

GLO1643

MOTHER EARTH INDUSTRIES INC.

COMPLETION REPORT

WELL 47-6

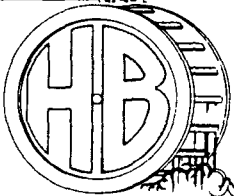
LEASEHOLDER

MOTHER EARTH INDUSTRIES

CAREFREE, ARIZONA

PREPARED BY

HIGGINSON-BARNETT, CONSULTANTS



AUGUST, 1985

WELL COMPLETION REPORT

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TABLE OF CONTENTS

	<u>PAGE</u>
I. ABSTRACT.....	1
II. LOCATION.....	3
III. WELL DRILLING AND CONSTRUCTION HISTORY.....	5
IV. WELL TESTS.....	16
V. GEOLOGY.....	21

TABLE OF FIGURES

<u>FIGURE NUMBER</u>	<u>PAGE</u>
1 LOCATION MAP.....	4
2 DAILY DRILLING ACTIVITIES.....	6-8
3 CHART OF DAYS SPENT ON WELL.....	9
4 WELL PROFILE.....	10
5 MUD DATA.....	11
6 AIR CIRCULATING DATA.....	12
7 DRILLING BIT RECORD.....	13
8 DIRECTIONAL SURVEY DATA.....	14
9 SPECIFICATIONS OF DRILLING RIG.....	15
10 TEMPERATURE SURVEY DATA.....	17-18
11 PRESSURE SURVEY DATA.....	19-20
12 LITHOLOGIC LOG OF WELL #47-6.....	23-24

I. ABSTRACT

I. ABSTRACT

Mother Earth Industries of Carefree, Arizona acquired the majority of the federal leases in the Cove Fort-Sulphurdale Known Geothermal Resource Area (KGRA), from Union Oil Company. Union Oil Company had drilled four wells and concluded that they were no longer interested in proceeding with development of the property. Mother Earth Industries, succeeding Union Oil, determined they would proceed to explore for geothermal resources beyond the exploration that had been accomplished by Union Oil.

In the fall of 1983, and MEI affiliate, Cove Creek Geothermal, drilled Well #34-7. At a depth of about 1,100 feet the well bore encountered dry steam, which was not anticipated, and Well #34-7 became an uncontrolled blow-out well. After considerable effort Cove Creek Geothermal successfully closed the discovery well and proceeded to move a few 100 feet to the northeast and drill Well #34-7B. #34-7B was successfully completed and it verified the existence of quality steam on the property. With that verification MEI moved back to the well pad constructed for the drilling of Well #34-7 and at a location slightly to the south of the initial location, drilled Well #34-7A.

In May of 1985, Mother Earth Industries moved away from the discovery wells and drilled Wells #34-30, #66-28, and #47-6. Each of these wells was drilled to test a bona fide geothermal objective and to preserve the federal leases on which they were situated as provided in Bureau of Land Management Instruction Memorandum No. 85-63, dated October 23, 1984. Drilling, in each instance, was commenced before the termination of the primary term of the affected lease and continued over the end of the primary term. These wells were completed in June and July of 1985. This report is prepared specific to the drilling of Well #47-6 which commenced on May 22, 1985 and was completed to a total depth of 1964' on July 13, 1985.

This report is prepared as required by federal regulations as a well completion report and is submitted to the Bureau of Land Management. The material in the report was obtained from a number of sources and was correlated and summarized by Higginson-Barnett, Consultants, a consulting firm in Bountiful, Utah. Higginson-Barnett participated in the activities associated with the drilling of the well, particularly as they related to geology and permitting. ThermaSource Inc. of Santa Rosa, California, particularly Mr. Louis Capuano, designed the well and supervised it's construction. The well location was determined by Forsgren-Perkins, a consulting engineering firm in Salt Lake City, Utah. The information provided herein, is by the approval of Wayne A. Portanova, President of Mother Earth Industries.

