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Documents status of investigation and actions taken on the dewatering
sys facil. Summarizes work accomplished between 780527 and 780901 w/the
exception of well 8.

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K. P. BASKIN

MANAGER, GENERATION ENGINEERING

October 5, 1978

TELEPHONE
213-572-1401

Director of Nuclear Reactor Regulation
Attention: Mr. Robert Baer
LWR Branch 2, DPM
U. S. Nuclear Regulator Commission
Washington, D. C. 20555

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Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

As part of Southern California Edison's commitment to keep the NRC staff informed of work performed in demobilizing the dewatering well system, fifty (50) copies of "Status Report on the Investigation of the Dewatering System, September 21, 1978", are enclosed for your use. The report summarizes work accomplished between May 27, 1978, and September 1, 1978, with the exception of the final disposition of Well 8. The final disposition report on Well 8 was forwarded to the NRC in a separate report on August 25, 1978.

If you have any comments concerning the information presented, please contact me.

Sincerely yours,

KP Baskin

Enclosure

cc: R. H. Engelken (NRC, Director I&E - Region V)

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STATUS REPORT ON THE
INVESTIGATION OF THE DEWATERING SYSTEM
SEPTEMBER 21, 1978

I. 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 the work accomplished between the period of May 27, 1978 and September 1, 1978 with the exception of the final disposition of Well 8, which was documented under a separate transmittal to the NRC.

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. Investigative work has been done on Wells 3, 5, 6, 7 and 8 (shaded in yellow) during this time period. A casing driving test was performed in the test grout area to simulate the conditions encountered during the casing driving at Well 6 and a seismic cross-hole survey was performed at Well 3. In addition, the three-dimensional stick model for Dewatering Well 8 has been completed.

Demobilization work at Well 8 was completed during this period and the results of the Deep Exploration Drilling Program, Shallow Exploration/Grouting Program and stability analysis of the cavity materials were forwarded to the NRC under separate cover. No additional discussion of Well 8 is included in this report. No further work has been done on Wells 4 or 10 through September 1, 1978. Because Wells 11 and 12 are outside the site area, no work was completed or is planned for these wells. The paragraphs that follow summarize work completed and planned for Wells 3, 5, 6 and 7 and discuss the casing driving field tests, the observations of the settlement observation monitoring program, and update progress on completion of the models.

WELL 3

Sixteen additional borings, for a total of 30 borings were drilled, and a total of 27 were slope indicatored. A gravity meter survey was performed at Well 3 and was unsuccessful due to ambient vibration levels. A cross-hole seismic survey was performed with promising results for cavity detection. The results of this survey are presently being analyzed for possible use on Wells 4 and 5. The geometry of the cavity is being reviewed based on these data.

WELL 5

The interior of the 14-inch casing was airlift cleaned to a depth of about 150 feet when the casing filled with gravel from the annulus outside to about 141 feet. The airlift operations were terminated due to: (1) excessive volume of material removed; and, (2) the observation that gravel in the annulus between the casing and the well bore dropped about three feet. The casing was then videotaped. It was encrusted below 50 feet, and very heavily encrusted below 130 feet. The casing is louvered below 92 feet. Enlargment of the louvers was noted in the casing at depths of about 115, 125 and 126 feet and the casing at 141 feet appeared to be irregular. The irregular plan view of the casing in the TV videotape was likely due to material caving into the casing at that depth through a hole. Future investigation of this well will be performed by the use of deep drilling and/or cross-hole seismic techniques.

WELL 6

The deep exploration drilling program at Well 6 was started on May 27, 1978 and to date a total of 18 holes comprising a total of 3577 lineal feet have been completed. Four holes were abandoned prematurely after encountering buried obstructions within ten feet of the plant grade. These holes were subsequently replaced by adjacent borings. Six supplementary borings were

drilled to complete the program and to provide data in areas where the original closure between borings was unacceptable due to the drifts associated with these borings. The location of all 18 borings and the projected drift are plotted in Figure 2 and a summary of the logs of the borings is presented in tabular form in Figure 3. All depths referenced are from the existing plant grade at Elevation +30.

All of the borings except three (6B-4, 6B-11 and 6B-14) were maintained within the two foot maximum vertical offset. The maximum drift encountered was at 6B-14 which drifted 3.43 feet from vertical at the completion depth of the survey of 186 feet.

All holes which did not encounter obstructions were completed to 200 feet except one, 6B-13A, which encountered gravel at 145 feet and was terminated at 154 feet. The presence of gravel and other drilling characteristics indicates that the hole drifted into the well at 145 feet.

