

San Onofre Nuclear Generating Station Units 2 and 3



H&CF Geology

REPORT ON DEEP EXPLORATION DRILLING PROGRAM DEWATERING WELL NO. 6

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REPORT ON
DEEP EXPLORATION DRILLING PROGRAM
DEWATERING WELL NO. 6

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

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1.0 INTRODUCTION

This report documents the results of a deep exploration drilling program performed at Dewatering Well No. 6 at San Onofre Nuclear Generating Station Units 2 & 3. The deep drilling program was required to determine the maximum depth of the cavity adjacent to the well bore, and to assist in determining the required locations of borings and general scope of the Exploration/Grouting Program subsequently completed to more closely investigate and grout the area of known cavity. The Deep Exploration Drilling Program consisted of closely spaced holes placed around the well bore to provide the necessary information to define the depth of the known cavity, and to conclude that significant cavities do not exist at depth.

Dewatering Well No. 6 is near the east road, south of the Unit 2 Fuel Handling Building, and east of the Unit 2 Auxiliary Building (Figure 1). The well was constructed on June 26, 1974 as one of thirteen 14-inch diameter gravel packed dewatering wells. This system allowed construction of the plant to be performed in a dry excavation to depths of approximately 30 feet below sea level.

2.0 PROGRAM OBJECTIVES

Previous investigations outlined in Section 5 of this report delineated a cavity which extended from 20 feet to about 100 feet in depth in the vicinity of Dewatering Well No. 6. The primary objective of the Deep Exploration Drilling Program was to ensure, by closely spaced holes, that all significant cavities would be located. The secondary objective was to define the maximum depth of the known cavity and to provide additional subsurface information for the design of the aforementioned grouting program.

3.0 SUMMARY

The Deep Exploration Drilling Program consisted of drilling 26 holes around Dewatering Well No. 6. Nineteen holes were completed to a minimum of 200 feet, which is the depth of the original well bore. Three holes were terminated when they drifted into the well bore. Four holes were terminated at less than 10 feet in depth after encountering near surface buried obstructions. All holes deeper than 10 feet, except one, were gyro-surveyed to provide accurate drift data for determination of the distances between holes at depth. Results of the Deep Exploration Drilling Program are shown in Table 1. Adjacent to the well, the maximum depth of the cavity in any hole which did not encounter the well bore is 140 feet, and the maximum width of the cavity is about 11 feet at a depth of about 40 feet. The cavity is filled with grout and disturbed sand or well gravel. No open cavity was encountered during drilling.

4.0 CONCLUSIONS

The results of the drilling indicate that there are no significant deep cavities or zones of erosion below a depth of 140 feet (Elevation -110 feet). The cavity exhibits widening at two depths, one zone which extends from about 21 feet to 85 feet and is 11 feet wide and the other which extends from 100 feet to about 140 feet and is about 4 feet wide. Based on these findings the borings of the Exploration/Grouting Program will be extended to a conservative depth of 150 feet near the well.

No open cavity was encountered in the cavity region and the cavity fill material consists of grout and disturbed sand or well gravel.

5.0 BACKGROUND

A detailed description of a postulated mechanism of cavity formation was presented in a written report to the Nuclear Regulatory Commission (NRC) dated December 23, 1977. An indication of possible problems with the dewatering well system began at Well No. 6 in May 1977 when, during the last phase of the abandonment process, the gravel pack settled 30 to 40

feet. The well casing had been filled and capped and the ground surface immediately surrounding the well was being compacted when the gravel settlement occurred. The ensuing investigations at Well No. 6 have been documented in progress reports to the NRC. A summary of these investigations is included as background information leading to the initiation of the Deep Exploration Drilling Program.

An investigative program was initiated by Woodward-Clyde Consultants at Well No. 6 and the other wells in the system to determine the extent and significance of the cavities. At Well No. 6, this involved the drilling of seven exploratory holes and cleaning of the well bore to allow video taping of the casing. The video tape indicated a badly corroded casing in the upper 160 feet of the well. In the lower 40 feet of the well the casing is practically nonexistent.

The material between the casing and the hole wall was removed by airlifting which facilitated removal of 148 feet of the 14-inch diameter well casing. Additional airlifting and removal of sand in the cavity was performed to define the size and shape of the cavity by caliper and sonar measurements.

To explore the depth of the cavity, 28 borings (6A-1 through 6A-28) were placed in the vicinity of Well No. 6 in three stages. The locations of these drill holes are shown on Figure 2. In the first stage, Exploratory Holes 6A-1 through 6A-5 were placed along the edge of the Unit 2 Auxiliary Building as a preliminary step to determine if the cavity extended under the structure. No cavities were encountered by these five borings.

In an effort to stabilize the inflow of cavity fill material into the well bore from the cavity region, a 36-inch diameter casing was driven by vibratory hammer to 110 feet. Very little driving resistance was noted until 95 feet of casing had been placed. Resistance continued to increase to the final depth of 110 feet. Subsequent airlifting to a depth of 110 feet indicated that the cavity region was not adequately sealed from the well below

110 feet. The casing was then driven an additional 8 feet to a depth of 118 feet at which time the casing separated along a welded joint at a depth of 62 feet.

The casing was sealed at 62 feet, but additional attempts at airlift cleaning of the original well bore to the bottom of the well were unsuccessful due to the continued inflow of materials from the cavity region around the 36-inch casing. Based on downhole TV monitoring, it was concluded that the casing was out of alignment with the well bore and further attempts to seal the cavity from the well bore using the casing were discontinued and further airlift operations were terminated.

Between January 13 and April 25, 1978, an additional 16 drill holes (6A-6 through 6A-21) were drilled in the cavity region to define the void area and extent of disturbed sand. The location of these drill holes is shown on Figure 2.

Comparison of drill hole data obtained following the casing driving with the void determination made from the sonar surveys made prior to casing driving indicated that the roof of the cavity had migrated upward approximately 30 feet from Elevation -20 to Elevation +10. This change in the cavity configuration is attributed to localized failure of the cavity roof during the casing driving resulting in the filling of the existing void with disturbed sand and the creation of the void in the upper zone. Rainfall, which was heavy during this period (January 13 to April 25, 1978), also contributed to cavity enlargement from erosion due to runoff water entering open exploration holes.

The void portion of the cavity was backfilled with 112 cubic yards of grout (site G-3 mix) to stabilize the area and prevent further enlargement of the cavity. Following the G-3 grout placement, seven additional exploratory holes (6A-22 through 6A-28) were placed in the cavity area to determine the completeness of the grouting operation and to ascertain the depth of disturbed sand in the cavity region. Based on these data, the known cavity

extended from about 20 feet (Elevation +10) to 97 feet (Elevation -67). However, these investigations did not confirm the absence of cavities below this depth. A deep drilling program, the subject of this report, was then initiated to determine if cavities existed at depth.

6.0 DEEP EXPLORATION DRILLING PROGRAM

6.1 Program Plan

The Deep Exploration Drilling Program was similar to that performed at Well No. 8. The initial phase was planned to consist of six equally spaced deep holes drilled around the circumference of the well at a 5-foot radius from its center, as shown schematically in Plan View, Figure 3, and Profile, Figure 4. The second phase was planned to consist of a series of holes drilled 6 feet from the well bore. These holes were to be drilled between the holes of the first phase. The actual locations would be adjusted in the field depending upon the vertical deviation of the first six holes.

6.2 Drilling and Sampling Methods

The rotary method using biodegradable drilling fluid was employed in the exploratory drilling. Careful logging of information obtained during drilling, including information on drilling rates, loss of circulation, penetration tests, and description of samples, provided additional information on the subsurface characteristics. All work was done under the direction and supervision of qualified Bechtel Geotechnical personnel.

Standard Penetration Tests (SPT) were performed at 10-foot intervals during drilling. The interval was staggered randomly in the various holes to provide a diversity in sample depths. When backfill concrete or grout was penetrated, the SPT were performed to verify the nature of underlying material. The SPT were also performed at intermediate intervals as necessary when significant changes in drilling characteristics or materials were noted.

The drill holes were accurately located on the ground surface by survey. To determine the precise location of the holes at depth, two procedures were employed. While the hole was being drilled, a single-shot magnetic survey instrument was used at 20-foot intervals to provide an indication of the drift so that corrective measures could be taken. On completion of drilling, the hole was again surveyed using a gyroscopic survey instrument which provided a precise plot of the direction and drift in each hole.

7.0 PROGRAM IMPLEMENTATION

7.1 Area Preparation

Prior to the start of the Deep Exploration Drilling Program, a gyroscopic survey was run inside the 36-inch casing to a depth of 110 feet, the maximum depth of open casing. At 110 feet, the center of the 36-inch casing is offset 0.83 feet from the vertical at a bearing of S28°25'W as shown in plan on Figure 5 and profile on Figure 6. The 36-inch casing was then filled with sand to provide a better working surface and to prevent possible grout intrusion into the casing during backfilling of the deep exploration holes.

7.2 Drilling

To satisfy the criteria for determining if cavities exist at depth, a total of 26 holes comprising 4339 lineal feet were drilled. All of the deep exploration holes were drilled using rotary drilling techniques. Revert, a biodegradable drilling fluid or mud, was used to maintain circulation and minimize caving of the hole walls. Occasionally, under severe caving conditions, a bentonite-base drilling mud was used. As a further aid in penetrating zones of cavity fill, the holes were advanced by using NC wire-line casing. Retraction of the bit allowed sampling to take place through the casing, thus minimizing the amount of interference from loose sand during Standard Penetration Tests. The intended depth of all the holes was 200 feet (Elevation -170 feet) from the ground surface at Elevation +30. Of the 26 holes attempted, 19 were completed to a depth of 200 feet. Four holes were terminated at 8 feet or less when buried obstructions were

encountered. Three holes were terminated when they drifted into the well bore. Locations of the holes are shown on Figures 2 and 5. A summary of the drilling is presented in Table 1, and geologic logs of the holes are presented in Appendix A.

With the exception of Holes 6B-19 through 6B-22, the amount of drift in each hole was measured during drilling at 20-foot intervals using the magnetic single-shot drift survey instrument. Borings 6B-19 through 6B-22 were not surveyed during hole advancement as they were drilled for the most part without casing. All information on drilling operations was recorded and samples were inspected and described. The samples have been retained for future reference.

On completion of each hole, a gyroscopic multi-shot survey was performed to determine its direction and drift. Plotting of this information aided in determining the geometry of the cavity and location of intermediate holes. A plan of the drill hole locations and measured drifts is shown in Figure 5. The gyroscopic surveys are included in Appendix B.

The initial six borings were drilled between May 26, 1978 and June 13, 1978. These holes are spaced approximately 5 feet radially from the center of the well as shown on Figure 5. Boring 6B-5 required relocation to the north due to the presence of a buried steel plate at a depth of about 8 feet. Based on the materials encountered and the drift of the initial six deep exploration drill holes, locations were selected for the next series of holes to close out the pattern. In order to provide the proper closure spacing, the second phase of the program was expanded from 6 to 16 holes, which were drilled June 15 through July 24, 1978. Difficulties were again encountered in the area immediately southeast of the well due to the presence of the buried steel plate. This plate supported a 42-inch diameter C.M.P. casing which was placed in the area during the early stages of the investigations to stabilize the work area around this well. Following an attempt to drill 6B-13, the plate was removed and Boring 6B-13A was drilled at the same location. Removal of the plate also allowed 6B-22 to be drilled at the

same location as 6B-5. Boring 6B-8 was replaced by 6B-8A after a railroad track was encountered at the original location.

7.3 Grouting

7.3.1 Tremie Grouting

After the gyro-directional survey was completed, each of the first 18 holes drilled in the Deep Exploration Drilling Program was backfilled with grout. A grout mix of 1:1 (water:cement by volume) with one percent Sika Intraplast-N additive (one percent of the weight of cement) was pumped at low pressure into the hole through either the AX-drill rods or NC casing which had been placed to the bottom of the hole. After displacement of the drilling fluid, the casing was gradually withdrawn and more grout was added to maintain a full hole. The grout logs are included in Appendix C. The quantity of grout placed is indicated in Table 2. All holes which took large amounts of grout were those which encountered zones of cavity fill material.

7.3.2 Pressure Grouting

Backfilling of Borings 6B-19 through 6B-22 was accomplished by pressure grouting. These holes were pressure grouted instead of tremie backfilled because they were drilled during the early phase of the Exploration/Grouting Program and were used both as deep exploration holes and grout holes. Pressure grouting of the two holes that encountered the well bore at depth (6B-19 and 6B-20) also provided for grouting in the well gravel in the lower portion of the well. While grouting 6B-20, communication with 6B-19 and a nearby exploration/grout hole verified grout travel through the well gravel pack. Grouting logs of Exploration Holes 6B-19 through 6B-20 are included in Appendix C. The quantity of grout placed is indicated in Table 2.

8.0 ANALYSIS OF DEEP EXPLORATION DRILLING

8.1 Drilling Program

A careful evaluation was made of the drilling and sampling data as the Deep Exploration Drilling Program progressed to assure that the cavity

detection objectives of the program were being met. A review of this information indicates the cavity is bounded by four borings in which no cavity was encountered. These four borings encountered undisturbed San Mateo Formation to their completed depth of 200 feet with the exception of 6B-12, which encountered thin seams of grout from 20.0 feet to 26.0 feet and is considered to have been drilled in undisturbed material. Grout and/or undisturbed San Mateo Formation was encountered in six holes. All of the holes that encountered disturbed sand also contain grout except 6B-10A, 6B-19 and 6B-20 which are all in the same area southeast of the well. Locations of the borings and an outline of the cavity boundary at a depth of 10 feet are shown on Figure 5. An isometric plot of the drill holes in profile is shown in Figure 6.

With the exception of the holes which encountered obstructions at a shallow depth, three drill holes (6B-13A, 6B-19 and 6B-20), were terminated before reaching the anticipated completion depth of 200 feet (Elevation -170). The first, 6B-13A, encountered grout from 28 feet to 43 feet and disturbed sand from 55 feet to 125 feet and 130 feet to 154 feet. At 145 feet the sample contained gravel pack from the well and a reduction in return circulation was noticed. Below 150 feet the hole caved and drilling became increasingly difficult. At a depth of 154 feet the hole was terminated. The materials encountered and survey of the hole indicated that the hole drifted into the well bore.

The other two deep exploration drill holes (6B-19 and 6B-20) that did not reach a depth of 200 feet were drilled on the same side of the well as 6B-13A and also entered the well bore. Well gravel was encountered in 6B-19 at 116 feet and at 160 feet in 6B-20. These data, when used in conjunction with some of the preliminary data from the Exploration/Grouting Program holes, were used to identify the projection of the well bore as shown in Figure 5. The exploration indicates that the original well bore was out of alignment by approximately 4.5 feet in a S62°E orientation.

8.2 Cavity Description

The cavity area at Well 6 is widened at two elevations. The upper section consists of a widening of the well bore which is transitional to a narrow

linear feature at approximately 40 feet below ground surface. The narrow sand filled cavity has a northwest and southeast orientation from the well bore with the longest portion approximately 85 feet below the surface. The cavity varies from about 11 feet wide at 40 feet to 5 feet wide at 85 feet. An additional widening of the cavity to about 4 feet was also noted between 100 and 140 feet. No disturbed material was noted below that depth.

The cavity fill materials encountered consisted of grout and disturbed sand. Grout placed during bulk cavity filling operations was encountered from 21 feet to 46 feet and from 55 feet to 60 feet. Lenses of grout mixed with sand were encountered from 20 feet to 26 feet and from ground surface to 70 feet in Boring 6B-22. The grout encountered in Hole 6B-22 was injected during the Exploration/Grouting Program. No open cavity was encountered during drilling, indicating that the cavity area is completely filled with grout or sand. The SPT samples taken in the cavity fill areas indicate that the sand is loose to very dense with most of the samples in the dense category. The "N" values obtained from the Standard Penetration Testing are shown graphically on Figure 7.

8.3 Identification of Cavities at Depth

The 22 holes completed in the Deep Exploration Drilling Program were specifically located to provide subsurface information on cavities at depth. Based on this program, it is concluded that there are no significant cavities or enlargement of the well bore below a depth of 140 feet near Dewatering Well No. 6. The borings of the Exploration/Grouting Program have been planned to extend to a conservative depth of 150 feet near the well based on the findings of the deep drilling program.

TABLE 1
SUMMARY OF DEEP DRILLING PROGRAM AT WELL NO. 6

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
6B- 1	201.0'	-	-	0.0-201.0'	S60° 4'E	1.45'	
6B- 2	200.0'	23.0-41.0'	20.0- 23.0' 41.0- 75.0' 129.0-140.0'	10.0- 20.0' 75.0-129.0' 140.0-200.0'	N12°25'E	1.63'	0.0-10.0 Fill. Railroad bed backfill (angular gravel) encountered at 20'. Disturbed material in zones.
6B- 3	200.0'	26.5-42.0'	10.0- 26.5' 42.0- 70.0'	70.0-200.0'	S71° 2'E	0.47'	0.0-10.0' Fill.
6B- 4	200.0'	1.0- 6.0' 31.0-38.0'	38.0- 80.0' 100.0-128.0'	6.0- 31.0' 80.0-100.0' 128.0-200.0'	N63° 7'W	2.55'	0.0-1.0' Fill.
6B- 5	8.0'	2.5- 8.0'			Not Run	Not Run	0.0-2.5' Loose fill. Hit steel plate at 8.0'.
6B- 5A	200.0'	28.0-46.0'	46.0- 48.0' 60.0- 80.0'	5.0- 28.0' 48.0- 60.0' 80.0-200.0'	N24° 4'W	0.65'	0.0-5.0' Fill.
6B- 6	200.0'	28.5-44.0'		10.0- 28.5' 44.0-200.0'	N51°48'E	0.68'	0.0-10.0' Fill.
6B- 7	200.0'	21.0-43.0'	60.0- 80.0'	3.0- 21.0' 43.0- 60.0' 80.0-200.0'	N 2°46'E	0.61'	0.0-3.0' Fill.
6B- 8	1.0'	-	-	-	Not Run	Not Run	Encountered railroad track.
6B- 8A	200.0'	10.0-43.0'	5.0- 10.0' 43.0- 84.0'	84.0-200.0'	S30°40'E	1.52'	0.0-5.0' Fill.
6B- 9	200.0'	31.0-43.0'	15.0- 31.0' 60.0- 70.0'	1.0- 15.0' 43.0- 60.0' 70.0-200.0'	S85°36'W	1.45'	0.0-1.0 Fill

TABLE 1
SUMMARY OF DEEP DRILLING PROGRAM AT WELL NO. 6

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
6B- 1	201.0'	-	-	0.0-201.0'	S60° 4'E	1.45'	
6B- 2	200.0'	23.0-41.0'	20.0- 23.0' 41.0- 75.0' 129.0-140.0'	10.0- 20.0' 75.0-129.0' 140.0-200.0'	N12°25'E	1.63'	0.0-10.0 Fill. Railroad bed backfill (angular gravel) encountered at 20'. Disturbed material in zones.
6B- 3	200.0'	26.5-42.0'	10.0- 26.5' 42.0- 70.0'	70.0-200.0'	S71° 2'E	0.47'	0.0-10.0' Fill.
6B- 4	200.0'	1.0- 6.0' 31.0-38.0'	38.0- 80.0' 100.0-128.0'	6.0- 31.0' 80.0-100.0' 128.0-200.0'	N63° 7'W	2.55'	0.0-1.0' Fill.
6B- 5	8.0'	2.5- 8.0'			Not Run	Not Run	0.0-2.5' Loose fill. Hit steel plate at 8.0'.
6B- 5A	200.0'	28.0-46.0'	46.0- 48.0' 60.0- 80.0'	5.0- 28.0' 48.0- 60.0' 80.0-200.0'	N24° 4'W	0.65'	0.0-5.0' Fill.
6B- 6	200.0'	28.5-44.0'		10.0- 28.5' 44.0-200.0'	N51°48'E	0.68'	0.0-10.0' Fill.
6B- 7	200.0'	21.0-43.0'	60.0- 80.0'	3.0- 21.0' 43.0- 60.0' 80.0-200.0'	N 2°46'E	0.61'	0.0-3.0' Fill.
6B- 8	1.0'	-	-	-	Not Run	Not Run	Encountered railroad track.
6B- 8A	200.0'	10.0-43.0'	5.0- 10.0' 43.0- 84.0'	84.0-200.0'	S30°40'E	1.52'	0.0-5.0' Fill.
6B- 9	200.0'	31.0-43.0'	15.0- 31.0' 60.0- 70.0'	1.0- 15.0' 43.0- 60.0' 70.0-200.0'	S85°36'W	1.45'	0.0-1.0 Fill

TABLE 1 (continued)

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
6B-10	6.5'	2.5- 6.5'			Not Run	Not Run	0.0-2.5' Fill. Hit steel plate at 6.5'.
6B-10A	200.0'		40.0- 45.0' 55.0- 85.0' 120.0-130.0'	7.0- 40.0' 45.0- 55.0' 85.0-120.0' 130.0-200.0'	S80°57'E	0.53'	0.0-7.0' Fill. Fine gravel in sample at 125'.
6B-11	200.0'	24.0-43.5'	43.5- 55.0'	7.0- 24.0' 55.0-200.0'	N70° 8'E	2.50'	0.0-7.0' Fill.
6B-12	200.0'			2.0-200.0'	N 3°20'W	1.01'	0.0-2.0' Fill. Seams of grout encountered between 20-26'.
6B-13	6.5'	2.5- 6.5'			Not Run	Not Run	0.0-2.5' Fill. Hit steel plate at 6.5'.
6B-13A	154.0'	28.0-43.0'	55.0-125.0' 130.0-154.0'	7.0- 28.0' 43.0- 55.0' 125.0-130.0'	N35°29'E	1.68	0.0-7.0' Fill. Gravel encountered at 145'. Hole entered well bore.
6B-14	200.0'	2.5- 6.0'	6.0- 20.0'	20.0-200.0'	S 3°52'W	3.43'	0.0-2.5' Fill. 155.0-156.0', Grout impregnation.
6B-15	200.0'	19.0-43.0'	43.0- 80.0' 120.0-125.0'	2.0- 19.0' 80.0-120.0' 125.0-200.0'	N69°50'E	0.92	0.0-2.0' Fill. 120.0-140.0' Drill fluid loss into adjacent hole.
6B-16	200.0	55.0-60.0'	60.0- 65.0'	7.0- 55.0' 65.0-200.0'	N14°42'E	1.40'	0.0-7.0' Backfill. Below 60', communication with previously drilled hole six feet north.
6B-17	200.0'	-	-	7.0-200.0'	N63°40'W	1.58'	0.0-7.0' Backfill.

TABLE 1 (continued)

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
6B-18	200.0'	-	-	7.0-200.0'	N72°59'W	1.24'	0.0-7.0' Backfill
6B-19	190.0'		0.0- 10.0' 78.5-120.0'	10.0- 78.5' 120.0-190.0'	Not Run	Not Run	0.0-10.0'Disturbed back- fill and concrete used to stabilize steel plate. 103.0-110.0' PVC pipe in cuttings. 116.0' Sample con- tained Well 6 gravel.
6B-20	172.0'		70.0- 80.0' 130.0-135.0' 160.0-172.0'	10.7- 70.0' 80.0-130.0' 135.0-160.0'	N24°55'W	1.20'	0.0-10.7' Backfill sand. 55.0' Lost circulation briefly, probable old exploration hole. Gravel encountered at 160.0'. Hole entered well bore.
6B-21	200.0'	6.0- 7.0' 30.0-44.0'		10.0- 30.0' 44.0-200.0'	S21°46'W	5.77'	0.0-6.0', 7.0-10.0' Fill.
6B-22	200.0'	0.0- 2.0' 50.0-70.0'	2.0- 50.0' 80.0- 85.0'	70.0- 80.0' 85.0-200.0'	S 5°35'E	7.69'	2.0-50.0' Mixed sand and grout. 50.0-70.0' Mixed grout and sand.

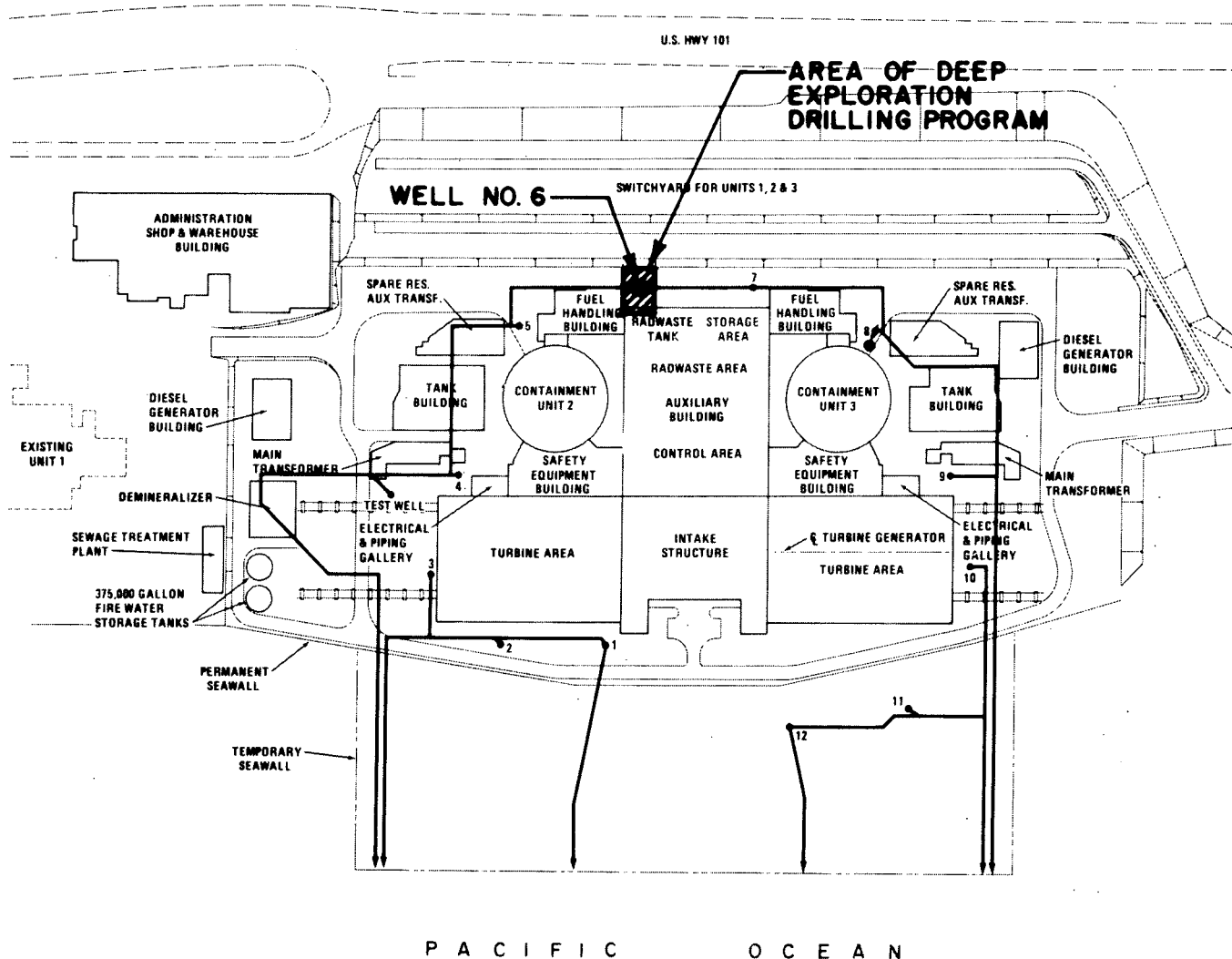
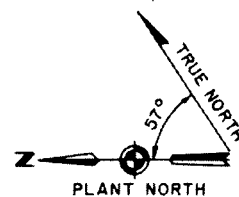
TABLE 2

DEEP EXPLORATION DRILLING PROGRAM
DEWATERING WELL NO. 6TABLE OF GROUT QUANTITIES

<u>HOLE NO.</u>	<u>TOTAL DEPTH (FT)</u>	<u>GROUT TAKE (BAGS)</u>
6B- 1	201	19
6B- 2	200	53
6B- 3	200	18
6B- 4	200	46
6B- 5A	200	68
6B- 6	200	16
6B- 7	200	13
6B- 8A	200	14
6B- 9	200	15
6B-10A	200	18
6B-11	200	14
6B-12	200	18
6B-13A	154	19
6B-14	200	16
6B-15	200	17
6B-16	200	14
6B-17	200	16
6B-18	200	12
6B-19 (2)	190	0 (1)
6B-20 (2)	165	89.3
6B-21 (2)	200	13.1
6B-22 (2)	200	19.5

(1) Drill rods stuck in hole, communication from 6B-20 to 6B-19 when grouting 6B-20.

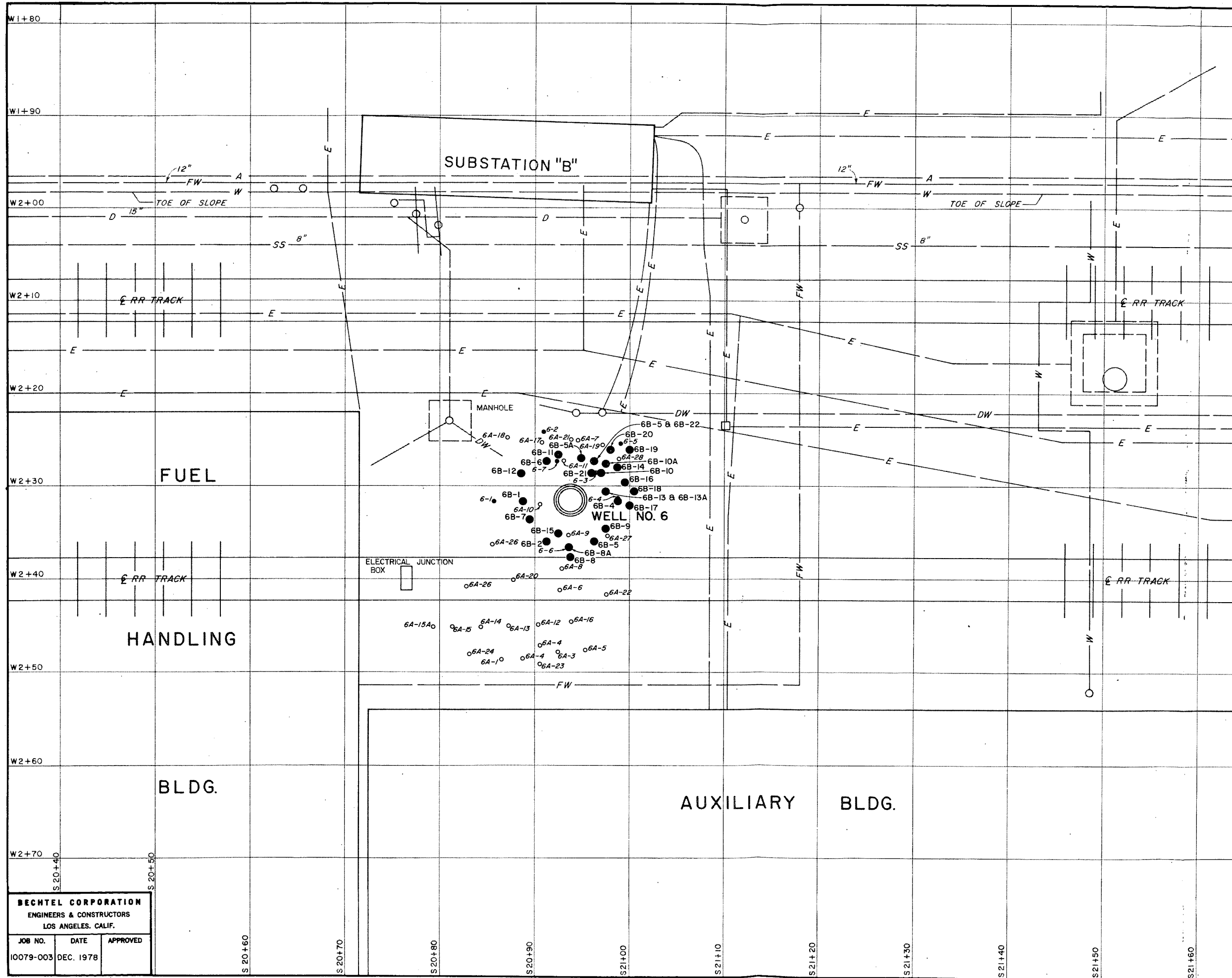
(2) Hole pressure grouted as part of Exploration/Grouting Program.



UNITS 2 & 3

BECHTEL CORPORATION		
ENGINEERS & CONSTRUCTORS		
LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
00079-003	DEC. 1978	

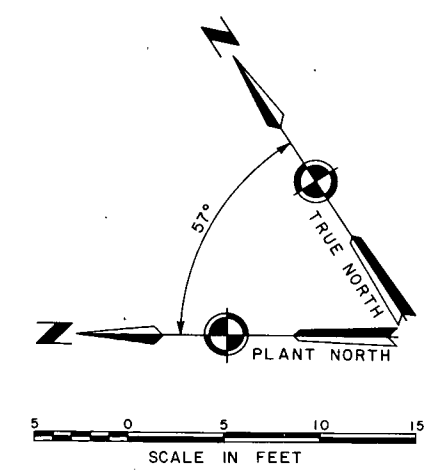
I.O. NO.		SAN ONOFRE NUCLEAR GENERATING STATION
FILE		DEEP: EXPLORATION
FIGURE		DRILLING PROGRAM - WELL NO. 6
1		LOCATION MAP
		SOUTHERN CALIFORNIA EDISON COMPANY
		SCALE N.T.S. LOS ANGELES, CALIF.



EXPLANATION

- 6B-1 thru 6B-22 Deep exploration holes drilled dates 6-6-78 thru 10-16-78
- 6-1 thru 6-7 Exploration holes drilled dates 5-18-77 thru 6-8-77
- 6A-1 thru 6A-28 Exploration holes drilled dates 12-27-77 thru 5-18-78
- DW Utility locations as shown
- E Utility locations as shown

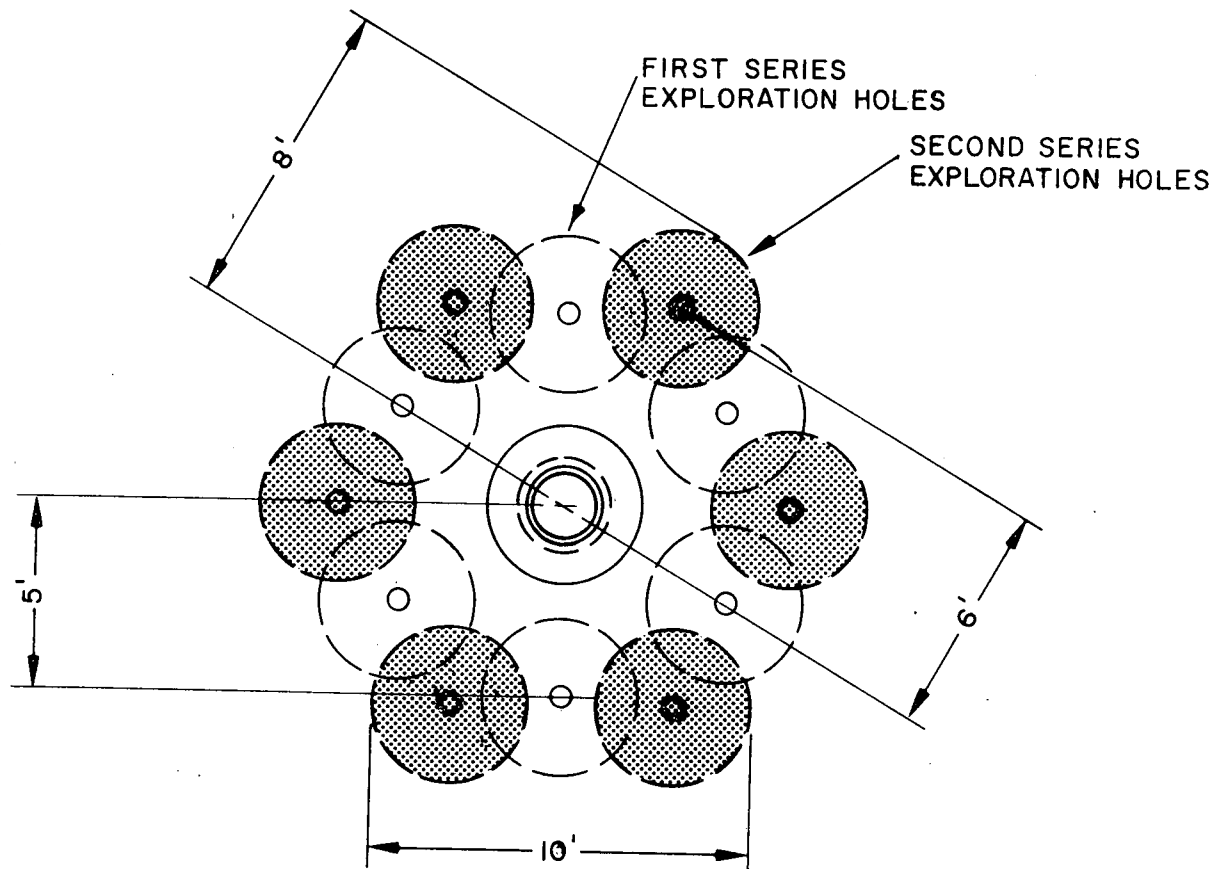
NOTE: Ground surface datum is at 30ft. above M.L.L.W.
Datum EL. 0.00ft M.L.L.W. is -2.66ft. M.S.L.



