STATUS REPORT ON THE
INVESTIGATION OF THE DEWATERING SYSTEM
OCTOBER 27, 1978

1. INTRODUCTION

The purpose of this report is to document the status of the investigation and actions being performed on the dewatering system at the San Onofre Units 2 and 3 construction site. This report provides a summary of work accomplished during the month of September 1978.

II. STATUS OF DEWATERING WELL INVESTIGATION

The status of each well is summarized in Figure 1 (recent work shaded in yellow). Wells 1, 2, 3A and 9 have been demobilized by filling with concrete after verifying that no cavities exist. Demobilization work at Well 8 has been completed and documented. Investigative work has been done on Wells 3, 5, 6 and 7 (shaded in yellow) during September. The analysis of the Well 3 seismic cross hole survey has been completed and is documented herein. In addition, work is progressing on the three-dimensional stick models for Dewatering Wells 6 and 7.

No further work has been done on Wells 4 or 10 during September 1978, although planning for a cross hole seismic survey at Well 4 is in progress. Because Wells 11 and 12 are outside the site area, no work was completed or is planned for these wells. The paragraphs that follow include: summaries of work completed and planned for Wells 3, 5, 6 and 7; the observations of the settlement observation monitoring program; and a progress report on completion of the models.

WELL 3

The data from the cross hole seismic survey of Well 3 has been reduced and analyzed to evaluate this procedure for cavity detection. These data were obtained using four 200-foot holes, the locations of which are shown in Figure 2. Three holes were instrumented with receivers while

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the fourth hole was instrumented with the seismic source. The survey was performed four times using a different hole as seismic source for each array. The seismic array (one source hammer and three geophone receivers) was raised levelly in 5-foot increments from a depth of 195 feet to 30 feet. Hammer blows were made in both the upward and downward direction to facilitate the recognition of the shear wave by inspecting the polarity reversals on the data records. Detailed analysis of these records indicates that the combination of arrival times, periodicity of various parts of the records, and wave form can be used as a conservative method to detect cavities. The procedure will be further confirmed by the use of a frequency analyzer on cross hole seismic surveys planned in conjunction with the deep drilling exploration of Wells 4 and 5. Results of this technique will be submitted in report format at the conclusion of this confirmation work.

WELL 5

To aid in locating drill holes for the proposed cross hole survey at Well 5, a gyroscopic survey to determine well drift was performed on the 14-inch diameter well casing on September 19, 1978. Depth of the survey was to 130 feet as the 14-inch casing is filled below 140 feet. Based on the drift of the well and the results obtained in the analysis of the cross hole seismic survey of Well 3, four deep exploration holes have been located as shown on Figure 3. The program includes two angle holes, 5B-1 and 2, sloping under the electrical tunnel and two vertical holes, 5B-3 and 4, to complete the pattern. As of October 1, the vertical holes were drilled to a depth of 200 feet and 4-inch diameter PVC was grouted in place. These two drill holes encountered only native San Mateo Formation.

WELL 6

Three additional holes have been proposed in the deep exploration drilling program to supplement the 18 holes documented in the May to August Status Report dated September 21, 1978. The locations of these

holes (6B-19, 20 and 21) are shown on Figure 4. To date, 6B-19 has been completed to 190 feet and work is in progress on 6B-20. The drift of 6B-19 was not determined because the drill rods became stuck in the hole while attempting to drill from 190 to 200 feet.

Boring 6B-19 encountered San Mateo Formation from 10 feet to 78.5 feet and from 120 feet to 190 feet. Disturbed material was encountered from 78.5 feet to 120 feet. Within the disturbed material PVC cuttings were encountered between 103 and 110 feet which suggests that another drill hole was encountered, and well gravel was encountered in the sample taken at 116 feet. A preliminary evaluation of these findings suggests that this boring encountered a slight enlargement of the well bore which may have formed during the construction phase. Based on these and other data from the exploration/grouting program, a preliminary interpretation of the bottom of the well bore and direction of drift of the well has been made and is shown on Figure 4. A summary of the logs of borings completed to October 1 is presented in tabular form in Figure 5.

Documentation of the additional deep exploration drill holes will be provided in subsequent progress reports and in the final report on the deep exploration drilling program at Well 6.

As reported in the August Status Report dated September 21, 1978, the exploration/grouting program at Well 6 started on July 25, 1978. Through September 1 a total of 2980.5 lineal feet of Stage 1 holes were drilled. From September 1 through October 1 an additional 2605 lineal feet of Stage 1, 2 and 3 holes were drilled as indicated by the following:

STAGE	TOTAL HOLES	LINEAL FEET
1	13	1275
2	11	1240
3	1	90

Included in the Stage 1 holes are two holes which were abandoned due to drilling difficulties and replaced by adjacent holes.

Of the 25 holes completed during September, 19 have been grouted. A total of 84.5 bags of cement have been injected into these holes. Completion of the exploration/grouting program is anticipated during October.

WELL 7

The deep exploration drilling program has been completed at Well 7. In addition to the 18 holes completed during July and August, 12 additional borings (consisting of a total of 1850 lineal feet) were drilled during September to reduce overall closure spacing around the buried utility duct banks. Three of the 12 drill holes were terminated between 10 and 20 feet due to drilling difficulties or encountering utility ducts.

The locations of the 37 deep exploration holes are shown on Figure 6. A summary of the logs of borings is presented in tabular form in Figure 7. Of the nine borings completed during September to the design depth of 200 feet, four (7B-19A, 7B-22A, 7B-24 and 7B-26) have encountered native material below 13 feet in depth. The maximum depth at which disturbed material was encountered in these borings was 145 feet in Hole 7B-20. The N-value of the material in this disturbed interval (140 to 145 feet) is 48 blows per foot which is considered dense sand.

Review of the data from the deep exploration drilling program is in progress. Additional documentation will be provided in the final report on the deep exploration drilling program at Well 7.

On September 30 and October 1 an area slightly larger than the approximate cavity outline at Well 7 was excavated to a depth of between 3 and 10 feet below grade. The purpose of the excavation was to expose the buried utility ducts and allow for the installation of PVC pipe as a guide surface casing during the exploration/grouting program. The area was then backfilled with fill-crete, a sand-cement-pozzolan mix, which will serve as a grout cap during the exploration/grouting program. A total of 46 access pipes (4-inch diameter PVC) were installed and 256.5 yards of fill-crete backfill was placed.

III. RELATED ACTIVITIES

SETTLEMENT OBSERVATION PROGRAM

A settlement observation monitoring program is being used to monitor the settlement of structures or components which are founded above or around those dewatering wells which have not been investigated and demobilized to date. The settlement monitoring system involves 43 observation points, 31 of which have been installed to date. Most of the observation monuments not yet installed will be located on the Unit 3 Electrical Tunnel and Tank Building when these structures are completed. For reference, Figure 8 is included to show the physical location of the various settlement observation monuments in current use.

A review of the settlement observation data indicates that no significant movement has been observed to date.

