M/019/005

Texasgulf Chemicals Co. A Division of Texasgulf Inc.

P.O. Box 1208 Moab, Utah 84532

Potash Operations
(801) 259-7171

January 2, 1986

RECEIVED

JAN 03 1986

DIVISION OF OIL
GAS & MINING

State of Utah Department of Health
Bureau of Water Pollution Control
150 West North Temple
P. O. Box 45500
Salt Lake City, Utah 84145

ATTN: Calvin K. Sudweeks, Executive Secretary
Utah Water Pollution Control - Committee

RE: Plugging and Abandonment Plan

Dear Mr. Sudweeks:

In compliance with 40 Cfr 144-52(a) 6 and 146.10 requirements, enclosed is the Plugging and Abandonment Plan.

Sincerely,

Chris W. Sterry

Chris W. Sterry
Enviromental Supervisor

Enlosures

cc: Pamela Grubaugh-Littig -Chief Reclamation Engr., DOGM
Rudy S. Higgins - Texasgulf
Clark H. Huff - Texasgulf
Jim H. Huizingh - Texasgulf

If Satisfactory, then send memo to Loren Morton by 1/10/86.
Call him when ready.

TEXASGULF INC.

MOAB, UTAH

CANE CREEK MINE

PLAN FOR ABANDONMENT OF CLASS III WELLS AND MINE SHAFTS

REVISION # 1a

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Description of Wells

Twenty three wells have been drilled by Texasgulf since operations began in 1962. These wells vary in depth from 2,648 to 4,133 feet. Casing size ranges from 4.5 inches to 20 inches. There are two main purposes for these wells. The first was to provide access to the old mine workings for the purpose of extracting ore by solution mining. The second was a test program to evaluate mining outside the old mine.

Wells #2 thru #16 were drilled from 1970 to 1975 for the purpose of solution mining in the old mine workings. These wells are located in faulted areas and have poor cementing between drill hole and casing.

Wells #17, #18, #19, #21, #22 and #23 were drilled from 1976 to 1981 for the test well program. Well #1 was drilled in 1970 but did not enter the mine and was used in the test well program from 1974 to present. Well #20 was drilled in 1981 for use as an extraction well. All of these wells were drilled in nonfaulted areas and have good cementing between drill hole and casing.

Wells #3 and #9 were drilled for injection but missed the mine. Well #3 was used for 6 months during 1974 in the test well program. Well #9 has never been used.

Wells #7 and #11 were drilled for injection and entered the mine but due to problems were plugged. Well #11 was plugged at 2084' and cemented with a small almount of cement. Well 7 was plugged at 2210' and filled with cement to 1371'.

Wells #2, #8, #13 and #14 were used for injection but developed leaks. These wells were plugged.

Wells #4, #5, #10, #12, #15 and #16 are used for injection. Wells #6 and #20 are used for extraction.

Procedure for Abandonment of Wells

The plan for abandonment of these wells is to isolate the paradox from the above formations. This will be accomplished in two steps. The first is by placing a bridge plug at the bottom of salt 2. This will require a workover rig and a Halliburton tool man. Drill pipe will then be lowered into the well to just above the bridge plug and a 400 foot cement plug will be pumped in. This will require the addition of a cement truck and water truck. To finish sealing the well the brine remaining in the well will be displaced by pumping bentonite thru the drill pipe. Another cement plug will be placed in the first 200 feet of the well. The placement of cement plugs shall be in accordance with 40 CFR 146.10(b). The placement of bentonite plugs shall be in accordance with CFR 146.10(c). The cement used will be salt saturated Class B neat cement at a ratio of 1.27 cu. ft. per sack with a density of 120 #/cu ft. The bentonite used wil be mixed at a ratio of 4 sacks per 20 barrels. This will give a density of 64.57 #/cu ft. The cement and bentonite will be installed thru a diverter tool located on the end of the drill pipe to assure proper placement in the well. All tubing in wells 1, 15, 17, 18, 19, 21, 22 and 23 will be removed prior to cementing of any wells. This will require a workover rig and a casing crew. The following spreadsheet outlines the equipment, material and costs required. Drawings of individual wells showing drilling information are also included.

ABANDONMENT PLAN

DETAILS OF EACH WELL AND MATERIALS REQUIRED

WELL #	Surface Elevation	Pipe Size	Wall Thickness	Inside Area	Top Depth	Bottom Depth	Plug Location	Cu Ft Bentonite	Cu Ft Cement	
1	3,944	10.750	0.350	0.551	0	2,960	2,400	992	331	Not into mine
Tubing		5.500	0.258	0.136	0	3,033				To be pulled
2	3,868	7.625	0.328	0.265	0	3,033				Plugged
		5.500	0.362		0	3,001	2,828			
3	4,215	10.750	0.350	0.551	0	3,057	2,550	1,074	331	Not into mine
4	4,223	10.750	0.350	0.551	0	2,951	2,500	1,047	331	Injection
5	4,150	10.750	0.350	0.551	0	3,160	2,600	1,102	331	Inj. and Ext.
6	4,037	20.000	0.635	1.913	0	1,040				Extraction
		16.000	0.625	1.187	937	3,198	2,700	4,336	857	
7	4,397	No Casing		Varies	(See Appendex F for Details)				350	Plugged
8	4,274	8.625	0.352	0.342	0	1,544				Plugged
		4.500	0.205	0.091	0	2,680	2,100	615	55	
9	4,289	4.500	0.205	0.091	0	2,745	2,200	146	55	Not into mine
10	4,254	7.000	0.272	0.227	0	1,913				Injection
		4.500	0.205	0.091	0	2,638	2,150	549	55	
11	4,367	7.000	0.272	0.227	0	1,974				Plugged
		4.500	0.205	0.091	0	2,700	2,084	557	55	
12	4,591	10.750	0.350	0.551	0	3,142	2,650	1,129	331	Injection
13	4,339	7.000	0.317	0.221	0	2,348				Plugged
		4.500	0.205	0.091	0	3,022	2,711	685	55	
14	4,365	8.625	0.400	0.334	0	2,727	2,200	534	200	Plugged.
15	4,262	9.625	0.395	0.426	0	2,285				Plugged
		7.000	0.362	0.215	2,127	3,038	2,550	1,282	171	
Tubing		7.000	0.362	0.215	0	2,127				To be pulled
16	4,256	9.625	0.395	0.426	0	2,110				Injection
		7.000	0.362	0.215	2,004	2,803	2,250	1,210	255	
17	3,956	9.625	0.395	0.426	0	2,711				Test Well
		7.000	0.362	0.215	2,616	3,443	2,900	1,606	255	
Tubing		5.500	0.275		0	2,603				To be pulled
Tubing		4.500	0.205		2,603	3,508				To be pulled
18	3,956	8.625	0.400	0.334	0	3,459	2,900	768	200	Test Well
Tubing		5.000	0.362		0	3,956				To be pulled
19	3,950	5.500	0.362	0.124	0	4,133	2,750	267	75	Test Well
Tubing		2.875	0.217		0	3,330				To be pulled
20	4,035	9.625	0.395	0.426	0	2,465				Extraction
		7.000	0.362	0.215	2,388	3,199	2,600	1,437	255	
21	3,996	7.000	0.362	0.215	0	3,560	2,950	505	129	Test Well
Tubing		4.500	0.250		0	3,556				To be pulled
22	4,010	7.000	0.362	0.215	0	3,546	2,950	505	129	Test Well
Tubing		4.500	0.250		0	3,546				To be pulled
23	4,011	7.000	0.362	0.215	0	3,800	3,200	558	129	Test Well
Tubing		4.500	0.250		0	3,811				To be pulled
						Totals		**20,904**	**4,935**	

Note: All tubing to be pulled before cementing

ABANDONMENT PLAN

Costs for Each Well

Well#	Tubing Removal Costs Rig	Casing Crew	Cost Plug	Rig Costs	Cost Cement	Cost Bentonite	Pumping Costs	Extra Costs	Total Cost Per Well
1	$1,750	$1,950	$2,989	$2,566	$3,244	$397	$1,670		$14,566
2			Existing						
3			$2,989	$2,566	$3,244	$430	$1,670		$10,898
4			$2,989	$2,566	$3,244	$419	$1,670		$10,888
5			$2,989	$2,566	$3,244	$441	$1,670	$250	$11,160
6			$5,500	$2,566	$8,399	$1,734	$1,670		$19,869
7			N.A.	$2,566	$3,430		$1,670	$800	$8,466
8			$1,222	$2,566	$539	$246	$1,670	$40,250	$46,493
9			$1,222	$2,566	$539	$58	$1,670		$6,055
10			$1,453	$2,566	$539	$220	$1,670		$6,448
11			Existing	$2,566	$539	$223	$1,670		$4,998
12			$2,989	$2,566	$3,244	$452	$1,670		$10,920
13			Existing	$2,566	$539	$274	$1,670	$250	$5,299
14			Existing	$2,566	$1,960	$214	$1,670		$6,410
15	$1,750	$1,950	$2,400	$2,566	$1,676	$513	$1,670		$12,525
16			$2,514	$2,566	$2,499	$484	$1,670		$9,733
17	$1,750	$1,950	$2,514	$2,566	$2,499	$642	$1,670		$13,591
18	$1,750	$1,950	$2,009	$2,566	$1,960	$307	$1,670		$12,212
19	$1,750	$1,950	$1,275	$2,566	$735	$107	$1,670		$10,053
20			$1,453	$2,566	$2,499	$575	$1,670		$8,763
21	$1,750	$1,950	$1,453	$2,566	$1,264	$202	$1,670		$10,855
22	$1,750	$1,950	$1,453	$2,566	$1,264	$202	$1,670		$10,855
23	$1,750	$1,950	$1,453	$2,566	$1,264	$223	$1,670		$10,876
	$14,000	$15,600	$40,866	$56,452	$48,363	$8,362	$36,740	$41,550	

Total Individual Costs	$261,933
Move in for Halliburton	$999
Move in for Rig	$350
Move in for Casing Crew	$396
Total Plugging Costs	**$263,678**

Note; See Appendex D & E for Details on Cost

ABANDONMENT PLAN

Miscellaneous Notes for Each Well

Well #	Notes
1	
2	Filled and Capped
3	
4	
5	$250 Allowed for Cementing the Casing Annulas
6	
7	See Appendex F and Page #17 For Abandoment Procedure of Well #7 ($800 Allowed for Gravel Fill)
8	$40,000 Allowed to Repair Offset $250 Allowed for Cementing The Casing Annulas
9	
10	
11	
12	
13	$250 Allowed for Cementing the Casing Annulas
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	

ABANDONMENT PLAN

Cost Estimate to Plug #1 Shaft

Remove Salt

Prepare Shaft for Solution Mining	HRS	$/HR	
Prepare Headframe as Derick			$10,000.00
Move in Workover Rig	8	$175.00	$1,400.00
Pickup Pipe	2	$175.00	$350.00
Rent 2000ft 2 7/8" Drill Pipe @$.06/ft/day 2 Days			$240.00
Drill to 2000ft @5ft/min West Side	8	$175.00	$1,400.00
Drill to 2000ft @5ft/min East Side	8	$175.00	$1,400.00
Lay Down Drill Pipe	2	$175.00	$350.00
Rental on 6" Pipe @$.07/ft/day for 40 Days			$11,200.00
Pickup 6" Pipe	2	$175.00	$350.00
Set 6" Pipe to 2000ft East Side	6	$175.00	$1,050.00
Pickup 6" Pipe	2	$175.00	$350.00
Set 6" Pipe to 2000ft West Side	6	$175.00	$1,050.00
Travel Costs Casing Crew			$396.00
Casing Crew 2 Days @$1950/Day			$3,900.00
Valves and Fittings for Surface			$10,000.00
Install Valves and Fittings			$4,000.00
Subtotal			$47,436.00 ok

Solution Mine Salt From #1 Shaft	
Prepare Area by River for Pumps	$1,000.00
Setup 50HP 1500GPM Diesel Pump at River	$500.00
Setup 2 - 200HP 1500GPM Diesel Pumps at River	$2,000.00
Rental on 50HP Pump for 30 Days @$50/Day	$1,500.00
Rental on 200HP Pumps for 30 Days @$100/Day Ea	$6,000.00
Install 2800Ft 8" Pipeline from River to Shaft	$1,500.00 - ? lower was $400
Rental on Pipe for 30 Days @$.13/ft/day	$10,920.00
Setup 50HP 1500GPM Pump At Shaft	$500.00
Rental on 50HP Pump for 30 Days @$50/Day	$1,500.00
Install 900ft 8" Pipe from Shaft to Tails Lake	$1,350.00
Rental on 900ft 8" Pipe	$3,510.00
Fuel for Pumps	
2 - 200HP 11gal/hr *24hrs*30days*$.92	$14,573.00
2 - 50HP 4GAL/HR *24*30*$.92	$5,299.00
Operator 30Days @ $27.55/HR	$19,836.00
Subtotal	$69,988.00

Remove 6" Pipe From Shaft	HRS	$/HR	
Move in Workover Rig	8	$175.00	$1,400.00
Remove 4000ft 6" Pipe	12	$175.00	$2,100.00
Lay Down 6" Pipe	4	$175.00	$700.00
Travel Costs Casing Crew			$396.00
Casing Crew 2 Days @$1950/day			$3,900.00
Subtotal			$8,496.00

Total For Removing Salt **~~$125,920.00~~** 128,620

ABANDONMENT PLAN

Cost Estimate to Plug #1 Shaft

Cost of Cement for Shafts

Quote from Ideal Cement @79.75/ton FOB SLC
$79.75/ton * 25 Ton Truck Capacity =$1,993.75
Freight Cost

Cost per 94lb Sack	$4.43	SACK
Halliburton Handling Charge	$0.95	SACK
	$5.38	SACK

Cementing Costs - 32,215 Sacks Required

Assuming 6 Days 5400 Sacks per Day

Move in Workover Rig			$350
Move in Cost for Halliburton			
Cement Pump Truck 140Miles @$2.15		$301.00	
Bulk Truck 140Miles @$.90		$126.00	
Crew Truck 140Miles @$.90		$126.00	
Subsistance 3 Men @$80 - 6 Days		$1,440.00 - Halliburton ok	
			$1,993
Workover Rig 6 - 8 HR Days @$175/hr			$8,400
Rent 2000ft 2 7/8" Drill Pipe @$.06/ft/Day 6 Days			$720
Halliburton Cement Truck 6 Days @$1,260			$7,560
Halliburton Subsistance 3 Men 6 Days @ $80/day			$1,440
1000 Sack Cement Bins 6 Required			
Move in Costs 140Miles @$.9		$756.00	
6 Bins @ $112/day * 6 Days		$4,032.00	
			$4,788
Total Pumping Costs			$25,251
Cement Cost #1 Shaft 32,215 Sacks			$173,317
Total Cementing Costs			**$198,568**

Prepare Shaft for Filling with Gravel

Drill and Blast 4ft Dia hole in Center of Shaft	Allow	$4,000
Fabricate 3ft Thick Removable Cover with 6" Inspection Pipe	Allow	$3,000
Fabricate Chute for Dumping Gravel in Shaft	Allow	$3,000
Subtotal		$10,000

Fill #1 Shaft with Gravel (1900ft Deep 22ft Diameter)

(See Appendex H for Availability and Cost of Gravel)
Fill with 26750 Cu Yds Gravel @$4.47/CY $119,573

Refill With Gravel after 5 Years

Gravel Refill
Assume 10% Settling (2675 Cu Yds) @$4.47/CY $11,957

Total Cost For Gravel Fill **$151,530**

Total Cost for Plugging #1 Shaft **$476,018** 478,718

ABANDONMENT PLAN

Cost Estimate to Plug #2 Shaft

Cementing Costs

Assuming 1 Day 5400 Sacks per Day

Move in Workover Rig		$350.00
Move in Cost for Halliburton		
Cement Pump Truck 140Miles @$2.15	$301.00	
Bulk Truck 140Miles @$.90	$126.00	
Crew Truck 140Miles @$.90	$126.00	
Subsistance 3 Men @$80 - 6 Days	$240.00	
		$793.00
Workover Rig 1 - 8 HR Days @$175/hr		$1,400.00
Rent 2650ft 2 7/8" Drill Pipe @$.06/ft/Day 1 Day		$159.00
Halliburton Cement Truck 1 Days @$1,260		$1,260.00
Halliburton Subsistance 3 Men 1 Day @ $80/day		$240.00
1000 Sack Cement Bins 1 Required		
Move in Costs 140Miles @$.9	$126.00	
1 Bin @ $112/day * 5 Days (min)	$560.00	
		$686.00
Total Pumping Costs		$4,888.00
Cement Cost #2 Shaft 1065 Sacks		$5,730.00
Total Cementing Costs		**$10,618.00**

Prepare Shaft for Filling with Gravel

Remove Steel Cap	ALLOW	$500.00
Fabricate 3ft Thick Removable Cover With 6" Inspection Pipe	ALLOW	$1,500.00
Use Chute From # 1 Shaft for Dumping Gravel		
Subtotal		$2,000.00

Fill #2 Shaft with Gravel (2250ft Deep 4ft Diameter)

(See Appendex H for Availability and Cost of Gravel)

Fill with 1187 Cu Yds Gravel @$4.47/CY — $5,306.00

Refill With Gravel after 5 Years

Gravel Refill

Assume 10% Settling (119 Cu Yds) @$4.47/CY — $532.00

Total Cost For Gravel Fill — **$7,838.00**

Total Cost for Plugging #2 Shaft — **$18,456.00**

ABANDONMENT PLAN

ABANDONMENT PLAN
TOTAL COST ESTIMATE

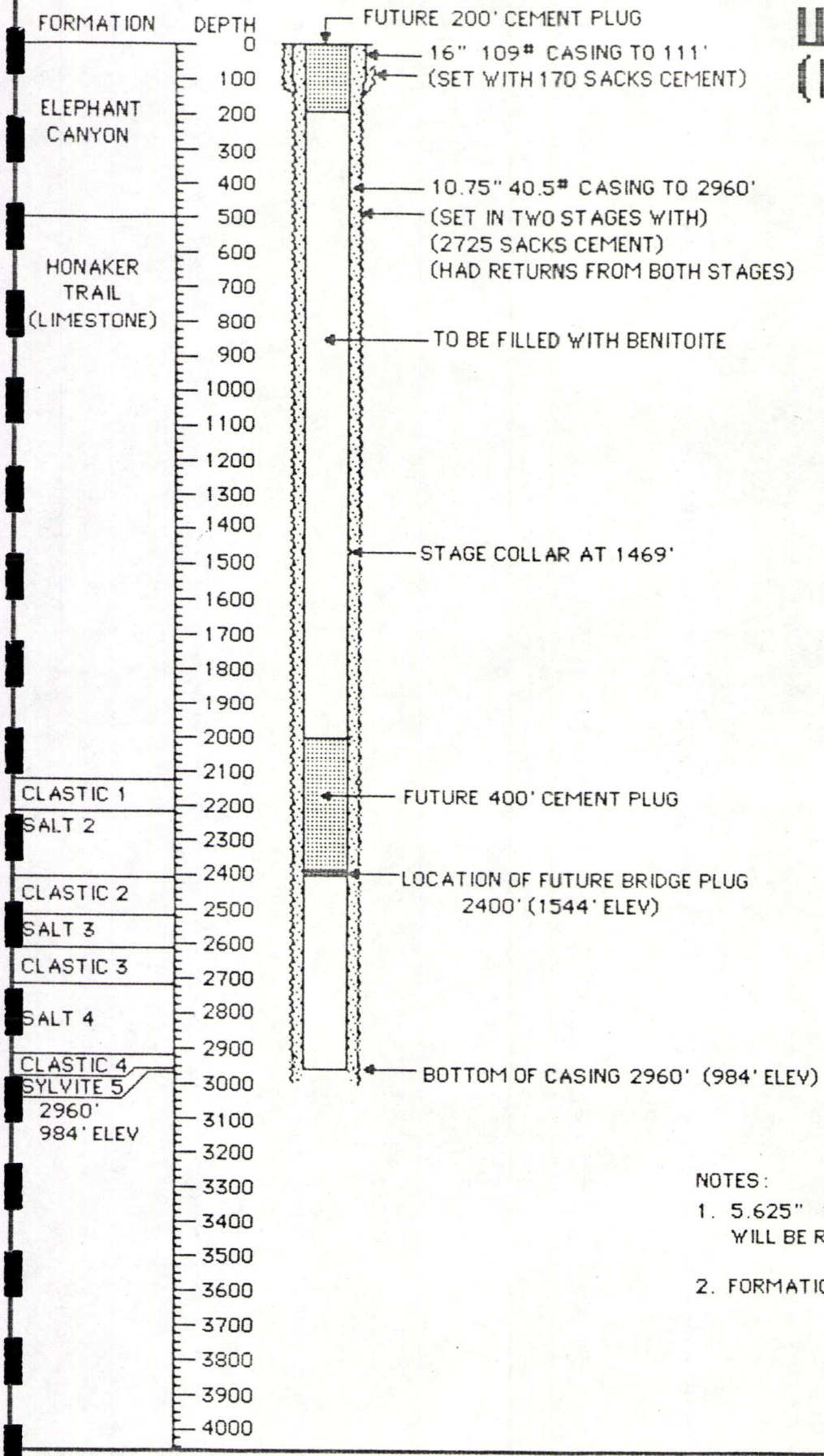
1. Plug Wells 1 thru 23	$263,700	
2. Plug #1 Shaft	$~~476,000~~	~~478,718~~ 479,000
3. Plug #2 Shaft	$18,500	
4. Engineering Supervision $535/Day - 60 Days	$32,100	
Subtotal	$790,300	793,300
15% Contingency	$118,500	118,995 = 15%
Total	$908,800	~~912,295~~
Adjusted to 1990 @3.75% Interest (rounded to ,000)	**$1,092,000**	

912,295 — 1985 dollars
946,506 — 1986
982,000 — 1987
1,018,825 — 1988
1,057,031 — 1989
1,096,600 — 1990 → $1,097,000

APPENDEX A

Graphic Representation of each Solution Mining Well

WELL ABANDONMENT PLAN



WELL #1
(NOT INTO MINE)

LOCATION
2,528,262 E
676,292 N

ELEV.
SURFACE 3944'
BOTTOM 984'

