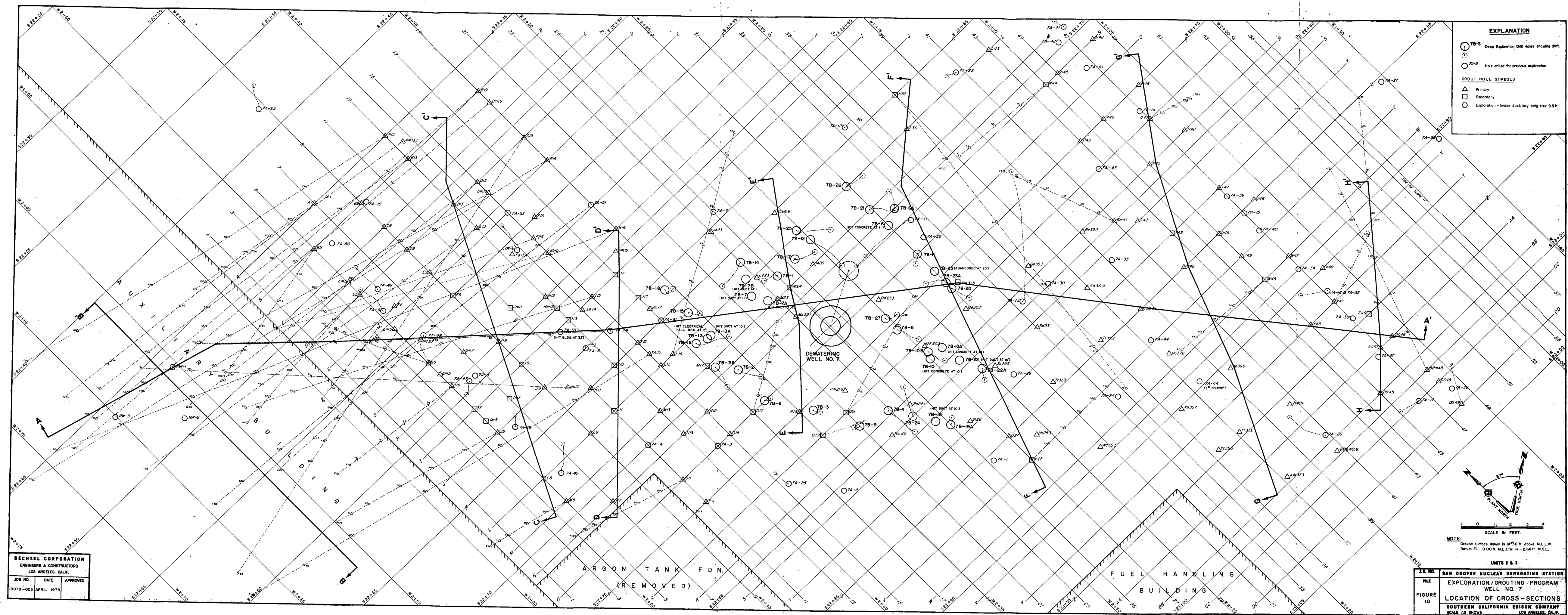


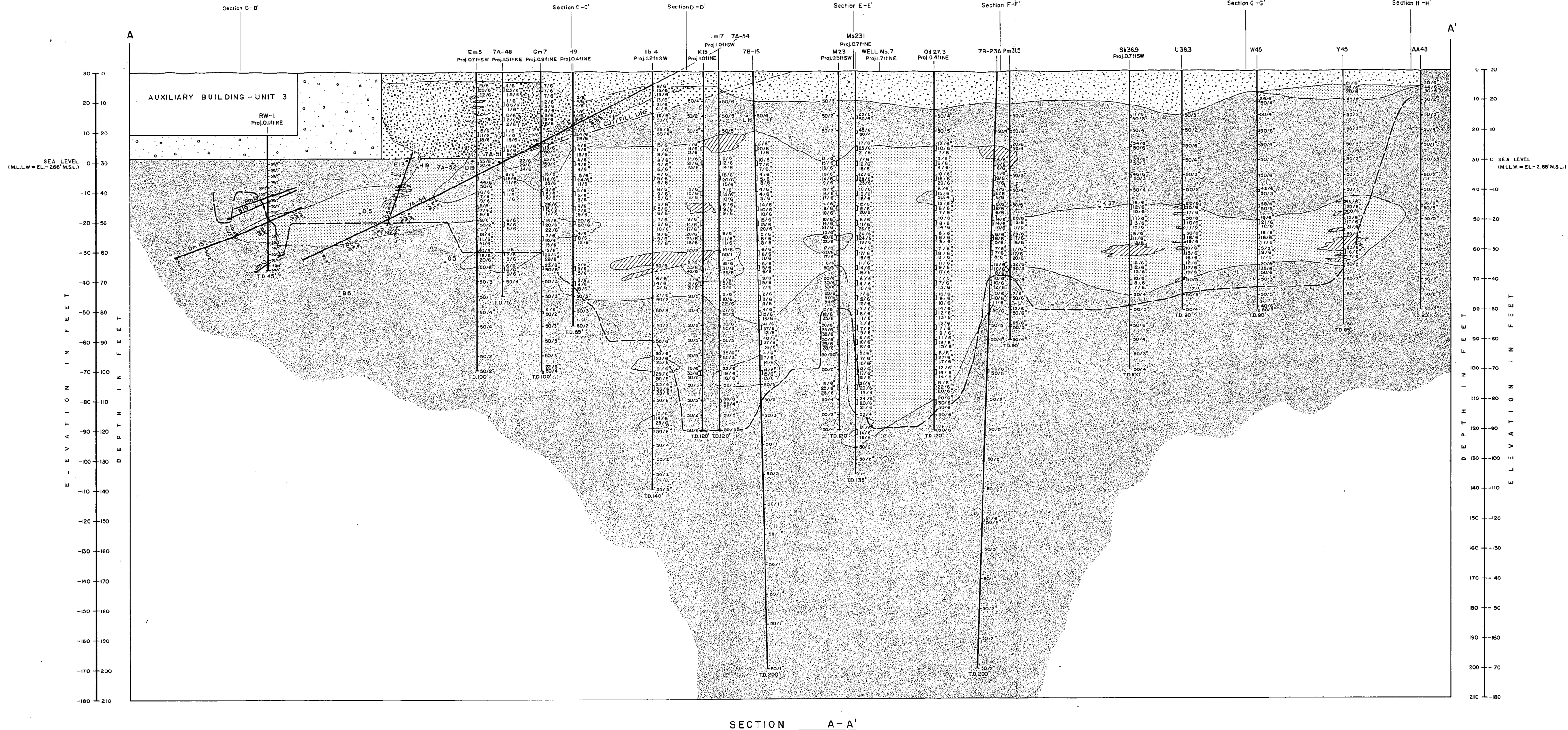
BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10079-003	APR. 1978	

UNITS 2 & 3

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE 9	WELL No. 7
SHEET 2 OF 2	ISOMETRIC OF CAVITY
	SOUTHERN CALIFORNIA EDISON COMPANY
	SCALE AS SHOWN LOS ANGELES, CALIF.



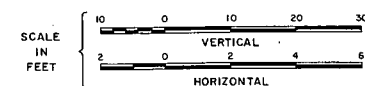


EXPLANATION OF SYMBOLS

- | | | | | | |
|--|--------------------|--|---------------------|--|---|
| | Backfill sand | | Grout (undiff.) | | Standard penetration tests showing blow counts and interval sampled. |
| | Concrete | | Disturbed sand | | Intersection of angle hole with plane of section. Portion of hole shown is a maximum of 1 foot projection off plane of section. |
| | Fillcrete | | San Mateo Formation | | Intersection of angle hole into plane of section. |
| | Disturbed backfill | | | | Top of San Mateo Formation as shown on contour map (Figure B) |

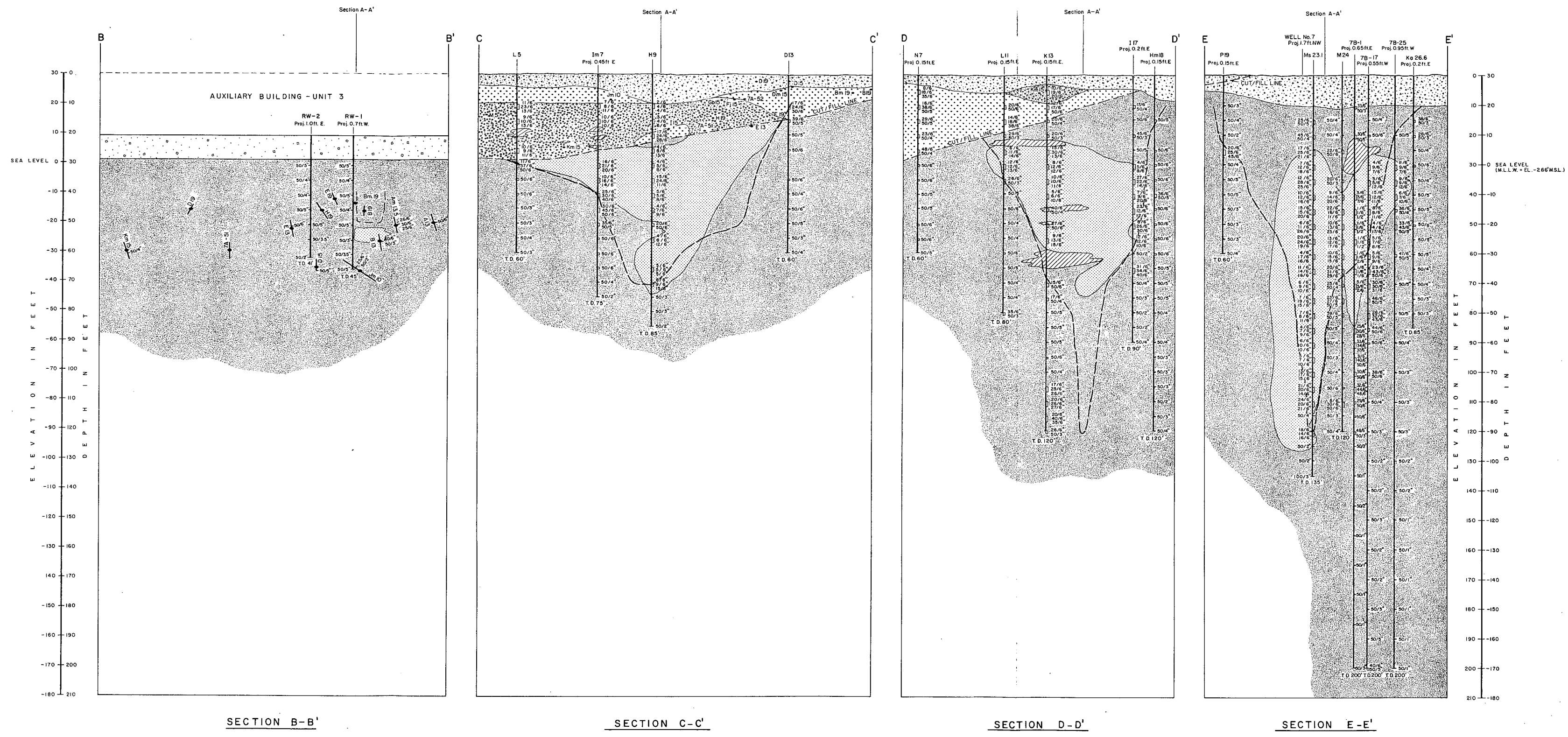
SECTION A-A'

- Notes:
1. For location of section see figure 10.
 2. Hole depths plotted are corrected for verticality.



BECHTEL CORPORATION		
ENGINEERS & CONSTRUCTORS		
LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	MAR. 1979	

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION / GROUTING PROGRAM
FIGURE	WELL No. 7
SHEET	CROSS-SECTIONS
1 OF 3	SOUTHERN CALIFORNIA EDISON COMPANY
	SCALE AS SHOWN LOS ANGELES, CALIF.



BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10079-003	APRIL 1979	

NOTES: 1. For location of sections see figure 10.
2. For explanation of symbols and notes see figure 11 sheet 1.

SCALE
IN FEET

VERTICAL
HORIZONTAL

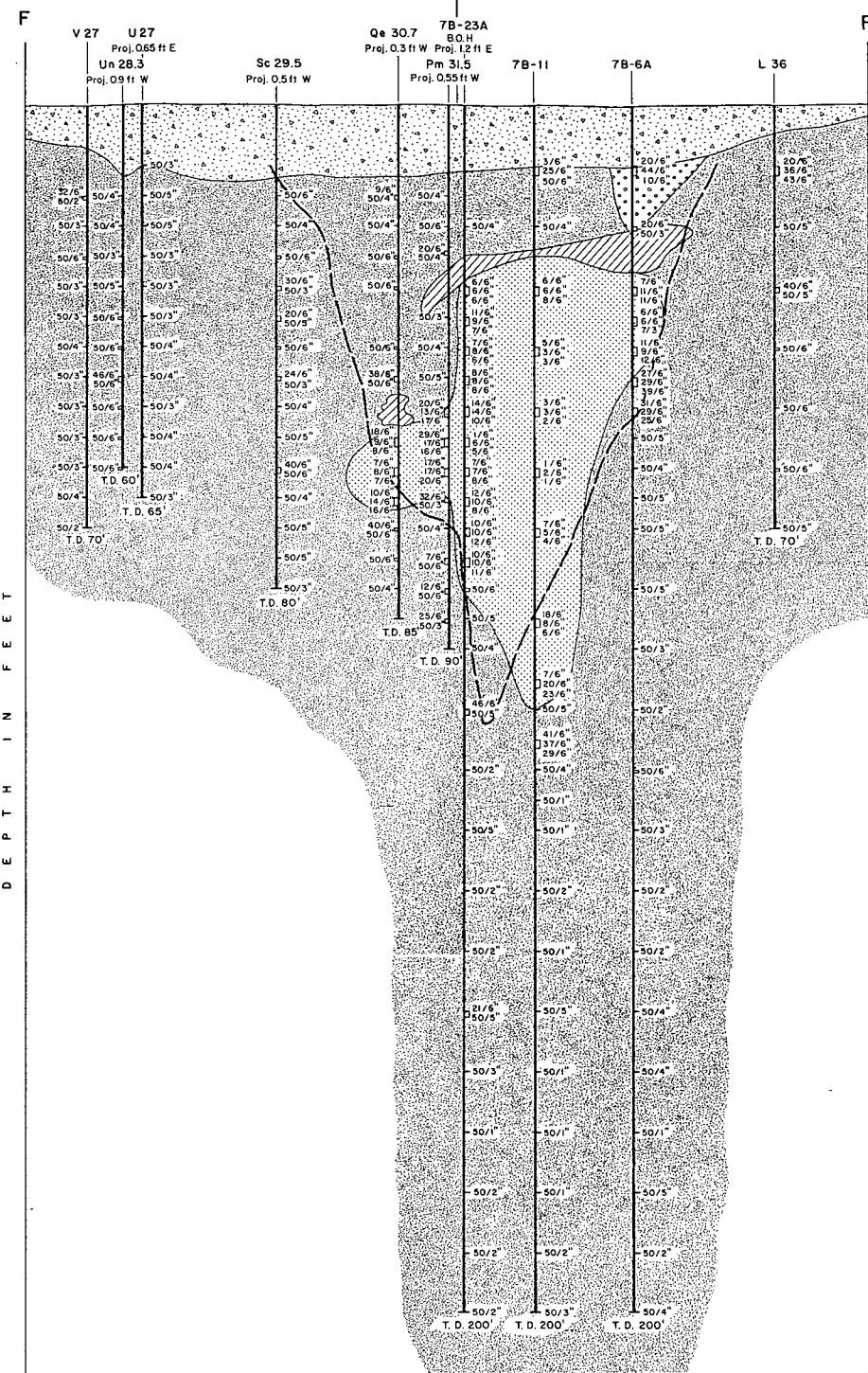
UNITS 2 & 3

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL No. 7
SHEET	CROSS-SECTIONS
2 OF 3	SOUTHERN CALIFORNIA EDISON COMPANY
	SCALE AS SHOWN LOS ANGELES, CALIF.

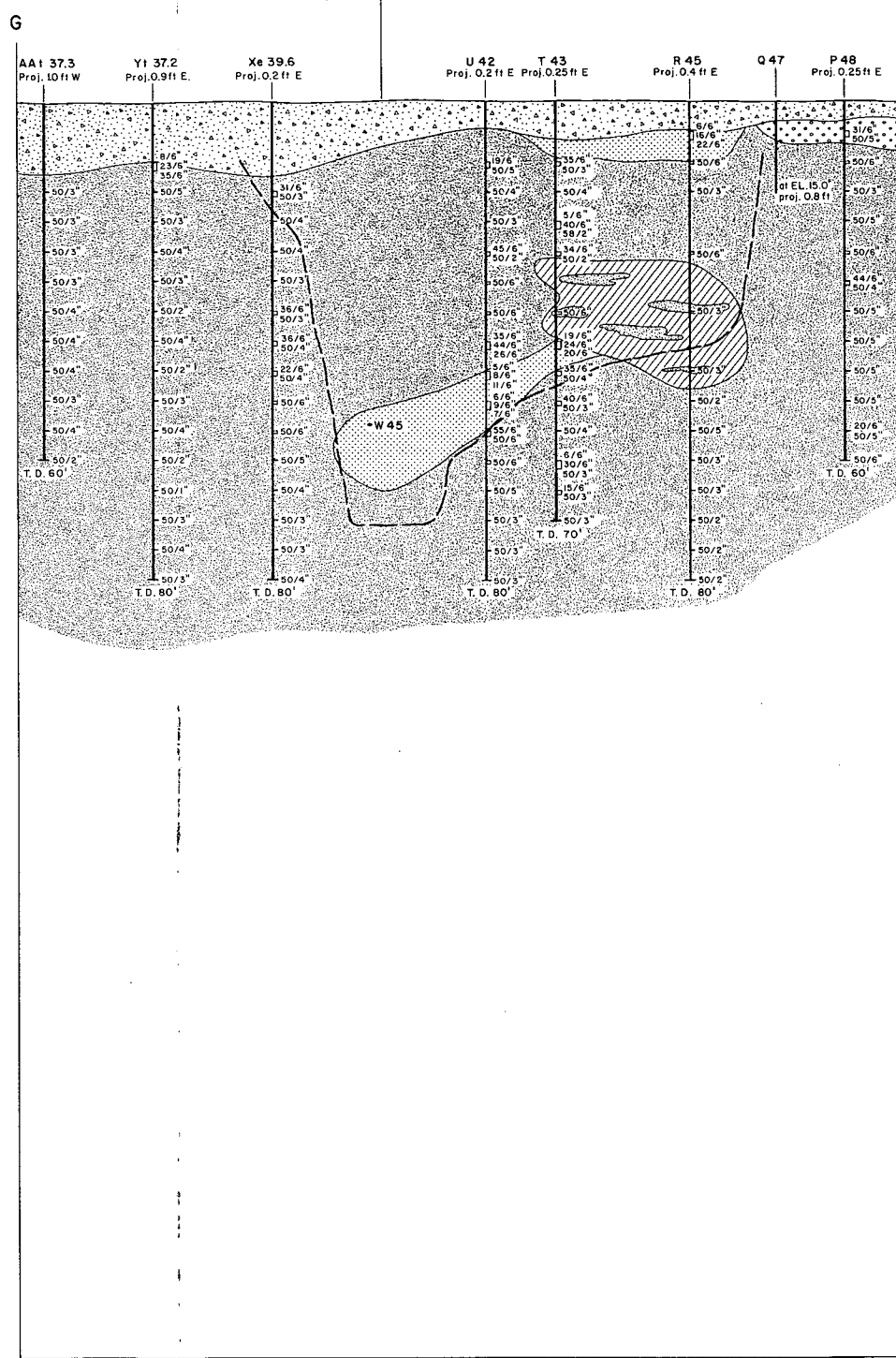
SEA LEVEL
(M.L.L.W. - EL. -2.66' M.S.L.)

ELEVATION IN FEET

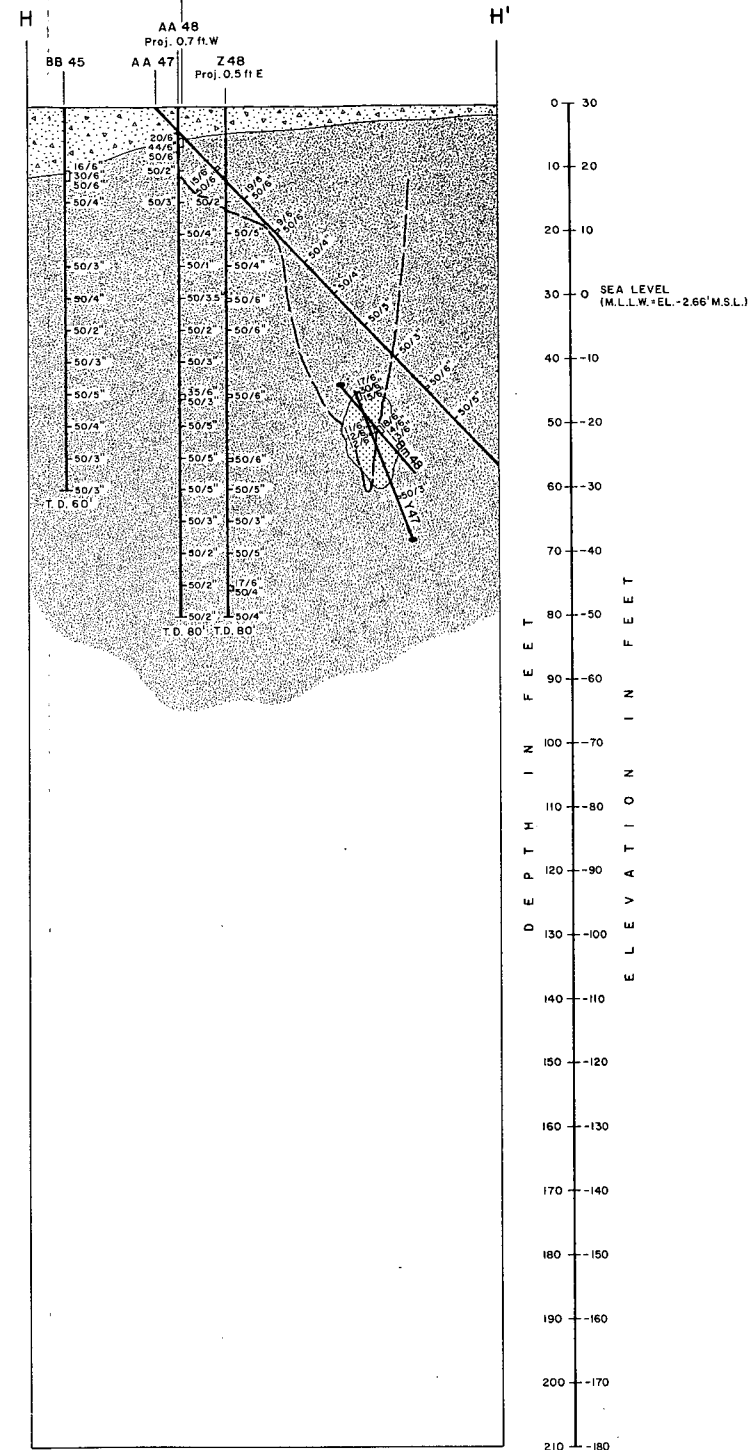
30 0
20 -10
10 -20
0 -30
-10 -40
-20 -50
-30 -60
-40 -70
-50 -80
-60 -90
-70 -100
-80 -110
-90 -120
-100 -130
-110 -140
-120 -150
-130 -160
-140 -170
-150 -180
-160 -190
-170 -200
-180 -210



SECTION F-F'



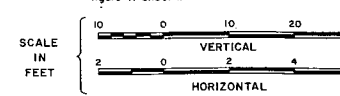
SECTION G-G'



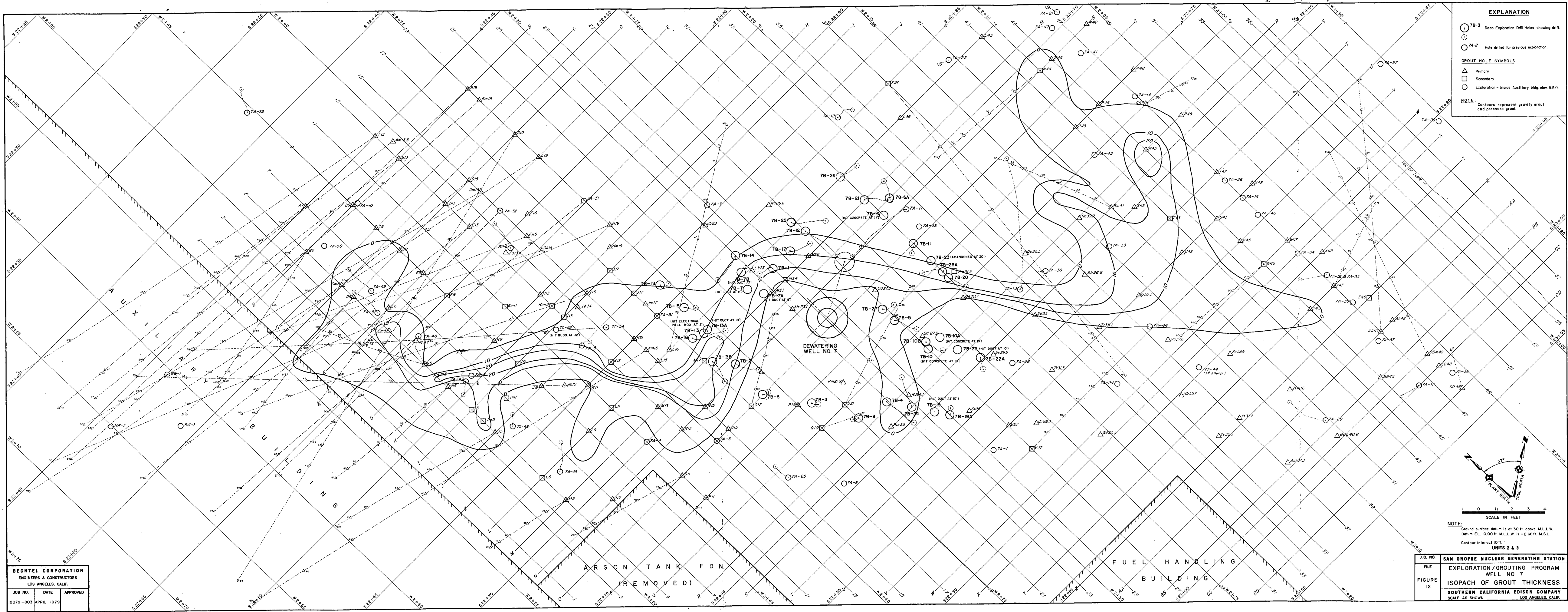
SECTION H-H'

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	MARCH 1979	

Notes:
1. For location of sections see figure 10
2. For explanation of symbols and notes see figure 11 sheet 1.