Borings 6B-14, 6B-16, 6B-17 and 6B-18 were added on the southeast side of the well to replace 6B-13 which was abandoned before completion and to provide the proper closure spacing between the deep exploration borings.

Five borings (6B-1, 6B-6, 6B-12, 6B-17 and 6B-18) encountered cavity fill grout and/or native material for their full depth. The remainder of the borings encountered disturbed material at various intervals to a maximum depth of 140 feet (6B-2).

Review of the data from the deep exploration drilling program is in progress. Two additional holes may be required in the southeastern quadrant for identification of the location of the well bore at depth and to provide closure in that area. Additional documentation will be provided in subsequent progress reports and in the final report on deep exploration drilling program at Well No. 6.

The exploration/grouting program at Well 6 started on July 25, 1978. The procedure and plan for the program are slightly different than that used at Well 8 to adapt to a different working surface (about 30 feet of native or disturbed material overlying the backfill grout instead of one to two feet at Well 8) and a different cavity configuration.

The program will be carried out in three steps: Stage 1 consists of drilling and grouting a series of holes in and along the periphery of the presently known area of disturbed sand and/or cavity to define the lateral and vertical extent of the cavity. Stage 2 consists of drilling and grouting a series of angle holes oriented to intersect the zone of disturbed material and/or cavity at depth. Stage 3 consists of drilling a series of holes (upon the completion of drilling and grouting Stage 1 and 2 holes) to check the effectiveness of the grouting program.

After completion of the drilling of each hole, the drill rods are withdrawn and slotted PVC pipe is installed to the bottom of each hole to keep the hole from sanding in and facilitate washing the hole before grouting.

Grouting of all holes is being done through a pipe nipple consisting of a five to ten foot section of NX casing which is installed at the top of the hole. To minimize surface leakage each nipple is sealed at the surface with a block of grout approximately two feet square and 1.5 feet thick. Grout mixes, injection pressures, and testing are similar to that done at Well 8.

Through September 1, 1978, a total of 2980.5 lineal feet has been drilled in Stage 1 holes. 27 holes have been drilled to planned depth and eight holes were abandoned prior to reaching planned depth. The eight holes were abandoned due to water loss, drilling difficulties, etc. After grouting these abandoned holes, a new hole will be drilled to the original planned depth adjacent to the first.

All 35 holes (27 drilled to planned depth and eight abandoned) drilled to date have been grouted. A total of 325 bags of cement have been injected into these holes.

With the exception of two borings which either entered the well bore or a previous drill hole, the deepest extent of disturbed sand encountered in the exploration/grout program to date is about 75 feet. Additional examination to verify the location of the well bore at depth is in progress as stated in previous sections of this report. In most of the holes, depth of disturbed sand has been 70 feet or less. A total of about 45 to 50 holes are planned in Stage 1, which will be followed by a series of angle holes in Stage 2.

WELL 7

Prior to starting the deep exploration drilling program at Well 7, a series of ten exploratory holes were placed parallel to the Unit 3 side of the auxiliary building wall in the vicinity of the known cavity location. Six vertical holes (7A-45 through 7A-50) were drilled six feet from the auxiliary building wall and four angle holes (7A-51 through 7A-54) were drilled to intersect the area below the auxiliary building foundation. Two of the angle holes (7A-52 and 7A-53) intersected the foundation at 32 and 33 feet, respectively, and were abandoned. Boring 7A-51 was drilled normal to the building wall and 7A-54 was drilled on line between the well bore and 7A-48. The locations of these holes is shown on Figure 4.

Disturbed material was encountered to various depths in all holes sampled except 7A-50 which encountered backfill sand to 29 feet and native San Mateo Formation below. The maximum depth of disturbed material encountered in the vertical holes was 70 feet in boring 7A-48.

Data from the angle holes was inconclusive due to caving conditions and lost circulation encountered during drilling. Sampling was performed in three of the angle holes, two of which hit the building. The third encountered disturbed material to a depth of 63 feet at a point which is approximately beneath the edge of the auxiliary building. Additional holes will be placed in this area during the exploration/grout program proposed for Well 7 to adequately define the relationship between the cavity and the auxiliary building foundation.

Due to the possibility of caving of the holes in areas of disturbed sand, six of the borings were pressure grouted. A total of 256.1 bags of cement were injected in the six holes. The greater portion of this (199.5 bags) was injected into hole 7A-48.

The deep exploration drilling program at Well 7 was started on July 24, 1978 and to date a total of 18 holes comprising a total of 3460.6 lineal feet have been completed. The presence of buried utility duct banks adjacent to Well 7 has required a modification in the deep exploration drill hole pattern used at Wells 6 and 8. The initial 12 holes were laid out in approximately the same position but at various distances from the well bore. Where closure spacings resulting from this departure have been inadequate, additional holes are being drilled to ensure proper closure. In several cases two or three attempts have been required to avoid interference from the utility ducts.