THREE-DIMENSIONAL STICK MODELS

Construction of the three-dimensional stick models for Wells 6 and 7 are in progress. Most of the work has been completed on the portion depicting the work performed prior to the deep exploration drilling program. The second stage will be developed as information is obtained from the deep exploration drilling and exploration/grouting program.

IV. SUMMARY

Work is in progress in the investigation/demobilization of Wells 5, 6 and 7. To date, the deep exploration drilling program at Wells 6, 7 and 8 has not encountered any cavities below a depth of about 140 feet.

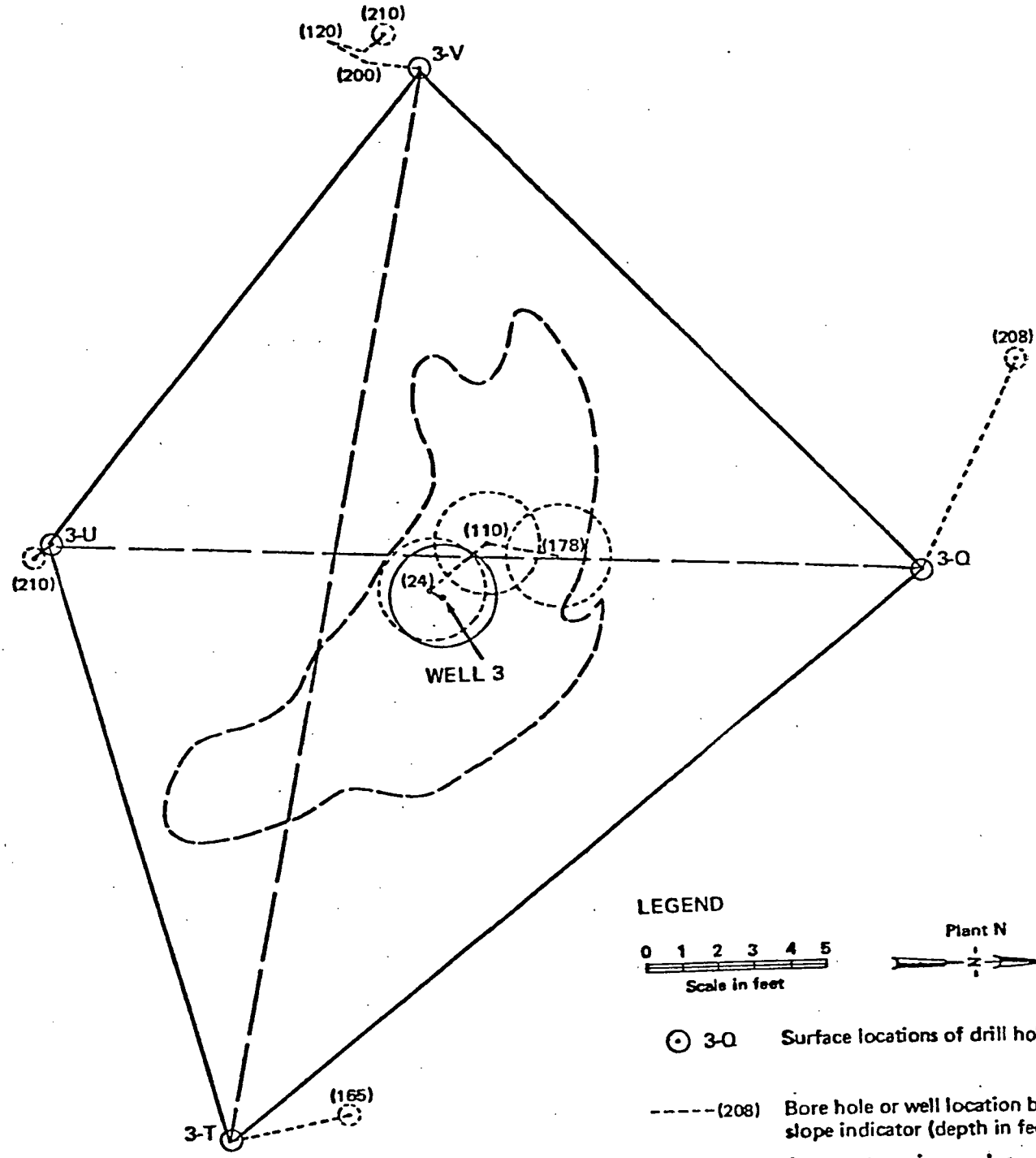
Drilling has started for a cross hole seismic survey at Well 5 after the successful use at Well 3 to demonstrate cavity detection. Additional holes are being drilled in the deep exploration drilling program at Well 6 to define the well location at depth. The exploration/grouting program at Well 6 is continuing with Stage 2 (angle) holes and Stage 3 (check) holes. The deep exploration drilling program has been completed at Well 7 and the area prepared for the exploration/grouting program.

Three drill rigs are currently involved in the deep exploration drilling and exploration/grouting programs. Figure 9 summarizes the projected schedule for completion of the balance of the investigation/demobilization work. The NRC will be notified of the specific dates when production grouting will commence at Well 7.