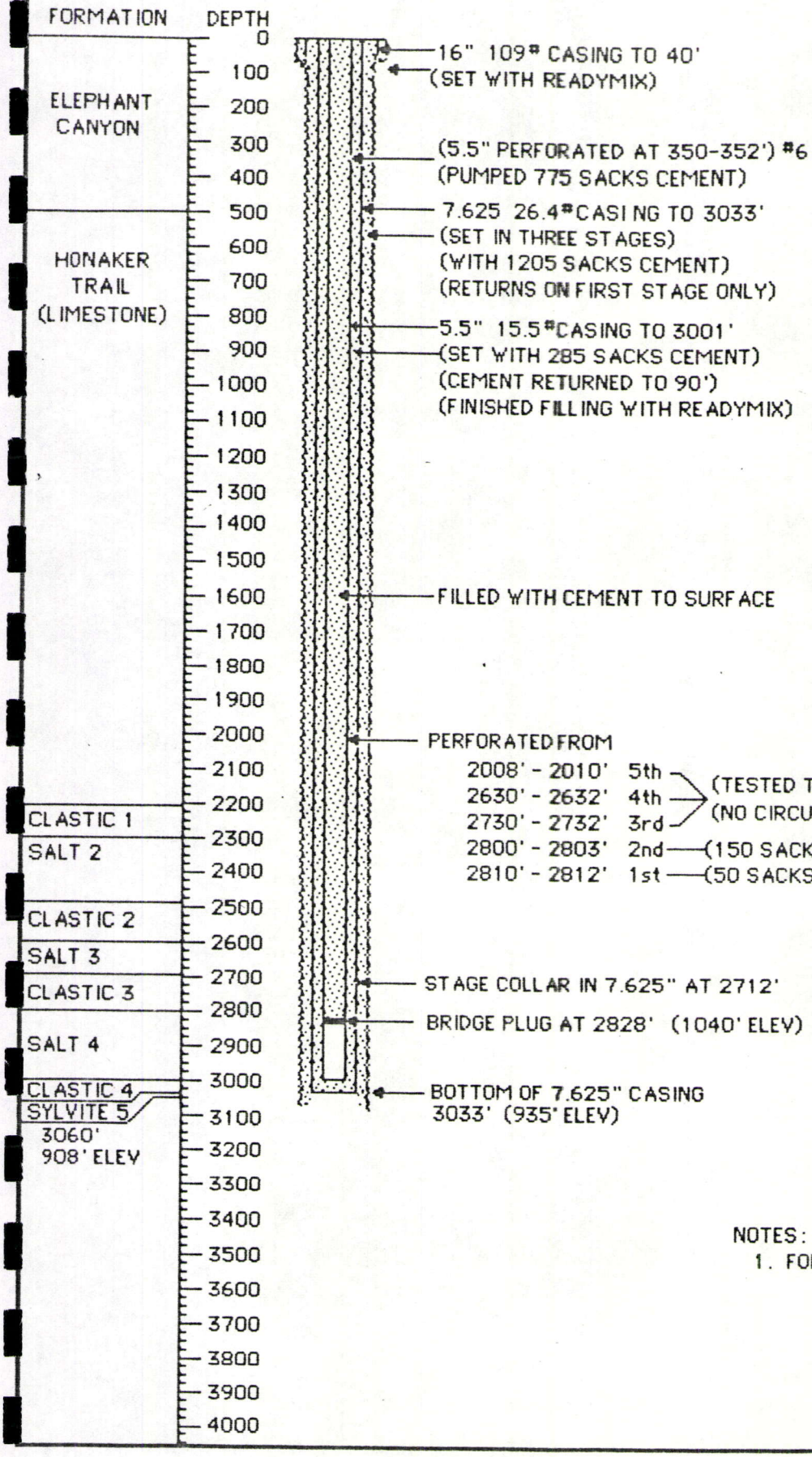
SPUD DATE
4 OCT 1970

COMPLETION DATE
23 NOV 1970

NOTES:

1. 5.625" 14.62# TUBING FROM 0 TO 3033' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE

WELL ABANDONMENT PLAN

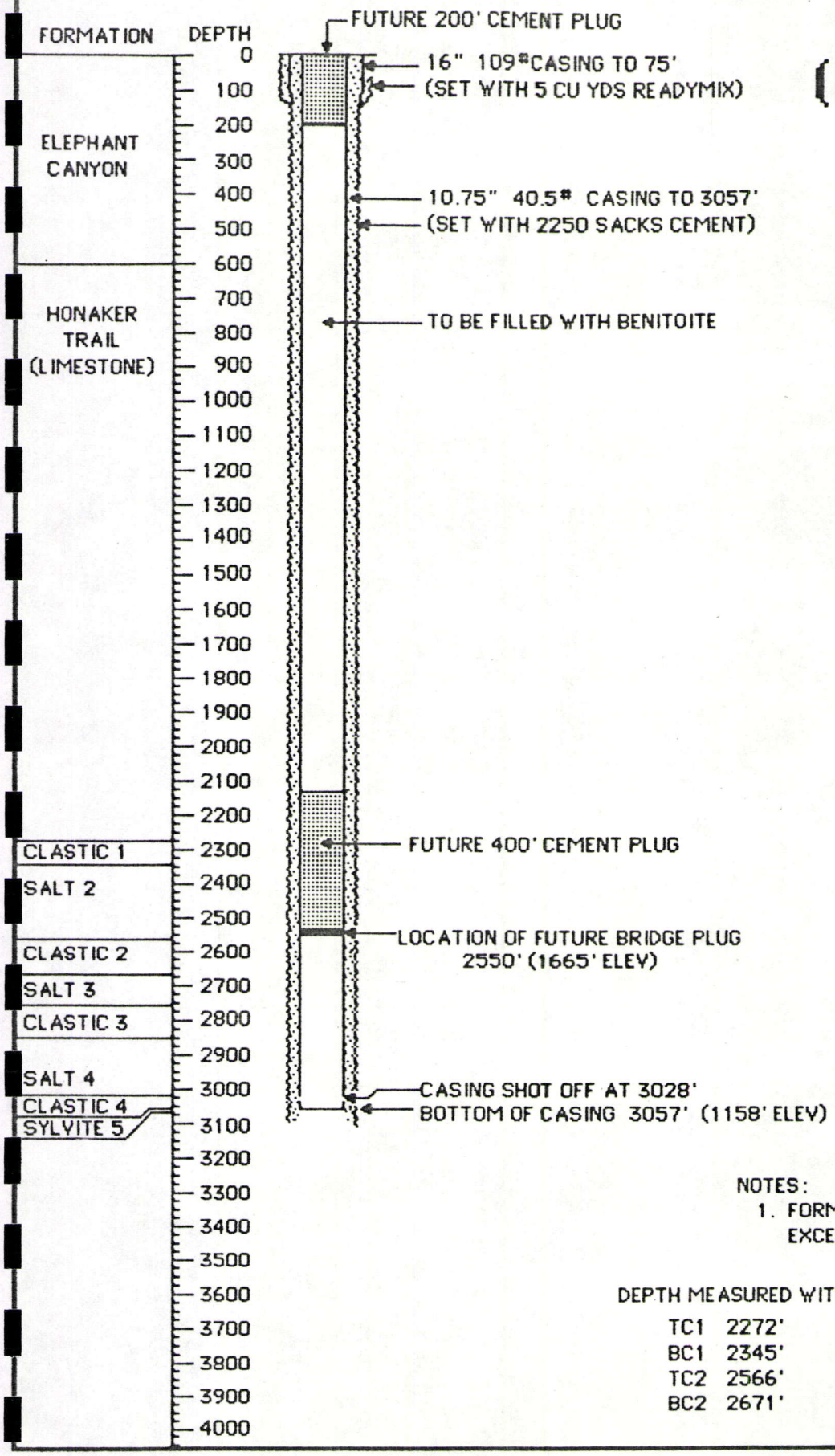


WELL # 2
LOCATION
2,527,714 E
676,682 N
ELEV.
SURFACE 3868'
BOTTOM 935'

SPUD DATE
28 NOV 1970
COMPLETION DATE
14 DEC 1970
INSTALL 5.5 INCH CASING
20 AUG 1975
PLUG WELL
28 OCT 1975

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE

WELL ABANDONMENT PLAN



WELL # 3
(NOT INTO MINE)

LOCATION
2,519,509 E
678,904 N

ELEV.
SURFACE 4215'
BOTTOM 1158'

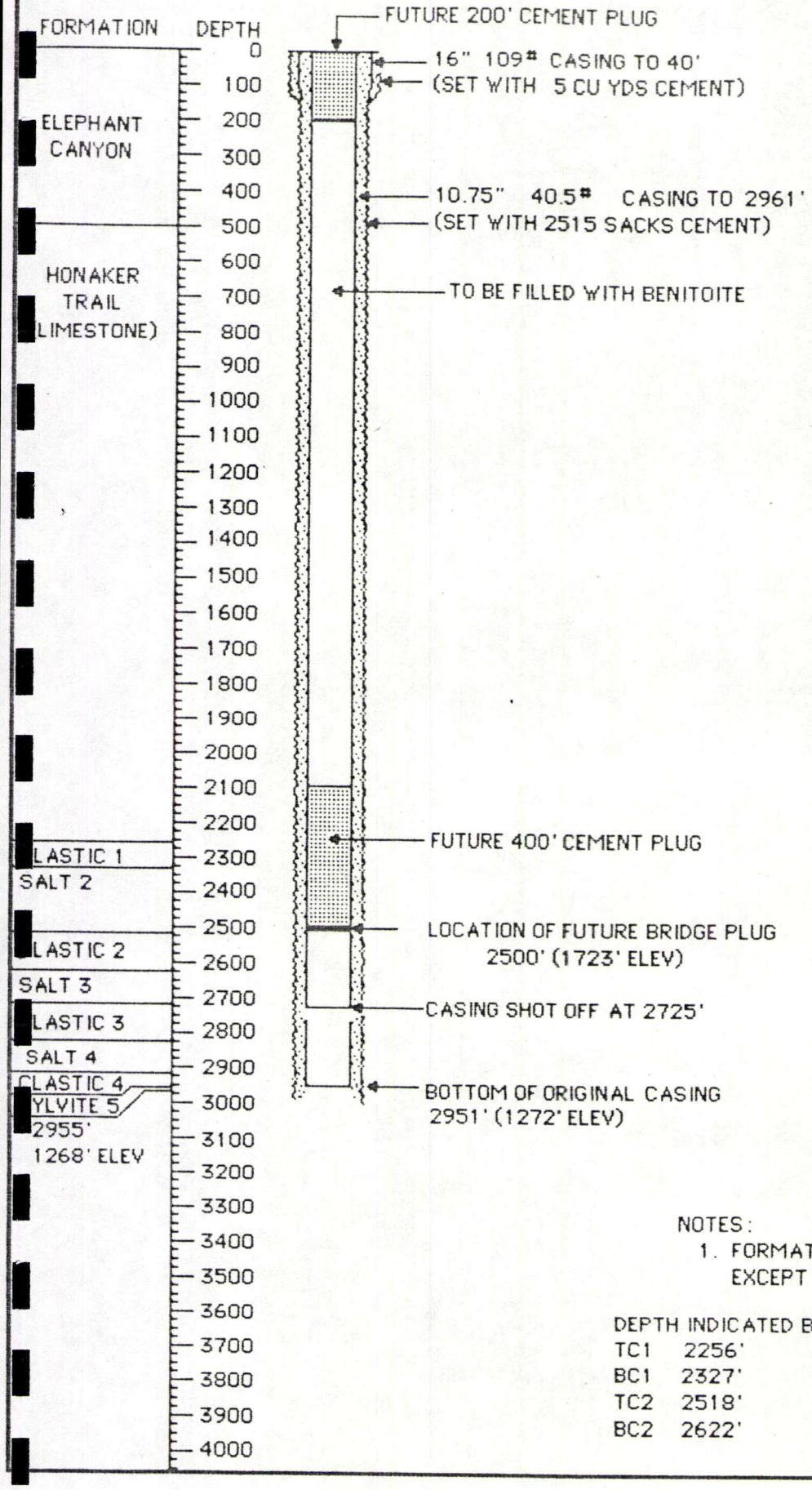
SPUD DATE
7 OCT 1970
COMPLETION DATE
2 DEC 1970

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2272'	TC3	2766'
BC1	2345'	BC3	2849'
TC2	2566'	TC4	3017'
BC2	2671'	BC4	3056'

WELL ABANDONMENT PLAN



WELL #4
LOCATION
2,519,146 E
678,499 N

	ELEV.
SURFACE	4223'
BOTTOM	1272'

SPUD DATE
5 DEC 1970
COMPLETION DATE
23 DEC 1970

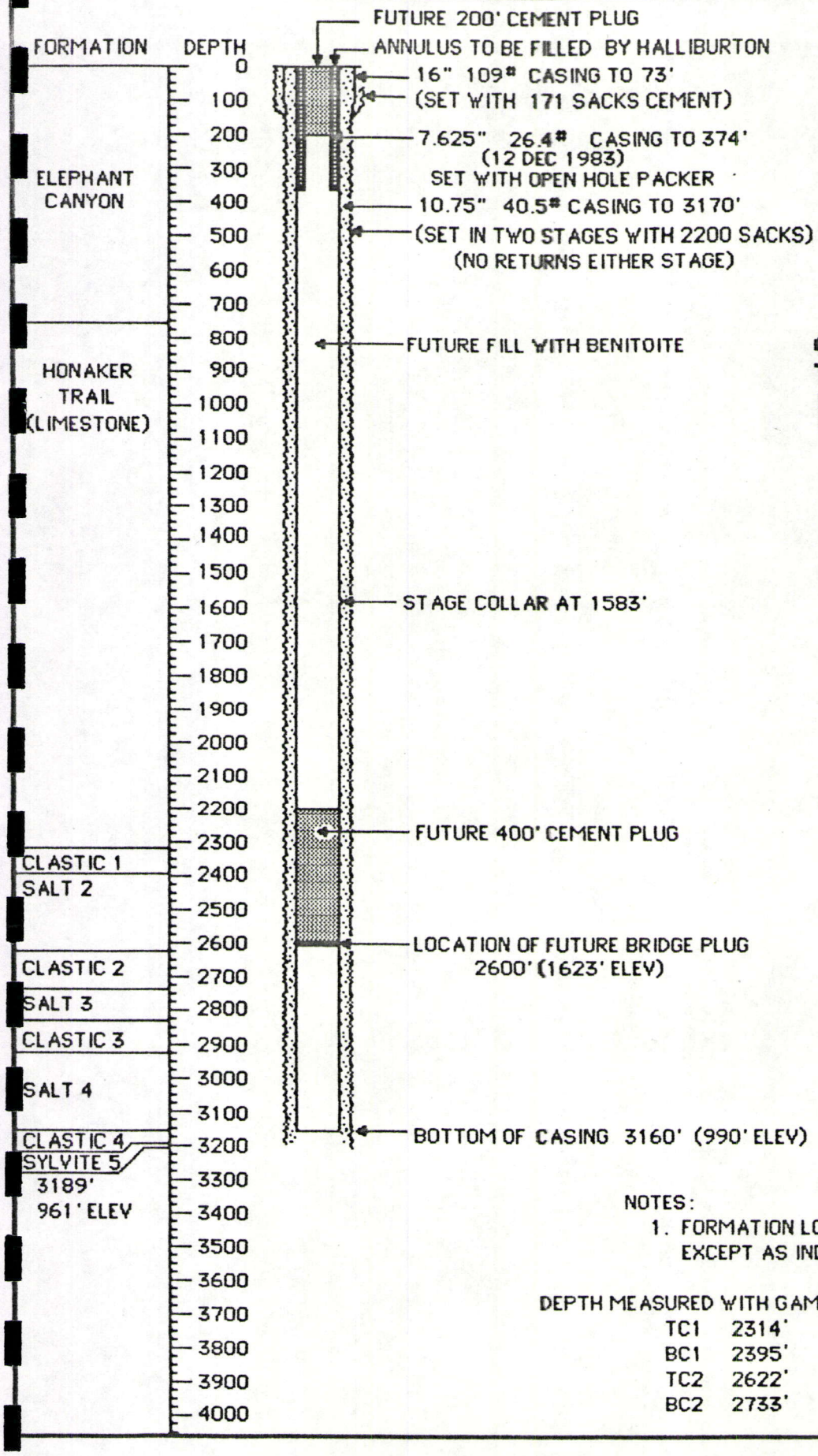
NOTES:

1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH INDICATED BY GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2256'
BC1	2327'
TC2	2518'
BC2	2622'

WELL ABANDONMENT PLAN



WELL # 5
LOCATION
2,524,629 E
677,914 N

ELEV.
SURFACE 4150'
BOTTOM 990'

SPUD DATE
12 DEC 1970
COMPLETION DATE
31 DEC 1970

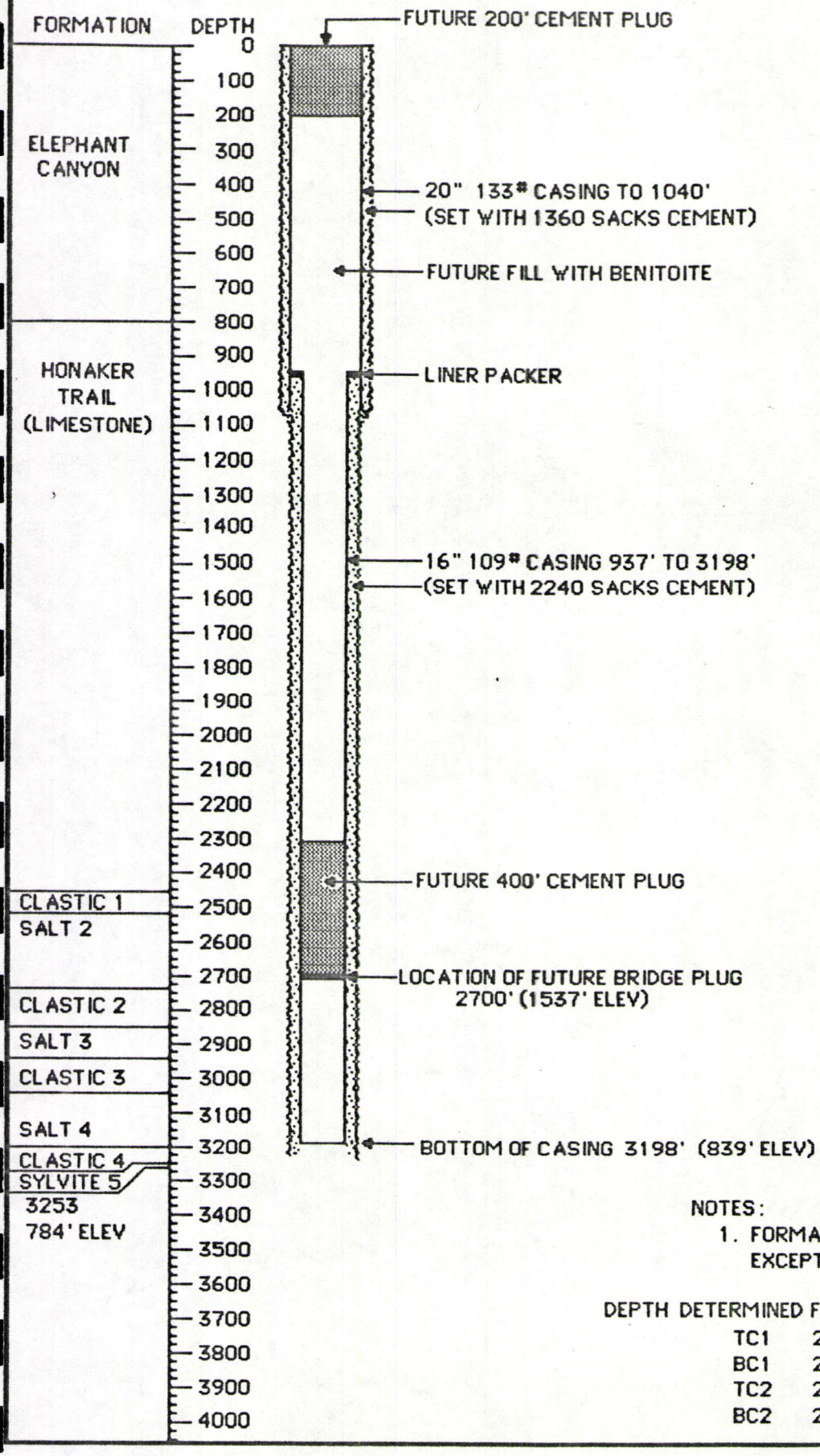
NOTES:

1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2314'	TC3	2833'
BC1	2395'	BC3	2927'
TC2	2622'	TC4	3154'
BC2	2733'		

WELL ABANDONMENT PLAN



WELL #6
LOCATION
2,526,916 E
677,737 N
ELEV.
SURFACE 4037'
BOTTOM 839'