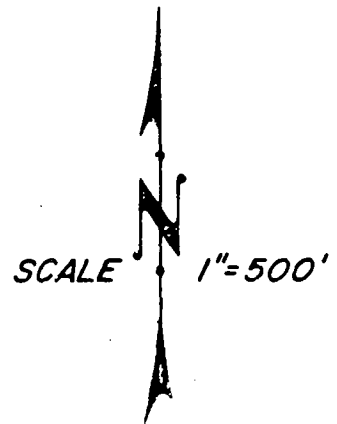
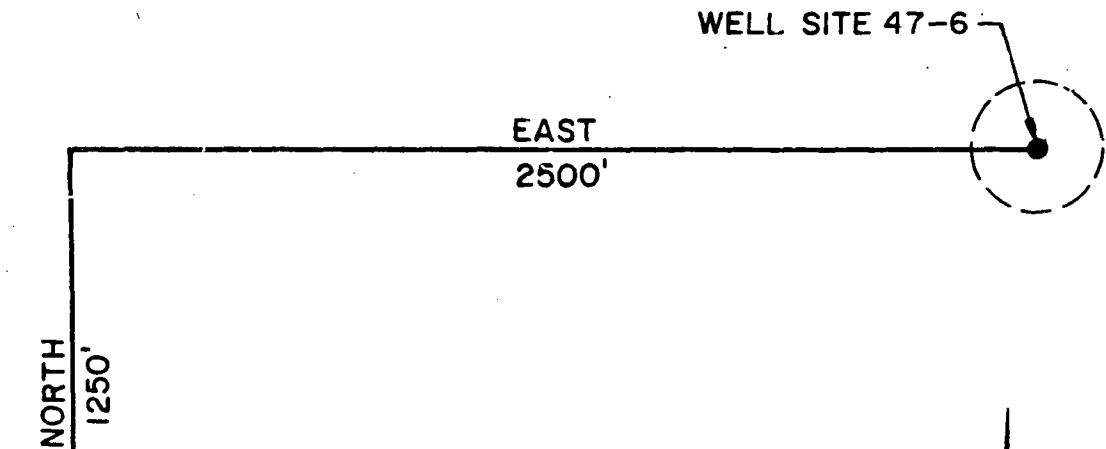
II. LOCATION

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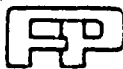
This report covers the completion of Mother Earth Industries' Well #47-6. The well is located in Millard County, Utah near Sulphurdale in the Cove Fort-Sulphurdale KGRA. More specifically the well is described as: Beginning from the Southwest Corner of Section 6, T26S, R6W, SLB&M, thence N. 1250' and E. 2500' to Well #47-6.

Figure #1 shows the location of Well #47-6.

FIGURE #1



SECTION 6
T 26 S, R 6 W
SALT LAKE BASE
& MERIDIAN

REVISED	DATE	 FORSGREH-PERKINS ENGINEERING, p.a.	DRAWN
			FOR:
		MOTHER EARTH INDUSTRIES WELL SITE 47-6	BY: <i>FSH</i>
			DATE: MAY 1985
			SCALE: AS NOTED
			DRAWING NO.

III. WELL DRILLING AND CONSTRUCTION HISTORY

III. WELL DRILLING AND CONSTRUCTION HISTORY

Drilling of Mother Earth Industries' Well #47-6 began on May 22, 1985 with the drilling of a 26" hole to a depth of 20' where 20" casing was set and cemented. This was accomplished with a Earth Drill Model #52. After setting casing the Earth Drill was changed out and replaced by a Wilson Truck Mounted Rotary Rig, which spudded in on July 4, 1985.

With the new rig the hole was drilled with mud to 122' where 13-3/8" casing was cemented into a 17-1/2" hole. At this depth blow out prevention equipment was installed and tested. A 12-1/4" hole was then drilled with mud to 601' where 9-5/8" casing was set and cemented. Here again the well was equipped with blow out prevention equipment.

The well was then drilled with air to a total depth of 1964'. The hole began to make a little water from 1490'-1530'. At 1645' drilling passed through a lost circulation zone and no cuttings were returned to the surface during the rest of the drilling. The extent and content of this zone is not known, but it is suspected that there is a small steam entry here. The well was completed on July 13, 1985.

Figure #2 is a daily journal of the drilling activities. Figure #3 shows a profile of the completed well. Figure #4 is a graph of the time taken in drilling. Figures #5 and #6, show a history of the mud and air, used in drilling the well. Figure #8 is the directional survey data which was obtained during the drilling. Figure #9 gives the specifications of the Wilson Rotary Rig which did the majority of the drilling.