Well No.	Operational Status	Exploration Borings	Casing Removal and/or Borehole TV		Investigation/Demobilization Status					Cavity Detected	Overall Status to 1 October 1978
			Depth	Condition of Casing	Initial	Airlift Cleaning	Gravity Grout	Pressure Grout	Caliper		
1	Offline, Demobilized Avg. Maint.	—	200' removed, TV to 196'	Heavily Encrusted	No	Yes	Yes	No	Mech.	None	Annulus cleaned; casing pulled in good structural conditions with no holes; caliper indicated no borehole enlargement indicative of erosion; well completely demobilized by gravity grouting.
2	Offline, Demobilized High Maint.	None	Casing 200' 200' removed, TV to 188'	Heavily Encrusted	No	Yes	Yes	No	Mech.	None	Annulus cleaned; casing pulled in good structural condition with no holes; caliper indicated no borehole enlargement indicative of erosion; well completely demobilized by gravity grouting.
3	Offline, Very Low Maint.	30 borings to El. -30' (27 slope indicators)	Casing * in place, TV to 196'	Heavily * Encrusted	No	Yes	—	—	Initial Mech. & Sonar	Yes	The annulus was airlift cleaned to a depth of 55'. The annulus subsequently filled to 44' depth. Cavity encountered, and source and extent was investigated by drilling, slope indicators, gravity survey and crosshole seismic survey.
3A	Offline, Test Well Demobilized	None	Casing in place, TV to 296'	Lightly Encrusted some Corrosion	No	No	Yes	No	No	None	Well operated a few days as test well; only 6' fill in bottom of well, TV showed minor encrustations and some louver corrosion, gravel pack visible where louvers were enlarged; well completely demobilized by gravity grouting the casing.
4	Offline, Very Low Maint.	—	Casing * in place, TV to 198'	Heavily * Encrusted	Yes	Yes (inside casing)	—	—	—	—	Well initially demobilized by cutting off top, filling with sand, and welding steel cap on top. Presently uncovered, larger (4' diameter) working casing set, accessible for investigation/demobilization. Inclination of well bore was measured.
5	Offline, High Maint.	21 borings to El. -20 to -175'	Casing * in place, TV to 141'	Heavily * Encrusted below 50'	Yes	Yes	—	Yes, Cement to El. -23'	—	Yes	Cavity detected near working surface by borings; 30" casing placed around well casing to El. -35' and cavity pressure grouted. Large diameter working casing set for investigation/demobilization. Casing cleaned to 141'. Inclination of well bore was measured.
6	Offline, High Maint.	35 borings to El. -20 to -170' (19 slope indicators) 21 deep borings to El. +29 to -170'	Casing 200' 150' removed, TV to 200'	Bad Deterioration below 115'	Yes	Yes Casing backfilled w/sand	Yes	Yes	Mech. & Sonar	Yes	Cavity detected by borings, inside casing cleaned by airlift and photographed, annulus and cavity partially cleaned of gravel and loose sand by airlift, cavity measured by mechanical caliper and sonar. Below 163' casing is almost non-existent but gravel pack and asphalt coating in place. (NOTE: Bailing tried in early stages but caused too much disturbance in well and was discontinued). A 36" casing was redriven from 108 to 118'. The casing weld broke at about 62', with about a 2" horizontal offset. Seals for the offset have been placed and airlift cleaned to 128-1/2'. The casing filled to 124', airlifted to 126-1/2' for bottom camera inspection. Casing filled to 125'. Open cavity filled with gravity grout. Deep exploration drilling has been completed. The grout hole drilling and grouting is presently in progress.
7	Offline, Very High Maint.	54 borings to El. -18 to -170' (19 slope indicators) 26 deep borings to El. +20 to -170'	Casing 199' TV to 199', 139'10" removed	Bad Deterioration 10" casing also bad	No	Yes	Partial Fill	—	Limited Sonar	Yes	New 10" casing placed early in operation inside original 14" casing because wall filled with sand (removed by bailing). Cleaned inside 14" and 10" casing to bottom of hole. Attempted cleaning of annulus around 14" casing, but unable to advance because of volume of material. Pulled 139' of 10" casing. Attempted retrieval of remainder of 10" casing by tool. The tool became lodged in the 14" casing at 122'. Partial concrete and sand filling of the open cavity on east side and a portion of west side has been completed. Well is presently accessible for investigation/demobilization. Cavity detected by borings. The deep exploration drilling is presently in progress.
8	Offline, Demobilized High Maint.	66 borings to El. -5 to -25' (12 slope indicators) 18 deep borings to El. -142½ to -172½'	142' Casing removed, TV from 142 to 185' through telescope casing	Minor Corrosion 100-120' highly corroded below 120'	Yes	Yes	Yes	Yes	Mech.	Yes above a depth of 115'	Casing and annulus was cleaned with airlift with caving impeding cleaning; casing removed and cavity calipered, boreholes drilled to define plan size and depth of cavity, central access casing set, grout pipes set through cavity and cavity filled with grout (gravity), subsidence occurred at west end due to local water rise during gravity grouting, area below pressure grouted, telescoping casing set and airlift operation resumed. Casing had to be telescoped to a 160' depth due to caving. Positive head airlifted to 192' and TV logged to 183'. The cavity was gravity grouted and excavation of the Unit 3 P&E Tunnel to El. +7' completed. The deep drilling exploration has been completed. The grout hole drilling and grouting has been completed. The well was demobilized August 1978.
9	Offline, Demobilized High Maint.	None	200' Casing removed, TV to 200' in casing	Heavily Encrusted with some corrosion below 90'	No	Yes	Yes	No	Mech.	No	Annulus around casing and 46' of fill in casing cleaned, casing removed in good structural condition with some minor corrosion below 90' (no holes larger than louvers), caliper indicated no borehole enlargement indicative of erosion, well completely demobilized by gravity grouting.
10	Operational Avg. to Low Maint.	—	200' Casing * TV to 189'	Heavily * Encrusted	No	—	—	—	—	—	Presently accessible for investigation/demobilization, currently in operation, lost visibility on TV below 150'.
11	Operational Avg. Maint.	—	200' Casing TV to 200'	Very Heavily Encrusted	No	—	—	—	—	—	Outside Plant area, no investigation work planned.
12	Operational	—	—	—	No	—	—	—	—	—	Outside Plant area, no investigation work planned.

* Brush-cleaned inside of casing and re-TV logged.

Fig. 1 - STATUS SUMMARY OF INVESTIGATION / DEMOBILIZATION OF WELLS AS OF 1 OCTOBER 1978



LEGEND

0 1 2 3 4 5
Scale in feet

Plant N

⊙ 3-Q Surface locations of drill holes

-----(208) Bore hole or well location based on slope indicator (depth in feet)