J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL No. 7
SHEET	CROSS-SECTIONS
3 OF 3	SOUTHERN CALIFORNIA EDISON COMPANY SCALE AS SHOWN LOS ANGELES, CALIF.



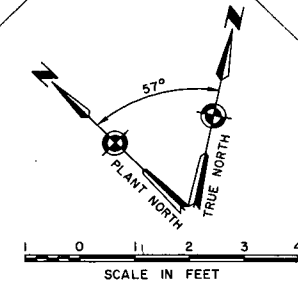
EXPLANATION

- 7B-3 Deep Exploration Drill Holes showing drift.
- 7A-2 Hole drilled for previous exploration.

GROUT HOLE SYMBOLS

- Primary
- Secondary
- Exploration - Inside Auxiliary bldg elev. 9.5 ft.

NOTE: Contours represent gravity grout and pressure grout.



NOTE: Ground surface datum is at 30 ft. above M.L.L.W. Datum EL. 0.00 ft. M.L.L.W. is -2.66 ft. M.S.L. Contour interval 10 ft.

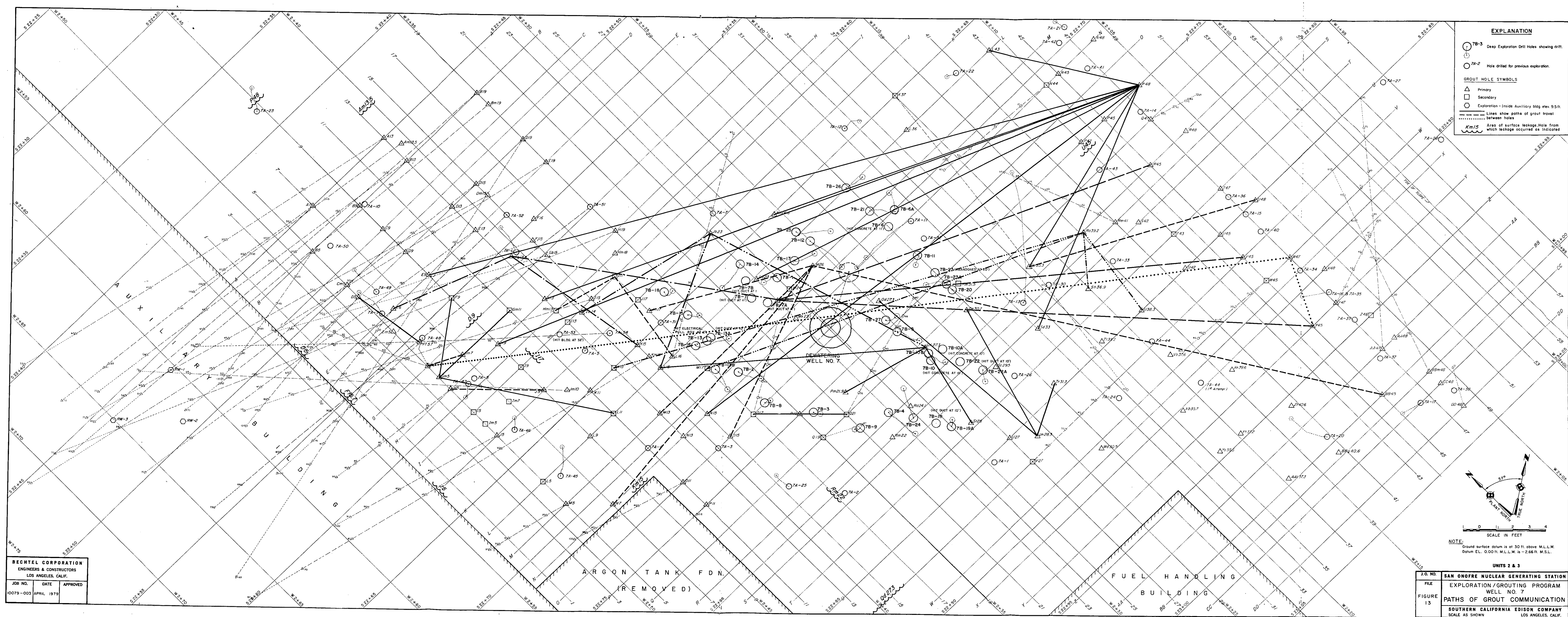
UNITS 2 & 3

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.
JOB NO. 10079-003 DATE APRIL 1979 APPROVED

J.O. NO. SAN ONOFRE NUCLEAR GENERATING STATION
FILE EXPLORATION/GROUTING PROGRAM
FIGURE 12 WELL NO. 7
ISOPACH OF GROUT THICKNESS
SOUTHERN CALIFORNIA EDISON COMPANY
SCALE AS SHOWN LOS ANGELES, CALIF.

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10079-003	APRIL 1979	



EXPLANATION

7B-3 Deep Exploration Drill Holes showing drift.

7A-2 Hole drilled for previous exploration.

GROUT HOLE SYMBOLS

Primary

Secondary

Exploration - Inside Auxiliary bldg. elev. 9.5 ft.

Lines show paths of grout travel between holes.

Area of surface leakage. Hole from which leakage occurred as indicated.

SCALE IN FEET

0 1 2 3 4

NOTE:
Ground surface datum is at 30 ft. above M.L.L.W.
Datum E.L. 0.00 ft. M.L.L.W. is -2.66 ft. M.S.L.

UNITS 2 & 3

TRUE NORTH

PLANT NORTH

J.O. NO. SAN ONOFRE NUCLEAR GENERATING STATION

FILE EXPLORATION/GROUTING PROGRAM

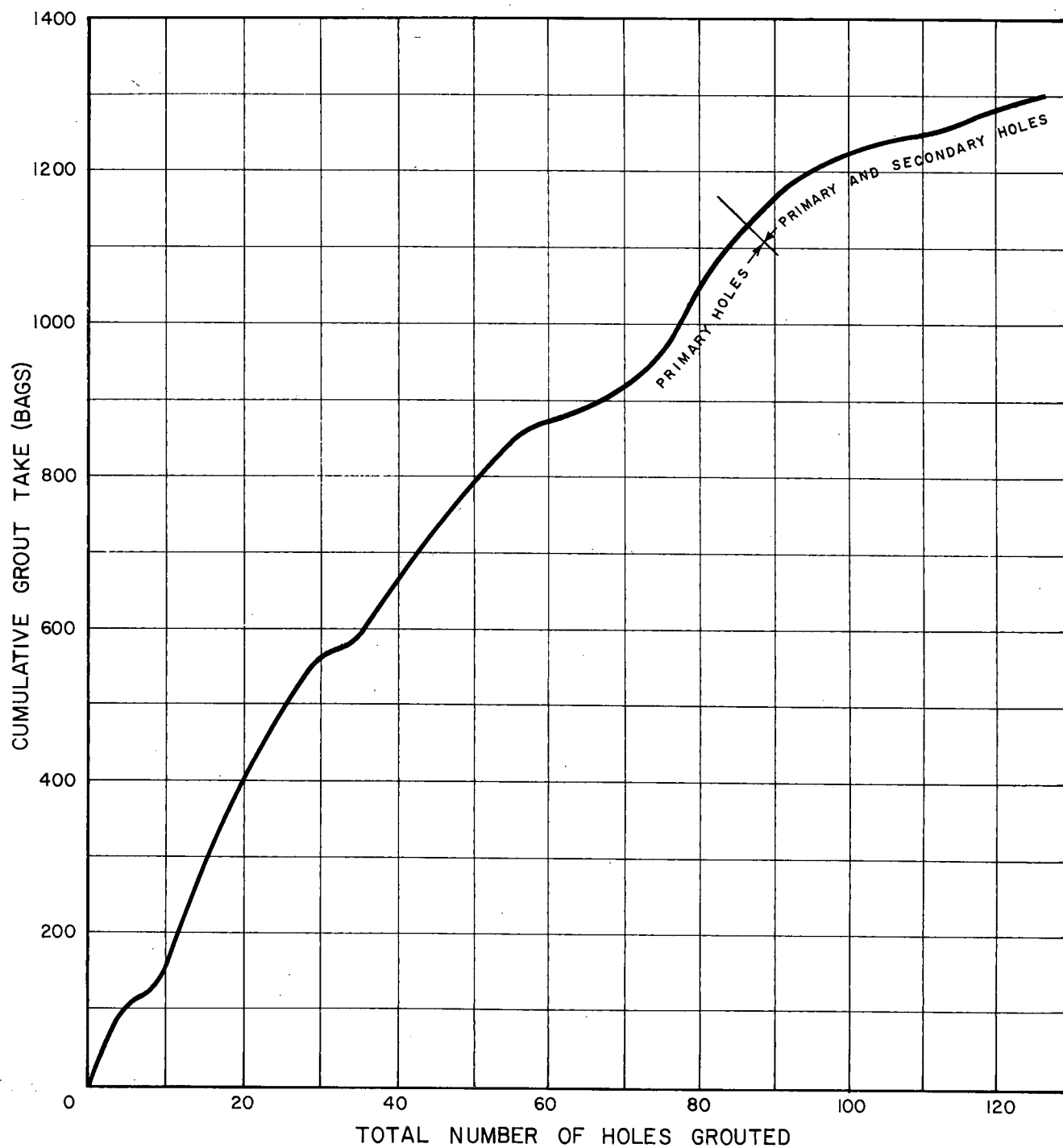
FIGURE 13 WELL NO. 7

PATHS OF GROUT COMMUNICATION

SOUTHERN CALIFORNIA EDISON COMPANY

SCALE AS SHOWN

LOS ANGELES, CALIF.

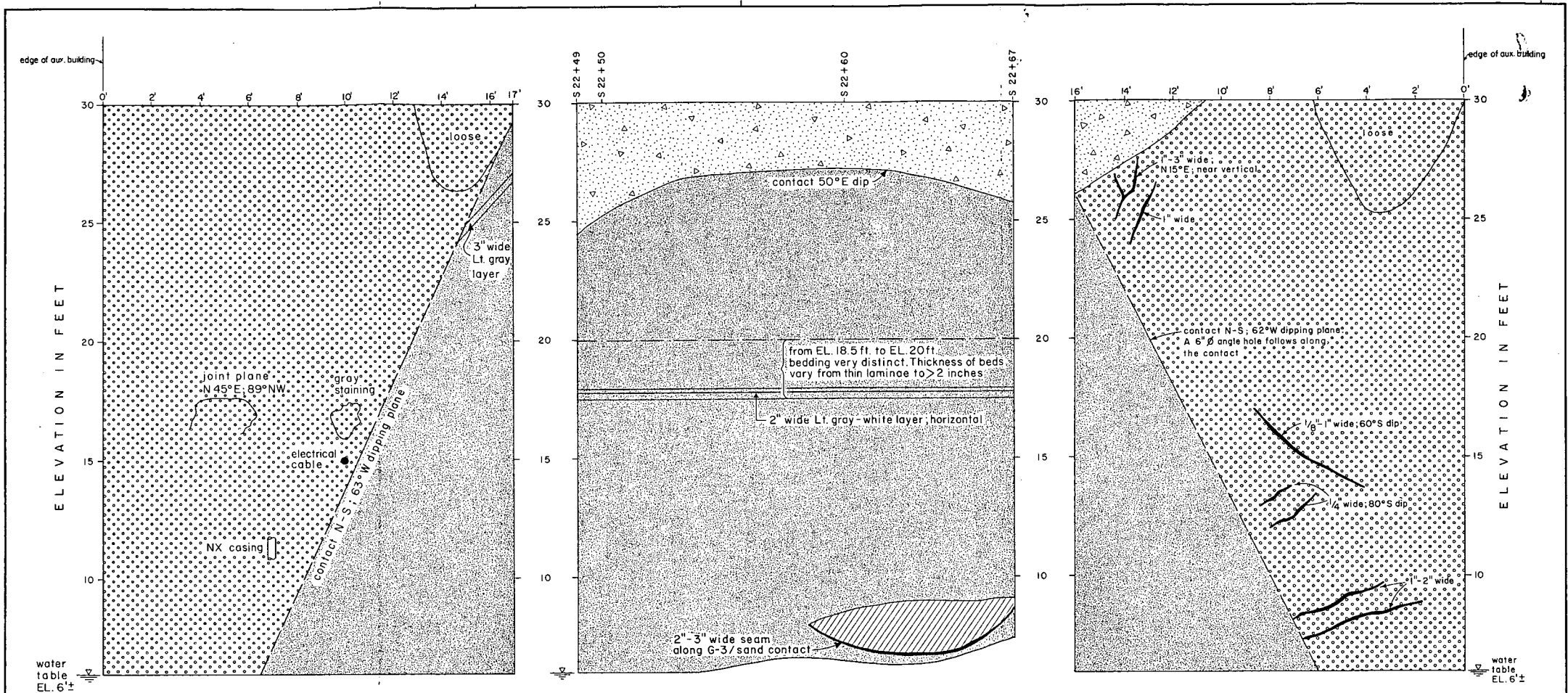


NOTE: The 3 holes drilled inside the Auxiliary Building are not included in the total shown.

UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO. 10079-003	DATE FEB. 1979	APPROVED

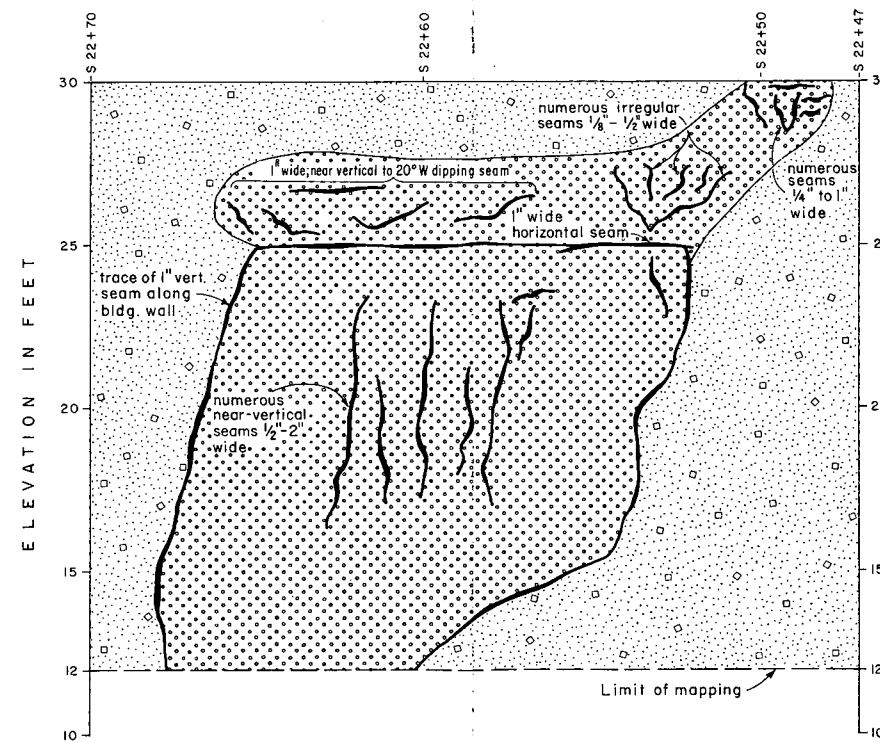
J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM WELL NO. 7
FIGURE 14	CUMULATIVE GROUT TAKE
SOUTHERN CALIFORNIA EDISON COMPANY SCALE N.T.S. LOS ANGELES, CALIF.	



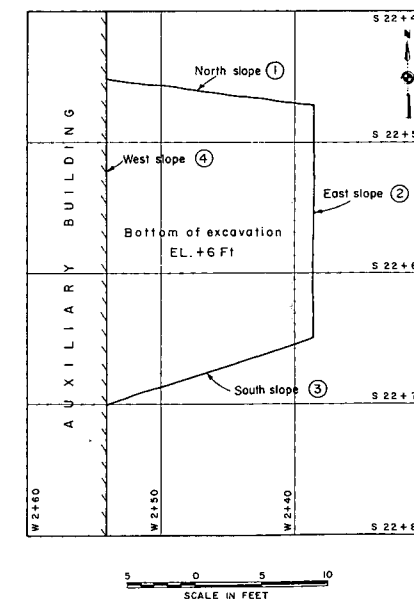
NORTH SLOPE OF EXCAVATION ①

EAST SLOPE OF EXCAVATION ②

SOUTH SLOPE OF EXCAVATION ③



WEST SLOPE OF EXCAVATION ④



LOCATION PLAN OF EXCAVATION

EXPLANATION

- Grout (G-3)
- Concrete
- Fillcrete
- Backfill sand - Tan, fine-coarse sand, dense-very dense except where noted
- San Mateo Formation - Lt. gray-tan, fine-coarse sand, scattered siltstone and claystone pods up to 1 1/2 inch diameter, very dense. Bedding distinct where noted
- Grout seams injected during pressure grout program. Grout consists of dark gray, hard Portland cement grout

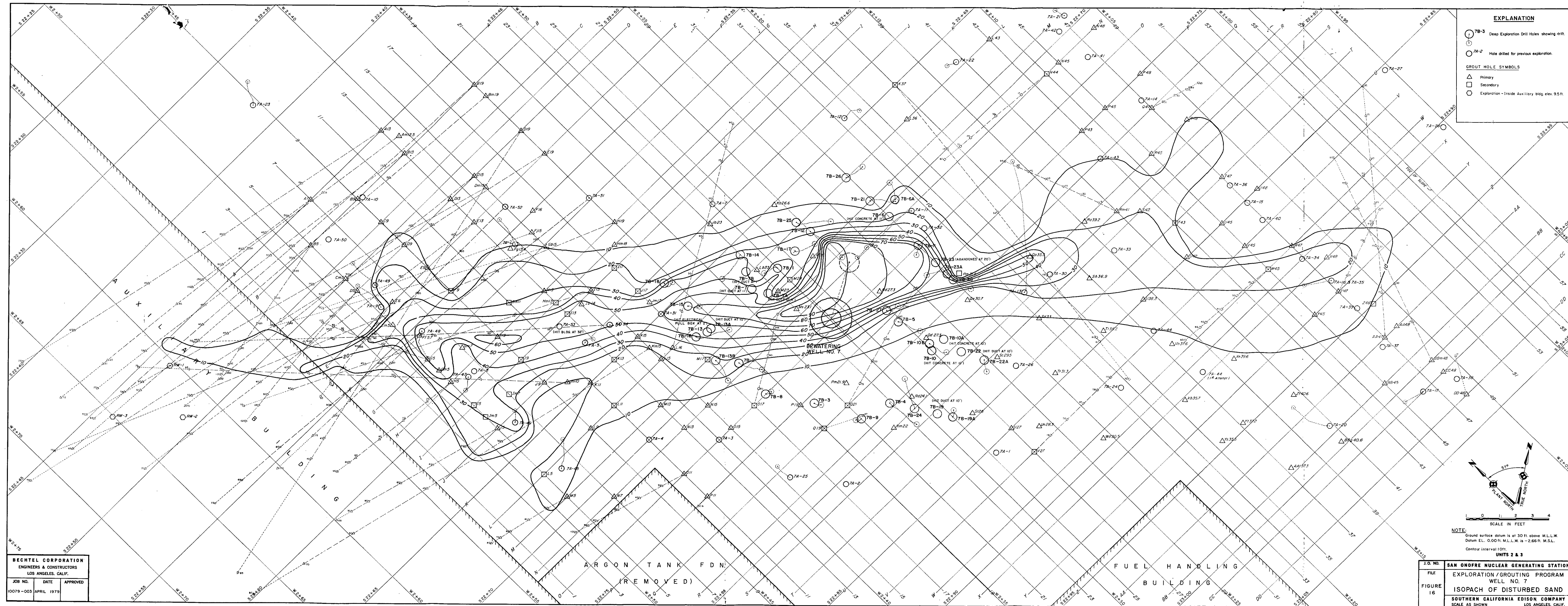
NOTES:

1. Unable to map west slope below EL. 12 ft. due to safety hazard during excavation.
2. Mapping was performed from February 27 thru March 1, 1979
3. Numerous exploration/grout holes, were intersected by the excavation.

SCALE IN FEET
(HORIZONTAL & VERTICAL)
UNITS 2 & 3

BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	APRIL 1979	

I.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	EXPLORATION/GROUTING PROGRAM
FIGURE	WELL No. 7
15	GEOLOGIC MAP OF EXCAVATION
	SOUTHERN CALIFORNIA EDISON COMPANY
	SCALE AS SHOWN LOS ANGELES, CALIF.



EXPLANATION

7B-3 Deep Exploration Drill Holes showing drift.

7A-2 Hole drilled for previous exploration.

GROUT HOLE SYMBOLS

△ Primary

□ Secondary

○ Exploration - Inside Auxiliary bldg. elev. 9.5 ft.

BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.

JOB NO.	DATE	APPROVED
10079-003	APRIL 1979	

NOTE:
Ground surface datum is at 30 ft. above M.L.L.W.
Datum E.L. 0.00 ft. M.L.L.W. is -2.66 ft. M.S.L.
Contour interval 10 ft.

SCALE IN FEET

0 1 2 3 4

SAN ONOFRE NUCLEAR GENERATING STATION

FILE
EXPLORATION/GROUTING PROGRAM
WELL NO. 7

FIGURE 16
ISOPACH OF DISTURBED SAND

SOUTHERN CALIFORNIA Edison COMPANY
LOS ANGELES, CALIF.

APPENDIX A

Appendix A includes results of the gyroscopic multi-shot surveys performed by Eastman Whipstock during the Exploration/Grouting Program. The computer printouts of the surveys and directional plots are included for the following holes:

A-7	I-15
A-13	J-5
A _m -13.5	J _m -10
B-5	K _m -15
B-13	K-37
B-19	L-16
B _m -19	M-5
D-5	N-44
D-15	O-11
D-19	O-17
D _m -15	Q-21
E-6	Q-47
E-13	R _m -41
E-19	V-27
F _f -5.7	W-45
G-5	Y-47
H-5	AA-47
H-19	BB _m -48
	RW-1

The above holes were surveyed to establish direction and inclination.

