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PROPRIETARY & CONFIDENTIAL
MOTHER EARTH INDUSTRIES, INC.

COMPLETION REPORT

GEOHERMAL EXPLORATORY WELL S-87-4

Sulphurdale, Utah

For

Mother Earth Industries, Inc.
7350 E. Evans, Suite B
Scottsdale, Arizona 85258



GEOHERMAL MANAGEMENT Co.

P.O. Box 2980 Evergreen, CO. 80439-2980

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MOTHER EARTH INDUSTRIES, INC.

Prepared By
Geothermal Management Company
P.O. Box 2980
Evergreen, Colorado 80439

October 1987

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COMPLETION REPORT FOR S-87-4
Sulphurdale, Utah

I. ABSTRACT

A geothermal exploratory "slim hole" designated S-87-4 was drilled on Mother Earth Industries, Inc. Federal Geothermal Lease Number U29557 between the dates of Aug. 1 and August 12, 1987. The well is 2580 ft. south and 1333 ft. east of the northwest corner of Section 7, T26S, R6W, SLB&M.

The well penetrated highly fractured and significantly altered rocks of the upper zone of the Three Creeks Tuff Member of the Bullion Canyon Volcanic series (Moore and Samberg, 1979) and encountered steam with some H₂S at 941 feet. Brief tests of productivity and of noncondensable gas content indicated that the resource discovered is very similar to that produced from wells 34-7A and 34-7B.

The well was drilled to a total depth of 1038 feet and has been shut in pending plans to drill an offsetting production well.

The prime contractor for the well was Sierra Drilling Company, Salina, Utah; the drilling plan was designed by William Jackson of Salt Lake City, Utah; surveys were done by Sunrise Engineering, Inc. of Fillmore, Utah; Safety Services were provided by Bell Safety of Evanston, Wyoming; wellsite geological supervision was by Geothermal Management Company of Evergreen, Colorado; petrographic examination of drill cuttings was done by Joseph Moore of Salt Lake City, Utah. All other activities were conducted by Mother Earth Industries, Inc.

This completion report is submitted in compliance with 43 CFR 3260 and GRC Order No. 5. Also submitted is USGS Form 9-1960 appropriately completed.

II. LOCATION

This report pertains to MEI exploratory slim hole S-87-4 located near Sulphurdale, in Beaver County, Utah within the Cove Fort-Sulphurdale KGRA.

Specifically, the well is 2580 feet south and 1333 feet east of the northwest corner of Section 7, T26S, R6W, SLB&M, and 365 feet S38W of MEI's production well 34-7B (Lady Linda) on Federal Geothermal Lease No. U29557.

Figure 1 depicts the location of the well relative to the section corner; Figure 1a is a topographic map of the drilling area, while Plate I (in the pocket) is a survey plat of the entire MEI production area. Following Figure 1a is a letter of commendation from the U.S. Bureau of Land Management to MEI with regard to MEI's concern and contributions in the management of public lands as evidenced by their reclamation of drill sites.

III. WELL DRILLING AND CONSTRUCTION HISTORY

In order to cost-effectively search for extensions of the dry steam geothermal resource discovered in wells 34-7A and 34-7B, exploratory well S-87-4 was drilled in a "slim hole" configuration as follows:

On August 1, 1987 at 4 PM Sierra Drilling Company spudded using a 17.5" bit for the conductor casing. On Aug. 2, 40 feet of 13.375", 54.5#/Ft., K-55, ST&C casing was landed at 33 feet and Redi-Mix cemented in place. Using a 9.875" bit, the cement was drilled out in the evening of Aug. 2 and drilling proceeded to 250 feet at which depth, on Aug. 3, 7", 20#/Ft., J-55, ST&C casing was landed and cemented in place with a type G high temperature mixture. August 4 was spent cutting off casing and nipling up and testing all the blowout prevention equipment on the 7" casing. Approval of the pressure test was obtained from the BLM representative at 0030 hrs on August 5.

After tagging cement at 100 feet, drilling resumed on Aug. 5 with a 6.25" F4 Smith button bit, and continued at an average rate of 5-7 feet per hour until TD was reached at 1038 feet on August 12. When all mud circulation was lost at 905 feet, air/foam drilling was started. All drilling below 905 feet was blind, that is without returns of any kind to the surface.

A steam entry was recorded at 941 feet on Aug. 11, however drilling continued in search of larger inflows. Drilling progress below 980 feet was very slow due to highly fractured but silicified rock. Rotating head rubbers required frequent replacement and on Aug. 12, with a worn out bit and another ruined rubber, the drilling was halted. The drill string was stripped out of the well carefully, observing all appropriate safety measures and, after a 10 minute steam escape due to a faulty valve on the BOP accumulator, the well was shut in at 1910 hours.