*Each Day from 7:00 AM to 7:00 Am

WELL NAME: Cove Fort #47-6

LOCATION: Cove Fort, Utah

OPERATOR: Mother Earth Industries

PREPARED BY: Louis Capuano

DATE	DEPTH	OPERATIONS
7/4/85	122'	Rig on day rate at 0800 hours, 7/3/85. Spud at 10:00 AM. Drill 12-1/4" hole with dyna drill to 66'. Pull out of hole and dyna drill rat hole. Dyna drill 12-1/4" hole from 66' to 124'. Pull out of hole. Lay down dyna drill and pick up 17-1/2" bottom hole assembly. Open 12-1/4" hole to 17-1/2" to 122'. Circulate. Pull out of hole and lay down 17-1/2" tools. Rig up casing tongs. Run 3 joints (124.5 feet), 13-3/8", 54#, K-55, S.T. & C. casing with stab-in float shoe at 119.65'. Load out casing tongs. Pick up stab in tool on drill pipe and run in hole. Stab in to float shoe. Rig up cementers and circulate. Pumped 20 barrels water followed by 166 cu.ft. (102 sacks) Class "H" cement with 40% silica flour and 3% CaCl ₂ , displaced with 1.8 barrels water. Had good cement to surface. Cement in place at 5:00 AM, 7/4/85. Wait on cement.
7/5/85	273'	Wait on cement. Cut off 20" conductor, land 13-3/8" casing and weld on 13-3/8" casing head. Set in and nipple up blow out preventer equipment. Pick up drill collars. Pick up 17-1/2" tools. Lay down 17-1/2" tools. Close complete shut off and test to 400 psi for 15 minutes with BLM witness. Test okay. Pick up 12-1/4" bottom hole assembly and run in hole. Test pipe rams to 400 psi for 15 minutes. Test witnessed by BLM. Test okay. Drill out cement and float shoe to 113' - 119'. Drill 12-1/4" hole from 122' to 273'.
7/6/85	601'	Survey at 247'. Drill from 273' to 394'. Survey at 394'. Drill to 555'. Pull out of hole to clean bit. Run in hole to 555'. Drill to 601'. Circulate and survey at 571'. Wipe hole to 13-3/8" shoe. Run in hole and circulate for casing job. Pull out of hole to run 9-5/8" casing.
7/7/85	601'	Pull out of hole for casing. Change rams in blow out preventer. Rig up casing tongs. Run 4 joints (596') of 9-5/8", 40#, K-55, buttress casing with guide shoe at 596'. Stab in float collar at 549'. Centralizers

WELL NAME: Cove Fort #47-6

LOCATION: Cove Fort, Utah

OPERATOR: Mother Earth Industries

PREPARED BY: Louis Capuano

DATE	DEPTH	OPERATIONS
		<p>in middle of bottom joint and every other collar to surface. Run 4-1/2" drill pipe with stab-in tool into casing. Could not stab in. Pull out of hole. Rig up to cement with wiper plug. Rig up and pump 20 barrels water followed by 200 cu.ft. (94 sacks) Class "H" cement blended with 1:1 perlite with 40% silica flour and 3% gel and 0.5% CFR-2, tailed with 176 Ft³ (109 sacks) of Class "H" cement with 40% silica flour and 0.5% CFR-2 and 2% CaCl₂. Cement in place at 2:40 PM with good returns. Displaced with 41.6 barrels water. No fall back of cement. Rig out cementers and wait on cement. Cut off casing. Change out blow out preventer equipment. Cut off 13-3/8" head. Land 9-5/8" casing and weld on casinghead and blow out preventer equipment. Install blooie line.</p>
7/8/85	805'	<p>Nipple up 12", 900 blow out preventer. Change blow out preventer rams. Lay down 8" drill collars. Test complete shut off to 600 psi for 15 minutes with state representative present to witness test. Pick up 8-3/4" bottom hole assembly and run in hole to 400'. Install rotating head rubber and test casing and pipe rams to 600 psi for 15 minutes with state representative present to witness test. Okay. Run in hole to top of cement at 539'. Drill out cement, float collar, and shoe. Clean out cement to 601', drill to 604' with 8-3/4" bit. Blow hole dry. Drill to 698'. Survey at 668'. Drill to 705'. Pull out of hole. Lay down stabilizers and bit. Run in hole to 705' and drill to 805'.</p>
7/9/85	1245'	<p>Drill to 879'. Survey at 837'. Drill to 1003'. Survey at 1003'. Pull out of hole. Change bits. Run in hole and drill to 1219'. Survey at 1188'. Drill to 1245'. Repair rig.</p>
7/10/85	1580'	<p>Repair rig. Drill to 1466'. Survey two times at 1435'. Pull out of hole for new bit. Run in hole and drill to 1530'. Survey at 1500'. Drill to 1580', some moisture from hole noted from 1490'-1530'.</p>