The location of the 18 borings and projected drifts are plotted in Figure 5 and a summary of the logs of borings is presented in tabular form in Figure 6. Three of the 18 borings (7B-4, 7B-12 and 7B-16) have exceeded the two foot maximum offset. The maximum drift encountered was at 7B-12 which drifted 2.18 feet from vertical at the completion depth of the survey of 112 feet. This boring was terminated at 122 feet where an obstruction was encountered which could not be penetrated. The obstruction is believed to be the well casing.

Five borings (7B-3, 7B-4, 7B-8, 7B-9 and 7B-10B) have encountered concrete fill and/or native material for their full depth. The maximum depth of disturbed material encountered to date outside the original well bore is 120 feet in hole 7B-16. The maximum depth of backfill grout encountered to date is 32 feet in hole 7B-1, which suggests that the backfill grout was placed largely above the water table in the near vicinity of the well and that the cavity was filled with sand up to that point.

Work is being concentrated in the area on the northeast and southeast of the well to provide closure in the vicinity of the buried electrical lines. Excavations have been planned in these areas to determine the exact location of these utilities so that the required holes can be drilled.

III. RELATED ACTIVITIES

CASING DRIVING FIELD TEST

Vibration measurements were made in the field during the driving of an open end steel casing through loose soil into native San Mateo Sand. The purpose was to develop data on the level of vibrations that were induced into the ground at Well 6 during installation of a 36-inch diameter casing. The test was carried out on the west side of Turbine Building No. 3 in the area used for the previously reported grout testing program. A plan and cross-section of the vibration monitoring program are shown on Figure 2. Basically, the test consisted of driving a casing from position X to position Y on Figure 7 (cross-section) and monitoring vibration at the points indicated.

The vibrations were monitored by particle velocity sensing instruments with maximum amplitudes ranging from about 0.1 to greater than one inch per second. The corresponding acceleration amplitudes of motion were calculated to be as high as 1.0g. It is intended that the vibration levels will be correlated to the Well 6 casing driving records to predict the amplitudes and number of load applications induced into the soil in the vicinity of Well 6 during casing driving. These data are presently being analyzed and the results will be reported concurrently with, or subsequent to, the transmittal of the results of the field exploration at Well 6.

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 contains 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 settlement or uplift has been observed to date.

THREE DIMENSIONAL STICK MODELS

The three dimensional stick model for Well 8 has been completed. It contains two parts, one depicting the exploration work performed prior to the deep exploration drilling program and a second which depicts subsequent investigations. A photograph of the second stage of the model is included in this report between Figures 8 and 9. The drill holes are depicted by rods placed to the depth of the hole. Different colors represent materials encountered. Brown represents San Mateo Formation, orange represents disturbed sand and green represents either backfill grout (G-3) or grout placed in the shallow exploration/grouting program.

Work is now in progress on the model for Well 6. This model will also be done in two parts. As information is developed for Well 7, a model of the exploration work will be made.