A drilling history, describing daily events between August 1 and August 13, 1987 accompanies this report as Appendix A. Figure 2 is a profile of the well as completed; Figure 3 is a drilling curve showing the rate of drilling progress, and Figure 4 shows the Blowout Preventer stack used on the 7" casing. Appendix B, attached, is MEI's basic drilling procedure developed for slim exploratory wells.

IV. WELL TESTING

Exploratory well S-87-4 encountered a significant steam entry at 941 feet while drilling with air on August 11, 1987. The well was deepened to 1038 feet in search of additional entries, some of which may have been found. The well was bottomed on August 12, and on August 13 a brief flow test was conducted. This test and its results are described in the August 14, 1987 Memorandum to the MEI Files by Jay C. Hauth (MEI Operations Manager) that is presented in the following section of this report.

MOTHER EARTH INDUSTRIES INC.

August 14, 1987

To: File

Re: 587-4 Flowtest

The referenced well was completed to 1040 Ft. TD, RKB on August 12, 1987, with 7" 20 ppf casing set/cemented to 250' KB, and OH 6 1/4" to TD. The well was intended as a slim-diameter exploration hole to be drilled into the production zone in order to determine/verify lithology, fracture depths, steam characteristics, etc.

On August 13, 1987, the referenced well was flowtested for a period of 50 minutes through the BOP/blooeey line configuration used for air drilling the well. The blooeey line was equipped with a lip pressure tap to be used for estimating flowrate, and a pressure gauge was installed to read WHP immediately above the 8" master valve. A 1/4" x 20' SST condensor coil was used for gas/steam sampling.

Prior to the test, the well had been flowed while drilling at steam flowrates estimated to be approximately 20,000 Lbm/hr. @ 8-10 psig WHP. Note that the flow area of the open hole is significantly reduced with the drillpipe and collars restricting flow. Open hole area is approx. 31 sq. in., while the annular flow area with the 2 7/8" DP is 24 sq. in., with 18 and 11 sq. in. respectively for 4" and 5" collars.

With the DP and BHA out of the hole, the MV and blind rams were opened at approximately 1315 hrs on 8/13/87. The well (which had been shut in for 19 hours) came on immediately. No pressure above atmospheric was observed on the lip pressure, indicating that sonic velocity was not obtained. The minimum flowrate (per Hiriart equation) that would have been required to obtain above-atmospheric pressure is about 40,000 Lbm/Hr. However, my observations were that the well nearly reached sonic velocity at the lip. It is then estimated that the well produced 35,000 Lbm/hr @ 15 psig for the duration of the test.

The following additional information was taken:

Shut-in WHP: 51 psig

Noncondensable gas, % of mass (2 tests): 5.4% and 5.8%

Condensate pH: 5.5

H₂S concentration in NC gas: 8000-10,000 ppm (Approx. 430-580 ppm in total mass flow)

After 50 minutes of production, the well was shut-in when an elbow in the blooey line started to wash out. The SIWHP of 51 psig was obtained in less than 15 seconds after shut-in.

Conclusion: S87-4 has a number of geochemical similarities to the production wells, with a leaning towards the (more desirable) gas characteristics of Olga. The well shows the typical fast buildup to the shut-in WHP of 51 psig. Further testing will be required to determine productivity, interference, etc.



Jay C. Hauth
Operations Manager

JCH/

V. GEOLOGY

The Cove Fort-Sulphurdale region, in southwestern Utah, comprises folded and faulted sedimentary and metasedimentary rocks of Paleozoic to Mesozoic age that are overlain, sequentially, by Oligocene to Miocene age ash-flow tuffs and Quaternary basalts. All of the rocks except the basalts have been intruded locally by Miocene quartz monzonite and/or latite porphyry stocks, sills, and dikes.

The rocks penetrated in S-87-4 consist entirely of lavas, breccias and ash-flow tuffs designated as the Three Creeks Tuff Member of the Bullion Canyon Volcanics (one of the oldest of the volcanic units). The Three Creeks Tuff has three distinct zones: an upper and a lower zone of red to grey densely welded tuff and a middle zone of poorly welded white tuff. Only the lower zone of the Three Creeks Tuff has been mapped in the area of interest.

This lowermost zone of the Three Creeks Tuff has been further subdivided into two cooling units. The upper unit is characterized by euhedral plates of biotite up to several millimeters wide and euhedral (beta morphology) quartz crystals while the rocks of the lower cooling unit are mineralogically the same but much finer grained.

Unlike well S-87-1 which penetrated both of the cooling units in the lower portion of the Three Creeks Tuff, well S-87-4 encountered only the upper, coarse grained cooling unit. This suggests the existence of a fault between S-87-1 and S-87-4 with the latter well in a block which has been downthrown by at least 220 feet. It is not clear, from the evidence provided by the cuttings, whether this fault is an older, silica sealed, east-west trending structure or an offshoot of the steam conducting north-south fault encountered at 941 feet.