WELL NAME: Cove Fort #47-6

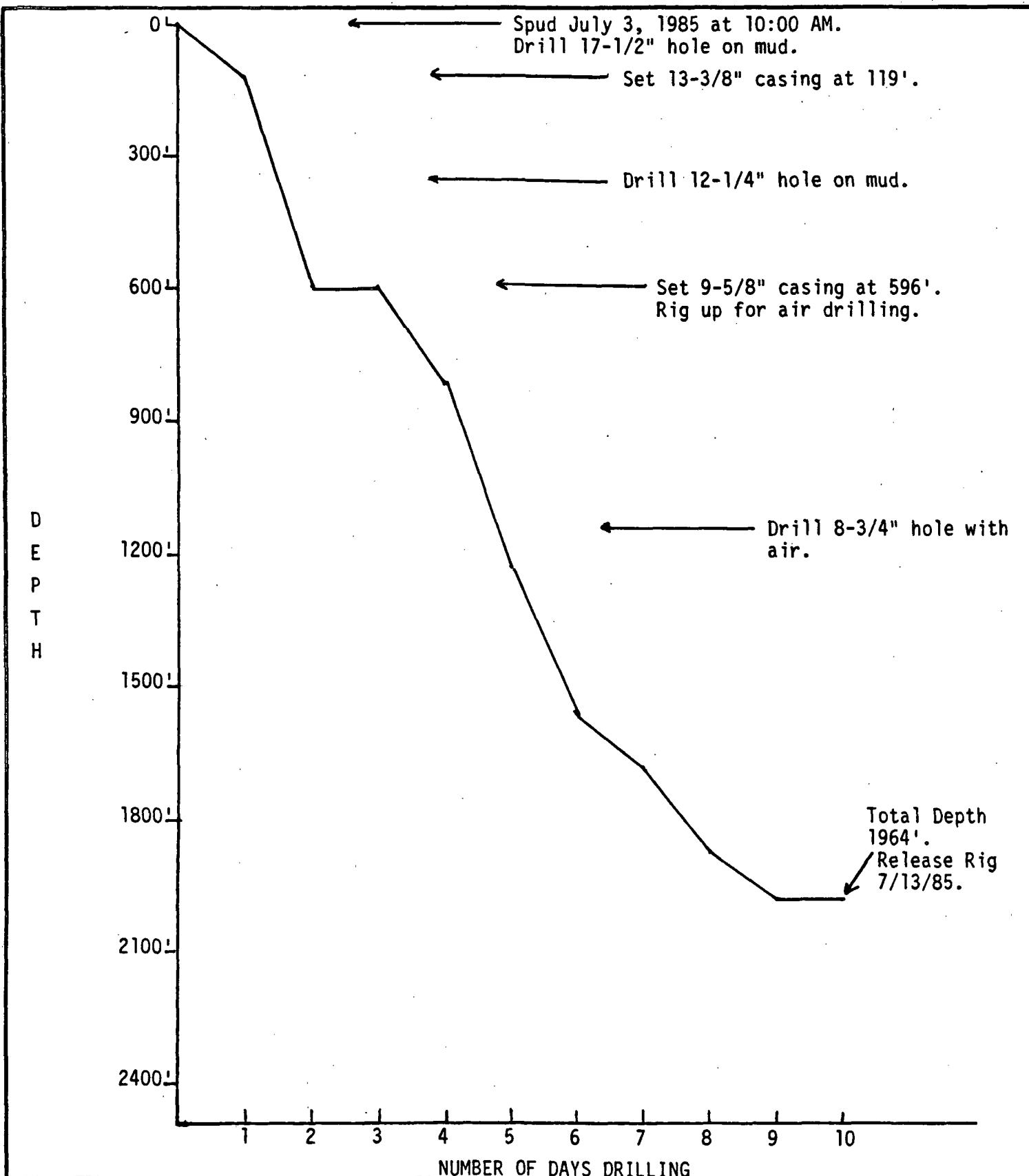
LOCATION: Cove Fort, Utah


OPERATOR: Mother Earth Industries

PREPARED BY: Louis Capuano

DATE	DEPTH	OPERATIONS
7/11/85	1685'	<p>Drill to 1591'. Survey. Pull out of hole for new bit. Ran in hole and ream 1561-1591'. Drill to 1667'. Pull to shoe to repair rig. Stage in hole, unload well at 1146' with 240 psi at 115 degrees F. Run in hole to 1579'. Unload hole with 240 psi at 150 degrees F, after 10 minutes. Temperature is 175 degrees F. Well flashed steam to surface at 187 degrees F. Run in hole to 1612' and unload hole with 280 psi at 180 degrees F. Circulate with 310 psi at 190 degrees F. Drill ahead to 1685'. Pull out of hole to change bits. Run in hole to 1579' and flow test well.</p>
7/12/85	1870'	<p>Blow well. Drill to 1870'. Blowing and unloading well. Pull up to 1630' and blow well.</p>
7/13/85	1964'	<p>Drill to 1964'. Blowing well several times. Flow test well. Pull out of hole laying down drill pipe. Close water valve and install 1" bleed line.</p>
7/14/85	1964'	<p>Remove blow out preventer equipment separately. Tear out blooie line and release rig at 10:00 Am, 7/13/85.</p>