— — — Apparent maximum plan configuration of cavity based on borings

——— Cross hole leg across cavity

——— Cross hole leg around cavity

Project: SONGS WELLS Project No. 40881A	WELL NO. 3 BORING LOCATIONS	Fig. 2

WOODWARD—CLYDE CONSULTANTS

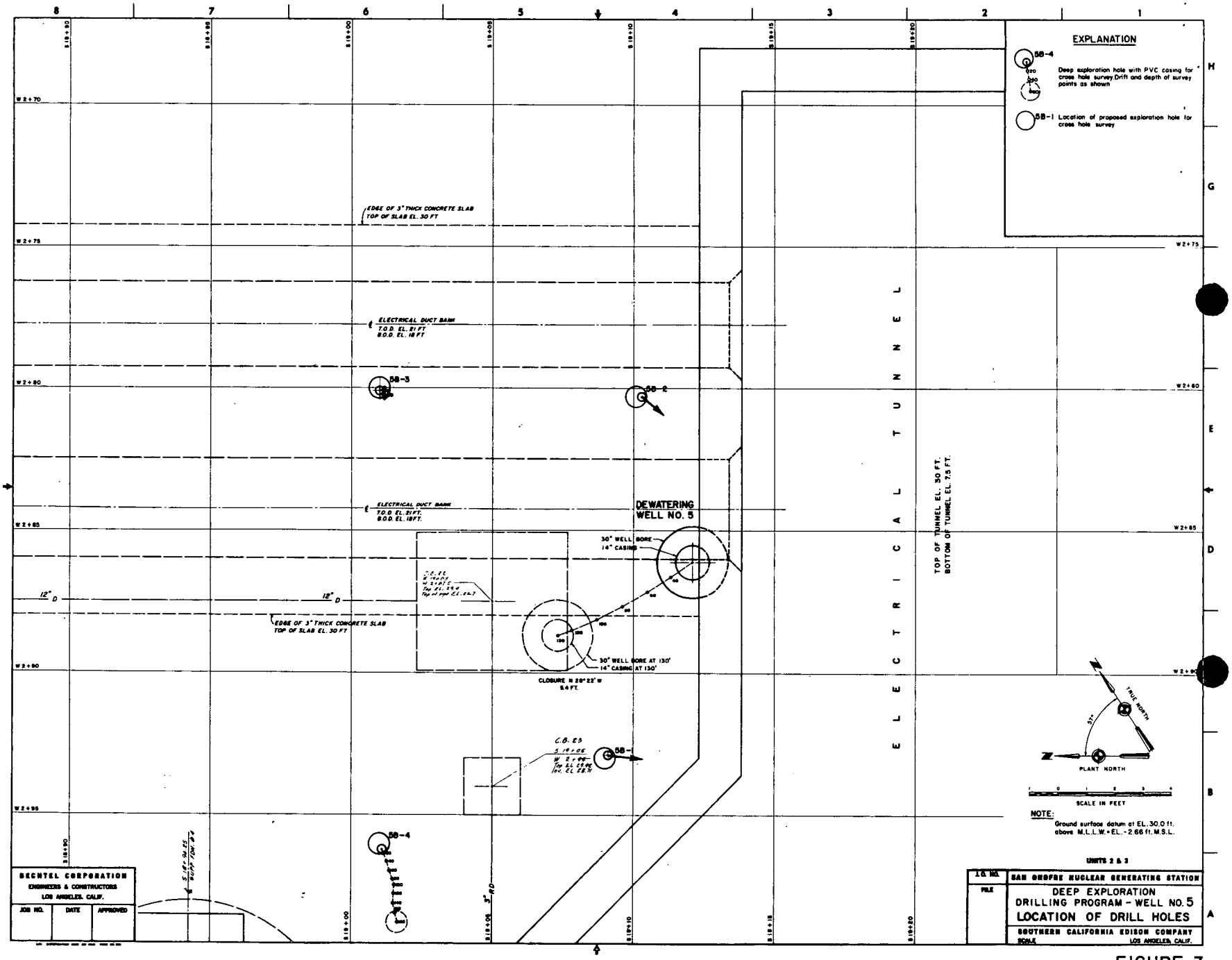

EXPLANATION
SB-4 Deep exploration hole with PVC casing for cross hole survey. Drift and depth of survey points as shown
SB-1 Location of proposed exploration hole for cross hole survey
EDGE OF 3" THICK CONCRETE SLAB
TOP OF SLAB EL. 30 FT
ELECTRICAL DUCT BANK
T.O.D. EL. 21 FT
B.O.D. EL. 18 FT
SB-3
SB-2
DEWATERING WELL NO. 5
30" WELL BORE
14" CASING
12" D
EDGE OF 3" THICK CONCRETE SLAB
TOP OF SLAB EL. 30 FT
30" WELL BORE AT 130'
14" CASING AT 130'
CLOSURE N 28° 23' W
5.4 FT.
SB-1
SB-4
ELECTRICAL TUNNEL
TOP OF TUNNEL EL. 30 FT.
BOTTOM OF TUNNEL EL. 7.5 FT.
TRUE NORTH
37°
PLANT NORTH
SCALE IN FEET
NOTE:
Ground surface datum at EL. 30.0 ft. above M.L.L.W. = EL. - 2.66 ft. M.S.L.
UNITS 2 & 3
BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.
JOB NO. DATE APPROVED
J.O. NO.
FILE
SAN ONOFRE NUCLEAR GENERATING STATION
DEEP EXPLORATION
DRILLING PROGRAM - WELL NO. 5
LOCATION OF DRILL HOLES
SOUTHERN CALIFORNIA EDISON COMPANY
SCALE
LOS ANGELES, CALIF.