Alteration of the S-87-4 rocks is predominantly of the weak to moderate argillic type. This alteration includes partial to complete replacement of feldspar phenocrysts by clay and/or carbonate minerals, alteration of hornblende to chlorite and carbonate and minor alteration of biotite to hematite, clay, and in more intensely altered spots, pyrite. Intense silicification, associated with brecciation, was noted in three sections within S-87-4. These silicified sections, together with the ubiquitous alteration in S-87-4 suggest that the well was drilled in or at least closely followed one or more major, north-south trending steam conducting faults.

Attached, as Appendix C, is a lithologic description of drill cuttings from this well together with some interpretive comments.

VI. PERMITS

As required by law, MEI applied for and received permits for drilling well S-87-4 from the U.S. Bureau of Land Management and the Utah Division of Water Resources. Also as required, archeological clearance of the site was obtained via the BLM's archeological consultant firm of Intersearch.

Attached to this report as Appendices D-1 through D-5 are copies of permits and clearances received and of correspondence related to permit acquisition and compliance.

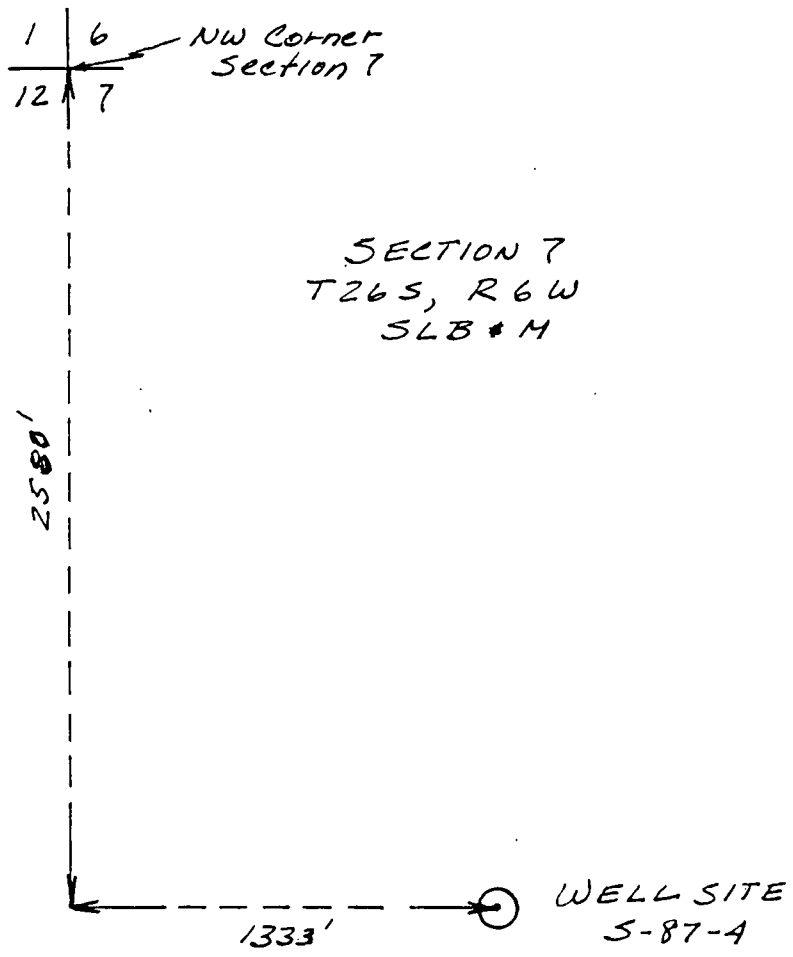
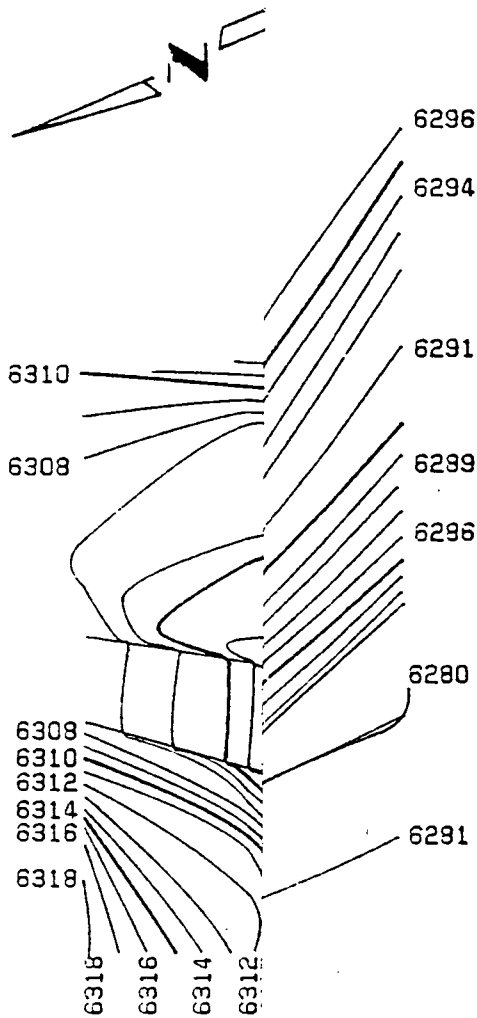