FIGURE #3

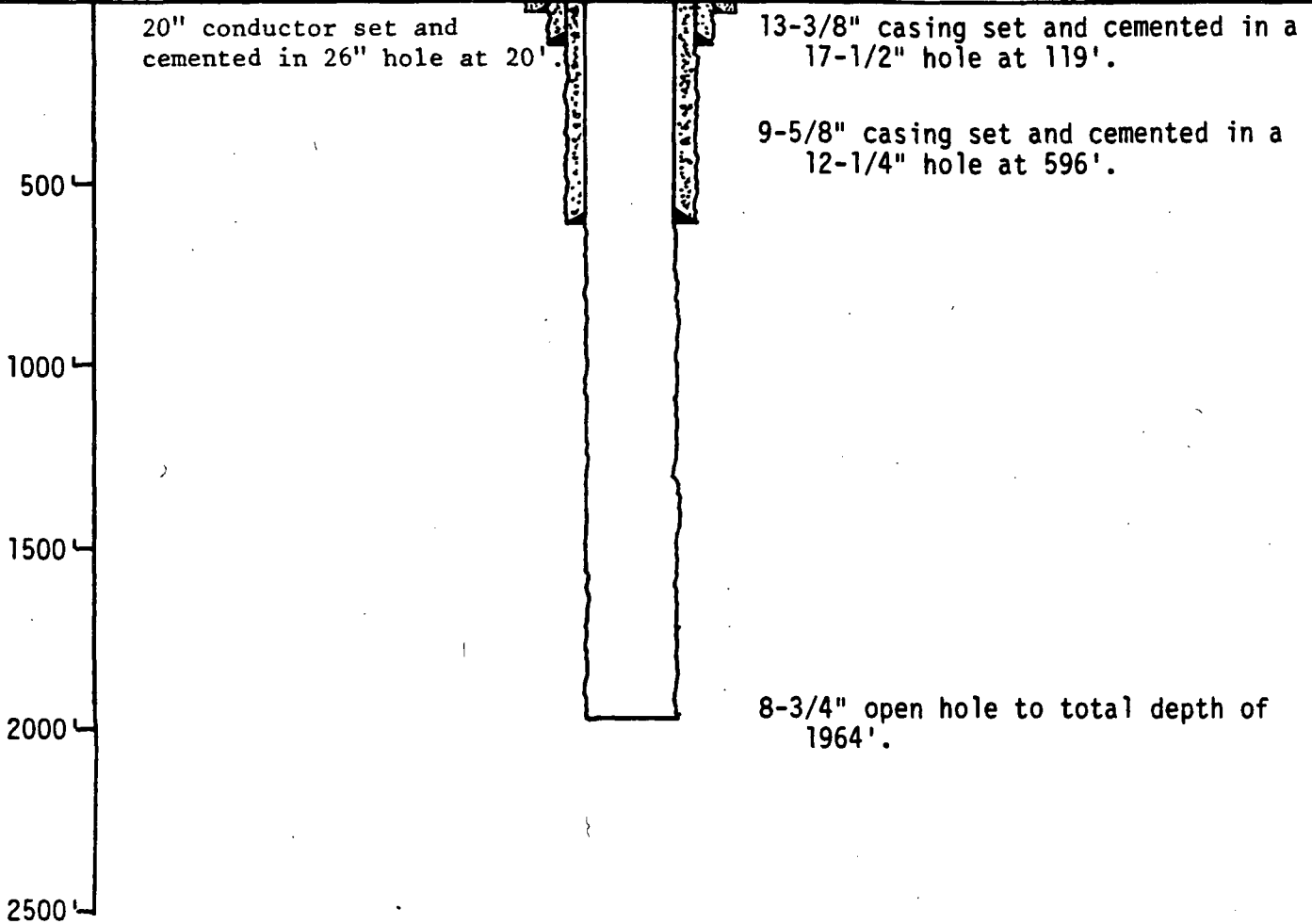


REVISED	DATE	 • P.O. Box 1236 • Santa Rosa, California 95402 (707) 523-2960 • Telex 171743 • TWX 510 7446439 ThermaSource Inc.	DRAWN
			FOR: MEI
			BY: LEC
			DATE: 8-1-85
			SCALE:
			DRAWING No.

DRILLING CURVE
 COVE FORT #47-6
 MOTHER EARTH INDUSTRIES

FIGURE #4

GROUND LEVEL



REVISED	DATE

TSI
ThermaSource Inc.

• P.O. Box 1236 • Santa Rosa, California 95402

(707) 523-2960 • Telex 171743 • TWX 510 7446439

WELL SCHEMATIC
COVE FORT #47-6
MOTHER EARTH INDUSTRIES

DRAWN	
FOR:	MEI
BY:	LEC
DATE:	
SCALE:	
DRAWING No.	