IV. SUMMARY

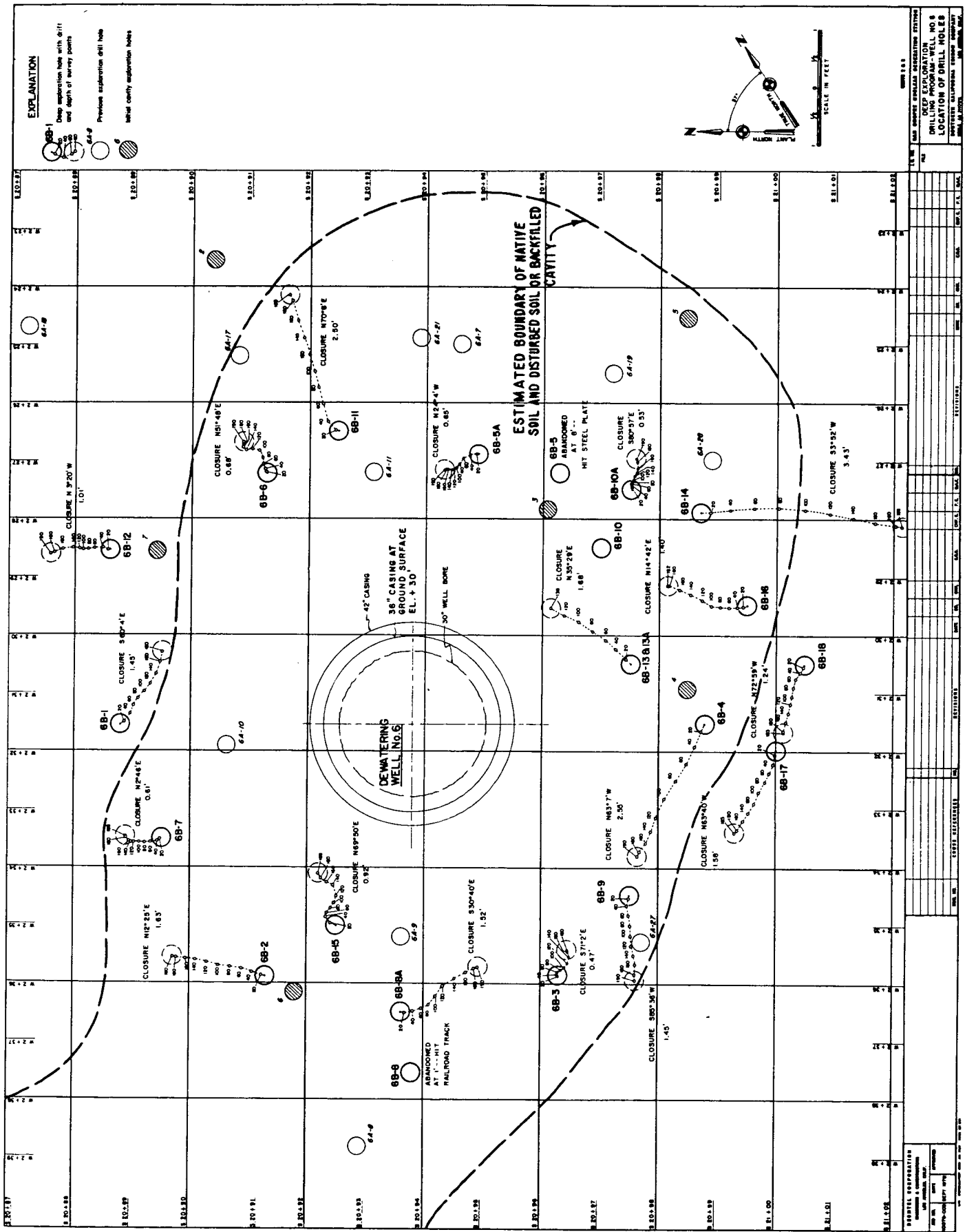
Well 8 has been successfully demobilized. Work is in progress in the investigation/demobilization of Wells 6 and 7. To date, the deep exploration drilling program at Wells 6, 7 and 8 has not encountered any cavities below a depth of about 140 feet.