UNITS 2 & 3

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	DEEP EXPLORATION DRILLING PROGRAM - WELL No. 6
FIGURE	LOCATION OF EXPLORATION DRILL HOLES
2	SOUTHERN CALIFORNIA EDISON COMPANY SCALE: AS SHOWN LOS ANGELES, CALIF.

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



Dashed circles indicate maximum allowable deviation of 2 feet in 200 feet hole

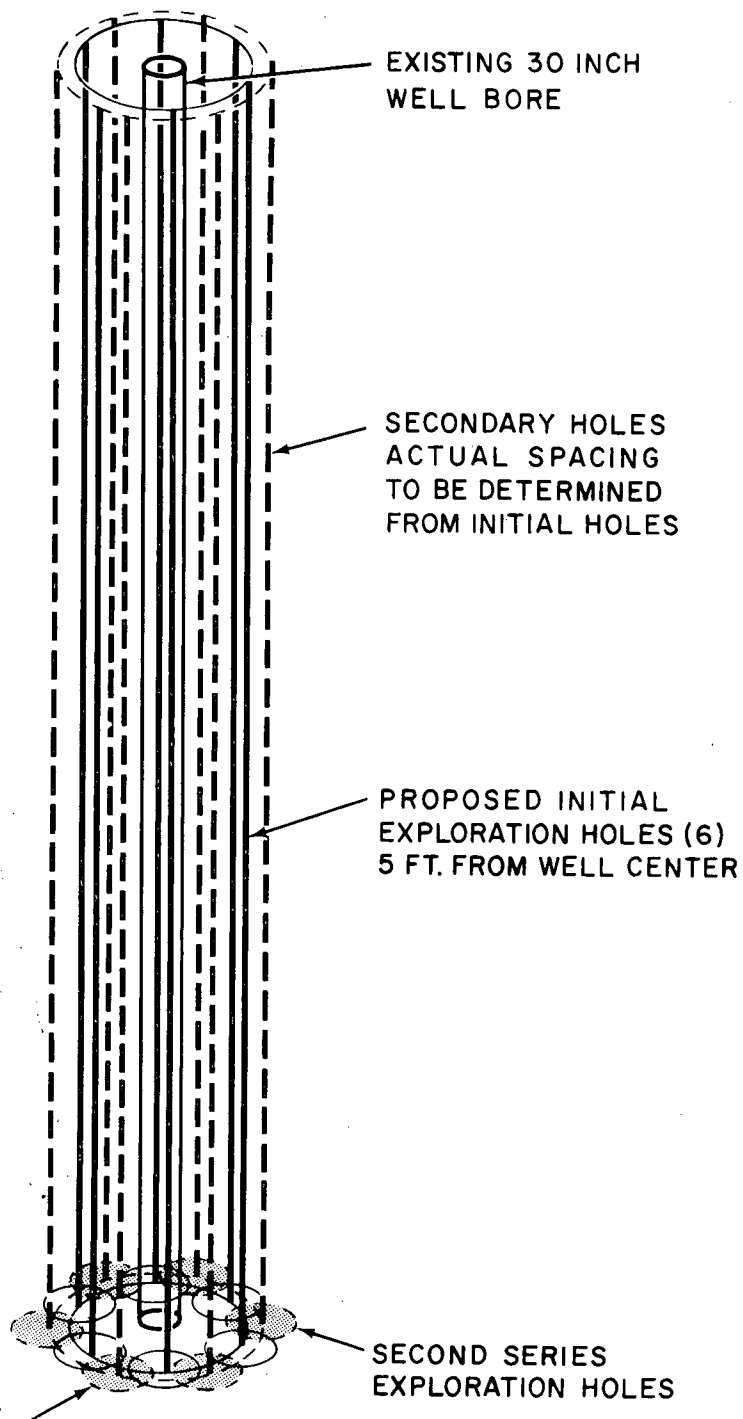
Actual spacing in field may be adjusted depending on deviation as each hole is completed

0 5
Scale (Feet)

UNITS 2 & 3

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

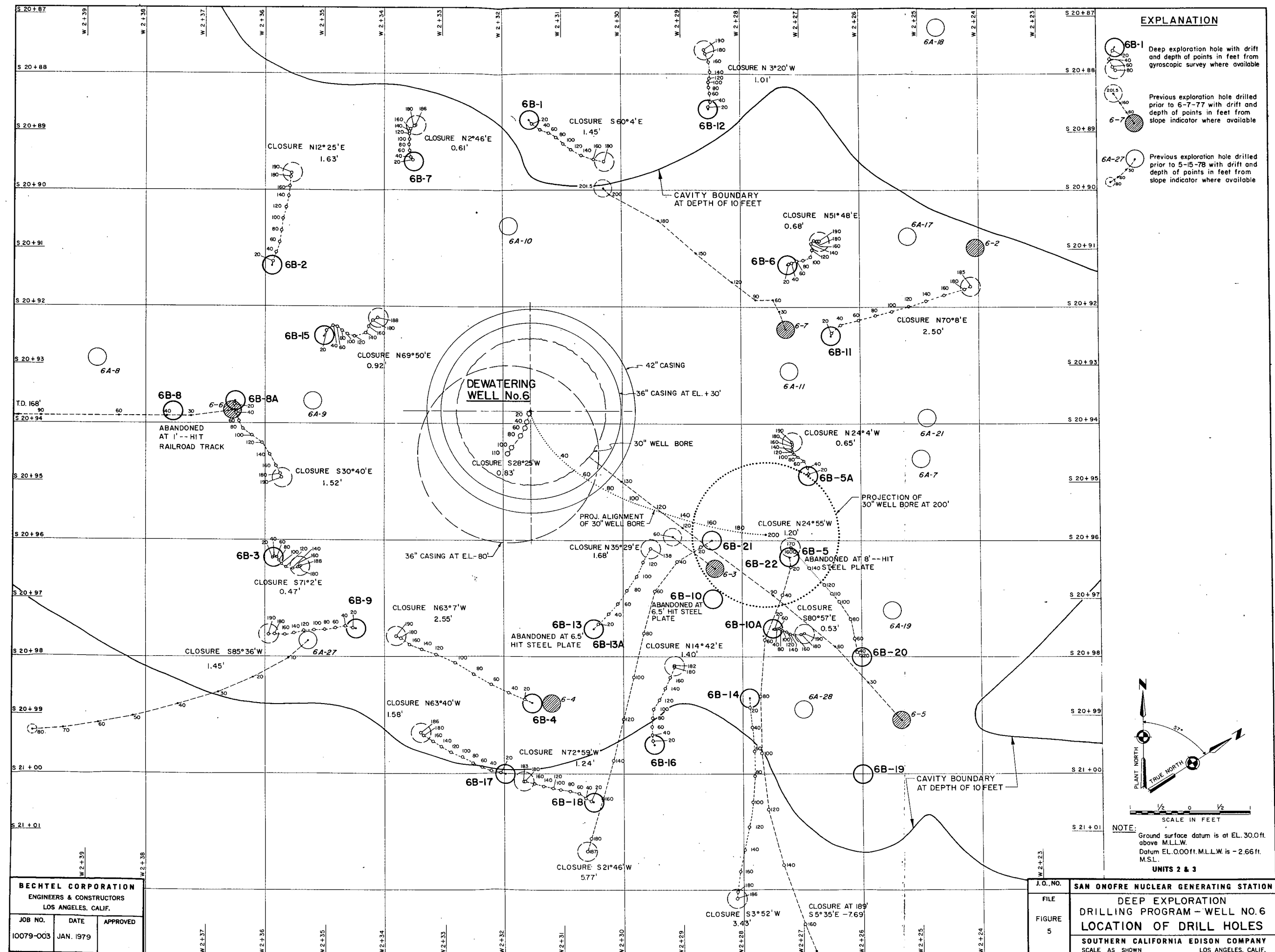
J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	DEEP EXPLORATION
FIGURE	DRILLING PROGRAM - WELL NO. 6
3	ORIGINAL PLAN OF DRILL HOLES
SOUTHERN CALIFORNIA EDISON COMPANY	
SCALE AS SHOWN	
LOS ANGELES, CALIF.	

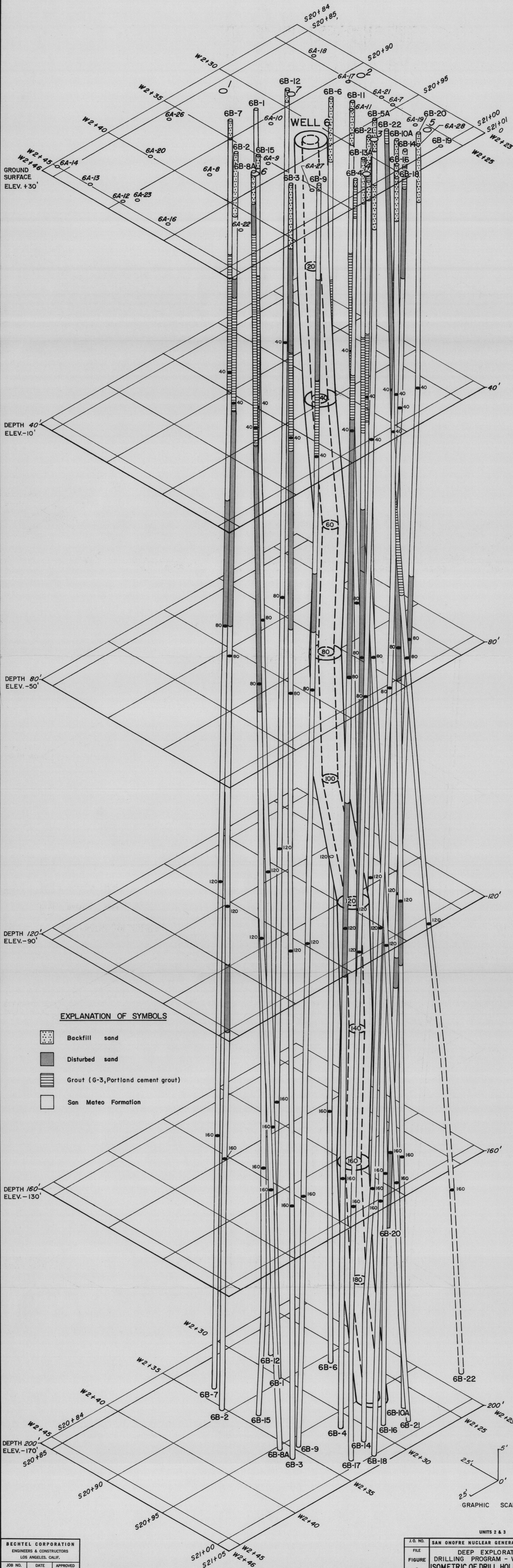


UNITS 2 & 3

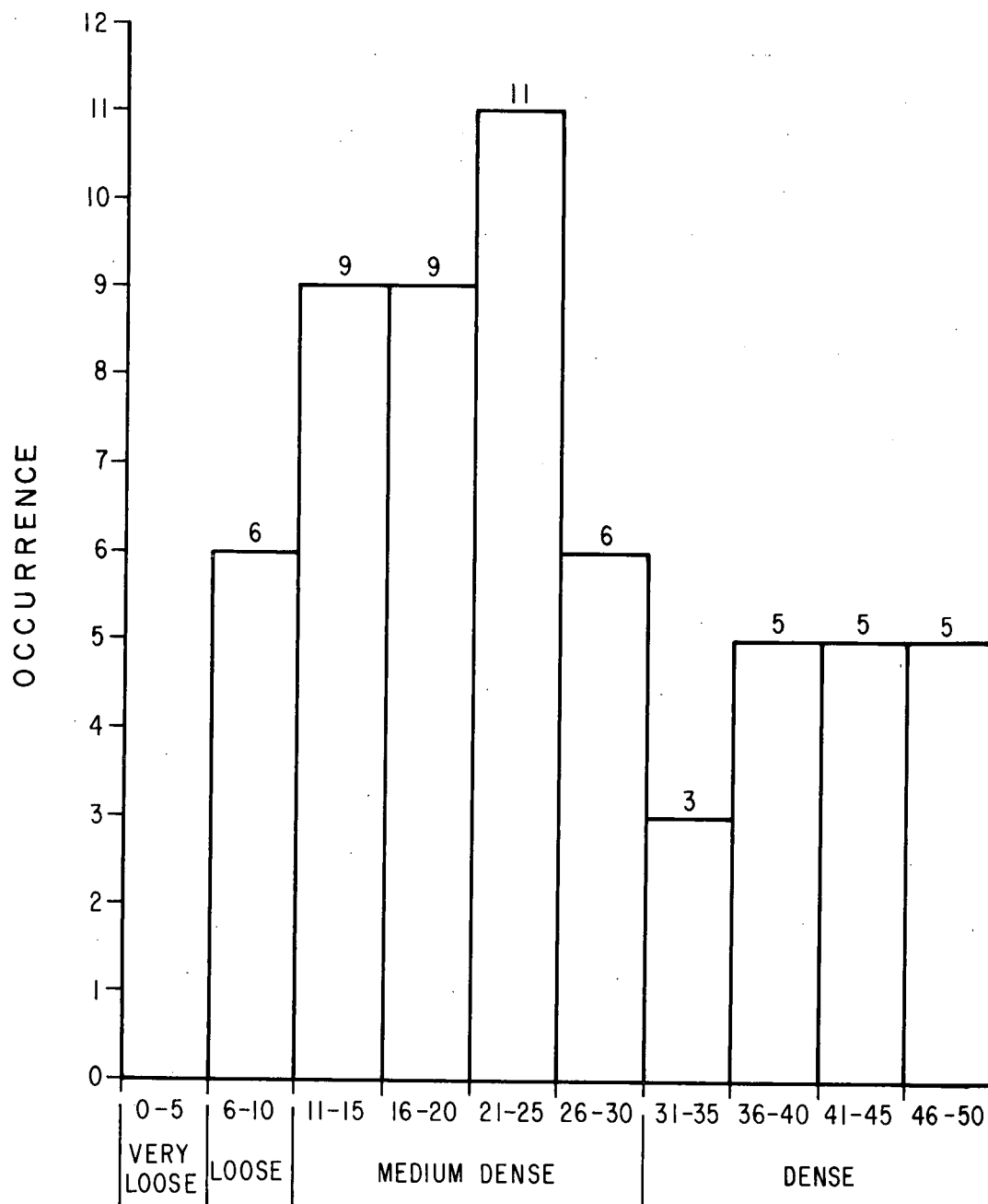
BECHTEL CORPORATION ENGINEERS & CONSTRUCTORS LOS ANGELES, CALIF.		
JOB NO.	DATE	APPROVED
10079-003	DEC.1978	

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	DEEP EXPLORATION DRILLING PROGRAM - WELL NO.6
FIGURE 4	PROFILE OF DEEP DRILL HOLE
SOUTHERN CALIFORNIA EDISON COMPANY 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 DEEP WELL EXPLORATION, HOLES 6B-1 THRU 6B-22

UNITS 2 & 3

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

J.O. NO.	SAN ONOFRE NUCLEAR GENERATING STATION
FILE	DEEP EXPLORATION DRILLING PROGRAM - WELL NO. 6
FIGURE 7	DISTRIBUTION OF S.P.T. RESULTS
SOUTHERN CALIFORNIA EDISON COMPANY SCALE N.T.S. LOS ANGELES, CALIF.	

APPENDIX A

This appendix presents the Geologic Drill Logs of Holes 6B-1 through 6B-22 prepared for the Deep Exploration Drilling Program at Dewatering Well No. 6. Holes 6B-1 through 6B-18 were drilled by P. C. Exploration, Inc. of Roseville, California from May 26, 1978 through July 24, 1978 using a truck mounted Joy 22 rotary drill rig. Holes 6B-19 and 6B-20 were drilled by All Terrain Exploration Drilling of Roseville, California from September 14, 1978 to October 9, 1978 using a CME-750 drill rig. Holes 6B-21 and 6B-22 were drilled by Boyles Brothers Drilling Company of Salt Lake City, Utah between October 11, 1978 and October 16, 1978 using a track mounted Simco 4000 drill rig. A total of 4339 lineal feet of hole was drilled in the 22 holes.

Logging of the holes was performed by qualified Bechtel Geotechnical personnel. Original logs of the holes were completed and checked in the field and will be retained in the Hydro and Community Facilities Division, Geotechnical Services files.



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.								
Unit 2 Well 6				S20 + 88.78/W2 + 31.55		10079	1 OF 3	6B-1								
SITE		COORDINATES				ANGLE FROM HORIZ.		BEARING								
Unit 2 Well 6		S20 + 88.78/W2 + 31.55				90°		---								
BEGUN	COMPLETED	DRILLER		DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	TOTAL DEPTH								
6-6-78	6-7-78	PC Exploration C. Baker/R. Holt		Joy SH Truck		NC	0	201.0'								
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK								
---		---	17	---	30.0'	25.0'/5.0'		0.0'/30.0'								
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:											
140#/30"		None			J. Gallerani/M. Salem/P. Yen											
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES									
								FT	FT							
					Single Shot Record											
SS	12"	5"	6-	55/6"				20	10			0.0-200.0' SAN MATEO FORMATION	Hole started on day shift. Hole advanced to 20' using roller bit and water. Used revert after 20'.			
												Yellow-tan, fine to medium sand; scattered coarse; angular-subangular; quartzitic; scattered mica.	10'-4.3" casing installed.			
SS	11"	9"	40-	55/5"				10	20							
					Drift 0°5'N 25°E											
SS	6"	5"		52/6"				0	30							
SS	12"	7"	42-	55/6"				- 10	40							
					Drift (Not developed, film exposed)								No mud loss to 70'.			
SS	6"	6"		52/6"				- 20	50							
SS	12"	8"	31-	54/6"				- 30	60							
					Drift 0°30'N 75°E											
								- 40	70							
												Tan, fine to medium sand; scattered coarse; angular-subangular; quartzitic; scattered mica.				
												Light tan; pieces of soft, micaceous siltstone (brown) in cuttings.				
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		HOLE NO.	
Unit 2 Well 6															6B-1	



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

2 of 3

HOLE NO.

6B-1

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	12"	9"	40-	56/6"	Single Shot Record								Siltstone in cuttings.	No mud loss 70'-110'
SS	5"	4"	55/5"						- 50	80			Tan, fine-medium sand, scattered silt and coarse sand; angular-subangular; quartzitic; scattered mica throughout.	
SS	4"	2"	55/4"						- 60	90				
SS	10"	10"	30- 55/4"						- 70	100				
SS	2.5	2.5	50/2.5"						- 80	110			Tan, fine-grained to silty sand, minor coarse sand, sub-rounded to subangular, slightly micaceous.	End day shift.
SS	3"	3"	50/3"						- 90	120			Same as above but more micaceous and 20% silt.	Start swing shift. Drilling rate varies from 3/4 to 1 foot per minute from 110' to 150'.
SS	4.5	4.5	50/4.5"						-100	130			Same as above but estimated 30% silt.	Driller reports very firm sand 120' to 130'. Little to no water loss 110' to 150'.
SS	8"	8"	8- 50/2"						-110	140			Same as above but contains brown silty nodule.	
									-120	150				

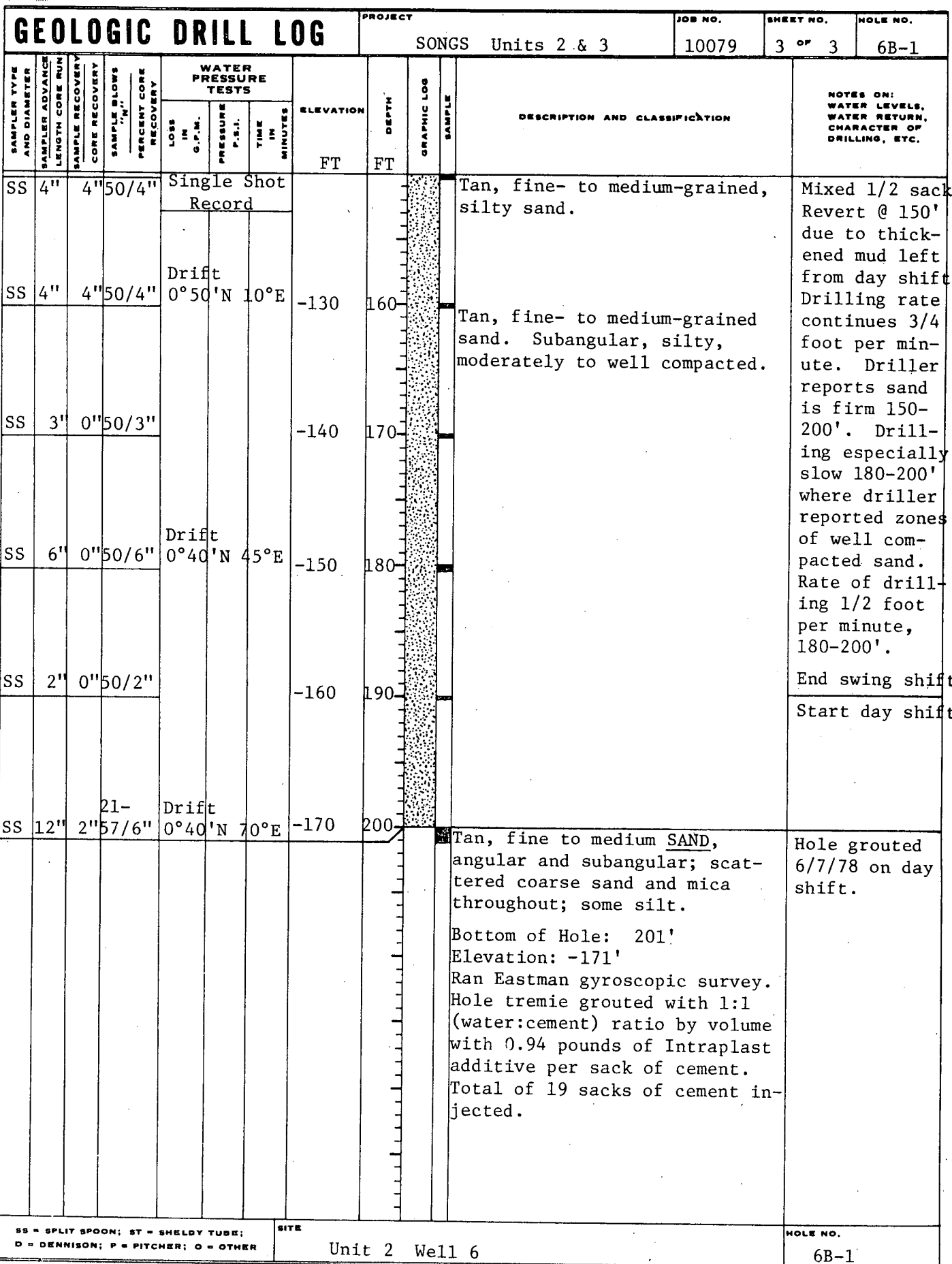
SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-1





GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.						
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 OF 3	6B-2						
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING						
Unit 2 Well 6				S20 + 91.28/W2 + 35.88		90°		---						
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH						
5/26/78	6/1/78	C. Baker/R. Holt		Joy SH Truck	NC	10'	190'	200'						
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK						
---		---	14	---	30'	25.0'/5.0'		10.0'/20.0'						
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:								
140#/30"			None			J. Gallerani/P. Yen								
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY	SAMPLER RECOVERY PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
								FT	FT					
No Samples				Single Shot Record								0.0-10.0' BACKFILL SAND	Hole started on swing shift. Advanced hole 0-5' using roller bit (NC)	
SS 10"	6"	28-50/4"						20	10			10-20' SAN MATEO FORMATION	NCWL diamond core barrel from 5'-12'. 90% mud loss first 10'. Core barrel plugged at 12' had to be pulled.	
												Tan, fine-medium sand; scattered coarse; predominantly angular, subangular, scattered subround, quartzitic; angular gravel-size hard rock pieces in upper part of split-spoon; hard drilling 12'-14'.	Changed to NC carbide hollow bit.	
SS 18"	12"	6-11-19		Drift				10	20			20.0-23.0' DISTURBED SAND AND GRAVEL, Sample @ 20' is 90% angular 3/8"± gravel.	Used this from 12'-25', then used NCWL diamond core barrel again.	
				0°25'S 50°W								23.0-41.0' GROUT, Portland Cement with medium-coarse sand. Drill water white-light gray. Scattered angular pebbles present up to 1-1/2" diameter.	End swing shift.	
				Drift				0	30			41.0-75.0' DISTURBED SAND, Tan brown sand, fine- to medium-grained, silty, subrounded to subangular, quartzitic, poorly compacted.	Start day shift. Drilled using water from 41'. Complete water loss below concrete. Installed 4" casing. Problem because of no return of water.	
SS 15"	6"	8-42-50/3"		0°50'N 60°W				- 10	40			50.0' Siltstone nodule, gray, sandy.	Changed to Revert mud and got return back. End day shift.	
												60.0' Contains 2" siltstone nodule. Balance of sample is tan silty fine- to medium-grained quartz sand; predominantly subrounded.	Start swing shift. Soft sand @ 50' Lost 90-100% circulation 50-80'. Installed 4" casing to 80'.	
SS 18"	15"	5-4-4		Drift				- 20	50					
				0°40'N 50°W				- 30	60					
								- 40	70					

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

Unit 2 Well 6

H&CF 19-1

Hole 6B-2



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		2 of 3		6B-2	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.					
			LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES												
2" Disc	5" 0"	30/6"	Single Shot Record									Used 2" diameter disc for drive at 70' & 80' due to caving. Drilling rate 1-1/2 feet per minute at 80-90'. Obtained 90-100% circulation 80-129'. Mixed 1 sack Revert @ 50' and 1 sack @ 70'.					
2" Disc	5.5" 0"	50/5.5"	Drift 0°35'S 80°E				- 50	80			75.0-129.0' <u>SAN MATEO FORMATION</u> , Fine- to medium-grained silty tan-brown predominantly subrounded quartz sand.						
SS	2" 2"	50/2"					- 60	90			Medium-grained tan sand. Minor fine-and coarse-grained fraction. Predominantly glassy quartz, slightly silty, firm.						
SS	3" 3"	50/3"	Drift 0°40'N 80°W				- 70	100									
SS	5" 5"	50/5"					- 80	110									
SS	16" 16"	40-48-50/4"	Drift 0°40'N 30°W				- 90	120									
SS	18" 12"	31-24-26-50					-100	130			129.0-140.0' <u>DISTURBED SAND</u> Tan, fine to medium sand, scattered coarse; angular-sub-angular, quartzitic. Drill rods dropped on their own weight from 135-139'.						
SS	11" 11"	35-50/5"	Drift 0°40'N 35°W				-110	140			140.0-200.0' <u>SAN MATEO FORMATION</u> , Tan, fine- to medium-grained sand, poorly compacted, very dense, quartzitic.						
							-120	150									
											Lost 100% water @ 129'. End day shift. Start swing shift. 4" casing to 130' Complete mud loss @ 135'.						

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Well 6 Unit 2

HOLE NO.
6B-2



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		3 of 3		6B-2	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE FLOWS IN	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	4"	0"	50/4"		Single Shot Record										Put in 4" dia- meter casing after drilling to 150'. Casing to 150'. Mud return after casing set to 150'		
SS	5"	0"	50/5"		Drift 0°35'N 55°W				-130	160							
SS	11"	11"	50/5"	21-					-140	170			Tan, fine to medium sand; scat- tered coarse; subround-angular, quartzitic grains, mica present.	1 foot per 3 minutes ± rate @ 160- 170'. Advanced hole using NC car- bide bit (hollow) 130-200'. Drilling rate about 1 foot per minute 180- 200'. End swing shift.			
SS	5"	4"	50/5"		Drift 0°35'N 50°W				-150	180					Start day shift. Mud return 90- 100%, 180-200'.		
SS	14"	10"	50/2"	19-39-					-160	190			190.0' Medium-grained sand, subrounded, slight amount of fine and coarse sand and inter- stitial silt. Poorly cemented to uncemented, moderately com- pacted sand, Tan color.				
SS	9"	9"	50/3"	48-	Drift 0°30'N 50°W				-170	200			Bottom of Hole: 200' Elevation: -170' Ran Eastman gyroscopic survey. Grouted hole using tremie method AW rods, 1:1 mix plus 0.94 lbs. Intraplast per bag cement. Total take 53 bags.	Hole grouted 6/1/78 on day shift.			

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-2



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
Unit 2 Well 6										SONGS Units 2 & 3		10079		1 of 3		6B-3	
SITE										COORDINATES				ANGLE FROM HORIZ.		BEARING	
Unit 2 Well 6										S20 + 96.28/W2 + 35.88				90°		---	
BEGUN		COMPLETED		DRILLER		DRILL MAKE AND MODEL		HOLE SIZE		OVERBURDEN (FT.)		ROCK (FT.)		TOTAL DEPTH			
6/7/78		6/8/78		PC Exploration C. Baker/R. Holt		Joy SH Truck		NC		10'		190'		200.0'			
CORE RECOVERY (FT./%)				CORE BOXES		SAMPLES		EL. TOP OF CASING		GROUND EL.		DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK			
---				---		11		---		30'		25.0'/5.0'		10.0'/20.0'			
SAMPLE HAMMER WEIGHT/FALL				CASING LEFT IN HOLE: DIA./LENGTH				LOGGED BY:									
140#/30"				80' NC + 10' NCWL Core Barrel + Diamond Bit				M. Salem/P. Yen									
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
					Single Shot Record								0-10' <u>FILL</u> , Primarily sand with angular gravels and tan silt.	Start drilling on day shift. Hole advanced to 10', Roller bit/water. Hard drilling. End day shift.			
SS	18"	10"	5-	14-30					20	10			10-26.5' <u>DISTURBED SAND</u> Tan, moderately to poorly com- pacted, silty, subrounded to subangular quartz sand. Massive friable, slight limonite or iron oxide staining, fine- to medium-gravel.	Start swing shift. Set 10' (4.3") casing. Encountered angular gravel 0-10' falling into drill hole. Advanced 4.3" casing to 20'. Continued to advance hole with NC rods. Advanced 26.0 -50' using NCWL core barrel and diamond bit, 50-70' NC/Diamond bit.			
SS	10"	7"	21-	50/4"	Drift 0°30'N 10°W				10	20							
					Drift 0°5'N 10°W				- 10	40			26.5-42.0' <u>GROUT</u> , Gray, hard, primarily 1/8" minus aggregate- rich mix, top of core @ 70° angle.				
SS	18"	10"	16-	7-7					- 20	50			42-70' <u>DISTURBED SAND</u> , Medium- to fine-grained, tan, moderate to slight compaction, sub- angular quartz sand with minor rock fragments, silt, and iron oxide staining.	End swing shift.			
					Drift 0°5'N 15°W				- 30	60				Start day shift. Lost circulation 50-60' (200 gallons). Mix 1/2 sack Revert. Lost circulation 60-70' (300 gallons).			
SS	18"	8"	6-	9-12					- 30	60			Tan, fine-medium, scattered coarse sand; poorly graded; loose to medium dense; angular- subangular.				
									- 40	70							

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-3



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		2 OF 3		6B-3	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY	CORE RECOVERY	SAMPLE SLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
						LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES									
SS	18"	9"	30-49-			Single Shot Record							70-200' SAN MATEO FORMATION	Ream the hole, pulled out 20' casing, redrill with Roller bit 0-45', set 70' casing (4.3"). Mix 1/2 sack Revert, continue advancing hole from 70-200' with NC/Diamond bit. Little or no loss of circulation, 70-110'. Lost 50 gallons 110-120'. Drilling rate averages 1-1/2" per minute from 110 to 150'. End day shift. Start swing shift. Losing 55% water circulation 120-150'. Mixed 1 sack Revert @ 140'.			
			57										Light tan, fine-medium, scattered coarse sand and mica throughout, poorly graded, angular-subangular. Dense to very dense.				
			106										Dense to very dense.				
SS	11"	6"	31-50/5"			Drift	0°10'N	75°W	- 50	80							
SS	10"	5"	33-55/4"						- 60	90			Dense to very dense.				
SS	4"	2"	55/4"			Drift	0°10'N	75°E	- 70	100			Same as above, more coarse sand and mica, dense to very dense.				
SS	4"	0"	55/4"						- 80	110			Dense to very dense SAND.				
SS	5-1/2"	5-1/2"	53/5-1/2"			Drift	0°10'N	75°W	- 90	120			Tan, fine-grained, very silty slightly micaceous sand and minor coarse-grained sand. Mainly quartz.				
SS	3.5"	3.5"	50-3.5"						-100	130			Medium-grained, tan, subangular scattered fine and coarse-grained quartz sand. Friable and poorly compacted sample recovered.				
SS	4"	2"	50/4"			Drift	0°5'N	10°W	-110	140							
									-120	150							

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-3



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 of 3

HOLE NO.