SPUD DATE
12 FEB 1971
COMPLETION DATE
19 APR 1971

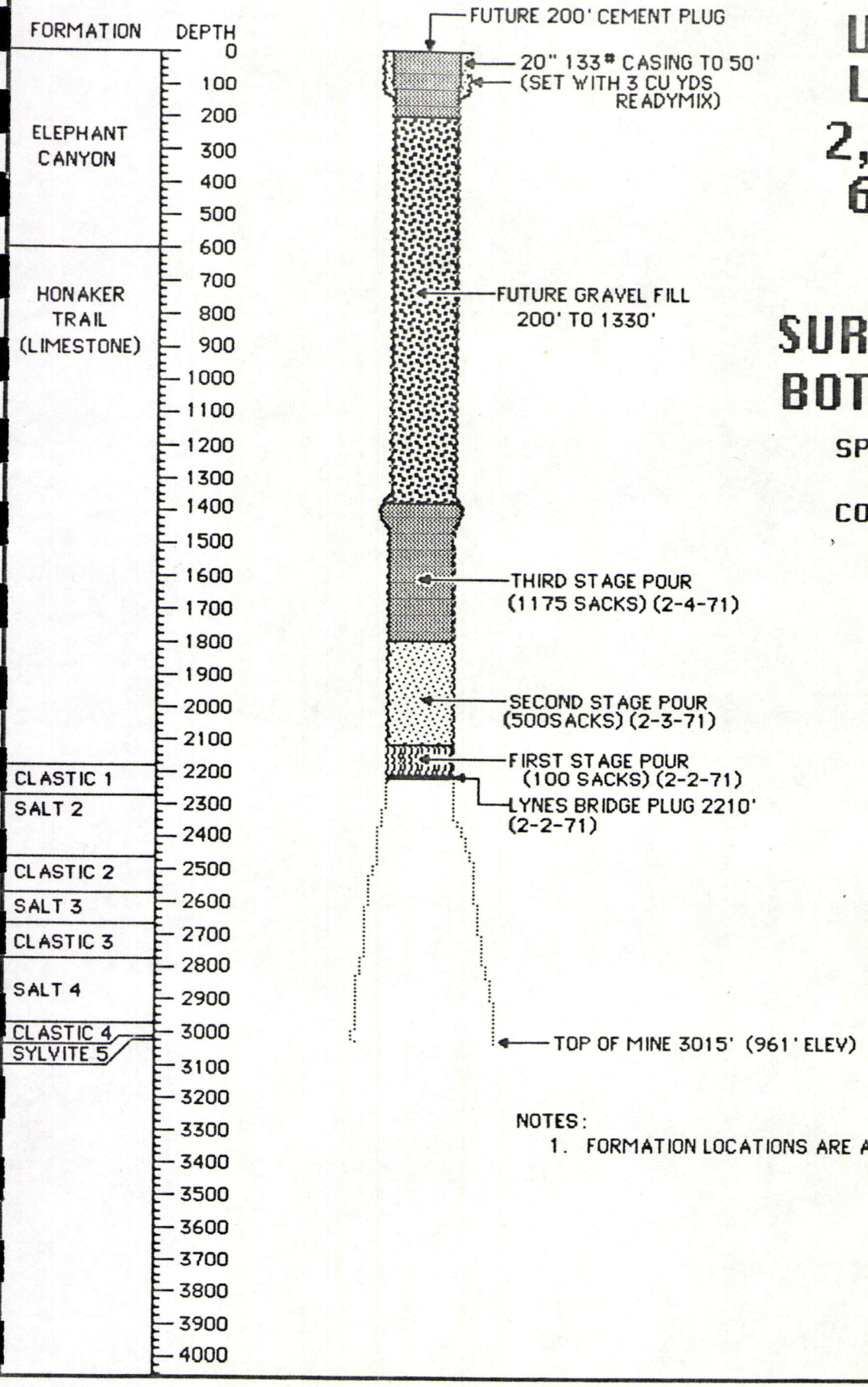
NOTES:

1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH DETERMINED FROM PENETRATION RATE CHARTS 6-6-85

TC1	2464'	TC3	2944'
BC1	2518'	BC3	3039'
TC2	2738'	TC4	3197'
BC2	2854'		

WELL ABANDONMENT PLAN



WELL # 7
LOCATION
2,524,924 E
674,659 N

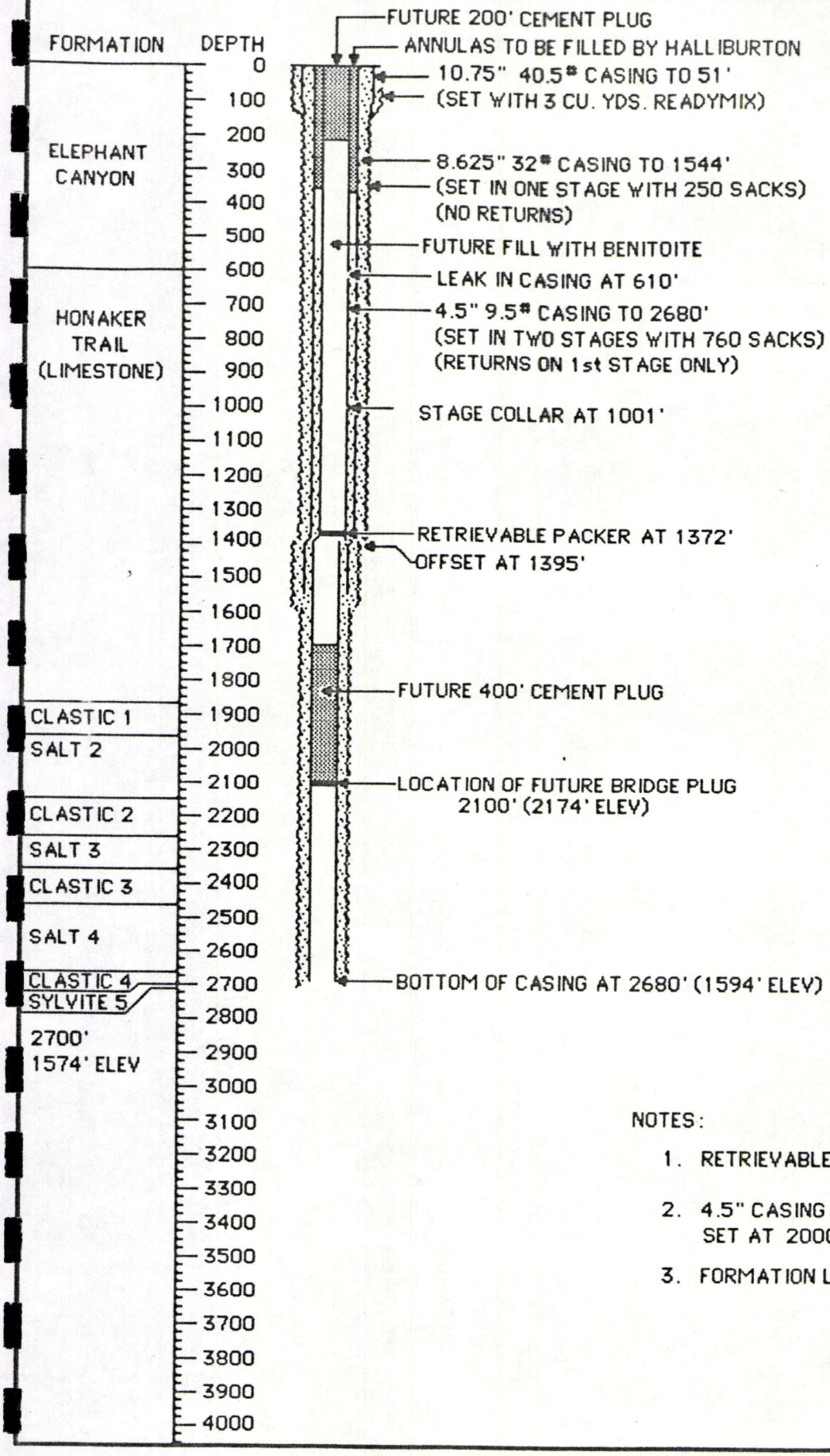
ELEV.

SURFACE	4397'
BOTTOM	1382'

SPUD DATE
27 DEC 1970
COMPLETION DATE
20 JAN 1971

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 8

LOCATION

2,526,558 E

671,830 N

ELEV.

SURFACE 4274'

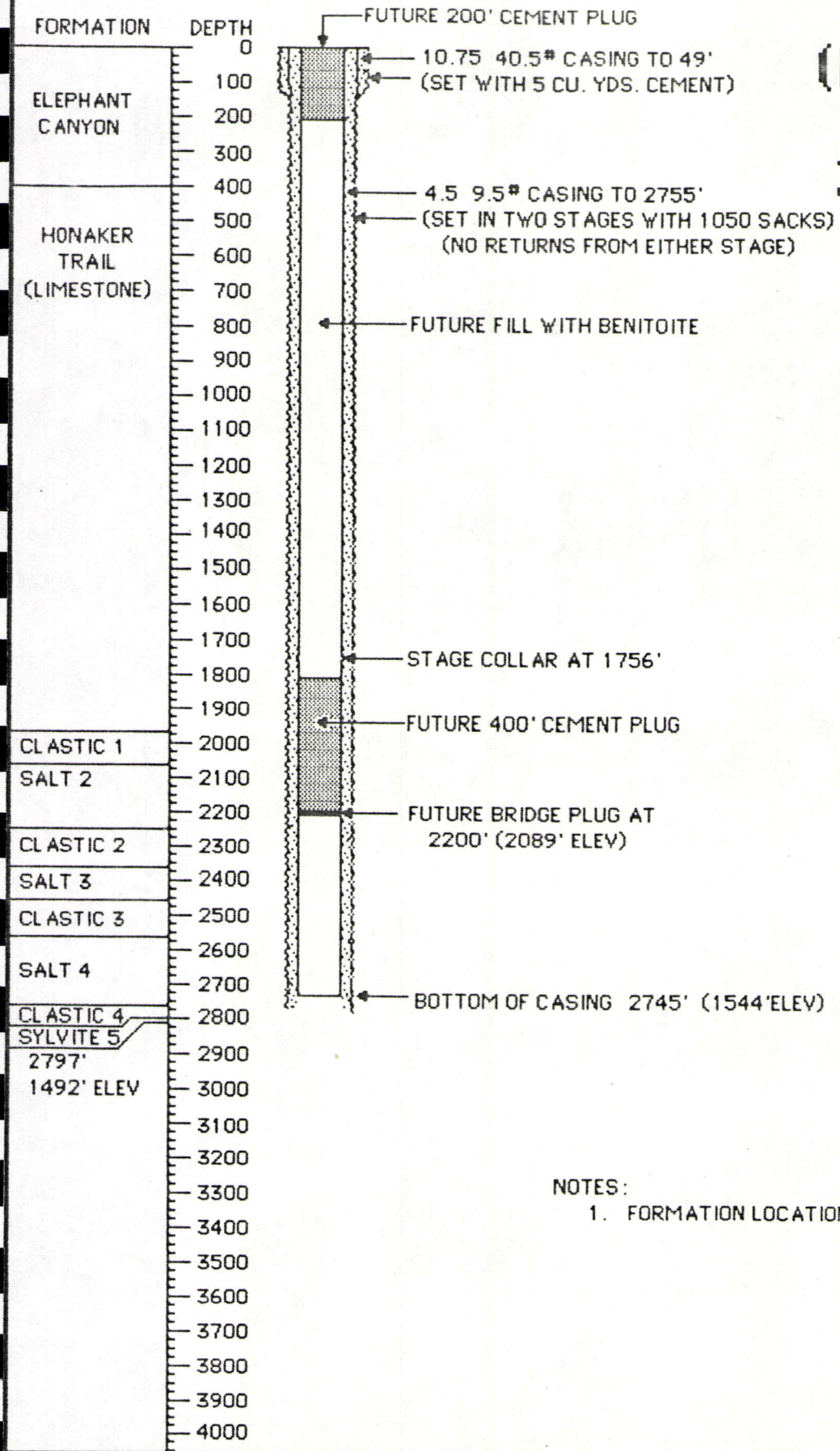
BOTTOM 1594'

SPUD DATE
15 OCT 1970
COMPLETION DATE
8 NOV 1970

NOTES:

1. RETRIEVABLE PACKER AT 1372' TO BE REMOVED
2. 4.5" CASING TO BE MILLED UNTIL BRIDGE PLUG CAN BE SET AT 2000'
3. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 9
(NOT INTO MINE)

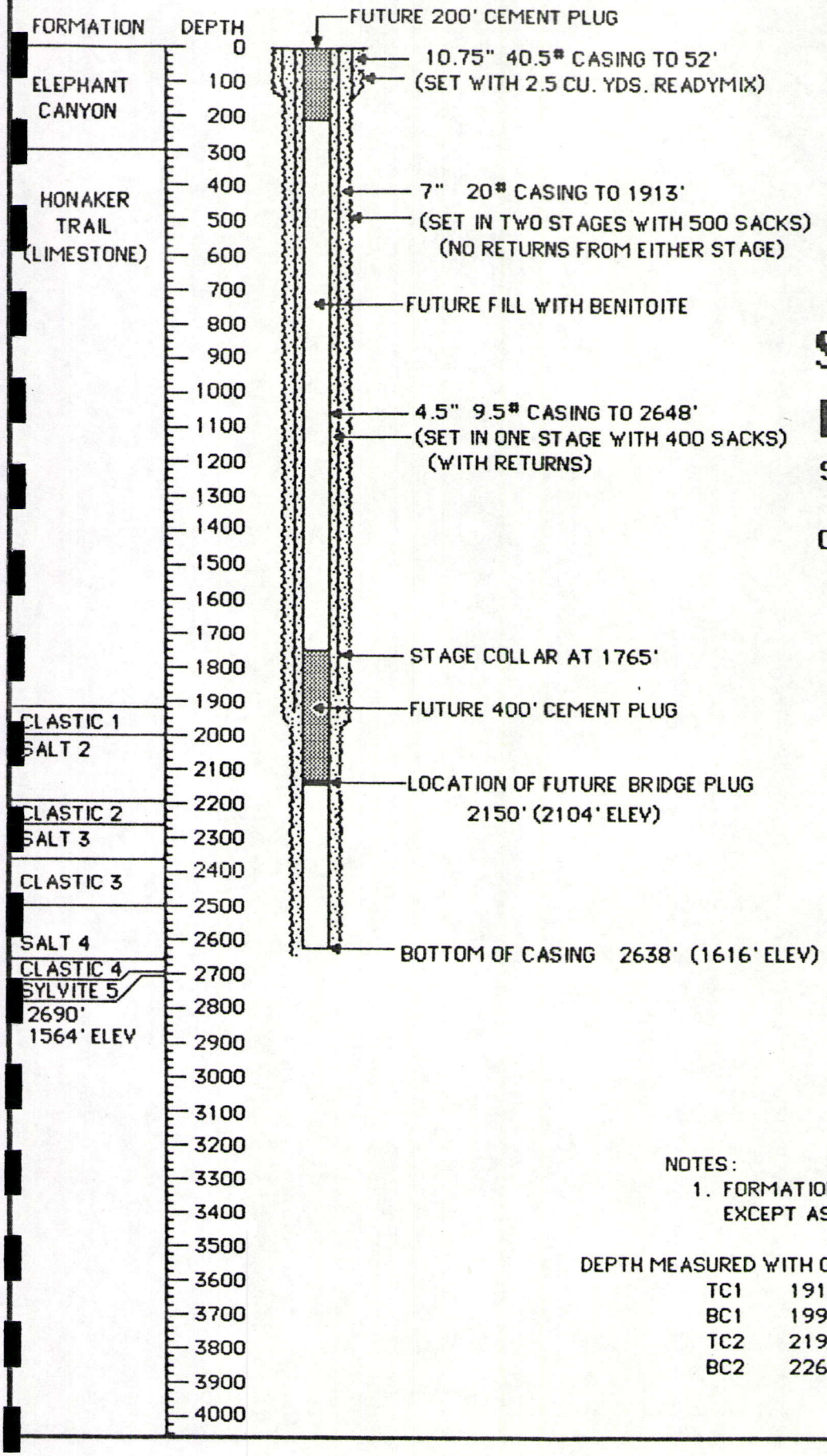
LOCATION
2,525,351 E
671,670 N

ELEV.
SURFACE 4289'
BOTTOM 1544'

SPUD DATE
10 NOV 1970
COMPLETION DATE
29 NOV 1970

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 10
LOCATION
2,525,320 E
672,034 N

ELEV.
SURFACE 4254'
BOTTOM 1616'

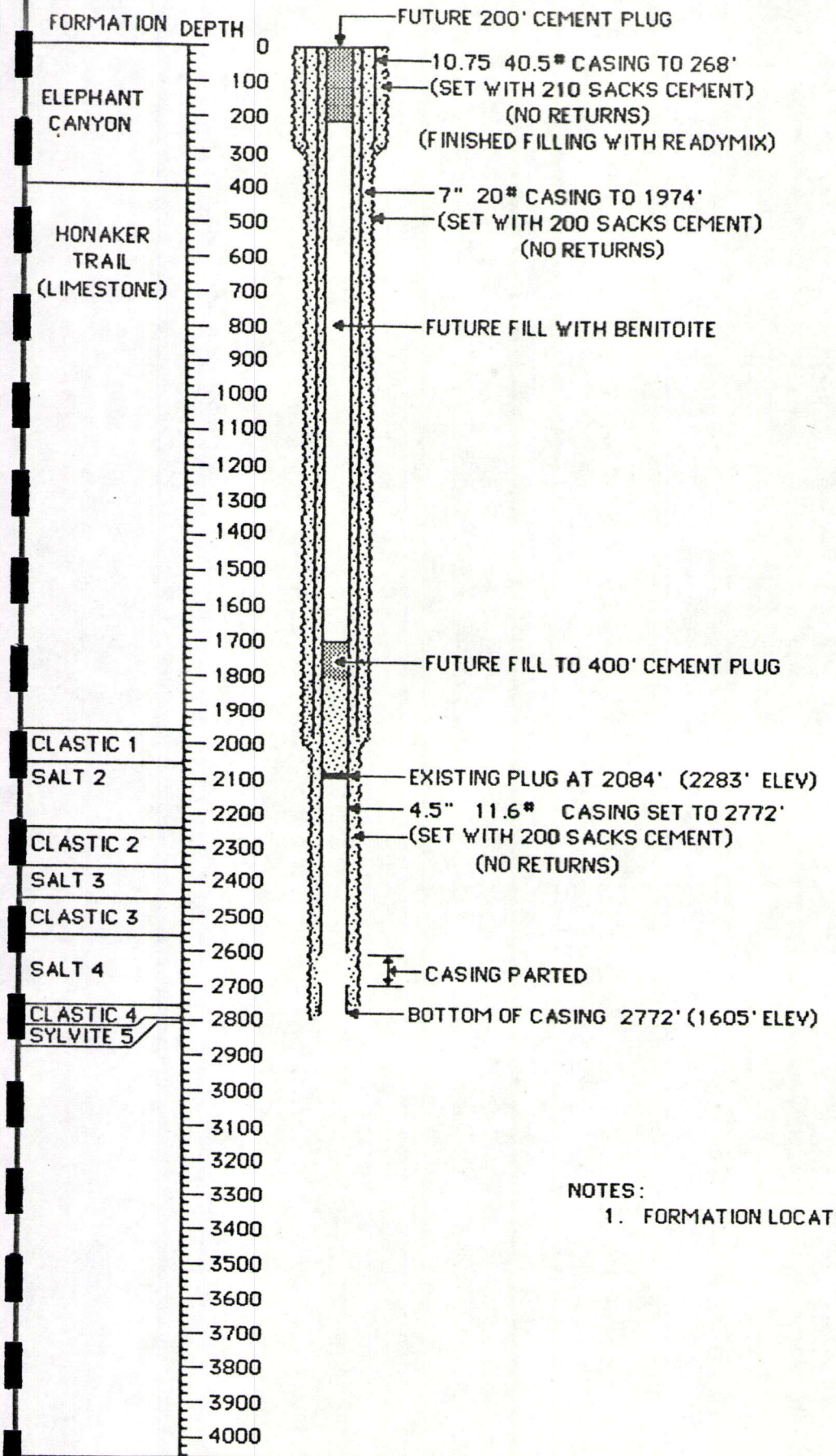
SPUD DATE
1 DEC 1970
COMPLETION DATE
16 DEC 1970

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	1916'	TC3	2364'
BC1	1997'		
TC2	2190'		
BC2	2263'		

WELL ABANDONMENT PLAN



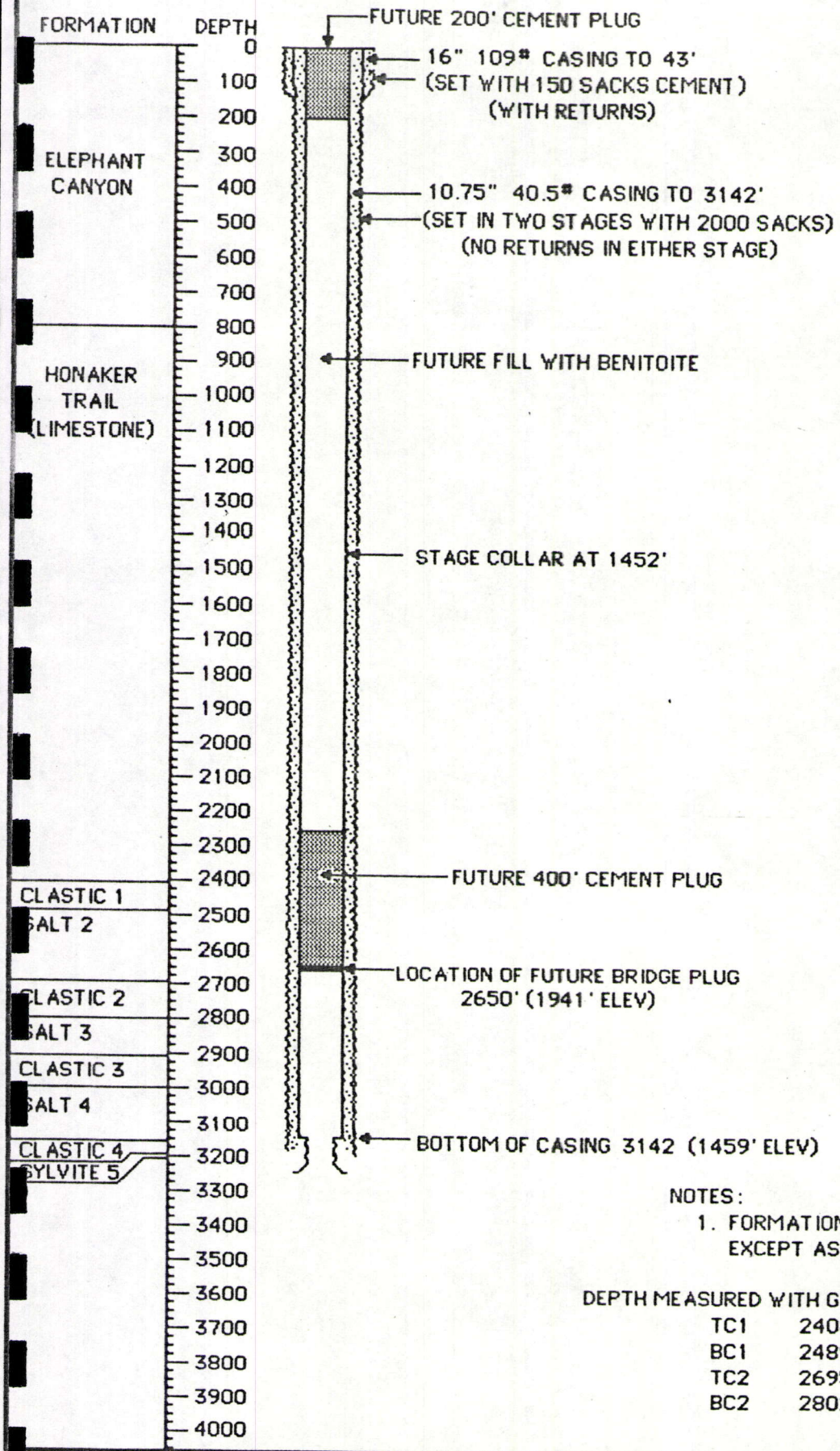
WELL # 11
LOCATION
2,526,983 E
672,589 N