FIGURE 3

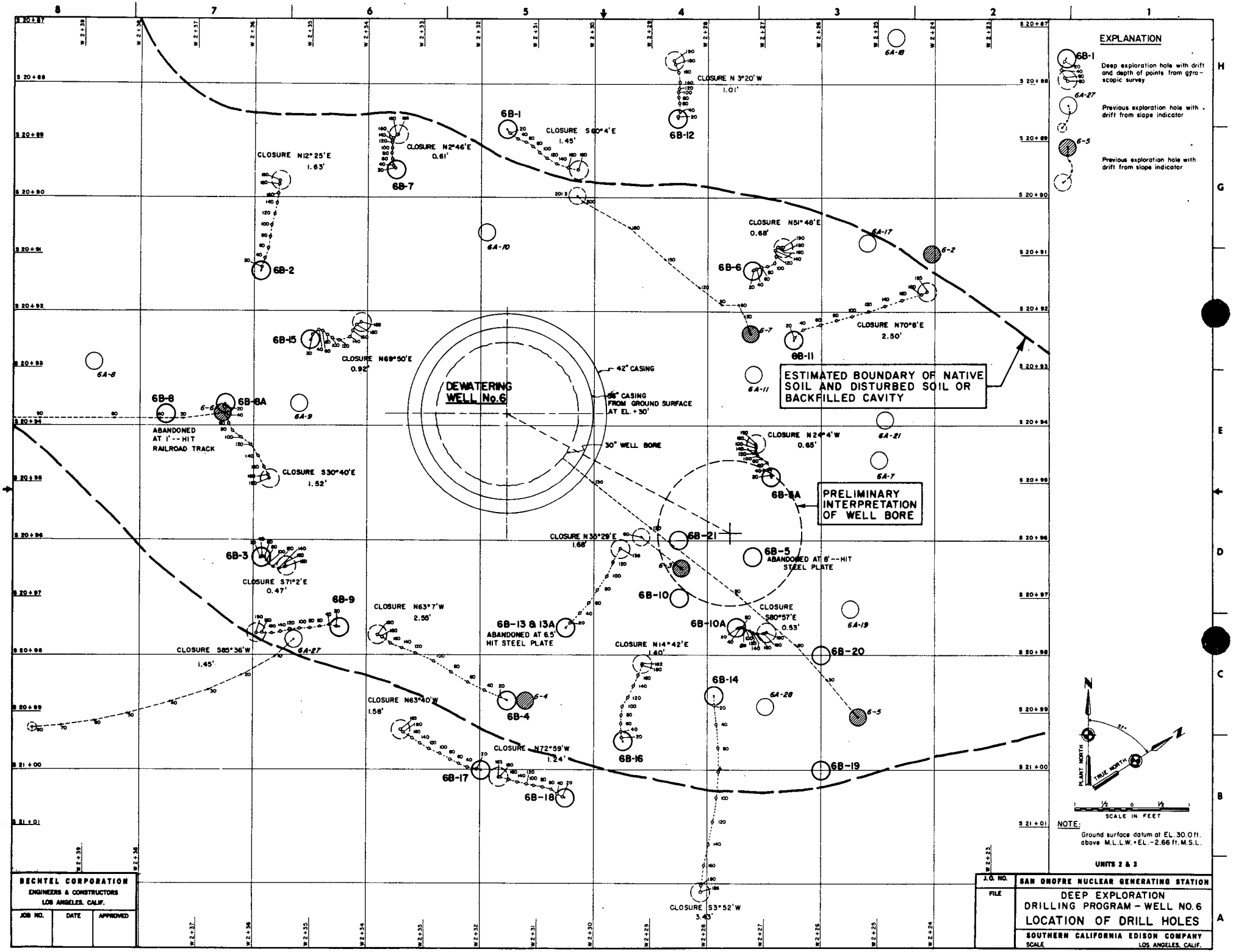

EXPLANATION
6B-1
Deep exploration hole with drift and depth of points from gyroscopic survey
6A-27
Previous exploration hole with drift from slope indicator
6-5
Previous exploration hole with drift from slope indicator
DEWATERING WELL No.6
42" CASING
48" CASING FROM GROUND SURFACE AT EL. +30'
30" WELL BORE
ESTIMATED BOUNDARY OF NATIVE SOIL AND DISTURBED SOIL OR BACKFILLED CAVITY
PRELIMINARY INTERPRETATION OF WELL BORE
6B-1
CLOSURE S 60° 4' E 1.45'
CLOSURE N 3° 20' W 1.01'
6B-12
CLOSURE N 12° 25' E 1.63'
CLOSURE N 2° 46' E 0.61'
6B-7
6B-2
6A-10
CLOSURE N 51° 48' E 0.68'
6B-6
6A-17
6-2
6-7
CLOSURE N 70° 8' E 2.50'
6B-11
6B-15
CLOSURE N 69° 50' E 0.92'
6A-8
6A-11
6A-21
6B-8
6B-8A
6-6
6A-9
ABANDONED AT 1'--HIT RAILROAD TRACK
CLOSURE S 30° 40' E 1.52'
CLOSURE N 2° 4' W 0.65'
6B-8A
6A-7
6B-21
CLOSURE N 35° 29' E 1.68'
6B-3
CLOSURE S 71° 2' E 0.47'
6B-5
ABANDONED AT 8'--HIT STEEL PLATE
6B-10
6-3
6B-9
CLOSURE N 63° 7' W 2.55'
6B-13 & 13A
ABANDONED AT 6.5' HIT STEEL PLATE
6B-10A
CLOSURE S 80° 57' E 0.53'
6A-19
CLOSURE S 85° 36' W 1.45'
6A-27
CLOSURE N 14° 42' E 1.40'
6B-20
6B-14
6A-28
6-4
6B-4
CLOSURE N 63° 40' W 1.58'
6-5
6B-16
CLOSURE N 72° 59' W 1.24'
6B-19
6B-17
6B-18
CLOSURE S 3° 52' W 3.43'
N
57°
PLANT NORTH
TRUE NORTH
½ 0 ½
SCALE IN FEET
NOTE:
Ground surface datum at EL. 30.0 ft. above M.L.L.W. = EL. -2.66 ft. M.S.L.
UNITS 2 & 3
BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.
JOB NO. | DATE | APPROVED
J.O. NO.
FILE
SAN ONOFRE NUCLEAR GENERATING STATION
DEEP EXPLORATION DRILLING PROGRAM - WELL NO.6
LOCATION OF DRILL HOLES
SOUTHERN CALIFORNIA EDISON COMPANY
LOS ANGELES, CALIF.
SCALE

FIGURE 4

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'	0-10.0' 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'	Railroad bed backfill (angular gravel) encountered at 20' Disturbed material in zones
6B-3	200.0'	26.5-42.0'	0-10.0' 10.0-26.5' 42.0-70.0'	 70.0-200.0'	S71°2'E	0.47'	0-10 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'	0-1 loose fill
6B-5	8.0'	2.5-8.0'			Not Run	Not Run	0.0-2.5 loose fill hit steel plate at 8'
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'	0.0-0.5 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'	N2°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'	43.0-84.0'	84.0-200.0'	S30°40'E	1.52'	0.0-10.0 fill and sand
6B-9	200.0'	31.0-43.0'	15.0-31.0'	0.0-15.0 43.0-200.0	S85°36'W	1.45'	
6B-10	6.5'	2.5-6.5'			Not Run	Not Run	0.0-2.5 fill. Hit steel plate at 6.5'

FIGURE 5
Sheet 1 of 2

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED: GROUT INTERVALS	MATERIAL ENCOUNTERED: DISTURBED MATERIAL	MATERIAL ENCOUNTERED: SAN MATEO FORMATION	DRIFT: DIRECTION	DRIFT: DISTANCE	REMARKS
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'	SEAMS 20.0-26.0'		2.0-200.0'	N3°20'W	1.01'	0-2 fill
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 assumed to have entered well bore.
6B-14	200.0'	2.5-6.0'	6.0-20.0'	20.0-200.0'	S3°52'W	3.43'	0.0-2.5 fill, 155-156 grout impregnation
6B-15	200.0'	19.0-43.0'	43.0-80.0' 120.0-125.0'	0.0-19.0' 80.0-120.0' 125.0-200.0'	N69°50'E	0.92'	120-140 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 6 feet north
6B-17	200.0'	-	-	7.0-200.0'	N63°40'W	1.58'	0.0-7.0 backfill
6B-18	200.0'	-	-	7.0-200.0'	N72°59'W	1.24'	0.0-7.0 backfill
6B-19	190.0'		78.5-120'	10.0-78.5' 120.0-190.0'	Not Run	Nor Run	0.0-10.0 backfill and concrete used to stabilize steel plate 103-110' PVC Pipe in cutting 116' Sample contained Well 6 gravel
6B-20			In Progress				