MUD DATA

WELL NAME: Cove Fort #47-6

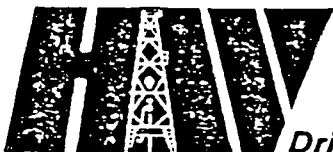
DATE	DEPTH (meters) (ft)	MUD WEIGHT (lbs/ft ³)	MUD VISCOSITY (sec)	STAND PIPE PRESSURE (psig)	TEMPERATURE OUT (°F)	REMARKS
7/4/85	122'	Spud Mud	57	600		Run 13-3/8" casing at 122'.
7/5/85	273'	64	38	800	79°	
7/6/85	601'	69	45	800	95°	
7/7/85						Run 9-5/8" casing. Rig up for air.

AIR CIRCULATING DATA

DATE	DEPTH (FEET)	CIRCULATING MEDIA	COMP. PRESSURE (PSIG)	INPUT VOLUME OR (CFPH)	NO. OF COMP. OR RUNNING	TEMP OUT OF	EXIT PRESSURE (PSIG)	REMARKS
7/7/85	601'	RIG	UP FOR AIR	DRILLING				
7/8/85	805'	Air	140	1142	1	72°		Drill 8-3/4" hole.
7/9/85	1245'	Air	195	1142	1	83°		
7/10/85	1580'	Air	305	1142	1	128°		
7/11/85	1685'	Air	320	1150	1	186°		Flow Test Well.
7/12/85	1870'	Air	315	1150	1	176°		
7/13/85	1964'	Air	410	1140	1	195°		Flow Test Well.

DIRECTIONAL INFORMATION
MOTHER EARTH INDUSTRIES
MEI #47-6

<u>DEPTH</u>	<u>DEVIATION</u>
211'	No good
247'	2°0'
394'	2°15'
571'	5°0'
668'	3°0'
837'	3°0'
1003'	3°0'
1188'	2°30'
1435'	5°0'
1500'	6°0'
1591'	6°0'



Drilling Inc. P.O. Box 1851, El Centro, California 92244 (619) 353-5440

RIG 7

DESCRIPTION

WILSON Mogul 42 Double Drum Drawworks, S/N 10034, 450 HP, LEBUS Grooved for 1" Line, 9/16" Sand Line Drum, Water Circulating Brake, Texas Western 56S Makeup S/N 112 and Spinning Catheads, Hydraulic Breakout Cylinder, Air Drillers Control, Mounting Bracket for Halliburton Measuring Device

WILSON Single Engine Compound

CATERPILLAR 3412 600 HP Diesel Engine, S/N 38S1658 w/Air Starter, Radiator, Gauges, Allison TC955 Torque Converter S/N 63016

QUINCY 325-15 Air Compressor S/N 183914S, Compound Driven

WILSON 102-250 102' Hydraulically Raised and Scoped Mast, 250,000 lb. Static Hook Load, Crown Block w/5 Sheaves, 1" Line, 3½" Standpipe, Crown Safety Platform, Racking Board, Tong Counterweights, Catline Sheave, Ladder, Derrick Climber, Mast Stand (Mounted on Carrier), Fluorescent Lights, 5/8" and 3/4" Guy Lines

SUBSTRUCTURE 10'H x 13'W x 21'6"L w/Rotary Beams, 4' Folding Side Mounted Wings, V-Door Ramp, (1) 14' Stair Floor to Ground Parallel w/Ramp on Off Drillers Side, (2) 8'6" Stairs Floor to Unit each side, Safety Rails, Boxes Plated Top and Bottom, Sub Carrier in Base, (Rotary Table Mount Flush w/Floor), Opening for Rat Hole and Mouse Hole

MUD TANK - 3'H x 6'W x 28'L 100 Bble w/2-3' x 4' Single Shale Shakers
3 Cone Desilter

PUMP - Emsco D-500 7½" x 16" Driven by Caterpillar 3412 Engine

WATER TANK - 1500 Gal

GENERATOR - 25 KW Powered by Detroit 371 Diesel Engine

BLOCKS & HOOK - Combination 150 Ton Sowa

SWIVEL - Gray 150 Ton

KELLY - 4½ Square

ROTARY TABLE - Hacker 17½" Opening

TONGS - Woolley Type C

WATER TRUCK - 1977 Chevy 2000 Gal Tank

IV. WELL TEST

IV. WELL TEST

Though it is anticipated at a future date, no flow testing of the well has been performed. If at a future time such testing is done the results will be submitted. There have, however, been temperature and pressure surveys taken of the well since its completion. The temperature survey indicates that a maximum temperature of 316 F was measured at the lowest point the temperature probe was able to go (1714'). The pressure survey indicates that the water table begins at about 1250' and that the pressure increases linearly from that point. The data from these two surveys is shown in Figures #10 and #11.