ELEV.
SURFACE 4367'
BOTTOM 1605'

SPUD DATE
18 DEC 1970
COMPLETION DATE
3 JAN 1971

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 12
LOCATION
2,521,020 E
675,241 N
ELEV.
SURFACE 4591'
BOTTOM 1459'

SPUD DATE
2 JAN 1971
COMPLETION DATE
20 JAN 1970

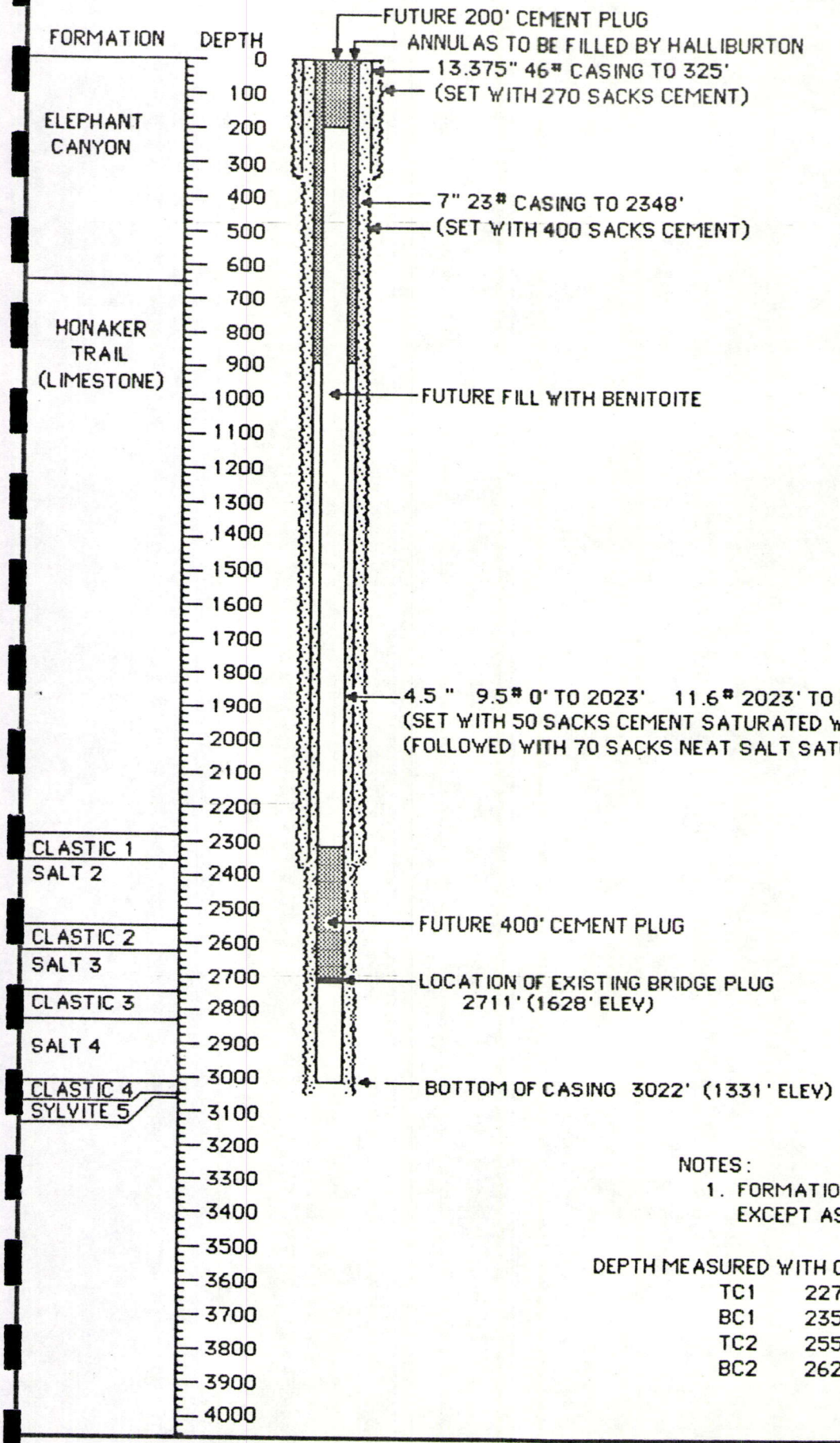
NOTES:

1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2408'	TC3	2908'
BC1	2489'	BC3	2992'
TC2	2695'		
BC2	2802'		

WELL ABANDONMENT PLAN



WELL # 13
LOCATION
2,523,592 E
675,925 N
ELEV.
SURFACE 4339'
BOTTOM 1331'

SPUD DATE
26 MAR 1973
COMPLETION DATE
25 APR 1973

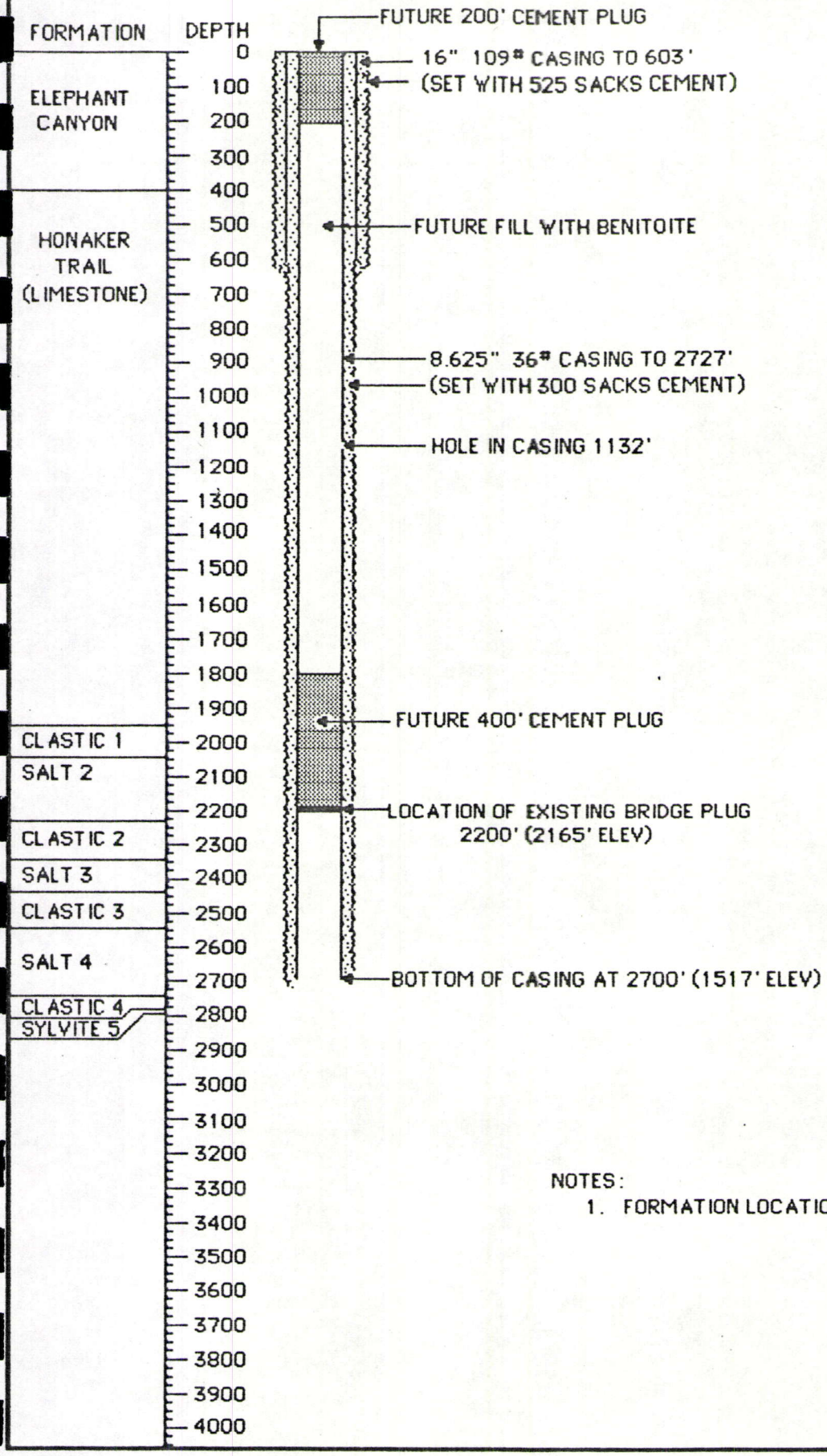
NOTES:

1. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2279'	TC3	2744'
BC1	2357'	BC3	2831'
TC2	2550'		
BC2	2626'		

WELL ABANDONMENT PLAN



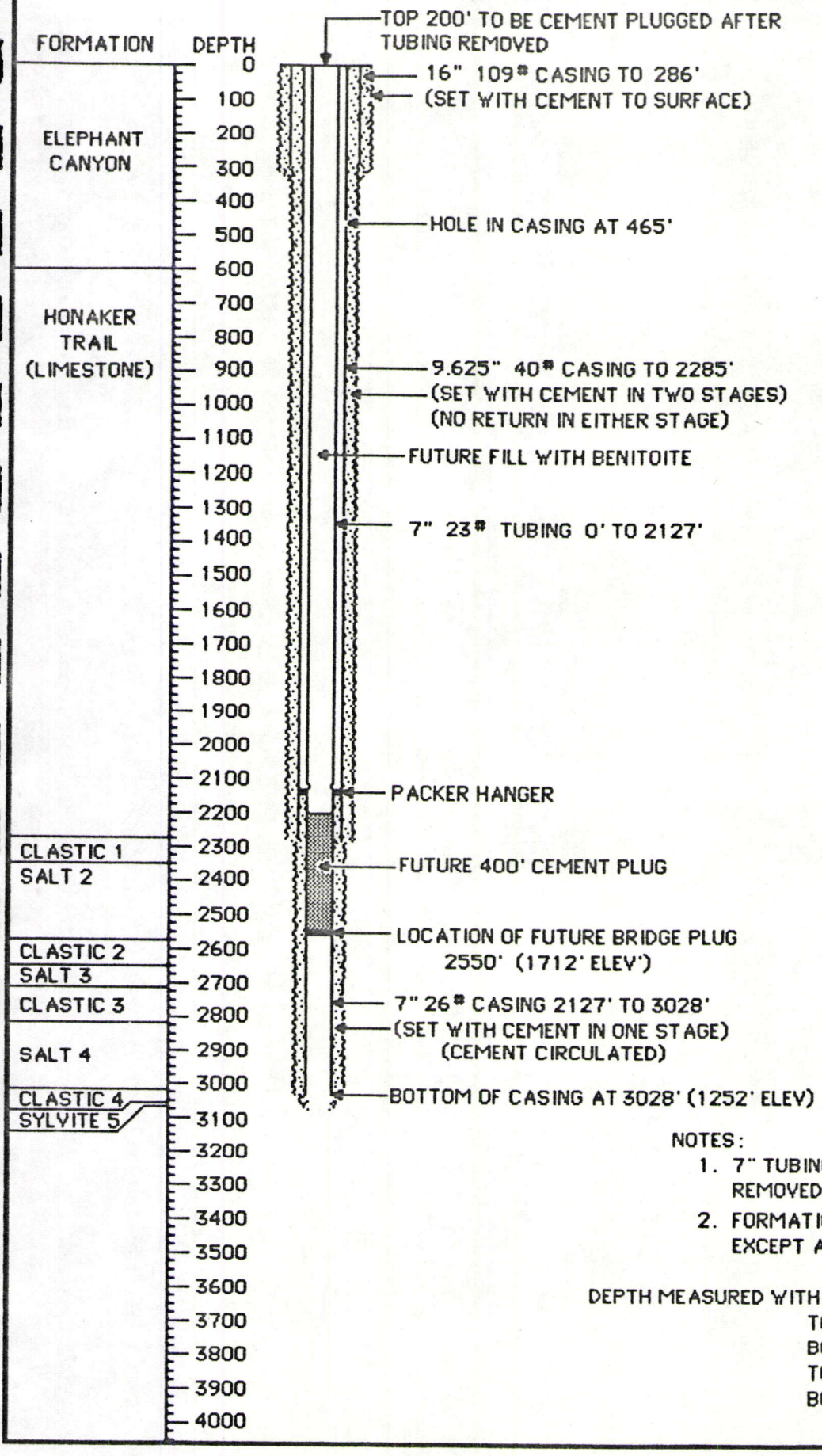
WELL # 14
LOCATION
2,527,017 E
672,339 N

ELEV.
SURFACE 4365'
BOTTOM 1517'

SPUD DATE
3 MAY 1974
COMPLETION DATE
6 JUN 1974

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 15
LOCATION
2,521,780 E
677,700 N
ELEV.
SURFACE 4262'
BOTTOM 1252'

SPUD DATE
20 MAR. 1975
COMPLETION DATE
16 APR 1975

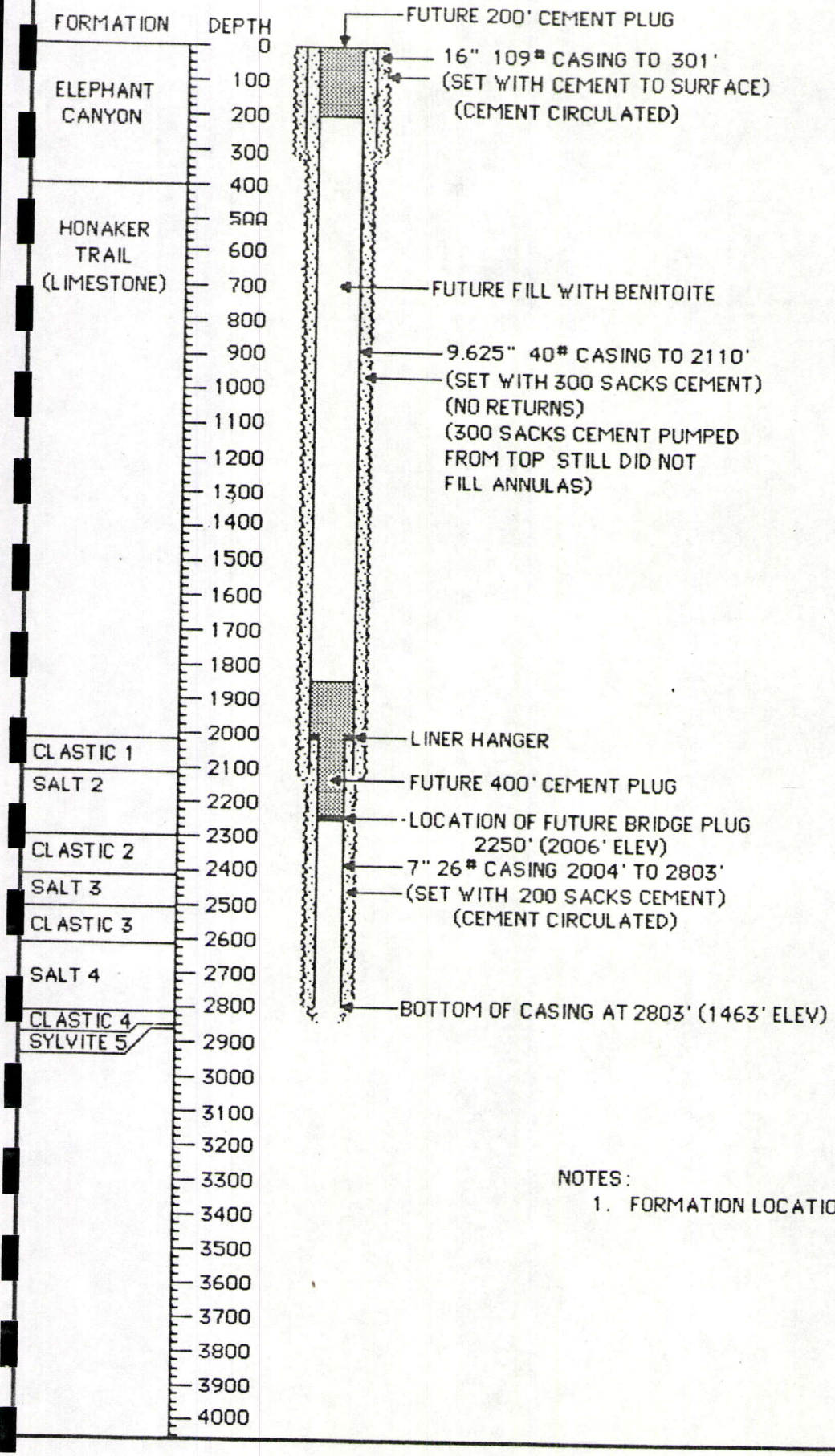
NOTES:

1. 7" TUBING FROM SURFACE TO 2127' TO BE REMOVED BEFORE CEMENTING.
2. FORMATION LOCATIONS ARE APPROXIMATE EXCEPT AS INDICATED BELOW.

DEPTH MEASURED WITH GAMMA RAY NEUTRON LOGS 6-6-85

TC1	2275'
BC1	2348'
TC2	2575'
BC2	2650'

WELL ABANDONMENT PLAN

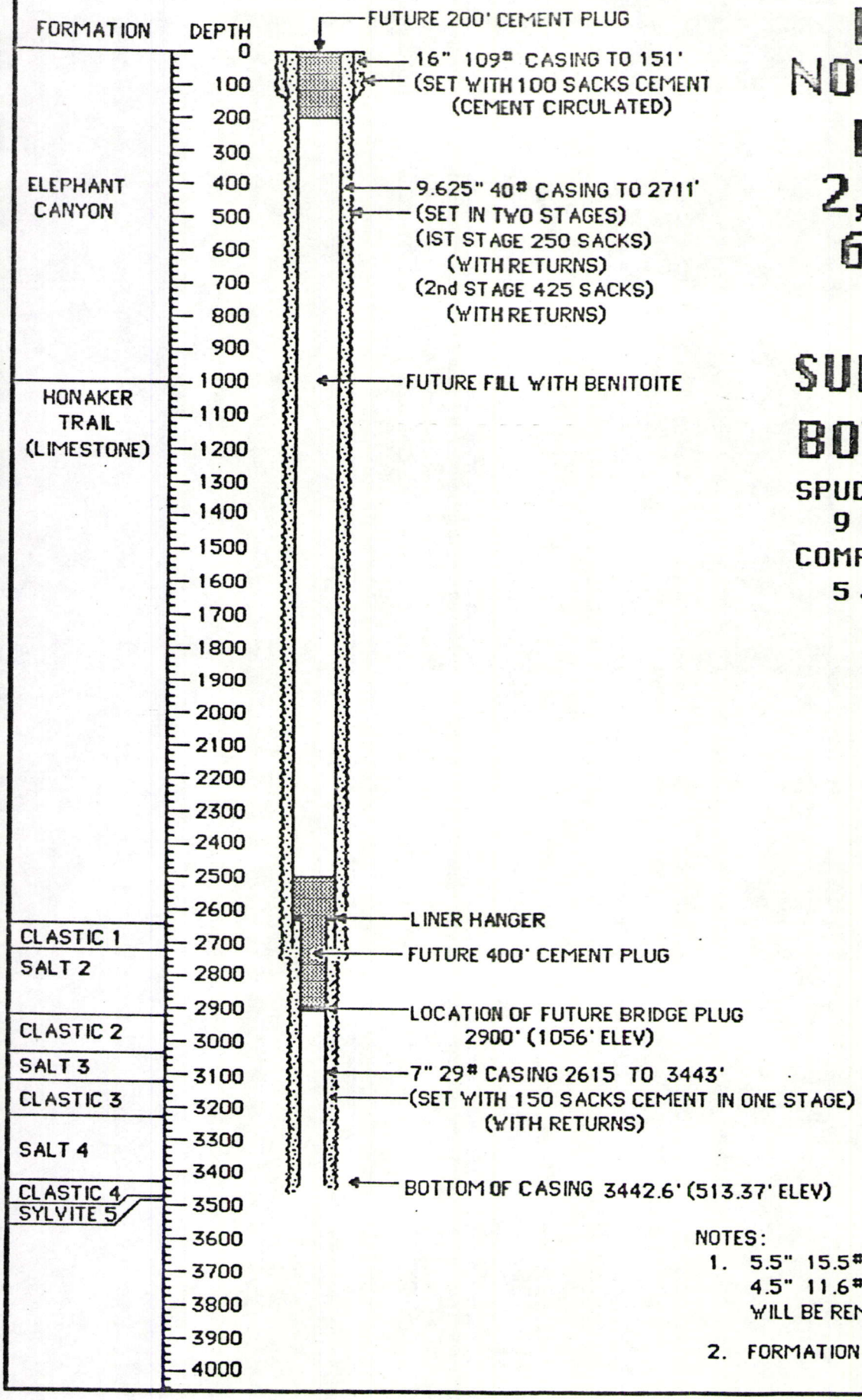


WELL # 16
LOCATION
2,523,261 E
673,447 N
ELEV.
SURFACE 4256'
BOTTOM 1463'