6B-3

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	3"	0"	50/3"		Single Shot Record								Driller reports very firm com- pacted sand 150-200'. Drilling rate 1 foot per min- ute from 150- 200'. Water loss 55- 60% from 150' to 200'. Mixed 3 sacks Revert @ 160', 170', & 190' (1 sack at each depth).
SS	2"	0"	50/2"					-130	160			Well compacted sand.	
SS	2"	0"	50/2"					-140	170				
SS	2"	0"	50/2"					-150	180				
SS	1"	0"	50/1"					-160	190				
SS	1"	0"	50/1"					-170	200				
												Bottom of Hole: 200' Elevation: -170' Ran Eastman gyroscopic survey. 6/9/78 Hole grouted, water/cement mix (1:1) + 1% Intraplast. Total take = 18 bags of cement. Casing sanded in 100-190'; unable to recover 80' NC casing, 10' NCWL core barrel and diamond bit from lower portion of hole. Casing grouted in.	Hole grouted on day shift. 6/9/78

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-3



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.						
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 OF 3	6B-4						
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING						
Unit 2 Well 6				S20 + 98.78/W2 + 31.55		90°		---						
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN(FT.)	ROCK (FT.)	TOTAL DEPTH						
6/1/78	6/5/78	C. Baker/R. Holt		Joy SH Truck	NC	6'	194'	200'						
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK						
---		---	12	---	30'	25'/5'		6'/24'						
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:									
140#/30"		None			J. Gallerani/P. Yen									
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record				FT	FT			0.0-1.0' LOOSE FILL	Hole started on swing shift. Advance hole to 5' with roller bit. NCWL diamond core to 6'.
													1.0-6.0' GROUT, Sample has 3/8" aggregate.	
SS 5"	5"	50/5"							20	10			6.0-31.0' SAN MATEO FORMATION	Moderately compacted, tan, silty fine- to medium-grained, subrounded quartz sand, very dense.
SS 6"	6"	50/6"							10	20			Tan, fine-medium sand, scattered coarse; subround-angular grains.	Driller felt he broke through grout @ 6'. Easier drilling.
SS 11"	11"	36-50/5"							0	30			Same as above except mostly fine-grained.	Hard drilling from 15-31' due to foaming and thinning of Revert.
													31.0-38.0' GROUT, Portland cement and aggregate (1/4" minus), gray, hard.	
SS 18"	0"	12-10-15-25							- 10	40			38.0-80.0' SAND, Tan, poorly compacted, silty, fine-medium-grained, subrounded to sub-angular. Minor coarse fraction, 1-1/2' per predominantly quartz, loose to dense.	Soft drilling 38-70'. Drill rate 1-1/2' per minute 38-80'.
SS 18"	0"	6-6-12-18							- 20	50				Mixed 1/2 sack Revert @ 60'.
SS 18"	6"	4-5-5-10							- 30	60				
									- 40	70				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-4



GEOLOGIC DRILL LOG						PROJECT		SONGS Units 2 & 3		JOB NO.		SHEET NO.		HOLE NO.									
SAMPLER TYPE AND DIAMETER		SAMPLER ADVANCE LENGTH CORE RUN		SAMPLER RECOVERY CORE RECOVERY		SAMPLE BLOWS "N"		PERCENT CORE RECOVERY		WATER PRESSURE TESTS		ELEVATION		DEPTH		GRAPHIC LOG		SAMPLE		DESCRIPTION AND CLASSIFICATION		NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
						LOSS IN G.P.M.		PRESSURE P.S.I.		TIME IN MINUTES		FT		FT									
SS	18"	12"	11-	Single Shot Record								- 50	80							Predominantly fine-grained, moderately-poorly compacted.		Losing 20% water 70-90'.	
			13-14																				
			27																				
			14-																				
SS	18"	18"	34-34									- 60	90							80.0-100.0' <u>SAN MATEO FORMATION</u> , Moderately compacted, tan, silty fine- to medium-grained, subrounded quartz sand, very dense.		Mixed 1/2 sack Revert @ 80'.	
			68																				
SS	5"	5"	50/5"									- 70	100							Medium-grained, silty, tan, quartz sand.		Losing 30-40% water 90-100'.	
SS	18"	8"	33-29-18	Drift 1°5'S 70°W								- 80	110							100.0-128.0' <u>DISTURBED SAND</u> , Tan, fine-medium sand, scattered coarse; angular-subangular with scattered subround; quartzitic, loose.		End day shift.	
			47									- 90	120							Attempted SPT @ 110'. AW rods would not stop @ 110'. Added rods. Finally stopped at 128'. Dropped with no resistance 'til 128' Took SPT @ 128'. NC rods went to 115' before drilling was resumed.		Start swing shift. Drill rate greater than 1 ft/min in third gear 100-120'.	
SS	12"	12"	15-50/6"	Drift 0°45'S 40°E								- 100	130							128.0-200' <u>SAN MATEO FORMATION</u> Same as 80-100' with scattered siltstone lenses. 128' Dark gray, sandy silt; moderately dense (smells organic). Sample tube was full. Possibly blow counts for last 6" were high because of this.		Drilling fluid shows little loss. Return good.	
SS	6"	6"	50/6"									- 110	140							130.0' Tan, fine-medium sand; scattered coarse, well compacted.		No appreciable drilling mud loss to 150'.	
SS	3"	0"	50/3"	Drift 0°45'S								- 120	150										
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER												SITE Unit 2 Well 6										HOLE NO. 6B-4	



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.										
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 of 1	6B-5										
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING										
Unit 2 Well 6				S 20 + 96.28/W 2 + 27.22		90°		---										
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH										
6/13/78	6/13/78	C. Baker/ R. Holt		Joy SH Truck	NC	---	---	8.0'										
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK										
---		---	0	---	30.0'	25.0'/5.0'		---										
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:												
140#/30"			None			P. Yen												
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS N.	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.					
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES											
												0.0-2.5' FILL	Hole drilled on day shift. Drilled with 4-1/2" rock bit to 8.0'. While reaming hole to place 4" surface casing, encountered solid material @ 3.5' Unable to advance 4.3" casing after 30 minutes drilling. Harsh drilling action and rough vibrations indicated possible steel encountered @ 3.5'.					
												2.5-8.0' HARD GROUT						
												Bottom of Hole 8.0'	Pulled surface casing and back-filled with sand.					
												20 10						
												10 20						
												0 30						
												- 10 40						
												- 20 50	Moved to set up 12" plant-north of present position.					
												- 30 60						
												- 40 70						
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		Unit 2 Well 6		HOLE NO. 6B-5	



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.									
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 OF 3	6B-5A									
SITE		COORDINATES				ANGLE FROM HORIZ.		BEARING									
Unit 2 Well 6		S 20 + 94.90/W2 + 26.90				90°		---									
BEGUN	COMPLETED	DRILLER		DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)									
6/13/78	6/14/78	PC Exploration		Joy SH Truck		NC	5'	195'									
C. Baker/R. Holt								200'									
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK									
---		---	13	---	30'	25.0'/5.0'		5.0'/25.0'									
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:												
140#/30"		None			P. Yen/B. Hebbbron												
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.					
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
					Single Shot Record						0.0-5.0' FILL, Primarily sub-angular quartz sand.	Hole started on swing shift.					
SS	5"	5"	50/5"					20	10		5.0-28.0' SAN MATEO FORMATION Tan, fine-to coarse-grained, subangular to subrounded, silty, slightly iron oxide stained, well compacted quartz sand.	Advanced hole to 10' with 4.3" casing with roller bit. Advanced 10-28' using NC rods and carbide bit. Driller using Revert additive in the drill water. Mixed 1/2 sack Revert @ 0'.					
SS	4.5"	4.5"	50/4.5"		Drift 0°5'S 50°W			10	20			Changed to roller bit @ 28' to advance hole through cement. Changed to carbide bit @ 46.0'. Communication through 6B-6 @ 46' beneath grout cap. Continued drilling					
					Drift 0°5'S 50°W			- 10	40		28.0-46.0' GROUT, Portland cement grout with 1/4" minus aggregate.	Drilling rate in grout 1"/min.					
SS	6"	6"	50/6"					- 20	50		46.0-48.0' SAND, Tan, poorly compacted.	Drilling rate in sand 0-28' & 46-70' is 1-1/2'/min.					
					Drift 0°10'S 60°W			- 30	60		48.0-60.0' SAN MATEO FORMATION Tan, fine- to coarse-grained, subangular, well compacted, silty, predominantly glassy quartz sand.	Very little water loss 0-48'. About 30% water loss 48-60'.					
SS	18"	15"	23-20-17	37				- 40	70		60.0-80.0' DISTURBED SAND Tan, fine- to coarse-grained, subangular, well compacted, silty, predominantly glassy quartz sand.						
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER												SITE		Unit 2 Well 6		HOLE NO. 6B-5A	



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		2 OF 3		6B-5A	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.					
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS 18"	15"	6-			Single Shot Record												
		6-7															
		13															
SS 4.5	4.5	50/4.5			Drift 0°10'S 60°W			- 50	80								
SS 2"	2"	50/2"						- 60	90								
SS 4"	3"	50/4"			Drift 0°10'SW (Exposed Film?)			- 70	100								
SS 3"	3"	50/3"						- 80	110								
SS 3 1/2"	3"	50/3 1/2"			Drift 0°5-10'SW			- 90	120								
SS 11"	9"	45/50/5"						-100	130								
SS 3"	0"	50/3"			Drift 0°5'SW			-110	140								
								-120	150								

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-5A



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	3 OF 3	6B-5A
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	1.5	1"	50/1.5		Single Shot Record									Lost 500 gal. mud 150-160' then 80% return. Driller reports normal drilling conditions. Continue to lose mud then 80% return. 180'-unable to place sampler to bottom of hole. Probably cored hard silt zone and part fell to bottom of hole. End day shift. Begin swing shift. Performed gyroscopic survey of hole 0-200'.
SS	5.5	0"	50/5.5		Drift 0°15'SW				-130	160				
SS	4"	3"	50/4"						-140	170				
					Drift 0°10'SW				-150	180				
SS	2.5	0"	50/2.5						-160	190				
SS	5"	5"	50/5"		Drift 0°10'N70°W				-170	200			Tan, silty, fine- to medium-grained sand. Bottom of Hole: 200' Elevation: -170' Grouted hole by tremie method with 1:1 (cement:water mix) by volume and 0.94 lbs. Intraplast per sack of cement. Injected 68 sacks of cement. Two additional sacks wasted.	Hole grouted 6/14/78 on swing shift.

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-5A



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.								
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 of 3	6B-6								
SITE		COORDINATES		ANGLE FROM HORIZ.		BEARING										
Unit 2 Well 6		S 20 + 91.28/W2 + 27.22		90°		---										
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH								
6/9/78	6/13/78	C. Baker/R. Holt	Joy SH Truck	NC	10'	190'	200'									
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK									
---		---	16	---	30'	25'/5'	10'/20'									
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH		LOGGED BY:												
140#/30"		None		M. Salem/B. Hebbbron/P. Yen												
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES									
SS	11"	6"	42-50/5"		Single Shot Record			FT	FT			0.0-10.0' FILL, Mainly SAND with angular gravel and some silt. Poorly graded, tan, dense to very dense.	Hole started on day shift. Advanced hole 0-10' with Roller bit/water. Set 10' casing (4.5").			
SS	10"	5"	45-50/4"		Drift 0°0'			10	20			10.0-28.5' SAN MATEO FORMATION Tan, medium- to coarse-grained, well compacted quartz sand.	Mix 1/2 sack Revert @ 10'. Advance hole with NC rods/carbide bit. End Day Shift.			
					Drift 0°5'N 60°W			0	30			28.5-44.0' GROUT, Lens of weak grouted sand at 28.5'.	Start swing shift. 10-28.5' 100% water return. Rock bit from 28.5-44', NC/Carbide bit from 44-200'. Lost 200 gallons from 44-50'.			
								- 10	40				End Swing Shift.			
SS	16.5	12	39-48 50/4.5		Drift 0°5'N 30°E			- 20	50			44.0-200.0' SAN MATEO FORMATION, Tan, fine- to coarse-grained, well compacted, silty, iron oxide stained, quartz sand with scattered nodules of sandy silt.	Begin Day Shift.			
												Tan, fine- to medium-grained silty, subangular, well compacted, quartz sand.	Losing 50-65% circulation from 50-70'.			
SS	10"	10"	43-50/4"					- 30	60				Mixed 1/2 sack Revert additive @ 60'			
								- 40	70				Mixed 1/2 sack Revert @ 70'.			
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		HOLE NO.	
Unit 2 Well 6													Unit 2 Well 6		6B-6	



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	2 of 3	6B-6
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
SS 10.5"	8"	45-	50/4.5	Single Shot Record										
SS 5"	5"	50/5"		Drift 0°5'N 70°W				- 50	80			Silty sand; tan, fine- to medium-grained.	Mixed 1/2 sack Revert additive @ 70' & 80'. Drilling rate is 1-1/2'/min. 70-150'.	
SS 3"	3"	50/3"						- 60	90			Sandy silt nodule, micaceous, iron oxide stained, tan-gray, friable.	Water loss of over 50% (up to 65%) continues 70-150'. Driller continues to use Revert to keep hole open.	
SS 2"	0"	50/2"		Drift 0°5'N 25°W				- 70	100					
SS 2"	2"	50/2"						- 80	110			Tan, primarily medium-grained, subangular, silty, quartz sand.	Mixed 1/2 sack of Revert additive @ 110' & 140'.	
SS 2"	2"	50/2"		Drift 0°5'N 35°W				- 90	120			As above, but fine-medium-grained sand.	Additional NC drill rods brought to site @ 1930 hours.	
SS 2"	2"	50/2"						-100	130			Primarily tan, silty quartzitic fine-grained, subangular sand.		
SS 2"	0"	50/2"						-110	140					
								-120	150				Mixed 1/2 sack Revert @ 150'.	

SS - SPLIT SPOON; ST - SHELBY TUBE;
D - DENNISON; P - PITCHER; O - OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-6



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 of 3

HOLE NO.

6B-6

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	2"	2"	50/2"	Single Shot Record								Tan, medium-fine-grained, silty quartz sand.	Drilling rate 1-1/2'/min. 150-180'. Water loss 50- 60% @ 150-180'. Driller con- tinues to ad- vance hole with Revert additive, making good pro- gress 150-180'. End Day Shift			
SS	2"	2"	50/2"					-130	160			Medium- to fine-grained sand.		Begin Swing Shift. 150-180' Mud circulation 90%.		
SS	1"	1"	50/1"					-140	170			Medium-grained, silty sand, poorly graded, well compacted.				
SS	4"	3"	50/4"	Drift 0°10'NW				-150	180			Dense, medium-grained, silty sand, quartzose.				
SS	2"	2"	50/2"					-160	190			Medium- to fine-grained, beige color sand.				
SS	2"	1"	50/2"	Drift 0°10'				-170	200			Bottom of Hole: 200' Elevation: -170' Eastman gyro survey conducted. Tremied cement grout backfill. Water:cement ratio 1:1 with 0.94 lbs. Intraplast additive per sack. Total injection: 16 sacks.	Hole grouted 6/13/78 during day shift.			
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE Unit 2 Well 6		HOLE NO. 6B-6	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-6



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.					
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 OF 3	6B-7					
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING					
Unit 2 Well 6				S20 + 89.50/W2 + 33.50		90°		---					
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH					
6/22/78	6/23/78	C. Baker/R. Holt	Joy SH Truck	NC	3.0'	197.0'	200.0'						
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK					
---		---	16	---	30'	25'/5'		3'/27'					
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH		LOGGED BY:									
140#/30"		None		B. Hebbbron/P. Yen									
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY	SAMPLE BLOWS "N."	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
					Single Shot Record								
SS 16"	3"	28-39	50/4"					20	10			0.0-3.0' FILL, And gravel (railroad ballast).	Hole started on day shift. Ream 4.3" diameter casing to 20'. Drill with water and very little mud. 100% circulation. Drilling rate normal-1'/min. Broken core barrel tooth-fishing.
SS 9"	2"	44-	50/3"					10	20			3.0-21.0' SAN MATEO FORMATION. Yellow, compact, poorly cemented sub-rounded to well rounded, very quartzose sandstone.	
								0	30			21.0-43.0' GROUT, Gray, hard cement.	End Day Shift.
								- 10	40				Begin Swing Shift. Slow drilling through cement 1'/10 minutes.
SS 9"	8"	48-	50/3"					- 20	50			43.0-60.0' SAN MATEO FORMATION Tan, predominantly fine- to medium-grained, silty, dense, subangular, quartz sand.	Drilling rate 43-70' about 1'/minute. Very little water loss 30-70'. Mixed 1/2 sack Revert additive @ 60'
SS 18"	15"	11-16-19	35					- 30	60			60.0-80.0' DISTURBED SAND, Tan-brown, fine- to medium-grained, friable, poorly compacted quartz sand.	
								- 40	70				
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER				SITE				Unit 2 Well 6				HOLE NO. 6B-7	



GEOLOGIC DRILL LOG					PROJECT		SONGS Units 2 & 3		JOB NO.		SHEET NO.		HOLE NO.						
							10079		2 of 3		6B-7								
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.						
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES												
SS	18"	18"	8-	10-11	Single Shot Record							Same as above except predominantly medium-grained sand.	Drilling rate 70-130' is 1-1/4 to 1-1/2' per minute.						
			21																
SS	5"	0"	50/5"		Drift 0°0'			- 50	80			80.0-200.0' <u>SAN MATEO FORMATION</u> , Tan, predominantly fine-to medium-grained, silty, very dense, subangular, quartz sand.	Water loss 70-130' is very little.						
SS	3"	3"	50/3"					- 60	90			Tan, medium-grained, silty quartz sand.							
SS	3"	0"	50/3"		Drift 0°5'S 80°W			- 70	100										
SS	3"	3"	50/3"					- 80	110			Tan, medium- to coarse-grained, silty, slightly stained, quartz sand.							
SS	5.5"	4"	50/5.5		Drift 0°10'N 25°W			- 90	120			Tan, silty, predominantly fine-grained, slightly stained quartz sand.							
SS	9.59"	5.50"	42-50/3.5					- 100	130			Same as above but predominantly medium-grained.	End Swing Shift						
													Begin Day Shift						
													Nearly 100% water return.						
SS	11"	6"	50-50/5"		Drift 0°10'NW			- 110	140			Medium-grained yellow silty sand.	Drill rate is 1 foot per minute.						
								- 120	150										
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER														SITE		Unit 2 Well 6		HOLE NO. 6B-7	



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.	
										SONGS Units 2 & 3		10079	3 of 3	6B-7	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS; WATER RETURN, CHARACTER OF DRILLING, ETC.		
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
SS	2"	2"	50/2"		Single Shot Record								Good water return. Normal drilling rate.		
SS	2.5	2.5	50/2.5		Drift 0°10'NW			-130	160			Yellow, medium- to coarse- grained quartzose sand.			
SS	3"	2"	50/3"					-140	170			Silty, chiefly medium-grained.			
SS	2"	2"	50/2"		Drift 0°5'NW			-150	180			Medium- to coarse-grained, coarse-grain predominantly; very quartzose.			
SS	2"	2"	50/2"					-160	190			Same as above with grain size to 1/4".			
SS	2"	2"	50/2"		Drift 0°0'			-170	200			Slightly more silt.			
												Bottom of Hole: 200' Elevation: -170' Conducted Eastman gyro survey of hole. Tremie grouted hole with cement grout. Water- cement ratio 1:1 with 0.94 lbs. of Intraplast additive per sack.			
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER										SITE		Unit 2 Well 6		HOLE NO.	6B-7



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

1 of 1

HOLE NO.

6B-8

SITE

Unit 2 Well 6

COORDINATES

S20 + 93.78/W2 + 37.55

ANGLE FROM HORIZ.

90°

BEARING

BEGUN

6/15/78

COMPLETED

6/15/78

DRILLER PC Exploration

C. Baker/ R. Holt

DRILL MAKE AND MODEL

Joy SH Truck

HOLE SIZE

NC

OVERBURDEN (FT.)

1.0'

ROCK (FT.)

TOTAL DEPTH

1.0'

CORE RECOVERY (FT./%)

CORE BOXES

SAMPLES

0

EL. TOP OF CASING

GROUND EL.

30.0'

DEPTH/EL. GROUND WATER

25'/5'

DEPTH/EL. TOP OF ROCK

SAMPLE HAMMER WEIGHT/FALL

140#/30"

CASING LEFT IN HOLE: DIA./LENGTH

None

LOGGED BY:

B. Hebbbron

SAMPLER TYPE
AND DIAMETERSAMPLER ADVANCE
LENGTH CORE RUNSAMPLER RECOVERY
CORE RECOVERYSAMPLE BLOWS
"N"PERCENT CORE
RECOVERYLOSS
IN
G.P.M.PRESSURE
P.S.I.TIME
IN
MINUTESWATER
PRESSURE
TESTS

ELEVATION

DEPTH

GRAPHIC LOG

SAMPLE

DESCRIPTION AND CLASSIFICATION

NOTES ON:
WATER LEVELS,
WATER RETURN,
CHARACTER OF
DRILLING, ETC.

Drill hole commenced at planned location but encountered a rail obstruction at 10 inch depth. Moved drill rig 1 foot plant east and started hole 6B-8A.

Hole drilled on day shift.

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-8



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.			
Unit 2 Well 6										SONGS Unit 2 & 3		10079	1 OF 3	6B-8A			
SITE					COORDINATES					ANGLE FROM HORIZ.		BEARING					
Unit 2 Well 6					S60 + 93.60/W2 + 36.50					90°		---					
BEGUN		COMPLETED		DRILLER			DRILL MAKE AND MODEL			HOLE SIZE		OVERBURDEN (FT.)		ROCK (FT.)		TOTAL DEPTH	
6/15/78		6/16/78		PC Exploration C. Baker/R. Holt			Joy SH Truck			NC		---		---		200'	
CORE RECOVERY (FT./%)				CORE BOXES		SAMPLES		EL. TOP OF CASING		GROUND EL.		DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK			
---				---		10		---		30'		25'/5'		---			
SAMPLE HAMMER WEIGHT/FALL					CASING LEFT IN HOLE: DIA./LENGTH					LOGGED BY:							
140#/30"					None					P. Yen/B. Hebbbron							
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
					Single Shot Record								0.0-5.0' <u>BACKFILL</u> , Upper fill sand.	Hole begun on day shift. Hole is 1' plant east of proposed hole. Hit obstruction at 10". Hole advanced with tremie rock bit to 20'. Set 4" casing. Drill from 20' in with NC casing.			
									20	10			5.0-10.0' <u>DISTURBED SAND</u>				
									10	20			10.0-43.0' <u>GROUT CAP</u>				
														Suspected crooked hole.	End Day Shift		
									0	30							
															Begin Swing Shift. Start losing water at 43.5'. Driller used carbide bit & reamed 4.3" casing 12-43'. Drilling rate 50-70' 1-1/2' per minute. Lost 50% return water 40-70'.		



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

2 of 3

HOLE NO.

6B-8A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.		
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
SS 18"	10"	12-	15-13	28	Single Shot Record							Tan, medium-grained silty quartz sand.	Driller con- tinues to lose 40-60% of return water. Mixed 1 sack of Revert @ 80'. Drilling rate 70-150' continues 1-1/2' per minute.		
SS 18"	18"	6-	7-11	18	Drift 0°30'N 80°E			- 50	80			84.0-200.0' <u>SAN MATEO FORMA- TION</u> , Tan, fine-to coarse- grained sand, containing minor silt, slight iron oxide stain- ing and is primarily subangular quartz sand. Sample @ 90' is fine-grained and silty.			
SS 5.55	5.55	50/5.5						- 60	90						
SS 5"	0"	50/5"			Drift 0°30'N 45°E			- 70	100						
SS 4.5	0"	50/4.5						- 80	110						
SS 5"	0"	50/5"			Drift 0°25'N 20°E			- 90	120						
SS 9"	0"	44- 50/3"						-100	130						
SS 3"	0"	50/3"			Drift 0°10'N 65°E			-110	140						
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER										SITE			Unit 2 Well 6		HOLE NO. 6B-8A
													End Swing Shift.		



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 OF 3

HOLE NO.

6B-8A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	2"	2"	50/2"	Single Shot Record							Dense, fine-grained silty sand.	Begin Day Shift. Continue losing 50-60% mud return. Rate of drilling 50-60 seconds per foot. Continue losing mud.	
SS	4"	2"	5-4"	Drift 0°10'NE			-130	160			Light yellow, quartzose, sub- rounded sand, dense.		
SS	2"	0"	50/2"				-140	170					
SS	2.5	2"	50/2.5	Drift 0°30'SE			-150	180			Very quartzose, medium- to coarse-grained sand.		
SS	2"	2"	50/2"				-160	190			Silt, gray; quartzose, well compacted.		
SS	3"	2"	50/3"	Drift 0°15'NE			-170	200					
											Bottom of Hole: 200' Elevation: -170' Eastman gyrosurvey conducted. Hole tremie grouted with 14 sacks of cement at 1:1 water: cement ratio and 0.94 lbs. Intraplast additive per sack of cement.	Hole grouted 6/16/78 on day shift.	
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER										SITE Unit 2 Well 6		HOLE NO. 6B-8A	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-8A



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.						
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 of 3	6B-9						
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING						
Unit 2 Well 6				S20 + 97.50/W2 + 34.50		90°		---						
BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH						
6/20/78	6/21/78	PC Exploration C. Baker/R. Holt	Joy SH Truck		NC	1.0'	199.0'	200'						
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	KL TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK						
---		---	16	---	30.0'	25'/5'		1'/29'						
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:									
140#/30"		None			Vincent Richards/B. Hebbbron/P. Yen									
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record									
SS 18"	7"	13-40-45		85				20	10			0.0-1.0' BACKFILL SAND 1.0-15.0' SAN MATEO FORMATION Tan, fine-to coarse-grained, well graded, subangular to angular, mostly quartz, friable, very dense.	Hole started on swing shift. Driller reported rough drilling first 10'. 0-20' drilled with water and 5-7/8" tricone rock bit.	
SS 18"	12"	13-11-10		21	Drift 0°40'S 20°W			10	20			15.0-31.0' SAND (SW), Tan, fine- to coarse-grained, well graded, subangular to angular, abundant quartz, very slightly weathered. Medium dense (disturbed San Mateo) Same as above but 0.1' G3 grout from 30.8-30.9'.	20-200' drilled with water and Revert. 4.3" casing set 20'. 0-15' drilling rate 48 sec/ft.	
SS 11.5"	11.5"	23-50/5.5						0	30			31.0-43.0' G3 GROUT	20-30' drilled with NC casing 15-31' drilling rate 25 sec/ft.	
SS 12"	12"	33-50/6"						- 10	40			43.0-60.0' SAN MATEO FORMATION, Dark blue-grey, medium-to coarse-grained, subangular to angular. Blue could be from Revert seepage. Light grey San Mateo for 4.5" grades into light tan well graded SS.	30-43' drilled with 3-5/8" tricone rock bit. 43-200', advanced hole with NC casing.	
SS 5"	5"	50/5"						- 20	50					
SS 18"	13"	12-29/12"			Drift 0°40'S			- 30	60			60.0-70.0' SAND (SW) 60.0'-60.2 Micaceous siltstone dark blue-grey with orange oxidation layer grades into light tan at 60.2'. Medium dense zone (disturbed San Mateo).		
								- 40	70					
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE	
Unit 2 Well 6													HOLE NO.	
													6B-9	



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

2 of 3

HOLE NO.

6B-9

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	18"	12"	59/12"		Single Shot Record							70.0-200.0' <u>SAN MATEO</u> <u>FORMATION</u> Same as 43.0-60.0'	
SS	6"	6"	50/6"		Drift 0°30'S			- 50	80			Very dense, silty.	No water loss.
SS	3.5"	3"	50/3.5"					- 60	90			Tan, well graded, subangular to angular, dense.	
SS	3"	3"	50/3"		Drift 0°40'S			- 70	100				End Day Shift.
SS	2"	2"	50/2"					- 80	110			Tan, fine- to medium-grained, silty, subangular, quartz sand, dense.	Begin Swing Shift.
SS	11"	0"	40- 50/5"		Drift 0°25'S 75°W			- 90	120				Mixed 1/2 sack Revert additive at 120'.
SS	1.5"	0"	43- 50/5.5"					-100	130				
SS	5"	5"	50/5"		Drift 0°30'S			-110	140				End Swing Shift.
SS	1"	1"	50/1"					-120	150				Begin Day Shift.

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-9



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		3 of 3		6B-9	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER SLOWS 'N'	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.				
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	1"	1"	50/1"		Single Shot Record							Gray, silty, fine-grained dense sand.	80% mud return. Driller reports normal drilling.				
SS	6"	0"	50/6"		Drift 0°30'S			-130	160								
SS	5.5	0"	50/5.5					-140	170								
SS	10"	4"	42-50/4"		Drift 0°30'SW			-150	180			Yellow, fine-grained, silty sand.	Drill rate 60 sec/foot.				
SS	5.5	3"	50/5.5					-160	190			Slightly more silt in fine-grained sand.	100% water return.				
SS	2"	0"	50/2"		Drift 0°30'S			-170	200			Bottom of Hole: 200' Elevation: -170' Gyroscopic survey of hole. Tremie grouted hole with 15 sacks of cement at 1:1 water-cement ratio. Additive 0.94 lbs. Intraplast per sack of cement.	Hole grouted 6/21/78 on day shift.				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-9



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

1 of 1

HOLE NO.

6B-10

SITE

Unit 3 Well 6

COORDINATES

S20 + 97.00/W2 + 28.50

ANGLE FROM HORIZ.

90°

BEARING

BEGUN

6/23/78

COMPLETED

6/23/78

DRILLER

PC Exploration

C. Baker/R. Holt

DRILL MAKE AND MODEL

Joy SH Truck

HOLE SIZE

NC

OVERBURDEN (FT.)

2.5'

ROCK (FT.)

TOTAL DEPTH

6.5'

CORE RECOVERY (FT.%)

CORE BOXES

SAMPLES

0

EL. TOP OF CASING

GROUND EL.

30.0'

DEPTH/EL. GROUND WATER

25'/5'

DEPTH/EL. TOP OF ROCK

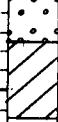
SAMPLE HAMMER WEIGHT/FALL

140#/30"

CASING LEFT IN HOLE: DIA./LENGTH

LOGGED BY:

P. Yen

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES					
								20	10		0-2.5' BACKFILL, Sand and silt	Advanced hole from 0-3' with roller bit. Advanced from 3-6.5' with NC diamond bit. Used Revert additive and water. Obstruction (steel?) encountered at 6.5'.
											2.5-6.5' GROUT, Gray Portland cement concrete with 1" minus aggregate. Encountered steel at 6.5'. Unable to proceed with drilling.	
								10	20		Bottom of Hole: 6.5' Elevation: 23.5' Abandoned hole. No backfill placed.	
											See Log 6B-13 for discussion of conjectured steel plate at Well 6.	
								0	30			
								- 10	40			
								- 20	50			
								- 30	60			
								- 40	70			

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-10



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 of 3	6B-10A				
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING				
Unit 2 Well 6				S20 + 97.50/W2 + 27.50		90°		---				
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH				
7-13-78	7-14-78	C. Baker/R. Holt		Joy SH Truck	NC	7.0'	137.0'	200.0'				
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK				
---		---	24	---	+30.0'	25.0'/5.0'		7.0'/23.0'				
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:						
140#/30"			---			B. Hebbbron/J. E. Kaiser						
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N."	PERCENT CORE RECOVERY	WATER PRESSURE TESTS		ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES	FT	FT			
Single Shot Record												
SS 11"	5"	10-50/5"						20	10		0.0-7.0' BACKFILL	Hole started on day shift. Start hole with tricone rock bit and drilling mud. Set 4.3" dia. casing at 10'. At 10' changed to open carbide bit on NC pipe.
SS 5.5"	5"	50/5.5"						10	20		7.0-40.0' SAN MATEO FORMATION Yellow, fine- to medium-grain, quartzose sand. Poorly cemented, well compacted, silty in part. Light yellow, medium-grained.	
SS 5"	5"	50/5"						0	30		Beige, fine to medium sand, dense.	
SS 18"	18"	24-24-22						- 10	40		40.0-45.0' DISTURBED SAND, Tan, silty, predominantly coarse-grained with fines constituting 20%. Poorly compacted	
SS 18"	18"	46-26-39-40						- 20	50		45.0-55.0' SAN MATEO FORMATION, Same as 7.0-40.0' At 45' sand becoming finer though still containing coarse constituents.	Begin Swing Shift. No loss in circulation fluid noted. Sand appearing to be becoming more compact. At 55' material very poorly compacted. Added 1/2 sack Revert to mud tank.
SS 18"	18"	79-43-46-50						- 30	60		55.0-85.0' DISTURBED SAND, Tan, silty, fine- to coarse-grained, fines less than 20%, poorly compacted, med. dense.	
SS 18"	18"	96-5-6-6						- 40	70		Tan to grey (Revert stain), fine-grain (predominantly) to medium, silty.	
SS 18"	18"	12-7-10-12-24										
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER												
Unit 2 Well 6												HOLE NO. 6B-10A



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

2 OF 3

HOLE NO.

6B-10A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS 'N'	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS 18"	18"	7-9-14	23		Single Shot Record								Small interfingerings (2mm-5mm) of a red-brown silty plastic clay noted.	50% loss in drilling fluid noted in last 20'.
SS 18"	14"	11-10-6	16		Drift 0°15'N			- 50	80				Tan, fine- to medium-grained, silty, wet.	
SS 18"	13"	10-15-15	30										Tan, fine- to medium-grained, subangular-subrounded as with virtually all samples recovered, silty, wet, fines 30%.	
SS 18"	14"	25-33-33	66										85.0-120.0' <u>SAN MATEO FORMATION</u> , Tan, silty sand, firm, fine- to coarse-grained.	
SS 4"	0"	50/4"											Locally, clay (rare) particles, subangular to subrounded.	
SS 2"	0"	50/2"			Drift 0°15'N 20°E			- 60	90				Tan with grey, fine- to coarse, medium/coarse 60% of fraction slightly silty.	At 85' communication with hole 4'N. Becoming firm (no recovery) at 90'. Circulation loss 20-30% SPT @ 10' interval; 1/2 sack Revert added to mud tank.
SS 2"	2"	50/2"											Coarse sand, tan, silty, wet, as with all earlier samples the sand is quartzitic.	
SS 2"	0"	50/2"												
SS 2"	0"	50/2"												
SS 2"	0"	50/2"												
SS 18"	12"	7-9-14	23		Drift 0°15'N 10°E			- 70	100					At 120' material appears soft. Began SPT at 5' intervals. Added 1/2 sack Revert. Added 1/2 sack Revert.
SS 18"	9"	19-17-16	33										120.0-130.0' <u>DISTURBED SAND</u> Fine to medium sand, silty, wet, some micaceous particles noted. Some dark chemical staining. Medium dense.	
SS 5"	0"	50/5"											At 125', gravel pack-material very coarse and chemically stained, blackish. Particles of gravel 1/8"-1/4".	
SS 6"	5"	50/6"											130.0-200.0' <u>SAN MATEO FORMATION</u> , Fine to coarse sand. Slightly silty to silty.	
SS 3"	0"	50/3"											Quartzitic; well compacted. Subangular-subrounded particles	
SS 2"	2"	50/2"			Drift 0°15'N			- 80	110					Losing 90% drilling mud.
SS 2"	2"	50/2"												
SS 2"	2"	50/2"						- 90	120					
SS 2"	2"	50/2"						- 100	130					
SS 2"	2"	50/2"						- 110	140					
SS 2"	2"	50/2"						- 120	150					

SS - SPLIT SPOON; ST - SHELBY TUBE;
D - DENNISON; P - PITCHER; O - OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-10A



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	3 of 3	6B-10A
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	2"	2"	50/2"		Single Shot Record							Medium- to coarse-grained sand, quartzose, 30% coarse.	Continue communication with hole 6B-11.	
SS	2"	2"	50/2"				Drift 0°20'N	-130	160			Yellow, medium- to coarse-grained, as above.	Drill rate 40 sec. for 1 foot.	
SS	2"	2"	50/2"					-140	170			Light yellow, medium- to coarse-grained sand, dense uncemented.		
SS	3"	3"	50/3"				Drift 0°30'N 10°E	-150	180			Chiefly medium-grained with scattered coarse-grained sand, rounded, quartzose.	Losing 50% drilling mud.	
SS	2"	2"	50/2"					-160	190			As above; 1 piece of sub-rounded sand 1/2" long and tubular.		
SS	2"	0"	50/2"				Drift 0°20'N	-170	200			Bottom of Hole: 200' Elevation: -170' Conducted Eastman gyro survey of hole. Grouted hole by tremie method. Water:cement ratio 1:1 with 0.94 lbs. of Intraplast additive per sack. 18 sacks placed. 2 wasted.	Hole grouted 7/14/78 on day shift.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE	Unit 2 Well 6	HOLE NO. 6B-10A
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GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		3 of 3		6B-10A	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.				
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	2"	2"	50/2"		Single Shot Record							Medium- to coarse-grained sand, quartzose, 30% coarse.	Continue communication with hole 6B-11.				
SS	2"	2"	50/2"		Drift 0°20'N			-130	160			Yellow, medium- to coarse- grained, as above.	Drill rate 40 sec. for 1 foot.				
SS	2"	2"	50/2"					-140	170			Light yellow, medium- to coarse-grained sand, dense uncemented.					
SS	3"	3"	50/3"		Drift 0°30'N 10°E			-150	180			Chiefly medium-grained with scattered coarse-grained sand, rounded, quartzose.	Losing 50% drilling mud.				
SS	2"	2"	50/2"					-160	190			As above; 1 piece of sub- rounded sand 1/2" long and tubular.					
SS	2"	0"	50/2"		Drift 0°20'N			-170	200			Bottom of Hole: 200' Elevation: -170' Conducted Eastman gyro survey of hole. Grouted hole by tremie method. Water:cement ratio 1:1 with 0.94 lbs. of Intraplast additive per sack. 18 sacks placed. 2 wasted.	Hole grouted 7/14/78 on day shift.				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-10A



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
Unit 2 Well 6										S 20 + 92.50/W2 + 26.50		10079	1 of 3	6B-11
SITE										COORDINATES		ANGLE FROM HORIZ.		BEARING
Unit 2 Well 6										S 20 + 92.50/W2 + 26.50		90°		---
BEGUN	COMPLETED	DRILLER	PC Exploration		DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH				
7/11/78	7/12/78	C. Baker/R. Holt			Joy SH Truck		NC	7'	193'	200'				
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING		GROUND EL.		DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK				
---		---	18	---		30'		25.0'/5.0'		145.0'/55.0'				
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:								
140#/30"			None			B. Hebbbron/J. Kaiser								
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record							0.0-7.0' BACKFILL	Start drilling on day shift. Hole advanced with 4-3/4" tricone bit and water as drilling fluid.	
SS	5"	5"	50/5"					20	10			7.0-24.0' SAN MATEO FORMATION		Change to open carbide bit at 10'. Set 4.3" diameter casing.
												Yellow, poorly cemented sub-rounded, fine- to medium-grained, slightly silty sand.		
SS	4"	4"	50/4"		Drift 0°10'S			10	20			24.0-43.5' GROUT	Change to tricone rock bit.	
								0	30					
					Drift 1°0'N 20°W			- 10	40			43.5-55.0' DISTURBED SAND	Change to open end carbide bit. Drilling with Revert.	
SS	18"	10"	5-4-5									Loose, black, fine- to medium-grained, quartzose sand. Revert stain.		
SS	18"	12"	3-2-8					- 20	50					
SS	4"	0"	50/4"									55.0-200.0' SAN MATEO FORMATION	Drill rate normal 1'/min.	
SS	5"	5"	50/5"		Drift 1°0'N 10°W			- 30	60			Yellow, fine- to medium-grained, iron stained, trace of mica.		
SS	6"	6"	50/6"									Chiefly fine-grained.		
								- 40	70					

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-11



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	2 of 3	6B-11
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE SLOWS IN PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
SS	6"	5"	50/6"	Single Shot Record								Well graded, very dense.	Good water (mud) return.	
SS	11"	11"	33-50/5"	Drift 1°0'N				- 50	80			Gray, iron stained, clayey silt. Slight squeezing of hole.	Slow drilling in this formation. Probably a San Mateo Formation silt pod. Normal drilling at 84'.	
SS	2"	1"	50/2"					- 60	90			Fine-grained sand, tan.		
SS	2"	0"	50/2"	Drift 1°0'N				- 70	100					
SS	2"	1"	50/2"					- 80	110			Tan, fine-grained silty sand. Clay (Gray) layers or inter-fingers noted.		
SS	3"	3"	50/3"	Drift 1°N 10°W				- 90	120				End Day Shift.	
SS	2"	2"	50/2"					-100	130			Tan, fine- to coarse-grained, coarse constitutes about 20% of sample. No clays noted. Very slightly silty.	Begin Swing Shift. Added 1/2 sack Revert to mud tank.	
SS	2"	2"	50/2"	Drift 1°N 05°W				-110	140					
								-120	150				Penetration rate about 1' every 30 to 40 seconds. No water/circ. loss noted.	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-11



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 of 3

HOLE NO.