FIGURE 1
LOCATION MAP
5-87-4

SUNRISE ENGINEERING, INC. PC/CAD DRAFTING SYSTEMS-FILE HEADQUARTERS-PARK-COURTWAY



REVISIONS			DESIGNED	CHECKED	DRAWN EDF
NO	DATE	BY			
1			DATE 9-11-87		DRAWING NO
2			SCALE 1"=30'		SHEET NO 1 OF 3
3			<p style="text-align: center;">SUNRISE INDUSTRIES</p> <p style="text-align: center;">CONSULTING ENGINEERS</p> <p style="text-align: center;">Fillmore, Utah S 87-4</p>		



Re: 587-1 + 587-4 Location

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WARM SPRINGS RESOURCE AREA
15 EAST 500 No.
P. O. BOX 778
FILLMORE, UTAH 84631

IN REPLY
REFER TO:

3240
U-057

October 13, 1987

Mother Earth Industries, Inc.
3761 South 700 East
Suite 200
Salt Lake City, Utah 84106

Gentlemen:

On September 21, 1987, Toby Manzaneres, Geologist, from the BLM Warm Springs Resource Area held an on-site inspection of previous disturbed areas that need reclamation at the MEI Geothermal Project at Cove Fort, Utah.

Toby has reported to this office that the efforts being taken by Mr. Mike Fry in the upkeep, and reclamation work at MEI's Cove Fort Project is beginning to show as an outstanding endeavor. All the drill holes drilled in the past were visited during the inspection and the reclamation work discussed. It was agreed by both parties as to what areas at the drill sites need to be contoured, cleaned and reseeded. The whole geothermal production complex has never looked cleaner, as well kept and orderly as it is now.

The BLM Warm Springs Resource Area extends its compliments and thanks to MEI and its personnel, particularly Mr. Mike Fry, for their concern and contribution in the management of the public lands.