The exploration/grout program has been initiated at Well 6 and a total of 325 bags of cement have been injected. Three drill rigs are currently involved in the deep exploration drilling and exploration/grout 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 September 1978
			Depth	Condition of Casing	Initial	Airlift Cleaning	Cavity Grout	Pressure Grout	Caliper	
1	Offline, Demobilized, Avg. Maint.	—	200' removed, TV to 196'	Heavily Encrusted	No	Yes	Yes	No	Mech.	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.
2	Offline, Demobilized, High Maint.	None	Casing 200' removed, TV to 188'	Heavily Encrusted	No	Yes	Yes	No	Mech.	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 200' removed, TV to 196'	Heavily Encrusted	No	Yes	—	—	Initial Mech. & Bore	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 200' removed, TV to 296'	Lightly Encrusted, Some Corrosion	No	No	Yes	No	No	Well operated a few days as test well; only 6' fill in bottom of well, TV and slope indicators and some lower corrosion, gravel pack visible where lower hole were enlarged; well completely demobilized by gravity grouting the casing.
4	Offline, Very Low Maint.	—	Casing 200' removed, TV to 198'	Heavily Encrusted	Yes (inside casing)	Yes	—	—	—	Well initially demobilized by cutting off top, filling with sand, welding steel cap on top and covering with compacted fill. Presently uncovered, larger (4' diameter) working casing set, accessible for investigation/demobilization.
5	Offline, High Maint.	18 borings to El. -20' to -30'	Casing 200' removed, TV to 141'	Heavily Encrusted Below 50'	Yes	Yes	—	Yes, Cement to El. -23'	—	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 has been cleaned to 141'.
6	Offline, High Maint.	35 borings to El. -20' to -170' (19 slope indicators) 21 deep borings to El. -42 to -170'	Casing 200' removed, TV to 200'	Bad Deterioration below 115'	Yes	Yes	Yes	—	Mech & Bore	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 143' casing is almost non-existent but gravel pack and asphalt coating is present. (2nd) Bailing tried in early stages but caused too much disturbance in well and was discontinued. A 34' casing was redriven from 106' to 116'. The casing would break at about 67' with about a 2' hole at 116'. The casing was drilled to 124', airlifted to 136-1/2' for bottom casing inspection. Casing filled to 125'. Open cavity filled with gravity grout. Casing exploration drilling has been completed. The gravel hole drilling and grouting is presently in progress.