PRUETT INDUSTRIES INC
 8915 ROSEDALE HWY. BAKERSFIELD, CA. 93308
 (805) 589-2768

SUB-SURFACE TEMPERATURE SURVEY

CO. MOTHER EARTH IND	RUN 01 FIELD SULPHURDALE	WELL 47-6
EFF DEPTH 1964'	WELL STAT 1" BLEED	TOOL HUNG
CASING 9 5/8" @ -596'	CASING PRESS	DN BOTTOM 14:26
LINER -	TUBING PRESS	OFF BOTTOM 14:31
DATE 071885	ELEMENT RANGE 57 - 490	ZERO POINT 12'
ELEVATION	ZONE	SHUT-IN
MAX TEMP	PICK-UP 1714'	DN-PROD
PERF -	CAL SER NO. 31	MPP
TUBING -		
UNITS ENGLISH	PURPOSE	TEMPERATURE GRADIENT 7/16/85

SURVEY DATA

CO. MOTHER EARTH IND			RUN 01 FIELD SULPHURDALE		WELL 47-6		
TIME	DEPTH	P/T	GRAD	TIME	DEPTH	P/T	GRAD
1:00	0	101.2	0.000	1:00	500	235.7	.030
1:00	50	147.7	.930	1:00	950	237.0	.026
1:00	100	154.0	.125	1:00	1000	238.3	.023
1:00	150	158.4	.089	1:00	1050	239.3	.021
1:00	200	163.1	.094	1:00	1100	240.0	.013
1:00	250	167.7	.091	1:00	1150	240.2	.004
1:00	300	169.8	.042	1:00	1200	242.9	.055
1:00	350	172.7	.058	1:00	1250	250.7	.156
1:00	400	174.6	.038	1:00	1300	259.5	.175
1:00	450	177.5	.059	1:00	1350	267.4	.157
1:00	500	179.4	.038	1:00	1400	275.1	.155
1:00	550	181.5	.042	1:00	1450	281.6	.130
1:00	600	199.6	.361	1:00	1500	292.2	.212
1:00	650	205.8	.124	1:00	1550	299.9	.155
1:00	700	211.3	.111	1:00	1600	307.0	.141
1:00	750	214.8	.069	1:00	1650	314.8	.156
1:00	800	232.1	.347	1:00	1700	316.8	.039
1:00	850	234.2	.043	1:00	1714	316.8	0.000

BY S. WILSON/B. DAILY



BAKERSFIELD, CA
(805) 689-2788

10 x 10 1/2 INCH
10 x 14 INCHES

TEMPE

MOTHE

SULPH

WELL

7/18/

file

TEMPERATURE

320.0

280.0

240.0

200.0

160.0

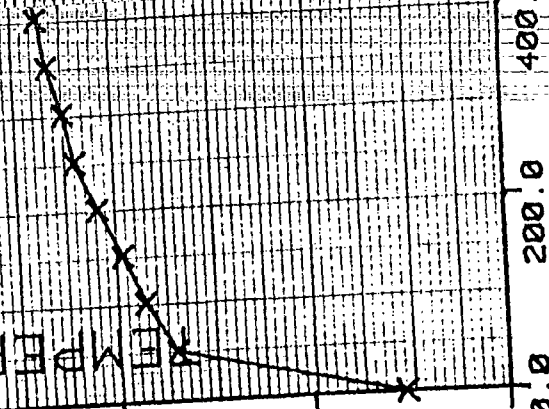
120.0

80.0

0.0

200.0

400.0



V. GEOLOGY

V. GEOLOGY

The lithology of Well #47-6 was determined primarily by examining the drill cuttings under a binocular microscope with added input coming from the study of geologic reports and maps of the area as well as direct input from geologists Dr. Myron Best and Tom Steven.

Well #47-6 was drilled in an area which has been identified as a Known Geothermal Resource Area. Three different hydrothermal episodes have been identified by Moore and Samberg (1979)¹ with the last being related to the active deposition of sulphur in the area. These episodes of hydrothermal activity are tied to relatively recent volcanic and seismic activity in the area.

The well was drilled in the structural block south of the east-west trending Cove Creek fault. In this block there are north trending basin and range faults as well as low angle gravity slide faults. Both fault systems were initiated almost concurrently, though activity along the basin and range faults has continued to the present.

Alteration in a road cut just southeast of the well indicates faulting in the area of the well. Both Steven (1983)² and Moore (1979)¹ map a major north trending fault passing just east of the well site. Moore also maps a east-west fault passing just south of the drill pad. The basin and range faults have provided the conduits for the deposition of pyrite and other basemetal sulfides which were found in the well cuttings.

1) GEOLOGY OF THE COVE FORT-SULPHURDALE KGRA, by J. N. Moore and S. M. Samberg, 1979.

2) GEOLOGIC MAP OF THE COVE FORT QUADRANGLE, WEST-CENTRAL UTAH, By Thomas A. Steven and Hal T. Morris, 1983.