FIGURE 5
Sheet 2 of 2

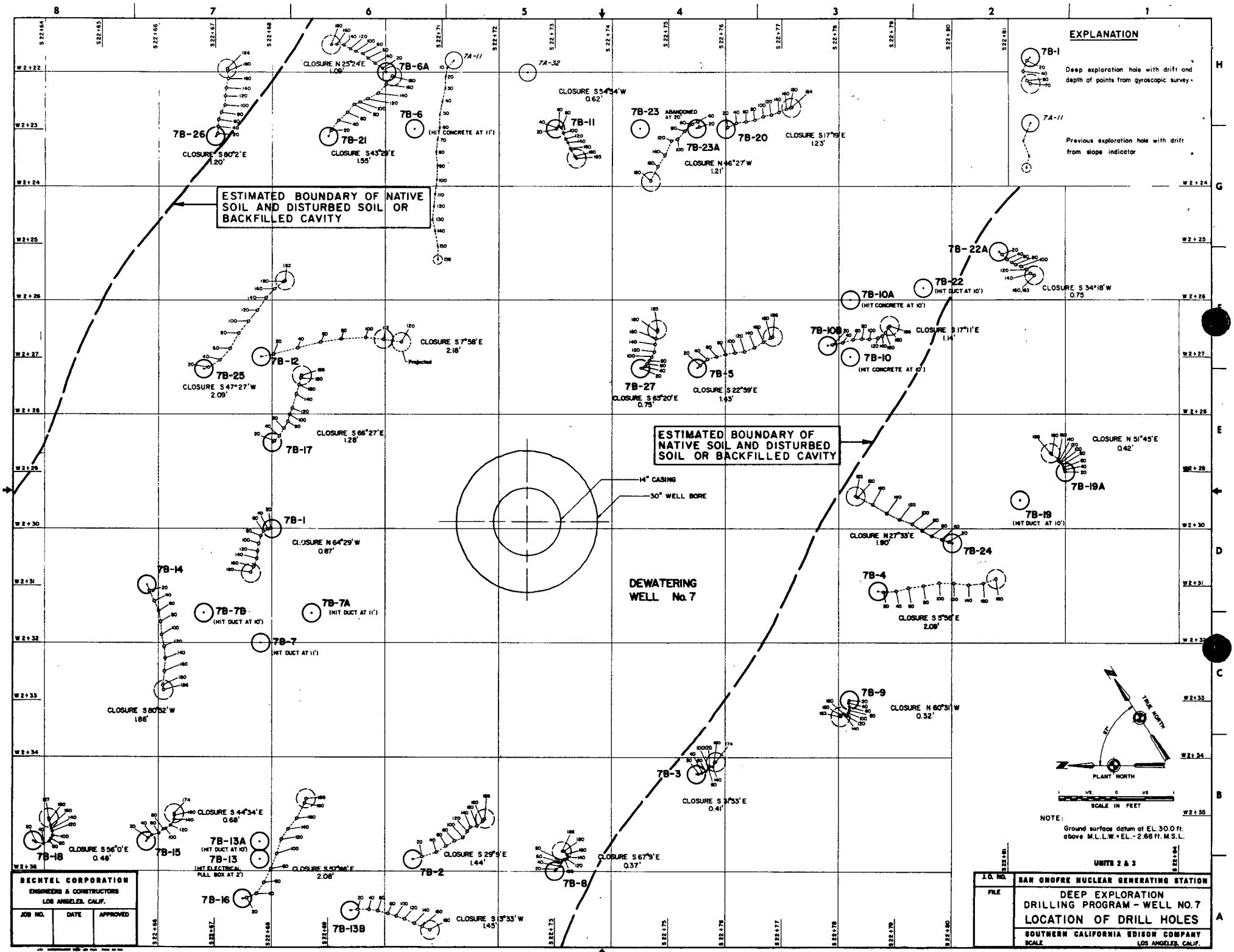

EXPLANATION
7B-1
Deep exploration hole with drift and depth of points from gyroscopic survey.
7A-11
Previous exploration hole with drift from slope indicator
ESTIMATED BOUNDARY OF NATIVE SOIL AND DISTURBED SOIL OR BACKFILLED CAVITY
ESTIMATED BOUNDARY OF NATIVE SOIL AND DISTURBED SOIL OR BACKFILLED CAVITY
14" CASING
30" WELL BORE
DEWATERING WELL No. 7
7B-6A
CLOSURE N 25°24'E 1.09'
7A-11
7B-6
(HIT CONCRETE AT 11')
7B-26
CLOSURE S 80°2'E 1.20'
7B-21
CLOSURE S 43°29'E 1.55'
7A-32
7B-11
CLOSURE S 54°34'W 0.62'
7B-23
ABANDONED AT 20'
7B-23A
CLOSURE N 46°27'W 1.21'
7B-20
CLOSURE S 17°19'E 1.23'
7B-22A
CLOSURE S 34°18'W 0.75
7B-22
(HIT DUCT AT 10')
7B-10A
(HIT CONCRETE AT 10')
7B-10B
CLOSURE S 17°11'E 1.14'
7B-10
(HIT CONCRETE AT 10')
7B-25
CLOSURE S 47°27'W 2.09'
7B-12
CLOSURE S 7°56'E 2.18'
Projected
7B-27
CLOSURE S 65°20'E 0.75'
7B-5
CLOSURE S 22°59'E 1.63'
7B-17
CLOSURE S 66°27'E 1.28'
7B-19A
CLOSURE N 51°45'E 0.42'
7B-19
(HIT DUCT AT 10')
7B-1
CLOSURE N 64°29'W 0.87'
7B-24
CLOSURE N 21°33'E 1.80'
7B-4
CLOSURE S 5°56'E 2.09'
7B-14
CLOSURE S 80°52'W 1.86'
7B-7B
(HIT DUCT AT 10')
7B-7A
(HIT DUCT AT 11')
7B-7
(HIT DUCT AT 11')
7B-9
CLOSURE N 60°31'W 0.32'
7B-3
CLOSURE S 3°53'E 0.41'
7B-18
CLOSURE S 56°0'E 0.48'
7B-15
CLOSURE S 44°34'E 0.68'
7B-13A
(HIT DUCT AT 10')
7B-13
(HIT ELECTRICAL PULL BOX AT 2')
CLOSURE S 57°36'E 2.08'
7B-16
7B-2
CLOSURE S 29°9'E 1.44'
7B-8
CLOSURE S 67°9'E 0.37'
7B-13B
CLOSURE S 13°33'W 1.45'
TRUE NORTH
8°E
PLANT NORTH
SCALE IN FEET
NOTE:
Ground surface datum at EL. 30.0 ft. above M.L.L.W. = EL. -2.66 ft. M.S.L.
UNITS 2 & 3
BECHTEL CORPORATION
ENGINEERS & CONSTRUCTORS
LOS ANGELES, CALIF.
JOB NO.
DATE
APPROVED
J.O. NO.
FILE
SAN ONOFRE NUCLEAR GENERATING STATION
DEEP EXPLORATION
DRILLING PROGRAM - WELL NO. 7
LOCATION OF DRILL HOLES
SOUTHERN CALIFORNIA EDISON COMPANY
SCALE
LOS ANGELES, CALIF.