Sincerely,

Thomas A. Terry

for Dave Henderson
Area Manager

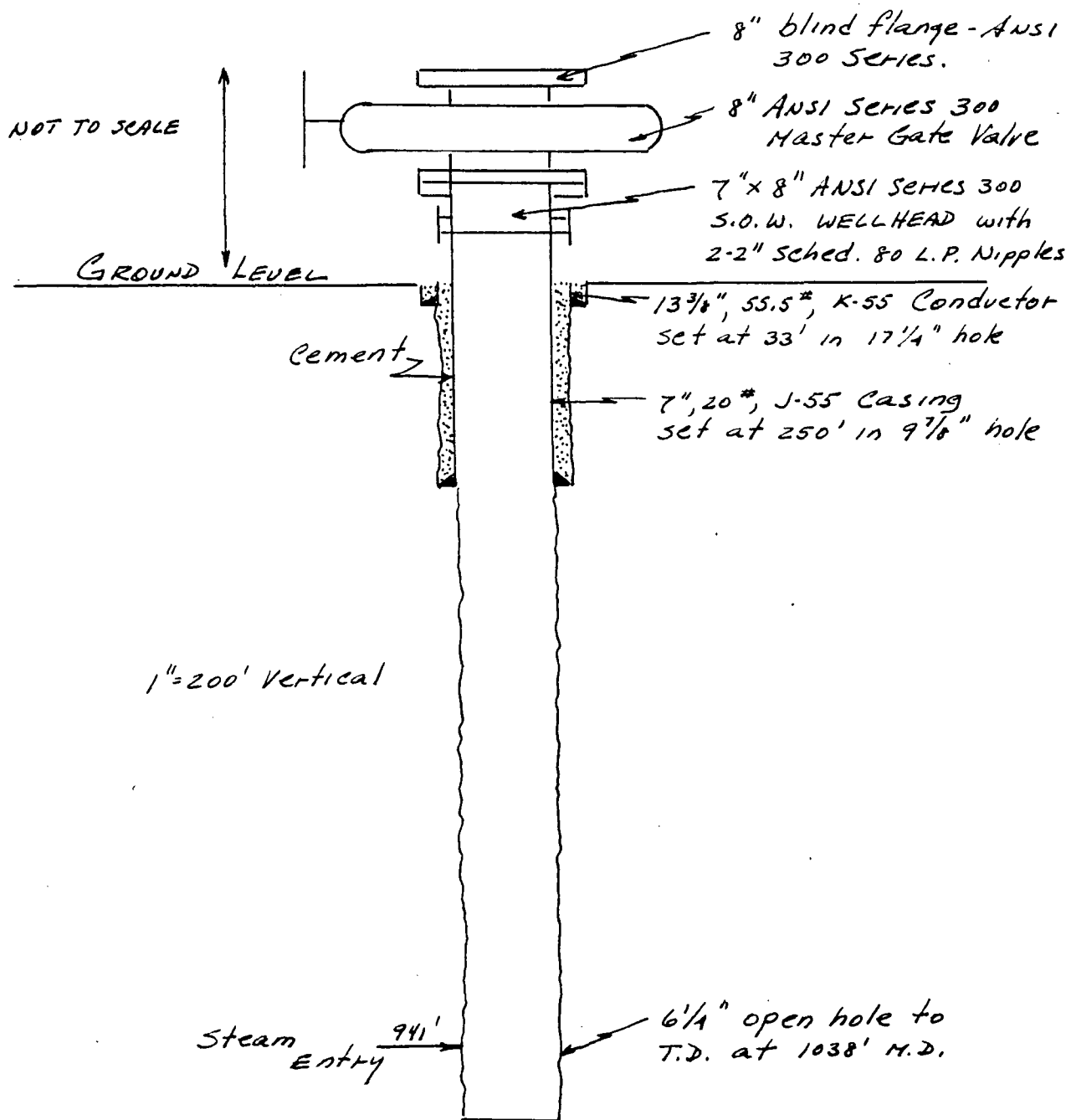


FIGURE 2

WELL PROFILE

S-87-4

FOR: MEI
 By: GWH
 Geothermal
 Mgmt. Co.