SPUD DATE
27 APR 1975
COMPLETION DATE
21 MAY 1975

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



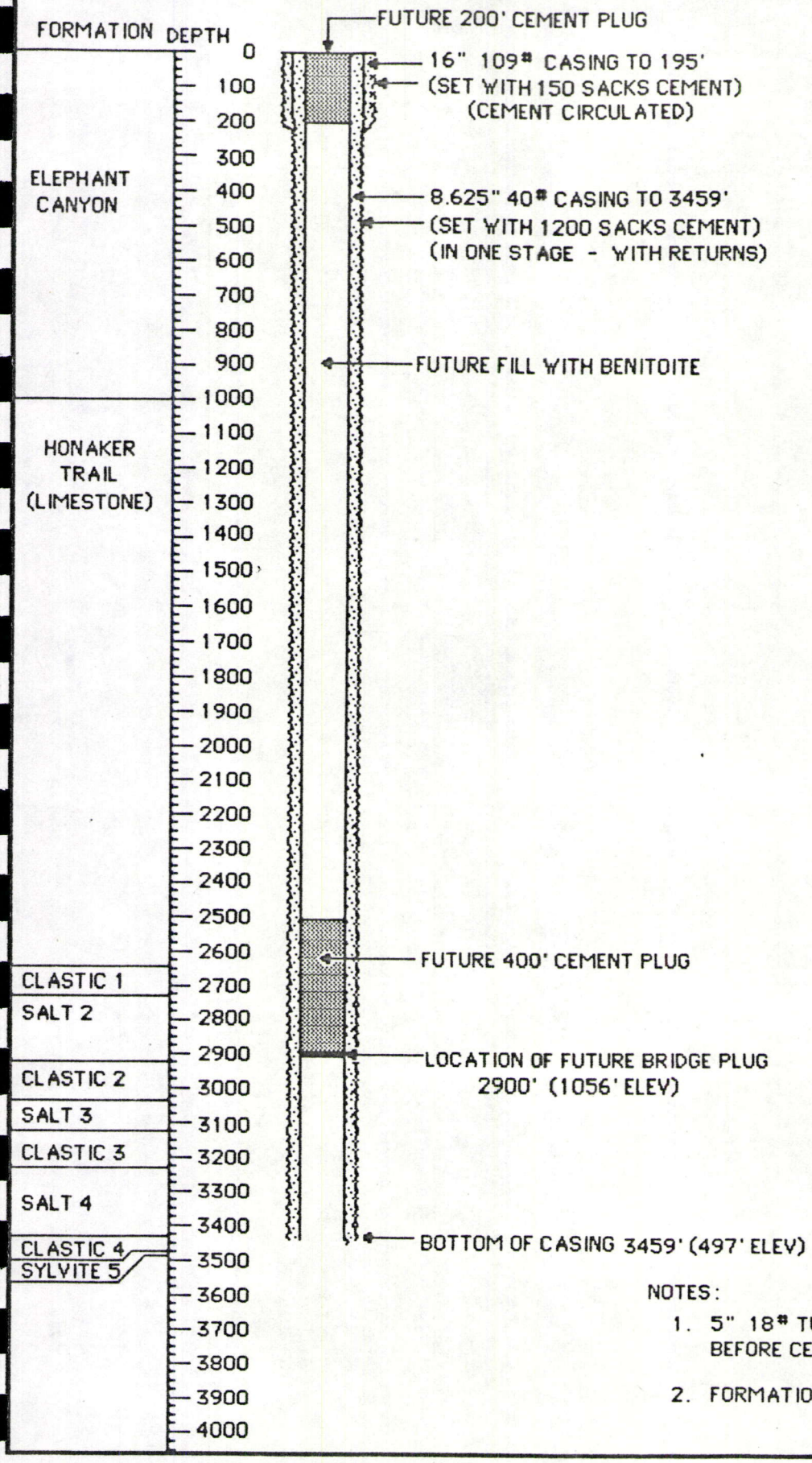
WELL # 17
NOT INTO MINE
LOCATION
2,528,501 E
678,539 N
ELEV.
SURFACE 3956'
BOTTOM 1463'

SPUD DATE
9 MAY 1976
COMPLETION DATE
5 JUN 1976

NOTES:

1. 5.5" 15.5# TUBING FROM 0 TO 2603' AND 4.5" 11.6# TUBING FROM 2603' TO 3508' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



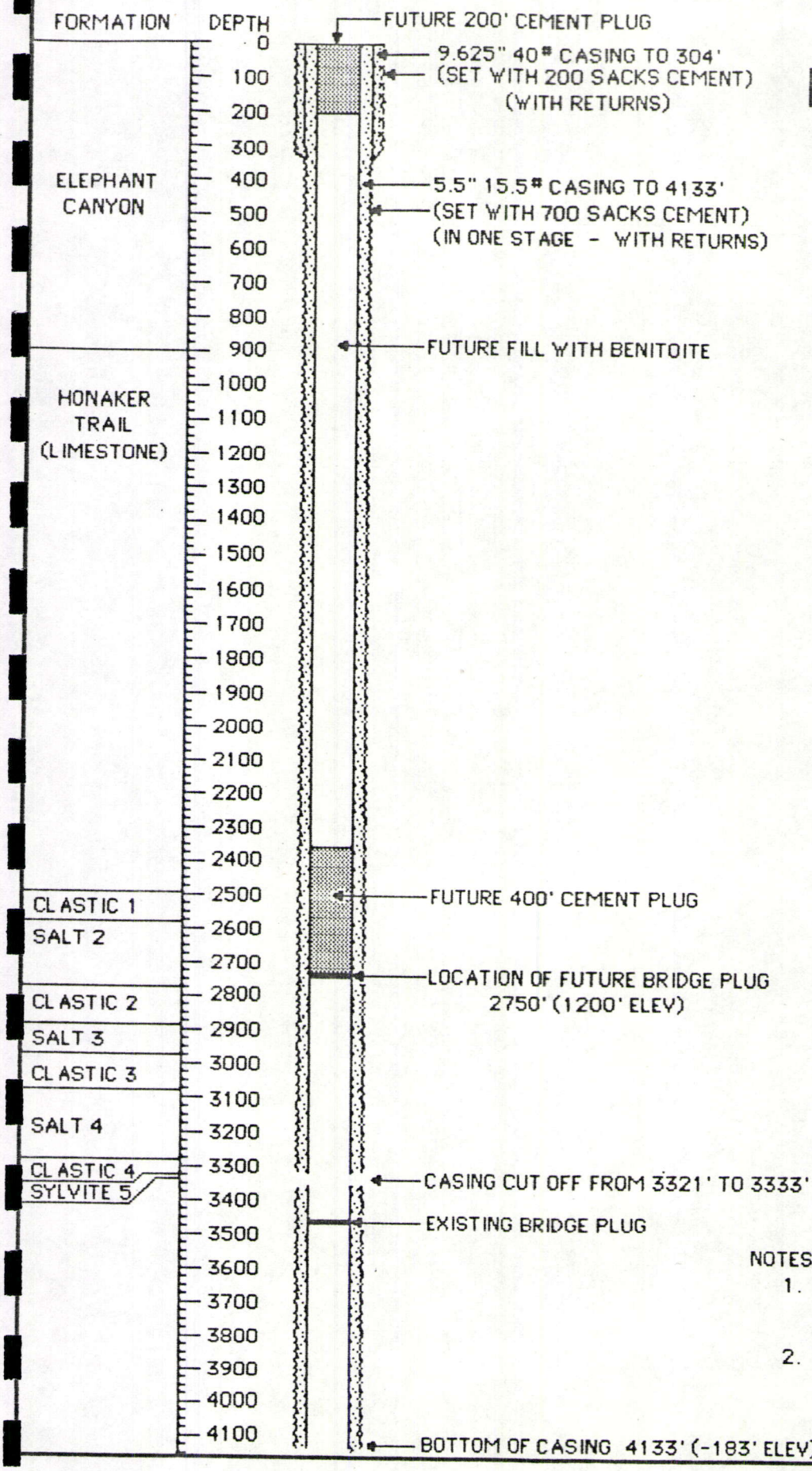
WELL # 18
NOT INTO MINE
LOCATION
2,528,508 E
678,589 N
ELEV.
SURFACE 3956'
BOTTOM 497'

SPUD DATE
8 JUN 1976
COMPLETION DATE
2 JUL 1976

NOTES:

1. 5" 18# TUBING FROM 0 TO 3956' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



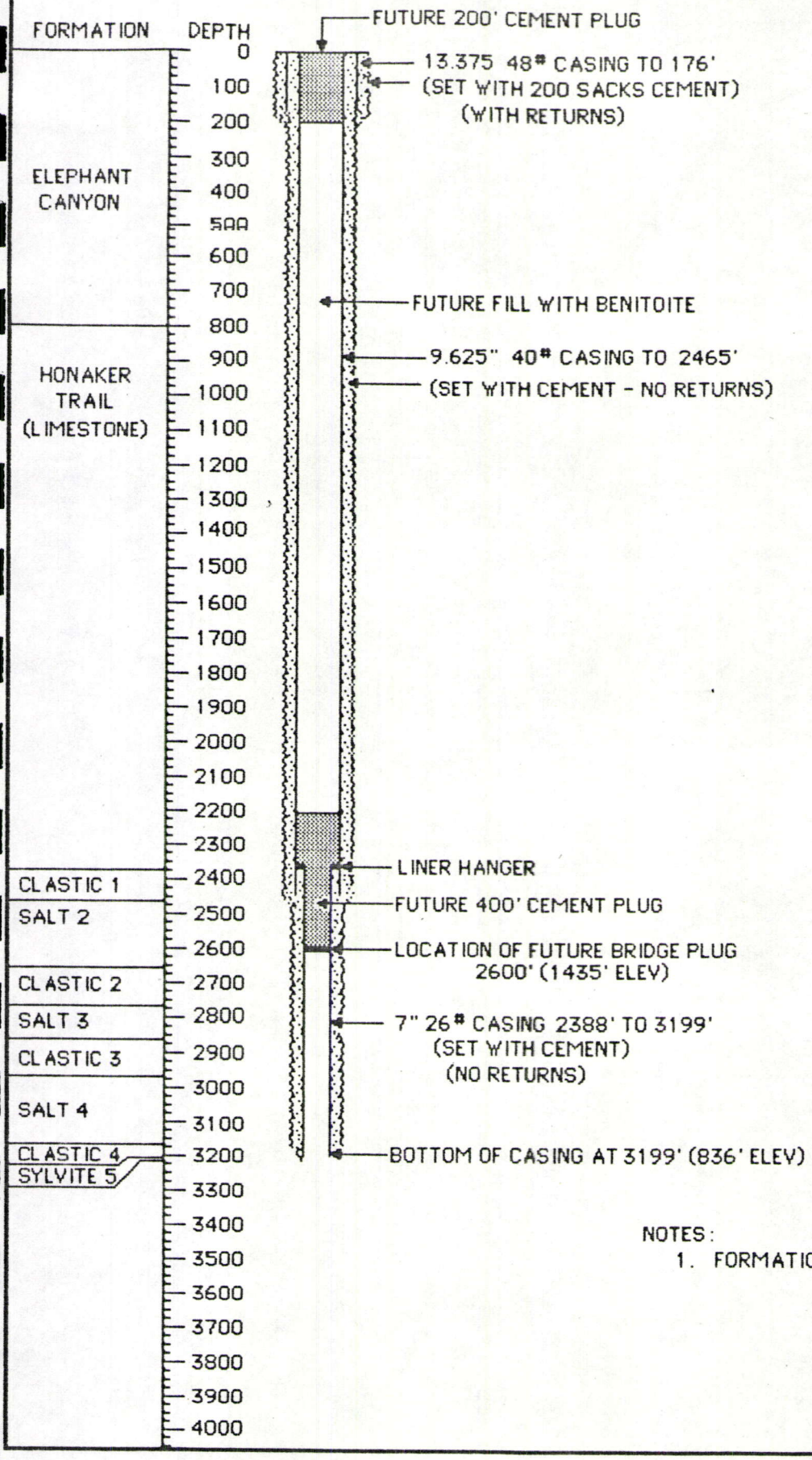
WELL # 19
NOT INTO MINE
LOCATION
2,528,418 E
677,819 N
ELEV.
SURFACE 3950'
BOTTOM -183'

SPUD DATE
21 FEB 1979
COMPLETION DATE
18 MAR 1979

NOTES:

1. 2.875" 6.5# TUBING FROM 0 TO 3330' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN

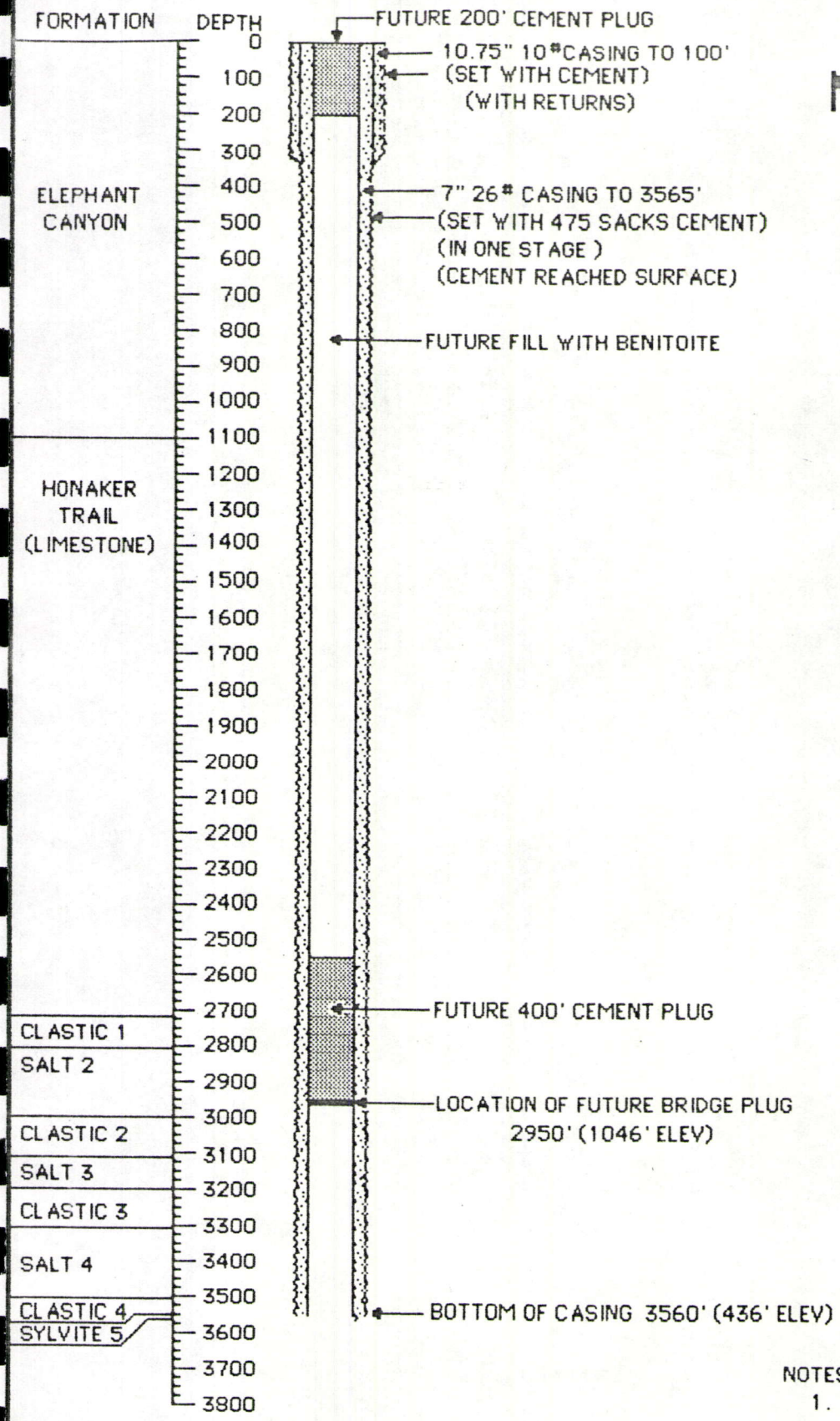


WELL # 20
LOCATION
2,527,598 E
677,376 N
ELEV.
SURFACE 4035'
BOTTOM 835'

SPUD DATE
14 MAY 1981
COMPLETION DATE
30 JUN 1981

NOTES:
1. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



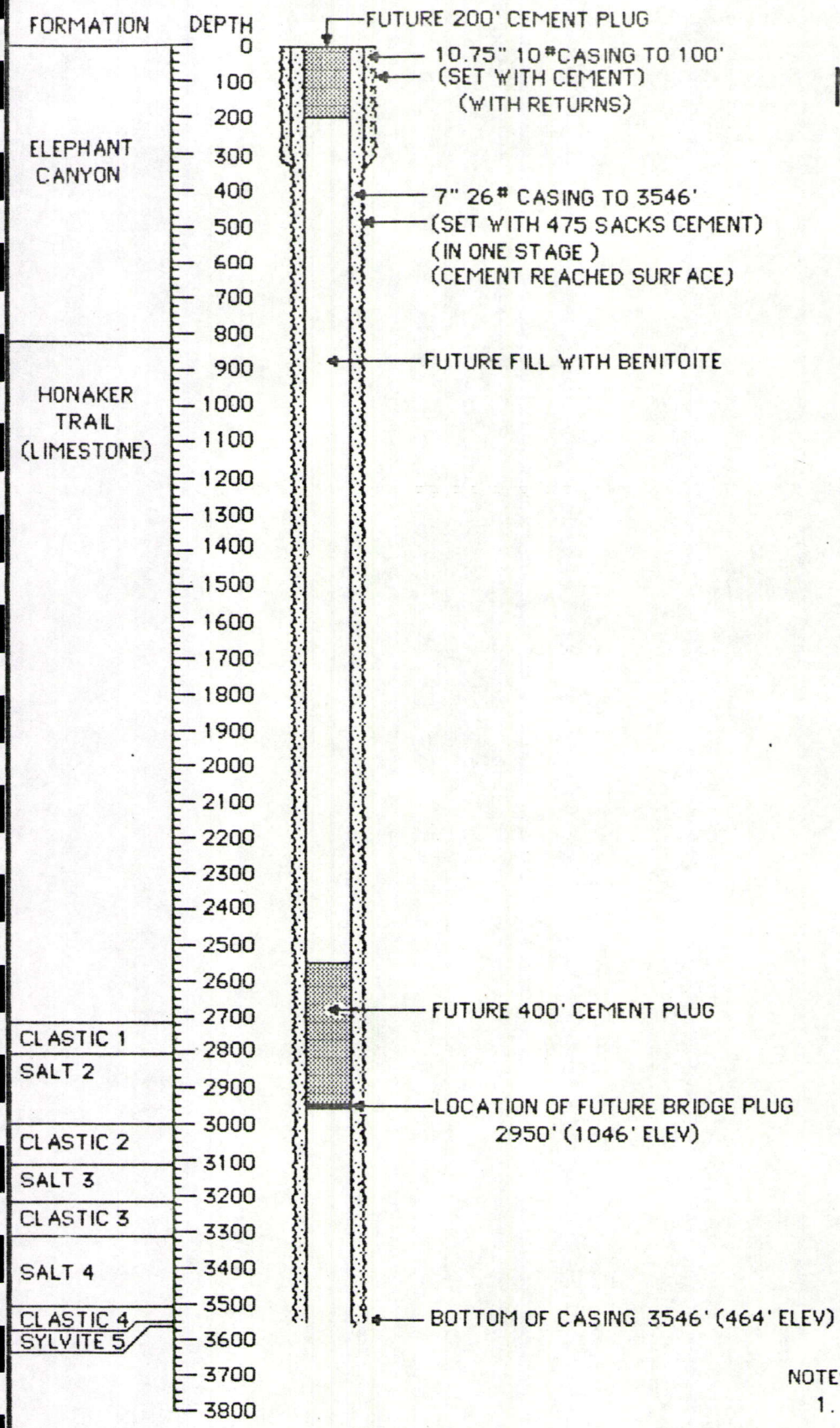
WELL # 21
NOT INTO MINE
LOCATION
2,527,978 E
679,248 N
ELEV.
SURFACE 3996'
BOTTOM 436'

SPUD DATE
24 JUN 1981
COMPLETION DATE
28 JUL 1981

NOTES:

1. 4.5" 11.6# TUBING FROM 0 TO 3556' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE

WELL ABANDONMENT PLAN



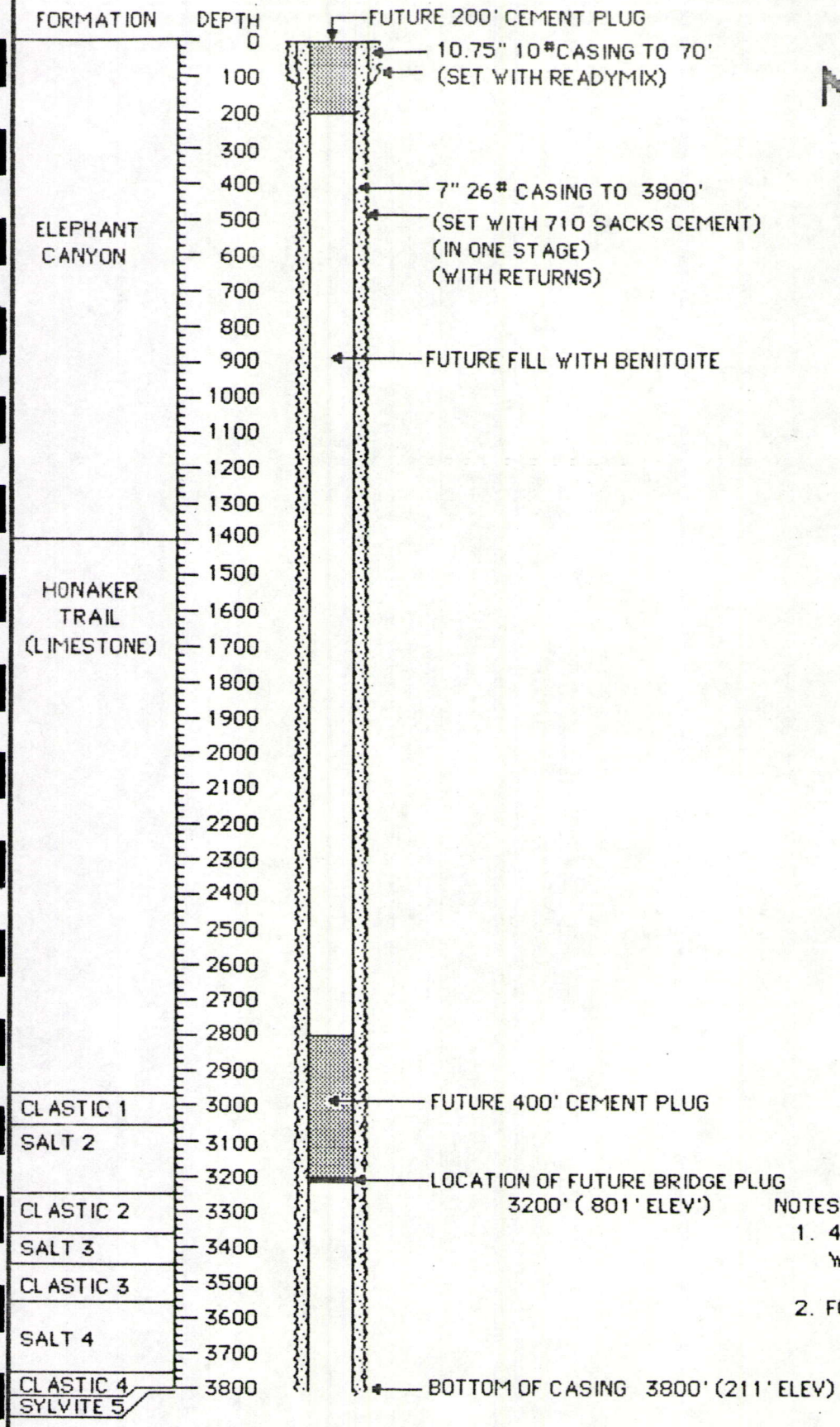
WELL #22
NOT INTO MINE
LOCATION
2,527,339 E
679,700 N
ELEV.
SURFACE 4010'
BOTTOM 464'

SPUD DATE
31 JUL 1981
COMPLETION DATE
28 AUG 1981

NOTES:

1. 4.5" 11.6# TUBING FROM 0 TO 3546' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE.