Volcanic activity began in the region about 30 m.y. ago and continued up until 0.5 m.y. ago (Steven and Morris, 1983).² These volcanics consist of predominately intermediate composition lava flows, tuff breccias, and ash-flow tuffs which were deposited on erosional surfaces of deformed Paleozoic and Mesozoic sedimentary rocks. These volcanics have since been faulted and altered.

Well #47-6 begins in unconsolidated alluvial fill material made up mostly of volcanic debris presumably from the mountains above and to the east of the well. Unconsolidated material is found to a depth of about 140' where beds of moderately consolidated and stratified mud and debris flow material starts. This sedimentary rock, which contains abundant clasts of volcanic rock continues to 430'.

At 430' the well cuts into the Three Creeks Tuff Formation, a densely welded, crystal rich, ash-flow tuff whose source was a caldera to the east. The Three Creeks Tuff continues to 1140' where the top of Paleozoic rocks are found. These undifferentiated sedimentary rocks consist predominately of dolomites with a little red siltstone.

Located at 1645' within the well there is a lost circulation zone. The extent of the zone is not known, but no cuttings were returned to the surface from 1645' to total depth of 1964'. The lithologic log of Well #47-6 is shown in Figure #12.

HIGGINSON-BARNETT, CONSULTANTS

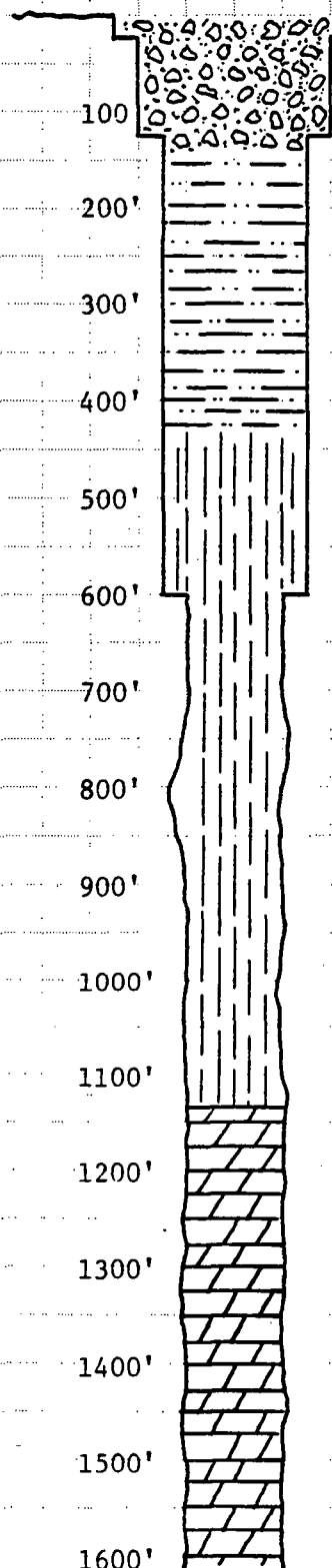
106 West 500 South Suite 101
 BOUNTIFUL, UTAH 84010
 (801) 292-4662

JOB MOTHER EARTH INDUSTRIES' WELL #47-6
 SHEET NO. 1 OF 2
 CALCULATED BY DAB DATE 8/26/85
 CHECKED BY JAB DATE 9/26/85
 SCALE 1"=400' (vertical)

LITHOLOGY

MINERALIZATION

FIGURE #12



0'-140' QUATERNARY ALLUVIUM

Cv 140'-430' QUATERNARY & TERTIARY SEDIMENTS

A sequence of bedded, moderately consolidated Quaternary and Tertiary mud flow, debris flow, and alluvial material containing many clasts of volcanic rock.

430'-1140' THREE CREEKS TUFF

Densely welded, crystal rich, ash-flow tuff, containing phenocrysts of plagioclase, hornblende, and biotite.

Sp

Sp 1140'-1645' UNDIFFERENTIATED PALEOZOIC ROCKS

A sequence of undifferentiated Paleozoic sedimentary rocks consisting predominately of dolomites with minor bedding of siltstone.

Sp

Sp

HIGGINSON-BARNETT, CONSULTANTS

106 West 500 South Suite 101
BOUNTIFUL, UTAH 84010
(801) 292-4662

SHEET NO. 2 OF 2

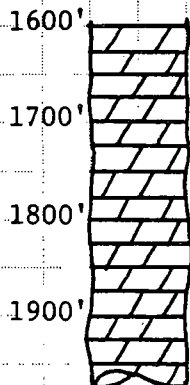
CALCULATED BY DAB DATE 8/26/85

CHECKED BY JAB DATE 9/26/85

SCALE 1"=400' (vertical)

LITHOLOGY

MINERALIZATION



1645'-TD No cuttings were returned below 1645'.

MINERALIZATION KEY

- S_p - Speckled with pyrite.
- C_v - Calcite veining.