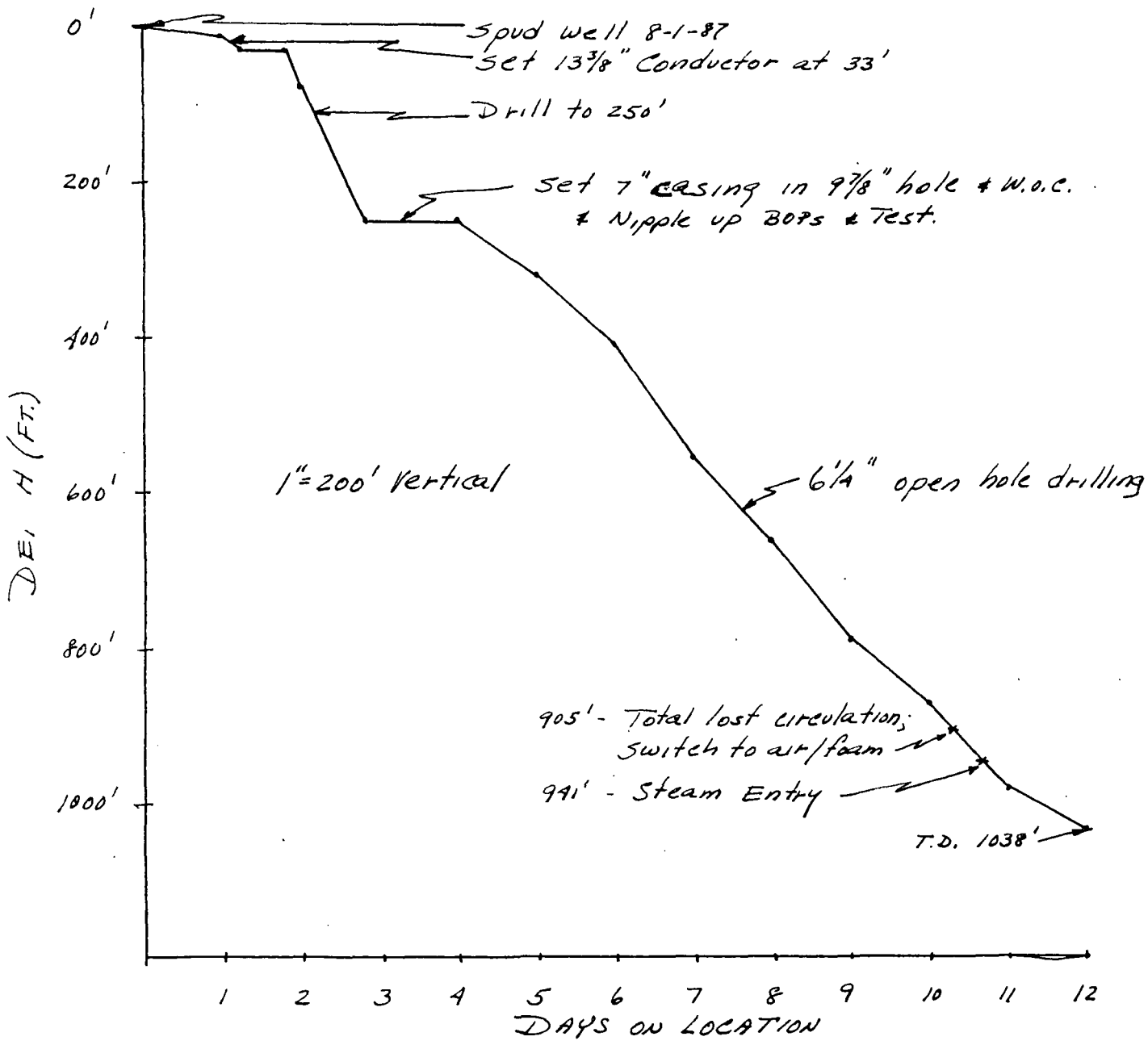


FIGURE 3
 DRILLING CURVE
 S-87-4

FOR: MEI
 BY: GWH
 Geothermal
 Mgmt. Co.

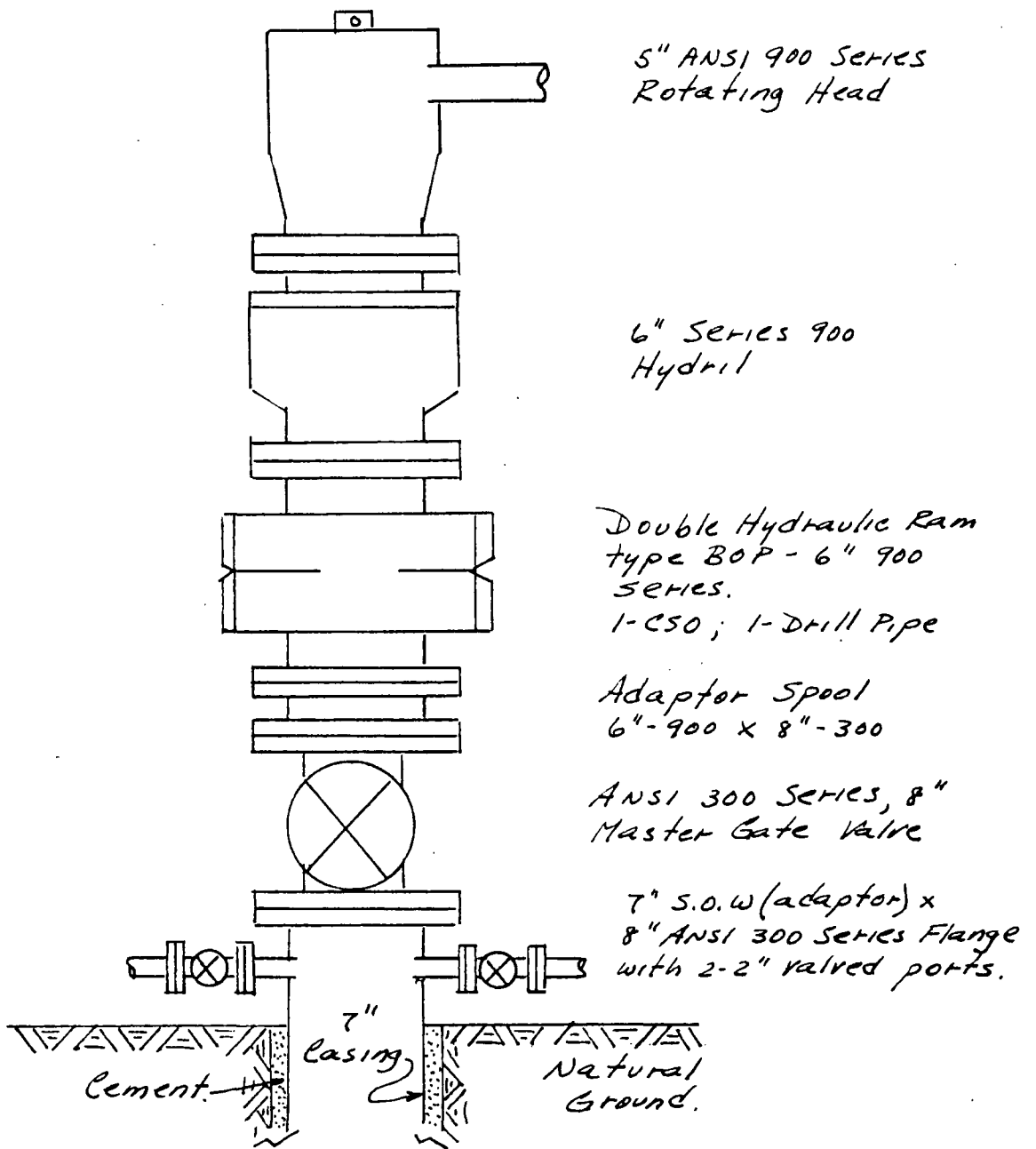


FIGURE 4
7" BLOWOUT PREVENTER STACK
S-87-4

For: MEI
By: GWH
Geothermal
Mgmt. Co.