BECHTEL POWER CORP.--- WELL 7 #A-7 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 5 DECEMBER 1978

JOB NO: P-1278-G0289

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-3

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

Figure 10
RECORD OF SURVEY

ANGLE AVERAGING METHOD

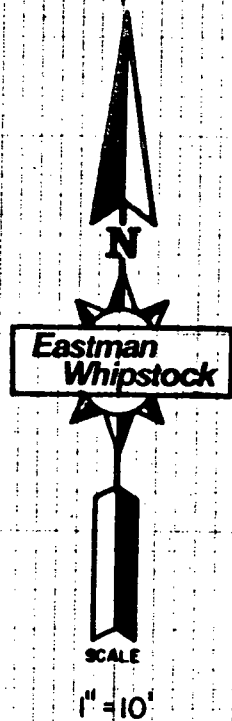
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
---------------------------	-----------------------	---------------------------	-----------------------------------	-----------------------------	--	--

0.	4 55	N 82 0 W	0.00	0.00	0.00	0.00
----	------	----------	------	------	------	------

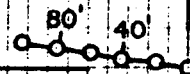
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	4 55	N 82 0 W	19.93	1.71	0.24 N	1.70 W
40.	4 50	N 81 30 W	39.85	3.41	0.48 N	3.38 W
60.	4 45	N 81 0 W	59.78	5.08	0.74 N	5.03 W
80.	4 30	N 82 30 W	79.72	6.70	0.97 N	6.63 W
100.	4 30	N 83 30 W	99.66	8.27	1.16 N	8.18 W

FINAL CLOSURE - DIRECTION: N 81 DEGS 56 MINS 17 SECS W
DISTANCE: 8.27 FEET



DEPTH - 100'
NORTH - 1.16'
WEST - 8.18'
CLOSURE - 8.27' N 81° 56' 17" W



BECHTEL POWER CORP.-- WELL 7 4A-13 -- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W
DATE: 12 DECEMBER 1978
JOB NO: P-1278-G0325
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F143-1
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
---------------------------	-----------------------	-------------------------	-----------------------------------	-----------------------------	------------------------------------	--

0.	22 45	N 79 W	0.00	0.00	0.00	0.00
----	-------	--------	------	------	------	------

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	22 45	N 79 W	13.83	5.80	1.11 N	5.69 W
30.	21 45	N 79 W	27.72	11.48	2.19 N	11.27 W
45.	21 15	N 78 W	41.67	16.98	3.29 N	16.66 W
60.	21 15	N 77 W	55.65	22.41	4.46 N	21.96 W

FINAL CLOSURE - DIRECTION: N 78 DEGS 30 MINS 49 SECS W
DISTANCE: 22.41 FEET



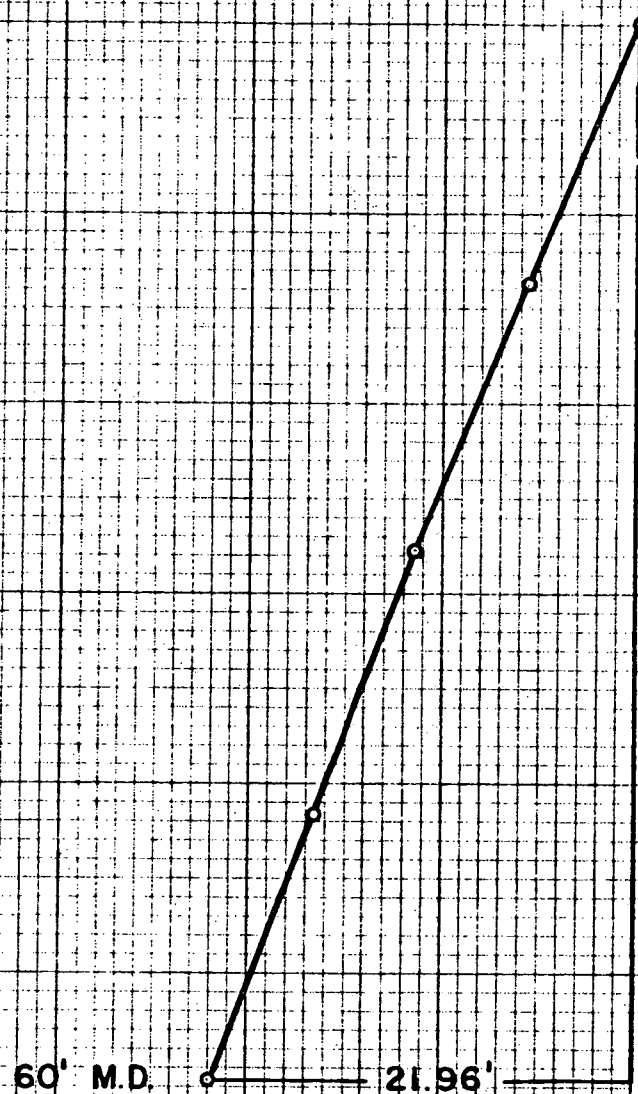
1" = 10'

DEPTH - 60'
NORTH - 4.46'
WEST - 21.96'
CLOSURE - 22.41' N 78° 30' 49" W



WELL 7 N2A-13

P-1278-60235

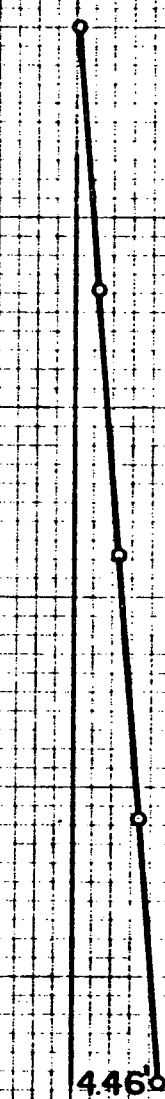


SURFACE

20' V.

40' V.

55.65' V.D.



WELL 7 N^o A-3

SCALE
1" = 10'

BECHTEL POWER CORP.---WELL 7 #A_m-13.5 --EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 20 DECEMBER 1978

JOB NO: P-1278-G0358

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-13

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

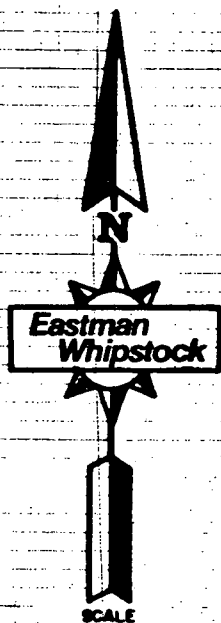
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
---------------------------	-----------------------	-------------------------	-----------------------------------	-----------------------------	------------------------------------	--

0.	22 30	N 82 W	0.00	0.00	0.00	0.00
----	-------	--------	------	------	------	------

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

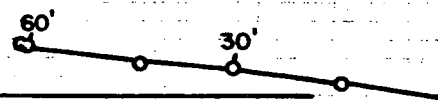
15.	22 30	N 82 W	13.86	5.74	0.80 N	5.68 W
30.	22 0	N 83 W	27.74	11.42	1.54 N	11.32 W
45.	21 30	N 84 W	41.67	16.98	2.17 N	16.84 W
60.	21 30	N 85 W	55.63	22.47	2.70 N	22.31 W
61.	21 30	N 85 W	56.56	22.84	2.73 N	22.68 W

FINAL CLOSURE - DIRECTION: N 83 DEGS 8 MINS 21 SECS W
DISTANCE: 22.84 FEET



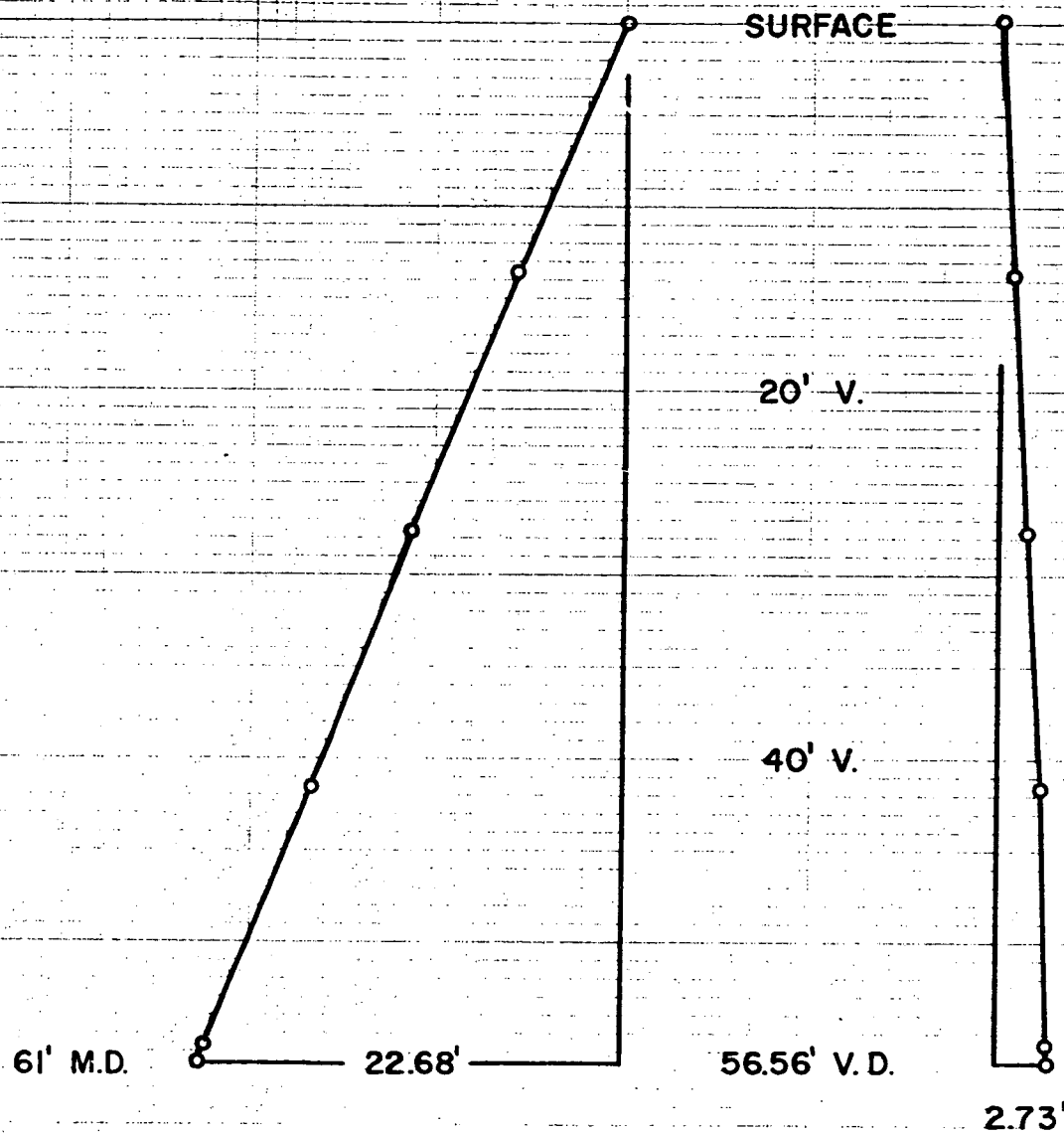
1"=10'

DEPTH - 61'
NORTH - 2.73'
WEST - 22.68'
CLOSURE - 22.84' N 83° 08' 21" W



WELL 7 N^o A_m-13.5

JOB N^o P-1278-G0357



VERTICAL SECTION

WELL 7 N^o A -13.5
m

SCALE
1" = 10'

EAST

NORTH

BECHTEL POWER CORP.-- WELL 7 #8-5 --EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 1 NOVEMBER 1978

JOB NO: P-1178-G0159

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-12

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
---------------------------	-----------------------	-------------------------	-----------------------------------	-----------------------------	------------------------------------	--

0.	5 35	S 78 W	0.00	0.00	0.00	0.00
----	------	--------	------	------	------	------

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

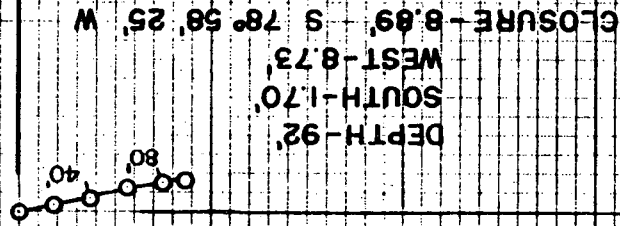
20.	5 35	S 78 W	19.91	1.95	0.40 S	1.90 W
40.	5 35	S 79 W	39.81	3.89	0.79 S	3.81 W
60.	5 30	S 79 W	59.72	5.82	1.16 S	5.71 W
80.	5 30	S 60 W	79.62	7.74	1.51 S	7.59 W
92.	5 30	S 81 W	91.57	8.89	1.70 S	8.73 W

FINAL CLOSURE - DIRECTION: S 78 DEGS 58 MINS 25 SECS W
DISTANCE: 8.89 FEET



WELL 7 № B-5

JOB № P-1178-G0159



SURFACE

WELL 7 N° 8-5

SCALE

1" = 10'

VERTICAL SECTION

20' V

40' V

60' V

80' V

92' M.D.

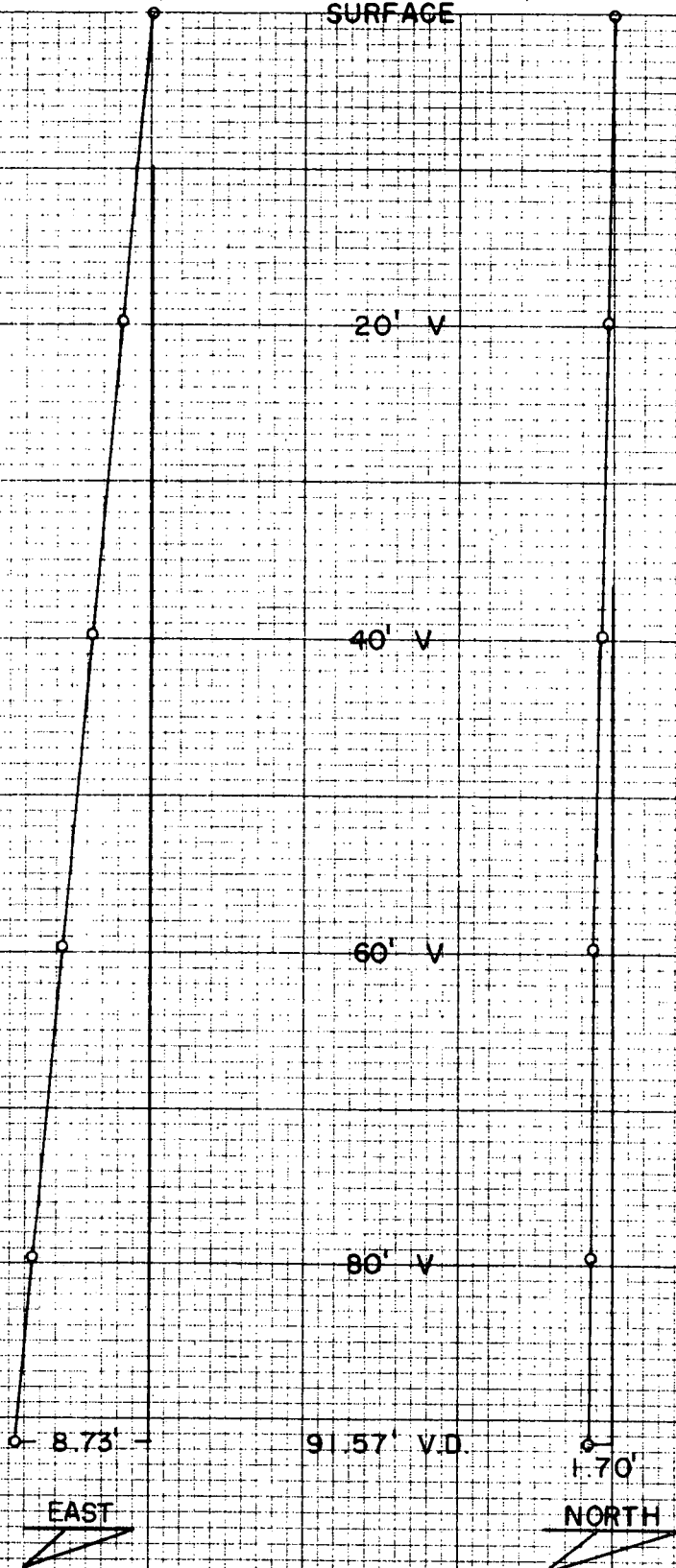
8.73'

91.57' V.D.

1.70'

EAST

NORTH



BECHTEL POWER CORP.--- WELL 7 1B-13 ----EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 06 DECEMBER 1978
JOB NO: P-1278-G0299
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F141-6
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	20 0	N 83 0 W	0.00	0.00	0.00	0.00

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 E

15.	20 0	N 83 0 W	14.10	5.13	0.83 N	5.09 W
30.	19 45	N 82 30 W	28.20	10.23	1.27 N	10.15 W
45.	19 30	N 83 0 W	42.33	15.27	1.90 N	15.15 W
59.	19 0	N 83 30 W	55.55	19.88	2.45 N	19.73 W

FINAL CLOSURE - DIRECTION: N 82 DEGS 55 MINS 50 SECS W
DISTANCE: 19.88 FEET

Eastman
Whipstock

DEPTH - 59'

NORTH - 2.45'

WEST - 19.73'

CLOSURE - 19.86' N 82° 55' 50" W

30°

SCALE

1" = 10'

WELL 7 N° B - 13

P-1278-60299

SURFACE

VERTICAL SECTION

WELL 7 N^o B-13

SCALE
1" = 10'

20' V.

40' V.

59' M.D.

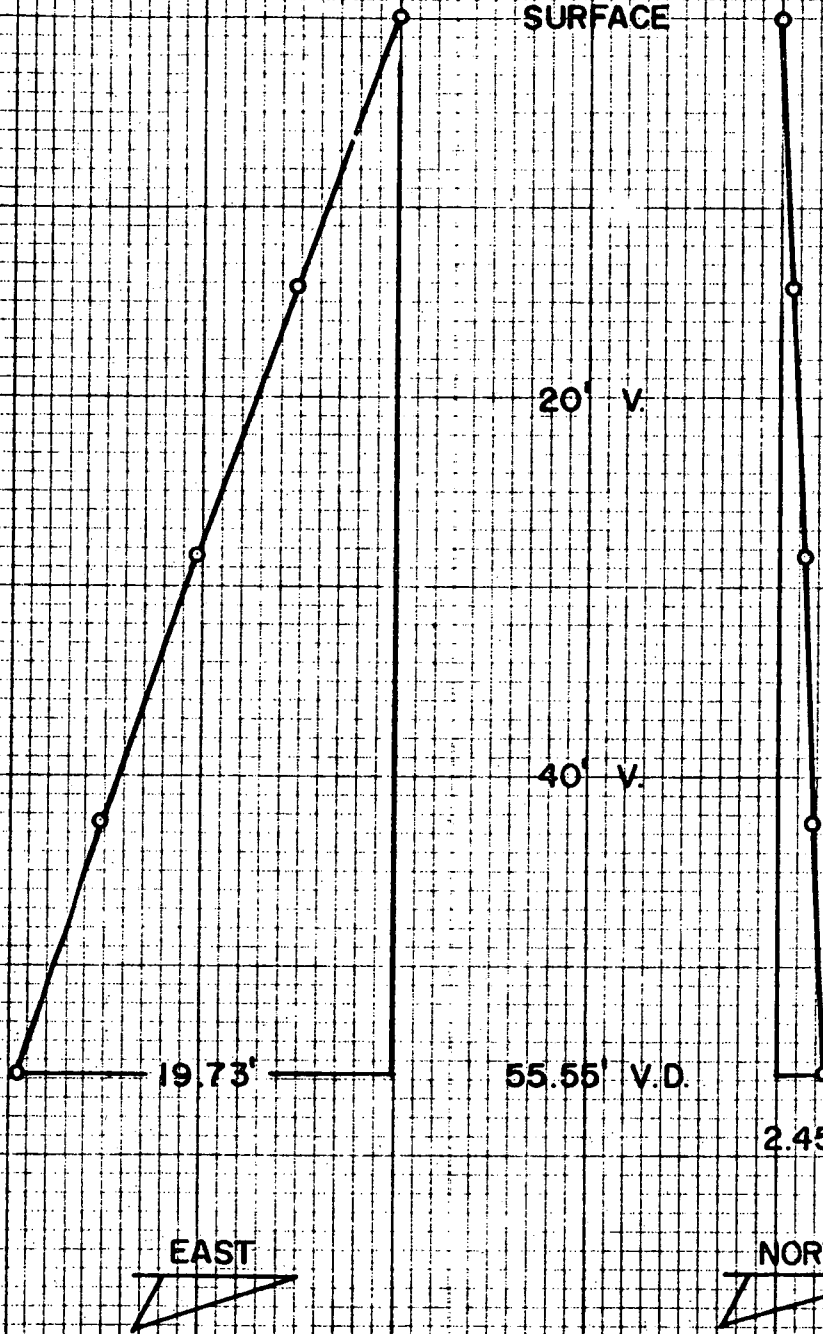
19.73'

55.55' V.D.