6B-11

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN "N"	SAMPLER RECOVERY CORE RECOVERY "N"	SAMPLE BLOWS PERCENT CORE RECOVERY "N"	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				LOSS IN O.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	1"	0"	50/1"	Single Shot Record									
SS	1"	1"	50/1"	Drift 1°N 05°W				-130	160			Tan, fine-to coarse-grained sand with medium fractions predominating. Fine/coarse constitutes about 30%. Wet, silty.	No circulation losses noted.
SS	1"	1"	50/1"					-140	170				
SS	1.25	1.25	50/1.25	Drift 1°N 10°W				-150	180			Tan; coarse to fine sand. Coarse fraction about 40% with medium about 40-50%. Silty, wet, subrounded to subangular particles.	Penetration rate about 40 seconds for 1 foot.
SS	1"	1"	50/1"					-160	190				
SS	1"	1"	50/1"	Drift 1°N 40°E				-170	200			Tan, fine- to medium-grained sand, silty, wet. Bottom of Hole: 200' Elevation: -170' Gyroscopic directional survey performed. Hole grouted with 14 sacks of cement at a water:cement ratio of 1:1 with 0.94 lbs. of Intra- plast additive per sack.	No unusual water losses noted through- out drilling.

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-11



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.							
Unit 2 Well 6				SONGS Units 2 & 3		10079	1 OF 3	6B-12							
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING							
Unit 2 Well 6				S 20 + 88.58/W2 + 28.55		90°		---							
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH							
6/16/78	6/19/78	C. Baker/R. Holt		Joy SH Truck	NC	2'	198'	200'							
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK							
---		---	15	---	30'	25.0'/5.0'		2.0'/28.0'							
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:									
140#/30"			---			P. Yen/B. Hebbbron									
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
					Single Shot Record								0.0-2.0' FILL, Tan sand & silt	Hole started on swing shift. Advanced hole 0-10' with roller bit.	
													2.0-200.0' SAN MATEO FORMATION		
SS	5"	5"	50/5"						20	10				Tan, medium- to coarse-grained, silty, subangular, friable, poorly sorted, slightly iron oxide stained, quartz sand.	Installed 10' 4.3" casing. Advanced hole 10-200' with NC rods and carbide bit and water.
SS	5"	0"	50/5"						10	20				Encountered small seams of grout 20-26'.	
SS	5"	5"	50/5"						0	30					Mixed 1/2 sack Revert additive @ 30', continued to drill hole with Revert and water. Rate of advance 1 to 1-1/2' per minute 10-70'. Water loss is only 5-10% 10-70'.
SS	5.5	0"	50/5.5						- 10	40					
SS	4.5	4.5	50/4.5						- 20	50				Fine- to medium-grained, silty tan sand.	Mixed 1/2 sack Revert additive at 70'.
SS	5.5	5.5	50/5.5						- 30	60				Tan, silty, medium-grained, poorly sorted, slightly micaceous, primarily glassy quartz sand.	
									- 40	70					

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-12



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		2 of 3		6B-12	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.				
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	4"	4"	50/4"		Single Shot Record												
SS	3"	3"	50/3"		Drift 0°30'W			- 50	80			Tan, silty, fine- to medium-grained sand and silt nodules.	Driller continues to advance hole at a rate of 3/4 to 1'/minute. Water loss is minimal 5-10% from 70 to 120'. Cuttings washed up from hole consist of more coarse-grained sand than usual.				
SS	2"	0"	50/2"					- 60	90			Tan, medium- to coarse-grained silty, quartz sand.					
SS	2.5	0"	50/2.5		Drift 0°10'N60°W			- 70	100								
SS	2.5	2.5	50/2.5					- 80	110			Tan, medium-grained, silty, slight iron oxide staining, well compacted, subangular, quartz sand.					
SS	2"	2"	50/2"		Drift 0°25'N70°W			- 90	120				Driller notes difficulty removing cuttings from hole.				
SS	2"	2"	50/2"					- 100	130			Tan, medium- to coarse-grained sand.	End Swing Shift.				
SS	1"	1"	50/1"		Drift 0°21'SW			- 110	140			Slightly finer-grained.	Start Day Shift.				
								- 120	150				Good water return.				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-12



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	3 OF 3	6B-12
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.		
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	2"	2"	50/2"		Single Shot Record							80% water return.		
SS	1.5	1"	50/1.5		Drift 0°20'W			-130	160		Fine-grained, very well compacted sand.	Drill rate 50-60 seconds per foot - 150-200'.		
SS	2"	2"	50/2"					-140	170		Very dense.			
SS	3"	0"	50/3"		Drift 0°10'W			-150	180					
SS	1.5	0.5	50/1.5					-160	190		Tan, medium-grained, partially washed out sample, quartz sand.	End Day Shift.		
SS	1.5	0.5	50/1.5		Drift 0°20'N70°W			-170	200			Start Swing Shift.		
											Bottom of Hole: 200' Elevation: -170' Ran gyroscopic drift survey. Hole grouted with 18 sacks of cement - tremie method, using a water:cement ratio of 1:1 with 0.94 lbs. of Intraplast additive per sack.	Hole grouted 6/19/78 on swing shift.		

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-12



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.									
Unit 2 Well 6				S20 + 97.50/W2 + 30.50		10079	1 of 1	6B-13									
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING									
Unit 2 Well 6				S20 + 97.50/W2 + 30.50		90°		---									
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH									
6/23/78	6/23/78	C. Baker/R. Holt		Joy SH Truck	NC	2.5'	---	6.5'									
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK									
---		---	0	---	30.0'	25.0'/5.0'		---									
SAMPLE HAMMER WEIGHT/FALL			CASING LEFT IN HOLE: DIA./LENGTH			LOGGED BY:											
140#/30"			None			P. Yen											
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.				
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
												0.0-2.5' <u>BACKFILL</u> , Tan silty sand.	Began hole on swing shift. Advanced hole 0-5' with roller bit and water with Revert additive. Drilling rate in grout is very slow, averaging 1' per 10 minutes. Very little water loss 0-6.5'. Changed to core barrel and NC diamond bit at 5' due to steel in hole. Cored 12" from 5'-6' including a 1-1/4" piece of rebar. Encountered additional rebar at 6.5'. Abandoned hole.				
								20	10			2.5-6.5' <u>GROUT</u> , Encountered concrete with 1" minus aggregate. Encountered 1-1/4" rebar at 5' and at 6.5'. Bottom of Hole: 6.5' Elevation 23.5' Abandoned hole, no backfill placed.					
								10	20			NOTE: 1-1/4" rebar cored out with 1" minus concrete and a piece of gunny sack material at 5'. Also learned from G. Dawson that a possible 1/2" thick steel plate was the obstruction at 6.5'.					
								0	30								
								- 10	40								
								- 20	50								
								- 30	60								
								- 40	70								
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		Unit 2 Well 6	HOLE NO.	6B-13



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
Unit 2 Well 6				S20 + 97.50/W2 + 30.50		10079	1 of 3	6B-13A				
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING				
Unit 2 Well 6				S20 + 97.50/W2 + 30.50		90°		---				
BEGUN	COMPLETED	DRILLER	PC Exploration	DRILL MAKE AND MODEL	HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH				
7-10-78	7/11/78	C. Baker/R. Holt		Joy SH Truck	NC	7.0'	147.0'	154.0'				
CORE RECOVERY (FT.%)	CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK					
---	---	21	---	30.0'	25.0'/5.0'		7.0'/23.0					
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH		LOGGED BY:								
140#/30"		---		B. Hebbbron/J. Kaiser								
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES					
					Single Shot Record						0.0-7.0' BACKFILL	Started hole on day shift. Hole advanced with tricone rock bit and water as drilling fluid.
SS 11" 0"			34-50/5"					20	10		7.0-28.0' SAN MATEO FORMATION	End Day Shift.
								10	20		Tan, fine- to coarse-grained silty sand. Locally, oxide staining, well compacted.	
SS 18" 0"			4-4-7 11		Drift 0°45'S 10°E						25.0' Caved material, due possibly to drilling and casing installation.	Begin Swing Shift. Clean out hole to 15'. Commenced installation of 4.3" casing to 20' (casing jamming). Advanced hole to 25' with tricone. Added 1/2 bag Revert to mud tank. Changed from carbide bit at 30' to tricone for easier penetration rate in grout, about 1"/minute.
								0	30		28.0-43.0' GROUT, Consists of Portland cement with 1/4" aggregate.	
SS 5" 2.1			50/5"		Drift 0°40'N 50°W			- 10	40			
								- 20	50		43.0-55.0' SAN MATEO FORMATION	Penetration rate in San Mateo about 1'/minute.
SS 18" 11"			10-11-11								Tan, when stained with Revert a light gray. Fine- to coarse-grained silty sand. Fines predominate at about 70%. Predominantly subrounded grains. Micas present (less than 10%).	
SS 18" 14"			11-17-21					- 30	60		55.0-125.0' DISTURBED SAND,	Drilling rate in loose material about 2'/30 sec. Sample from SS at 65' with greater amount of fines.
SS 18" 12"			15-18-22		Drift 0°40'N 70°W			- 40	70		Tan, fine- to coarse-grained, loose or not well compacted. Coarser-grained material appearing to predominate. Organic-fishy odor of material noted.	
			40									
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER				SITE				Unit 2 Well 6				HOLE NO. 6B-13A



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

2 OF 3

HOLE NO.

6B-13A

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	18"	12"	10-11-13		Single Shot Record								70.0' SAND, Tan to gray (Revert stained). Predominantly medium-grained with coarse and fine fraction about 40%. Very few (less than 10%) micas noted.	Drilling rate about 2'/min. No loss of circulation noted. At 75' sand becoming coarser. At 80' sand very poorly compacted, finer grained.
SS	18"	13"	10-8-8											
SS	18"	12"	5-16						- 50	80				
SS	18"	14"	5-11											
SS	18"	14"	5-12		Drift 0°40'NW								Gray, silty sand, fine-grained, loose.	80' - End Swing Shift.
SS	18"	10"	4-11						- 60	90			Medium-grained, silty tan to light gray.	Begin Day Shift.
SS	18"	12"	6-11											Good mud circulation.
SS	18"	9"	5-15						- 70	100			Fine-grained, gray.	Drill rate 1' in 50 feet.
SS	18"	10"	9-19		Drift 0°40'NW								As above with 1/4" streak of clay dipping 10°.	
SS	18"	6"	11-14-16						- 80	110			Tan, fine-grained.	Hole staying open.
SS	18"	8"	23-46										Tan, fine- to medium-grained, quartzose.	
SS	18"	10"	11-12-14						- 90	120			Gray, fine-grained, silty quartzose.	
SS	11"	5"	50/5"		Drift 1°0'W								125.0-130.0' SAN MATEO FORMATION, Dark gray Revert stained, fine-grain to medium-grained, quartzose sand.	Normal drill rate.
SS	18"	10"	24-43						-100	130			130.0-154.0' DISTURBED SAND, Black fine-grained, occasional isolated coarse particles; quartzose, Revert stained.	
SS	18"	7"	18-43											
SS	18"	10"	30-77						-110	140			Still black to gray and very quartzose.	Very black mud.
SS	18"	9"	10-20		Drift 0°50'N								Black pebbles, organic stained, vertical membrane-like separation between sand and pebbles.	
									-120	150				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-13A



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
				SONGS Units 2 & 3		10079	3 OF 3	6B-13A				
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N" PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	18"	2"	11- 8-8 16				-124	154			Pea gravel	Start losing mud between 145-150'. Evidently hole drifted into the well gravel pack at 145'. Hole caving, unable to advance hole. Hole grouted on swing shift 7/11/78.
											Bottom of Hole: 154' Elevation: -124' Gyrodirectional survey completed. Grouted hole by tremie with 1:1 cement:water mix (with 0.94 lbs. Intraplast per sack cement). Total take 19 sacks, 1 sack wasted.	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-13A



GEOLOGIC DRILL LOG

PROJECT SONGS Units 2 & 3				JOB NO. 10079		SHEET NO. 1 OF 3		HOLE NO. 6B-14			
SITE Unit 2 Well 6				COORDINATES S20 + 98.70/W2 + 27.90				ANGLE FROM HORIZ. 90°		BEARING ---	
BEGUN 6/23/78		COMPLETED 6/27/78		DRILLER PC Exploration C. Baker/R. Holt		DRILL MAKE AND MODEL Joy SH Truck		HOLE SIZE NC		OVERBURDEN (FT.) 20'	
ROCK (FT.) 180'		TOTAL DEPTH 200'		CORE RECOVERY (FT.%) ---		CORE BOXES ---		SAMPLES 35		EL. TOP OF CASING ---	
GROUND EL. 30'		DEPTH/EL. GROUND WATER 25.0'/5.0'		DEPTH/EL. TOP OF ROCK 20.0'/10.0'							
SAMPLE HAMMER WEIGHT/FALL 140#/30"				CASING LEFT IN HOLE: DIA./LENGTH None				LOGGED BY: P. Yen/B. Hebbbron/M. Murillo			

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record								0.0-2.5' <u>BACKFILL</u> , Silty sand	Began drilling on swing shift.
													2.5-6.0' <u>GROUT</u> , Gray cement and probable aggregate (no core recovered).	Advanced hole 0-20' with NC roller bit.
SS18"	18"		4- 8-18	26					20	10			6.0-20.0' <u>DISTURBED SAND</u> , Tan poorly cemented, poorly com- pacted, silty, medium- to coarse-grained, quartz sand.	Set 4.3" casing to 20'.
SS10"	4"		42- 50/4"						10	20				End Swing Shift.
SS 9"	4"		44- 50/4"										20.0-200.0' <u>SAN MATEO FORMA- TION</u> , Tan, medium- to coarse- grained, silty, subangular to subrounded, friable, very dense quartz sand.	Begin Day Shift. Using Revert as drilling mud. Nearly 100% circulation.
SS5.5"	5"		50/5.5						0	30			Fine- to medium-grained, silty, yellow-gray well compacted sand	Normal drilling rate is 1 foot per minute.
SS 4"	4"		50/4"											
SS 5"	1"		50/5"						- 10	40			Chiefly medium-grained.	Good drill fluid circu- lation.
SS 4"	4"		51/4"											
SS 4"	1"		50/4"						- 20	50				
SS 4.54"	5.50/4.5													End Day Shift
SS 5"	5"		50/5"						- 30	60			Tan, fine- to medium-grained, micaceous quartz sand.	Begin Swing Shift. Drill rate 1 to 1-1/4"/minute.
SS 17.512"	50/5.5		31-47										Tan-brown, fine-grained, iron oxide stained, quartz sand with a silt nodule, gray.	Water loss 50- 70' is 15-20%.
									- 40	70			Tan, primarily medium-grained quartz sand.	Mixed 1/2 sack Revert at 65'

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE
Unit 2 Well 6

HOLE NO.
6B-14



GEOLOGIC DRILL LOG					PROJECT		SONGS Units 2 & 3		JOB NO.		SHEET NO.		HOLE NO.	
									10079		2 of 3		6B-14	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE SLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.		
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	18"	10"	20-		Single Shot Record						Tan, fine-grained silt nodule and interbedded light gray quartz sand.	Mixed 1/2 sack Revert additive at 70'.		
			23-36											
SS	17.5"	10"	33-50	59							Tan, fine-grained quartz sand.	Driller reports		
			50/5.5		Drift 1°5'E			- 50	80				50% water loss	
SS	11"	11"	29-									Tan, fine-grained sand and silt. Dense, firm, nodular.	70-90'.	
			50/5"										Drilling rate	
SS	2"	2"	50/2"									Tan-brown sandy silt and light gray coarse sand.	1-1/4-1-1/2" per minute 70-	
													120'.	
SS	2.52.55	50/2.5						- 60	90			Tan, medium-coarse-grained subangular quartz sand, some silt and iron oxide staining.		
SS	3"	0"	50/3"											
SS	2"	0"	50/2"		Drift 1°5'S80°E			- 70	100				Mixed 1/2 sack Revert additive at 95'.	
													Water loss 90-	
SS	3"	0"	50/3"										150' is 60-70%	
													or about 80	
SS	1"	1"	50/1"					- 80	110				gallons per 5' advance.	
											Tan, medium-grained, subangular silty, dense, quartz sand with minor coarse rock fragments.	Mixed 1/2 sack Revert additive at 110'.		
SS	2"	2"	50/2"								Tan, medium-grained silty nodules.			
SS	3.53.55	50/3.5			Drift 1°0'N80°E			- 90	120				End Swing Shift.	
SS	3"	3"	50/3"									Tan, fine-grained, silty quartz sand.	Begin Day Shift.	
												Chiefly medium-grained.		
SS	5"	2"	50/5"					- 100	130			Tan-gray, fine-grained silty sand. Quartzose.		
SS	8"	2"	50/2"									Yellow, quartzose fine- to medium-grained, well compacted.		
SS	4"	2"	50/4"		Drift 1°0'E			- 110	140			Medium- to coarse-grained, very quartzose, slightly silty.	Driller reports	
													harder drilling.	
SS	2"	2"	50/2"											
								- 120	150					
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER					SITE		Unit 2 Well 6					HOLE NO. 6B-14		



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 of 3

HOLE NO.

6B-14

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	2"	2"	50/2"		Single Shot Record									Mud loss in- creased to 50%. Mixed one bag Revert.
SS	5"	5"	50/5"											
SS	9.53"		15- 50/3.5"		Drift 1°0'E				-130	160			Medium-coarse-grained, same as 150', very dense, some Revert impregnation-occurs in fingers. Fine-grained, quartzose, very well compacted.	Drill rate normal, one foot per minute.
SS	4"	4"	50/4"											
SS	5"	5"	50/5"						-140	170			Fine-grained silty quartzose sand.	Circulation improves at 175'.
SS	5.54"		50/5.5"										Slightly coarser than above.	
SS	4"	2"	50/4"		Drift 1°0'S65°E				-150	180				End Day Shift.
SS	4.54.5		50/4.5"											
SS	1.5	1.5	50/1.5"						-160	190			Tan, fine- to medium-grained, dense, silty, primarily quartz sand.	Begin Swing Shift.
SS	1.5	1.5	50/1.5"											
SS	1"	1"	50/1"		Drift 1°5'E				-170	200			Tan, medium-grained, silty iron oxide stained quartz sand.	Hole grouted on swing shift 6/27/78.
													Bottom of Hole: 200' Elevation: -170' Performed gyroscopic survey of hole. Grouted hole with 1:1 (cement: water ratio) mixture by volume, and 0.94 lbs. Intraplast per sack of cement. Total take: 16 sacks	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-14

GEOLOGIC DRILL LOG						PROJECT SONGS Units 2 & 3		JOB NO. 10079	SHEET NO. 1 OF 3	HOLE NO. 6B-15			
SITE Unit 2 Well 6				COORDINATES S20 + 92.50/W2 + 35.00				ANGLE FROM HORIZ. 90°		BEARING ---			
BEGUN 6/28/78	COMPLETED 6/29/78	DRILLER PC Exploration C. Baker/R. Holt		DRILL MAKE AND MODEL Joy SH Truck		HOLE SIZE NC	OVERBURDEN(FT.) 2.0'	ROCK (FT.) 198.0'	TOTAL DEPTH 200.0'				
CORE RECOVERY (FT./%) ---		CORE BOXES ---	SAMPLES 28	EL TOP OF CASING ---	GROUND EL. 30.0'	DEPTH/EL. GROUND WATER 25.0'/5.0'		DEPTH/EL. TOP OF ROCK 2.0'/28.0'					
SAMPLE HAMMER WEIGHT/FALL 160#/30"			CASING LEFT IN HOLE: DIA./LENGTH None			LOGGED BY: B. Hebbbron/P. Yen							
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
					Single Shot Record							0.0-2.0' BACKFILL	Hole started on day shift. Advanced hole with tricone bit to 20'. Set 4.3" dia. casing. Using water for drilling.
SS 11"	8"	50/5"						20	10		2.0-19.0' SAN MATEO FORMATION Well compacted, poorly cemented, fine- to medium-grained, quartzose sand. Subrounded to rounded, silty in part.		
									10	20		19.0-43.0' GROUT	100% water return.
					Drift 0°20' No direction in casing								
								0	30				
					Drift 0°10' N				- 10	40		43.0-80.0' DISTURBED SAND, Loose, penetrated to some extent by drilling mud. Thin, horizontal 1/2" lense of hard cement in shoe of sampler.	Losing 20% of mud starting at 45'.
SS 11"	9"	15"						- 20	50				
SS 18"	0"	3-3-4											
		7-12-14										Dark gray, fine-grained, medium dense.	End Day Shift
		21-12-16-20			Drift 0°5' N 20° W				- 30	60		Revert stained gray, fine to medium-grained, slightly silty quartz sand.	Begin Swing Sh
SS 18"	9"	16-20										Tan, fine-medium-grained, silty, quartz sand.	Drilling rate 1'/minute.
		36-7-17-14											
SS 18"	6"	17-14						- 40	70				
		31											

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; F = FITCHER; O = OTHER

Unit 2 Well 6

HOLE NO.
6B-15



GEOLOGIC DRILL LOG										PROJECT	JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3	10079	2 of 3	6B-15
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE SLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS 18" 8"	13-	18-24	42	12-	Single Shot Record							Tan to gray, silty to slightly silty, subangular, partially Revert stained, quartz sand, dense.	Revert additive at 70'. Water loss 10-20%, 79-90'.
SS 18" 12"	10-13	23	50/7.5	5	Drift								
SS 5.55.55	0°5'N20°E	- 50	80										
SS 4" 4"	50/4"											80.0-120.0' <u>SAN MATEO FORMATION</u> Tan, fine- to medium-grained, silty, dense, quartz sand.	
SS 2" 0"	50/2"							- 60	90				
SS 2.5 0"	50/2.5												
SS 5" 0"	50/5"				Drift								Water loss is 40-50%, 90-120'.
SS 3" 3"	50/3"				0°5'N20°E			- 70	100				
SS 1' 1"	50/1"							- 80	110				
SS 2" 2"	50/2"											Tan, fine-to coarse-grained, slightly silty, subangular, very dense quartz sand.	Mix 1/2 sack Revert additive at 105'.
SS 18" 18"	26-19-27	46	23-	35-46	Drift								
SS 18" 18"	81	43-	46-43		0°5'N30°E			- 90	120				
SS 18" 10"	89	21-	25-32					-100	130			120-125' <u>DISTURBED SAND</u> , Tan to black, Revert black stained 10" length, H ₂ S odor is strong, fine- to medium-grained quartz sand. Moderate water loss. 125-200' <u>SAN MATEO FORMATION</u> Tan to black, fine- to medium-grained, silty, subangular, quartz sand. 130-140' Revert stained quartz sand with strong H ₂ S odor.	Mix 1/2 sack Revert additive at 120'. Water loss is 60-75%, 120-130'. Water loss 70-80%, 130-140'. Possibly lost water into previously drilled hole. 140'- End Swing Shift.
SS 18" 14"	57				Drift								
SS 4.54.55	0°5'S45°E	-110	140										
SS 2" 2"	50/2"							-120	150			Normal fine- to medium-grained subrounded sand.	Begin Day shift. 60-70% mud loss. Drill rate 1'/min.

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-15



GEOLOGIC DRILL LOG										PROJECT		SONGS Units 2 & 3		JOB NO.		SHEET NO.		HOLE NO.	
												10079		3 of 3		6B-15			
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE FLOWS "N" PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.						
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES													
SS	4"	2"	50/4"	Single Shot Record								Finer-grained, silty.	Mix 1/2 sack of Revert.						
SS	2"	2"	50/2"									Fine-grained, yellow, very quartzose sand, little silt.	50% mud loss.						
SS	1.5"	0"	50/1.5"	Drift 0° 10' NE				-130	160			Medium- to coarse-grained quartz sand, subrounded.	Normal drilling rate of 1'/min.						
SS	2"	2"	50/2"									Chiefly medium-grained quartzose sand, slightly silty.	Continue losing 50% drilling mud.						
SS	3"	3"	50/3"					-140	170			Fine-to medium-grained and silty.							
SS	2"	2"	50/2"									Chiefly coarse-grained, well compacted yellow sand.							
SS	3"	2"	50/3"	Drift 0° 10' NE				-150	180			Still coarse-grained, up to 1/4"	More normal mud return at 190' about 20% loss.						
SS	2"	2"	50/2"									Fine-grained, little silt, light beige.	End Day Shift.						
SS	4"	3"	40/4"					-160	190			Bottom of Hole: 200' Elevation: -170' Conducted Eastman gyroscopic survey of hole. Grouted hole with 1:1 ratio by volume of cement and water plus 0.94 lbs. Intraplast per sack of cement. Total sacks injected: 17 sacks No waste.	Hole grouted on Swing Shift 6/29/78.						
SS	2"	2"	50/2"																
SS	2.5"	2"	50/2.5"	Drift 0° 15' NW				-170	200										
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER										SITE		Unit 2 Well 6		HOLE NO.		6B-15			

GEOLOGIC DRILL LOG						PROJECT SONGS Units 2 & 3		JOB NO. 10079	SHEET NO. 1 OF 3	HOLE NO. 6B-16			
SITE Unit 2 Well 6				COORDINATES S20 + 99.50/W2 + 29.50				ANGLE FROM HORIZ. 90°		BEARING ---			
BEGUN 7/19/78	COMPLETED 7/20/78	DRILLER PC Exploration C. Baker/R. Holt		DRILL MAKE AND MODEL Joy SH Truck		MOLE SIZE NC	OVERBURDEN (FT.) 7.0'	ROCK (FT.) 197.0'	TOTAL DEPTH 200.0'				
CORE RECOVERY (FT./%) ---		CORE BOXES ---	SAMPLES 20	EL TOP OF CASING ---	GROUND EL. 30.0'	DEPTH/EL. GROUND WATER 25.0'/5.0'		DEPTH/EL. TOP OF ROCK 7.0'/23.0'					
SAMPLE HAMMER WEIGHT/FALL 140#/30"				CASING LEFT IN HOLE: DIA./LENGTH None		LOGGED BY: J. Kaiser/B. Hebbbron							
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N."	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT.	DEPTH FT.	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
					Single Shot Record							0.0-7.0' BACKFILL, Sand, tan, fine- to medium-grained, artificially compacted.	Added 1 sack Revert to mud tank.
SS	4"	4"	50/4"						20	10		7.0-55.0' SAN MATEO FORMATION, Sand, fine- to coarse-grained, tan. Subrounded particles. Coarse (less than 5%), medium (20-50%), micas noted. Slightly silty.	Removed 5-1/4" tricone, emplaced 10"-4.3" casing in hole. Placed NX tricone on drill string.
SS	1"	1"	50/1"		Drift 0°45'N75°W				10	20			Added 1/2 sack Revert. Drilling rate 1'/minute.
SS	4"	2.5	50/4"						0	30		Silty, fine-medium sand. Light gray in appearance apparently due to grout.	At about 25', noted change in color of drilling fluid to gray. Changed to carbide bit.
SS	3"	3"	50/3"		Drift 0°30'N85°W				- 10	40		Tan, slightly silty, slightly coarser than preceeding samples. Particles greater than 1 mm about 10-20%. Some micas observed. Locally, grout stain.	No unusual fluid losses noted.
SS	3"	3"	50/5"						- 20	50		Fine to medium sands predominate appearance. Predominantly subrounded particles.	
SS	18"	12"	20-24 44		Drift 0°30'S75°W				- 30	60		Tan, fine-medium micas present. Appears more uniform than previous samples, few coarse grain.	55-60' in cement (Drilling rate 6"/minute).
SS	6"	0"	50/6"						- 40	70		55.0-60.0' GROUT	At 60' communication with hole 7' N-NE.
												60.0-65.0' DISTURBED SAND	
												Black gray, predominantly medium-grained, micas (less than 5%), stained due to chemicals, putrid odor.	

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = FITCHER; O = OTHER

SITE Unit 2 Well 6

HOLE NO. 6B-16



GEOLOGIC DRILL LOG					PROJECT		JOB NO.		SHEET NO.		HOLE NO.			
					SONGS Units 2 & 3		10079		2 of 3		6B-16			
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	15"	15"	15-20		Single Shot Record								65.0-200.0' SAN MATEO FORMATION	65.0' SPT
SS	4"	4"	50/3"										70.0' Sand and sandy siltstone. Tan (dark gray where stained). Fine-medium sand with mica.	No recovery. Added 1/2 sack Revert.
SS	6"	6"	50/6"		Drift 0°30'W				- 50	80			75.0' Tan, predominantly medium-grained, clean, well compacted. Coarse particles less than 5%; appears fairly uniform, micas.	End Swing Shift.
SS	3"	2"	50/3"										80.0' Similar to above except more fines, has a slight putrid odor.	Begin Day Shift.
SS	2"	2"	50/2"						- 60	90			85.0' Gray, medium-grained. 90.0 Medium- to coarse-grained, gray, revert stained, quartzose.	Still communication with hole 6' N (6B-11?)
SS	4"	3"	50/4"		Drift 0°30'NW				- 70	100			100.0' Fine- to medium-grained yellow, uncemented, well compacted, quartzose.	80% mud return.
SS	2"	2"	50/2"						- 80	110				Normal drilling rate, about 50 seconds per foot.
SS	2"	2"	50/2"		Drift 0°40'SW				- 90	120			120.0' Highly quartzose, fine-grained, gray.	
SS	3"	2"	50/3"						-100	130			As above with scattered coarse grains less than 10%.	
SS	3"	0"	50/3"		Drift 0°30'NW				-110	140				Mix bag of Revert.
									-120	150				

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-16



GEOLOGIC DRILL LOG					PROJECT		JOB NO.	SHEET NO.	HOLE NO.		
					SONGS Units 2 & 3		10079	3 OF 3	6B-16		
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES					
SS	2"	0"	50/2"	Single Shot Record							Harder drilling about 148-155' 1-1/2 min/foot.
SS	2"	2"	50/2"	Drift 0°45'NW			-130	160		Fine- to medium-grained sub-rounded, silty, sand. Light gray, occasional coarse-grain.	Mix bag of Revert.
SS	4"	3"	50/4"				-140	170			
SS	2"	2"	50/2"	Drift 0°45'SW			-150	180		Fine- to medium-grained, light gray, silty, no coarse-grains.	Rough drilling 2-3'.
SS	2"	2"	50/2"				-160	190			
SS	5"	5"	50/5"	Drift 0°30'NW			-170	200		200.0' Sand, tan, fine- to medium-grained, well compacted, particles subrounded (predom.) to subangular, slightly silty.	Circulation the same, 80% return. Some caving.
										Bottom of Hole: 200' Elevation: -170' Completed gyro directional survey. Hole grouting completed. Grout 1:1 mix (cement:water) with 0.94 lbs. Intraplast added per sack cement. Total take: 14 sacks. Waste: None	End Day Shift.
											Begin Swing Shift. Hole grouted on swing shift 7/20/78

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-16



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	2 of 3	6B-17
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record							7.0-200.0' SAN MATEO FORMATION		
SS	5"	0"	50/5"										Mix one bag Revert.	
								- 50	80					
SS	4"	4"	50/4"		Drift 0°35'SW							Medium- to coarse-grained, silty, uncemented, subrounded.	At about 80' some minor mud loss.	
								- 60	90					
SS	3"	3"	50/3"									As above with about 10% fine- grained sand.	Drill rate 1'/50 seconds.	
								- 70	100					
SS	3"	2"	50/3"		Drift 0°45'SW							Medium- to coarse-grained sand, subrounded, quartzose.	10-20% mud loss.	
								- 80	110					
SS	2"	2"	50/2"									Greenish, medium-grained with scattered minor amount of coarse factions of sand.		
								- 90	120					
SS	2"	2"	50/2"		Drift 0°40'SE									
								-100	130					
SS	2"	2"	50/2"									Tan, medium-grained, sub- rounded sand.	30% mud loss.	
								-110	140					
SS	3"	3"	50/3"		Drift 0°40'SW							Fine- to medium-grained with scattered coarse grains, sand.	Drill rate 1'/40 seconds.	
								-120	150					

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-17



GEOLOGIC DRILL LOG										PROJECT	JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3	10079	2 of 3	6B-17
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
					Single Shot Record							7.0-200.0' SAN MATEO FORMATION	
SS	5"	0"	50/5"										Mix one bag Revert.
									- 50	80			At about 80' some minor mud loss.
SS	4"	4"	50/4"					Drift 0°35'SW				Medium- to coarse-grained, silty, uncemented, subrounded.	
									- 60	90			Drill rate 1'/50 seconds.
SS	3"	3"	50/3"									As above with about 10% fine- grained sand.	
									- 70	100			10-20% mud loss.
SS	3"	2"	50/3"					Drift 0°45'SW				Medium- to coarse-grained sand, subrounded, quartzose.	
									- 80	110			
SS	2"	2"	50/2"									Greenish, medium-grained with scattered minor amount of coarse factions of sand.	
									- 90	120			
SS	2"	2"	50/2"					Drift 0°40'SE					
									- 100	130			
SS	2"	2"	50/2"									Tan, medium-grained, sub- rounded sand.	30% mud loss.
									- 110	140			Drill rate 1'/40 seconds.
SS	3"	3"	50/3"					Drift 0°40'SW				Fine- to medium-grained with scattered coarse grains, sand.	
									- 120	150			

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.
6B-17



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	3 of 3	6B-17
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
					Single Shot Record							7.0-200.0' <u>SAN MATEO FORMATION</u>		
SS	2"	2"	50/2"											
								-130	160			Fine- to medium-grained sand with occasional coarse fraction.	About 20% mud loss.	
SS	1"	0"	50/1"											
								-140	170					
SS	2"	2"	50/2"									Chiefly medium-grained, sub-rounded, quartzose sand.	Good clean hole.	
								-150	180					
SS	2"	2"	50/2"											
								-160	190					
SS	2"	1"	50/2"										Drill rate normal, 50 seconds per foot.	
SS	1"	1"	50/1"					-170	200			Medium-grained, quartzose, slightly silty, uncemented.	End Day Shift	
												Bottom of Hole: 200' Elevation: -170' Completed directional survey (gyro). Grouting completed. 16 sacks cement (no waste) used. 1:1 cement:water ratio. 0.94 lbs. Intraplast added per sack cement.	Start Swing Shift. Hole grouted 7/21/78 on swing shift.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE Unit 2 Well 6	HOLE NO. 6B-17
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GEOLOGIC DRILL LOG				PROJECT		JOB NO.		SHEET NO.		HOLE NO.					
				SONGS Units 2 & 3		10079		1 OF 3		6B-18					
SITE				COORDINATES				ANGLE FROM HORIZ.		BEARING					
Unit 2 Well 6				S21 + 00.50/W2 + 30.50				90°		---					
BEGUN		COMPLETED		DRILLER		DRILL MAKE AND MODEL		HOLE SIZE		OVERBURDEN (FT.)					
7/22/78		2/24/78		PC Exploration C. Baker/R. Holt		Joy SH Truck		NC		7.0'					
CORE RECOVERY (FT./%)		CORE BOXES		SAMPLES		EL. TOP OF CASING		GROUND EL.		DEPTH/EL. GROUND WATER					
---		---		19		---		30.0'		25.0'/5.0'					
SAMPLE HAMMER WEIGHT/FALL				CASING LEFT IN HOLE: DIA./LENGTH				LOGGED BY:							
140#/30"				None				J. E. Kaiser/B. Hebbron							
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N."	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.	
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES								
					Single Shot Record								0.0-7.0' <u>BACKFILL</u> , Sand, tan, fine to medium, well graded, artificially compacted.	Hole started on swing shift. Hole advanced with 5" tricone to 10'.	
SS	6"	3"	50/6"						20	10			7.0-200.0' <u>SAN MATEO FORMATION</u> Sand, tan; fine- to coarse-grained. Well graded; well compacted. Subrounded particles predominate; weakly cemented; slightly silty; occasional siltstone fragments very dense. Similar to above but appearing coarser.	Added 1/2 sack Revert. Drilling rate at 1'/45 seconds. Drill advance by hydraulic feed. Placed 10'-4.3" casing. Placed NX carbide bit. No unusual flow losses noted. 30' - End Swing Shift.	
SS	3"	3"	50/3"		Drift 0°15'S70°W				10	20					
SS	4"	3"	50/4"						0	30					
SS	3"	2"	50/3"		Drift 0°15'SW				- 10	40			Well graded quartzose sand, noncemented, well compacted.	Begin Day Shift. 10-20% mud loss.	
SS	4"	4"	50/4"						- 20	50					
SS	4"	3"	50/4"		Drift 0°20'SW				- 30	60			Fine- to medium-grain quartzose sand, no cement but well compacted.		
									- 40	70					

SS = SPLIT SPOON; ST = SHELBY TUBE;
 D = DENNISON; P = PITCHER; O = OTHER

SITE Unit 2 Well 6

HOLE NO. 6B-18



GEOLOGIC DRILL LOG					PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
					SONGS Unit 2 & 3		10079	2 OF 3	6B-18				
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT.	DEPTH FT.	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	5"	0"	50/5"		Single Shot Record							7.0-200.0' SAN MATEO FORMATION (Continued)	Changed dull bit.
SS	4"	3"	50/4"		Drift 0°30'S			- 50	80			Fine- to medium-grained sand with few scattered coarse fractions.	
SS	2"	2"	50/2"					- 60	90			Medium- to coarse-grained sand, some silt.	Mix bag of Revert.
SS	3"	3"	50/3"		Drift 0°30'SW			- 70	100			Subrounded to rounded, highly quartzose sand; medium- to coarse-grained.	Losing 10-20% mud.
SS	2"	2"	50/2"					- 80	110			Same as above but chiefly medium-grained.	Normal drill rate 50 seconds per foot.
SS	3"	2"	50/3"		Drift 0°30'SW			- 90	120			Well compacted medium- to coarse-grained, silty sand slightly green.	
SS	2"	2"	50/2"					-100	130			Well graded and compacted yellowish sand.	Hole caving some.
SS	2"	2"	50/2"		Drift 0°30'SW			-110	140				Still losing 10-20% drilling fluid. Normal drilling rate.
								-120	150			Tan, fine- to coarse-grained, well graded/compact.	End Day Shift.