7	Offline, Very High Maint.	54 borings to El. -15' to -170' (19 slope indicators) 25 deep borings to El. -20 to -170'	Casing 199' removed, TV to 199', 139' 10' removed	Bad Deterioration 10' casing also bad	No	Yes	Partial Fill	—	Limited Sonar	New 10' casing placed early in operation inside original 14' casing because well 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 121'. Portion of 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' (13 slope indicators) 18 deep borings to El. -140' to -170'	142' Casing removed, TV from 142 to 185' through tallescope casing	Minor Corrosion 100-120' Highly Corroded below 120'	Yes	Yes	Yes	Yes	Mech.	Casing and annulus was cleaned with airlift with casing legging cleaning; casing removed and cavity calipered, boreholes drilled to define plan area and depth of cavity, central access casing set, gravel pack placed through cavity and cavity filled with gravel (gravity), substances encountered at west end due to local water rise during gravity grouting, gravel pack was grouted, telescoping casing set and airlift operation resumed. Casing was cleaned to a 160' depth due to casing. Investigation/demobilization and gravel grouting program. Observation holes were drilled to monitor future work. Casing was airlifted to 182' and TV logged to 181'. The cavity was filled with gravel and excavation of the Unit 3 P&G tunnel to El. -47' completed. The deep drilling application has been completed. The gravel 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.	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 lower), caliper indicated no borehole enlargement indicative of erosion, well completely demobilized by gravity grouting.
10	Operational, Avg. to Low Maint.	—	200' Casing 200' removed, 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.

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

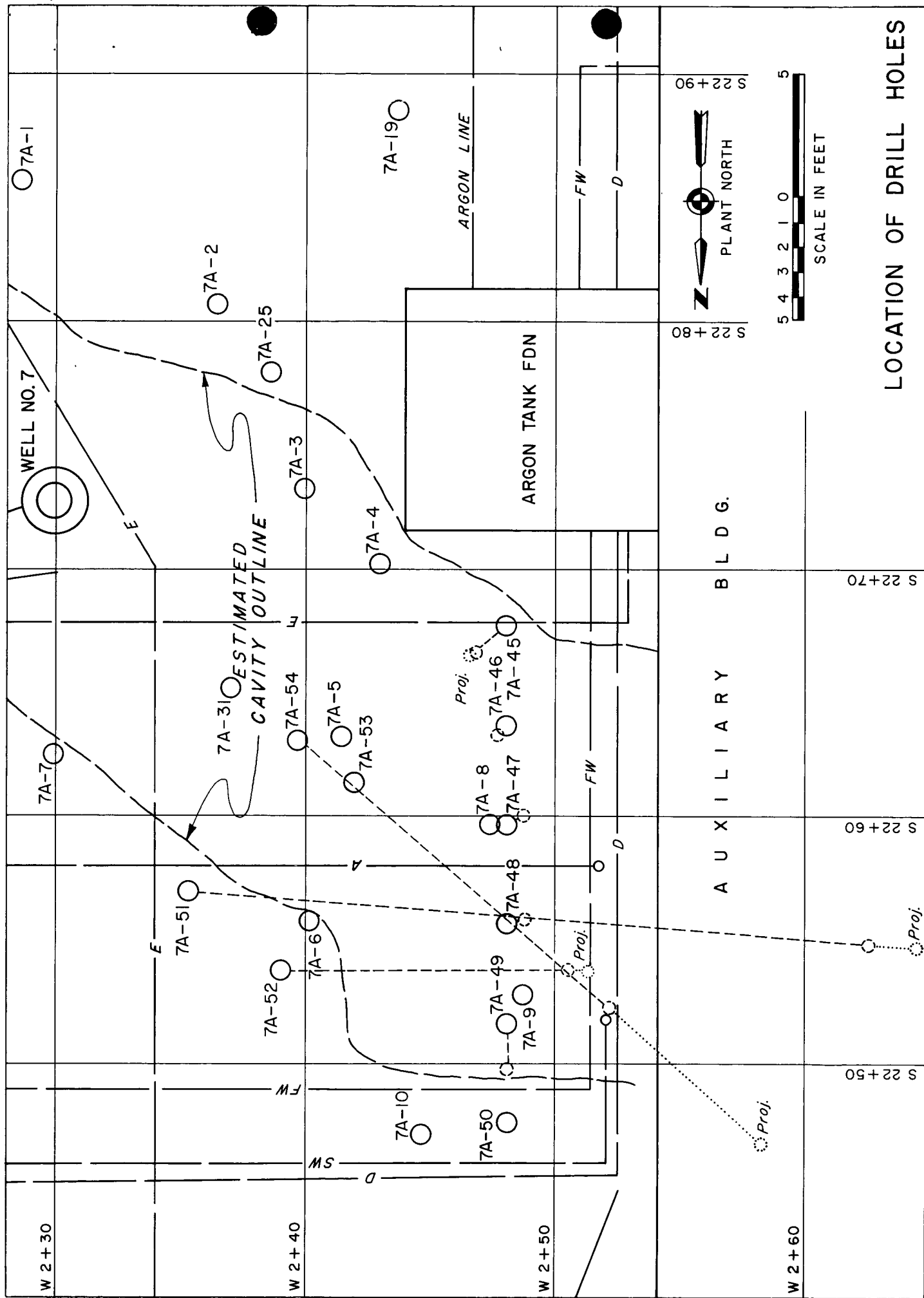
Figure 1 - STATUS SUMMARY OF INVESTIGATION/DEMobilIZATION OF WELLS AS OF 1 SEPTEMBER 1978