2.45'

EAST

NORTH



BECHTEL POWER CORP. --- WELL 7 4B-19 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 52 00 W

DATE: 14 DECEMBER 1978
JOB NO: P-1278-G0339
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F143-4
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D N	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	29 30	N 87 30 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	29 30	N 87 30 W	13.06	7.39	0.32 N	7.38 W
30.	29 30	N 86 30 W	26.11	14.77	0.71 N	14.76 W
45.	29 15	N 86 30 W	39.18	22.13	1.16 N	22.10 W
58.	29 15	N 86 0 W	50.52	28.48	1.57 N	28.44 W

FINAL CLOSURE - DIRECTION: N 86 DEGS 50 MINS 0 SECS W
DISTANCE: 28.48 FEET

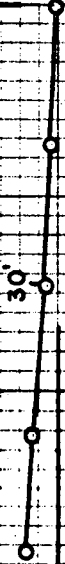
Eastman
Whipstock



SCALE

1"=10'

DEPTH - 58'
NORTH - 1.57'
WEST - 28.44'
CLOSURE - 28.48' N 86° 50' 00" W



BECHTEL POWER CORP. --- WELL 7 48m-19 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 18 DECEMBER 1978
JOB NO: F-1278-G0531
GYRO MULTI-SHOT SURVEY
FILE: F143-8
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

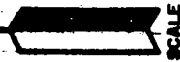
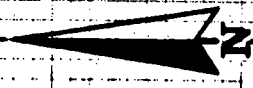
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	30 50	N 85 30 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	30 50	N 85 30 W	12.88	7.69	0.60 N	7.66 W
30.	30 45	N 86 0 W	25.77	15.37	1.17 N	15.32 W
45.	30 50	N 86 30 W	38.65	23.05	1.67 N	22.98 W
54.	30 55	N 86 30 W	46.38	27.66	1.96 N	27.59 W

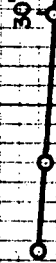
FINAL CLOSURE - DIRECTION: N 85 DEGS 56 MINS 40 SECS W
DISTANCE: 27.66 FEET



SCALE

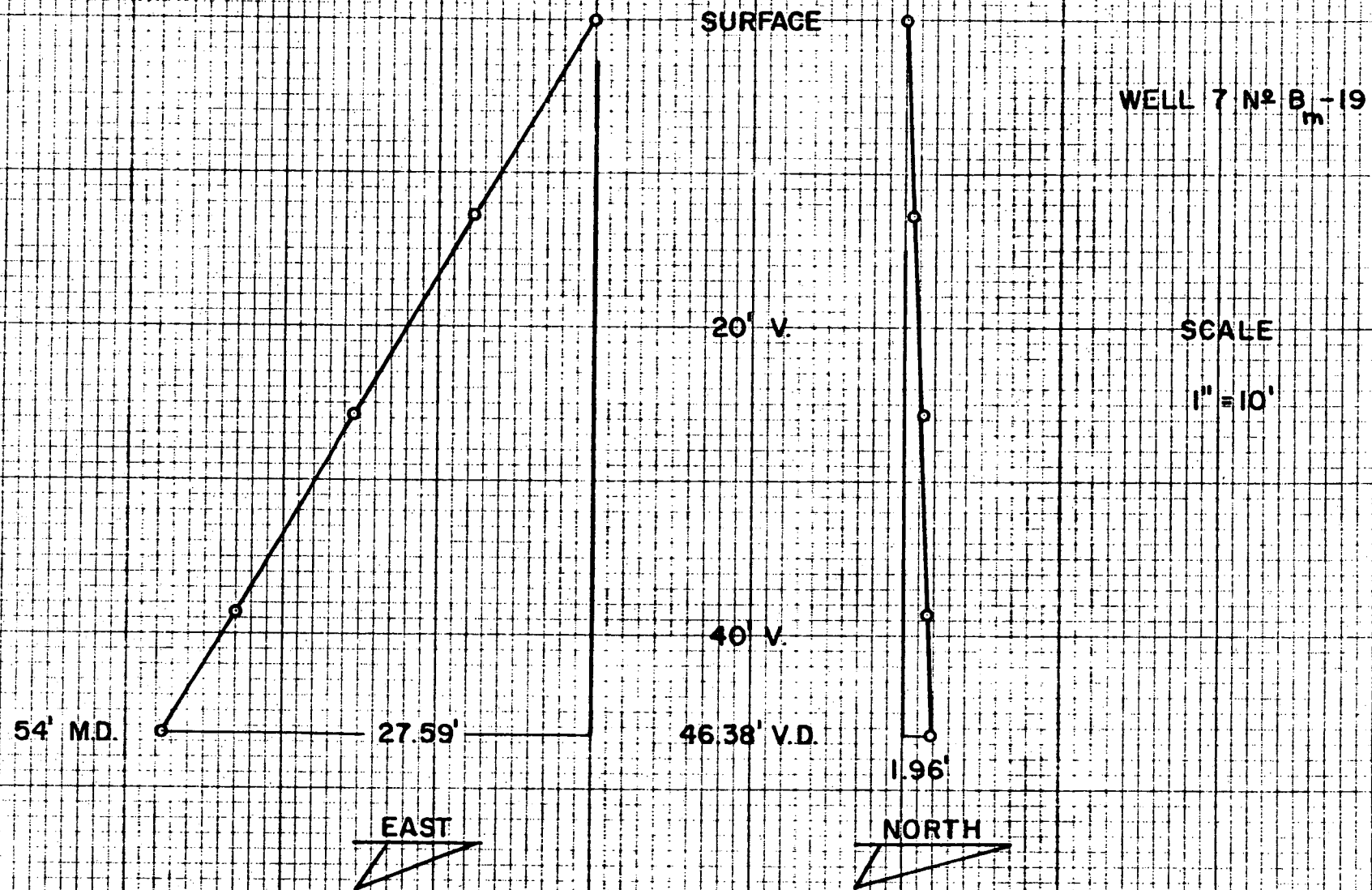
1" = 10'

DEPTH - 54'
NORTH - 196'
WEST - 27.59'
CLOSURE - 27.66' N 85° 56' 40" W



WELL 7 No 8 m -19

P-1278-60351



BECHTEL POWER CORP. --- WELL 7 4D-5 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 18 OCTOBER 1978
JOB NO: P-1078-G0118
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F136-2
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

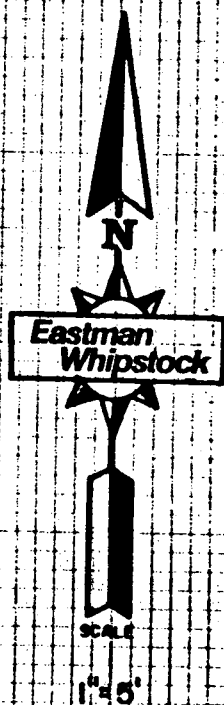
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	6 5	S 88 0 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	6 5	S 87 0 W	19.87	2.12	0.09 S	2.12 W
40.	5 55	S 85 0 W	39.78	4.21	0.24 S	4.20 W
60.	6 5	S 83 30 W	59.67	6.30	0.45 S	6.28 W
80.	6 5	S 83 30 W	79.56	8.42	0.69 S	8.39 W
88.	6 0	S 84 0 W	87.51	9.26	0.78 S	9.23 W

FINAL CLOSURE - DIRECTION: S 85 DEGS 10 MINS 18 SECS W
DISTANCE: 9.26 FEET



DEPTH-88'
SOUTH-0.78'
WEST -9.23'
CLOSURE-926° S 85° 10' 18" W

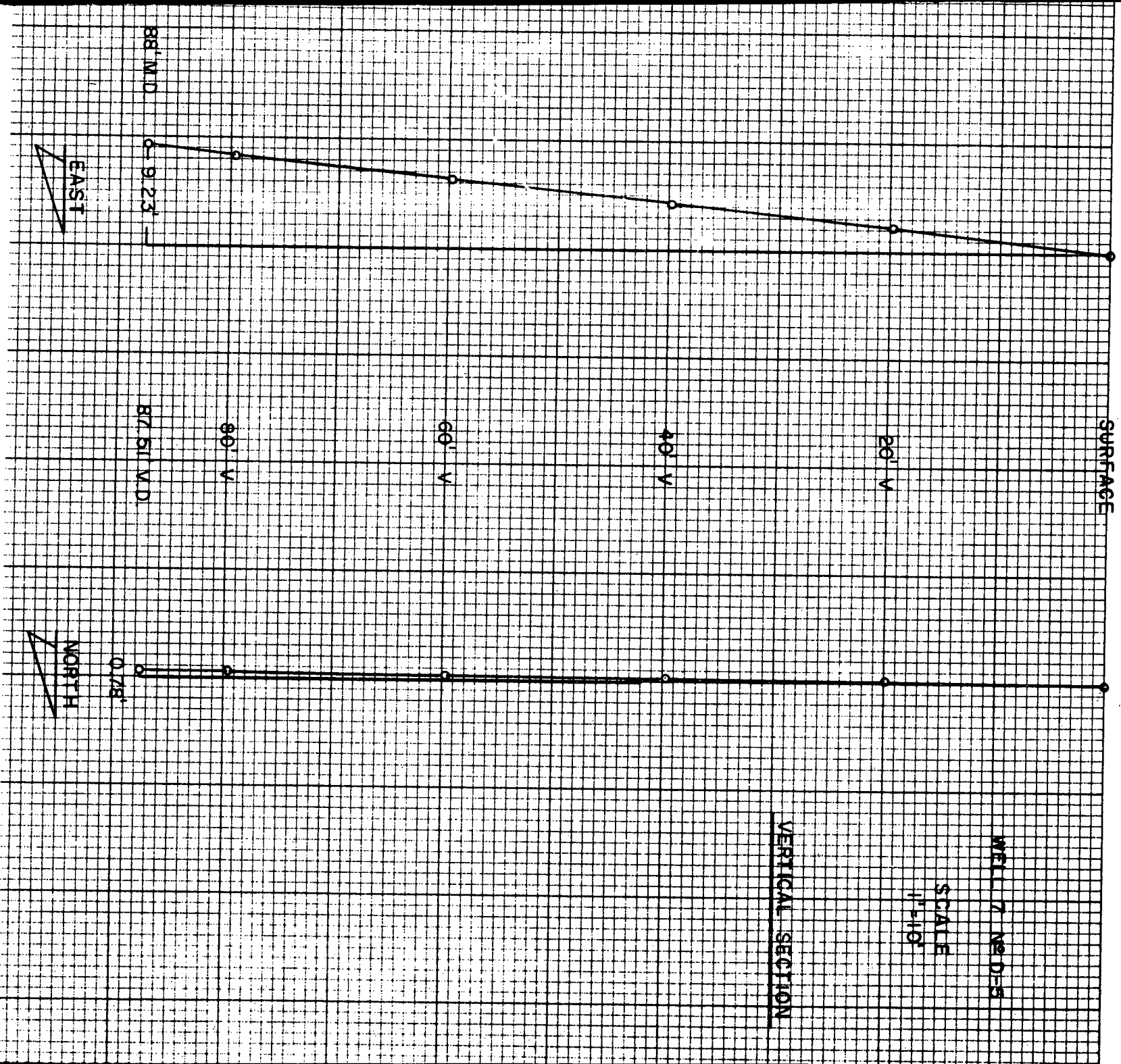
WELL 7 N° D-5

JOB N° P-1078-G0118

WELL NO. D-5

SCALE
1"=10'

VERTICAL SECTION



BECHTEL POWER CORP.--- WELL 7 4D-1C ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

DATE: 12 DECEMBER 1978

JOB NO: P-1278-0324

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-19

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	18 50	N 84 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57.00 W

15.	18 50	N 84 W	14.20	4.84	0.51 N	4.82 W
30.	18 45	N 84 W	28.40	9.67	1.01 N	9.62 W
45.	18 40	N 84 W	42.60	14.49	1.51 N	14.41 W
60.	18 40	N 84 W	56.82	19.29	2.02 N	19.18 W
62.	18 40	N 84 W	58.71	19.93	2.08 N	19.82 W

FINAL CLOSURE - DIRECTION: N 84 DEGS 0 MINS 0 SECS W
DISTANCE: 19.93 FEET

Eastman
Whipstock

DEPTH - 62'
NORTH - 2.08'
WEST - 19.82'
CLOSURE - 19.93' N 84° 00' W

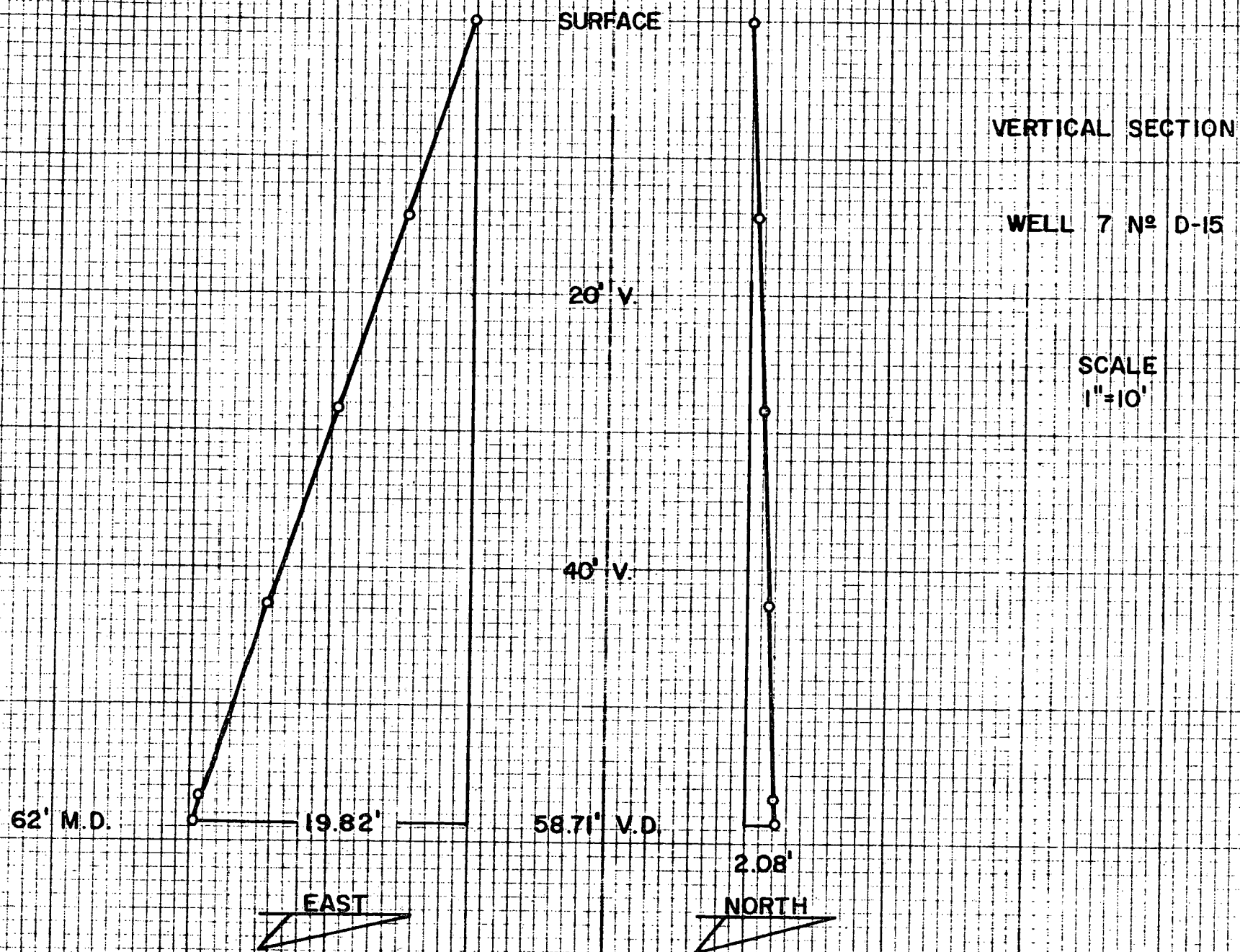
60'
30'

SCALE

1" = 10'

WELL 7 N8 D-15

JOB N# P-1278-G0324



BECHTEL POWER CORP.--- WELL 7 #D-19 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 18 DECEMBER 1978
JOB NO: P-1278-G0350
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F143-9
PITI

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

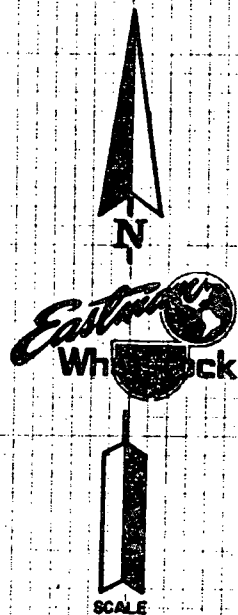
ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	30 10	S 77 W	0.00	0.00	0.00	0.00

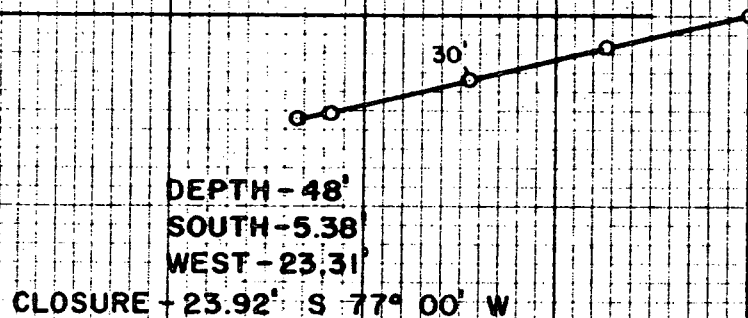
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	30 10	S 77 W	12.97	7.54	1.70 S	7.34 W
30.	29 45	S 77 W	25.96	15.03	3.38 S	14.64 W
45.	29 30	S 77 W	39.00	22.44	5.05 S	21.87 W
48.	29 30	S 77 W	41.61	23.92	5.38 S	23.31 W

FINAL CLOSURE - DIRECTION: S 77 DEGS 0 MINS 0 SECS W
DISTANCE: 23.92 FEET

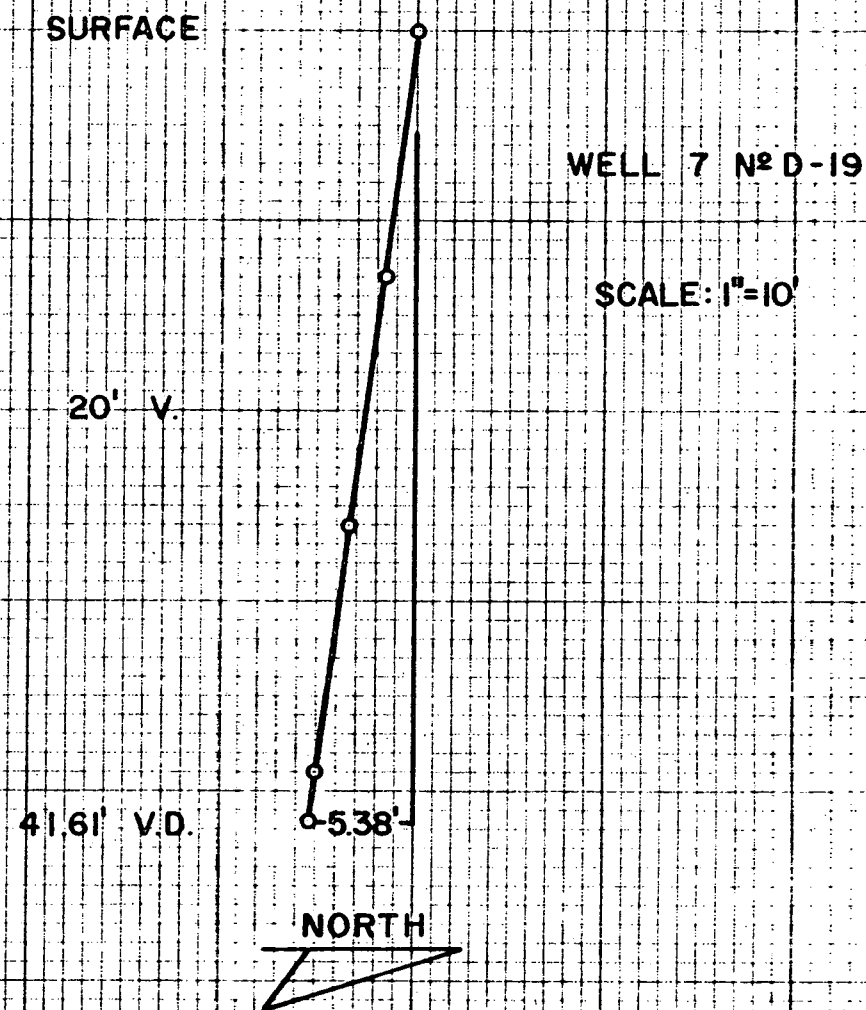
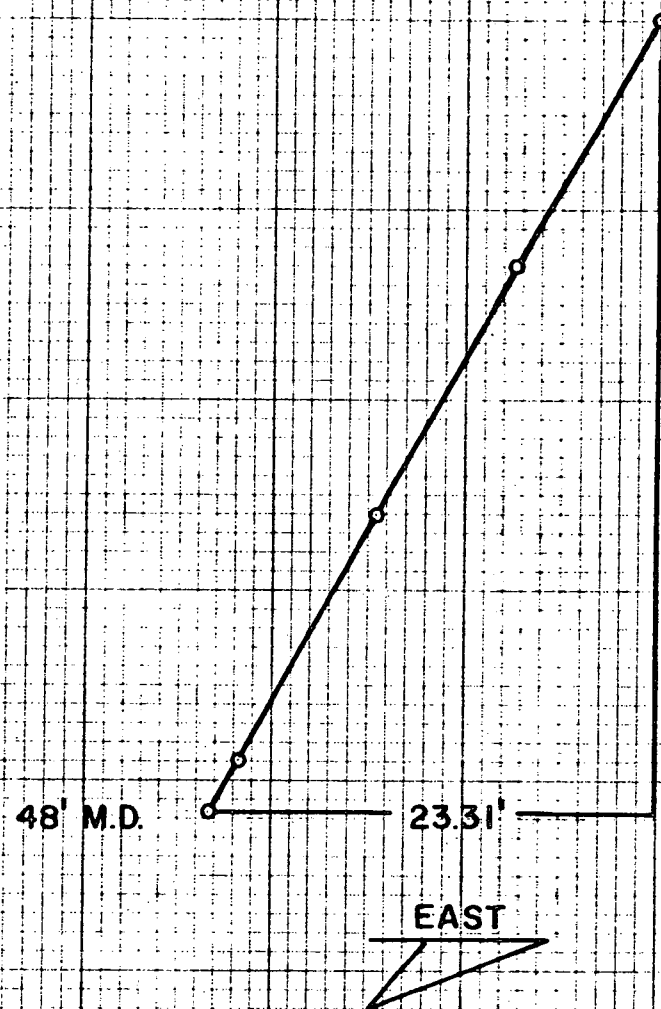


1" = 10'



WELL 7 N# D-19

P-1278-G0350



BECHTEL POWER CORP.-- WELL 7 #1_m 15 --EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 8 NOVEMBER 1978

JOG NO: P-1178-60183

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-14

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	23 45	N 74 30 W	0.00	0.00	0.00	0.00
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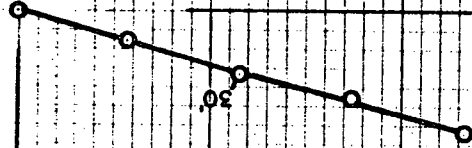
NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

15.	23 45	N 74 30 W	13.73	6.04	1.61 N	5.82 W
30.	23 30	N 75 0 W	27.47	12.05	3.20 N	11.62 W
45.	23 30	N 75 30 W	41.23	18.03	4.72 N	17.41 W
60.	23 30	N 75 30 W	54.98	24.01	6.22 N	23.20 W

FINAL CLOSURE - DIRECTION: N 74 DEGS 59 MINS 54 SECS W
DISTANCE: 24.01 FEET

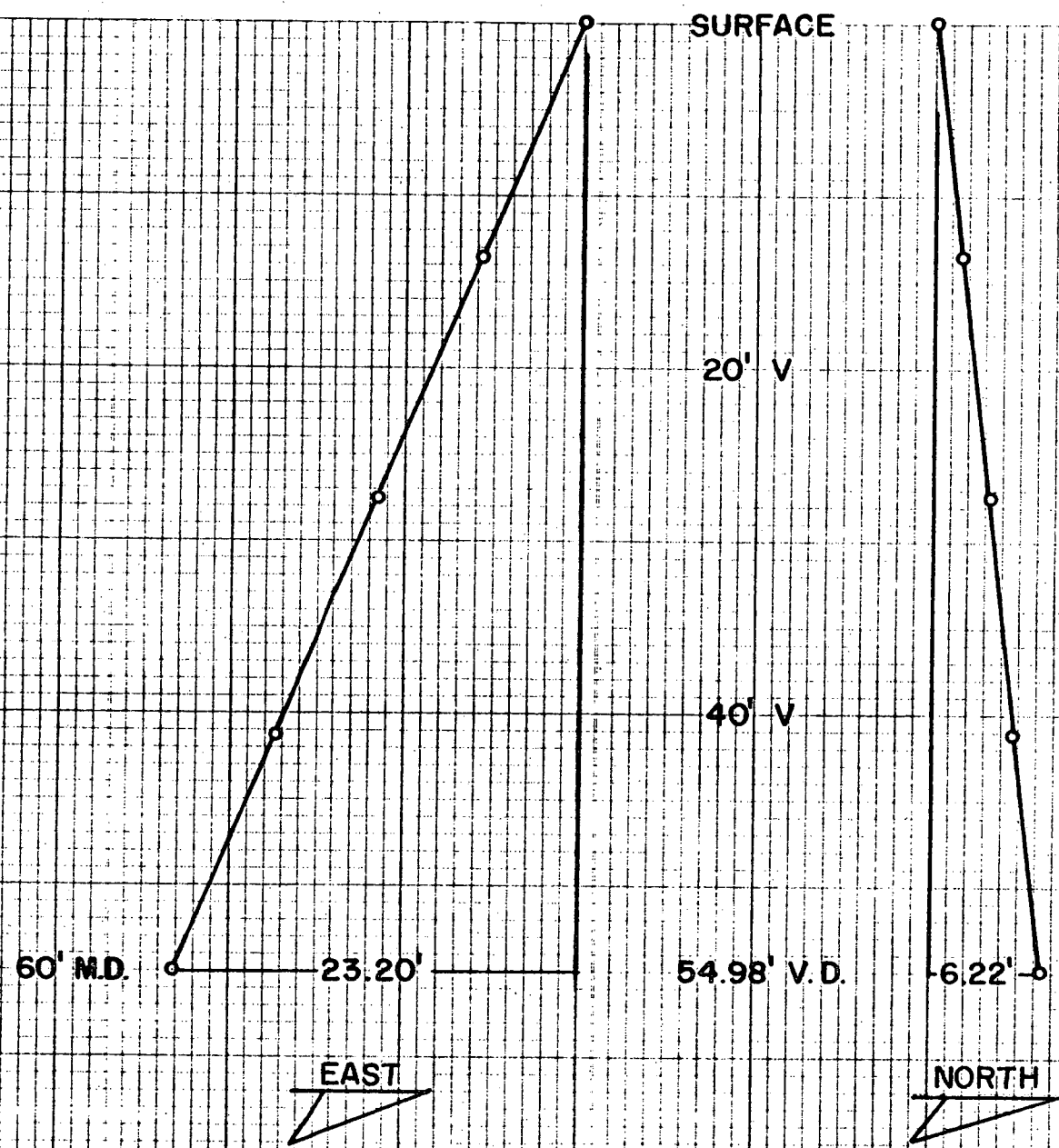


DEPTH - 60'
NORTH - 6.22'
WEST - 23.20'
CLOSURE - 24.01' N 74° 59' 54" W



WELL 7 No D. 15

JOB No P-1178-G01B3



SURFACE

WELL 7 No D 15

SCALE
1"=10'

VERTICAL SECTION

20' V

40' V

54.98' V.D.