SS - SPLIT SPOON; ST - SHELBY TUBE;
D - DENNISON; P - PITCHER; O - OTHER

SITE

HOLE NO.



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		3 of 3		6B-18	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	2"	2"	50/2"		Single Shot Record								7.0-200.0' SAN MATEO FORMATION (Continued)	Begin Swing Shift.			
SS	1"	1"	50/1"					Drift 0°15'S25°W	-130	160			Tan, fine- to coarse-grained, appears slightly coarser than previous samples. Particles subrounded (predominantly) to subangular; some micas, well compacted.	No unusual drilling fluid losses. Drilling rate at 1'/40 sec.			
SS	2"	2"	50/2"						-140	170			Fine- to medium-grained. Well compacted; micaceous; particles predominantly subrounded.				
SS	2"	2"	50/2"					Drift 0°15'S10°W	-150	180			Same as above, but slightly coarser.	Added 1/2 sack Revert to mud tank.			
SS	1"	1"	50/1"						-160	190			Tan, fine- to coarse-grained, well graded.				
SS	1"	1"	50/1"					Drift 0°45'S50°W	-170	200			Same as above with siltstone.				
													Bottom of Hole: 200' Elevation: -170' Conducted Eastman gyrosurvey of hole. Grouted hole with 12 sacks of cement. Water:cement ratio 1:1 by volume with 0.94 lbs. of Intraplast additive per sack of cement.	Hole completed 7/22/78 Hole grouted on day shift 7/23/78.			

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-18



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.								
				SONGS Units 2 & 3		10079	1 of 3	6B-19								
SITE		COORDINATES		ANGLE FROM HORIZ.		BEARING										
Unit 2 Well 6		S21 + 00.00/W2 + 26.00		90°		---										
BEGIN	COMPLETED	DRILLER	DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH								
9/14/78	9/21/78	All Terrain R. Clark/J. Weger	CME 750		NC	10.0'	180.0'	190.0'								
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK								
---		---	17	---	30.0'	25.0'/5.0'		10.0'/20.0'								
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE: DIA./LENGTH		LOGGED BY:												
140#/30"		142' Failing rod- abandoned in hole		D. Brodie/J. Broughton/J. Gallerani												
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N."	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES														
					No single shot record							0.0-10.0' <u>DISTURBED SAND</u> with grout or cement lenses; tan, fine- to coarse-grained, sub- angular to subrounded sand. 5.0-7.0' Thin lenses of grout and/or backfill concrete (chunks of concrete with large aggregate in cuttings).	Started hole on day shift 9/14/78 Advanced hole with 4" drag bit. Mixed 1/2 bag Revert to drill.			
SS 10" 6"	46- 50/4"							20	10			10.0-78.5' <u>SAN MATEO FORMATION</u> Tan, fine- to coarse-grained, subangular to subrounded, slightly silty sand with minor mica and fine gravel, v. dense. 10.0' Yellow-tan, fine sand to fine gravel, subangular to sub- round sand with minor silt and trace mica.	During sampling at 10', hammer rope broke. Had to replace. 10.0'- End day 9/14/78			
SS 4.5 2"	50/4.5							10	20			20.0' Same as above except light tan in color. 30.0' Same as above except fine- to coarse-grained, no fine gravel. Chunks of siltstone coming up in cuttings.	Begin day 9/15/78 Mixed 1/2 bag Revert.			
SS 4.5 1.5	52/4.5							0	30			40.0' Tan, fine- to coarse- grained, subangular to sub- rounded sand with minor silt and trace of mica.				
SS 4" 2.5	51/4"							- 10	40			Fine- to medium-grained, siltier, more micaceous sand.	Nothing unusual during drilling. No down pressure used. No water loss.			
SS 4" 3"	51/4"							- 20	50							
SS 18" 9"	24- 31-39 70							- 30	60			Dark gray (Revert stained) fine- to medium-grained micaceous sand with trace silt				
								- 40	70							
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		HOLE NO.	
Unit 2 Well 6													6B-19			



GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.	
										SONGS Units 2 & 3		10079		2 of 3		6B-19	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES										
SS	18"	7.5	29-		No single shot record								Same as above except contains minor fine gravel.	78.5-80.0' Rods dropped very fast, probably very loose sand zone.			
			34-53	87										Some loss of circulation but regained quickly.			
SS	18"	6"	22-					- 50	80				78.5-120.0' <u>DISTURBED SAND</u> , Tan to gray (Revert stained), fine sand to fine gravel, sub- angular to subrounded sand with minor silt and mica.	86.5-89.5' Rods dropped again. Circulation lost, but quickly regained.			
			34-29	63									Grades in color from dark gray at top to light tan at bottom, fine sand to fine gravel with minor silt and trace mica.	90.0-100.0' Drilling very irregular, alternately fast and slow-like hard and soft lenses.			
SS	4"	2.5	52/4"					- 60	90				90.0' Same as above except all tan.	95.0' Mixed about 1/2 bag Revert.			
SS	4"	2.5	52/4"										105.0' Tan for first inch, rest gray (Revert), fine- to coarse-grained, trace fine gravel, minor silt, trace mica, some thin, very silty or clayey layers.	103.0-110.0' PVC coming up in cuttings.			
SS	3"	0.5	51/3"					- 70	100				110.0' Mostly gray (Revert) with vertical zone of tan, fine- to coarse-grained with minor fine gravel, trace silt and mica.	110.0-116.0' Drilled very fast, driller overshot sample point by one foot.			
SS	18"	7.75	38- 48-48	96				- 80	110				116.0' 5" - greenish-gray faintly laminated siltstone.	116.0' After first 6-8", hammer was in water and sampler wouldn't advance.			
SS	18"	7.5	8-										4" - fine to coarse sand.	Added 5' rod and took rest of blow counts.			
			8-12	20									6" - fine sand to fine gravel with pieces of jelled Revert and 1/4-1/2" pieces of black gravel, possibly from Well #6.	Questionable data. Probably hit Well #6.			
SS	18"	15"	21- 35-50	85				- 90	120				120.0-190.0' <u>SAN MATEO FORMA-</u> <u>TION</u> , Tan or gray (Revert), fine- to coarse-grained sub- angular to subrounded sand.	125.0' End day 9/15/78			
SS	2"	0"	51/2"										125.0' Black (Revert stain) as above with trace fine gravel.	Begin day 9/16/78			
SS	3.5	3"	51/3.5					- 100	130				130.0' Light gray, fine- to coarse-grained, subrounded to subangular, very dense.	Added 1/2 sack Revert.			
SS	5"	3"	50/5"														
SS	3"	0"	50/3"					- 110	140								
								- 120	150								

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-19



GEOLOGIC DRILL LOG						PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
						SONGS Units 2 & 3		10079	3 OF 3	6B-19				
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	2"	0"	50/2"		No single Shot Record									130.0'
														Sample #16
SS	2"	1"	50/2"						-130	160				Revert stained gray.
														140.0'
														Mixed new batch of drilling fluid, added 1/2 sack Revert.
SS	2"	0"	50/2"						-140	170				150.0'
														Revert continues to flow from drill rod after reaching sample depth and uncoupling rods.
SS	3"	0"	50/3"						-150	180				Continues to flow for 5 ⁺ minutes.
														170.0' Hole sanded in-unable to get spoon to 170'-had to mix 1/2 bag Revert and rewash hole to 170.0'
SS	2"	0"	50.2"						-160	190				190.0' End day 9/18/78
														Begin day 9/19/78
														Bottom of Hole: 190'
														Elevation: -160'
														Driller went back in hole on 9/19/78 to drill 190-200' but hole was sanded in at 100'.
														Continued to 140' with Failing rods. No circulation. At 140' rods got stuck. Able to rotate but could not move up or down. Tried 300# hammer. Moved 2 feet up then stopped. Unable to move further. Tried washing through rods with 3/4" pipe and then alongside rods with Revert. Only able to get pipe to approximately 100 feet. Unable to regain circulation or move rods using these methods. Last attempt was reaming over rods with 4" casing. Drilled to 98'. Then unable to advance further. Casing vibrating as if it was hitting steel. Pulled 4" casing out. Tried to pull rods one last time. Unable to move rods. Backfilled hole with 1:1 mix, tremie method.
														Spent 3 days attempting to retrieve rods.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE	Unit 2 Well 6	HOLE NO. 6B-19
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GEOLOGIC DRILL LOG										PROJECT		JOB NO.		SHEET NO.		HOLE NO.			
Unit 2 Well 6										SONGS Units 2 & 3		10079		1 OF 3		6B-20			
SITE										COORDINATES				ANGLE FROM HORIZ.				BEARING	
Unit 2 Well 6										S20 + 98.00/W2 + 26.00				90°				---	
BEGUN		COMPLETED		DRILLER		DRILL MAKE AND MODEL		HOLE SIZE		OVERBURDEN (FT.)		ROCK (FT.)		TOTAL DEPTH					
9/26/78		10/9/78		James Weger All Terrain Drilling		CME 750		BX		10.7'		134.3'		165.0'					
CORE RECOVERY (FT.%)		CORE BOXES		SAMPLES		EL. TOP OF CASING		GROUND EL.		DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK							
---		---		15		---		30.0'		25.0'/5.0'		10.7'/19.3'							
SAMPLE HAMMER WEIGHT/FALL				CASING LEFT IN HOLE: DIA./LENGTH				LOGGED BY:											
140#/30"				3" perforated PVC-120'				D. Brodie/S. Sanders											
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.					
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES												
SS8.5	2.5	51	2.5	31-					20	10			0.0-10.7' BACKFILL SAND, Tan, fine- to coarse-grained with trace fine gravel and much 1/4" 1" gravel, subangular to sub-rounded sand with trace silt.	Hole begun on day shift 9/26/78 Advanced hole with open face carbide bit on BX casing (2-7/8" O.D.). Mixed 3/4 bag Revert for drilling fluid. 0-10' Uneven drilling-fast and slow. Grout chips and gravel in cuttings. At 10' high blow counts probably due to gravel in sample. 10-30' Drilled fairly smooth and even. 30' Lost circulation when casing got plugged with clots of Revert, but was regained when casing was cleared. 40' Mixed 1/2 sack Revert. 50-55' Drilled slow at first, then had a few fast drops of several inches each. 55' Lost all circulation, but regained it after a few minutes. Probably hit an old hole.					
SS	5.5	4"	51	5.5					10	20			10.7-70.0' SAN MATEO FORMATION Tan or gray (Revert stained), fine- to coarse-grained with occasional fine gravel, sub-angular to subrounded sand with variable silt and mica content. Occasional siltstone lenses. 20.0' Tan, fine- to medium-grained with minor coarse-grained, subangular to sub-round sand with minor silt content. 30.0' Gray (Revert stained) fine- to coarse-grained sand with minor mica.						
SS	5"	4"	51	5"					0	30									
SS	4"	3.75	51	4"					- 10	40			Gray (Revert) fine- to coarse-grained with trace fine gravel, minor silt and mica. 50.0' - 1.5" gray, finely laminated clayey siltstone with extremely micaceous layers weathered to orange. 4" gray (Revert) extremely micaceous sand grading from fine at top to medium at bottom. Faintly laminated with orangish layers. 60.0' Gray-tan with streaks of dark gray (Revert) grading from mostly coarse to mostly fine (top to bottom). Finer portion siltier, almost clayey and more micaceous.						
SS	5.75	5.5	51	5.75					- 20	50									
SS	18"	8.5	30-31	61					- 30	60									
									- 40	70									

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Unit 2 Well 6

HOLE NO.

6B-20



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.				
				SONGS Units 2 & 3		10079	2 of 3	6B-20				
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLER BLOWS "N" PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				LOSS IN O.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS 18"	8"	14-	19-19								70.0-80.0' <u>DISTURBED SAND</u> , Dark gray (Revert) fine- to coarse-grained micaceous sand with minor silt.	55-60' Drilled slow, then fast for last 1.5'.
SS 18"	6"	10-	14-17								70.0' As above except minor coarse fraction and contained 1/2" angled white clayey silt-stone lens.	60-70' Drilled alternately fast & slow-a few quick drops of 3-6' in last 5' but no circulation loss.
SS 18"	9.5"	29-	30-33				- 50	80			75.0' Dark gray, fine- to coarse-grained micaceous sand with minor silt.	70-75' Drilled very fast with several quick drops of 3-6'.
SS 18"	9"	42-33	38								80.0-130.0' <u>SAN MATEO FORMATION</u> , Tan to gray (Revert), fine- to coarse-grained, generally with traces of fine gravel, sub-angular to subrounded and with mica and silt.	75-80' Drilled very fast w/rapid drops up to 5".
SS 2"	0"	51/2"	71				- 60	90			80.0' As above, gray in color.	80-85' Drilled fast except for a few short, slow intervals.
SS 2"	2"	50/2"					- 70	100			85.0' As above, tan with some orange staining (oxidation).	85-90' Smooth drilling, intermediate speed.
SS 2"	0"	50/2"					- 80	110			100.0' As above; tan in color.	90-100' Smooth, hard drilling, no sample this shift.
SS 5"	0"	50/5"					- 90	120			130.0-135.0' <u>DISTURBED SAND</u> Dark gray (Revert) fine- to coarse-grained sand mixed with much 1/4-1/2" black gravel from Well #6.	90' End Day Shift 9/26
SS 18"	6"	18-25	18				- 100	130			135.0-160.0' <u>SAN MATEO FORMATION</u> , Tan to gray (Revert stained), fine- to coarse-grained with occasional fine gravel, subangular to sub-rounded sand, variable silt and mica content.	Begin Day Shift 9/27/78
SS 6"	4"	52/6"	43								135.0' As above, but black in color, minor silt and mica.	Lost all water in hole overnight. Had trouble establishing circulation. Mixed 1 bag Revert.
SS 3.5"	0"	50/3.5					- 110	140			145.0' Dark gray (Revert stained), fine- to medium-grained, minor coarse fraction, trace fine gravel, trace mica.	100-110' Drilled hard & smooth. Used much water, but then when casing was uncoupled, water flowed from casing for several minute.
SS 18"	8.5"	37-44	41								150.0' Dark gray (Revert stained), fine- to coarse-grained, as above.	110-120' Drilled slow & steady, Hole caved to 114',
			85				- 120	150				
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER				SIZE					HOLE NO.			

SS = SPLIT SPOON; ST = SHELBY TUBE;
 O = DENNISON; P = PITCHER; Q = OTHER

SITE

HOLE NO.



GEOLOGIC DRILL LOG

PROJECT

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 of 3

HOLE NO.

6B-20

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS18"	8.5	19- 25-28 53							-130	160			Cuttings at 158.0' are very coarse sand.	but was reamed back to 120' when casing was added (driller advances hole w/Kelly) Mixed 1 bag Revert. 120' Driller dropped last 20' section of A-rod w/sampler attached down hole from surface. Retrieved but lost sample.
									-140	170			160.0-172.0' Gravel from well pack.	Poor circulation. 130' Continued to lose water after sampler was pulled. 130-135' Much small black gravel coming up in cuttings. Poor circulation. 135' Add 1 bag Revert. 140-145' Drilled hard and even. Some water loss. 145-150' Drilled as above. Mixed 1/2 bag Revert. 150.0'
													Bottom of Hole: 172.0' Elevation: -140' Cuttings are black well gravels, sample of cuttings taken. Ran Eastman Whipstock Gyroscopic Survey on 10/9/78. Hole pressure grouted on 10/10 by Gallerani using 1:1 cement: water mix with 0.94 lbs. Intraplast per sack. Total sacks used - 90.3 Take - 89.3 bags Waste - 1.0 bags.	End Day Shift 9/27 Begin Day Shift 9/28/78 *
<p>*No samples collected due to extreme drilling problems. Hole 6B-20 was completed on 10/9/78 during which time 150' of BX casing became stuck in hole due to lack of circulation. In trying to retrieve this casing, 100' of 4" casing was used, unsuccessfully. It became hung up on failing rods and gravels inside and finally was cut open to pull it from hole. All failing rods and 4" casing was removed by 10/6/78. 10/9/78, reamed hole out to 172'. 120' of perforated PVC casing was installed due to sanding in of gravels below. Hole was gyroed on 10/9/78 and grouted 10/10/78.</p>														
<p>SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER</p>										SITE				HOLE NO.
										Unit 2 Well 6				6B-20

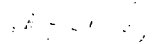


GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.								
Well 6 Unit 2				SONGS Units 2 & 3		10079	1 OF 3	6B-21								
SITE				COORDINATES		ANGLE FROM HORIZ.		BEARING								
Well 6 Unit 2				S20 + 96.00/W2 + 28.50		90°		---								
BEGIN	COMPLETED	DRILLER	DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)	TOTAL DEPTH								
10/11/78	10/12/78	Boyles Bros. K. Mahler	Simco 4000		BX	10.0'	190.0'	200.0'								
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK								
---		---	10	---	30.0'	25.0'/5.0'		10.0'/20.0'								
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE DIA./LENGTH		LOGGED BY:												
140#/30"		1-1/2"PVC: 180' Perforated 20' Solid		C. Dunham/J. Broughton												
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.			
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES									
SS	6"	6"	50/6"					20	10			0.0-6.0' <u>BACKFILL</u> , Fine- to medium-grained sand, tan, dense.	Hole advanced using 3-7/8" Tricone rock bit and Revert.			
												6.0-7.0' <u>GROUT</u> , Firm, Gray.				
												7.0-10.0' <u>BACKFILL</u>				
SS	3"	3"	50/3"					10	20			10.0-30.0' <u>SAN MATEO FORMATION</u> Fine- to medium-grained sand, tan, subangular to subrounded, very dense.				
								0	30			30.0-44.0' <u>GROUT</u> , Firm, gray with fine gravel, very dense.				
								- 10	40							
SS	3"	2"	50/3"					- 20	50			44.0-200.0' <u>SAN MATEO FORMATION</u> Fine- to medium-grained sand, light gray, very dense.	Gray color due to Revert staining. At 44', pulled out rock bit and began drilling with BX casing.			
								- 30	60							
SS	18"	12"	26-35-50 85					- 40	70			Fine-grained sand, gray, very dense with 4" seam gray clay-stone, hard.				
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													SITE		HOLE NO.	
Well 6 Unit 2													6B-21			



GEOLOGIC DRILL LOG							PROJECT	JOB NO.	SHEET NO.	HOLE NO.			
							SONGS Units 2 & 3	10079	2 of 3	6B-21			
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS 11"	6"	18-50/5"											Gray color due to Revert staining.
SS 4"	4"	50/4"						- 50	80				
SS 3"	0"	50/3"						- 60	90				
SS 8"	8"	35-50/2"						- 70	100				
													Gray color due to Revert stain.
SS 3"	0"	50/3"						- 80	110				
SS 2"	0"	50/2"						- 90	120				End Swing Shift
													Begin Day Shift
SS 4"	3"	50/4"						-100	130				
													Sample 7 - Revert stained gray.
SS 3"	3"	50/3"						-110	140				
													Sample 8 - Revert stained gray.
								-120	150				

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE	Well 6 Unit 2	HOLE NO. 6B-21
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**PROJECT**

SONGS Units 2 & 3

JOB NO.

10079

SHEET NO.

3 OF 3

HOLE NO.

6B-21

SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLE RECOVERY CORE RECOVERY	SAMPLE SLOWS IN PERCENT CORE RECOVERY	WATER PRESSURE TESTS				ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
				LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
SS	4"	0"	50/4"										
SS	3"	0"	50/3"					-130	160				
SS	3"	2"	50/3"					-140	170			Tan sand, fine- to coarse-grained, trace fine gravel, subrounded to subangular, very dense.	170-180' Lost 20% drilling fluid.
SS	2"	0"	50/2"					-150	180				
SS	3"	0"	50/3"					-160	190				
SS	2"	0"	50/2"					-170	200				
												Bottom of Hole: 200.0' Elevation: -170.0' Installed 200' of PVC casing. Ran Eastman Whipstock Gyroscopic Survey on 10/12/78 Hole pressure grouted by J. Gallerani on 10/12/78 and 10/13/78 using 1:1 grout:water cement mix with 0.94 lbs. Intraplast per sack. Total take 13.1 bags. Waste 24.9 bags.	Hole pressure grouted on swing shift 10/12/78 and day shift, 10/13/78.

SS - SPLIT SPOON; ST - SHELBY TUBE;
D - DENNISON; P - PITCHER; O - OTHER

SITE
Unit 2 Well 6

HOLE NO.
6B-21



GEOLOGIC DRILL LOG				PROJECT		JOB NO.	SHEET NO.	HOLE NO.					
Well 6 Unit 2				SONGS Units 2 & 3		10079	1 of 3	6B-22					
SITE		COORDINATES				ANGLE FROM HORIZ.		BEARING					
Well 6 Unit 2		S20 + 96.30/W2 + 27.20				90°		---					
BEGUN	COMPLETED	DRILLER		DRILL MAKE AND MODEL		HOLE SIZE	OVERBURDEN (FT.)	ROCK (FT.)					
10/16/78	10/16/78	Boyles Bros.		Simco 4000		BX	70.0'	130.0'					
CORE RECOVERY (FT./%)		CORE BOXES	SAMPLES	EL. TOP OF CASING	GROUND EL.	DEPTH/EL. GROUND WATER		DEPTH/EL. TOP OF ROCK					
---		---	8	---	30.0'	25.0'/5.0'		70.0'/-40.0'					
SAMPLE HAMMER WEIGHT/FALL		CASING LEFT IN HOLE, DIA./LENGTH			LOGGED BY:								
140#/30"		1-1/2" PVC: 180' Perforated 20' Solid			J. Broughton/C. Dunham								
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
								FT	FT				
								20	10			0.0-2.0' GROUT, Gray, hard.	Hole begun on day shift. Advancing hole with 4-1/4" rock bit from 0-200'. Recirculating Revert drilling fluid.
								10	20			2.0-50.0' DISTURBED SAND, Tan, fine- to coarse-grained sand with seams of hard gray grout.	
								0	30				
								- 10	40				
								- 20	50			50.0-70.0' GROUT, Predominantly firm, gray grout with trace, fine, black subangular well gravels.	At 35' sand Revert stained gray, possibly drilling in old hole.
								- 30	60			Gray, fine- to medium-grained trace coarse sand with thin seams of gray, firm grout.	
								- 40	70				Sample 1 - Revert stained gray.
SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER													HOLE NO.
Well 6 Unit 2													6B-22



GEOLOGIC DRILL LOG										PROJECT		JOB NO.	SHEET NO.	HOLE NO.
										SONGS Units 2 & 3		10079	2 of 3	6B-22
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.		
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES							
			20-								70.0- 80.0' <u>SAN MATEO FORMATION</u>	Sample 2 - Revert stained gray from 70' Losing about 20% drilling fluid.		
SS	18"	12"	37-37	74							Tan and gray, fine- to coarse-grained, subrounded to sub-angular, very dense.			
											70.0' Dark gray, fine- to medium-grained sand, very dense.			
SS	18"	12"	19-20-26	46				- 50	80		80.0-85.0' <u>DISTURBED SAND</u> , gray, same as above with thin seams of brown, medium plasticity, micaceous silty clay.	Sample 3 - Revert stained gray.		
SS	3"	2"	50/3"											
SS	2"	0"	50/2"					- 60	90		85.0-200.0' <u>SAN MATEO FORMATION</u>			
											Tan, fine- to coarse-grained sand, subangular to subrounded, very dense.			
SS	2"	0"	50/2"					- 70	100					
												End Day Shift.		
SS	2"	0"	50/2"					- 80	110			Begin Swing Shift.		
SS	4"	4"	50/4"					- 90	120		Brown-gold, fine- to medium-grained, 20% coarse sand, slightly micaceous, slightly silty, occasional thin seams of gray, medium plasticity, silty clay.			
SS	3"	0"	50/3"					- 100	130					
SS	6"	0"	50/6"					- 110	140					
SS	3"	3"	50/3"					- 120	150		Light gray, fine- to medium-grained, 20% coarse sand.	Sample 6 - Revert stained gray.		

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER	SITE	Well 6 Unit 2	HOLE NO. 6B-22
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GEOLOGIC DRILL LOG								PROJECT		JOB NO.	SHEET NO.	HOLE NO.	
								SONGS Units 2 & 3		10079	3 of 3	6B-22	
SAMPLER TYPE AND DIAMETER	SAMPLER ADVANCE LENGTH CORE RUN	SAMPLER RECOVERY CORE RECOVERY	SAMPLE BLOWS "N"	PERCENT CORE RECOVERY	WATER PRESSURE TESTS			ELEVATION FT	DEPTH FT	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
					LOSS IN G.P.M.	PRESSURE P.S.I.	TIME IN MINUTES						
SS	2"	2"	50/2"										
								-130	160			Tan, fine- to coarse-grained sand, subrounded to subangular, very dense.	Good circulation. No drilling problems.
SS	2"	0"	50/2"										
								-140	170				
SS	3"	3"	50/3"										
								-150	180				
SS	2"	0"	50/2"										
								-160	190				
SS	2"	0"	50/2"										
								-170	200				
												Bottom of Hole: 200.0' Elevation: -170.0' Eastman Whipstock Gyroed hole on 10/17/78. Hole pressure grouted by J. Gallerani on 10/17/78 using 2:1 mix water:cement ratio with 1% by weight Intraplast additive. Total take 19.5 bags Waste, 4.0 bags	End Swing Shift. Hole grouted on day shift. 10/17/78

SS = SPLIT SPOON; ST = SHELBY TUBE;
D = DENNISON; P = PITCHER; O = OTHER

SITE

Well 6 Unit 2

HOLE NO.
6B-22

APPENDIX B

This appendix presents the reports of the Gyroscopic Multi-Shot Surveys performed by Eastman Whipstock, Inc. The surveys were performed by Eastman personnel on the completion of each hole in the Deep Exploration Drilling Program except 6B-19 and the holes that were terminated at a depth of less than 8 feet (6B-5, 6B-8, 6B-10 and 6B-13). The surveys were performed to determine the direction and drift of each hole so that the distances between holes at depth could be measured in order to define the location and need for intermediate holes.

The depth of the survey was determined by several factors, i.e., length of the instrument, position of the NC casing, caving conditions, etc., and does not reflect the total depth of the hole. In most cases, however, the survey reached within 20 feet of the bottom of the completed hole.

Survey data for each hole consists of a cover sheet describing the parameters used for the survey, a second sheet showing the calculations performed, and two sheets of plots (plan and profile) which depict graphically the drift survey.

In addition to the 21 holes surveyed, the 36-inch diameter stabilization casing installed in the well was surveyed to a depth of 110 feet (top of sand fill in the well).

BECHTEL POWER CORP.----- HOLE NO: 6 -----EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 24 MAY 1978

JOB NO: P-0578-G0828

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F13-17

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

BECHTEL POWER CORP.----- HOLE NO: 6 -----EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 24 MAY 1978

JOB NO: P-0578-G0828

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F13-17

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

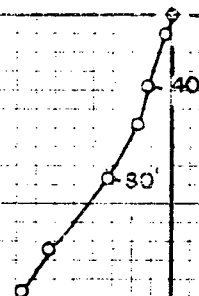
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	0 0	0	0.00	0.00	0.00	0.00
20.	0 20	S 21 W	20.00	-0.02	0.05 S	0.02 W
40.	0 30	S 12 W	40.00	-0.06	0.19 S	0.06 W
60.	0 5	S 21 W	60.00	-0.09	0.29 S	0.09 W
80.	0 50	S 39 W	80.00	-0.17	0.43 S	0.17 W
100.	0 35	S 38 W	100.00	-0.32	0.62 S	0.32 W
110.	0 50	S 29 W	110.00	-0.39	0.73 S	0.39 W

FINAL CLOSURE - DIRECTION: S 28 DEGS 25 MINS 24 SECS W
DISTANCE: 0.83 FEET

PLANT
NORTH



1" = 5'



DEPTH-110'
SOUTH - 0.73'
WEST - 0.39'

CLOSURE - 0.83' S 28° 25' 24" W

HOLE № 6

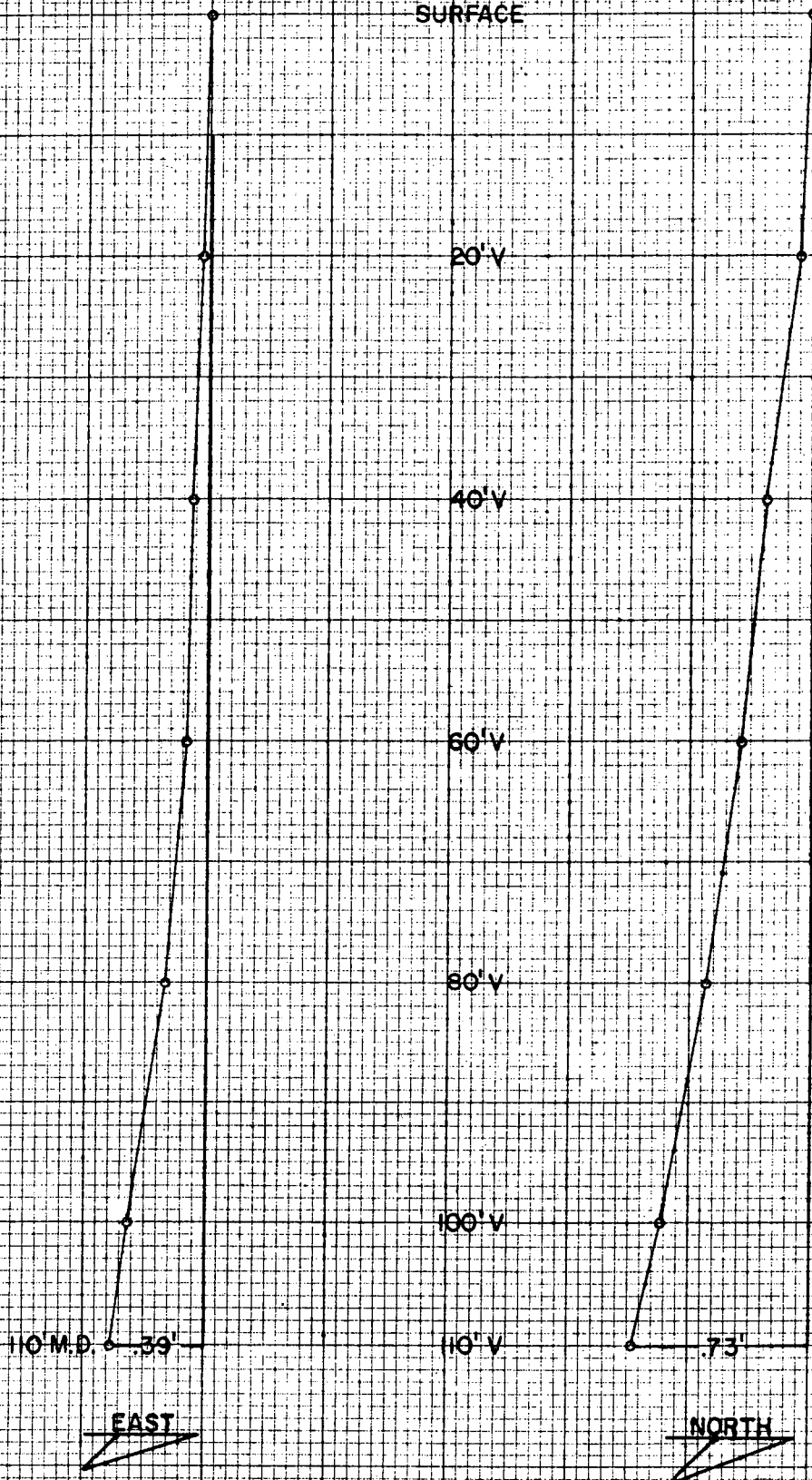
JOB № P-0578-G0828

SECTIONAL VIEW

HOLE Nº 6

SURFACE

SCALE
VERTICAL 1"=10'
HORIZONTAL 1"=5'



BECHTEL POWER CORP.--- HOLE: 6-B-1 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 7 JUNE 1978

JOB NO: P-0678-G0863

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-13

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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	
---------------------------	-----------------------	-------------------------	-----------------------------------	-----------------------------	--	--

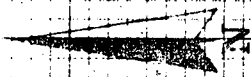
0.	0 0	0	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

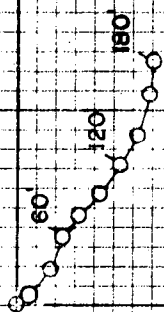
20.	0 30	S 34 E	20.00	0.05	0.07 S	0.05 E
40.	0 30	S 72 E	40.00	0.19	0.18 S	0.19 E
60.	0 25	S 70 E	60.00	0.34	0.23 S	0.34 E
80.	0 25	S 45 E	80.00	0.46	0.31 S	0.46 E
100.	0 30	S 48 E	100.00	0.58	0.42 S	0.58 E
120.	0 25	S 57 E	120.00	0.71	0.52 S	0.71 E
140.	0 45	S 64 E	140.00	0.88	0.62 S	0.88 E
160.	0 30	S 76 E	159.99	1.09	0.69 S	1.09 E
180.	0 30	S 81 E	179.99	1.26	0.72 S	1.26 E

FINAL CLOSURE - DIRECTION: S 60 DEGS 3 MINS 28 SECS E
 DISTANCE: 1.45 FEET

PLANT
NORTH



Eastman
Whipstock



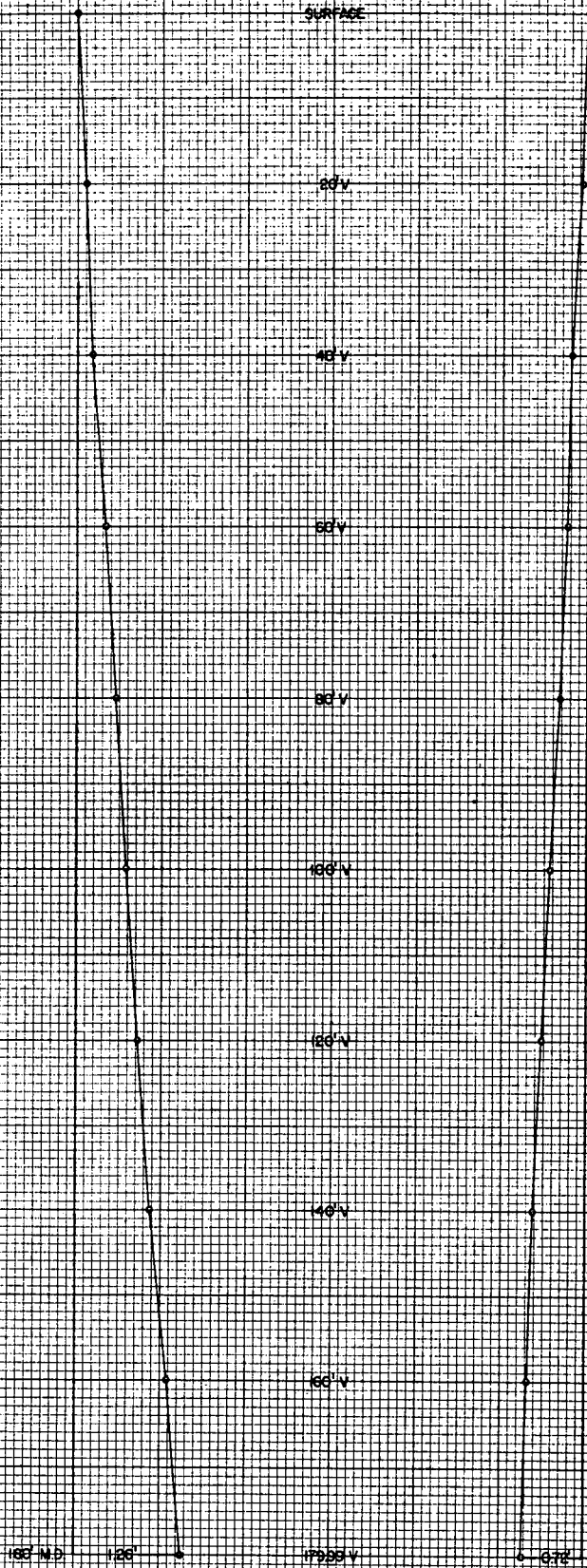
DEPTH-180'
SOUTH-0.72'
EAST -1.26'
CLOSURE-1.45' S 60° 03' 28" E

SECTIONAL VIEW

FILE 5-B-1

SURFACE

SCALE
VERTICAL 1"=20'
HORIZONTAL 1"=1'



EAST

NORTH

BECHTEL POWER CORP. --- HOLE: 6-B-2 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 1 JUNE 1978

JOB NO: P-0678-60842

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-11

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

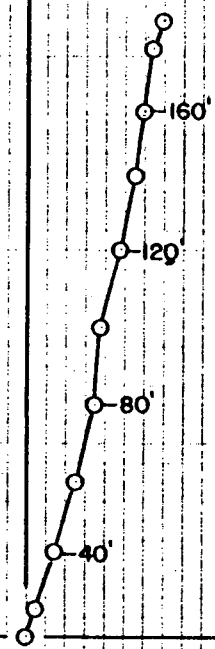
ANGLE AVERAGING METHOD

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.	0 0	0	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W						
20.	0 25	N 17 E	20.00	0.02	0.07 N	0.02 E
40.	0 30	N 20 E	40.00	0.07	0.22 N	0.07 E
60.	0 35	N 15 E	60.00	0.13	0.40 N	0.13 E
80.	0 35	N 6 E	80.00	0.17	0.60 N	0.17 E
100.	0 35	N 10 E	100.00	0.19	0.80 N	0.19 E
120.	0 35	N 16 E	120.00	0.24	1.00 N	0.24 E
140.	0 30	N 11 E	139.99	0.28	1.19 N	0.28 E
160.	0 30	N 0 E	159.99	0.30	1.36 N	0.30 E
180.	0 25	N 17 E	179.99	0.32	1.52 N	0.32 E
190.	0 30	N 21 E	189.99	0.35	1.59 N	0.35 E

FINAL CLOSURE - DIRECTION: N 12 DEGS 24 MINS 47 SECS E
 DISTANCE: 1.63 FEET



SCALE
1" = 5'



DEPTH-190'
NORTH-1.59'
EAST -0.35'
CLOSURE - 1.63' N 12° 24' 47" E

SURFACE
SECTIONAL VIEW

SCALE
VERTICAL 1"=10'
HORIZONTAL 1"=1'

HOLE: 6-B-2

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

190' M.D.