WELL ABANDONMENT PLAN



WELL # 23
NOT INTO MINE
LOCATION
2,527,841 E
680,492 N
ELEV.
SURFACE 4011'
BOTTOM 211'

SPUD DATE
1 SEP 1981

COMPLETION DATE
28 SEP 1981

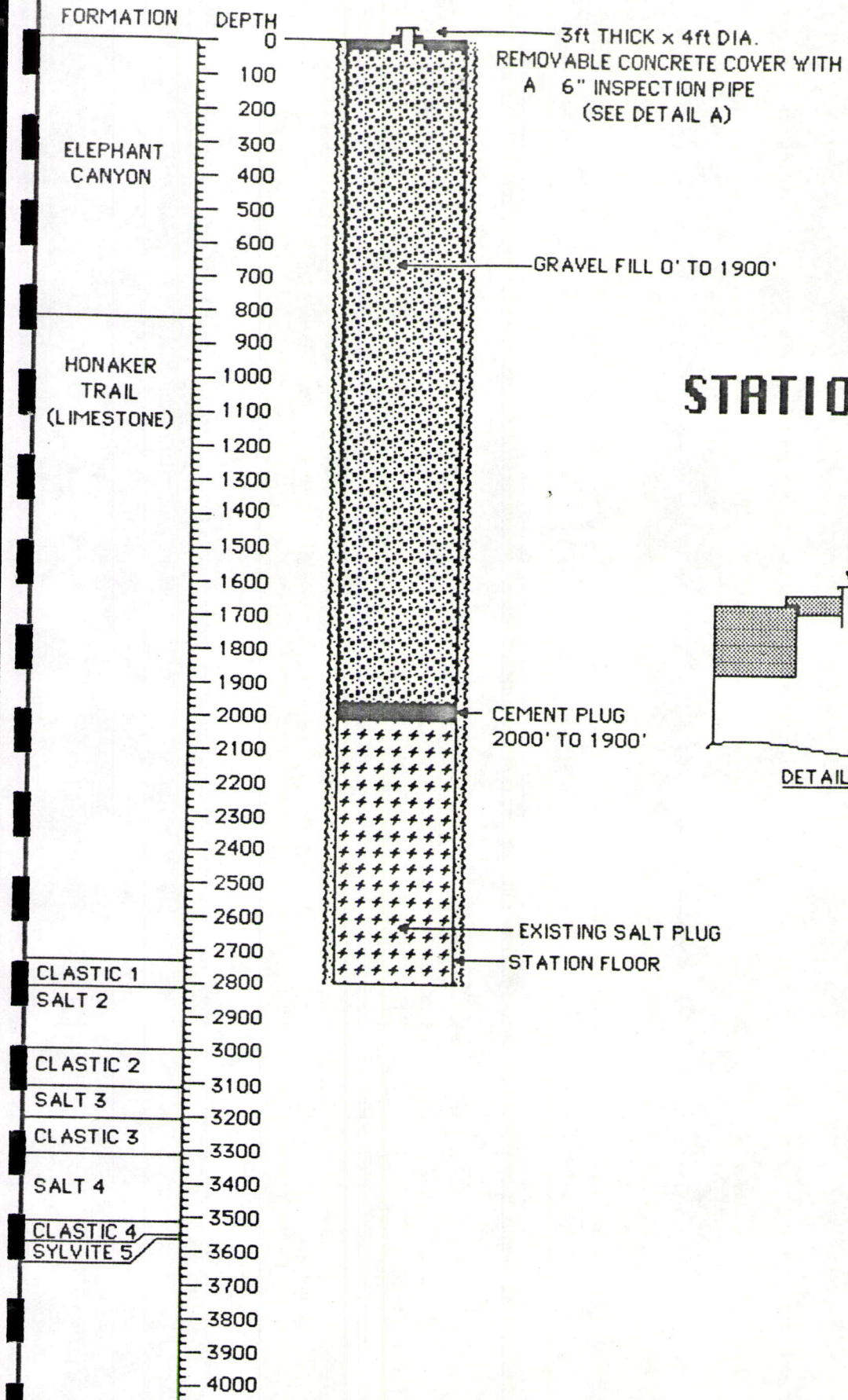
NOTES:

1. 4.5" 11.6# TUBING FROM 0 TO 3811' WILL BE REMOVED BEFORE CEMENTING
2. FORMATION LOCATIONS ARE APPROXIMATE.

APPENDEX B

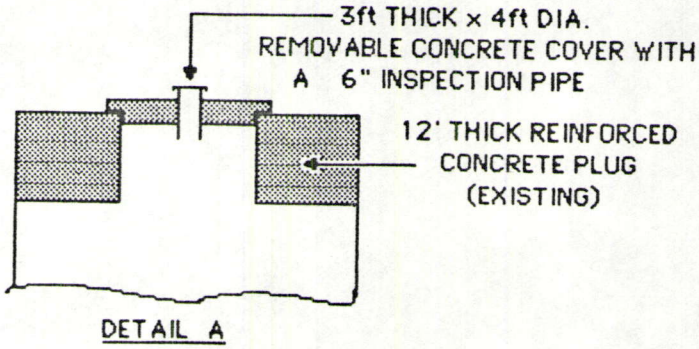
Graphic Representation of each Shaft

SHAFT ABANDONMENT PLAN



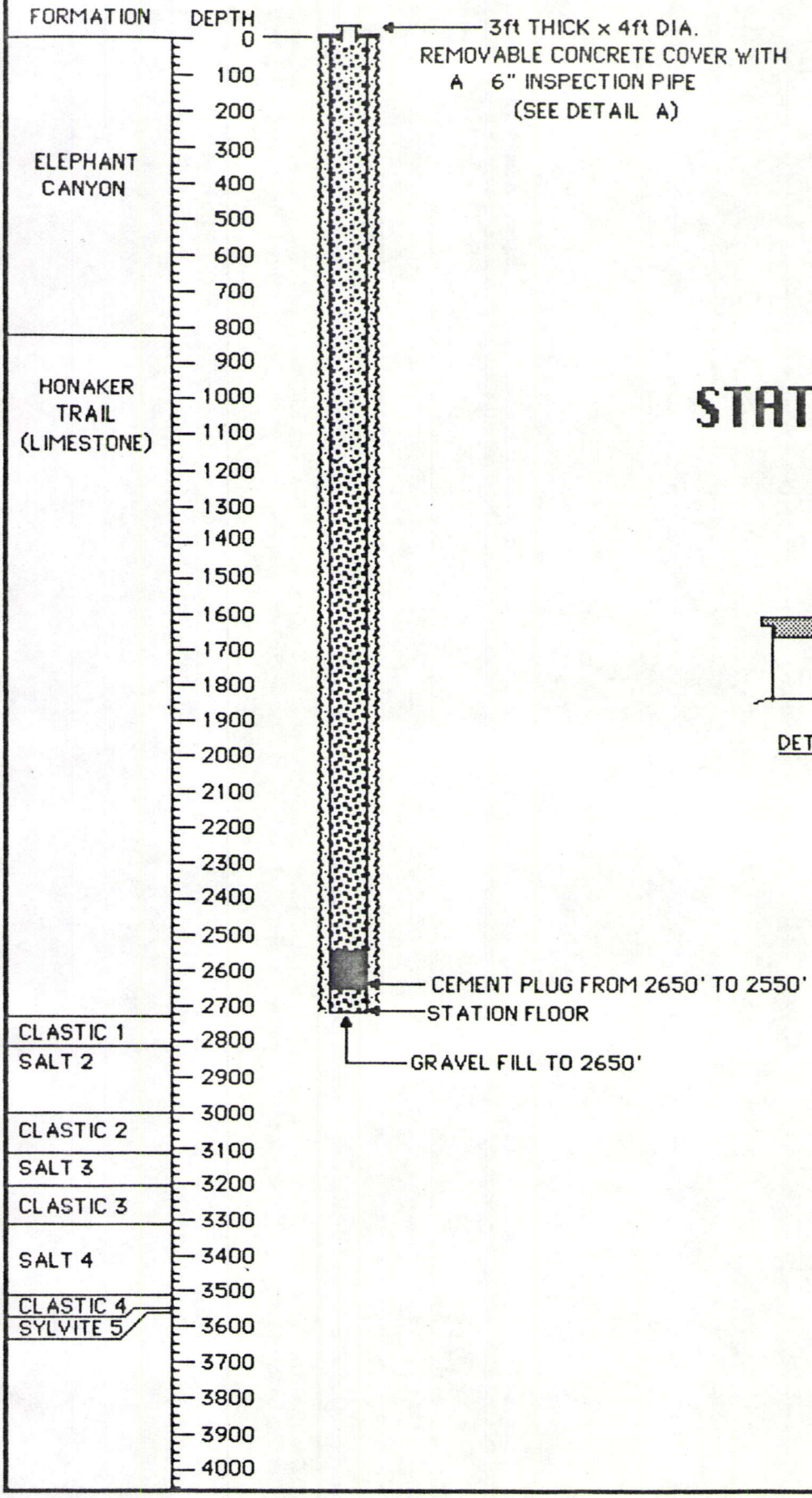
#1 SHAFT LOCATION
2,526,389 E
680,532 N

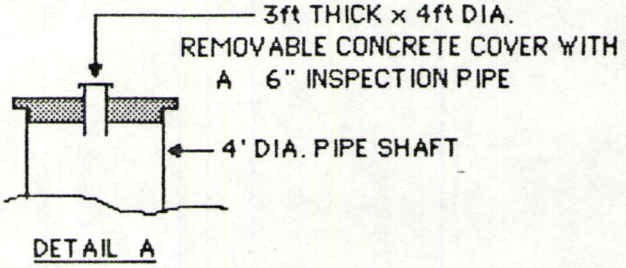
ELEV.
SURFACE 4032'
STATION FLOOR 1310'
BOTTOM 1236'



SHAFT ABANDONMENT PLAN

#2 SHAFT
LOCATION
2,526,752 E
680,717 N
ELEV.
SURFACE 4018'
STATION FLOOR 1318'
BOTTOM 1308'



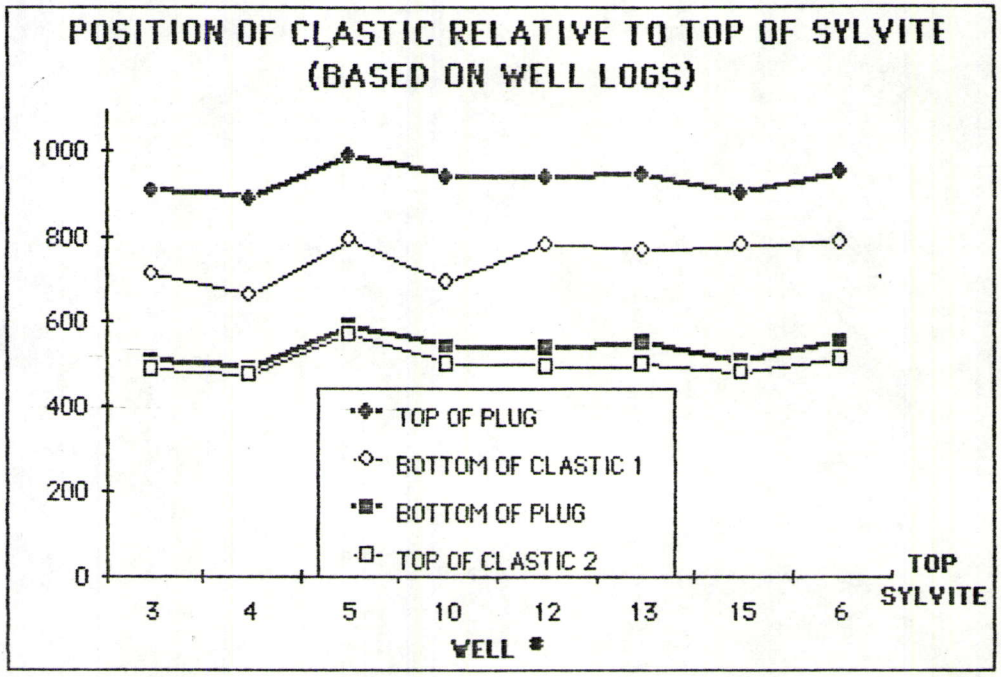


APPENDEX C

Criteria for Location of Bridge Plugs

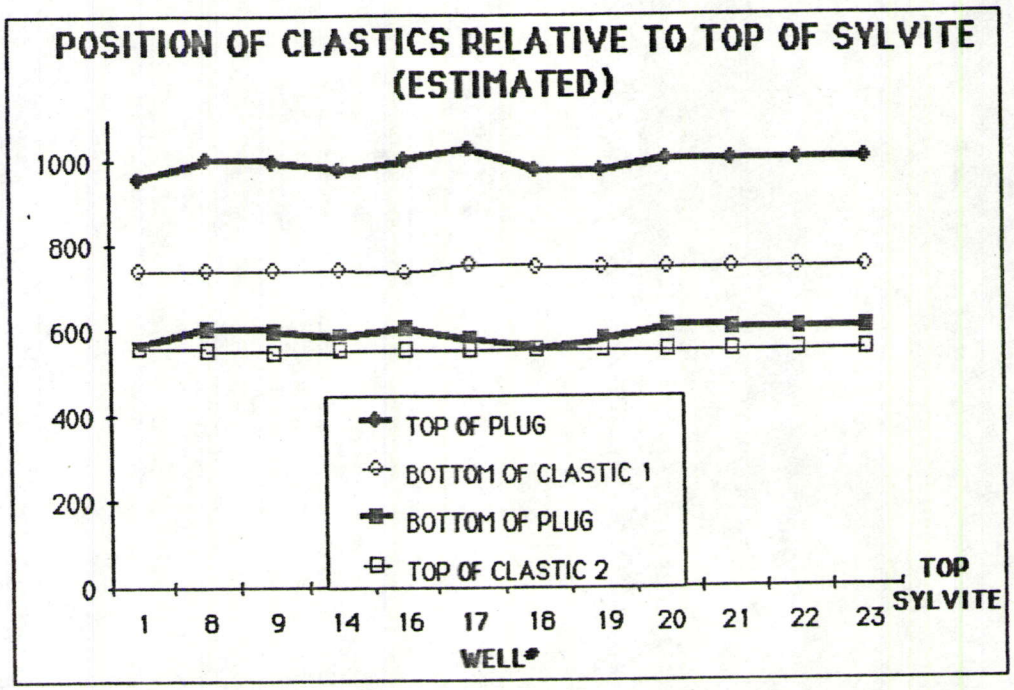
CRITERIA FOR LOCATION OF BRIDGE PLUGS IN SOLUTION MINING WELLS

The following graph shows the elevation of two clastic beds in relation to the top of sylvite 5. These elevations were determined by gamma ray - neutron logs. The top of clastic 2 ranges from 500 to 600 feet above sylvite 5. The bridge plug in these wells is to be set just above clastic 2 as shown .



CRITERIA FOR LOCATION OF BRIDGE PLUGS IN SOLUTION MINING WELLS

The main concern in the placement location of the cement plug is to seal off the Paradox from the above formations. The combined thickness of the Clastic 1 and Salt 2 portions of the Paradox is approximately 200ft. A plug of 400ft thick was chosen to be sure the cement extended above the top of the Paradox. As shown on the following graph the bottom of the plug is to be located 600ft above the top of the mine (top of Sylvite) which is approximately the base of Salt 2.



APPENDEX D

One Time and Unit Costs
Summary Sheet

ABANDONMENT PLAN

One Time Costs

	Miles	$/Mile		Costs Used in Calculations
Halliburton Move in Costs - From Cortez Colorado				
Cement Pump Truck	140	$2.15	$301.00	
Bulk Truck	140	$0.90	$126.00	
Crew Truck	140	$0.90	$126.00	
Tool Pushers Truck	140	$0.90	$126.00	
Subsistance 4 Men $80/day			$320.00	
Total				$999
Workover Rig Move in Costs - from Moab Utah				$350
Casing Crew Move in Costs - from Grand Junction Colorado				$396

Unit Costs

Halliburton per Well Assuming One well per Day				
Cement Pumping Truck			$1260.00	
Subsistance 4 Men @$80/day			$320.00	
Cement Truck 2 Men - Labor Included in Rate of Truck				
Bulk Truck 1 Man - Labor Included in Rate of Truck				
Toolman - Labor Included in Cost Of Plug				
Milage for 2 Trucks $.90/mile 50 Miles/day			$90.00	
Total				$1,670
Workover Rig - Per Well Costs During Cementing (See Appendex E)				$2,566
- Per Well Costs During Tubing Removal (See Appendex E)				$1,750
Casing Crew - Per Well Costs (See Appendex E)				$1,950
Bridge Plug Costs		+10% Delivered		
4.5	$1,111	$1,222		
5.5	$1,159	$1,275		
7	$1,321	$1,453		
8.625	$1,826	$2,009		
9.625	$2,285	$2,514		
10.75	$2,717	$2,989		
16	$5,000	$5,500		
Cement Costs (See Appendex E)			$9.80 /Cu Ft	
Bentonite Costs (See Appendex E)			$0.40 /Cu Ft	

APPENDEX E

Quotes

ABANDONMENT PLAN

QUOTE FROM: **T & M CASING SERVICES**
P.O.BOX 2722
GRAND JUNCTION COLORADO 81502
PHONE: 303-245-0593
CONTACTED RANDY MILLIGAN

WORK REQUIRED: REMOVE TUBING FROM THE FOLLOWING WELLS;

WELL #	FOOTAGE	SIZE	#/FT	WT OF PIPE
1	3033	5.500	14.62	44,342
15	2127	7.000	23.00	48,921
17	2603	5.500	15.50	40,347
	905	4.500	11.60	10,498
18	3956	5.000	18.00	71,208
19	3330	2.875	6.50	21,645
21	3565	4.500	11.60	41,354
22	3546	4.500	11.60	41,134
23	3811	4.500	11.60	44,208
Total Footage	26876			363,656 #
				182 Tons

RANDY ESTIMATED A TOTAL OF FIVE DAYS TO COMPLETE.

		Costs used in Calculations
Move In Costs		**$396.00**
Per Day Costs	(Total Cost - Includes Equipment & Subsistance)	**$1,950.00**

TO BE CONSERVATIVE AN ESTIMATE OF ONE WELL PER DAY IS USED.

ABANDONMENT PLAN

QUOTE FROM : BOB BEEMAN DRILLING
P.O. BOX 788
MOAB, UTAH 84532
PHONE: 801-259-7281
CONTACTED TED CHRISTIANSEN

	Hours	$/Hour	Total	Costs used in Calculations
MOVE IN COSTS	2	$175.00		**$350.00**

Workover Rig Costs (Per Well Cementing Costs)

	HOURS			
Rig Up	2			
Pickup Pipe	3			
Set Bridge Plug	2			
Assist Halliburton in Pumping Cement & Bentonite	3			
Lay Down	2			
Total Hours	12	$175.00	$2,100.00	
Rent 3100' - 2 7/8" Drill Pipe @ .06/ft/day			$186.00	
2 - Water Trucks For Cement & Bentonite (Hauling Capacity 3000gal.)	4	$35.00	$280.00	
Total				**$2,566.00**

WORKOVER RIG COSTS (PER WELL TUBING REMOVAL COSTS)

RIG UP	2			
PULL PIPE	6			
RIG DOWN	2			
	10	$175.00		
Total				**$1,750.00**

NOTE: LABOR AND SUBSISTANCE ARE INCLUDED IN THE HOURLY RATE OF $175.

ABANDONMENT PLAN

QUOTE FROM: **HALLIBURTON**
4109 E. MAIN
FARMINGTON N M
PHONE: 505-325-3575
CONTACTED LARRY WILLIINGER

SERVICES OUT OF CORTEZ COLO.
BOB ODELL
PHONE: 303-565-6521

Move In Costs	$/MILE
Cement Pump Truck	$2.15
Bulk Truck	$0.90
Crew Truck	$0.90
Tool Pushers Truck	$0.90

Cement Pumping Truck Cost

1st 8 Hours	$1,260.00
Other 8hr Shifts	$1,250.00

Includes Labor for Two Men
Capacity 10 - 12 Barrels(42 gal)/min
or 2847 Sacks/hr
Rates are for Depths from 1500ft to 3000ft
Over 3000ft add $15/100ft

Toolman Needed to Set Bridge Plug
First 8 Hours Included in the Cost of the Plug
Over 8hrs @$260 per 8hrs

1000 Sack Cement Bin Cost
$112.00 Per Day $1170.00 Per Month (5 Days Min)

Subsistance is $80 per Man per Night

Cement Cost (No Handling Charge When Using Halliburton Cement)
(To be mixed with brine to form Salt Saturated Cement)
(Truck driver labor included in cost of cement)

FOB Cortez	$7.50 /SACK
Transportation Cost @$.75/ton/mile	
140 Miles*94#/Sack*.75/2000#/ton	$4.94 /SACK
Total	$12.44 /SACK

Volume = 1.27 cu ft/sack Density = 120 cu ft/sack
Total **$9.80 /CU FT**

Bentonite Cost (TO be mixed with water)

FOB Cortez	$6.60 /SACK
Transportation	$4.94 /SACK
Total	$11.54 /SACK

Mix at a Rate of 4 Sacks per 20 Barrels	Volume in Gallons	Volume in Cu Ft	Weight in Pounds	Density #/ cu ft
Volume of Water = 20*42	840.00	112.30	7007	
Volume Bentonite @.0453gal/#	18.12	2.42	400	
Total Volume	858.12	114.72	7407	64.57

Total **$0.40 / Cu Ft**

APPENDEX F

Well # 7
Details on Plugging

ABANDONMENT PLAN

PROCEDURE FOR ABANDONMENT OF WELL #7

Well #7 is an uncased well that has been cemented from 2210ft to 1370ft.

A Caliper log of 10/29/76 (attached) showes a hole diameter varing from 15.5" to 23" with two places over 20". This well will be filled with gravel with a 200' cement plug being placed at the surface.