6.22'

EAST

NORTH

BECHTEL POWER CORP.-- WELL 7 #E-6 ---EASTMAN GYRO MULTI SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 3 NOVEMBER 1978

JOB NO: P-1178-G0164

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-13

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	4 55	S 81 30 W	0.00	0.00	0.00	0.00
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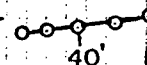
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	4 55	S 81 30 W	19.93	1.71	0.25 S	1.70 W
40.	4 50	S 82 0 W	39.85	3.41	0.50 S	3.38 W
60.	4 50	S 82 0 W	59.78	5.10	0.73 S	5.05 W
74.	4 50	S 82 0 W	73.73	6.28	0.90 S	6.21 W

FINAL CLOSURE - DIRECTION: S 81 DEGS 47 MINS 45 SECS W
DISTANCE: 6.28 FEET

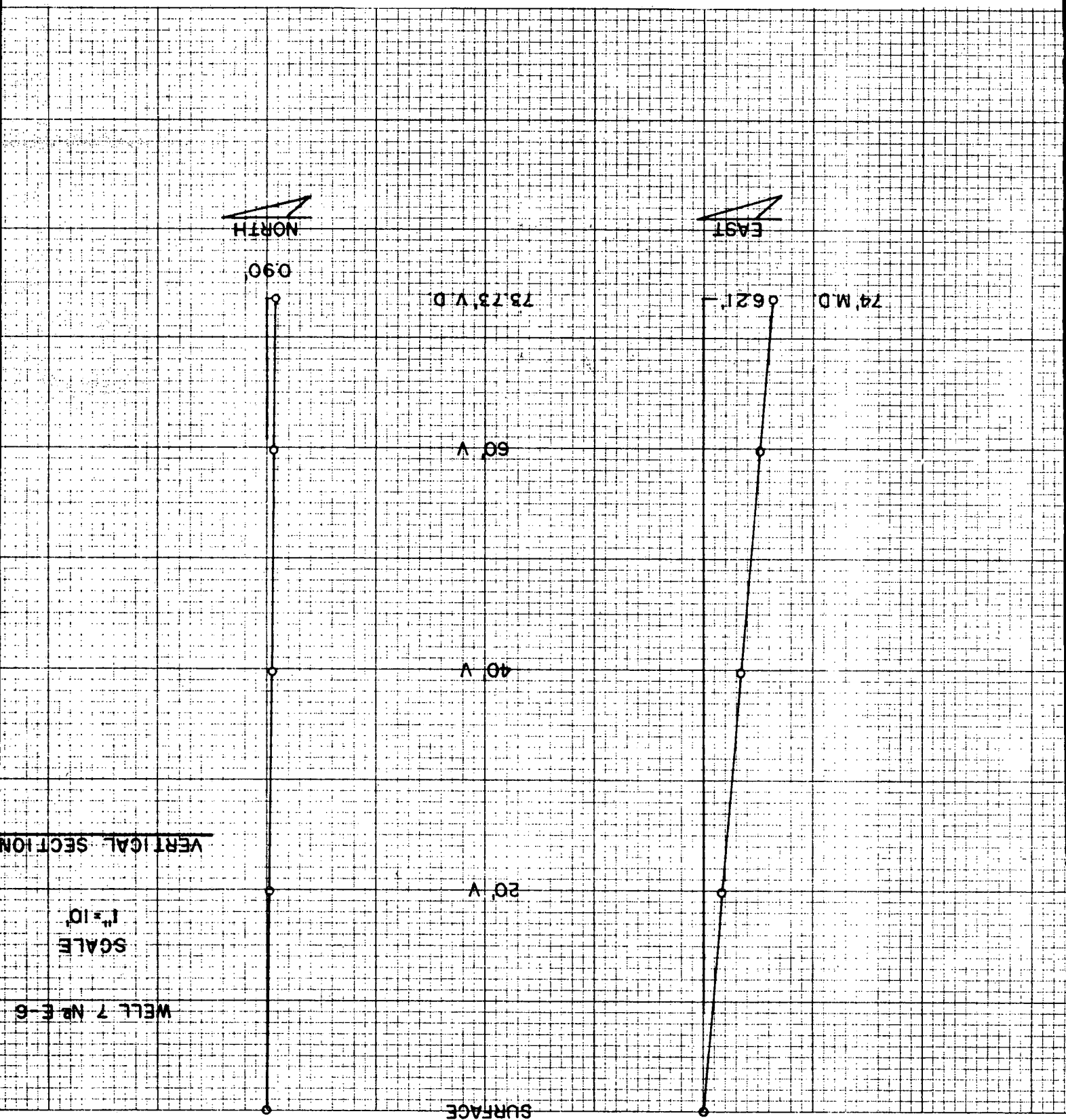


DEPTH-74'
SOUTH-0.90'
WEST-6.21'
CLOSURE-6.28' S 81° 47' 45' W



WELL 7 N² E-6

JOB N² P-1178-G0164



BECHTEL POWER CORP. --- WELL 7 4E-13 --- EASTMAN GYRO NORTH-SHOOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 04 W

DATE: 05 DECEMBER 1978

JOB NO: P-1278-G0288

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-4

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

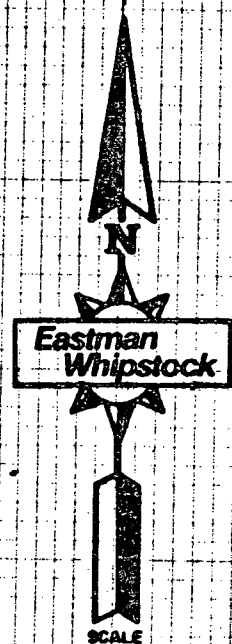
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET
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0.	21 30	N 82 30 W	0.00	0.00	0.00 0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	21 30	N 82 30 W	13.96	5.50	0.72 N 5.45 W
30.	21 0	N 82 0 W	27.94	10.93	1.45 N 10.84 W
45.	20 45	N 82 30 W	41.95	16.28	2.17 N 16.13 W
60.	20 30	N 83 0 W	55.99	21.58	2.84 N 21.38 W

FINAL CLOSURE - DIRECTION: N 82 DEGS 26 MINS 10 SECS W
DISTANCE: 21.56 FEET



1" = 10'

DEPTH - 60'
NORTH - 2.84'
WEST - 21.38'
CLOSURE - 21.56' N 82° 26' 0" W



WELL 7 N° E-13

JOB N° P-1278-G0288

VERTICAL SECTION

WELL 7 N° E-13

SCALE
1" = 10'

SURFACE

20' V.

40' V.

55.99' V.D.

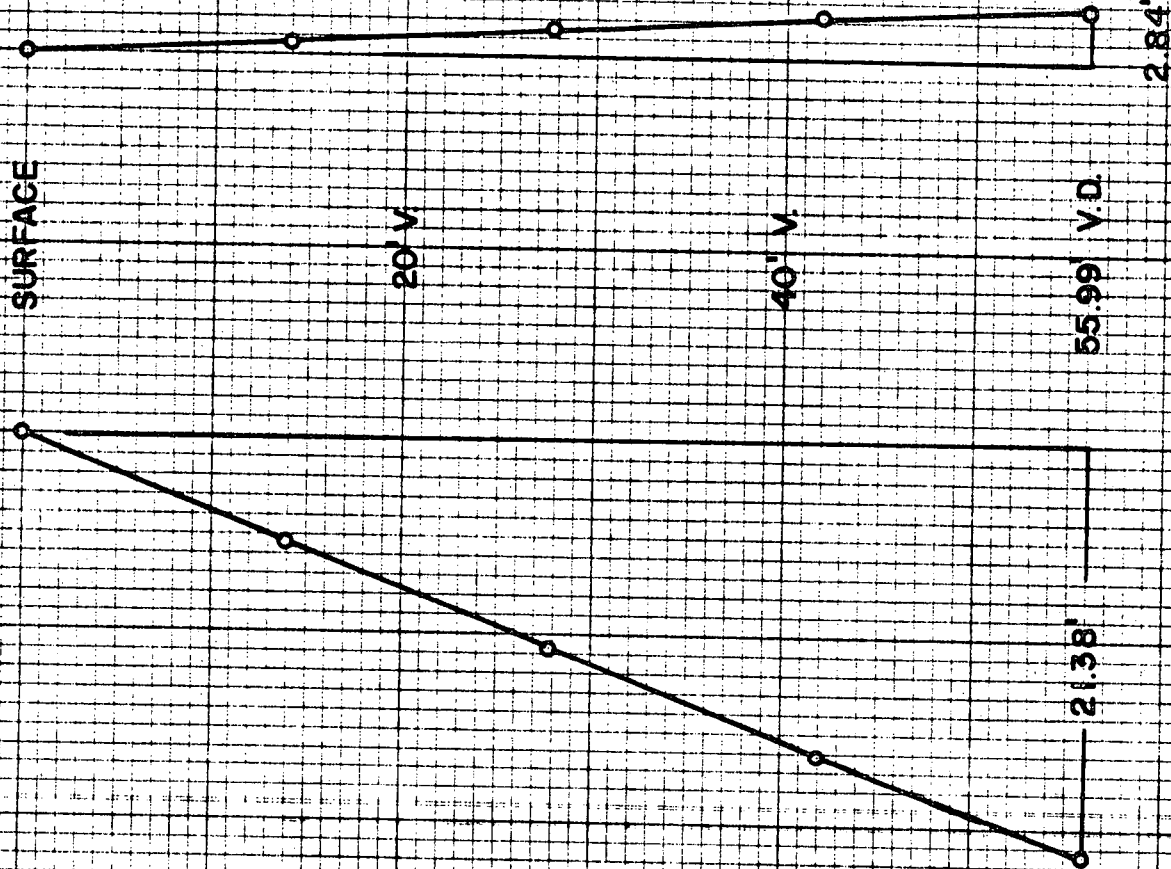
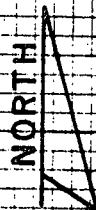
2.84'

60' M.D.

21.38'

EAST

NORTH



BECHTEL POWER CORP.--- WELL 7 #E-19 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 14 DECEMBER 1978

JOB NO: P-1278-60340

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-3

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	32 15	N 78 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	32 15	N 78 W	12.69	6.00	1.66 N	7.83 W
30.	32 0	N 78 W	25.39	15.96	3.32 N	15.63 W
45.	31 45	N 78 W	38.13	23.90	4.97 N	23.38 W
58.	31 15	N 78 W	49.21	30.69	6.38 N	30.02 W

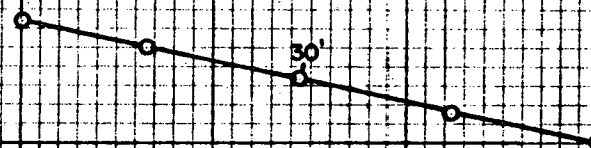
FINAL CLOSURE - DIRECTION: N 78 DEGS 0 MINS 1 SECS W
DISTANCE: 30.69 FEET



1"=10'

DEPTH-58'
NORTH-6.38'
WEST-30.02'

CLOSURE-30.69' N 78° 00' W



WELL 7 N² E-19

P-1278-60340

WELL 7 N°E-19

SCALE
1" = 10'

SURFACE

20' V.

40' V

58' M.D.

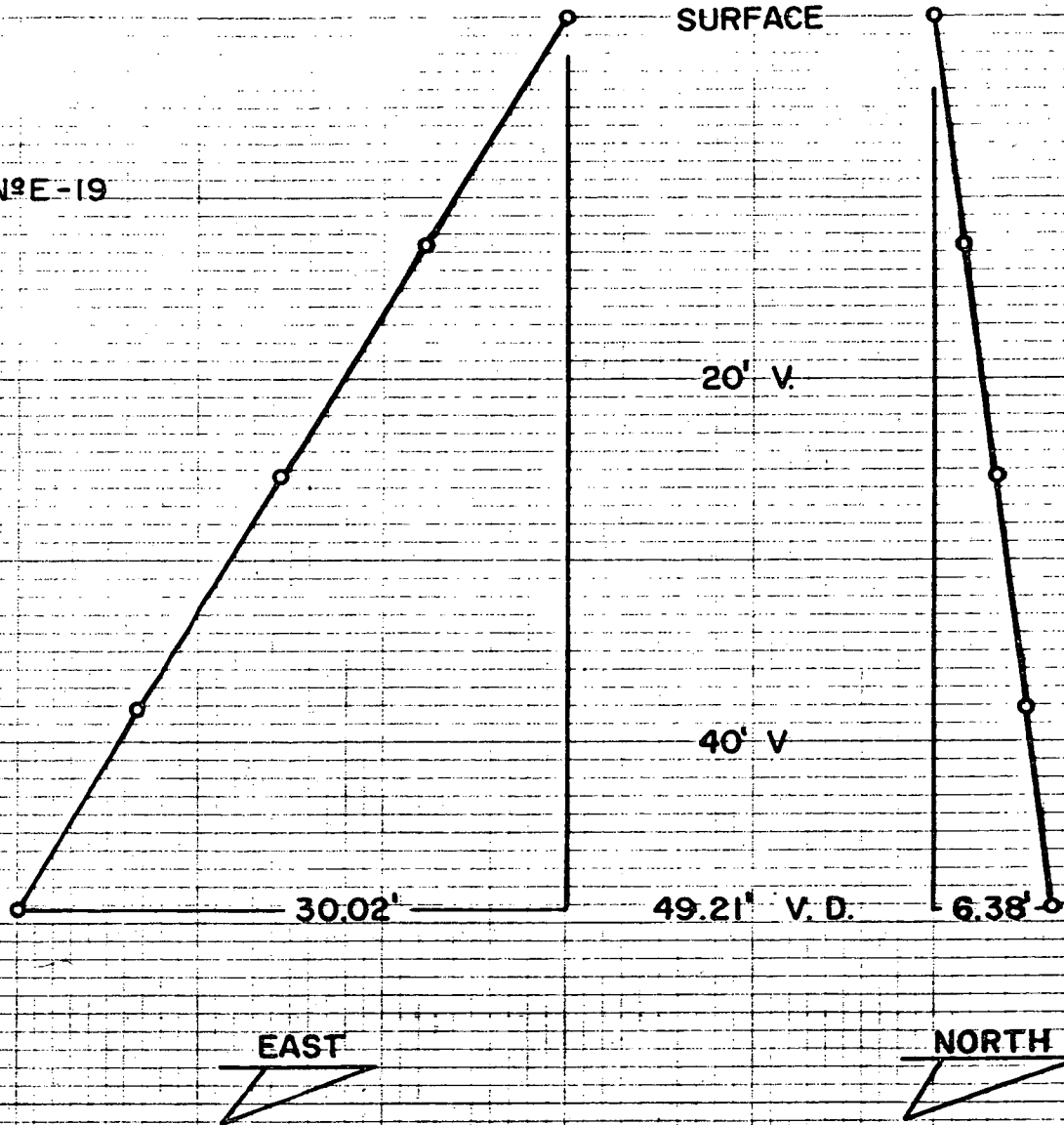
30.02'

49.21' V. D.

6.38'

EAST

NORTH



BECHTEL POWER CORP.-- WELL 7 #F 5.7 --EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 17 OCTOBER 1978

JOB NO: P-1078-G0115

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-1

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	7 0	N 89 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	7 0	N 89 W	19.85	2.44	0.04 N	2.44 W
40.	6 45	N 88 W	39.71	4.83	0.11 N	4.83 W
60.	6 45	N 89 W	59.57	7.18	0.17 N	7.18 W
75.	6 35	N 89 W	74.47	8.92	0.20 N	8.92 W

FINAL CLOSURE - DIRECTION: N 88 DEGS 44 MINS 3 SECS W
DISTANCE: 8.92 FEET

Eastman
Whipstock

SCALE

1"=5'

DEPTH-75'
NORTH-0.20'
WEST -892'

CLOSURE -8.92' N 86° 44' 03" W

40'

WELL: 7 N° F 5.7

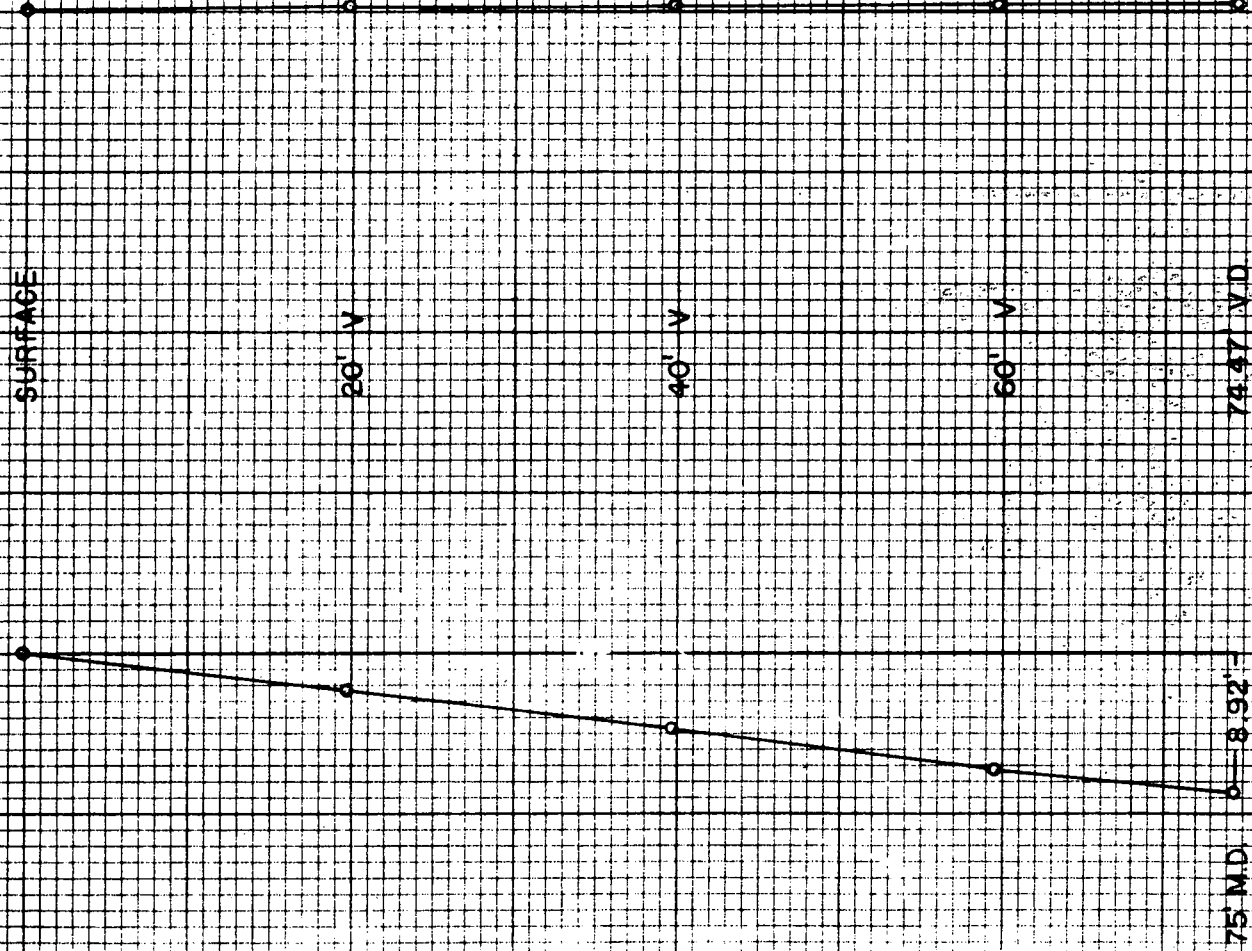
JOB N° P-1078-G0115

SURFACE

WELL No. F 5.7

SCALE
1"=10'

VERTICAL SECTION



BECHTEL POWER CORP.--- WELL 7 4G-5 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 6 DECEMBER 1978

JOB NO: P-1278-G0300

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-5

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

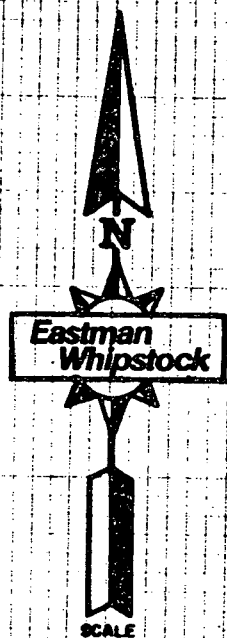
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	4 0	N 27 0 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

20.	4 0	N 27 0 W	19.95	1.39	1.24 N	0.63 W
40.	4 0	N 26 30 W	39.90	2.79	2.49 N	1.26 W
60.	3 40	N 24 30 W	59.86	4.13	3.70 N	1.84 W
80.	3 50	N 23 0 W	79.81	5.43	4.89 N	2.36 W
89.	3 50	N 23 0 W	88.79	6.04	5.45 N	2.60 W

FINAL CLOSURE - DIRECTION: N 25 DEGS 30 MINS 26 SECS W
DISTANCE: 6.04 FEET



1" = 10'

DEPTH-89'
NORTH-5.45'
WEST-2.60'
CLOSURE-6.04' N 25° 30' 26" W



WELL 7 N² G-5

P-1278-G0300

SURFACE

VERTICAL SECTION

WELL 7 N^o G-5

SCALE
1"=10'

20' V.

40' V.

60' V.

80' V.

89' M.D.

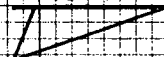
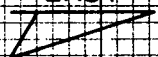
88.79' V.D.