35°

EAST

169.99' V

1.53'

NORTH

BY: EASTMAN WHIPSTOCK, INC.

BECHTEL POWER CORP. --- HOLE: 6-B-3 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 9 JUNE 1978

JOB NO: P-0678-G0865

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-14

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

BECHTEL POWER CORP. --- HOLE: 6-B-3 ---EASTMAN GYRO MULTI-SHOT SURVEY 00:24:03 00-472 PAGE NO. 1

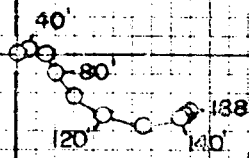
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	0 0	0	0.00	0.00	0.00	0.00

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

20.	0 0	0	20.00	0.00	0.00	0.00
40.	0 10	N 68 E	40.00	0.03	0.01 N	0.03 E
60.	0 5	S 36 E	60.00	0.07	0.00 S	0.07 E
80.	0 15	S 30 E	80.00	0.10	0.05 S	0.10 E
100.	0 10	S 47 E	100.00	0.15	0.11 S	0.15 E
120.	0 20	S 64 E	120.00	0.22	0.16 S	0.22 E
140.	0 20	S 87 E	140.00	0.33	0.19 S	0.33 E
160.	0 10	N 66 E	160.00	0.42	0.17 S	0.42 E
180.	0 0	0	180.00	0.44	0.16 S	0.44 E
188.	0 5	N 45 E	188.00	0.45	0.15 S	0.45 E

FINAL CLOSURE - DIRECTION: S 71 DEGS 2 MINS 21 SECS E
DISTANCE: 0.47 FEET

PLANT
NORTH



DEPTH - 138'
SOUTH - 0.15'
EAST - 0.45'

CLOSURE - 0.47' S 71° 02' 21" E

SECTIONAL VIEW

HOLE 6-B-3

SURFACE

SCALE
VERTICAL 1"=40'
HORIZONTAL 1"=10'

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

200' V

100' M.D. 0.40'

EAST

NORTH

BY EASTMAN WHIPSTOCK, INC.

BECHTEL POWER CORP.--- HOLE: 6-B-4 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 5 JUNE 1978

JOB NO: P-0678-00858

GYRO MULTI SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-12

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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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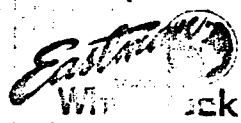
0.	0 0	0	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	0 50	N 65 W	20.00	-0.13	0.06 N	0.13 W
40.	0 45	N 68 W	40.00	-0.39	0.17 N	0.39 W
60.	1 5	N 62 W	60.00	-0.68	0.31 N	0.68 W
80.	0 55	N 53 W	79.99	-0.97	0.49 N	0.97 W
100.	1 10	N 62 W	99.99	-1.28	0.69 N	1.28 W
120.	0 50	N 71 W	119.99	-1.60	0.83 N	1.60 W
140.	0 40	N 70 W	139.98	-1.9	0.92 N	1.84 W
160.	0 35	N 63 W	159.98	-2.04	1.00 N	2.04 W
180.	0 30	N 50 W	179.98	-2.20	1.11 N	2.20 W
190.	0 30	N 67 W	189.98	-2.28	1.15 N	2.28 W

FINAL CLOSURE - DIRECTION: N 63 DEGS 7 MINS 13 SECS W
DISTANCE: 2.55 FEET

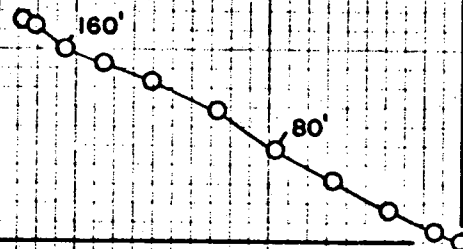
PLANT
NORTH



SCALE
1" = 1'

DEPTH -190'
NORTH -1.15'
WEST -2.28'

CLOSURE -2.55' N 63° 07' 13" W



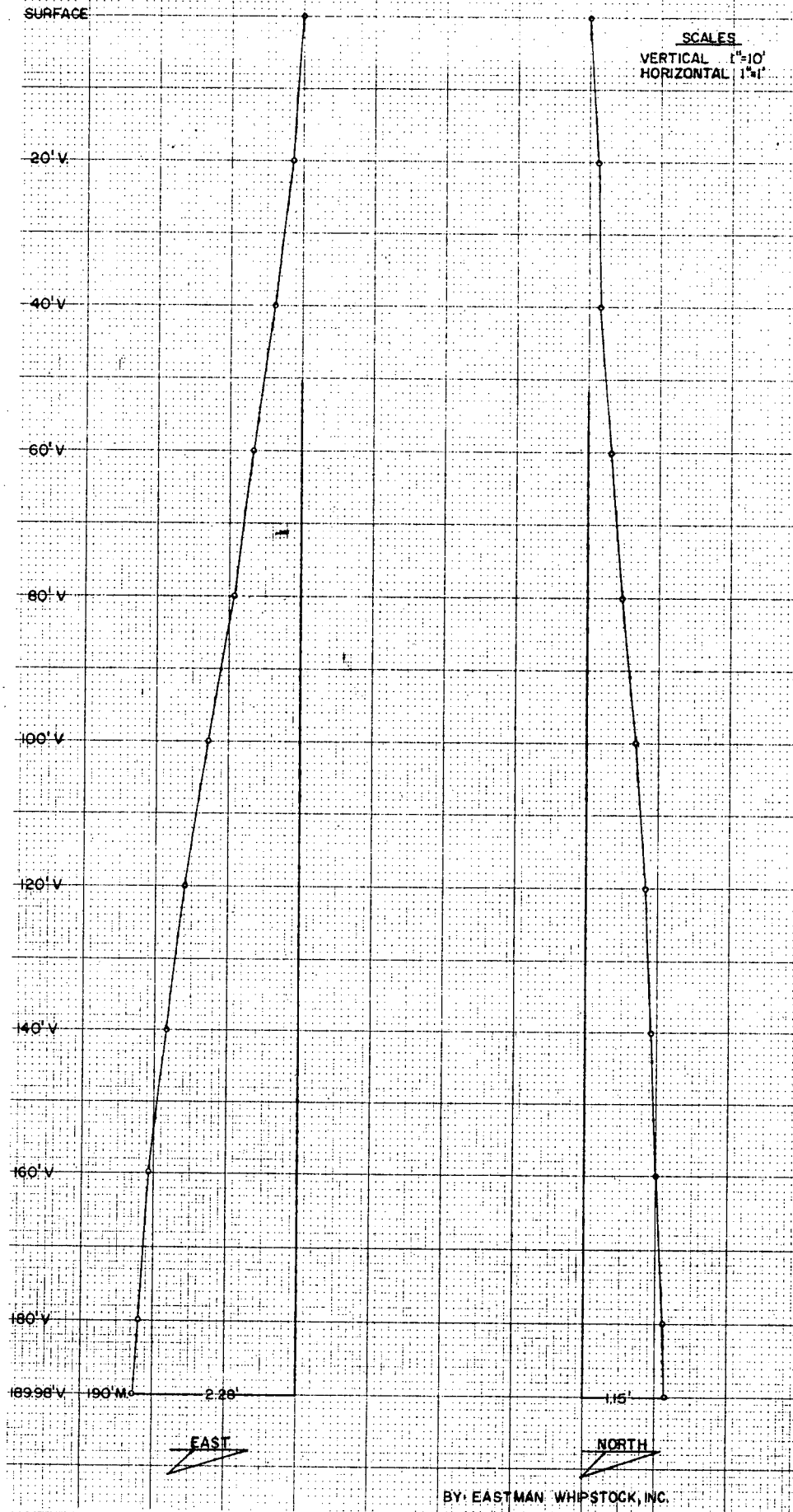
HOLE 6-B-4

JOB N° P-0678-G0858

SECTIONAL VIEW

HOLE 6-B-4

SCALES
VERTICAL 1"=10'
HORIZONTAL 1"=1'



BECHTEL POWER CORP.---- HOLE: 6-B-5A ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 14 JUNE 1978

JOB NO: P-0678-00875

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-16

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

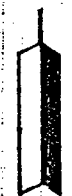
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	0 0	0	0.00	0.00	0.00	0.00
20.	0 15	N 14 E	20.00	0.01	0.04 N	0.01 E
40.	0 20	N 25 W	40.00	0.00	0.14 N	0.00 E
60.	0 25	N 38 W	60.00	-0.07	0.26 N	0.07 W
80.	0 20	N 70 W	80.00	-0.17	0.33 N	0.17 W
100.	0 5	N 32 W	100.00	-0.23	0.38 N	0.23 W
120.	0 10	N 23 W	120.00	-0.25	0.42 N	0.25 W
140.	0 10	N 3 E	140.00	-0.26	0.47 N	0.26 W
160.	0 5	N 17 E	160.00	-0.25	0.52 N	0.25 W
180.	0 10	N 20 W	180.00	-0.25	0.56 N	0.25 W
190.	0 15	N 18 W	190.00	-0.27	0.59 N	0.27 W

FINAL CLOSURE - DIRECTION: N 24 DEGS 3 MINS 43 SECS W
DISTANCE: 0.65 FEET

PLANT
NORTH

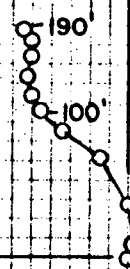


Eastman
Whitlock



SCALE
1" = 5'

DEPTH -190
NORTH -0.59'
WEST -0.27'
CLOSURE -0.65' N 24° 03' 43" W



HOLE: 6-B-5A

JOB N° P-0678-G0875

SECTIONAL VIEW

HOLE 6-B-5A

SURFACE

SCALE

VERTICAL 1"=20'
HORIZONTAL 1"=1'

20'

40'

60'

80'

100'

120'

140'

160'

180'

190'

190' M.D. 27' 0"

EAST

50' 0"

NORTH

BY EASTMAN WHIPSTOCK, INC.

BECHTEL POWER CORP. --- HOLE: 6-B-6 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 13 JUNE 1978
JOB NO: P-0678-G0872

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-15
PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

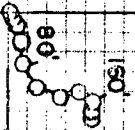
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	0 0	0	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W						
20.	0 10	N 68 E	20.00	0.03	0.01 N	0.03 E
40.	0 10	N 47 E	40.00	0.08	0.04 N	0.08 E
60.	0 20	N 89 E	60.00	0.16	0.07 N	0.16 E
80.	0 20	N 85 E	80.00	0.27	0.08 N	0.27 E
100.	0 25	N 39 E	100.00	0.39	0.14 N	0.39 E
120.	0 20	N 7 W	120.00	0.42	0.27 N	0.42 E
140.	0 15	N 16 W	140.00	0.40	0.37 N	0.40 E
160.	0 10	N 86 E	160.00	0.45	0.43 N	0.45 E
180.	0 10	S 74 E	180.00	0.50	0.42 N	0.50 E
190.	0 10	N 82 E	190.00	0.53	0.42 N	0.53 E

FINAL CLOSURE - DIRECTION: N 51 DEGS 48 MINS 14 SECS E
 DISTANCE: 0.68 FEET

PLANT
NORTH



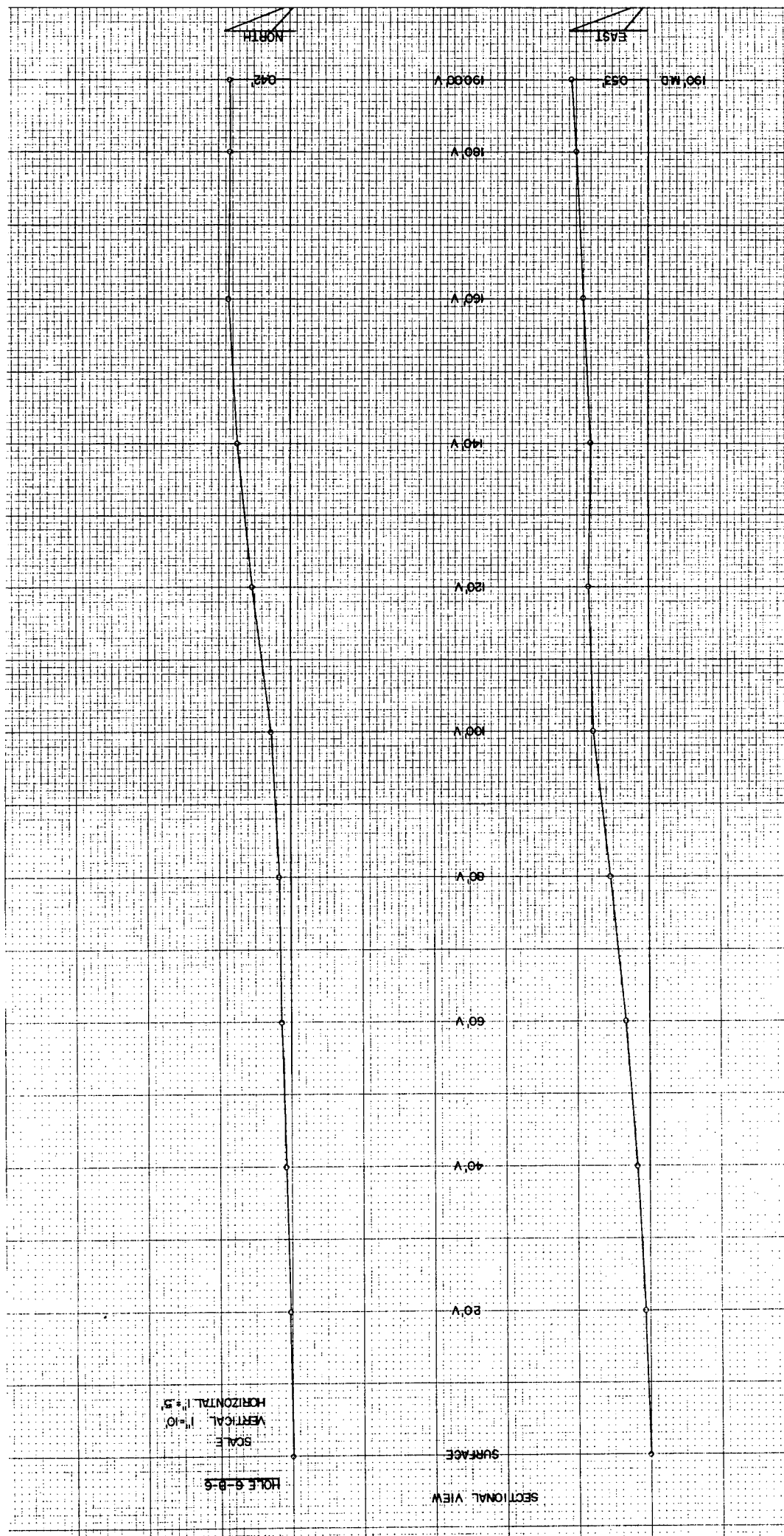
Chadwick
WH
DCK



DEPTH-190'
NORTH-0.42'
EAST -0.53'
CLOSURE-0.68' N 51° 49' 14" E

HOLE 6-B-6

JOB № P-0678-60872



BECHTEL POWER CORP.----- HOLE: 6-B-7 -----EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 23 JUNE 1978

JOB NO: P-0678-G0907

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: 18-20

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

20.	0 5	N 67 W	20.00	-0.01	0.01 N	0.01 W
40.	0 20	N 1 E	40.00	-0.05	0.07 N	0.05 W
60.	0 20	N 17 W	60.00	-0.07	0.18 N	0.07 W
80.	0 15	N 5 E	80.00	-0.08	0.28 N	0.08 W
100.	0 20	N 2 E	100.00	-0.07	0.38 N	0.07 W
120.	0 10	N 1 E	120.00	-0.07	0.47 N	0.07 W
140.	0 5	N 14 E	140.00	-0.07	0.52 N	0.07 W
160.	0 10	N 41 E	160.00	-0.05	0.55 N	0.05 W
180.	0 15	N 61 E	180.00	0.01	0.60 N	0.01 E
186.	0 10	N 55 E	186.00	0.03	0.61 N	0.03 E

FINAL CLOSURE - DIRECTION: N 2 DEGS 45 MINS 56 SECS E
DISTANCE: 0.61 FEET

PLANT
NORTH

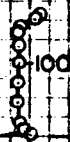


SCALE

1" = 1'

DEPTH-186'
NORTH-0.61'
EAST -0.03'

CLOSURE-0.61' N 2° 45' 56" E



HOLE: 6-B-7

JOB NO P-0678-G0907

SECTIONAL VIEW

SURFACE

HOLE: 6-B-7

SCALE
HORIZONTAL
VERTICAL

"= 1'
"= 10'

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

196' V

186' M.D. - 0.03'

WEST

0.61'

NORTH

BY: EASTMAN WHIPSTOCK

BECHTEL POWER CORP.--- HOLE: 6-B-8A ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 16 JUNE 1978

JOB NO: P-0678-G0884

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-17

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
20.	0 20	S 5 W	20.00	-0.01	0.06 S	0.01 W
40.	0 30	S 28 E	40.00	0.02	0.20 S	0.02 E
60.	0 20	S 3 E	60.00	0.06	0.34 S	0.06 E
80.	0 30	S 53 E	80.00	0.13	0.47 S	0.13 E
100.	0 35	S 53 E	100.00	0.28	0.58 S	0.28 E
120.	0 40	S 46 E	120.00	0.45	0.72 S	0.45 E
140.	0 40	S 22 E	139.99	0.58	0.92 S	0.58 E
160.	0 35	S 33 E	159.99	0.68	1.11 S	0.68 E
180.	0 20	S 19 E	179.99	0.75	1.25 S	0.75 E
190.	0 20	S 34 E	189.99	0.77	1.31 S	0.77 E

FINAL CLOSURE - DIRECTION: S 30 DEGS 40 MINS 2 SECS E
 DISTANCE: 1.52 FEET

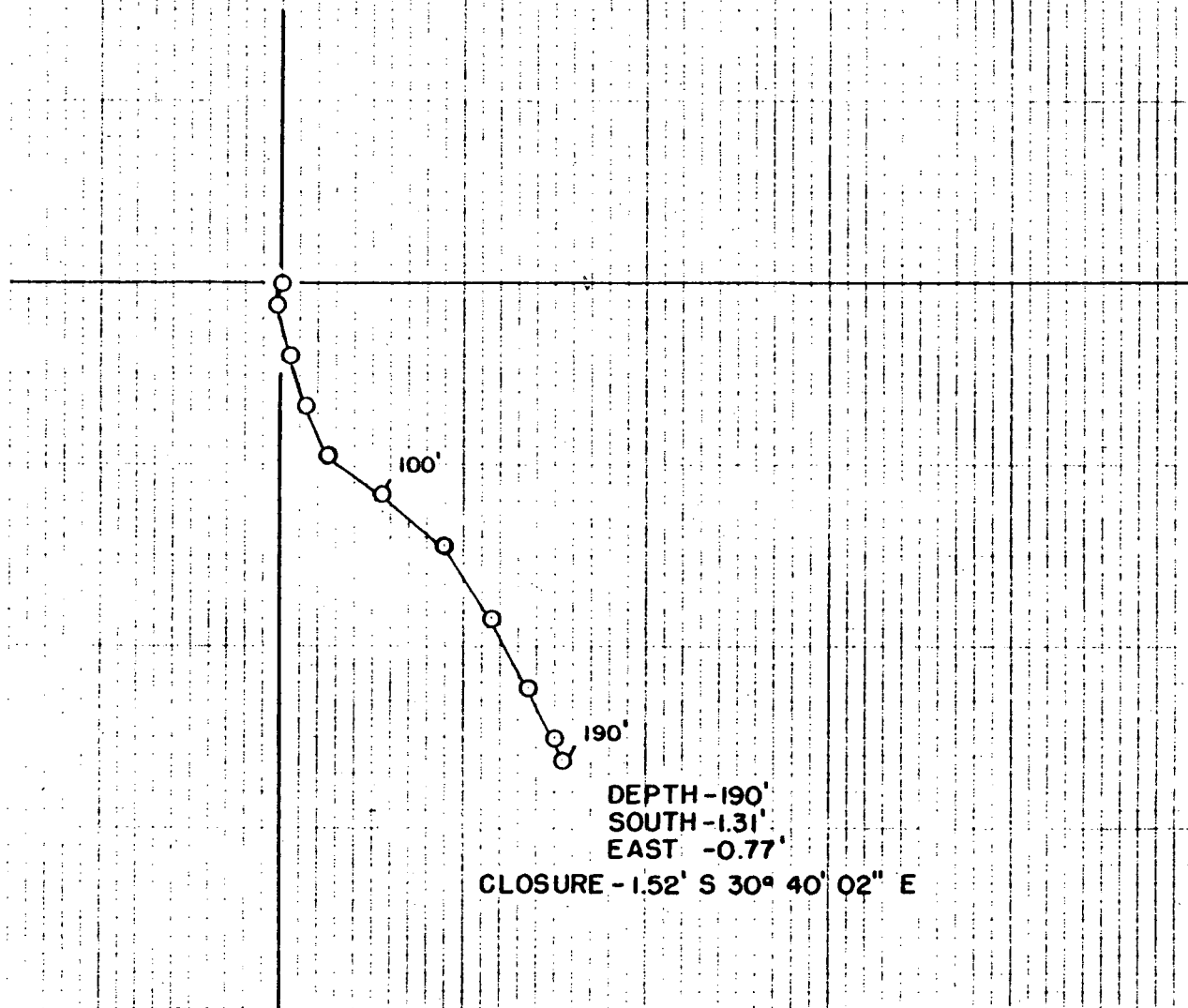
PLANT
NORTH



Eastman
Whipstock



SCALE
1" = .5'



HOLE: 6-B-8A

JOB N° P-067B-G0884

VERTICAL SECTION

HOLE: 6-B-8A

SURFACE

SCALE
VERTICAL 1"=10'
HORIZONTAL 1"=4'

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

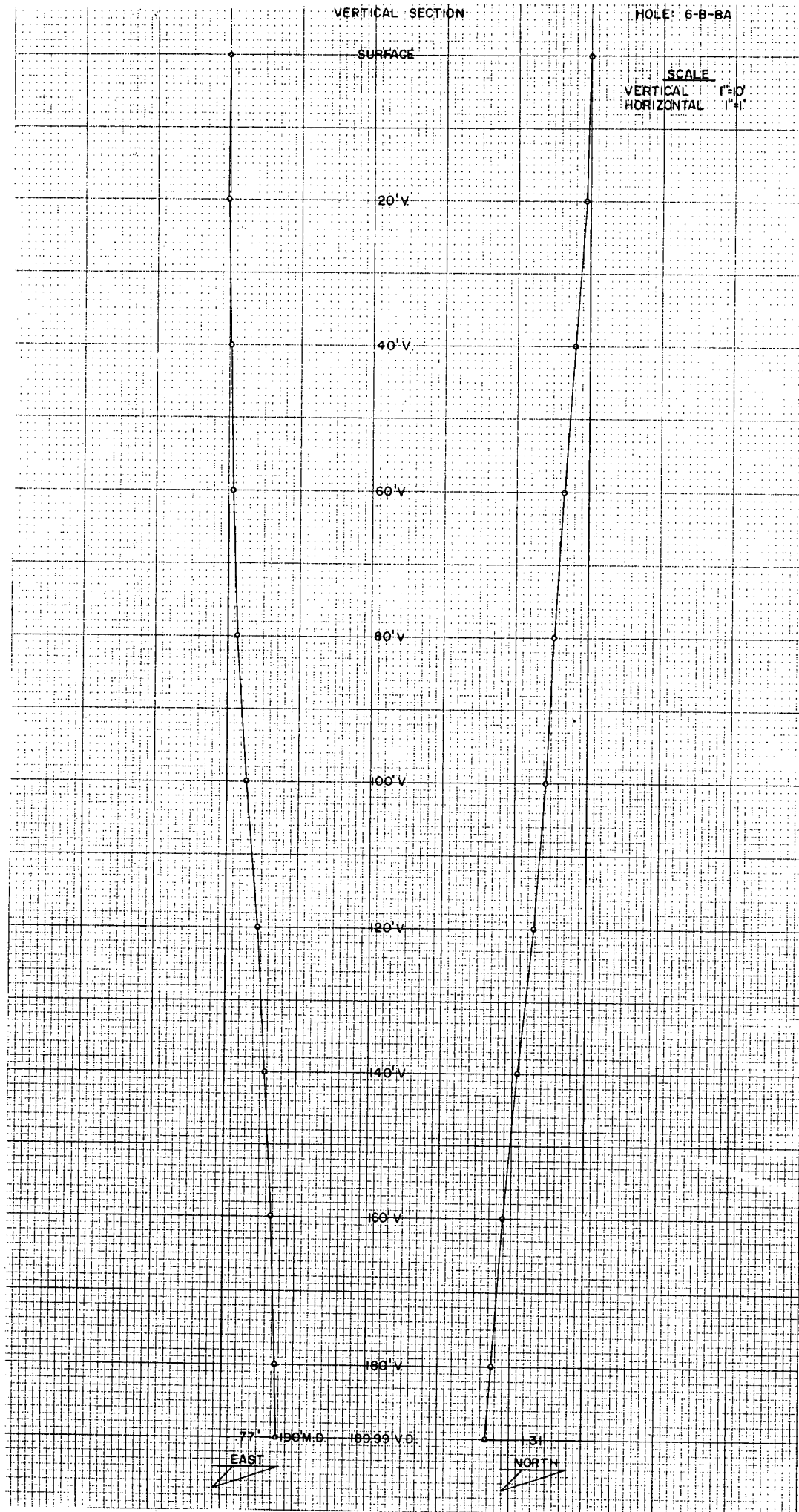
180' V

77' 4.90 M.O. 185.99 V.D.

EAST

NORTH

1.31'



BECHTEL POWER CORP.----- HOLE: 6-B-9 -----EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 21 JUNE 1978

JOB NO: P-0678-G0900

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-19

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W						
20.	0 15	N 74 W	20.00	-0.04	0.01 N	0.04 W
40.	0 30	N 86 W	40.00	-0.17	0.03 N	0.17 W
60.	0 30	S 73 W	60.00	-0.34	0.01 N	0.34 W
80.	0 30	S 82 W	80.00	-0.51	0.02 S	0.51 W
100.	0 30	N 88 W	100.00	-0.69	0.03 S	0.69 W
120.	0 30	S 81 W	120.00	-0.86	0.04 S	0.86 W
140.	0 30	S 75 W	140.00	-1.03	0.08 S	1.03 W
160.	0 25	S 88 W	160.00	-1.19	0.10 S	1.19 W
180.	0 30	N 89 W	179.99	-1.35	0.10 S	1.35 W
190.	0 35	S 80 W	189.99	-1.45	0.11 S	1.45 W

FINAL CLOSURE - DIRECTION: S 85 DEGS 35 MINS 57 SECS W
DISTANCE: 1.45 FEET

PLANT
NORTH



SCALE
1" = 5'

DEPTH-190'
SOUTH-0.11'
WEST -1.45'

CLOSURE-1.45' S 85° 35' 57" W



HOLE 6-B-9

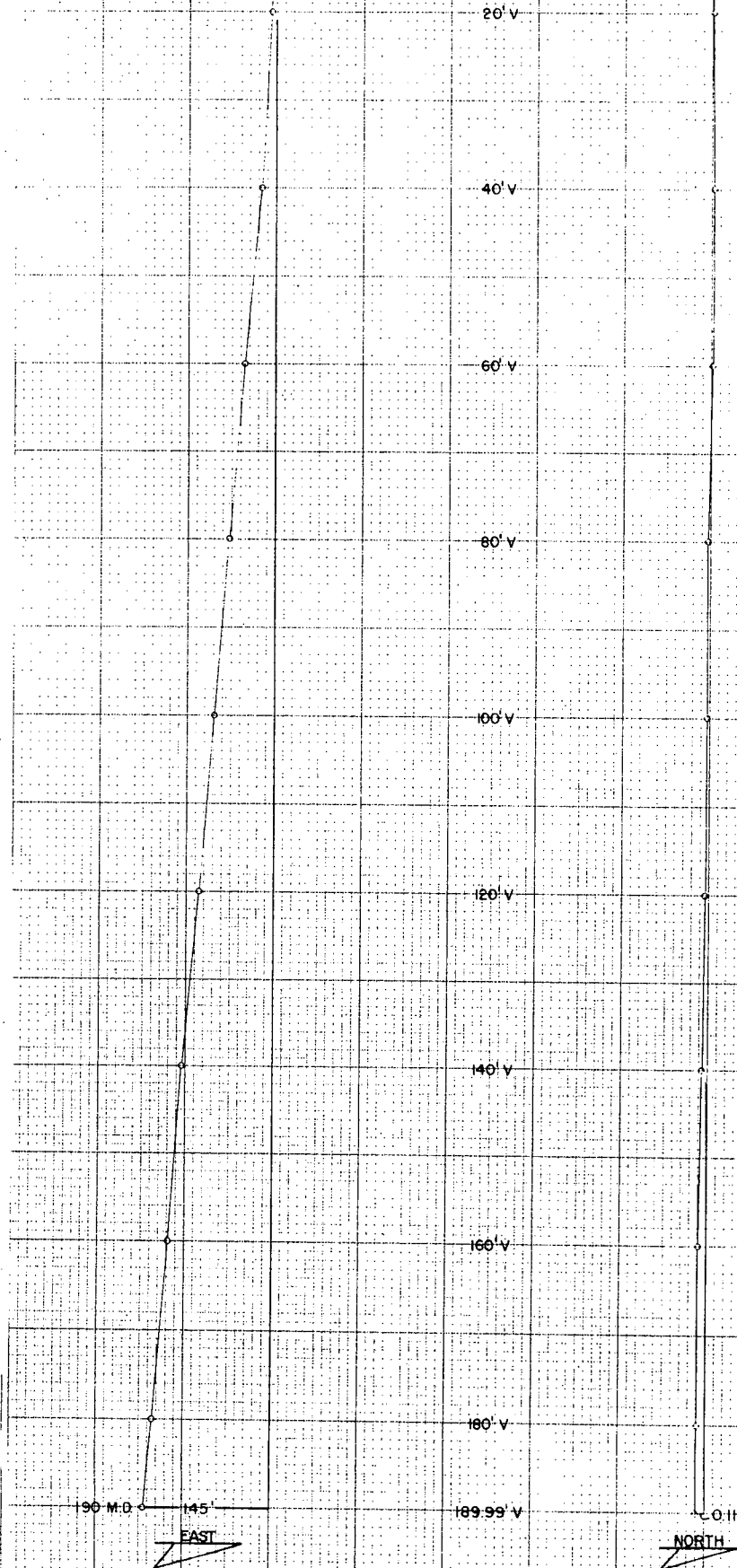
JOB № P-0678-G0900

SECTIONAL VIEW
SURFACE

HOLE N° 6-B-9

SCALE

VERTICAL 1"=10'
HORIZONTAL 1"=1'



BECHTEL POWER CORP.--- HOLE: 6-B-10 A ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 14 JULY 1978

JOB NO: F-0778-G0949

SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F131-17

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
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NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	0 10	S 76 E	20.00	0.03	0.01 S	0.03 E
40.	0 5	N 58 E	40.00	0.07	0.00 S	0.07 E
60.	0 5	S 84 E	60.00	0.10	0.01 N	0.10 E
80.	0 5	S 44 E	80.00	0.13	0.01 S	0.13 E
100.	0 10	S 80 E	100.00	0.16	0.03 S	0.16 E
120.	0 15	S 60 E	120.00	0.23	0.05 S	0.23 E
140.	0 10	S 63 E	140.00	0.30	0.09 S	0.30 E
160.	0 15	S 89 E	160.00	0.37	0.10 S	0.37 E
180.	0 20	N 78 E	180.00	0.47	0.09 S	0.47 E
190.	0 20	N 81 E	190.00	0.53	0.08 S	0.53 E

FINAL CLOSURE - DIRECTION: S 80 DEGS 57 MINS 8 SECS E
 DISTANCE: 0.53 FEET

PLANT
NORTH



SCALE
1" = 5'



DEPTH - 190'
SOUTH - 0.08'
EAST - 0.53'

CLOSURE - 0.53' S 80° 57' 06" E

HOLE: 6-B-10 A

JOB N° P-0778-60949

SECTIONAL VIEW

HOLE N° 6-B-10A

SURFACE

SCALE

VERTICAL 1"=10'
HORIZONTAL 1"=1'

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

190' V

190' M.D. G53°

0-00'

EAST

NORTH

BECHTEL POWER CORP.--- HOLE: 6-B-11 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 12 JULY 1978
JOB NO: P-0778-G0942
SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F131-17
PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
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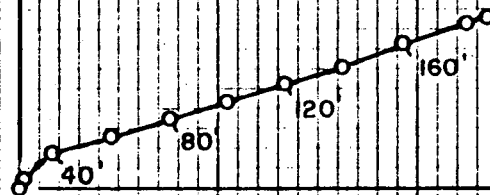
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

20.	0 20	N 23 E	20.00	0.02	0.05 N	0.02 E
40.	0 50	N 71 E	40.00	0.17	0.19 N	0.17 E
60.	0 55	N 78 E	60.00	0.47	0.27 N	0.47 E
80.	0 50	N 74 E	79.99	0.76	0.35 N	0.76 E
100.	0 50	N 74 E	99.99	1.04	0.43 N	1.04 E
120.	0 50	N 74 E	119.99	1.32	0.51 N	1.32 E
140.	0 55	N 70 E	139.99	1.61	0.60 N	1.61 E
160.	0 55	N 72 E	159.99	1.91	0.71 N	1.91 E
180.	1 5	N 72 E	179.98	2.25	0.81 N	2.25 E
185.	1 20	N 71 E	184.98	2.35	0.85 N	2.35 E

FINAL CLOSURE - DIRECTION: N 70 DEGS 7 MINS 38 SECS E
DISTANCE: 2.50 FEET



DEPTH - 185'
NORTH - 0.85'
EAST - 2.35'
CLOSURE - 2.50' N 70° 07' 38" E



WELL: 6-B-II

JOB N° P-0778-G0942

SURFACE

HOLE: 6-8-11

SCALES

VERTICAL 1"=10'
HORIZONTAL 1"=1'

VERTICAL SECTION

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

185' V

184.98' V.D.