DRILLING HISTORYMOTHER EARTH INDUSTRIES, INC. WELL S-87-4 COVE FORT, UTAH

8-1-87

- 0900-1600 - MIRU
- 1600-1730 - Drill 17.5" hole to 10' for 13.375" conductor.

8-2-87

- 0800-1030 - Drill to 33' with 17.5" bit.
- 1030-1115 - Set 40' of 13.375" conductor casing.
- 1115-1200 - Cement conductor with Redimix cement.
- 1200-1300 - Weld flow line.
- 1300-1500 - Haul water.
- 1500-1530 - RIH to 33'.
- 1530-1730 - Mix mud, circulate and condition.
- 1730-2400 - Drill ahead to 80 with 9.875" bit. Mud statistics: 40'-Ti=66, To=75; 60'- To=75; 80'- To=75.

8-3-87

- 0000-1845 - Drill ahead 80'-250'. Drilling rate 5-7 ft/hr. Mud Statistics: 80'- Ti=70, To=72; 100'- Ti=62, To=70; 120'- Ti=64, To=70; 220'- Ti=68, To=80; 230'-Ti=70, To=82; 240'-To=82; 250'-Ti=70, To=82, air=86.
- 1845-2030 - Install 7" casing to 250'.
- 2030-2100 - Cement 7" casing. Full returns to surface.
- 2100-2400 - Clean up pumps, pit, and site.

8-4-87

- 0000-2400 - Try to install water line from condensate pond to mud pit. Not possible because the pumps develop insufficient pressure. Haul water, cut off conductor, weld on wellhead, nipple up BOP, Hydril and Rotating Head. Three attempts to pressure up for BLM test of BOP. Leaks sealed and test approved by Tom Mitchel of Cedar City BLM office.

8-5-87

- 0000-0100 - Finish BOP test and get approval.
- 0100-0145 - RIH. Tag cement at 100'.
- 0145-0500 - Drill out 150' of cement.
- 0500-1800 - Drill ahead 250-305' with 6.25", F4 Smith Button bit. Formation hard 250-260, softer 276-279, hard below 270. Fracture zones: 284-284.5, 285-288. Mud statistics: 270'- Ti=72, To=81, air=64; 280'- Ti=78, To=82, air=90; 300'-Ti=80, To=85, air=90.

- 1800-2000 - P00H. Twisted off between 4" collars and sub. Try fishing with 4.5" overshot. No success. Try to twist in, failed once then succeeded and recovered fish.
- 2000-2400 - Drill ahead 305-320'. Fractured at 315'. Penetration rate 4-5'/hr.

8-6-87

- 0000-2400 - Drill ahead 320-410'. Drilling rate 4-6'/hr. Fractures at: 328, 375, 398-400, 410. Mud Statistics: 320'-Ti=78, To=80, air=78, vis=34, wt.=9.4; 340'-Ti=74, To=80, air=68, vis=34, wt.=8.7; 360'-Ti=62, To=82, air=60, vis=38, wt.=7.9; 380'-Ti=63, To=82, air=84, vis=32, wt.=8.0; 410'-Ti=79, To=84, air=56, vis=34, wt.=7.9.

8-7-87

- 0000-2400 - Drill ahead 410-555. Penetration rate 5-6'/hr. Fractures at: 417-419, 427, 456, 460-468, 473-480, 490, 503, 506 (5 bbls lost); soft zone at 541. Mud statistics: 420'-Ti=80, To=87, air=57, vis=34, wt.=8.2; 440'-Ti=80, To=88, air=55, vis=34, wt.=8.2; 460'-Ti=79, To=86, air=64, vis=42, wt.=8.7; 480'-Ti=76, To=84, air=74, vis=32, wt.=8.5; 500'-Ti=80, To=92, vis=32, wt.=8.7; 540'-Ti=74, To=94, vis=40, wt.=8.9; 555'-Ti=70, To=98, air=52, vis=52, wt.=9.1.

8-8-87

- 0000-2400 - Drill ahead 555-660. Penetration rate 4-5'/hr. Very hard (<4'/hr 562-564) made 1.5 bbls water. Fractures at: 567-568 (made 3 bbls), 582-583, 605, 600-607 (lost 1 bbl). Recondition mud at 610'. Small fractures at 638-645 (lost 2 bbls mud). Mud statistics: 560-Ti=89, To=100, air=50, vis=27, wt.=9.0; 580-Ti=80, To=100, air=52; 600-Ti=82, To=106, air=72, vis=36, wt.=9.3; 610'-Ti=82, To=104, air=74, vis=28, wt.=9.0, pH=10.0; 620'-Ti=86, To=98, air=78; 640'-Ti=92, To=102, air=72, vis=30, wt.=8.9; 660'-Ti=82, To=106, air=58, vis=27, wt.=8.8.