Depth From	To	Hole Dia.	Area SF	CF Cement	CF Gravel
0	40	15.5	1.31	52.41	
40	50	23	2.89	28.85	
50	170	17	1.58	189.15	
170	200	19	1.97	59.07	
200	270	19	1.97		138
270	400	18	1.77		230
400	670	17	1.58		426
670	800	16	1.40		182
800	880	36	7.07		565
880	920	16	1.40		56
920	1140	16	1.40		307
1140	1330	17	1.58		299
1330	1370	36	7.07		283

Total Cement	Total Gravel
329 CU FT	1511 CU FT
279 SACKS	56 CU YDS

For Estimating Assume **350 Cu Ft Cement**
100 Cu Yds Gravel

Caliper Log

Texas Gulf Inc. #17 Marsh

DRILLER'S DEPTH	BIT SIZE
1370	12 1/4
1370	8 5/8
470	

CASING RECORD	SIZE	WGT.	FROM	TO
12 3/4 Pipe				
8 5/8 Surface Pipe				
12 3/4 Pipe				
8 5/8 Cooper				

ELEV. GL ft. ABOVE FERM DATUM

ELEV.: K.B. D.F. G.L.

OTHER SERVICES

FOLD HERE

THIS HEADING AND LOG CONFORMS TO API RP 33

EQUIPMENT DATA

RUN NO.			
TOOL MODEL NO.			
DIAMETER			
DETECTOR MODEL NO.			
TYPE			
LENGTH			
DISTANCE TO N. SOURCE			
GENERAL			
HOIST TRUCK NO.			
INSTRUMENT TRUCK NO.			
TOOL SERIAL NO.			

RUN NO.			
LOG TYPE			
TOOL MODEL NO.			
DIAMETER			
DETECTOR MODEL NO.			
TYPE			
LENGTH			
SOURCE MODEL NO.			
SERIAL NO.			
SPACING			
TYPE			
STRENGTH			

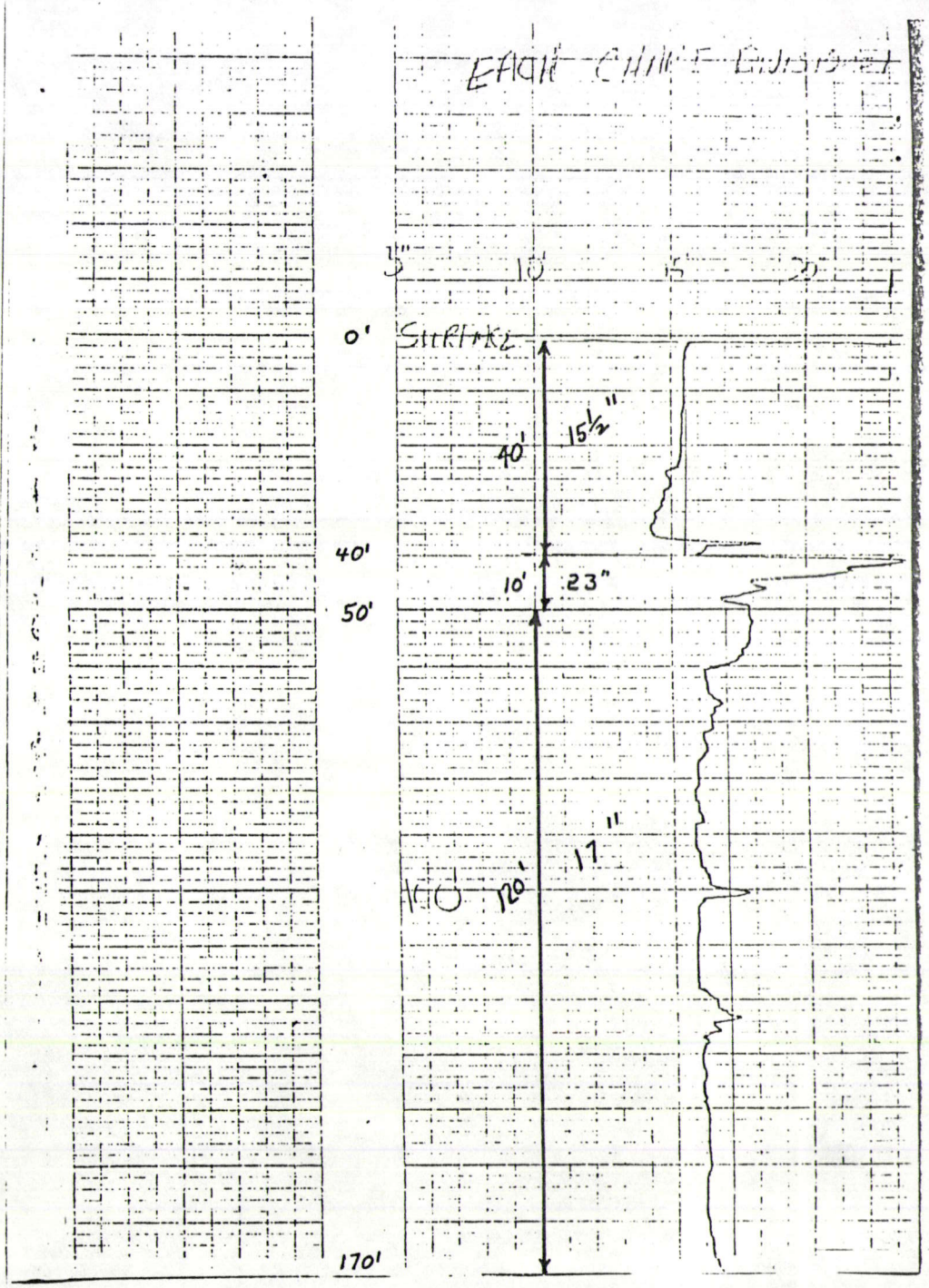
LOGGING DATA

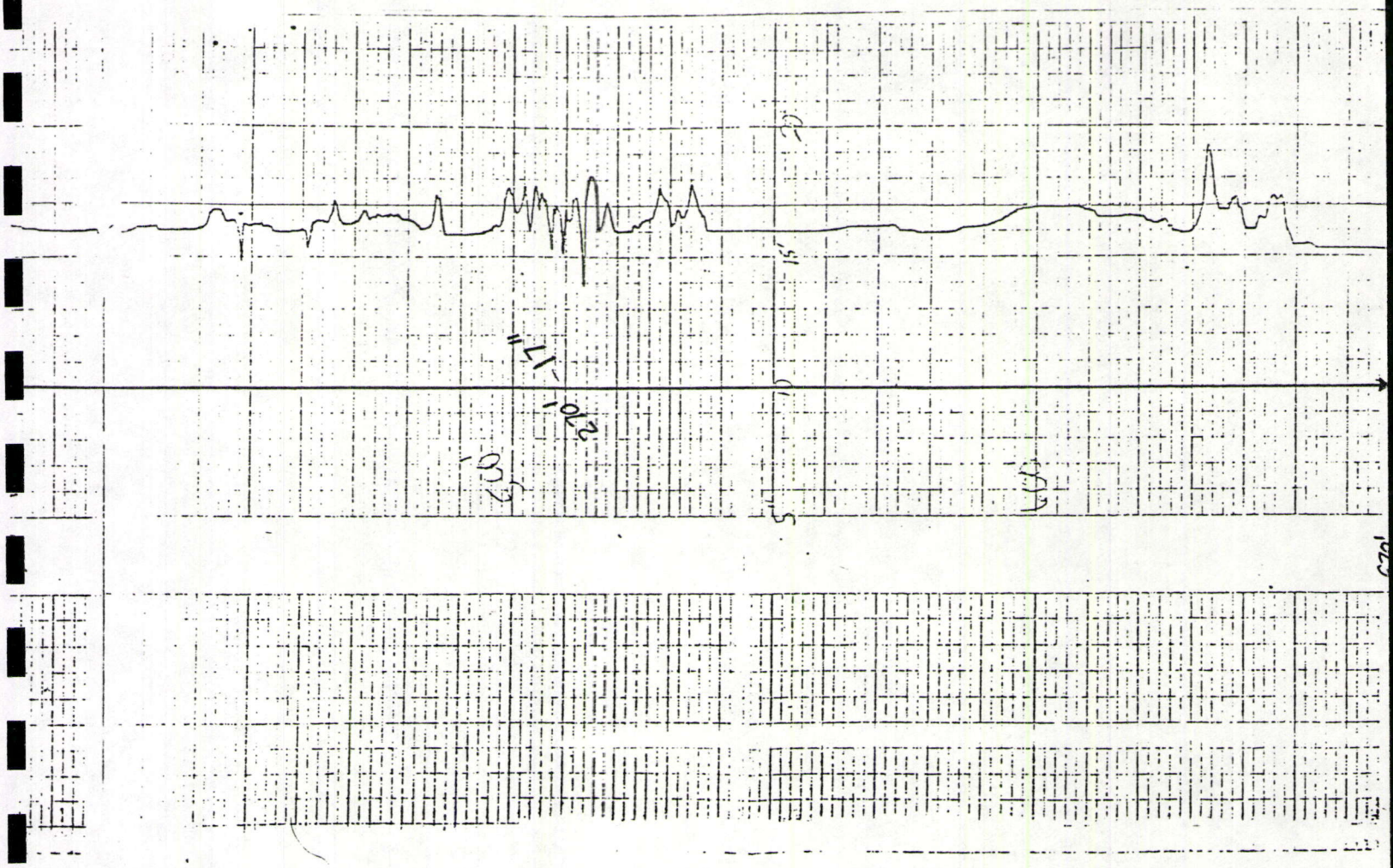
RUN NO.	GENERAL DEPTHS FROM	TO	SPEED FT/MIN.	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC.	SENS. SETTINGS	ZERO DIV. L OR R	API N. UNITS PER LOG DIV.
1	1370'	SURF.	25	1	179	433					

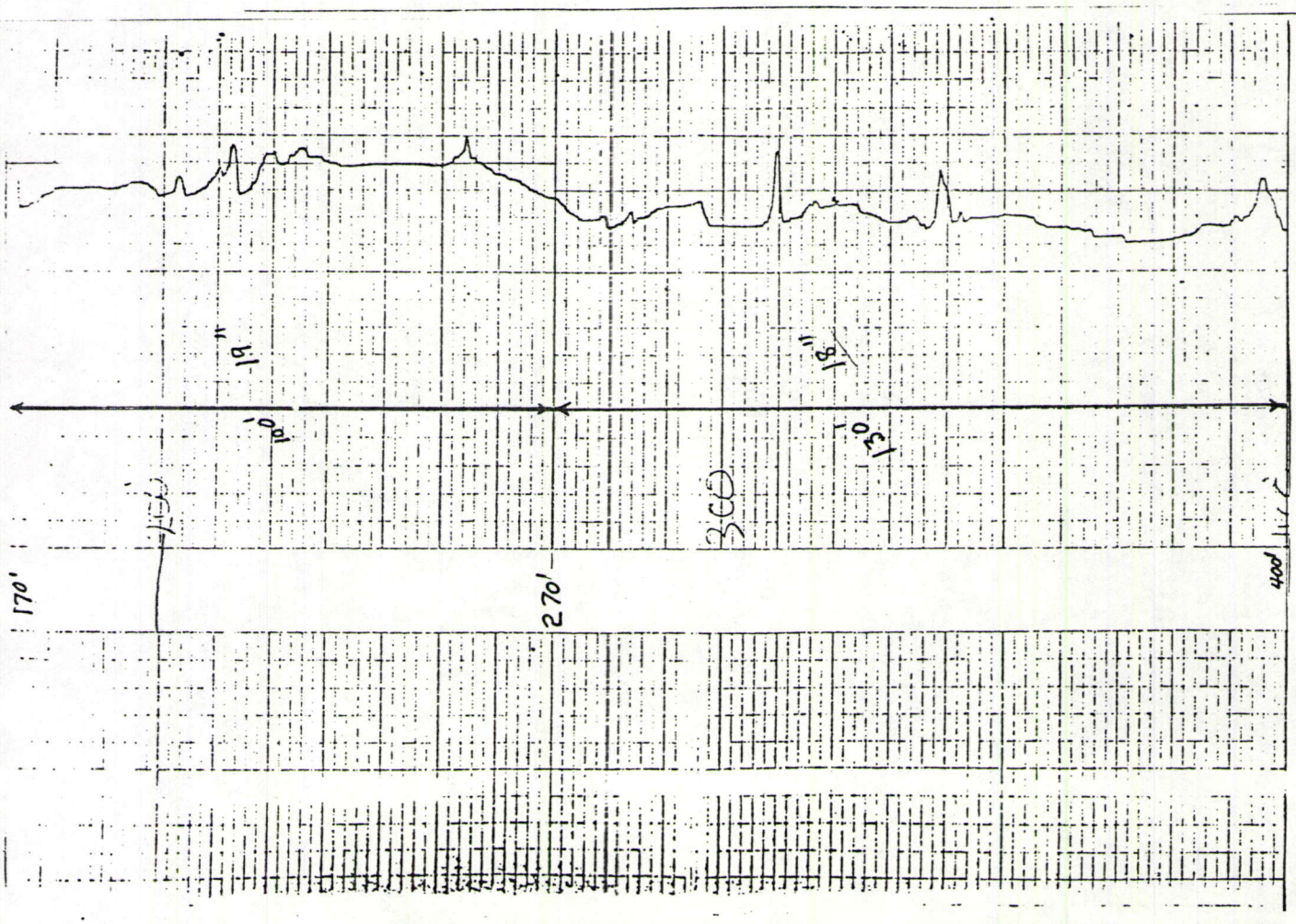
REFERENCE LITERATURE

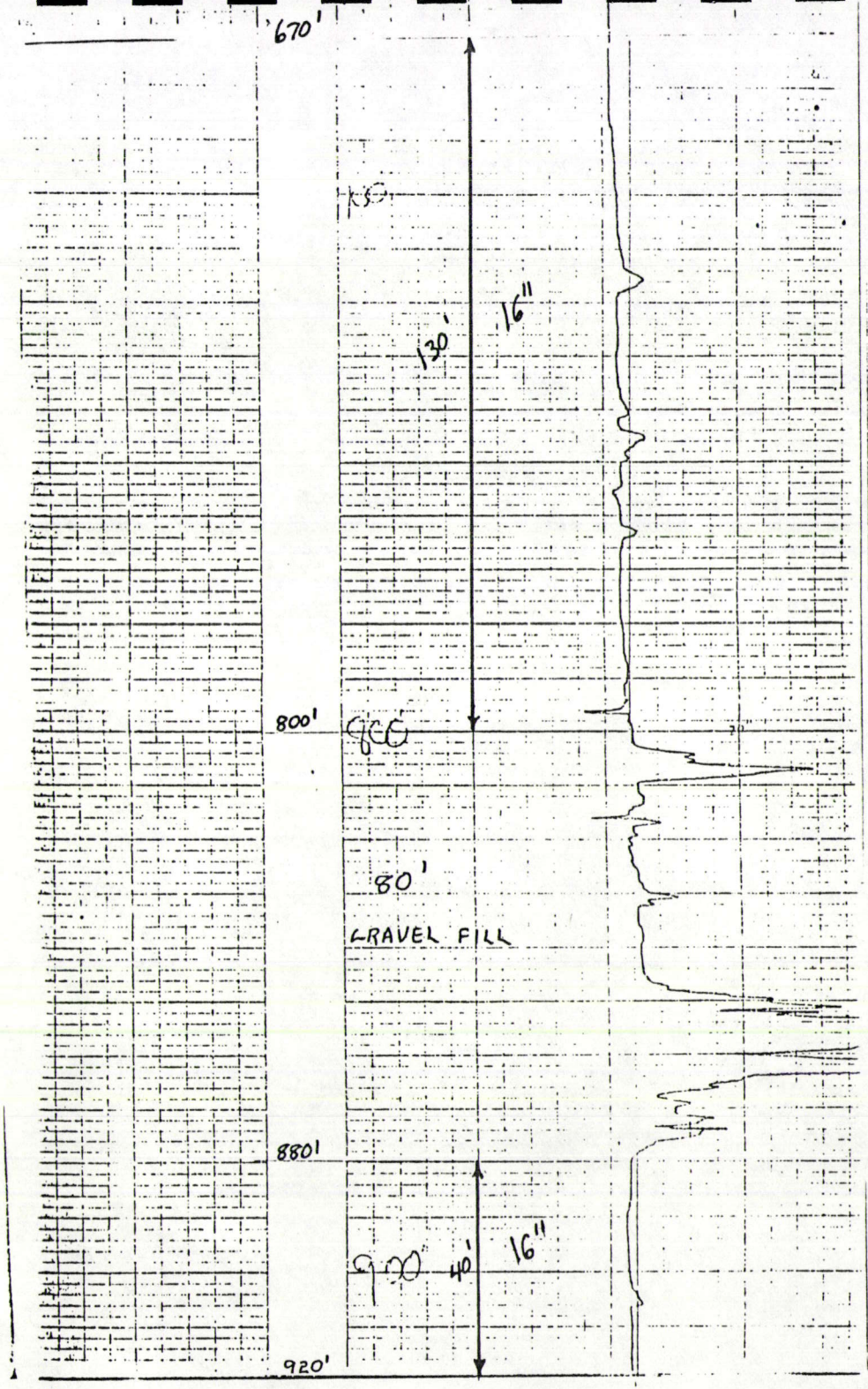
REMARKS

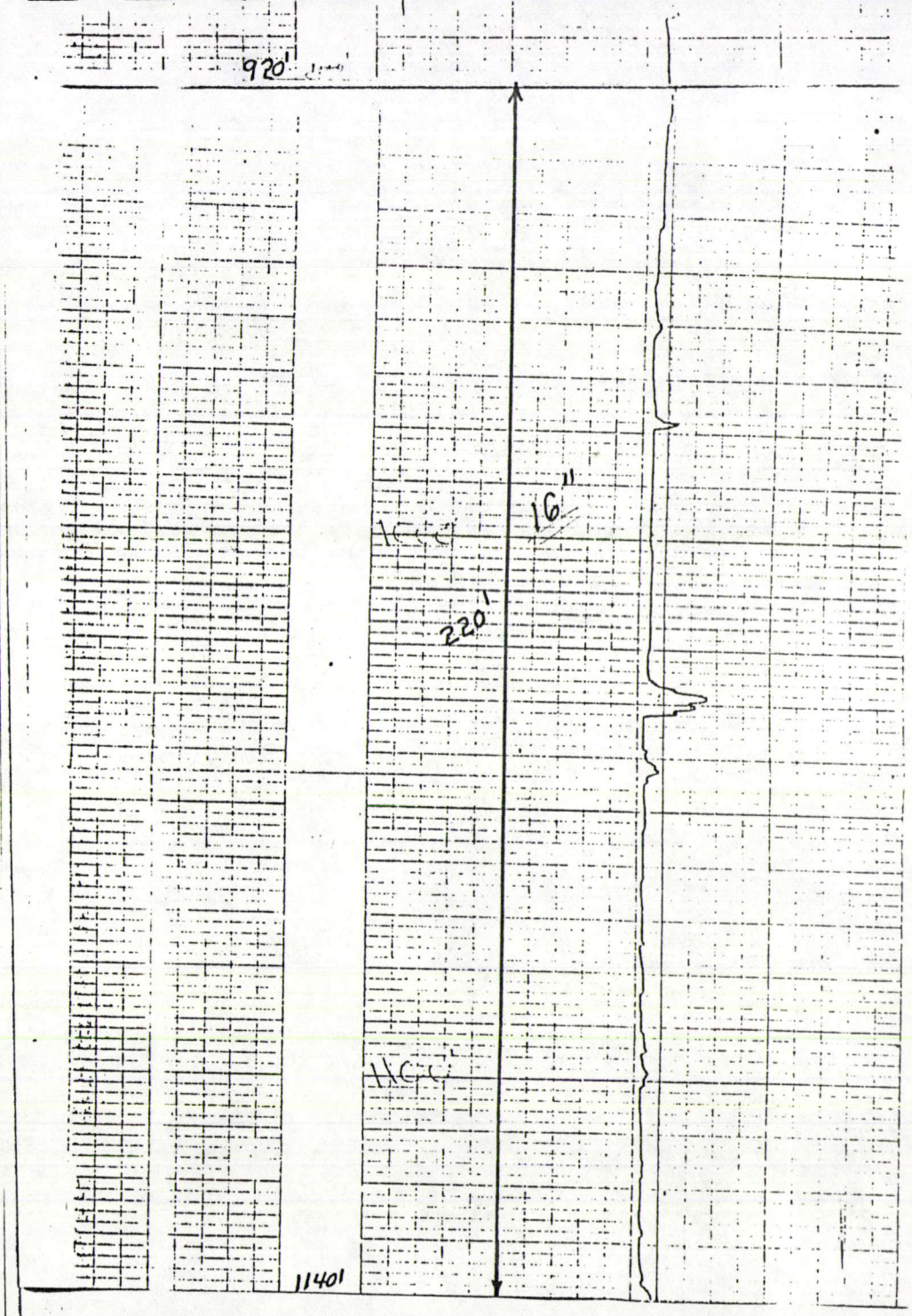
DEPTH

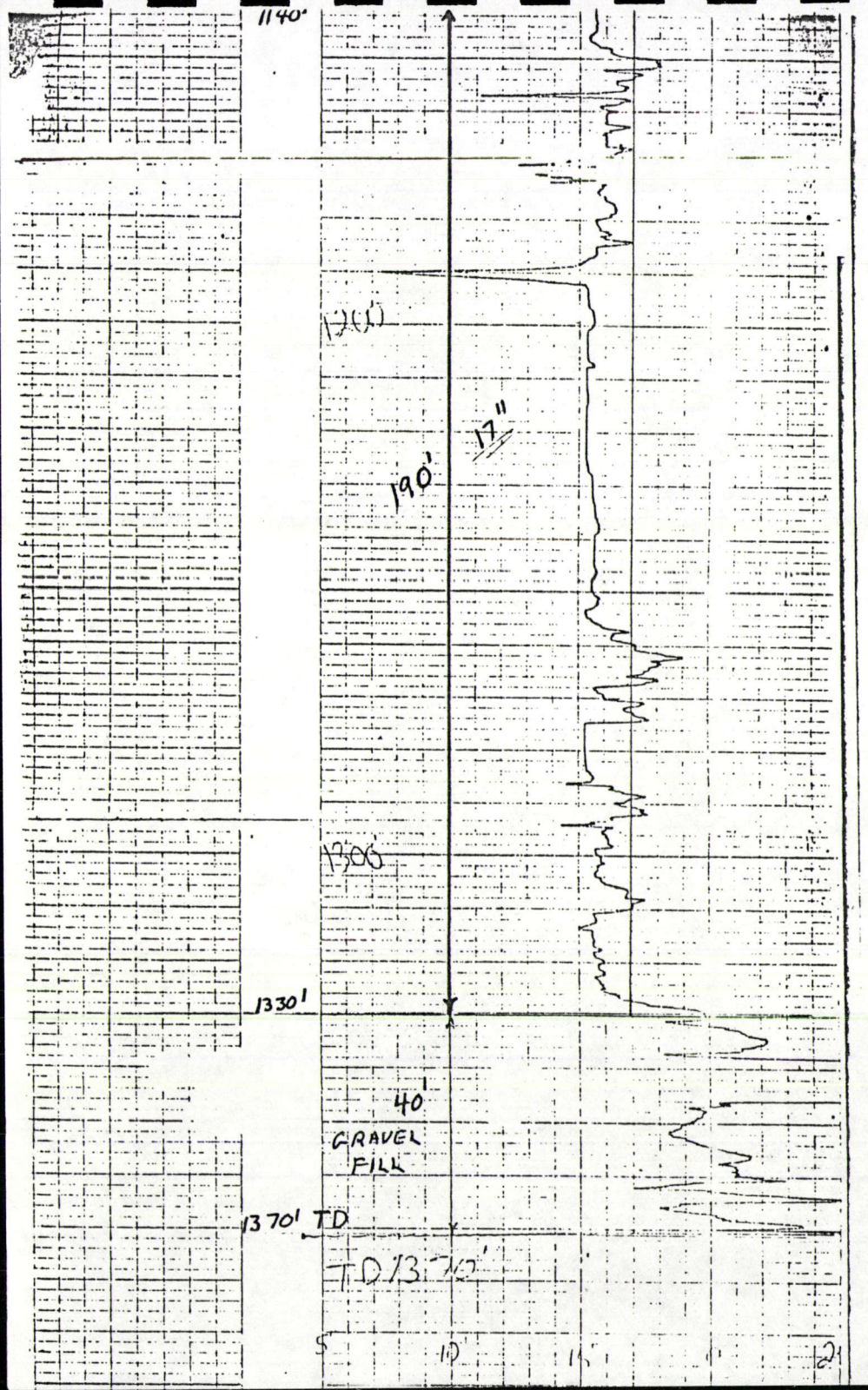



270'
17"
15'
5'
270'