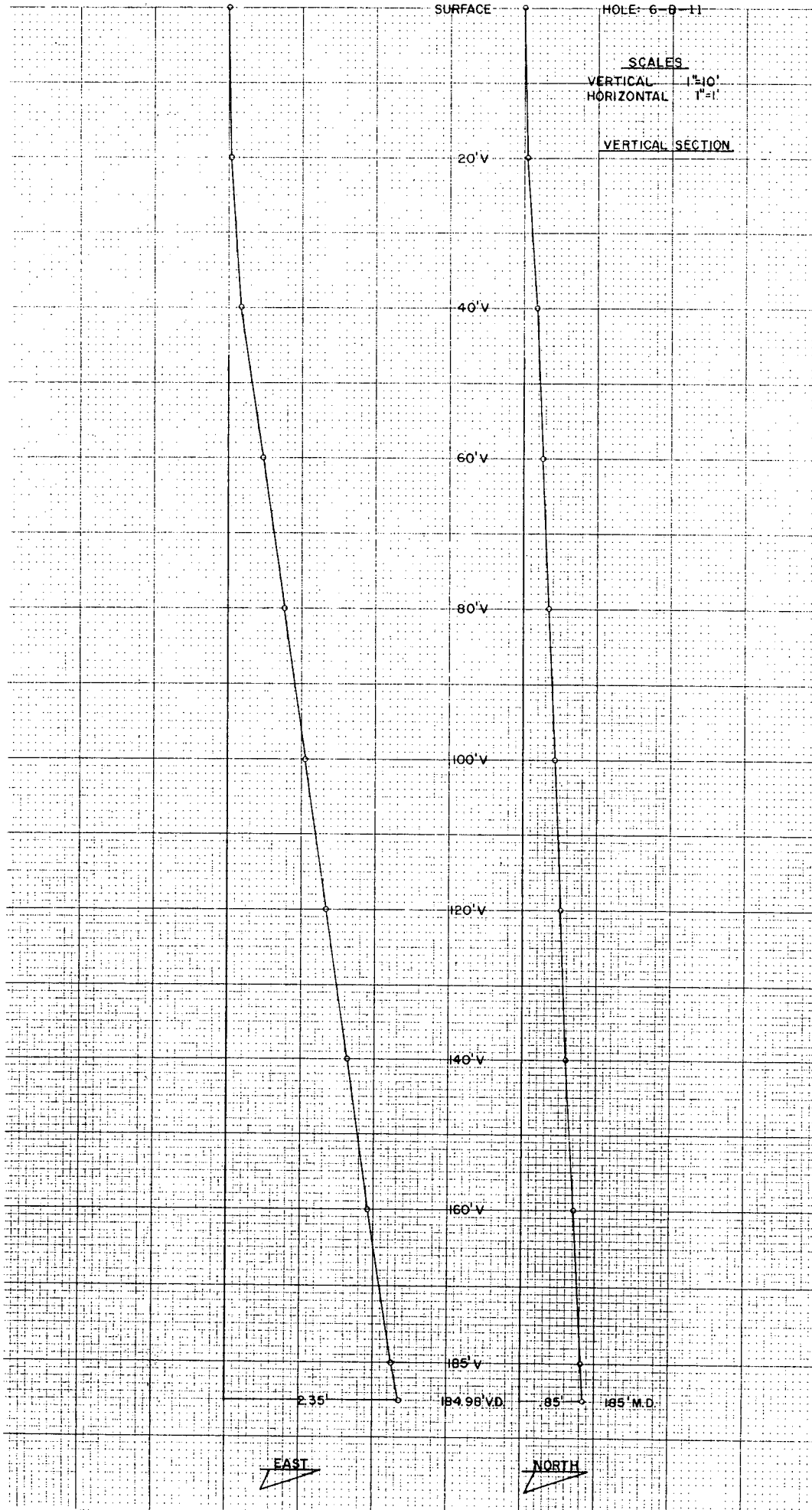
185'

185' M.D.

2.35'

EAST

NORTH



BECHTEL POWER CORP. --- HOLE: 6-B-12 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 19 JUNE 1978

JOB NO: P-0678-G0894

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F18-18

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W						
20.	0 10	N 18 E	20.00	0.01	0.03 N	0.01 E
40.	0 25	N 18 E	40.00	0.04	0.12 N	0.04 E
60.	0 20	N 16 W	60.00	0.04	0.26 N	0.04 E
80.	0 20	N 11 W	80.00	0.02	0.37 N	0.02 E
100.	0 10	N 5 E	100.00	0.01	0.46 N	0.01 E
120.	0 15	N 20 E	120.00	0.03	0.53 N	0.03 E
140.	0 25	N 6 W	140.00	0.04	0.64 N	0.04 E
160.	0 30	N 16 W	160.00	0.01	0.80 N	0.01 E
180.	0 25	N 20 W	180.00	-0.04	0.95 N	0.04 W
190.	0 15	N 19 W	190.00	-0.06	1.01 N	0.06 W

FINAL CLOSURE - DIRECTION:
DISTANCE:

N 3 DEGS 19 MINS 31 SECS W
1.01 FEET

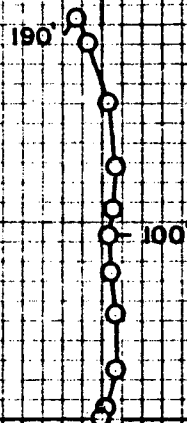
PLANT
NORTH



SCALE
1" = 5'

DEPTH - 190'
NORTH - 1.01'
WEST - 0.06'

CLOSURE - 1.01' N 3° 19' 31" W



HOLE 6-8-12

JOB N° P-0678-60894

SECTIONAL VIEW

HOLE 6-B-12

SURFACE

SCALE
VERTICAL 1"=10'
HORIZONTAL 1"=1'

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

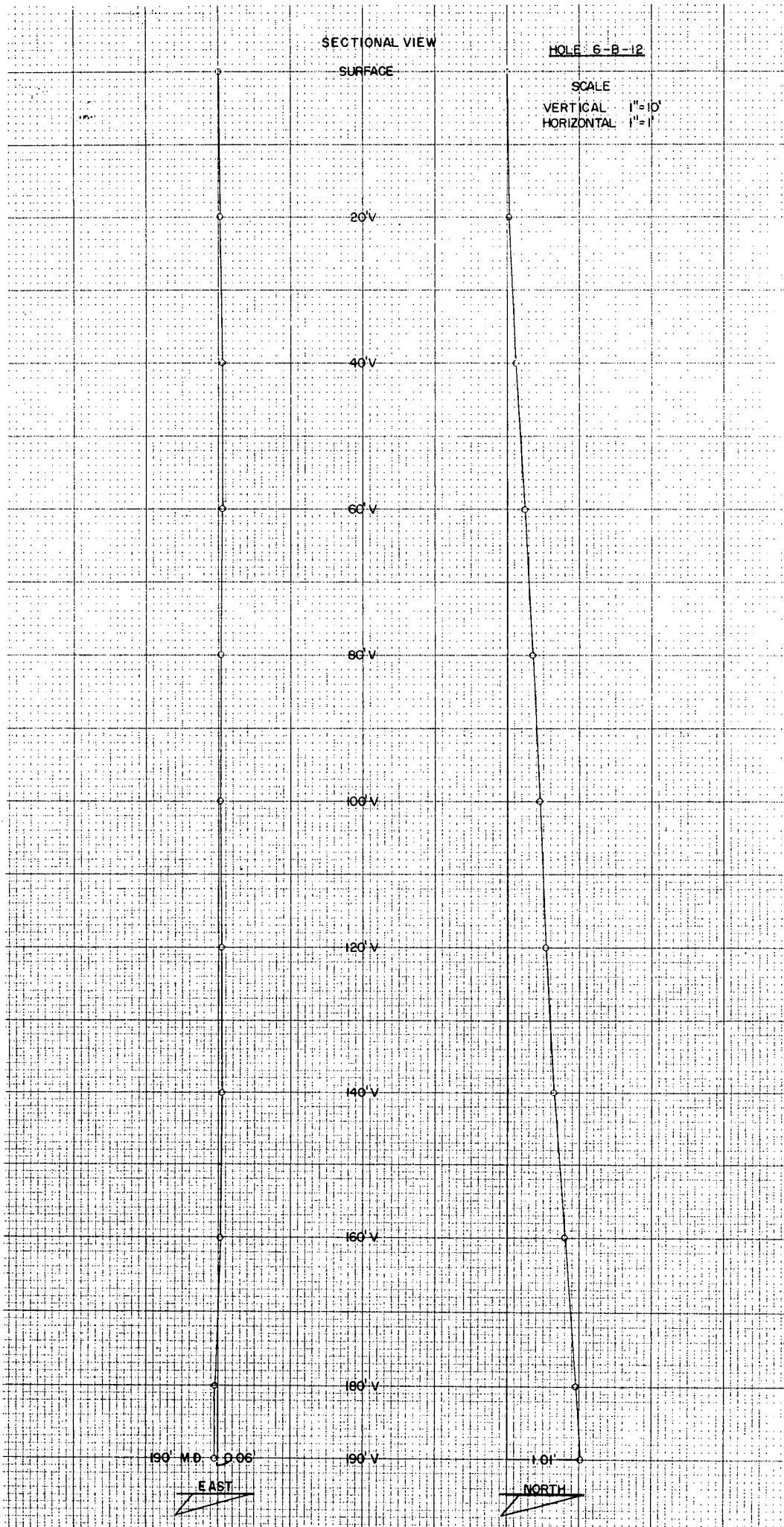
190' V

190' M.D. 0.06

EAST

1.01'

NORTH



BECHTEL POWER CORP. --- HOLE: 6-B-13 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 11 JULY 1978
JOB NO: P--0778-G0938

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F131-16
PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

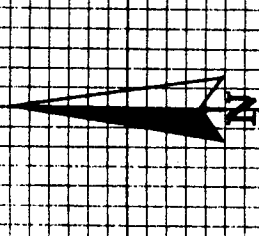
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
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0.	0 0	0	0.00	0.00	0.00	0.00
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NORTH FOR THIS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

20.	0 40	N 44 E	20.00	0.08	0.08 N	0.08 E
40.	0 40	N 46 E	40.00	0.25	0.25 N	0.25 E
60.	0 45	N 38 E	60.00	0.41	0.43 N	0.41 E
80.	0 45	N 30 E	80.00	0.56	0.65 N	0.56 E
100.	0 50	N 32 E	99.99	0.70	0.89 N	0.70 E
120.	0 50	N 27 E	119.99	0.84	1.14 N	0.84 E
138.	0 50	N 33 E	137.99	0.97	1.37 N	0.97 E

FINAL CLOSURE - DIRECTION: N 35 DEGS 29 MINS 6 SECS E
DISTANCE: 1.68 FEET

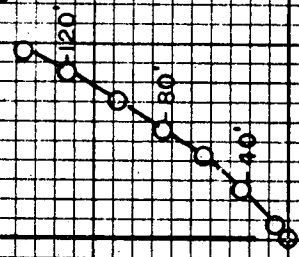


Eastman
Whitlock



SCALE
1" = 20'

DEPTH - 138'
NORTH - 1.37'
EAST - 0.97'
CLOSURE - 1.68' N 35° 29' 06" E



SURFACE

HOLE: 6-B-13

SCALES:
VERTICAL 1"=10'
HORIZONTAL 1"=11'

VERTICAL SECTION

20' V

40' V

60' V

80' V

100' V

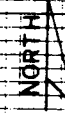
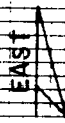
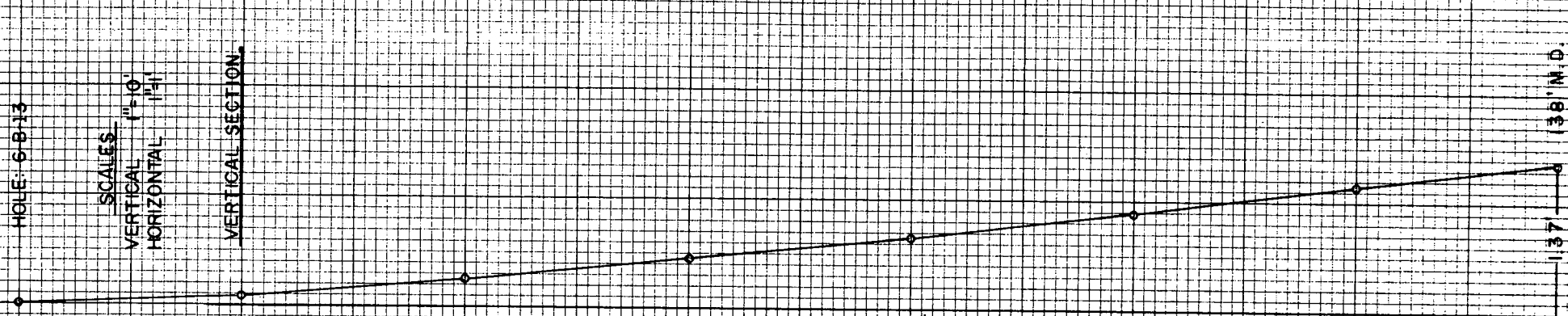
120' V

137.99' V.D.

EAST

NORTH

137.99' W.D.



BECHTEL POWER CORP. --- HOLE: 6-B-14 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 27 JUNE 1978

JOB NO: P-0678-G0912

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F131-12

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

ANGLE AVERAGING METHOD

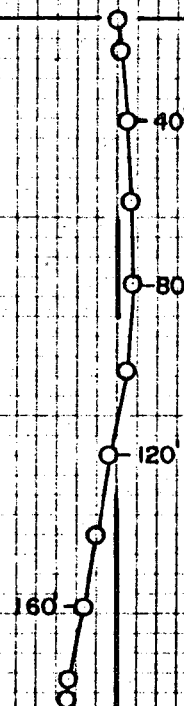
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	R E C T A N G U L A R C O O R D I N A T E S FEET	
0.	0 0	0	0.00	0.00	0.00	0.00
20.	0 55	S 3 E	20.00	0.01	0.16 S	0.01 E
40.	1 5	S 7 E	40.00	0.04	0.51 S	0.04 E
60.	1 15	S 4 E	59.99	0.08	0.91 S	0.08 E
80.	1 10	S 2 W	79.99	0.09	1.33 S	0.09 E
100.	1 20	S 7 W	99.98	0.05	1.77 S	0.05 E
120.	1 10	S 11 W	119.98	-0.02	2.20 S	0.02 W
140.	1 10	S 12 W	139.97	-0.10	2.60 S	0.10 W
160.	1 0	S 9 W	159.97	-0.17	2.97 S	0.17 W
180.	1 0	S 7 W	179.97	-0.22	3.32 S	0.22 W
186.	1 0	S 10 W	185.97	-0.23	3.42 S	0.23 W

FINAL CLOSURE - DIRECTION: S 3 DEGS 52 MINS 16 SECS W
DISTANCE: 3.43 FEET



SCALE
1" = 1'

DEPTH -186'
SOUTH -3.42'
WEST -0.23'
CLOSURE -3.43' S 3° 52' 16" W



HOLE: 6-B-14

JOB N° P-0678-G0912

HOLE: 6-B-14

SURFACE

SCALES
VERTICAL 1"=10'
HORIZONTAL 1"=1'

VERTICAL SECTION

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

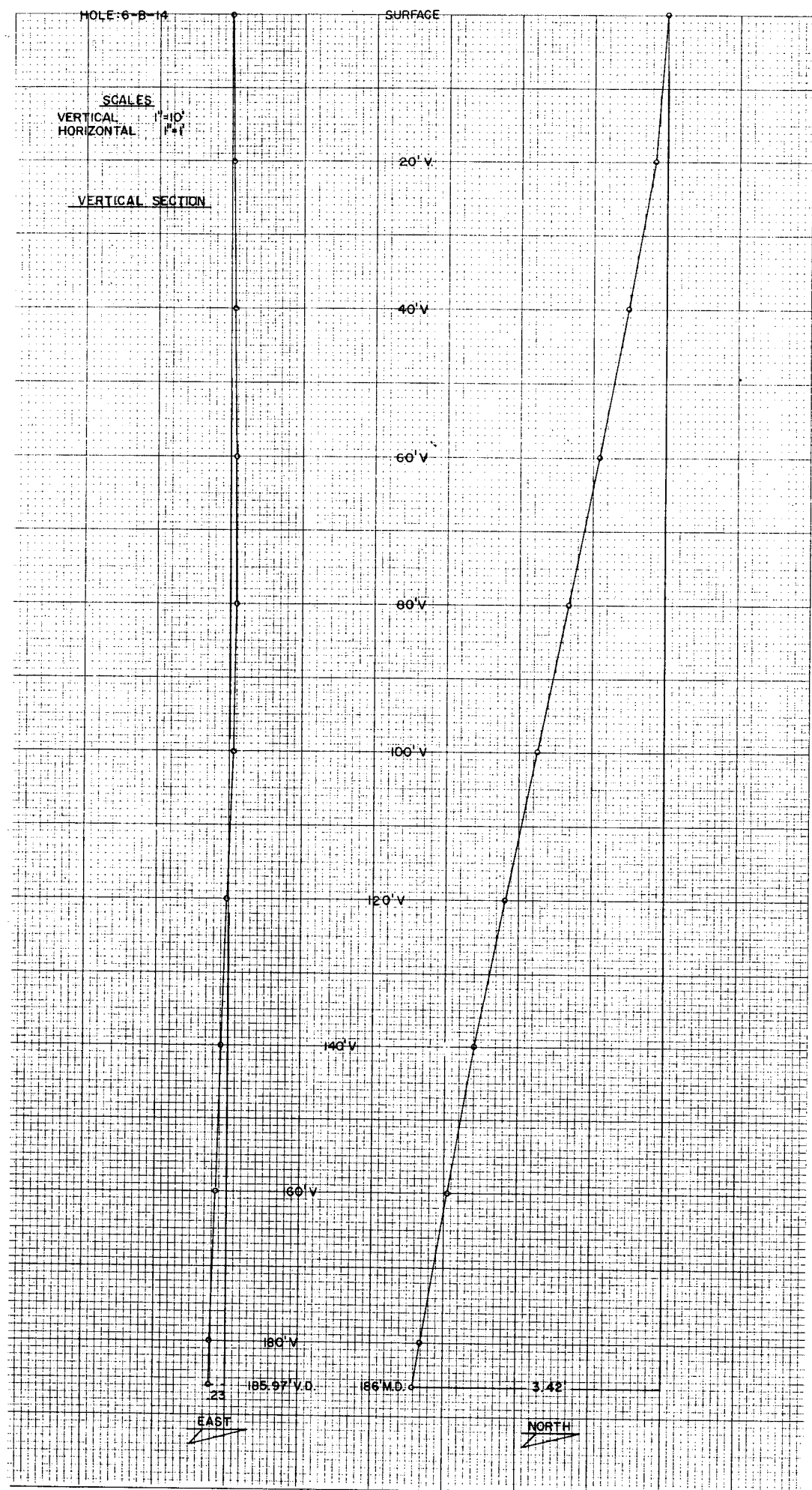
185.97' V.D.

186' M.D.

3.42'

EAST

NORTH



BECHTEL POWER CORP. --- HOLE: 6-B-15 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 29 JUNE 1978

JOB NO: P-0678-G0918

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F131:13

PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

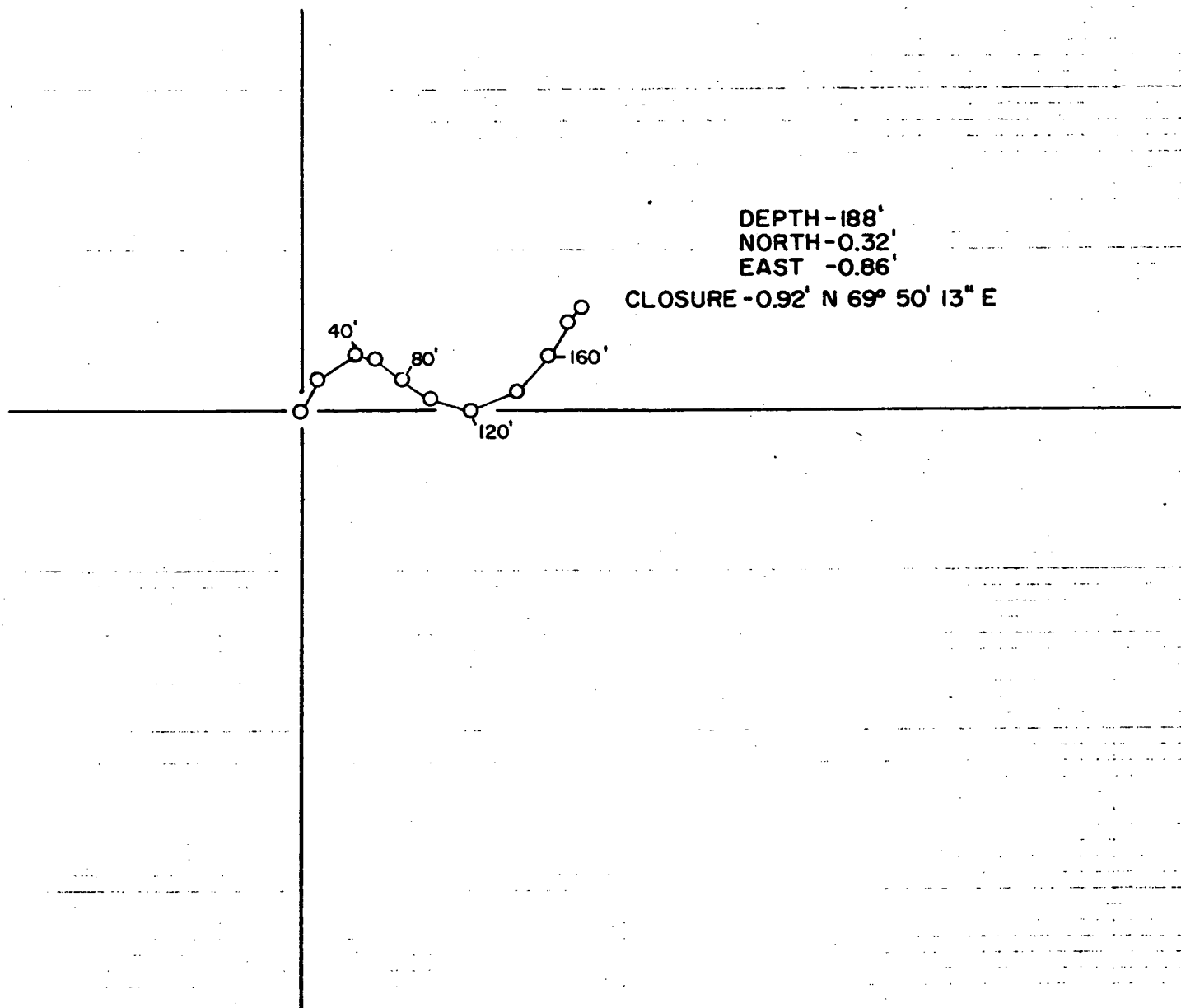
ANGLE AVERAGING METHOD

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.	0 0	0	0.00	0.00	0.00	0.00
20.	0 40	N 28 E	20.00	0.05	0.10 N	0.05 E
40.	0 5	N 81 E	40.00	0.16	0.18 N	0.16 E
60.	0 20	S 48 E	60.00	0.23	0.16 N	0.23 E
80.	0 15	S 58 E	80.00	0.31	0.10 N	0.31 E
100.	0 20	S 59 E	100.00	0.40	0.04 N	0.40 E
120.	0 25	S 86 E	120.00	0.52	0.00 N	0.52 E
140.	0 25	N 42 E	140.00	0.66	0.06 N	0.66 E
160.	0 25	N 41 E	160.00	0.76	0.17 N	0.76 E
180.	0 20	N 20 E	180.00	0.82	0.28 N	0.82 E
188.	0 25	N 75 E	188.00	0.86	0.32 N	0.86 E

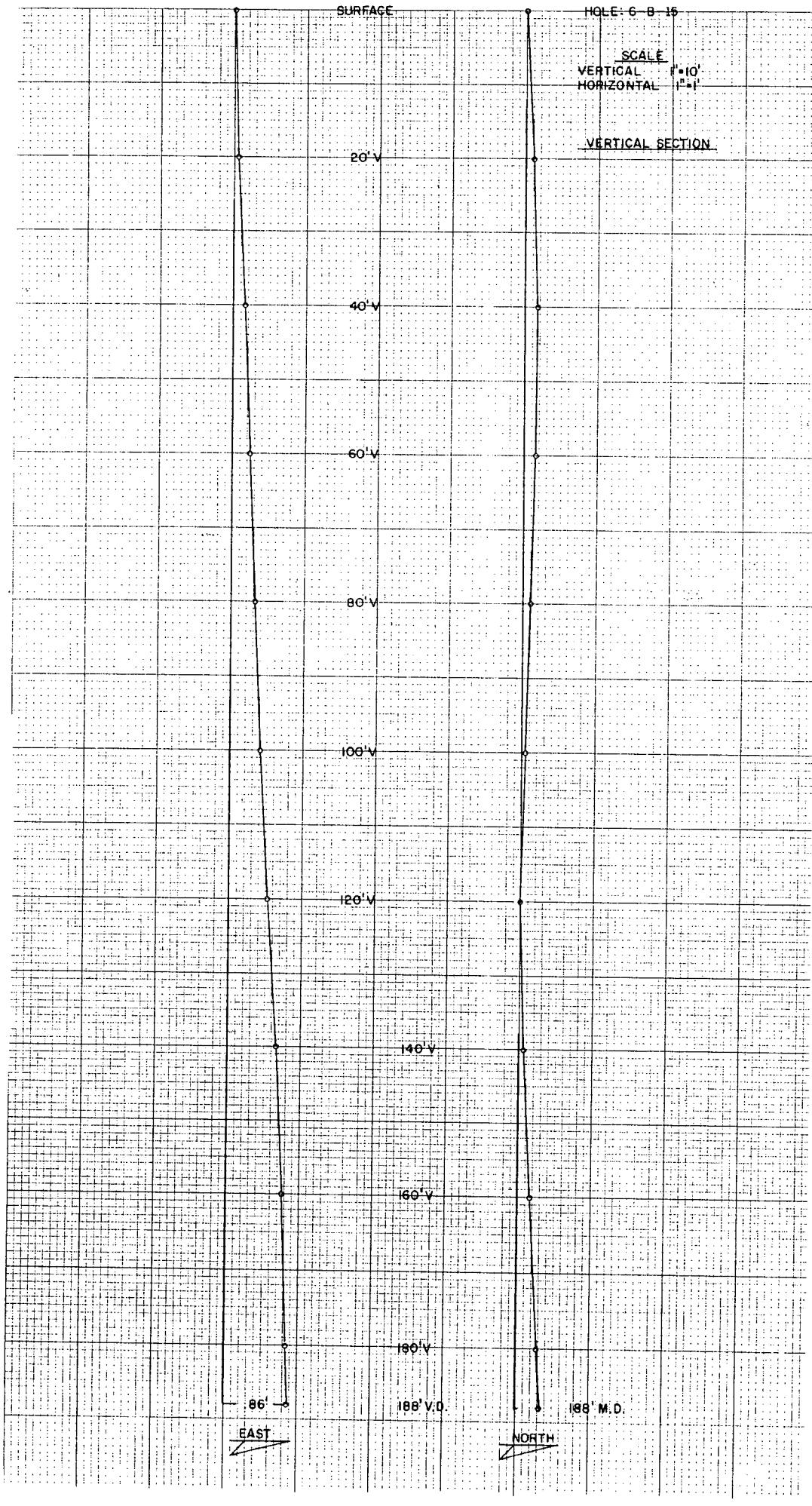
FINAL CLOSURE - DIRECTION: N 69 DEGS 50 MINS 13 SECS E
DISTANCE: 0.92 FEET



SCALE
1" = .5'



JOB N° P-0678-G0918



BECHTEL POWER CORP. --- HOLE: 6-B-16 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 20 JULY 1978
JOB NO: P-0778;G0966
SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F131-19
PIIT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00	0.00

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

20.	0 20	N 7 W	20.00	-0.01	0.06 N	0.01 W
40.	0 20	N 4 W	40.00	-0.02	0.17 N	0.02 W
60.	0 25	N 9 W	60.00	-0.03	0.30 N	0.03 W
80.	0 25	N 16 E	80.00	-0.02	0.45 N	0.02 W
100.	0 30	N 22 E	100.00	0.03	0.60 N	0.03 E
120.	0 35	N 26 E	120.00	0.10	0.77 N	0.10 E
140.	0 35	N 26 E	140.00	0.19	0.96 N	0.19 E
160.	0 35	N 22 E	160.00	0.28	1.14 N	0.28 E
180.	0 35	N 19 E	179.99	0.35	1.33 N	0.35 E
182.	0 35	N 19 E	181.99	0.35	1.35 N	0.35 E

FINAL CLOSURE - DIRECTION: N-14 DEGS 42 MINS 27 SECS E
DISTANCE: 1.40 FEET

PLANT
NORTH

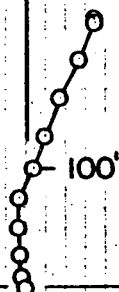


Eastman
Whipstock



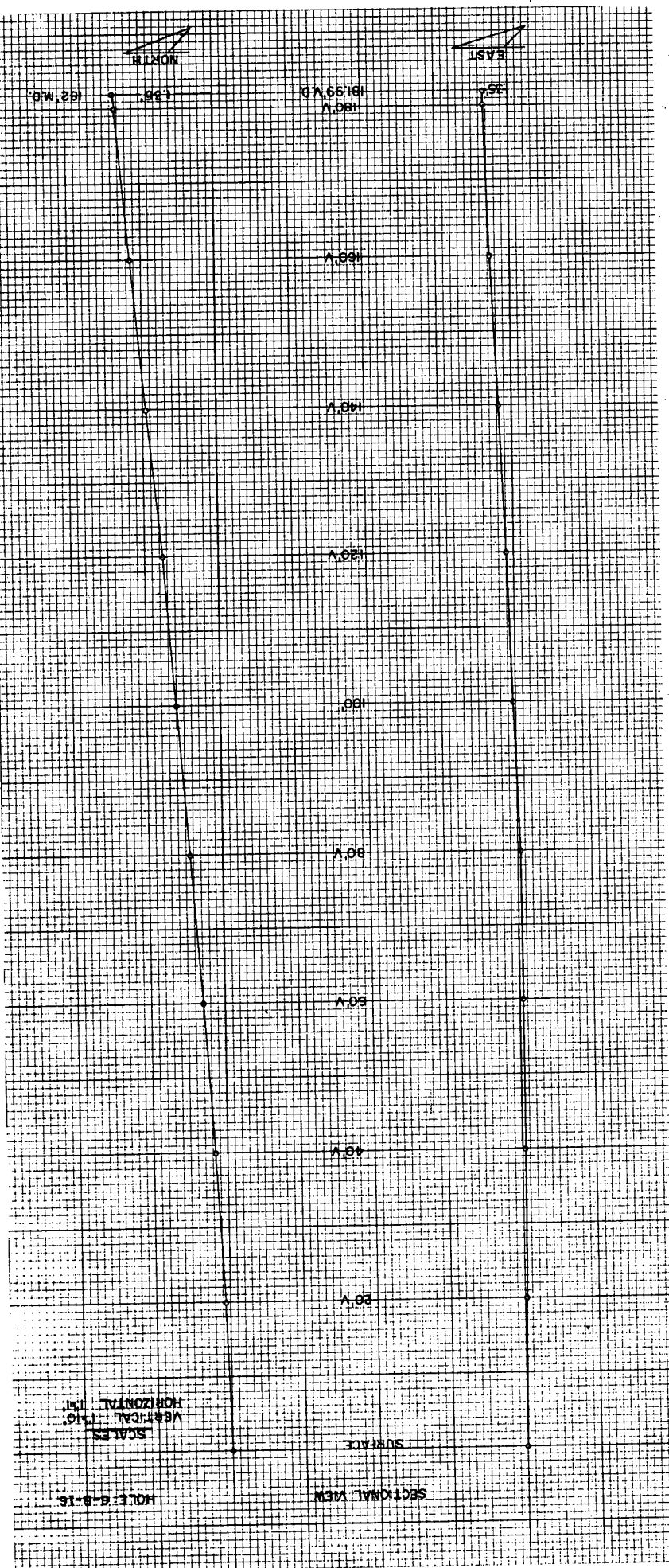
SCALE
1" = 1'

DEPTH-182'
NORTH-1.35'
EAST -0.35'
CLOSURE-1.40' N 14° 42' 27" E



HOLE: 6-B-16

JOB N° P-0778-G0966



BECHTEL POWER CORP.--- HOLE: 6-B-17 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 21 JULY 1978
JOB NO: P-0779-G0970

GYRO MULTI-SHOT SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F131-20
PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

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.	0 0	0	0.00	0.00	0.00 0.00

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

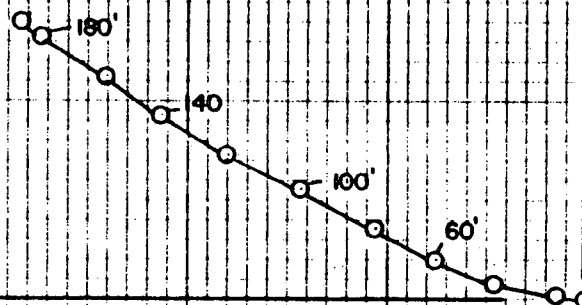
20.	0 25	N 83 W	20.00	-0.07	0.01 N 0.07 W
40.	0 30	N 71 W	40.00	-0.23	0.04 N 0.23 W
60.	0 25	N 70 W	60.00	-0.38	0.10 N 0.38 W
80.	0 35	N 52 W	80.00	-0.53	0.18 N 0.53 W
100.	0 35	N 70 W	100.00	-0.71	0.28 N 0.71 W
120.	0 35	N 62 W	120.00	-0.90	0.36 N 0.90 W
140.	0 30	N 54 W	139.99	-1.06	0.46 N 1.06 W
160.	0 30	N 60 W	159.99	-1.20	0.56 N 1.20 W
180.	0 35	N 54 W	179.99	-1.36	0.66 N 1.36 W
186.	0 40	N 56 W	185.99	-1.41	0.70 N 1.41 W

FINAL CLOSURE - DIRECTION: N 63 DEGS 39 MINS 55 SECS W
DISTANCE: 1.58 FEET



SCALE
1" = 5'

DEPTH - 186'
NORTH - 0.70'
WEST - 1.41'
CLOSURE - 1.58' N 63° 39' 55" W



HOLE: 6-B-17

JOB NO P-0779-G0970

SURFACE

HOLE: G-B-17

SCALES:
VERTICAL 1"=0'
HORIZONTAL 1"=1'

VERTICAL SECTION

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

185.99' M.D.

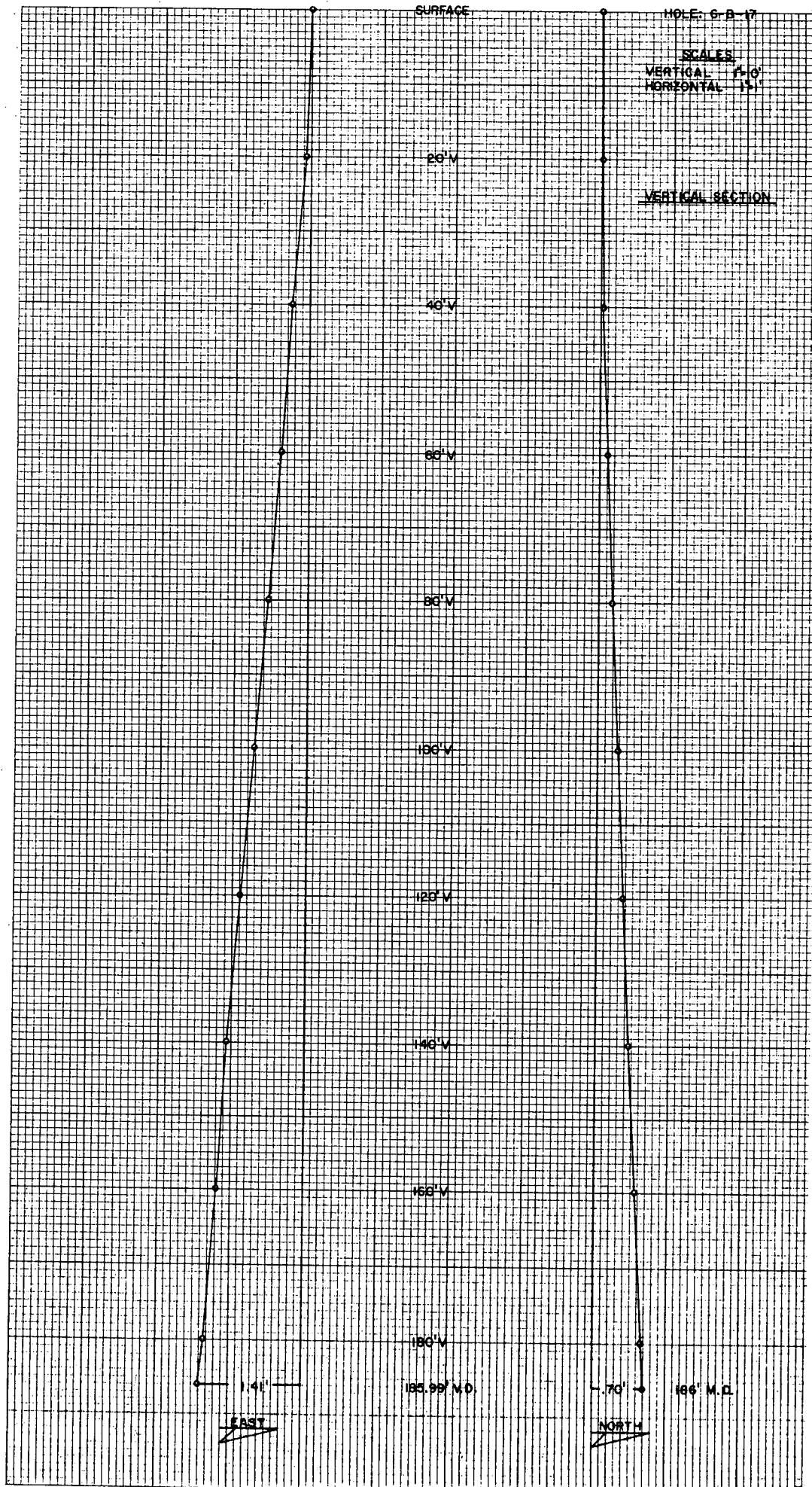
170' V

166' M.D.