545'

260'

EAST

NORTH



BECHTEL POWER CORP. --- HOLE: 7-H-1 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 31 OCTOBER 1978

JOB NO: P-1078-G0150

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-8

FITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

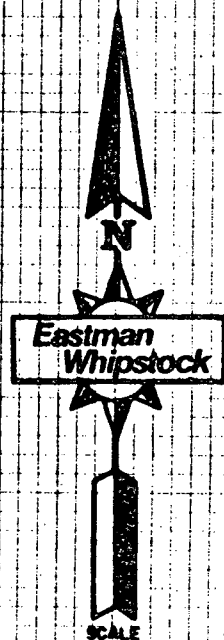
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	5 20	N 84 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	5 20	N 84 W	19.91	1.86	0.19 N	1.85 W
40.	5 25	N 84 W	39.83	3.73	0.39 N	3.71 W
60.	5 15	N 84 W	59.74	5.59	0.58 N	5.56 W
80.	5 15	N 83 W	79.65	7.42	0.79 N	7.38 W
85.	5 20	N 83 W	84.63	7.88	0.85 N	7.84 W

FINAL CLOSURE - DIRECTION: N 83 DEGS 49 MINS 32 SECS W
DISTANCE: 7.88 FEET



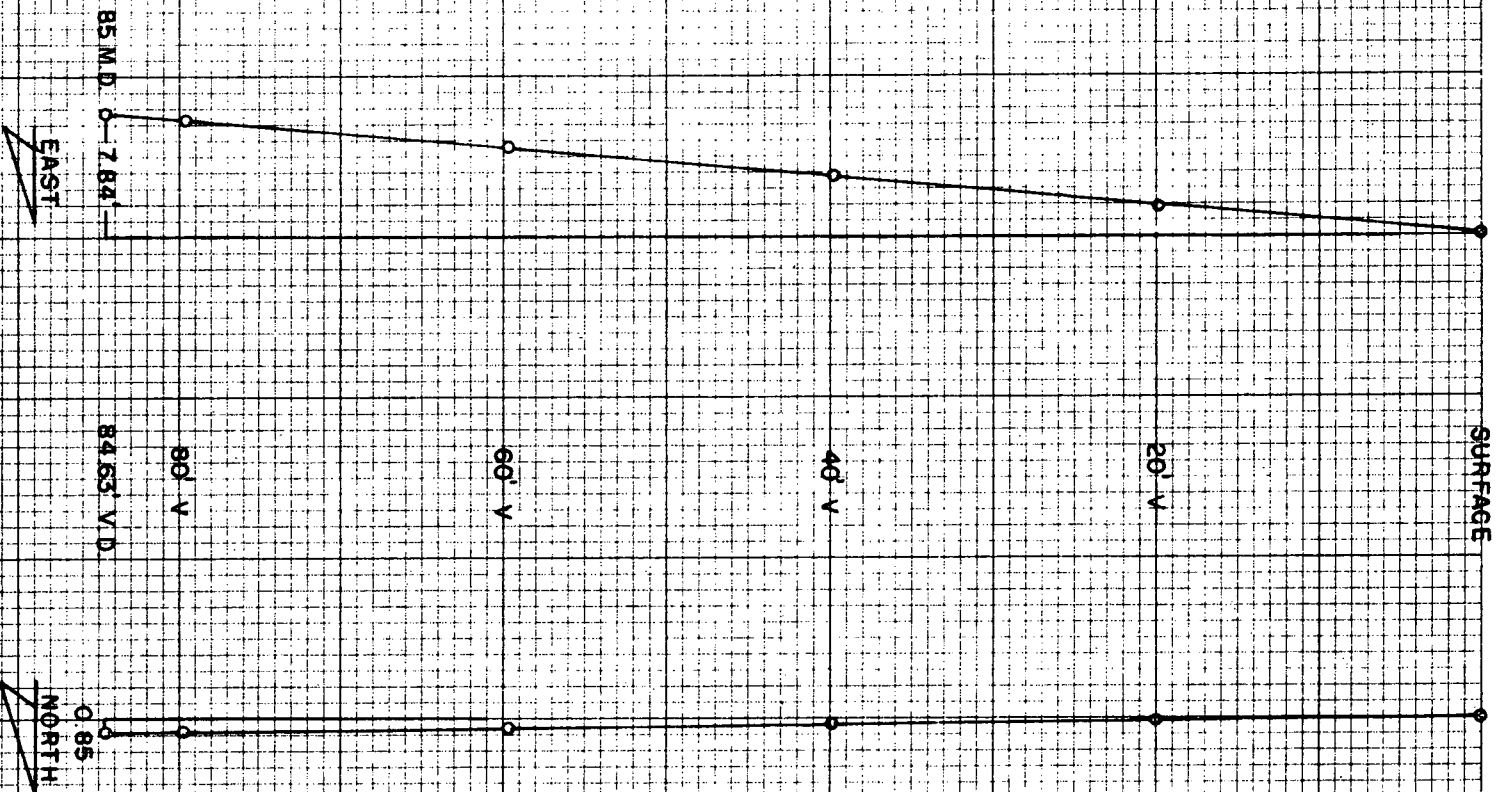
1"=10'

DEPTH-85'
NORTH-0.85'
WEST-7.84'
CLOSURE -7.88' N 83° 49' 32" W

80' 40'

WOLE 7-H-5

JOB № P-1078-G0150



HOLE 7-H-5

SCALE
1" = 10'

BECHTEL POWER CORP.--- WELL 7 4H-19 ---EASTMAN GYRO MULTI-THET SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 14 DECEMBER 1978

JOB NO: P-1278-G0341

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-5

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	31 20	N 67 30 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

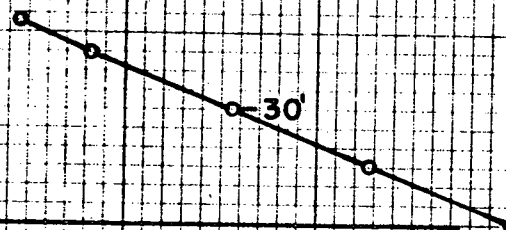
15.	31 20	N 67 30 W	12.81	7.80	2.99 N	7.21 W
30.	32 0	N 68 0 W	25.58	15.67	5.97 N	14.49 W
45.	31 45	N 68 0 W	38.32	23.60	8.93 N	21.84 W
53.	31 15	N 67 0 W	45.14	27.78	10.53 N	25.70 W

FINAL CLOSURE - DIRECTION: N 67 DEGS 42 MINS 48 SECS W
DISTANCE: 27.78 FEET



DEPTH - 53'
NORTH - 10.53'
WEST - 25.70'

CLOSURE - 27.78" N 67° 42' 48" W



WELL 7 N-H-19

JOB N° P-1278-G0341

SURFACE

WELL 7 No H-19

SCALE
1"=10'

53' M.D.

25.70'

45.14' V.D.

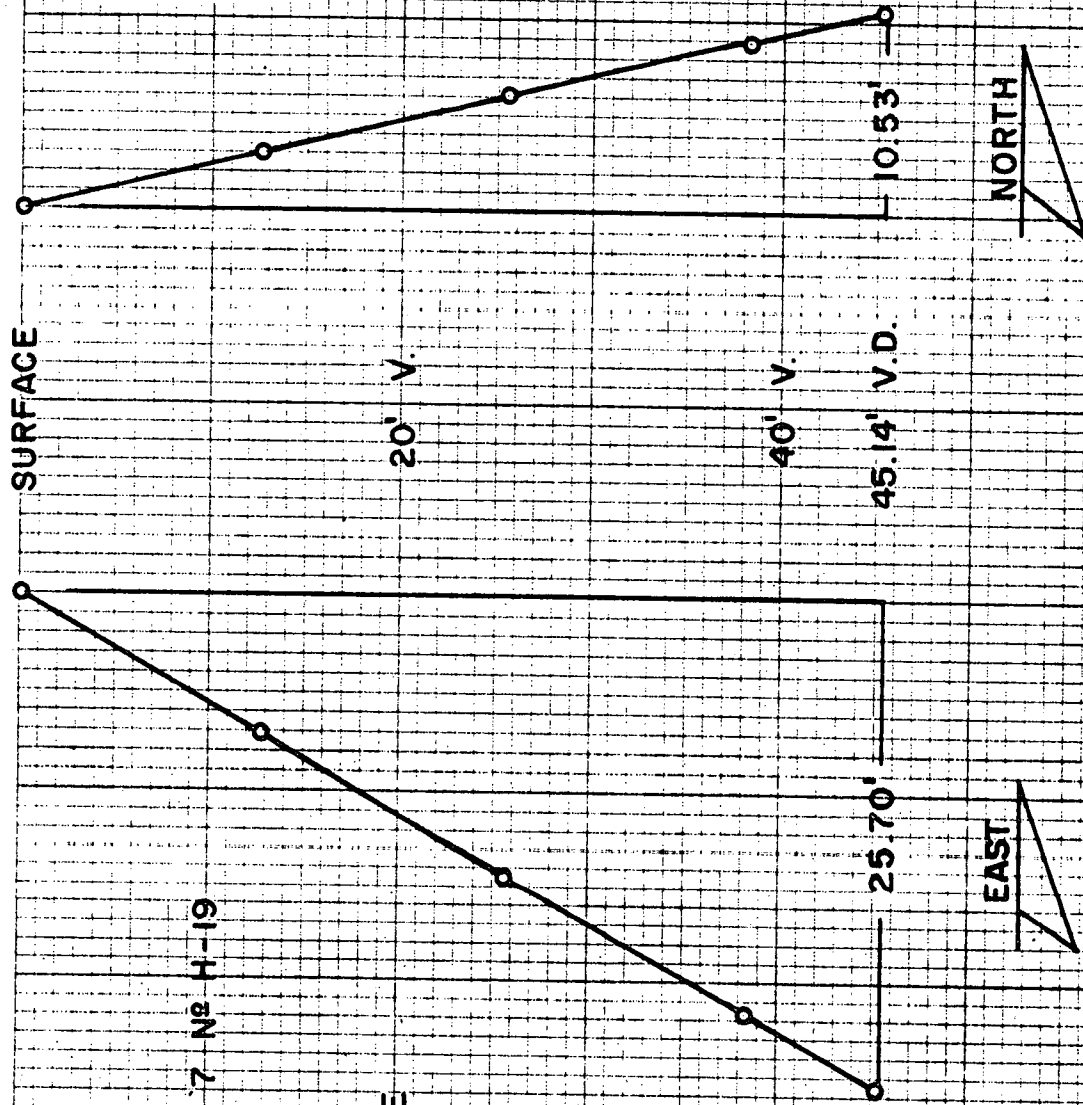
20' V.

40' V.

10.53'

EAST

NORTH



BECHTEL POWER CORP. --- WELL 7 #1-15 --- EASTMAN GYRO MULTI-SHOT
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 9 NOVEMBER 1978

JOB NO: F-1178-G0188

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-15

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

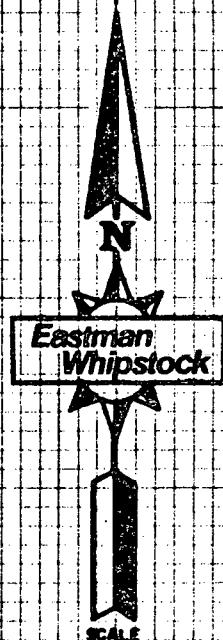
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	19 0	N 63 0 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	19 0	N 63 0 W	14.18	4.88	2.22 N	4.35 W
30.	18 25	N 63 30 W	28.39	9.69	4.38 N	8.65 W
45.	18 15	N 64 0 W	42.63	14.41	6.47 N	12.88 W
60.	18 5	N 64 30 W	56.88	19.09	8.50 N	17.09 W

FINAL CLOSURE - DIRECTION: N 63 DEGS 33 MINS 17 SECS W
DISTANCE: 19.09 FEET



1" = 10'

DEPTH - 60'
NORTH - 8.50'
WEST - 17.09'
CLOSURE - 19.09' N 63° 33' 17" W



WELL 7 N° I-15

JOB N° P-1178-G0188

SURFACE

WELL 7 N° I-15

SCALE

1" = 10'

VERTICAL SECTION

20" V

40" V

60' M.D.

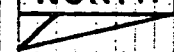
17.09'

56.88' V.D.

8.50'

EAST

NORTH



BECHTEL POWER CORP.--- HOLE: 7-J-5 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57.00 W

DATE: 31 OCTOBER 1978

JOB NO: P-1078-G0152

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-9

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D H	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	6 30	N 75 W	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W						
20.	6 30	N 75 W	19.87	2.26	0.59 N	2.19 W
40.	6 25	N 75 W	39.74	4.51	1.17 N	4.36 W
60.	6 25	N 75 W	59.62	6.75	1.75 N	6.52 W
80.	6 30	N 76 W	79.49	9.00	2.31 N	8.70 W
91.	6 30	N 75 W	90.42	10.24	2.62 N	9.90 W

FINAL CLOSURE - DIRECTION: N 75 DEGS 10 MINS 14 SECS W
DISTANCE: 10.24 FEET

Eastman
Whipstock

SCALE

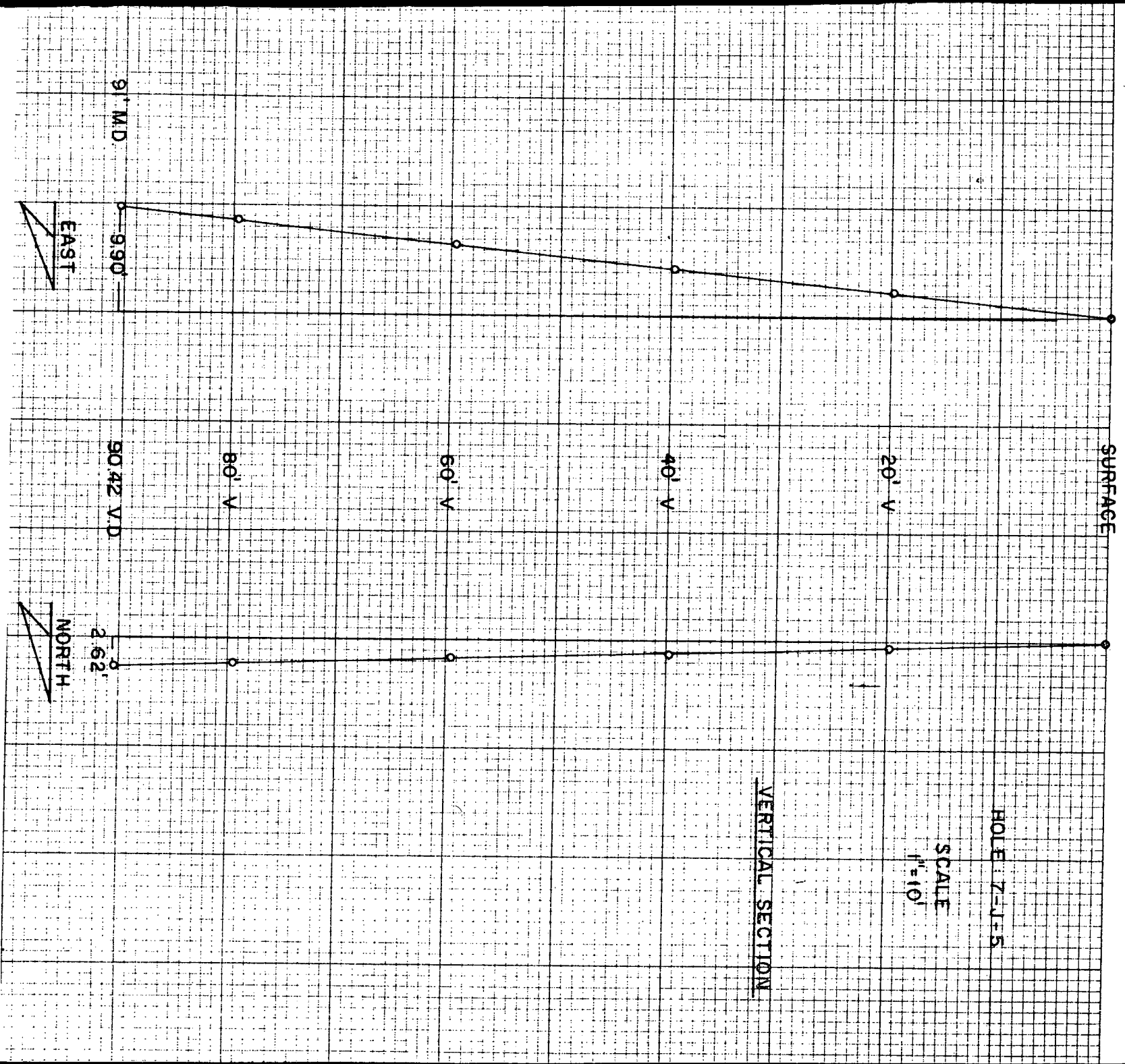
1"=10'

DEPTH - 91'
NORTH - 2.62'
WEST - 9.90'
CLOSURE - 10.24' N 75° 10' 14" W



HOLE 17-J-5

JOB N^o P-1078-60152



BECHTEL POWER CORP.-- WELL 7 4J₂ 10 --EASTMAN GYRO MULTI-SPOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 12 DECEMBER 1978

JOB NO: P-1278-60326

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-20

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	20 30	N 43 W	0.00	0.00	0.00	0.00

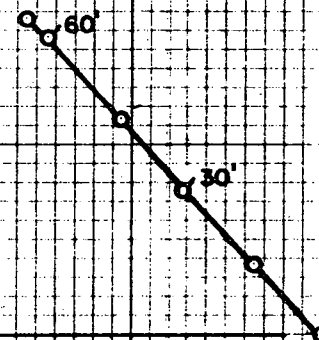
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	20 30	N 43 W	14.05	5.25	3.84 N	3.58 W
30.	20 15	N 43 W	28.11	10.48	7.66 N	7.14 W
45.	20 15	N 43 W	42.18	15.67	11.46 N	10.69 W
60.	20 15	N 43 W	56.26	20.86	15.26 N	14.23 W
66.	20 15	N 43 W	61.89	22.94	16.77 N	15.64 W

FINAL CLOSURE - DIRECTION: N 43 DEGS 0 MINS 0 SECS W
DISTANCE: 22.94 FEET

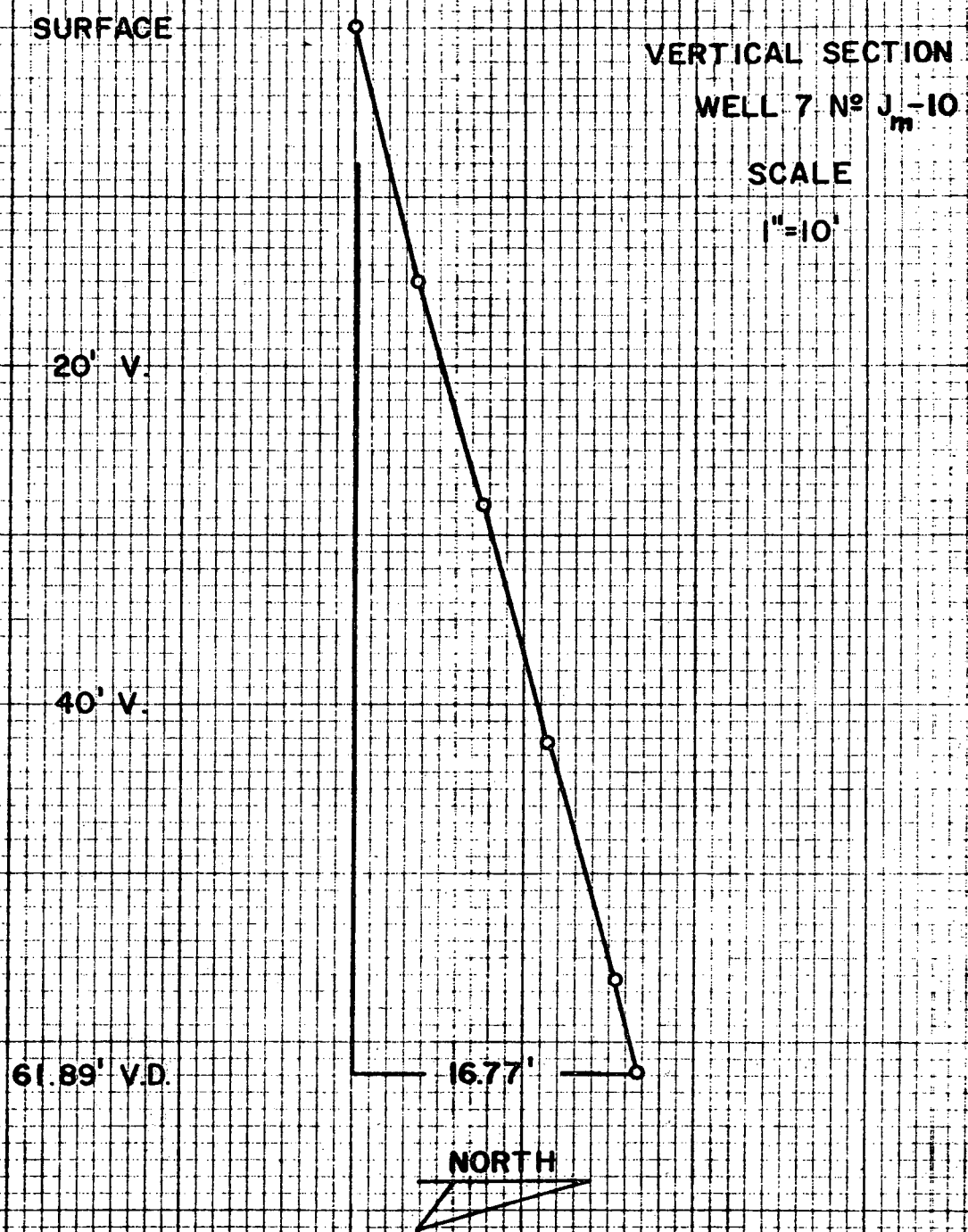
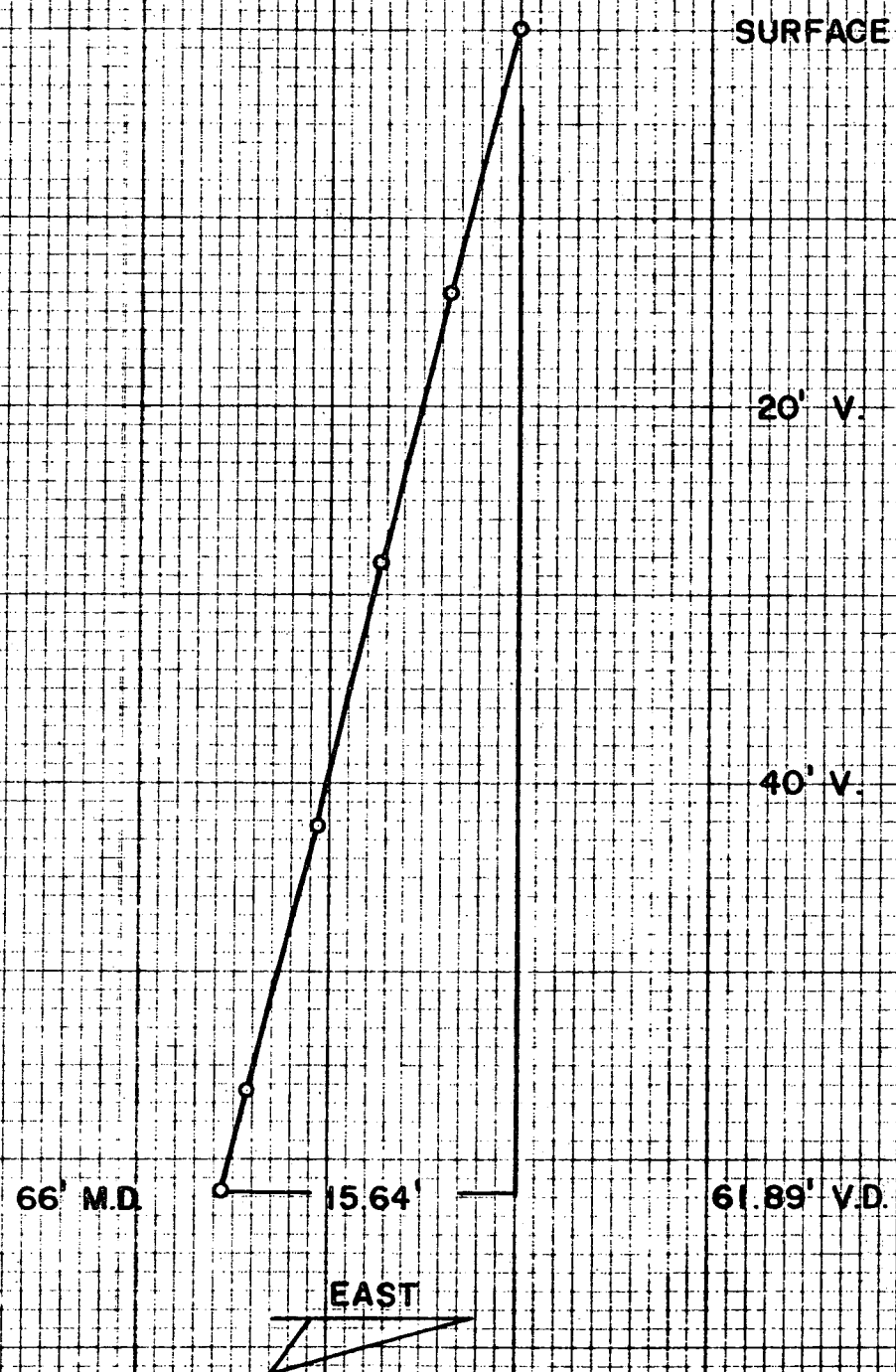


DEPTH-66'
NORTH-16.77'
WEST-15.64'
CLOSURE-22.94' N 43° 00' W



WELL 7 N² J_m-10

JOB N² P-1278-G0326



BECHTEL POWER CORP.-- WELL 7 #K_m 15 --EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 13 NOVEMBER 1978

JOB NO: F-1178-G0197

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-16

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

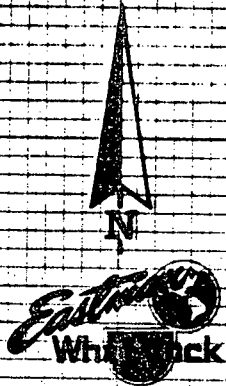
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	20 45	N 78 0 W	0.00	0.00	0.00	0.00
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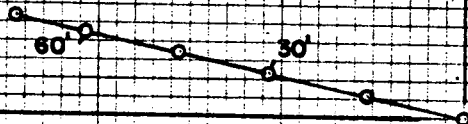
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	20 45	N 78 0 W	14.03	5.31	1.10 N	5.20 W
30.	21 0	N 77 30 W	28.04	10.66	2.24 N	10.42 W
45.	20 45	N 77 30 W	42.06	16.00	3.40 N	15.64 W
60.	20 30	N 77 0 W	56.10	21.29	4.56 N	20.79 W
70.	20 30	N 77 0 W	65.46	24.79	5.35 N	24.21 W

FINAL CLOSURE - DIRECTION: N 77 DEGS 32 MINS 14 SECS W
DISTANCE: 24.79 FEET



DEPTH-70'
NORTH-5.35'
WEST-24.21'
CLOSURE-24.79' N 77° 32' 14" W



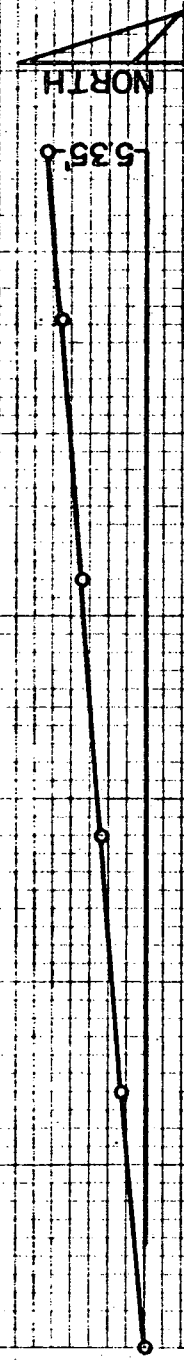
WELL: 7 N° K₁₅

JOB N° P-1178-G0197

VERTICAL SECTION

SCALE
1" = 10'

WELL 7 N&K m 15



65.46 V.D.

60' V.