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'		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'

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
6B-10A	200.0'		40.0-45.0'	7.0-40.0'	S80°57'E	0.53'	0.0-7.0 fill
			55.0-85.0'	85.0-120.0'			
			120.0-130.0'	130.0-200.0'			Fine gravel in sample at 125'
6B-11	200.0'	24.0-43.5'	43.5-55.0'	7.0-24.0'	N70°8'E	2.50'	0.0-7.0 fill
				55.0-200.0'			
		SEAMS					
6B-12	200.0'	20.0-26.0'		2.0-200.0'	N30°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'	7.0-28.0'	N35°29'E	1.68'	0.0-7.0 fill
			130.0-154.0'	43.0-55.0'			Gravel encountered at 145'. Hole assumed to have entered well bore.
				125.0-130.0'			
6B-14	200.0'	2.5-6.0'	6.0-20.0'	20.0-200.0'	S30°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'	0.0-19.0'	N69°50'E	0.92'	120-140 drill fluid
			120.0-125.0'	80.0-120.0'			Loss into adjacent hole
				125.0-200.0'			
6B-16	200.0'	55.0-60.0'	60.0-65.0'	7.0-55.0'	N14°42'E	1.40'	0.0-7.0 backfill
				65.0-200.0'			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



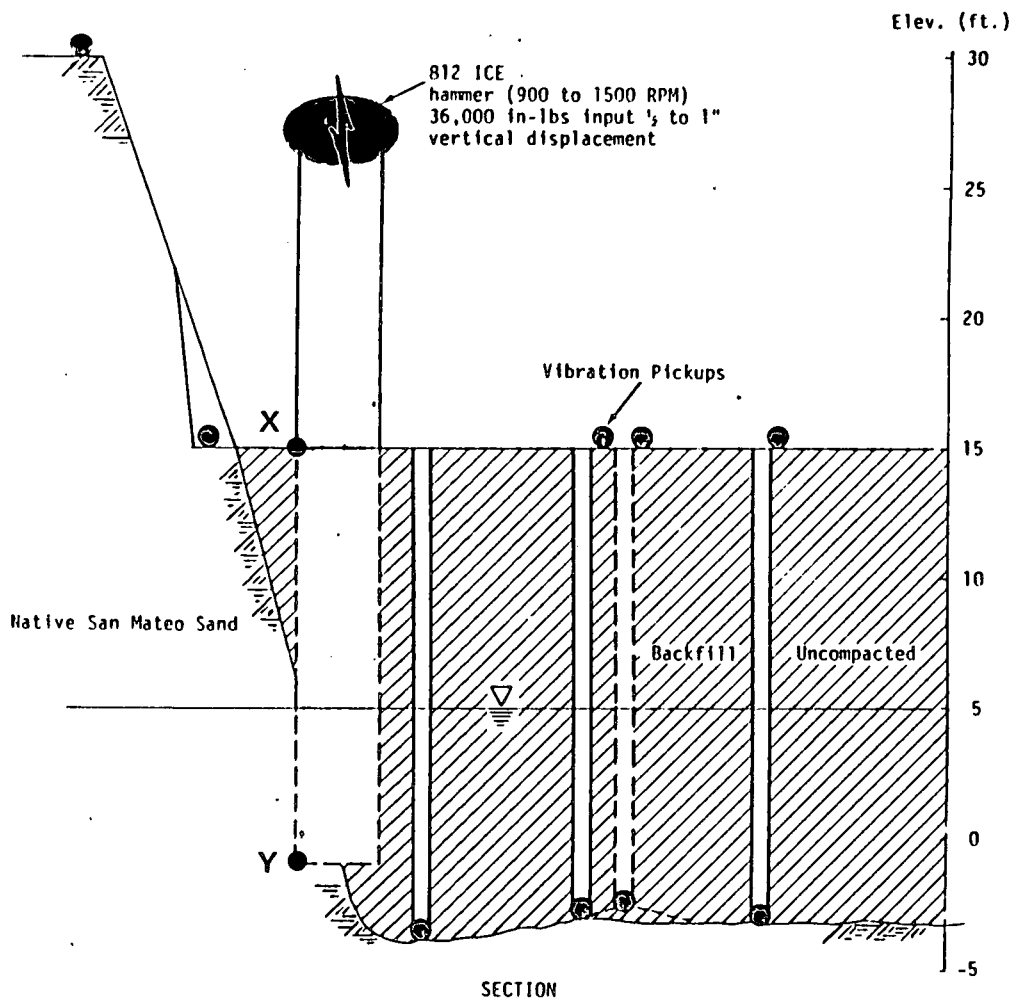
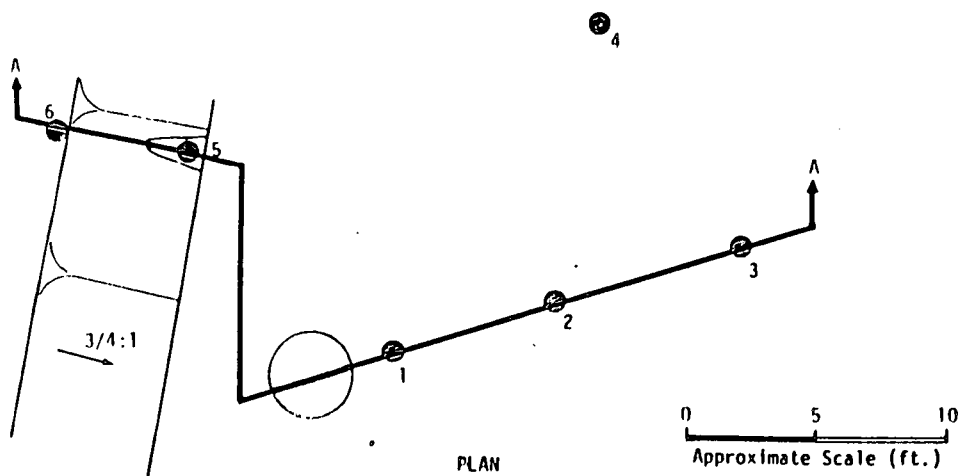
LOCATION OF DRILL HOLES

SUMMARY OF DEEP DRILLING PROGRAM
AT WELL NO. 7

HOLE NO.	TOTAL DEPTH	MATERIAL ENCOUNTERED			DRIFT		REMARKS
		GROUT INTERVALS	DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
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°09'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'			0.0-195.0'	S5°56'E	2.09'	
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	Hit electrical conduit, hole abandoned
7B-7B	10.0'				Not Run	Not Run	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' 7.0-200.0'	S67°09'E	0.37'	0.0-10.0 backfill
7B-9	200.0'				N60°31'W	0.32'	0.0-7.0 backfill
7B-10	10.0'				Not Run	Not Run	0.0-11.0 backfill, hit electrical conduit, hole abandoned
7B-10A	9.0'				Not Run	Not Run	0.0-9.0 backfill, hit electrical conduit, hole abandoned