19"
18"
100'
130'
300
170'
270'
400'


670'
KS
16"
130'
800'
GCC
80'
GRAVEL FILL
880'
GCC
40'
16"
920'


920'
16"
220'
1140'


1140'
1200
17"
190'
1300
1330'
40'
GRAVEL
FILL
1370' TD
TD 13 70'
5
10
15
20

APPENDEX g

Horsepower Requirements Required for Solution Mining Shaft # 1

ABANDONMENT PLAN

Horsepower Required for Solution Mining Salt From #1 Shaft

Pumping from River to #1 Shaft

Friction Loss in 8" Surface Pipe	
2800' * .0338 ft/ft * .433 psi/ft	41 PSI
Friction Loss in 6" Pipes Down Shaft	
2000' * .0357 ft/ft * .433 psi/ft	31 PSI
Static Head	
#1 Shaft Elev. = 4032'	
River Elev. = 3950'	
Difference 82' *.433	36 PSI
Brine - Water Differental	
Water = 2000ft * .433psi/ft =867psi	
Brine = 2000ft * ..533psi/ft = 1066psi	
Difference	199 PSI
Misc. Valves & Fittings	20 PSI
Total Head Required	327 PSI

Horsepower Required for Pump

$$HP = \frac{1500gpm * 327psi}{.433psi/ft * .7\ Eff * 3960} \quad 410\ HP$$

Pumping From #1 Shaft to Tails Lake

Friction Loss in 8" Surface Pipe	
900' * .0338 ft/ft * .433 psi/ft	13 PSI
Static Head	
Elev Tails Lake Dam = 4080ft	
Elev #1 Shaft = 4032ft	
Difference = 48ft *.52psi/ft	25 PSI
Misc Valves & Fittings	10 PSI
Total Head Required	48 PSI

Horsepower Required for Pump

$$HP = \frac{900gpm * 48psi * 1.23Sp\ Gr}{.433psi/ft * .7\ Eff * 3960} \quad 45\ HP$$

Time Required to Solution Mine to 2000ft

Volume =	760,265 CU FT
Weight of Salt @ 135#/CF	102,635,745 LBS
Wt Removed by 1 Gal Water	
(76.8#/cf-62.4#/cf)/7.48gal/cf	1.93 LBS/GAL
Gallons Required	53,313,568 GAL
Days Required @ 1500gpm	25 DAYS

APPENDEX H

Costs to Transport Gravel

ABANDONMENT PLAN

Costs to Transport Gravel from Beds to Shafts

Distance	5200 ft Each Way	
Material	Sand & Gravel Approximate Weight - 3400 #/CuYd	
	Assume 15% Swell Factor During Hauling - Wt. 2960 #/Cu Yd	
Equipment	Bulldozer	CAT D - 8K
	Frontend Loader	CAT 966-D WITH 4 CU YD BUCKET
	Trucks	25 TON DUMP

Bulldozer Will Cut and Pile Material for Front End Loader
Production Capacity = 245 Cu Yds/hr
Truck Capacity = 25 Tons
25Tons * 2000 #/Ton / 2960 #/Cu Yd 17 CU YDS

			USE
Load Time	17Cu Yds/245Cu Yds/hr * 60min/hr =	4.2 MIN	5 MIN
Travel Time	10400 ft/5280ft/mile/20mi/hr*60min/hr =	7.9 MIN	8 MIN
Dump Time	Assume		5 MIN
	Total Trip Time		18 MIN

Assume 8hr Days With 7 Hours Actual Working Time
@ 17 Cu Yds/Trip/Truck/18min/Trip * 60min/hr * 3 Trucks * 7 hrs/day = 1190 CU YDS/DAY

Assuming 15% Compaction Factor in Shaft = 1035 CU YDS/DAY

Equipment Cost	$/HR
Bulldozer	$125.00
Front End Loader	$89.25
3 - Dump Trucks @ $66.88/hr	$200.64
2 Operators @ $29.85/hr ea.	$59.70
3 Truck Drivers @$23.45/hr	$70.35
Foreman	$32.85
	$577.79
Total $/Day	$4622.32

Total $/CU Yd in Place **$4.47**
(Assuming 1035 Cu Yds/day in place Production)

Production Capacities and Costs Taken from Richardson Cost Estimation Books Volume 1 Page 2-18

Note: In order to make the hauling capacities accurate a swell factor of 1.15 was used
To calculate the actual in place material the Cu Yds hauled was divided by 1.15

APPENDEX 1

Quanties of Gravel Available and Size Distribution

ABANDONMENT PLAN

CALCULATIONS FOR VOLUMES OF GRAVEL SHOWN ON FIGURE #3

AREAS	WIDTH	LENGTH	ESTIMATED DEPTH	USED FOR CALC	CU YDS
I	180	350	5 - 10	5	11,667
II	180	400	10 - 15	10	26,667
III	200	650	10 - 15	10	48,148
IIII	200	200	5 - 10	5	7,407
			TOTAL AVAILABLE		93,889
REQUIRED FOR #1 SHAFT 22 FOOT DIA. 1900 FEET DEEP					26,750
REQUIRED FOR #2 SHAFT 4 FOOT DIA. 2550 FEET DEEP					1,187
			TOTAL CU YDS REQD		27,937

The following samples were taken from the locations shown on figure #2. In each case a 5 foot trench was dug with a backhoe and the sample taken from a vertical wall of gravel.

The total sample was split into +1, +1/8 and -1/8 inch by hand screening. A small sample was split from the -1/8 inch using splitter pans. After drying, the small sample was then separated using tyler square mesh screens on a rotap. Rotap time was 5 minutes for each sample.

GRAVEL SAMPLES TAKEN 12 NOV. 1985

SAMPLE #1

		%	CUMUL PERCENT
TOTAL WT - LBS	63.4		
+1	10.3	16.2	16.2
+1/8	33.3	52.5	68.8
-1/8	19.8	31.2	
TOTAL	63.4	100.0	

-1/8 SAMPLE	WT. GRAMS	CUMUL. PERCENT	Adj. to Actual Wt. in 19.8 # -1/8" Sample	% OF Total 63.4# Sample	
+10	44.7	23.4	4.6	7.3	76.1
+28	63.7	33.3	2.0	3.1	79.2
+48	163.0	85.2	10.3	16.2	95.4
+100	189.1	98.8	2.7	4.3	99.6
+200	190.4	99.5	0.1	0.2	99.9
-200	0.9	0.5	0.1	0.1	0.1
Total	191.3		19.8		

ABANDONMENT PLAN

GRAVEL SAMPLES TAKEN 12 NOV. 1985

SAMPLE #2

		%	CUMUL PERCENT
TOTAL WT - LBS	64.2		
+1	9.3	14.5	14.5
+1/8	33.4	52.0	66.5
-1/8	21.5	33.5	
TOTAL	64.2	100.0	

-1/8 SAMPLE	WT. GRAMS	CUMUL. PERCENT	ADJ. TO TOTAL		
+10	39.1	20.4	4.4	6.8	73.4
+28	53.1	27.8	1.6	2.5	75.8
+48	121.4	63.5	7.6	11.8	87.6
+100	180.7	94.5	6.7	10.4	98.0
+200	188.1	98.3	0.8	1.3	99.3
-200	4.2	2.2	0.5	0.7	0.7
TOTAL	191.3		21.5		

SAMPLE #3

		%	CUMUL PERCENT
TOTAL WT - LBS	66.7		
+1	27	40.5	40.5
+1/8	23.1	34.6	75.1
-1/8	16.6	24.9	
TOTAL	66.7	100.0	

-1/8 SAMPLE	WT. GRAMS	CUMUL. PERCENT	ADJ. TO TOTAL		
+10	69.1	36.0	6.0	9.0	84.1
+28	87.7	45.7	1.6	2.4	86.5
+48	131.8	68.6	3.8	5.7	92.2
+100	177.1	92.2	3.9	5.9	98.1
+200	185.9	96.8	0.8	1.1	99.2
-200	6.2	3.2	0.5	0.8	0.8
TOTAL	192.1		16.6		

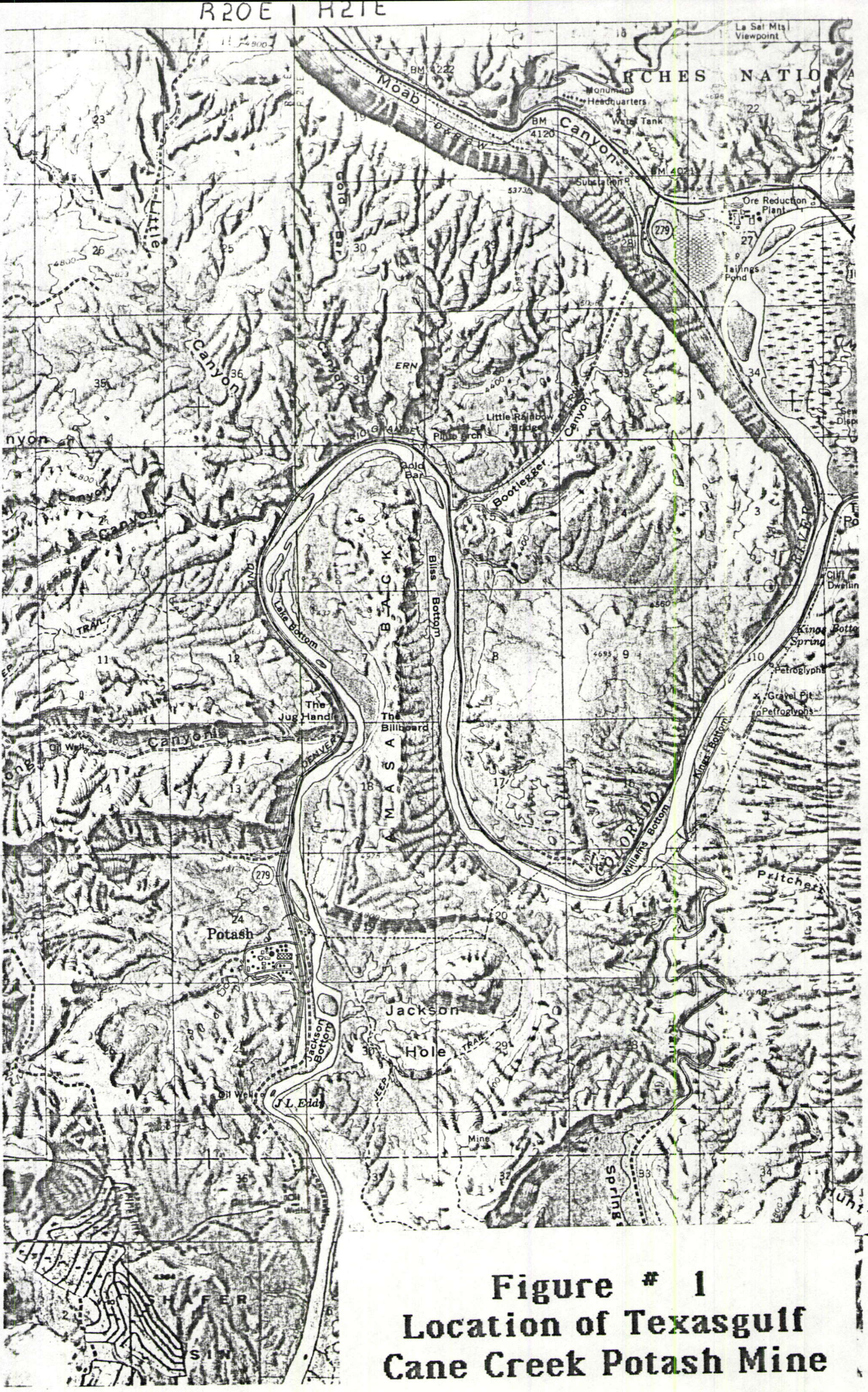


Figure # 1
Location of Texasgulf Cane Creek Potash Mine

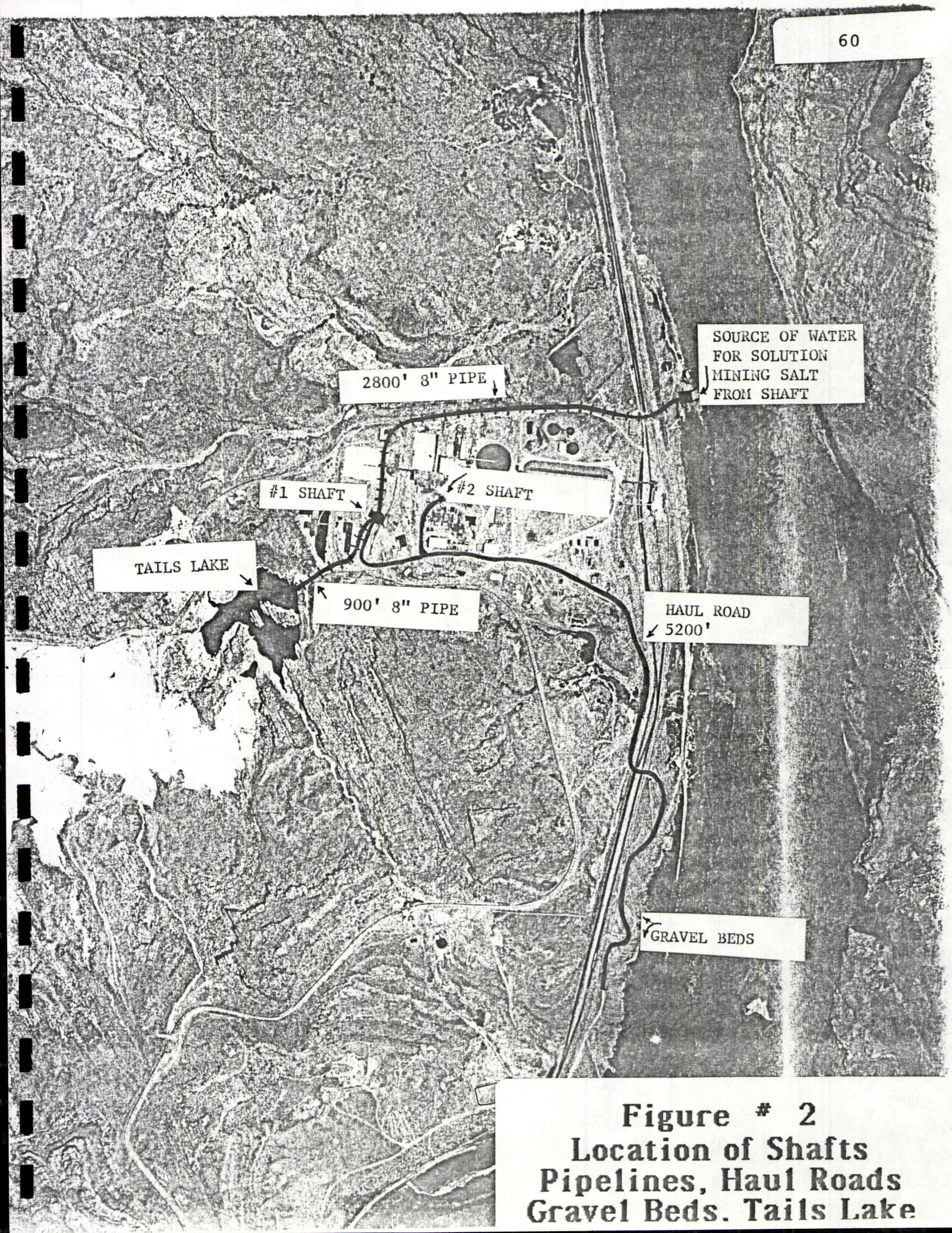


Figure # 2
Location of Shafts
Pipelines, Haul Roads
Gravel Beds. Tails Lake

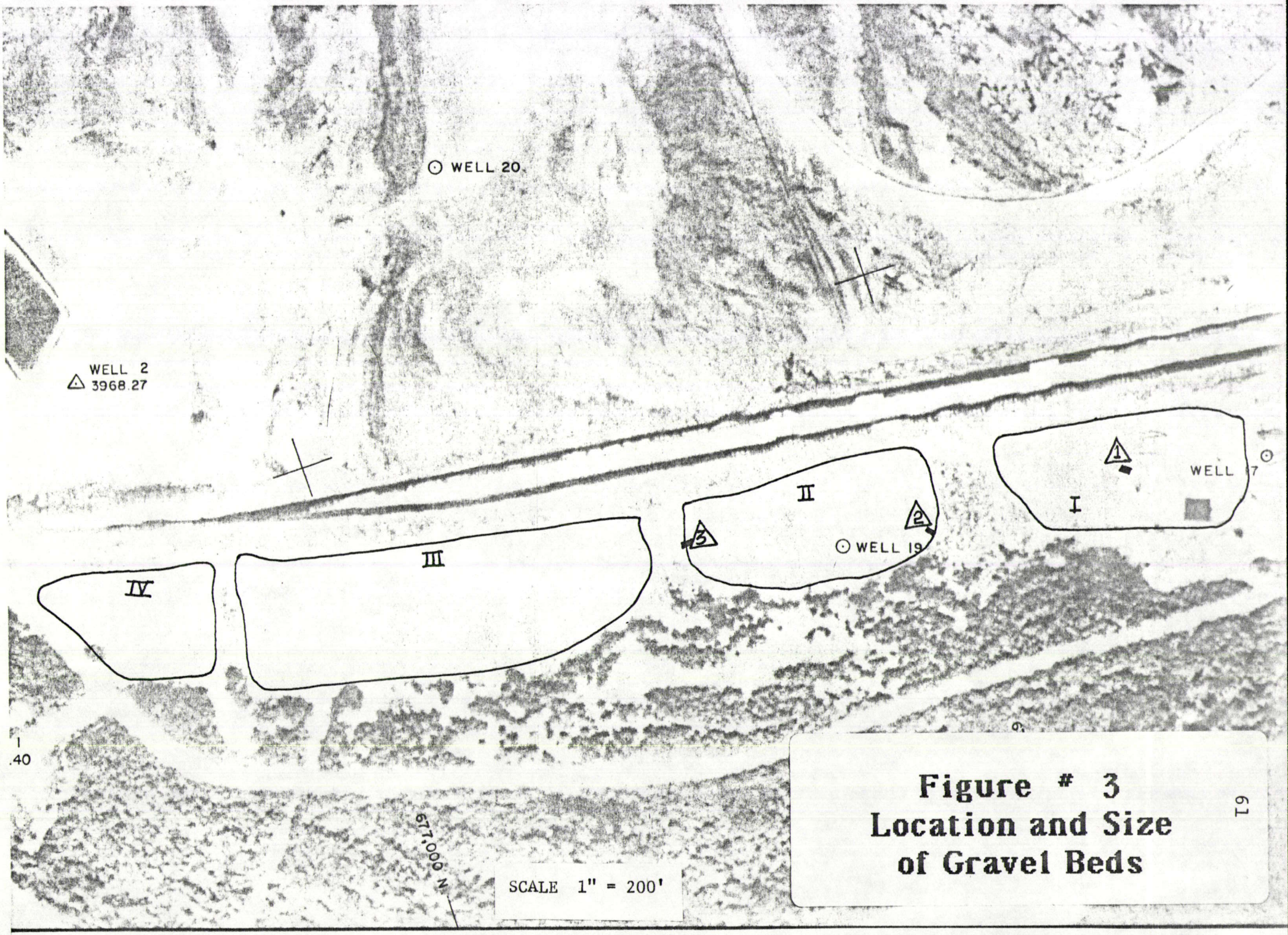


Figure # 3
Location and Size of Gravel Beds

This page is a reference page used to track documents internally for the Division of Oil, Gas and Mining

Mine Permit Number M0190005 Mine Name Cane Creek Potash
Operator Moab Salt LLC Date 1-3-1986
TO _____ FROM _____

__CONFIDENTIAL __BOND CLOSURE __LARGE MAPS X EXPANDABLE
__MULTIPUL DOCUMENT TRACKING SHEET __NEW APPROVED NOI
__AMENDMENT _OTHER_____

Description YEAR-Record Number

__NOI X Incoming __Outgoing __Internal __Superceded

Abondonment Plan of Class III Wells and Mine Shafts

___NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__TEXT/ 81/2 X 11 MAP PAGES __11 X 17 MAPS __LARGE MAP

COMMENTS: _____

CC: _____