1.46'

EAST

NORTH



BECHTEL POWER CORP.,--- HOLE: 6-B-18 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 23 JULY 1978
JOB NO: P-0778-G0972
SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F133-1
PITT

PLANE OF PROPOSED DIRECTION IS N 90 DEG. 0 MIN. E

RECORD OF SURVEY

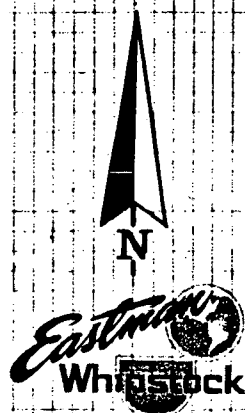
ANGLE AVERAGING METHOD

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.	0 0	0	0.00	0.00	0.00	0.00

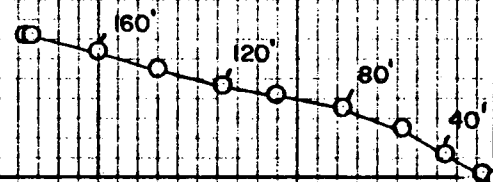
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W

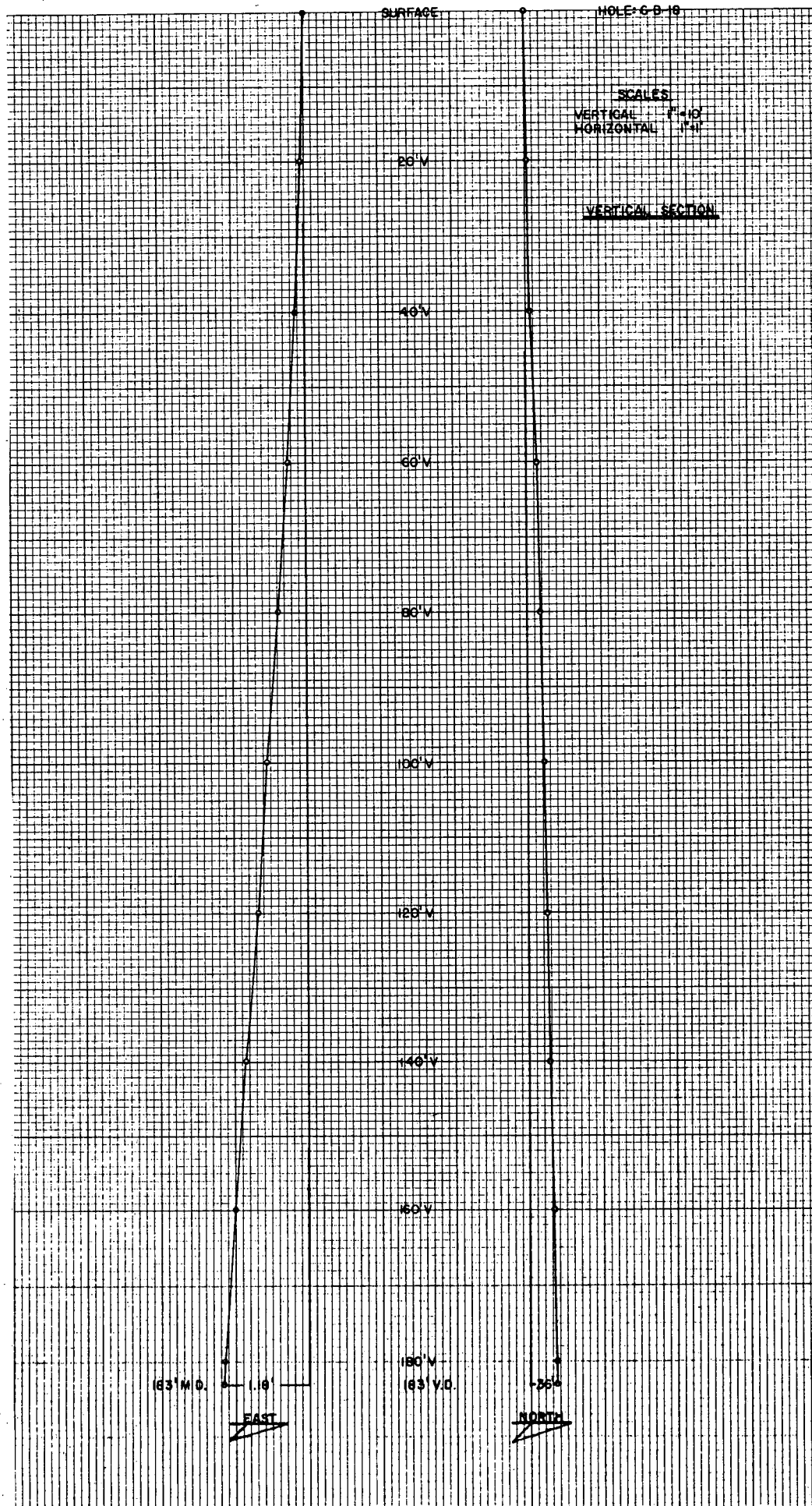
20.	0 15	N 72 W	20.00	-0.04	0.01 N	0.04 W
40.	0 20	N 51 W	40.00	-0.13	0.06 N	0.13 W
60.	0 25	N 64 W	60.00	-0.24	0.13 N	0.24 W
80.	0 30	N 79 W	80.00	-0.39	0.18 N	0.39 W
100.	0 25	N 82 W	100.00	-0.55	0.21 N	0.55 W
120.	0 25	N 75 W	120.00	-0.69	0.24 N	0.69 W
140.	0 30	N 76 W	140.00	-0.85	0.28 N	0.85 W
160.	0 25	N 76 W	160.00	-1.00	0.32 N	1.00 W
180.	0 30	N 76 W	180.00	-1.16	0.36 N	1.16 W
183.	0 30	N 76 W	183.00	-1.18	0.36 N	1.18 W

FINAL CLOSURE - DIRECTION: N 72 DEGS 59 MINS 8 SECS W
DISTANCE: 1.24 FEET



DEPTH-183'
NORTH-0.36'
WEST -1.18'
CLOSURE- 1.24' N 72°59'08" W





BECHTEL POWER CORP. --- HOLE: 6-8-20 ---EASTMAN GYRO MULTI-SHOT SURVEY
SAN ONOFRE POWER PLANT

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

DATE: 9 OCTOBER 1978
JOB NO: P-1078-G0101
GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.
FILE: F135-17
PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY.

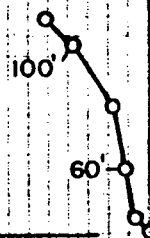
ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET	
0.	0 0	0	0.00	0.00	0.00	0.00
NORTH FOR THIS SURVEY IS "PLANT NORTH", N 57 00 W						
20.	0 5	N 63 W	20.00	0.01	0.01 N	0.01 W
40.	0 30	N 18 W	40.00	0.11	0.08 N	0.08 W
60.	0 50	N 2 W	60.00	0.33	0.31 N	0.12 W
80.	1 5	N 23 W	80.00	0.66	0.64 N	0.19 W
100.	1 0	N 38 W	99.99	1.02	0.95 N	0.38 W
110.	1 10	N 49 W	109.99	1.20	1.09 N	0.51 W

FINAL CLOSURE - DIRECTION: N 24 DEGS 55 MINS 21 SECS W
 DISTANCE: 1.20 FEET



DEPTH-110'
NORTH -1.09'
WEST -0.51'
CLOSURE -1.20' N 24°55' 21" W



HOLE 6-B-20

JOB № P-1078-G0101

SURFACE

HOLE 6-B-20

SCALE 1"=10'

20' V

VERTICAL SECTION

40' V

60' V

80' V

100' V

110' MD0.51' W

109.99' V

109' N

EAST

NORTH

BY EASTMAN WHIPSTOCK, INC.

BECHTEL POWER CORP. --- HOLE: 6-B-21 --- EASTMAN GYRO MULTI-SHOT SURVEY
SAN GONDORE POWER PLANT

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

DATE: 12 OCTOBER 1978

JOB NO: P-1078-G0103

GYRO SURVEY BY: ERASTMAN WHIPSTOCK, INC.

FILE: F135-19

PITT

VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

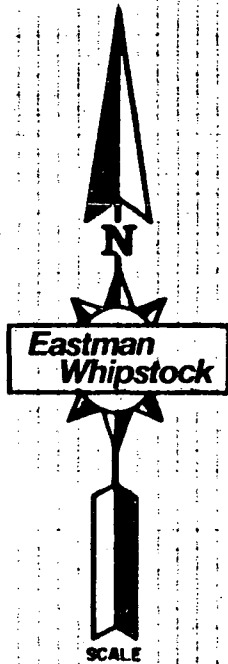
MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET
---------------------------	-----------------------	-------------------------	-----------------------------------	-----------------------------	------------------------------------

0.	0 0	0	0.00	0.00	0.00 0.00
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NORTH FOR THIS SURVEY IS 'PLANT NORTH', N 57 00 W

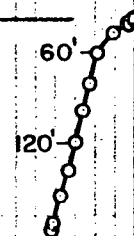
20.	1 15	S 61 W	20.00	0.17	0.11 S 0.19 W
40.	1 30	S 53 W	39.99	0.56	0.37 S 0.59 W
60.	2 5	S 18 W	59.98	1.17	0.88 S 0.96 W
80.	2 15	S 12 W	79.97	1.92	1.61 S 1.15 W
100.	2 10	S 14 W	99.95	2.68	2.36 S 1.33 W
120.	2 10	S 13 W	119.91	3.43	3.09 S 1.50 W
140.	2 0	S 15 W	139.93	4.15	3.80 S 1.68 W
160.	2 0	S 16 W	159.91	4.84	4.47 S 1.86 W
180.	2 0	S 18 W	179.90	5.54	5.14 S 2.07 W
187.	1 50	S 18 W	186.90	5.77	5.36 S 2.14 W

FINAL CLOSURE - DIRECTION: S 21 DEGS 46 MINS 8 SECS W
DISTANCE: 5.77 FEET



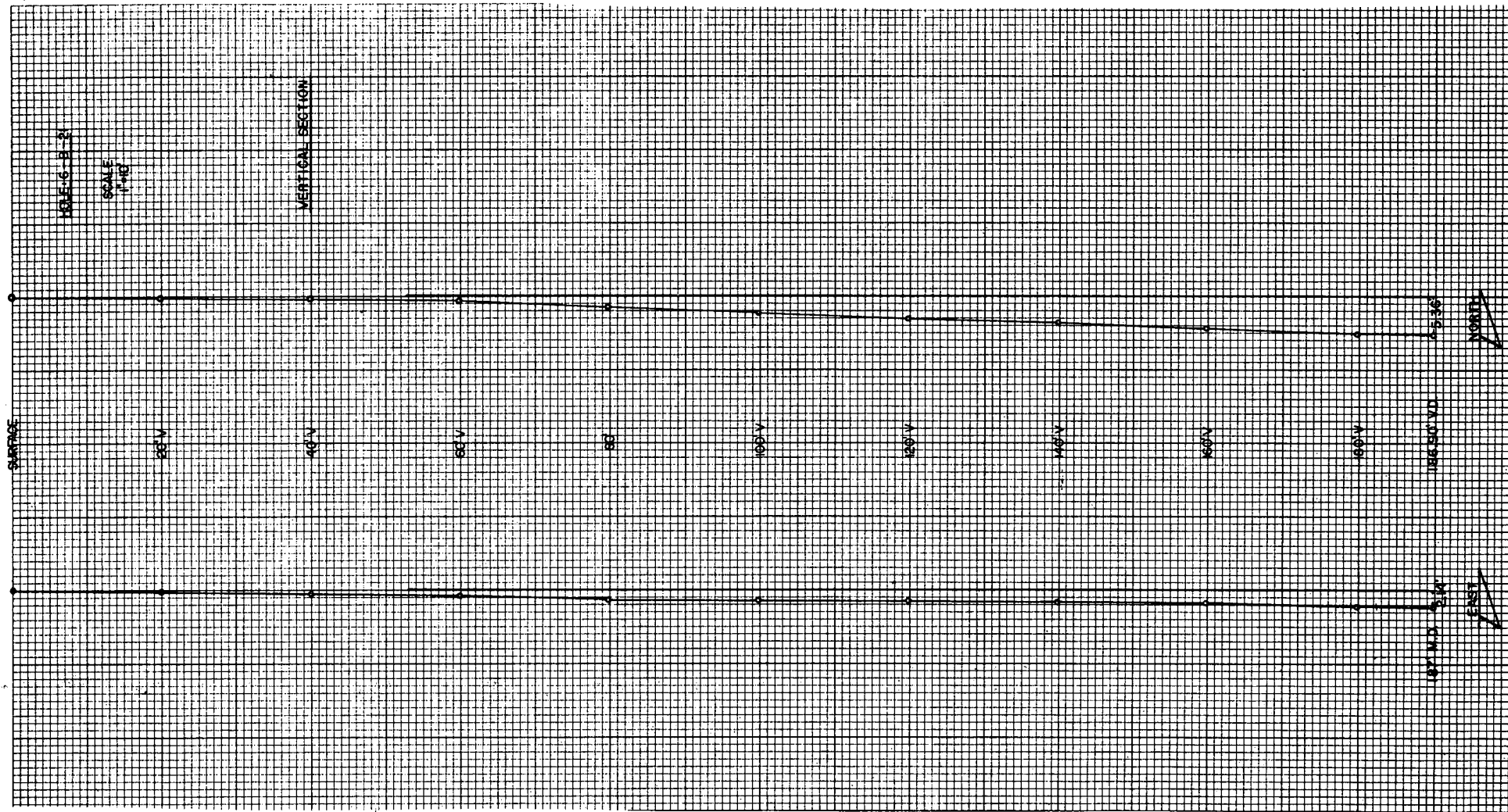
1"=5'

DEPTH - 187'
SOUTH - 5.36'
WEST - 2.14'
CLOSURE - 5.77' S 21° 46' 08" W



HOLE: 6-B-21

JOB No P-1078-G0103



10.5-6-B-21

SCALE
1"=40'

VERTICAL SECTION

SURFACE

160 V

140 V

120 V

100 V

80 V

60 V

40 V

20 V

100' 0" 0"

100' 0" 0"

100' 0" 0"

NORTH

EAST

BECHTEL POWER CORP.--- HOLE: 6-B-22 ---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-1078-60112

GYRO SURVEY BY: EASTMAN WHIPSTOCK, INC.

FILE: F135-20

FITT

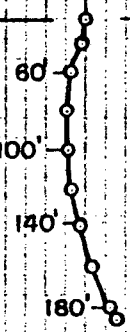
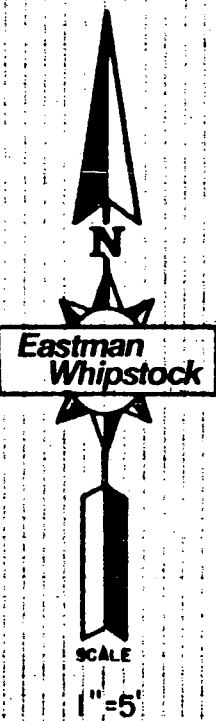
VERTICAL SECTION IS IN
PLANE OF BOTTOM HOLE CLOSURE.

RECORD OF SURVEY

ANGLE AVERAGING METHOD

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D 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.	0 0	0 0	0.00	0.00	0.00	0.00
20.	0 55	S 3 0 E	20.00	0.16	0.16 S	0.01 E
40.	2 0	S 34 0 W	39.99	0.63	0.65 S	0.13 W
60.	2 45	S 9 0 W	59.98	1.37	1.42 S	0.43 W
80.	2 50	S 0 30 E	79.95	2.33	2.39 S	0.50 W
100.	2 45	S 2 0 E	99.93	3.30	3.37 S	0.48 W
120.	2 45	S 10 0 E	119.91	4.26	4.32 S	0.38 W
140.	3 0	S 18 30 E	139.88	5.25	5.29 S	0.14 W
160.	3 10	S 20 0 E	159.85	6.30	6.31 S	0.22 E
180.	3 0	S 22 30 E	179.82	7.34	7.31 S	0.61 E
187.	3 0	S 22 0 E	186.81	7.69	7.65 S	0.75 E

FINAL CLOSURE - DIRECTION: S 5 DEGS 35 MINS 7 SECS E
DISTANCE: 7.69 FEET



DEPTH-187'
SOUTH-7.65'
EAST -0.75'
CLOSURE -7.69' S 5° 35' 07" E

HOLE 6-B-22

JOB Nº P-1078-G0112

SURFACE

HOLE S-B-22

SCALE
1"=10'

VERTICAL SECTION

20' V

40' V

60' V

80' V

100' V

120' V

140' V

160' V

180' V

157' M.D.

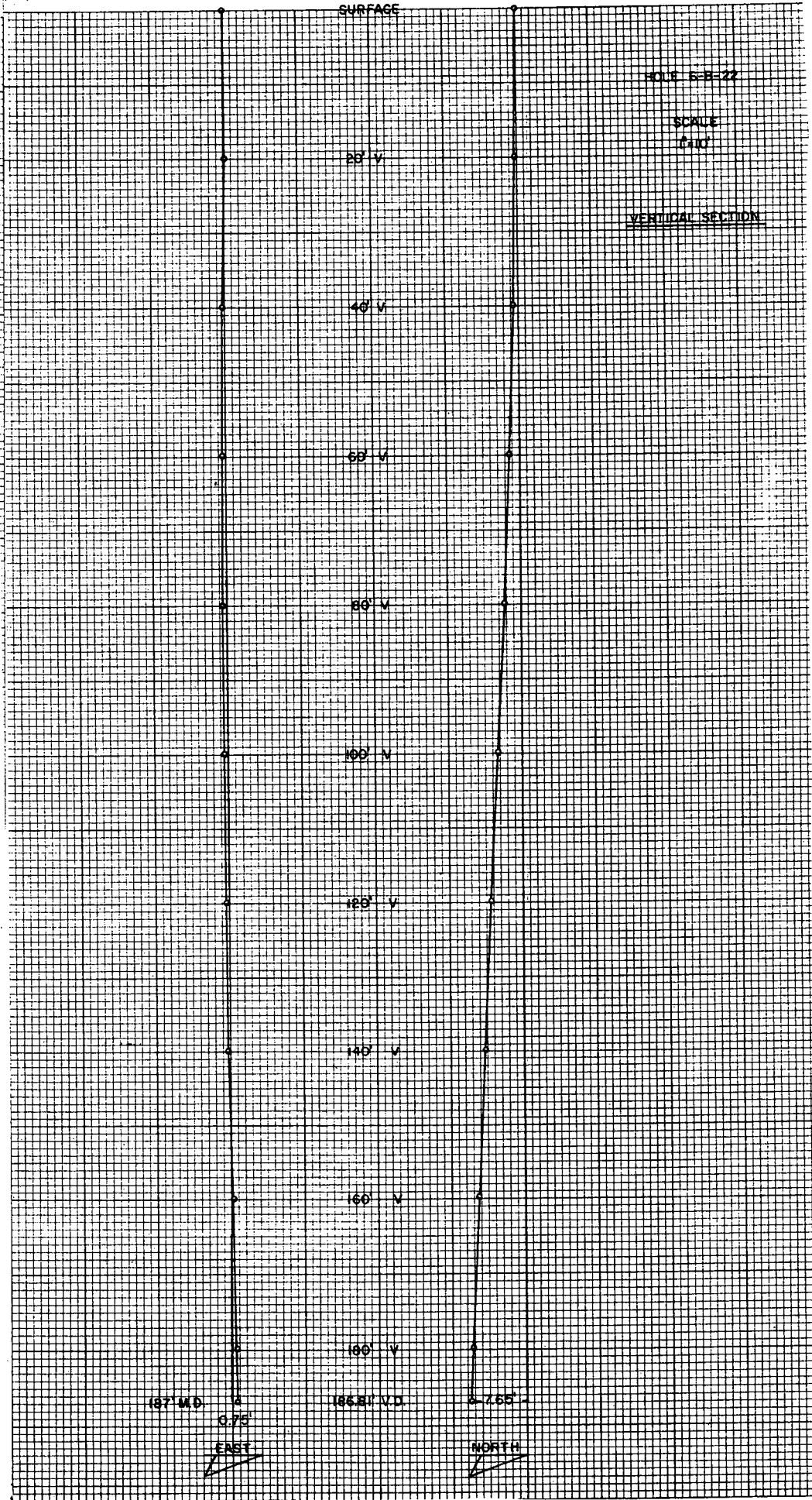
0.75'

EAST

186.8' V.D.

2.65'

NORTH



APPENDIX C

This appendix presents the grouting logs prepared during the tremie or pressure grouting of each of the 19 holes grouted as part of the Deep Exploration Drilling Program. The logs show the quantity of grout placed at each interval as the casing used in drilling was withdrawn from the hole.

The grout mix used consisted of 1:1 (water:cement by volume) with one percent Sika Intraplast-N additive (one percent by weight of cement) used to control shrinkage and increase the flowability of the mix.



SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-1

DATE	INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
6-7-78	0-200	9:30	1:1	Gravity		AW rods placed to bottom.
		10:30			6	Tremie grout through rods.
		10:50				
	0-200	11:05			1	Pulled AW rods. Topped NC casing.
		11:10				
		11:20			4	Pulled 60' NC casing.
		11:25				Topped hole off.
		11:35			2	Pulled 40' NC casing.
		11:38				Topped hole off.
		11:45			5	Pulled 50' NC casing.
		11:51				Topped hole off.
		11:55			1	Pulled 30' NC casing.
		11:57				Topped hole off.
		12:00			1	Pulled 20' NC casing.
		12:02				Topped hole off.
						Total Take: 19 bags.
						Waste = 1 bag.

* Water : Cement - or Water : Cement : Sand

+ 0.94 lbs Interplast per bag of Cement

PREPARED BY M. Salem
REVIEWED BY Robert J. Schuler



SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 86
HOLE NO. B2

DATE	CASING INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
6-1-78		1130				Placed AX rods to 200'.
6-1-78	0-200	1320	1:1:01	TREMIE GROUT	6	Grouted hole through 200' AX rods.
		1335				Pulled 200' AX rods out of hole.
"	0-200	1355	"	"	2	Grouted hole from surface (stopped off)
		1405				Pulled 60' NC rods out of hole.
"	0-140	1415	"	"	7	Grouted from surface (stopped off).
		1420				Pulled 50' NC rods out of hole.
"	0-90	1430	"	"	1	Grouted from surface.
		1440				Pulled 50' NC rods out of hole.
"	0-40	1445	"	"	1	Grouted hole from surface.
		1450				Pulled 40' NC rods out of hole.
"	0-150	1455	"	"	1	Grouted hole from surface.
		1500				Pulled 50' 4.3" casing from hole.
"	0-100	1510	"	"	2	Grouted hole from surface.
		1515				Pulled 80' 4.3" casing from hole.
"	0-20	1530	"	"	32 1/2	Grouted hole from surface.
		1600				Pulled 20' casing.
"	0	1600	"	"	1/2	Grouted hole from surface.
		1605				
						Totals:
						Take: 53 bags
						Waste: 5 bags

* Water : Cement or Water : Cement : Sand Sika (Volume)

PREPARED BY P. J. M.
REVIEWED BY Robert H. [Signature]



SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-3

DATE	CASING INTERVAL	TIME	MIX*	PRESSURE START / FINISH		CEMENT PLACED	REMARKS
6-9-78		8:30					200' AW Rods Placed to Bottom.
6-9-78	0-200	9:27	1:1	GRAVITY		7	Tremie grout through AW Rods
		9:34	thro	throughout			
	0-200	9:50				1	Pulled AW Rods.
		9:52					Topped NC Casing off
	0-70	10:42				3	Pulled 110' casing** (NC)
		10:45					Topped off
	0	12:12				5	Pulled 70' casing (4.3")
		12:17					Topped off.
	0	12:33				2	Let Grout Settle
		12:40					Topped Hole off
							Totals:
							Take = 18 Bags
							Waste = NONE
** LOST 80' of NC Casing + 10' NCWL							
CORE BARREL + DIAMOND BIT IN HOLE.							
THEY ARE GROUTED IN HOLE BOTTOM							
FROM 100' - 190'.							

* Water : Cement ~~or~~ Water : Cement : Sand
+ 0.94# Interplast per Cement Bag

PREPARED BY W. S. Salem
REVIEWED BY Robert Blochman



SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-4

DATE	INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
<i>Summary</i> 6-5-78	0-200	5:30	1:1	Grav. Hy		200' AW rods. Tremie grout
		5:40			6	Through these.
						Pulled rods
		5:40	1:1		1	Topped NC casing
		5:42				
		5:42				Started pulling NC casing.
						Cable broke. Repaired. Had
						to use 300# hammer
						Bumped 20' NC casing.
						Then washed hole to
						180'. Wasted 5 bags
		9:00 ^{PM}				Cement in mixer.
		9:30				
		10:40			5	Pulled NC casing up to 150'
						Put AW rods down to 150'.
						Tremie grouted. Plugged the
						rods. Had to pull & clean out.
		11:03			3	Pulled AW rods & 20' NC casing.
		11:05				Topped off hole.
		11:13			4	Pulled 30' NC rods. Topped off.
					23	Pulled 40' NC rods. Topped off.
		12:23			3	Pulled remaining 60' NC rods. Topped off.
						1 sack wasted (overmix)
						Total take: 46 sacks

* Water:Cement or Water:Cement:Sand

Total waste 6 sacks
PREPARED BY J. Williams P.
REVIEWED BY [Signature]

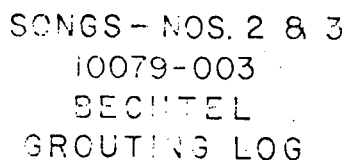
SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-5A

[illegible]

* Water : Cement or Water : Cement : ~~Sand~~ Sika

PREPARED BY [Signature]
REVIEWED BY [Signature]



WELL NO. 6
HOLE NO. B-12

* Water Content of Water Cement ~~and~~ Silica

PREPARED BY P. J. Jones
REVIEWED BY Robert H. Anderson

SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-13

DATE	INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
7/11/78	0-142 ^A	20:20	1:1	GRAVITY		AW RODS at 142'; NC at 136'
		20:25			5	GROUT TREMIED through AW RODS.
	"	20:50	"		7	Removed AW RODS and 50' of NC casing. Topped hole off.
		21:00				
	"	21:09	"			50' NC casing Removed.
		21:17			3	Topped hole off.
		21:21	"			
		21:27			2	Remaining 40' of NC casing Removed. Topped off hole.
		21:35				Began removal of 4.3" casing; problems with hammer.
		22:36	DELAY			Repaired hammer... CONT'D casing removal
		23:14				4.3" casing Removed (20 ft)
		23:19			2	Topped hole off.
						Total fake: 19 sacks
						Waste: ~ 1 sack

* Water : Cement or Water : Cement : Sand (0.94 lbs Interplast / bag of cement)

A 1 ft 3 in of sand added to hole to block off gravel pack. Original depth of hole 15 ft.

PREPARED BY J. Kas
REVIEWED BY [Signature]

SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-14

[illegible]

* Water : Cement or Water : Cement ~~same~~ *like*

PREPARED BY P. J. M.
REVIEWED BY Robert E. Edwards

SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B15

[illegible]

* Water : Cement or Water : Cement Sand. Sika

PREPARED BY P. J. M.
REVIEWED BY R. J. M. [Signature]

SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. B-16

DATE	INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
7/20/78	0-200'	18:25	1:1	Gravity		Aw rods placed to bottom
		18:45			5	Tremie grout through rods
		19:00				Pulled Aw rods
		19:02			2	Topped off Nc
		19:10				Removed 50 ft Nc
		19:12			1	Topped off
		19:21				Removed 50 ft Nc
		19:23			2	Topped off
		19:32				Removed 50 ft Nc
		19:36			2	Topped off hole
		19:43				Removed Remainder of Nc (~45')
		19:45			1	Topped off hole
		19:47				Removed 10' (all of) 4.3" casing
		19:50			1	Topped off hole
						Total take: 14 bags
						Waste: NONE

* Water : Cement or Water : Cement : Sand
0.94 Lbs Interplast per bag cement.

PREPARED BY
REVIEWED BY

SONGS -- NOS. 2 & 3

10079-003

BECHTEL
GROUTING LOG

WELL NO

HOLE NO. 6B-17

DATE	INTERVAL	TIME	MIX*	PRESSURE START / FINISH	CEMENT PLACED	REMARKS
7/21/78		19:12	1:1	Gravity		Lowered Aw to bottom of hole
		19:26			8	Trimmed cement to top of hole
		19:37				Removed Aw
		19:39			2	Topped off hole
		19:46				Removed 50 ft of Nc
		19:47			1	Trimmed cement to top of hole
		19:54				Removed 50 ft of Nc
		19:56			1	Topped off hole
		20:03				Removed 50 ft of Nc
		20:05			1	Topped off hole with grout
		20:11				Removed 45 ft of Nc
		20:14			1	Topped off hole
		* 20:38				Removed 10 ft - 4.3" surface casing
		20:42			2	Topped off hole
		* Delay because casing jammed				
						Total sacks used: 16
						Waste: NONE

* Water : Cement or Water : Cement : Sand

0.94⁴ Interplast added per sack cement

PREPARED BY

REVIEWED

SONGS - NOS. 2 & 3
10079-003
BECHTEL
GROUTING LOG

WELL NO. 6
HOLE NO. 6B-18

[illegible]

* Water : Cement or Water : Cement : Sand

PREPARED BY K. H. L. L. L.
REVIEWED BY Robert L. L. L.

Job No: 10011
Location: well 6
Hole No: 6B-19
Deep Hole

[illegible]

*NOTE: All mix contains 1% interplast per weight of cement

TOTAL USED: 0 bags

WASTE: - bags

NET TAKE

IN HOLE: 0 bags

INSPECTOR

REVIEWED BY

Casing in Hole _____ Ft.
Type Casing _____
Rep/Contractor Bechtel

BECHTEL POWER CORPORATION
GROUTING LOG

Job No: 1501
Location: Well 6
Hole No: 6B-20

SONGS UNITS 2 & 3

Deep hole

Page 1 of 2

DATE	INTERVAL	PRESSURE		MIX*	TIME	TANK LEVEL	TAKE CFM	BAGS TAKE	BAGS MIXED	REMARKS
		MIN	MAX							
10-10-78	0-140'			Fast-break						Washed to 140'.
	0-140'	0		2:1	2:20	9.0	-	-	6	Comm. to Pm-25
			0	2:1	2:27	2.0		5.2		Immediately. Watery grout
			0	2:1	2:31	9.0	-	-	6	with some revent coming
			0	2:1	2:33	4.0				out @ 2:27.
				2:1	2:34	10.0				2:1 grout coming out @ 2:32.
			0	2:1	2:38	1.0		6.4		Capped hole
				2:1	2:41	9.0	-	-	6	
		0	20	2:1	2:43	3.0				2 @ psi pressure @ 2:43
				2:1	2:44	6.0	-			
			20	2:1	2:46	1.0		6.0		
		20	20	1 1/2:1	2:52	5.5	-	-	10	
			20	1 1/2:1	2:57	1.0		9.9		
			20	1 1/2:1	3:02	9.0	-	-	10	
		20	20	1 1/2:1	3:07	5.5		7.8		
			20	1 1/2:1	3:12	1.0		2.2		2:1 leakage of revent at
				1:1	3:14	10.0	-	-	10	surface in crack in
			20	1:1	3:18	5.0				sand. Also coming up
			10	1:1	3:20	10.0				through rods at
			15	1:1	3:25	1.0		4.8		6B-19. leakage
		20	30	1:1	3:30	8.5	-	-	10	around nipple at 6B-20
		30	35	1:1	3:35	1.0		16.0		also.
					3:37	10.0			10	Took cap off Pm-25
		30			3:45	1.0		10.0		Appears to be only air
			30	1:1	3:50	10.0			10	leakage at surface @ 10psi.
		30	50	1:1	3:58	1.0		10.0		1:1 out of Pm-25 @ 3:21.
		30	50	1:1	4:01	10.0	-	-	10	Capped hole.
		40	40	1:1	4:21	1.0		10.0		Some grout at surface leakage
										@ 3:25. Only small amount
										of total take.
										1:1 grout out of 6B-19
										through rods @ 3:55.

*NOTE: All mix contains 1% interplast per weight of cement

TOTAL USED: _____ bags
WASTE: _____ bags
NET TAKE
IN HOLE: _____ bags

INSPECTOR

REVIEWED BY

No more comm. to Pm-25 @ 4:00 pm.

J. Gallison

Robert J. Gallison

Page 2 of 2

REVIEWED BY

Casing in Hole _____ Ft.
 Type Casing _____
 Rep/Contractor Bechtel

BECHTEL POWER CORPORATION
 GROUTING LOG

SONGS UNITS 2 & 3

Job No: 10079
 Location: Well 6
 Hole No: 6B-21
 Deep Hole
 Page 1 of 2

DATE	INTERVAL	PRESSURE		MIX*	TIME	TANK LEVEL	TAKE CFM	BAGS TAKE	BAGS MIXED	REMARKS
		MIN	MAX							
10-12-78	0-200			Fast break						Washed hole - tremie method
	0-200	0		2:1	6:07	9.0	-	-	8	
			10	2:1	6:10	8.0				
		15		2:1	6:11	9.0				
			20	2:1	6:15	6.0				
		20		2:1	6:16	9.2				
			20	2:1	6:25	1.0				
		20		2:1	6:26	8.3	-	7.6	8	
			20	2:1	6:30	6.0				
		20		2:1	6:31	4.2				
		25	30	2:1						
										Surface leakage @ 30 psi
										Stopped grouting. GROUT
										seal around scissor of
										hole not completely
										set. Rewashed hole
										with water. Made new
										surface seal. will grout
										again in morning.
10-13-78	0-200	10		2:1	8:34	8.9	-	-	8	
		15	20	2:1	8:38	6.0				
		15		2:1	8:38	9.5				
			20	2:1	8:42	8.0				
		20	20	2:1	8:48	6.0				
			20	2:1	8:49	9.5				
		25	30	2:1	8:52	8.0				
		30	30	2:1	8:56	7.5				
		35	40	2:1	9:00	5.5				
			40	2:1	9:03	4.0		6.4		
		40	40	2:1	9:04	9.0	-	-	8	
			45	2:1	9:09	7.5				
		45	45	2:1	9:19	6.0				
		50	50	2:1	9:24	5.8				
		60	70	2:1	9:28	5.3				
		70	70	2:1	9:32	4.7				
				2:1						

*NOTE: All mix contains 1% interplast per weight of cement

TOTAL USED: 8 bags
 WASTE: 16 bags
 NET TAKE
 IN HOLE: 0 bags



INSPECTOR

REVIEWED BY

J. Halleraw
[Signature]

Rep/Contractor Bechtel

GROUTING LOG

Job No: 10079

Location: well 6

Hole No: 6B-21

SONGS UNITS 2 & 3

Page 2 of 2

[illegible]

IN HOLE: * 13.1 bags

8.4 bags - pressure grout
4.7 - Backfill

INSPECTOR

REVIEWED BY

Casing in Hole _____ Ft.
 Type Casing _____
 Rep/Contractor Bechtel

BECHTEL POWER CORPORATION
 GROUTING LOG

Job No: 10077
 Location: Well 6
 Hole No: 68-22

SONGS UNITS 2 & 3

DATE	INTERVAL	PRESSURE		MIX*	TIME	TANK LEVEL	TAKE CFM	BAGS TAKE	BAGS MIXED	REMARKS
		MIN	MAX							
10-17-78	0-200			Fast break						Washed hole - tremie method
	0-200	10	10	2:1	12:52	8.2	-	-	1	
			10	2:1	12:55	3.0			-	Carryover 2.2 bags from
		20	20	2:1	12:56	9.5			8	L-31.5
		20	20	2:1	1:00	4.0				
			20	2:1	1:01	4.5				
		20	20	2:1	1:08	3.0				
		30	30	2:1	1:09	9.0				
		30	35	2:1	1:12	8.0				
		30	30	2:1	1:20	3.0		10.0		1.2
		40	40	2:1	1:21	9.6		-	8	
			40	2:1	1:25	5.0				
		40	40	2:1	1:30	6.0				
			40	2:1	1:31	4.2				
		45	50	2:1	1:35	8.5				
			50	2:1	1:40	7.0				
			50	2:1	1:43	6.0				
		50	50	2:1	1:46	5.3				
			50	2:1	1:48	9.2				
		50	50	2:1	1:56	9.0		5.5		Lines ok. Not plugged
										Carryover 3.7 bags to backfill.
							6.0	4	7	Backfilled hole with 1:1 mix - tremie method
										Only able to get hose down 70' feet.
										Waste: 4 bags

*NOTE: All mix contains 1% interplast per weight of cement

TOTAL USED: 23.5 bags
 WASTE: 4.0 bags
 NET TAKE
 IN HOLE: 19.5 bags

15.5 bags - pressure grouting
 4.0 bags - backfill



INSPECTOR

REVIEWED BY

J. Gallenani
[Signature]