SUMMARY OF DEEP DRILLING PROGRAM
AT WELL NO. 7

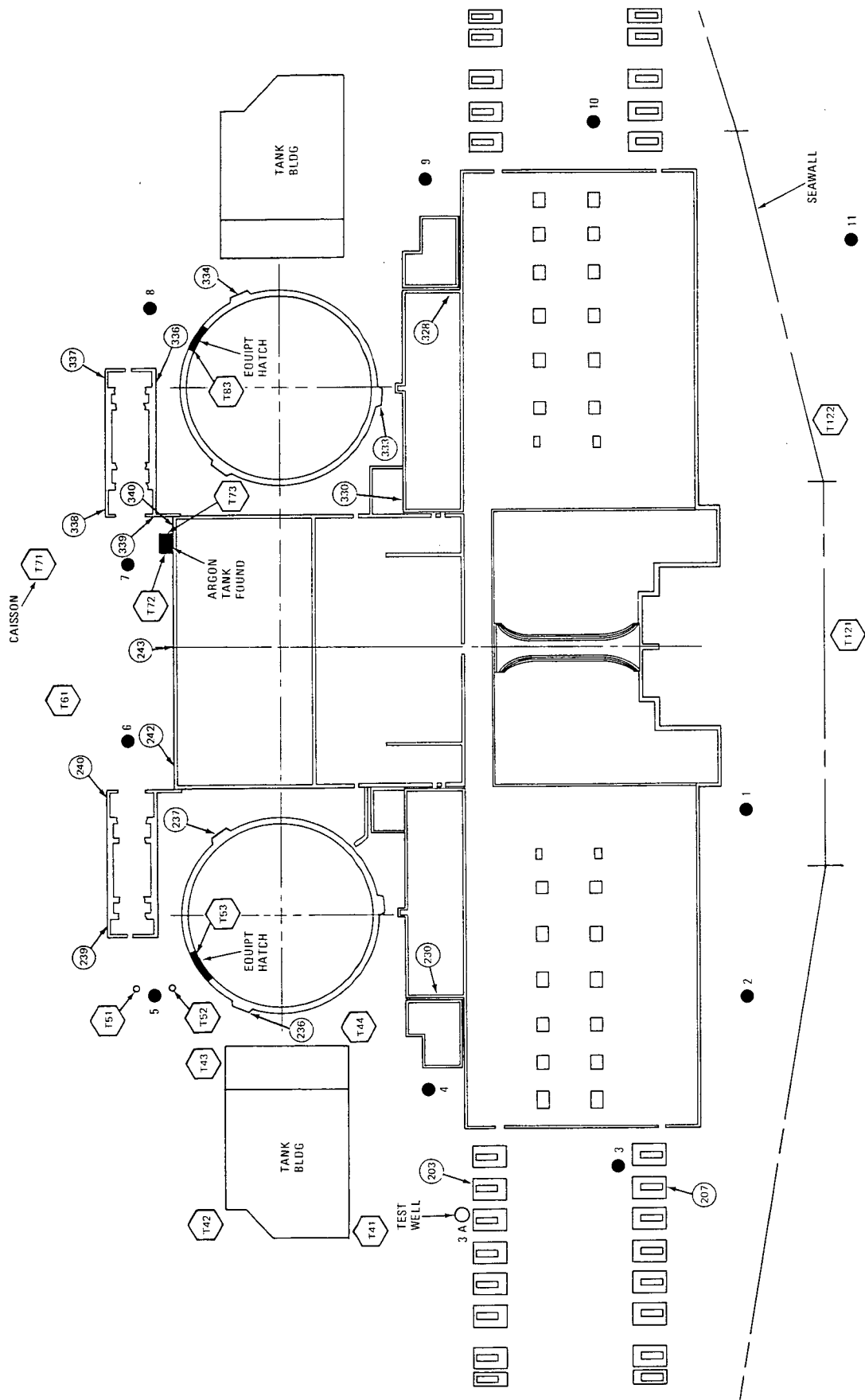
HOLE NO.	TOTAL DEPTH	GROUT INTERVALS	MATERIAL ENCOUNTERED		DRIFT		REMARKS
			DISTURBED MATERIAL	SAN MATEO FORMATION	DIRECTION	DISTANCE	
7B-10B	200.0'	27.0-28.0'		10.0-27.0' 28.0-200.0'	S17°11'E	1.14'	0.0-10.0 backfill
7B-11	200.0'	25.0-26.2'	26.2-100.0'	10.0-25.0' 100.0-200.0'	S54°54'W	0.62'	0.0-10.0 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'	0.0-23.0' 75.0-110.0' 120.0-200.0'	S57°46'E	2.08'	
7B-17	200.0'	24.0-27.0'	27.0-65.0'	0.0-24.0' 65.0-200.0'	S66°27'E	1.28'	
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'



Project: **SONGS WELLS**
Project No. **40881 A**

**PLAN AND CROSS SECTION OF CASING
DRIVING VIBRATION MONITORING PROGRAM**

Fig. **7**



DEWATERING SYSTEM SETTLEMENT
 OBSERVATION PROGRAM
 FIGURE 8



7.5'



-20'

-45'

-70'

-90'

-110'

-130'

-150'

-170'



PROJECTED SCHEDULE SONGS 2 & 3 WELL INVESTIGATION/DEMobilIZATION PROGRAM

REV. NO. 8

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