40' V.

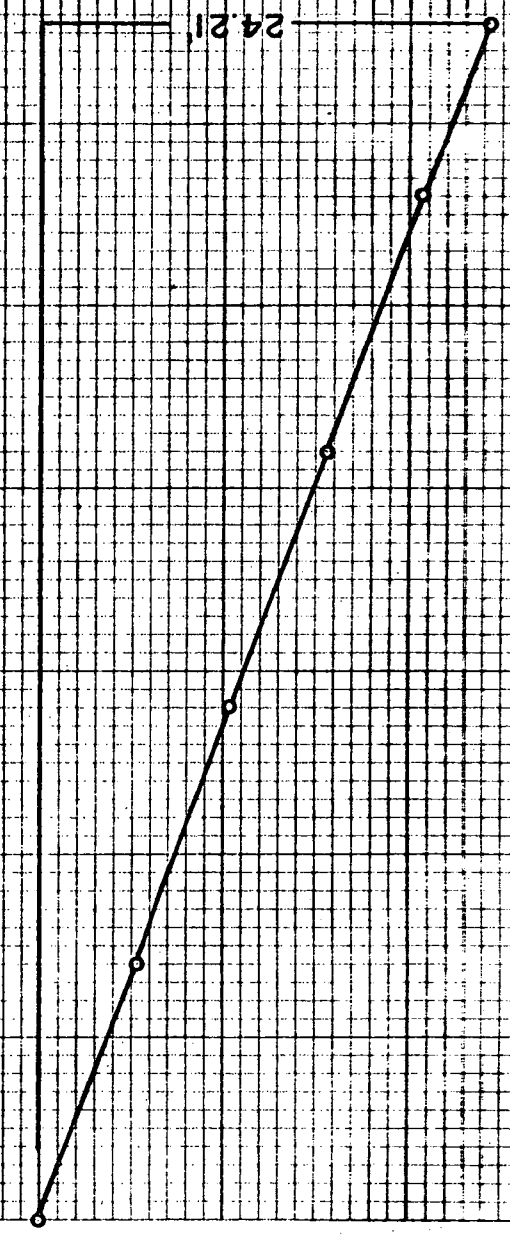
20' V.

SURFACE



24.21

70 MD.



BECHTEL POWER CORP. --- WELL 7 #K-37 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS *PLANT NORTH*N N 52.00 W

DATE:13 DECEMBER 1978

JOB NO: P-1278-G0336

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-2

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	19 35	S 6 30 W	0.00	0.00	0.00	0.00

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	19 35	S 6 30 W	14.13	5.03	5.00 S	0.57 W
30.	19 10	S 6 30 W	28.28	10.00	9.94 S	1.13 W
45.	19 0	S 7 30 W	42.46	14.91	14.81 S	1.73 W
60.	19 0	S 7 0 W	56.64	19.79	19.60 S	2.35 W
61.	19 0	S 7 0 W	57.59	20.12	19.97 S	2.39 W

FINAL CLOSURE - DIRECTION: S 6 DEGS 48 MINS 43 SECS W
DISTANCE: 20.12 FEET



SCALE

1" = 10'

DEPTH - 61'
SOUTH - 19.97'
WEST - 2.39'
CLOSURE - 20.12' S 6° 48' 43" W

WELL 7 No K-37

P-1278-G0336

SURFACE

WELL 7 N^o K-37

20' V.

SCALE

1" = 10'

40' V.

61' M.D.

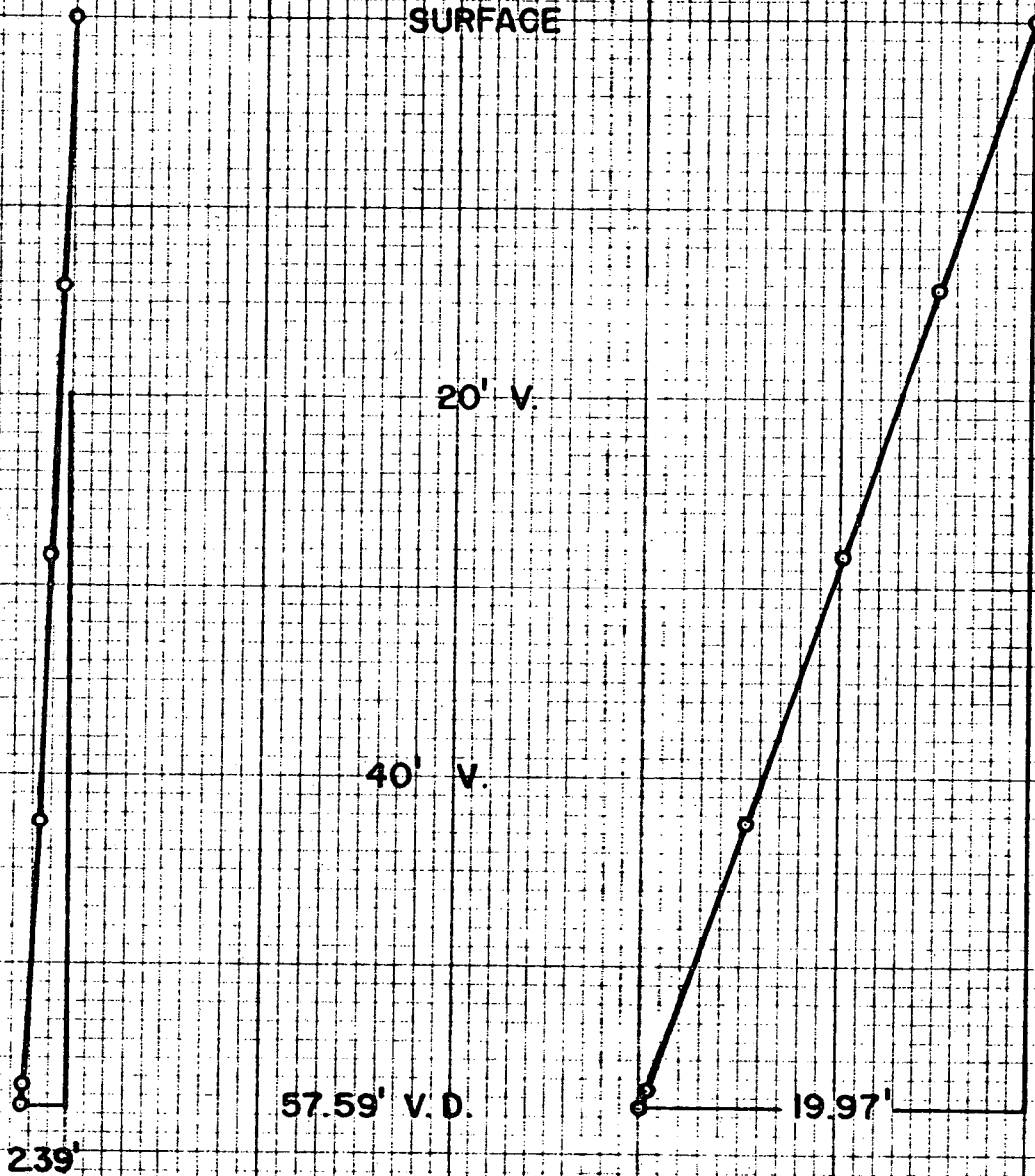
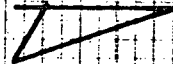
57.59' V. D.

19.97'

239'

EAST

NORTH



BECHTEL POWER CORP--- WELL 7 #M-5 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

DATE: 24 OCTOBER 1978

JOB NO: P-1078-30132

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F136-4

PIIT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

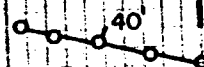
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	3 55	N 75 30 W	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W						
20.	3 55	N 75 30 W	19.95	1.37	0.34 N	1.32 W
40.	3 55	N 77 30 W	39.91	2.73	0.66 N	2.65 W
60.	3 45	N 79 0 W	59.86	4.07	0.93 N	3.96 W
70.	3 50	N 79 30 W	69.84	4.73	1.06 N	4.61 W

FINAL CLOSURE - DIRECTION: N 77 DEGS 5 MINS 25 SECS W
DISTANCE: 4.73 FEET



Eastman
Whipstock

DEPTH-70'
NORTH-1.06'
WEST -4.61'
CLOSURE- 4.73' N 77° 05' 25" W



WELL No 7 No M-5

JOB No P-1078-G0132

SURFACE

WELL 7 N° M-5

SCALE
1"=10'

VERTICAL SECTION

70' M.D.

64.61'

EAST

69.84' V.D.

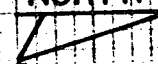
20' V

40' V

60' V

1.06'

NORTH



BECHTEL POWER CORP.--- WELL 7 4. -16 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 07 00 W

DATE: 11 DECEMBER 1978

JOB NO: P-1278-60318

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-17

PITT

RECORD OF SURVEY

ANGLE AVERAGING METHOD

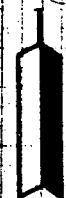
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	9 0	N 59 0 E	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	9 0	N 59 0 E	14.82	2.35	1.21 N	2.01 E
30.	9 5	N 60 0 E	29.63	4.70	2.40 N	4.04 E
45.	9 15	N 60 30 E	44.44	7.09	3.59 N	6.12 E
60.	9 15	N 59 0 E	59.24	9.50	4.81 N	8.20 E
75.	9 15	N 59 30 E	74.05	11.92	6.04 N	10.27 E
81.	9 10	N 59 0 E	79.97	12.83	6.53 N	11.10 E

FINAL CLOSURE - DIRECTION: N 59 DEGS 31 MINS 46 SECS E
DISTANCE: 12.88 FEET

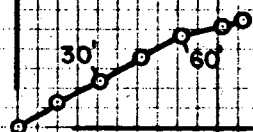


SCALE

1" = 10'

DEPTH-81'
NORTH-6.53'
EAST-11.10'

CLOSURE - 12.86' N 59° 31' 46" E



WELL 7 N^a L-16

P-1278-G0318

SURFACE

WELL 7 N° L-16

SCALE
1" = 10'

20' V

40' V

60' V

81' M.D.

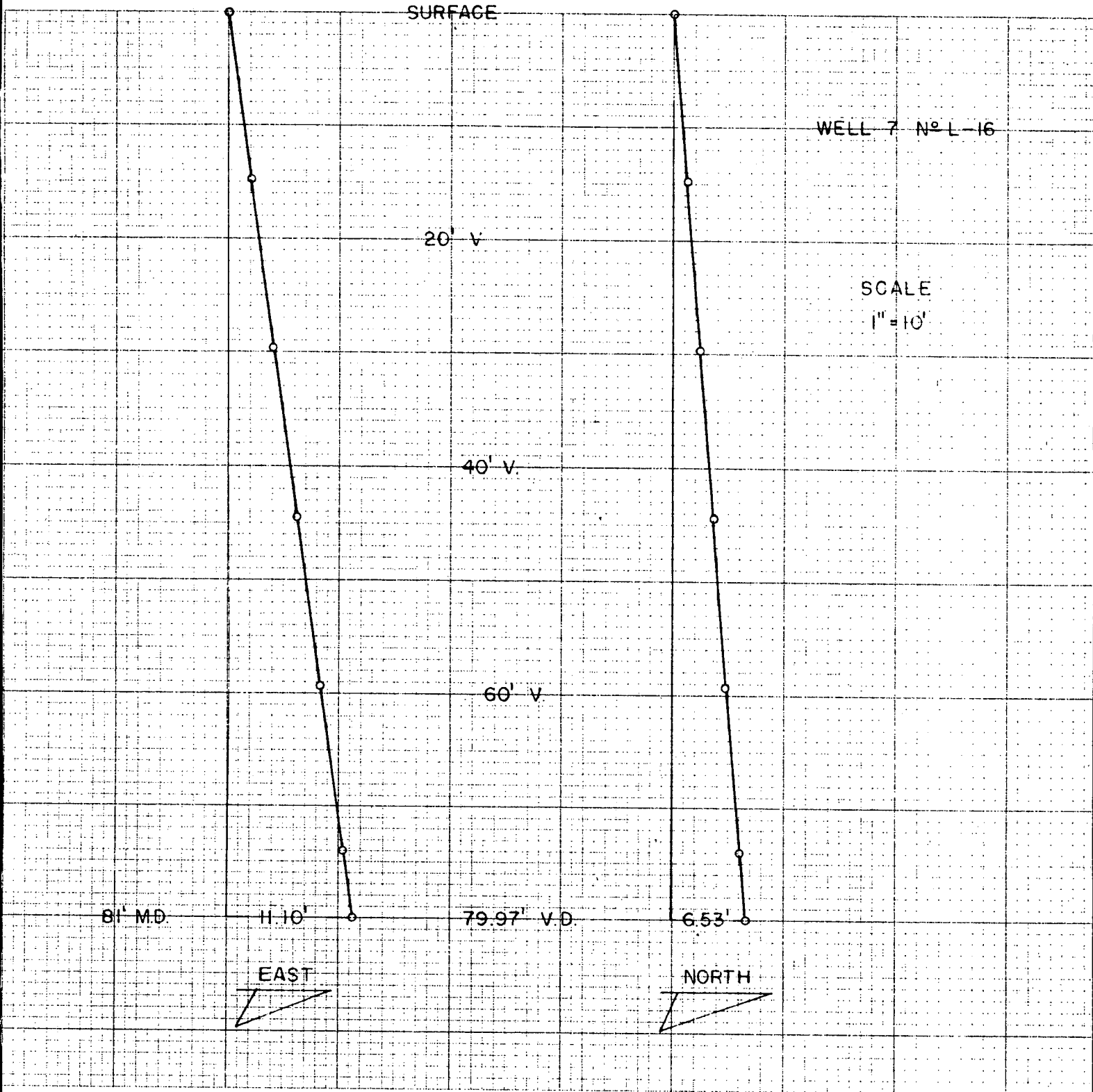
11.10'

79.97' V.D.

6.53'

EAST

NORTH



BECHTEL POWER CORP. --- WELL 7 IN-44 ---EASTMAN GYRO MULTI-POINT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 09 DECEMBER 1978
JOB NO: P-1278-60312
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F131-12
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	7 45	N 84 30 W	0.00	0.00	0.00	0.00
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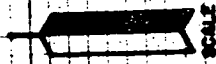
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	7 45	N 84 30 W	14.86	2.02	0.19 N	2.01 W
30.	7 45	N 86 0 W	29.73	4.05	0.36 N	4.03 W
45.	7 45	N 87 0 W	44.59	6.07	0.48 N	6.05 W
51.	7 45	N 86 0 W	50.53	6.88	0.53 N	6.86 W

FINAL CLOSURE - DIRECTION: N 85 DEGS 32 MINS 39 SECS W
DISTANCE: 6.88 FEET

DEPTH-51'
NORTH-0.53'
WEST -6.86'

CLOSURE-6.88' N 85° 32' 39" W



1"=5'

WELL 7 N^o N-44

SCALE

1" = 10'

SURFACE

20' V.

40' V.

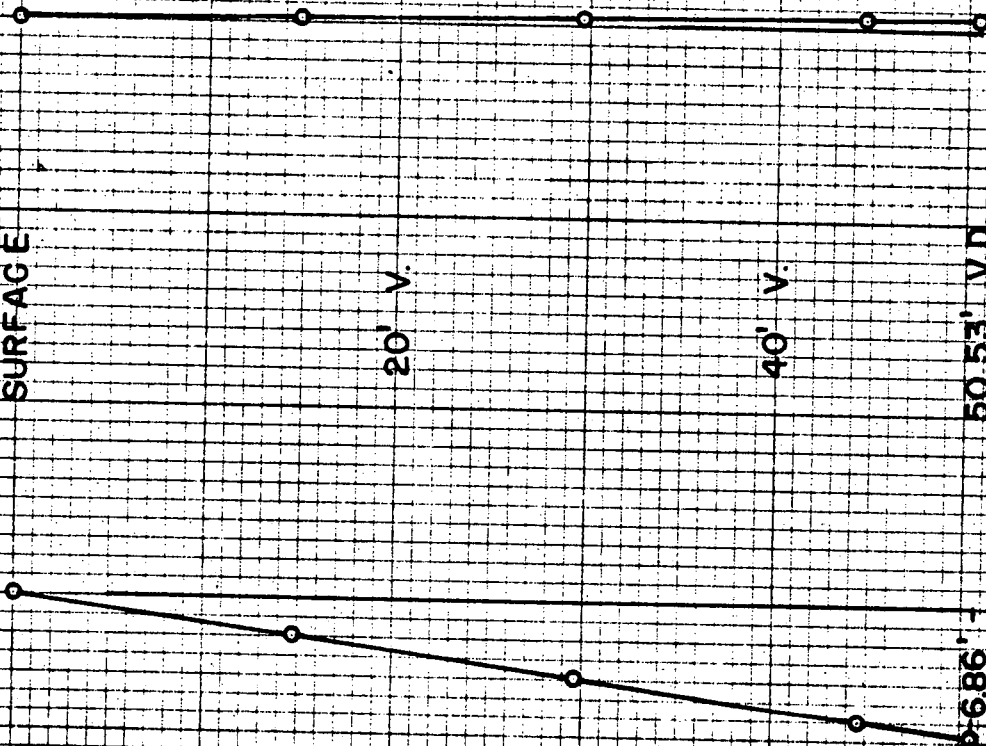
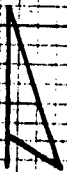
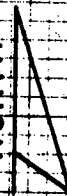
50.53' V.D.

51' M.D. - 6.86' -

0.53'

NORTH

EAST



BECNTEL POWER CORP. --- WELL 7 #0-11 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 24 OCTOBER 1978
JOB NO: P-1078-G0130
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F136-3
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	4 25	N 74 0 W	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W						
20.	4 25	N 74 0 W	19.94	1.54	0.42 N	1.48 W
40.	4 25	N 73 30 W	39.88	3.08	0.86 N	2.96 W
60.	4 10	N 73 30 W	59.83	4.58	1.28 N	4.39 W
80.	4 10	N 74 0 W	79.77	6.03	1.69 N	5.79 W
88.	4 0	N 73 0 W	87.75	6.60	1.85 N	6.34 W

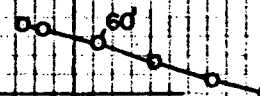
FINAL CLOSURE - DIRECTION: N 73 DEGS 43 MINS 48 SECS W
DISTANCE: 6.60 FEET



SCALE

1"=5'

DEPTH-88'
NORTH-1.85'
WEST -6.34'
CLOSURE-6.60' N 73° 43' 48" W



WELL 7 N20-II

JOB N° P-1078-G0130

SURFACE

WELL 7 N° 0-11

SCALE
1" = 10'

VERTICAL SECTION

20' V

40' V

60' V

80' V

88" M.D.

5.34'

87.75' V.D.

1.85'

EAST

NORTH



BECHTEL POWER CORP. --- WELL 7 40-17 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN Geronimo POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57.00 W

DATE: 8 DECEMBER 1978

JOB NO: P-1278-G309

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-11

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

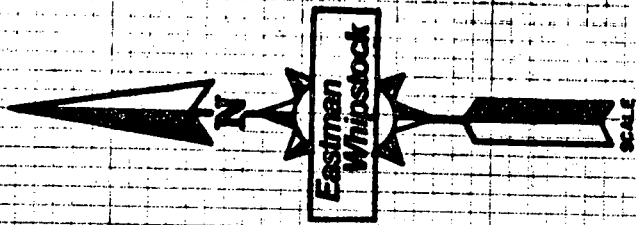
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET
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0.	3 5	N 60 0 E	0.00	0.00	0.00 0.00
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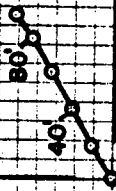
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	3 5	N 60 0 E	19.97	1.08	0.54 N 0.93 E
40.	3 5	N 60 0 E	39.94	2.15	1.08 N 1.86 E
60.	3 0	N 59 30 E	59.91	3.21	1.61 N 2.78 E
80.	2 55	N 57 0 E	79.89	4.24	2.15 N 3.66 E
94.	2 55	N 57 0 E	93.87	4.96	2.54 N 4.26 E

FINAL CLOSURE - DIRECTION: N 59 DEGS 9 MINS 4 SECS E
DISTANCE: 4.96 FEET



DEPTH - 94'
NORTH - 2.54'
EAST - 4.26'
CLOSURE - 4.96' N 59° 09' 04" E



WELL 7 N° 0-17

P-1278-G0309

SURFACE

VERTICAL SECTION

WELL 7 N^o 0-17

20' V.

40' V.

60' V.

80' V.

94' M.D.

93.87' V.D.

4.26'

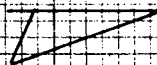
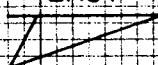
2.54'

EAST

NORTH

SCALE

1"=10'



BECHTEL POWER CORP.--- WELL 7 4Q-21 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 07 DECEMBER 1978

JOB NO: P-1278-G0303

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-8

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	6 0	N 73 0 E	0.00	0.00	0.00	0.00

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

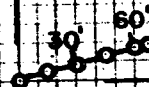
15.	6 0	N 73 0 E	14.92	1.57	0.46 N	1.50 E
30.	6 0	N 74 30 E	29.84	3.14	0.90 N	3.00 E
45.	6 0	N 73 30 E	44.75	4.70	1.33 N	4.51 E
60.	5 45	N 74 0 E	59.67	6.24	1.76 N	5.99 E
68.	5 45	N 75 0 E	67.63	7.04	1.97 N	6.76 E

FINAL CLOSURE - DIRECTION: N 73 DEGS 43 MINS 27 SECS E
 DISTANCE: 7.04 FEET



1" = 10'

DEPTH - 68'
NORTH - 1.97'
EAST - 6.76'
CLOSURE - 7.04' N 73° 43' 27"



WELL 7 N° Q-21

P-1278-60303

SURFACE

VERTICAL SECTION

WELL 7 N: Q-21

SCALE
1"=10'

20' V

40' V

60' V

67.63' V.D.

68' M.D.

1.97'

EAST

NORTH

1

2

3

4

5

6

7

8

9

10

11

12

BECHTEL POWER CORP. --- WELL 7 4Q-47 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 10 DECEMBER 1978
JOB NO: P-1278-G0315
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: E141-14
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET
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0.	3 10	S 76 E	0.00	0.00	0.00 0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	3 10	S 76 E	14.98	0.83	0.20 S 0.80 E
30.	3 5	S 74 E	29.95	1.60	0.41 S 1.59 E
45.	3 0	S 73 E	44.93	2.44	0.64 S 2.36 E
49.	3 5	S 73 E	48.93	2.65	0.70 S 2.56 E

FINAL CLOSURE - DIRECTION: S 74 DEGS 42 MINS 9 SECS E
DISTANCE: 2.65 FEET



30'

DEPTH - 49'
SOUTH - 0.70'
EAST - 2.56'

CLOSURE - 2.65' S 74° 42' 09' E

WELL 7 N 0-47

P-1278-60315

WELL 7 N^o Q-47

SCALE

1" = 10'

SURFACE

20' V.

40' V.

48' 93" V.D.

0.70'

NORTH

0

1

2

3

49' M.D.