FIGURE 6

SUMMARY OF DEEP DRILLING PROGRAM
AT WELL NO. 7

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED: GROUT INTERVALS	MATERIAL ENCOUNTERED: DISTURBED MATERIAL	MATERIAL ENCOUNTERED: SAN MATEO FORMATION	DRIFT: DIRECTION	DRIFT: DISTANCE	REMARKS
7B-1	200.0'	21.0-32.0'	32.0-85.0'	12.0-21.0' 85.0-200.0'	N64°29'W	0.87'	0.0-12.0 backfill
7B-2	200.0'	25.0-26.0'	26.0-45.0'	10.0-25.0' 45.0-200.0'	S29°9'E	1.44'	0.0-10.9 backfill, 25.0-45.0 possible drift into previously drilled hole
7B-3	200.0'	MIXED 25.0-26.5'		12.0-25.0' 26.5-200.0'	S31°53'E	0.41'	0-12 backfill, mixed sand and grout at 25
7B-4	195.0'			12.0-195.0'	S5°56'E	2.09'	0.0-12.0' backfill
7B-5	200.0'	25.0-26.0'	26.0-40.0'	10.0-25.0' 40.0-200.0'	S22°59'E	1.43'	0.0-10.0 fill
7B-6	11.0'		0.0-11.0'		Not Run	Not Run	Hit electrical conduit, hole abandoned
7B-6A	200.0'	21.0-28.0'	28.0-45.0'	45.0'200.0'	N25°24'E	1.09'	0.0-21 fill
7B-7	11.0'	MIXED 0.0-11.0'			Not Run	Not Run	Hit electrical conduit, hole abandoned
7B-7A	10.0'				Not Run	Not Run	0.0-10.0' backfill, hit electrical conduit, hole abandoned
7B-7B	10.0'				Not Run	Not Run	0.0-10.0' backfill, hit electrical conduit, hole abandoned
7B-8	200.0'	25.0-25.5' MIXED 25.5-40.0'		10.0-25.0' 40.0-200.0'	S67°9'E	0.37'	0.0-10.0 backfill
7B-9	200.0'			7.0-200.0'	N60°31'W	0.32'	0.0-7.0 backfill
7B-10	10.0'		0.0-10.0'		Not Run	Not Run	0.0-11.0 backfill, hit electrical conduit, hole abandoned
7B-10A	9.0'		0.0-9.0'		Not Run	Not Run	0.0-9.0 backfill, hit electrical conduit, hole abandoned

FIGURE 7
Sheet 1 of 3

SUMMARY OF DEEP DRILLING PROGRAM
AT WELL NO. 7

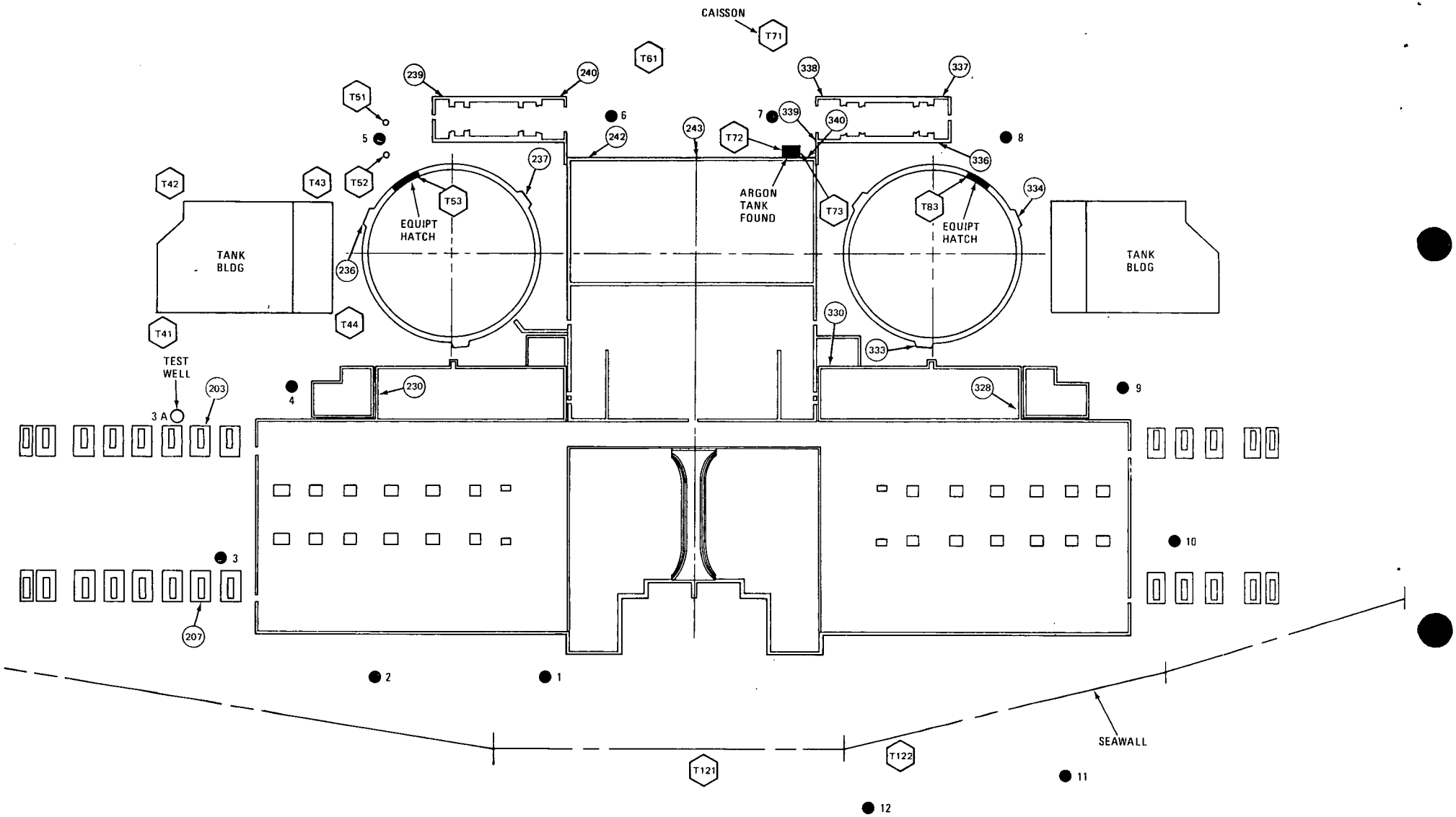
HOLE NO.	TOTAL DEPTH	GROUT INTERVALS	MATERIAL ENCOUNTERED DISTURBED MATERIAL	SAN MATEO FORMATION	DRIFT DIRECTION	DRIFT DISTANCE	REMARKS
7B-10B	200.0'	27.0-28.0'		10.0-27.0' 28.0-200.0'	S17°11'E	1.14'	0.0-10.0 backfill
7B-11	200.0'	25.0-26.2'	26.2-100.0'	10.0-25.0' 100.0-200.0'	S54°54'W	0.62'	0.0-10.0 backfill
7B-12	122.0'	23.0-29.5'	29.5-122.0'	10.0-23.0'	S7°58'E	2.18'	0.0-10.0 backfill, hit well casing at 122'
7B-13	2.0'				Not Run	Not Run	0.0-2.0 backfill, hit electrical Pull box, hole abandoned
7B-13A	10.6'				Not Run	Not Run	0.0-10.6 backfill, hit electrical conduit, hole abandoned
7B-13-B	200.0'	23.0-24.5'	24.5-45.0' 50.0-65.0'	10.0-23.0' 45.0'50.0' 65.0-200.0'	S13°33'W	1.45'	0.0-10.0 backfill, grout chips in samples at 50'
7B-14	200.0'	23.0-29.0'	29.0-71.0'	10.0-23.0' 71.0-200.0'	S80°52'W	1.86'	0.0-10.0 backfill
7B-15	200.0'	20.0-20.1'	20.1-85.0' 95.0-105.0'	10.0-20.0' 85.0-95.0' 105.0-200.0'	S44°34'E	0.68'	0.0-10.0 backfill
7B-16	200.0'	23.0-24.5'	24.5-75.0' 110.0-120.0'	10.0-23.0' 75.0-110.0' 120.0-200.0'	S57°46'E	2.08'	0.0-10.0' backfill
7B-17	200.0'	24.0-27.0'	27.0-65.0'	10.0-24.0' 65.0-200.0'	S66°27'E	1.28'	0.0-10.0' backfill
7B-18	200.0'		30.0-75.0'	12.0-30.0' 75.0-200.0'	S56°0'E	0.48'	0.0-12.0 backfill, lense of very dense sand at 60'