2.56'

EAST

BECHTEL POWER CORP. --- WELL 7 45_m-41 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57° 00' W

DATE: 09 DECEMBER 1978
JOB NO: P-1278-G0313
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F141-13
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	4 35	N 19 0 W	0.00	0.00	0.00	0.00
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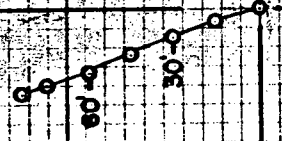
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	4 35	N 19 0 W	14.95	1.20	1.13 N	0.39 W
30.	4 30	N 19 30 W	29.90	2.39	2.25 N	0.78 W
45.	4 30	N 21 0 W	44.86	3.56	3.36 N	1.19 W
60.	4 25	N 21 30 W	59.81	4.73	4.45 N	1.61 W
75.	4 20	N 21 30 W	74.77	5.87	5.51 N	2.03 W
84.	4 20	N 21 0 W	83.74	6.55	6.14 N	2.28 W

FINAL CLOSURE - DIRECTION: N 20 DEGS 20 MINS 24 SECS W
DISTANCE: 6.55 FEET

DEPTH - 84'
NORTH - 6.14'
WEST - 2.28'

CLOSURE - 6.55' N 20° 20' 24" W



1" = 5'

WELL N° 7 N° R_m - 41

JOB N° P-1278-G0313

SURFACE

WELL 7 No. R-41

SCALE
1" = 10'

20' V

40' V

60' V

80' V

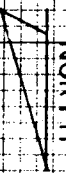
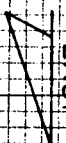
83.74' V.D.

84' M.D.

228'

EAST

NORTH



1

1

1

BECHTEL POWER CORP. --- WELL 7 4V-27 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 07 DECEMBER 1978

JOB NO: P-1278-G0302

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-9

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

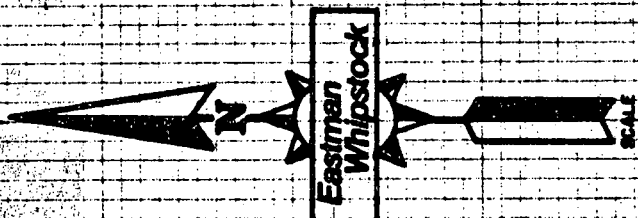
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	5 25	N 90 0 E	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	5 25	N 90 0 E	14.93	1.42	0.00	1.42 E
30.	5 20	N 90 0 E	29.87	2.82	0.00	2.82 E
45.	5 15	S 89 30 E	44.80	4.20	0.01 S	4.20 E
58.	5 15	N 90 0 E	57.75	5.39	0.01 S	5.39 E

FINAL CLOSURE - DIRECTION: S 89 DEGS 52 MINS 51 SECS E
DISTANCE: 5.39 FEET



DEPTH - 58'
SOUTH - 0.01'
EAST - 5.39'
CLOSURE - 5.39' S 89° 52' 51" E

30"

1"=10'

P-1278-60302

WELL 7 N8 V-27

SURFACE

VERTICAL SECTION

WELL 7 N° V-27

20' V.

SCALE

1" = 10'

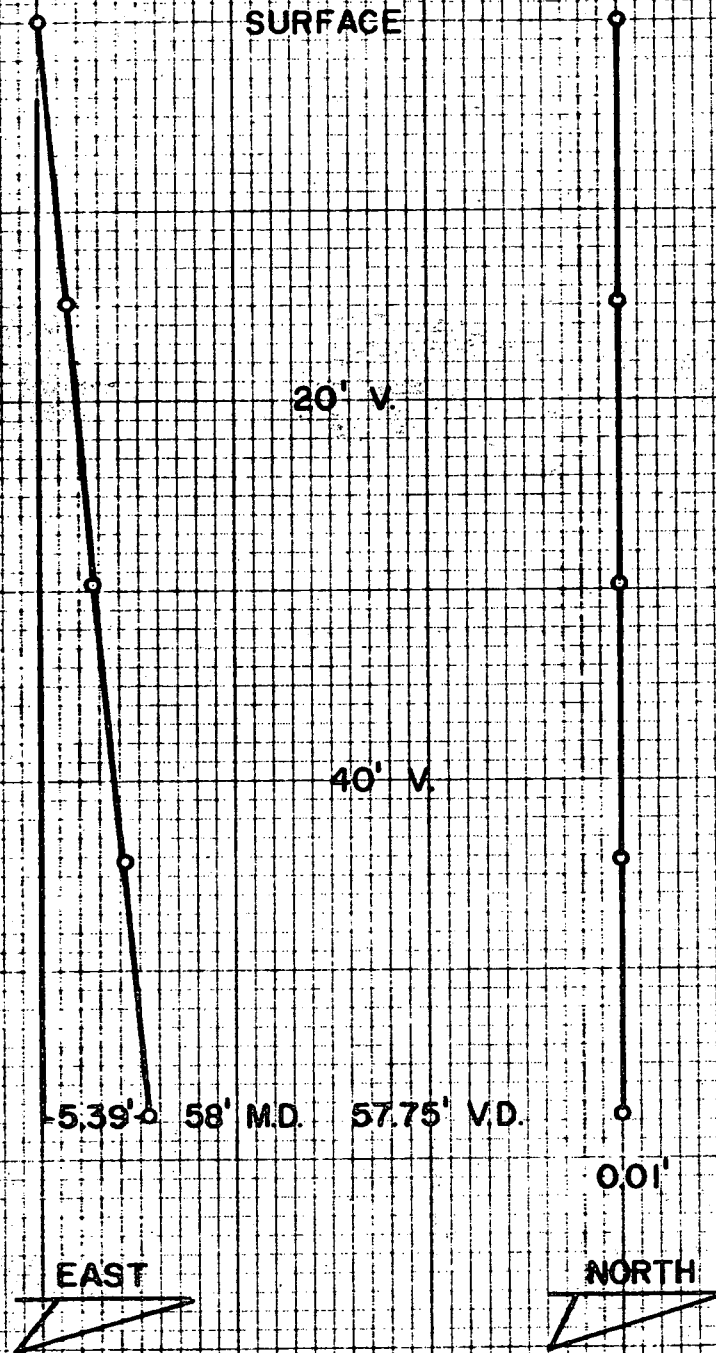
40' V.

5.39' 58' M.D. 57.75' V.D.

0.01'

EAST

NORTH



BECHTEL POWER CORP. --- WELL 7 4W-45 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 10 DECEMBER 1978

JOB NO: P-1278-G0316

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-16

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

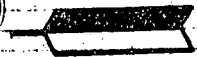
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	4 50	N 86 W	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	4 50	N 86 W	14.95	1.26	0.09 N	1.26 W
30.	4 50	N 86 W	29.89	2.53	0.18 N	2.52 W
45.	4 50	N 86 W	44.84	3.79	0.26 N	3.78 W
60.	4 35	N 87 W	59.79	5.02	0.34 N	5.01 W
66.	4 35	N 87 W	65.77	5.50	0.36 N	5.49 W

FINAL CLOSURE - DIRECTION: N 86 DEGS 11 MINS 56 SECS W
DISTANCE: 5.50 FEET



SCALE

1" = 10'

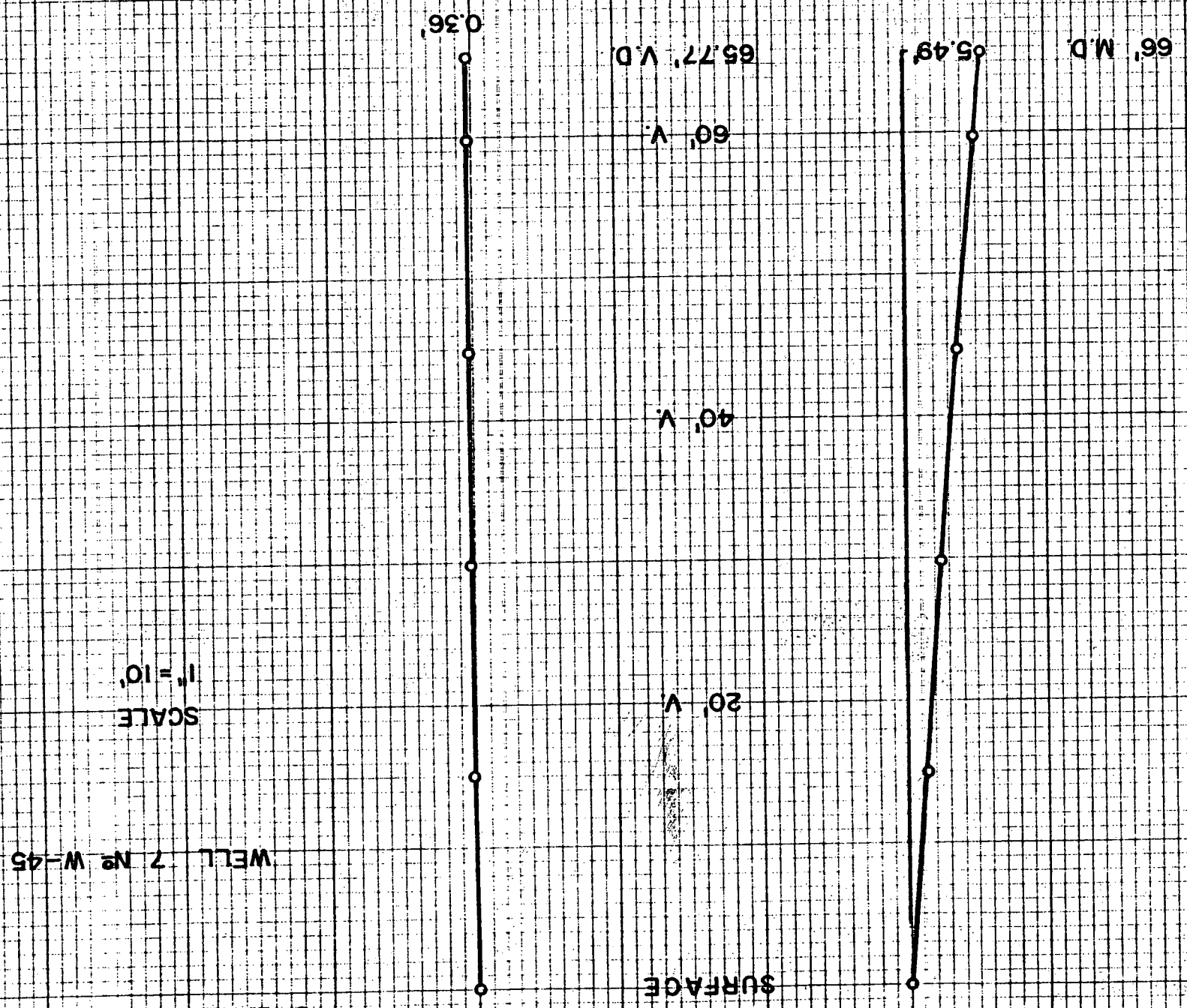
DEPTH - 66'
NORTH - 0.36'
WEST - 5.49'
CLOSURE - 5.50' N 86° 11' 56" W

30'



WELL 7 N 8 W - 45

P-1278-60316



BECHTEL POWER CORP. --- WELL 7-47-47 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57-00 W

DATE: 10 DEC 1978

JOB NO: P-1278-G0314

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F141-15

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	4 30	N 72 E	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

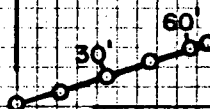
15.	4 30	N 72 E	14.95	1.18	0.36 N	1.12 E
30.	4 25	N 71 E	29.91	2.34	0.73 N	2.23 E
45.	4 20	N 71 E	44.86	3.49	1.11 N	3.31 E
60.	4 10	N 70 E	59.62	4.60	1.48 N	4.35 E
62.	4 10	N 70 E	61.87	4.74	1.53 N	4.49 E

FINAL CLOSURE - DIRECTION: N 71 DEGS 13 MINS 23 SECS E
DISTANCE: 4.74 FEET



1" = 5'

DEPTH - 62'
NORTH - 1.53'
EAST - 4.49'
CLOSURE - 4.74' N 71° 13' 23" E



WELL 7 N° Y-47

JOB N° P-1278-G0314

SURFACE

VERTICAL SECTION

WELL 7 N° Y-47

20' V.

SCALE

1"=10'

40' V.

449'

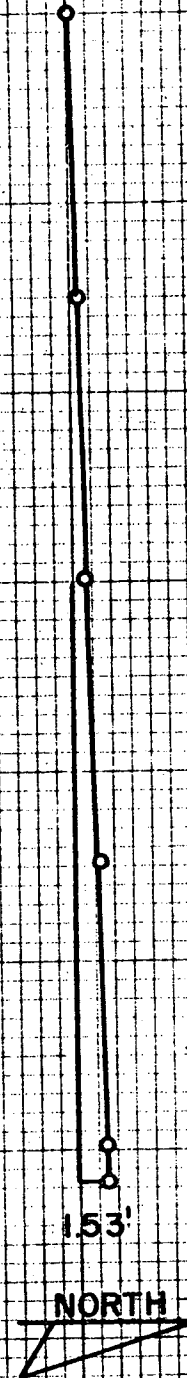
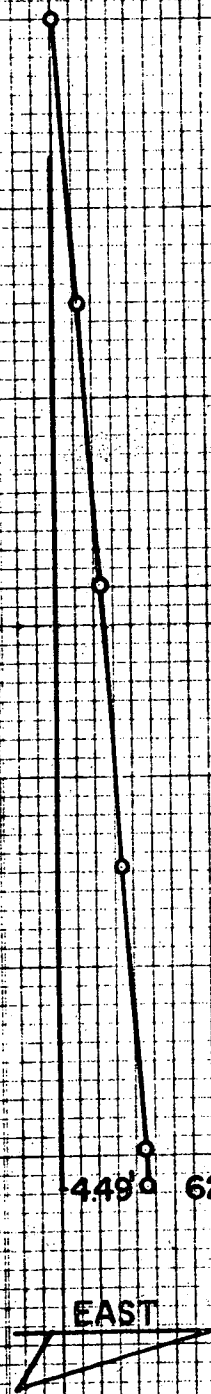
62' M.D.

61.82' V.D.

153'

EAST

NORTH



BECHTEL POWER CORP.--- WELL 7 #AA-47 ---EASTMAN GYRO MULTI-SHOT SURVEY.
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

DATE: 15 DECEMBER 1978
JOB NO: P-1278-G0346
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F143-7
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET
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0.	10 45	N 41 0 E	0.00	0.00	0.00 0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

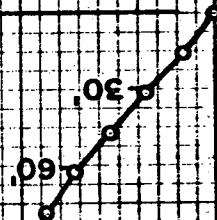
15.	10 45	N 41 0 E	14.74	2.80	2.11 N 1.84 E
30.	10 35	N 41 0 E	29.48	5.57	4.21 N 3.66 E
45.	10 30	N 39 30 E	44.22	8.32	6.30 N 5.43 E
60.	10 30	N 39 0 E	58.97	11.05	8.42 N 7.16 E
75.	10 20	N 38 30 E	73.73	13.76	10.53 N 8.86 E

FINAL CLOSURE - DIRECTION: N 40 DEGS 3 MINS 35 SECS E
DISTANCE: 13.76 FEET



WELL 7 No. AA-47

JOB No. P-1278-60346



DEPTH-75'
NORTH-10.53'
EAST-8.86'
CLOSURE-13.76' N 40° 03' 35" E

SURFACE

WELL 7 N° AA-47

SCALE
1" = 10'

20' V.

40' V.

60' V.

75' M.D.

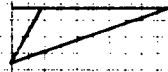
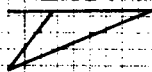
8.86'

73.73' V.D.

10.53'

EAST

NORTH



BECHTEL POWER CORP.---WELL 7 #BBM-48---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS "PLAN NORTH", N 57 00 W

DATE: 19 DECEMBER 1978

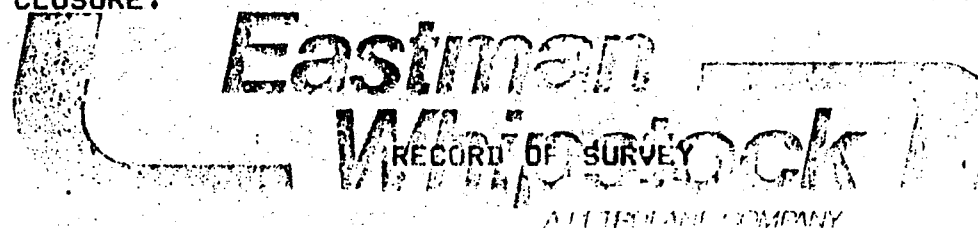
JOB NO: P-1278-G0353

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-10

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.



ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
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0.	10 10	N 19 30 E	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

15.	10 10	N 19 30 E	14.76	2.65	2.50 N	0.88 E
30.	10 0	N 20 0 E	29.53	5.27	4.97 N	1.77 E
45.	9 55	N 19 30 E	44.31	7.87	7.41 N	2.65 E
60.	9 45	N 19 30 E	59.09	10.43	9.82 N	3.50 E
70.	9 50	N 19 30 E	68.24	12.13	11.43 N	4.07 E

FINAL CLOSURE - DIRECTION: N 19 DEGS 36 MINS 27 SECS E
 DISTANCE: 12.13 FEET



DEPTH - 70'
NORTH = 11.43'
EAST = 4.07'
CLOSURE - 12.13' N 19° 36' 27" E



WELL 7 N° BB_m-48

JOB N° P-1278-G0353

SURFACE

20' V

40' V

60' V

68.94' V.D.

EAST

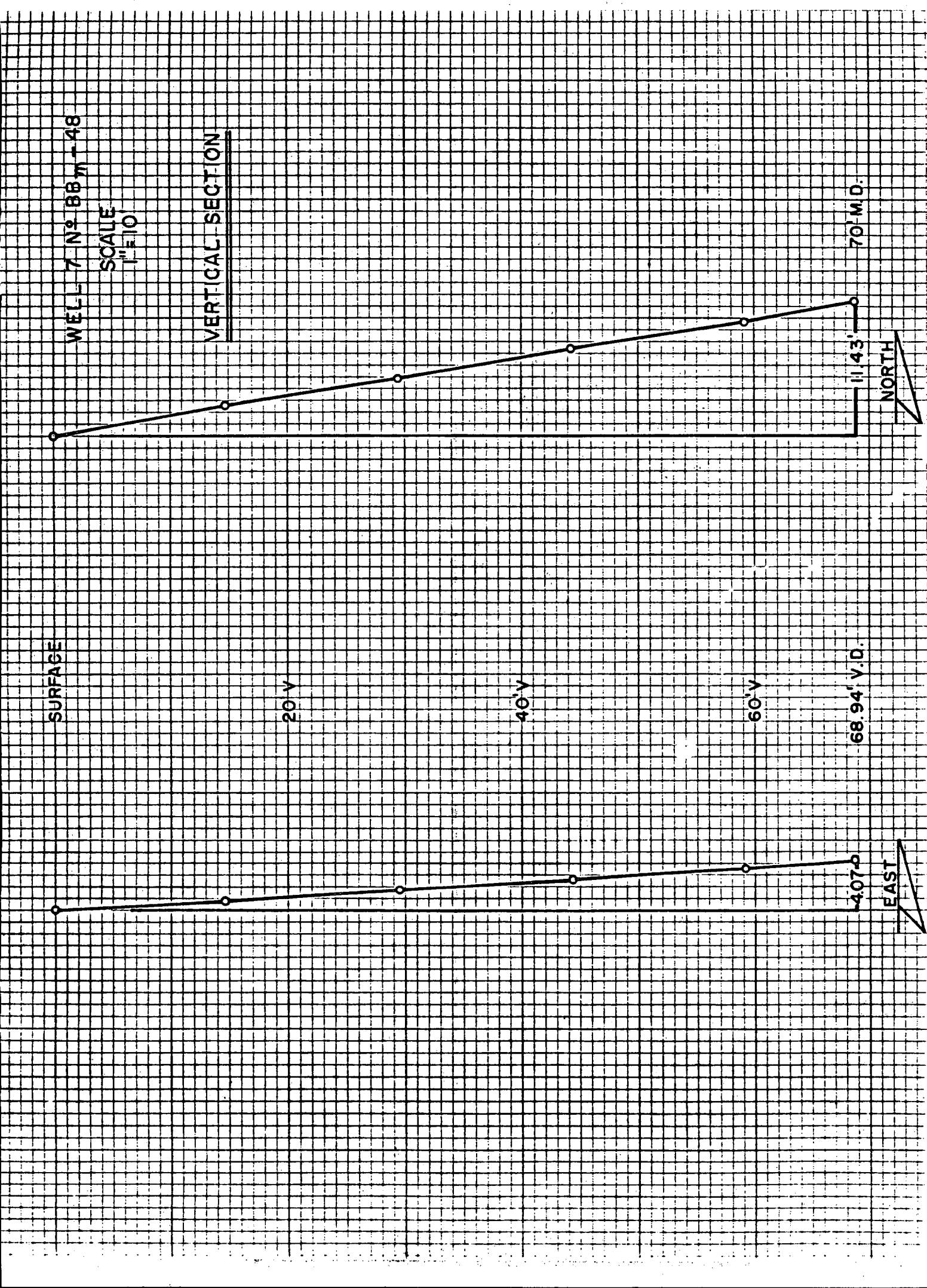
WELL 7 N° 88 W - 48

SCALE
1" = 10'

VERTICAL SECTION

70' M.D.

NORTH



BECHTEL POWER CORP--- HOLE: RW-1 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT, CA.

NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

DATE: 07 FEBRUARY 1978

JOB NO: P-0279-G0445

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F143-15

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

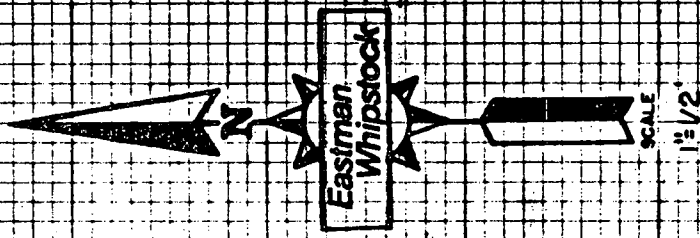
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	0 0	0 0	0.00	0.00	0.00	0.00
10.	0 25	S 20 30 E	10.00	-0.00	0.03 S	0.01 E
20.	0 15	N 53 0 E	20.00	0.04	0.05 S	0.07 E
30.	0 35	S 83 0 W	30.00	0.04	0.02 N	0.04 E

FINAL CLOSURE - DIRECTION: N 67 DEGS 32 MINS 40 SECS E
DISTANCE: 0.04 FEET

*Eastman
Whips*

DEPTH - 30'
NORTH - 102'
EAST - 104'
CLOSURE - 0.4' N 67° 32' 40" E

88.3d

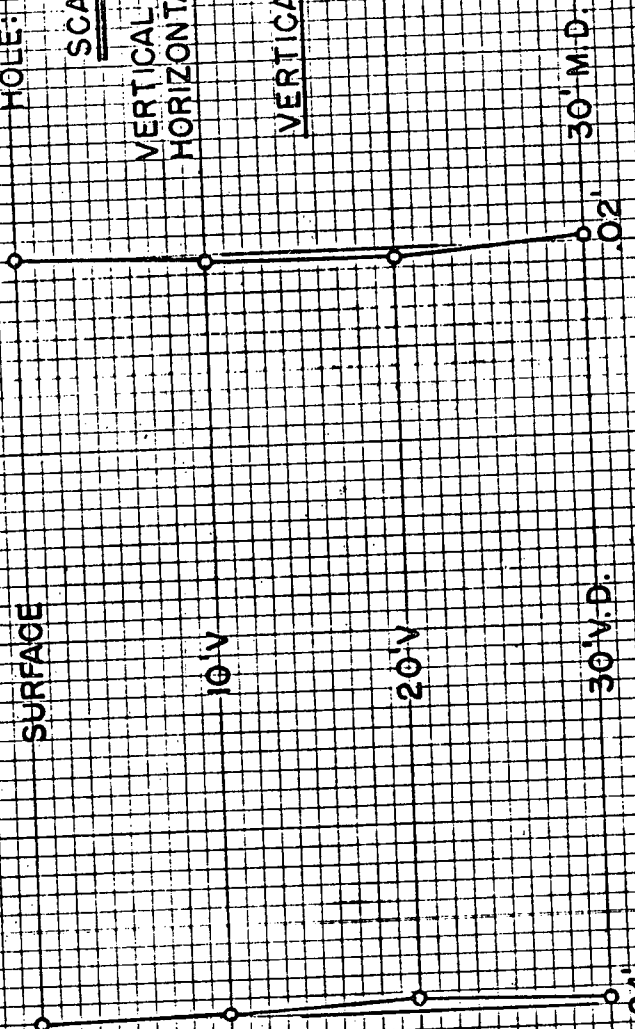


HOLE: RW-1

SCALES

VERTICAL $1''=10'$
HORIZONTAL $1''=1'$

VERTICAL SECTION



NORTH

EAST