FIGURE 7
Sheet 2 of 3

SUMMARY OF DEEP DRILLING PROGRAM
AT WELL NO. 7

HOLE NO.	TOTAL DEPTH	GROUT INTERVALS	MATERIAL ENCOUNTERED DISTURBED MATERIAL	SAN MATEO FORMATION	DRIFT DIRECTION	DRIFT DISTANCE	REMARKS
7B-19	20.0'		10.0-20.0'		Not Run	Not Run	0.0-10.0' Backfill, hole abandoned due to wrench in hole
7B-19A	200.0'			10.0-200.0'	N51°46'E	0.42'	0.0-10.0' Backfill
7B-20	200.0'		30.0-75.0' 140.0-145.0'	10.0-30.0' 75.0-140.0' 145.0-200.0'	S17°19'E	1.23'	0.0-10.0 Backfill, 6-inch grout seam at 64', 140-145' N-valve 48 blows per foot
7B-21	200.0'	29.0-37.0'	0.0-10.0' 37.0-40.0'	15.0-29.0' 40.0-200.0'	S43°29'E	1.54'	10-15.0' Backfill
7B-22	10.0'				Not Run	Not Run	0.0-10.0' Backfill, hit electrical duct at 10.0'
7B-22A	200.0'		0.0-10.0'	13.0-200.0'	S34°18'W	0.75'	10.0-13.0' Backfill
7B-23	20.0'	Mixed 0.0-10.0' 10.0-20.0'			Not Run	Not Run	Hole abandoned due to excessive drift at surface
7B-23A	200.0'	0.0-10.0' 25.0-29.0'	29.0-80.0'	10.0-25.0' 80.0-200.0'	N46°27'W	1.21'	
7B-24	200.0'			12.0-200.0'	N25°33'E	1.9'	0.0-12.0' Backfill
7B-25	200.0'		28.0-43.5'	12.0-28.0' 43.5-200.0'	S47°28'E	2.09'	0.0-12.0' Backfill
7B-26	200.0'			12.0-200.0'	S80°2'E	1.20'	0.0-12.0 Backfill
7B-27	200.0'		25.0-35.0' 55.0-65.0'	13.0-25.0' 35.0-55.0' 65.0-200.0'	S65°20'E	0.75'	0.0-13.0 Backfill

FIGURE 7



DEWATERING SYSTEM SETTLEMENT
OBSERVATION PROGRAM

FIGURE 8

PROJECTED SCHEDULE
SONGS 2 & 3 WELL INVESTIGATION/DEMOBILIZATION PROGRAM

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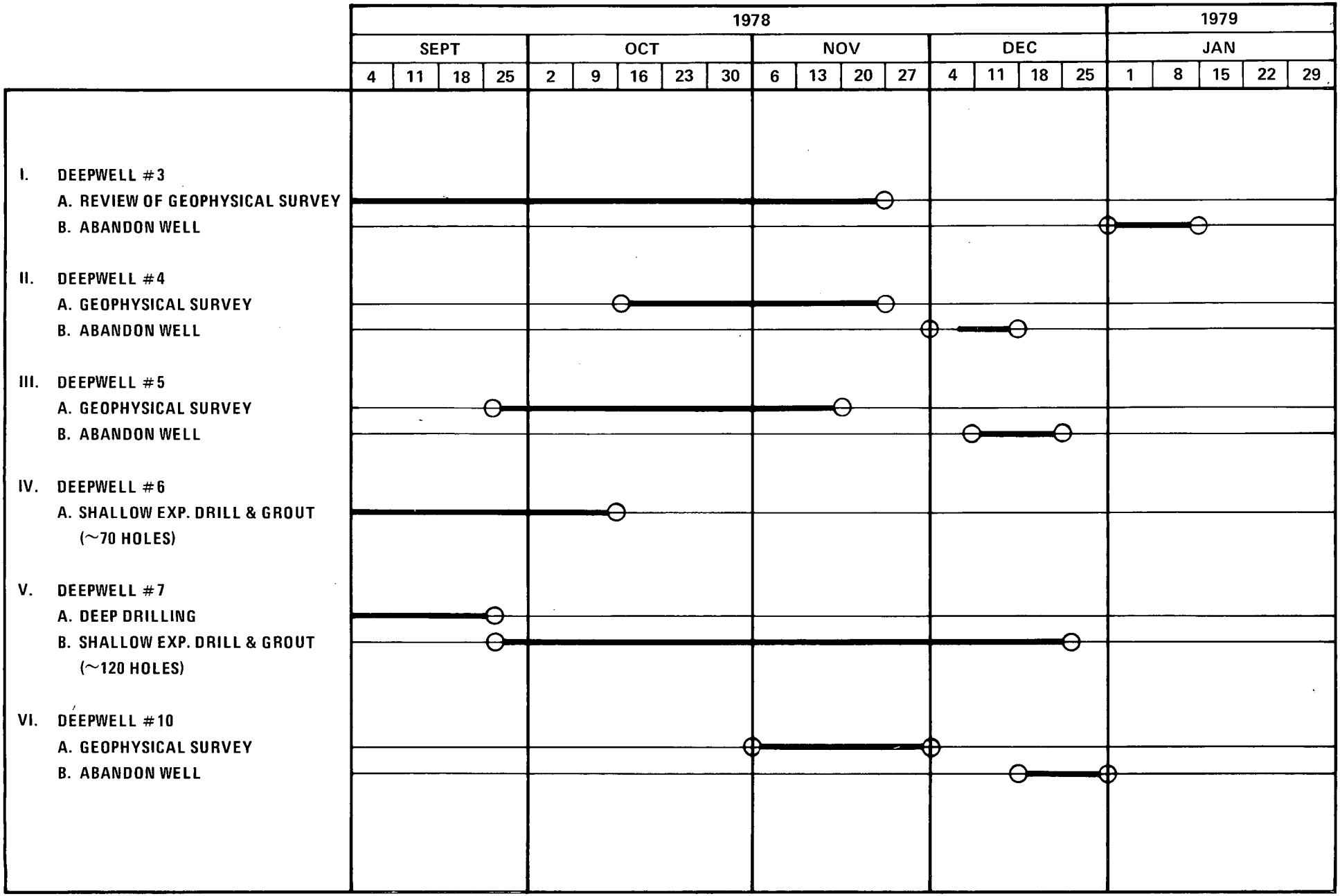

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Figure 9