8-9-87

- 0000-2400 - Drill ahead 660-785. Penetration rate 5-6'/hr. Fractures at: 669, 676-678, 687-688, 724-725, 757, 765, 774 (lost 1 bbl), 780 (bit dropped 6", lost 1.5 bbls).
- 0700-0800 - Installed H₂S monitors.
- 0900-1000 - Try drift surveys at 500, 600 and 700'. Only 500' shot successful.

- 1600-1700 - Changed 1300 gallons of mud. Added 1 sack of Polygel.
Mud Statistics: 670'-Ti=100, To=108, air=60, vis=30, wt.=9.3; 700'-Ti=103, To=112, air=62, vis=30, wt.=9.3; 720'-Ti=107, To=114, air=65, vis=32, wt.=9.3; 735'-Ti=107, To=115, air=73, vis=37, wt.=9.7; 740'-To=118, vis=33, wt.=9.8; 780'-Ti=109, To=119, air=60, vis=28, wt.=8.8.
- 8-10-87
- 0000-0530 - Drill ahead 785-800'. Penetration rate <3'/hr. Lost Circulation steady at 1 bbl/hr.
- 0530-0930 - PUGH, change to F5 Button bit and R1H. Change rubber on rotating head.
- 0930-1730 - Drill ahead 800-840'. Fractures at: 810-815 (lost 1 bbl), 825, 828.
- 1730-1900 - Drift survey at 600': 1.75° @121°; 700': 2° @ 120°.
- 1900-2400 - Drill ahead 840-867'.
Mud statistics: 785'-Ti=109, To=117, 800'-Ti=110, To=116, air=63, vis=30, wt.=9.1; 820'-Ti=112, To=119, air=60, vis=30, wt.=9.0, 830'-Ti=112, To=118, air=64, vis=34, wt.=9.1, 850'-Ti=104, To=121, air=68, vis=40, wt.=9.3, 860'-Ti=105, To=122, air=70, vis=40, wt.=9.0.
- 8-11-87
- 0000-0915 - Drill ahead 867-905. Lost 2 bbis in 4 hrs. Fracture at 902. Lost all circulation plus whole mud pit at 905'.
- 0915-1300 - Change over to air/foam drilling system.
- 1300-1445 - Drill ahead 905-941.
Penetration rate 10-15'/hr. Hit another fracture at 910. Blow down hole cleaning out all mud and cuttings. Air return temperature 240°. Steam entry at 941'.
- 1445-2100 - Drill ahead to 980' with air through steam zone. Broken rock. Numerous fractures. Air pressure 105 PSIG.
- 2100-2400 - Repair leaking rotating head rubber. Tested gas pressures and NCG quantities through kill line using MEI gas meter and gauges.
- 8-12-87
- 0000-0330 - Drill ahead 980-990.
- 0330-0430 - Install another new rubber in rotating head.
- 0430-0915 - Drill ahead 990-1025'. Fractures at: 995-1001, 1010, 1011, 1017.

- 0915-1100 - Retest gas production.
- 1100-1400 - Drill ahead 1025-1038' TD. Fracture zones at 1034 and 1038.
- 1400-1630 - Change rotating head rubber again.
- 1630-1900 - FGDH. H₂S 1600 ppm right at joints while breaking string. Masks worn by whole crew.
- 1904-1920 - Accumulator needle valve loosened while collars were being stripped out of Hydril. Lost all BOP pressure and steam blew out of well straight up through rotary table to the height of the finger board. Well shut in by closing the master gate valve without injury to personnel or damage to rig or environment. This was not a blow-out. It was a temporary release of steam to the atmosphere due to a malfunction of the BOP pressure maintenance equipment.
- 1920-2400 - Well shut in for the night. Site and rig cleanup preparatory for well testing.

EXHIBIT A

DRILLING PROCEDURE

Re: Geothermal Operations
Mother Earth Industries, Inc.
Drilling Procedure
Cove Fort Strat Tests
Beaver County, Utah

Originating
Office: Mother Earth Industries, Inc
Geothermal Operations
Salt Lake City, Utah

Date: March 27, 1987

By: Bill Jackson
(801) 254-2565 (central) *(copy)*
(702) 754-5443 (Mob. Ph. w/Trailer @ Skrambert)

OBJECT

Drill a 1500' geothermal exploratory hole for the purpose of obtaining data which can be used as part of long term development at Cove Fort. The drilling procedure will be to drill a 9 7/8" hole to \pm 250' and set and cement 7" casing; and drill a 6 1/4" hole to T.D.. Enclosed is the detailed Drilling Procedure with attached Programs and Attachments.

HIGGINSON-BARNETT, CONSULTANTS

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

JOB MOTHER EARTH INDUSTRIES WELL 34-7A

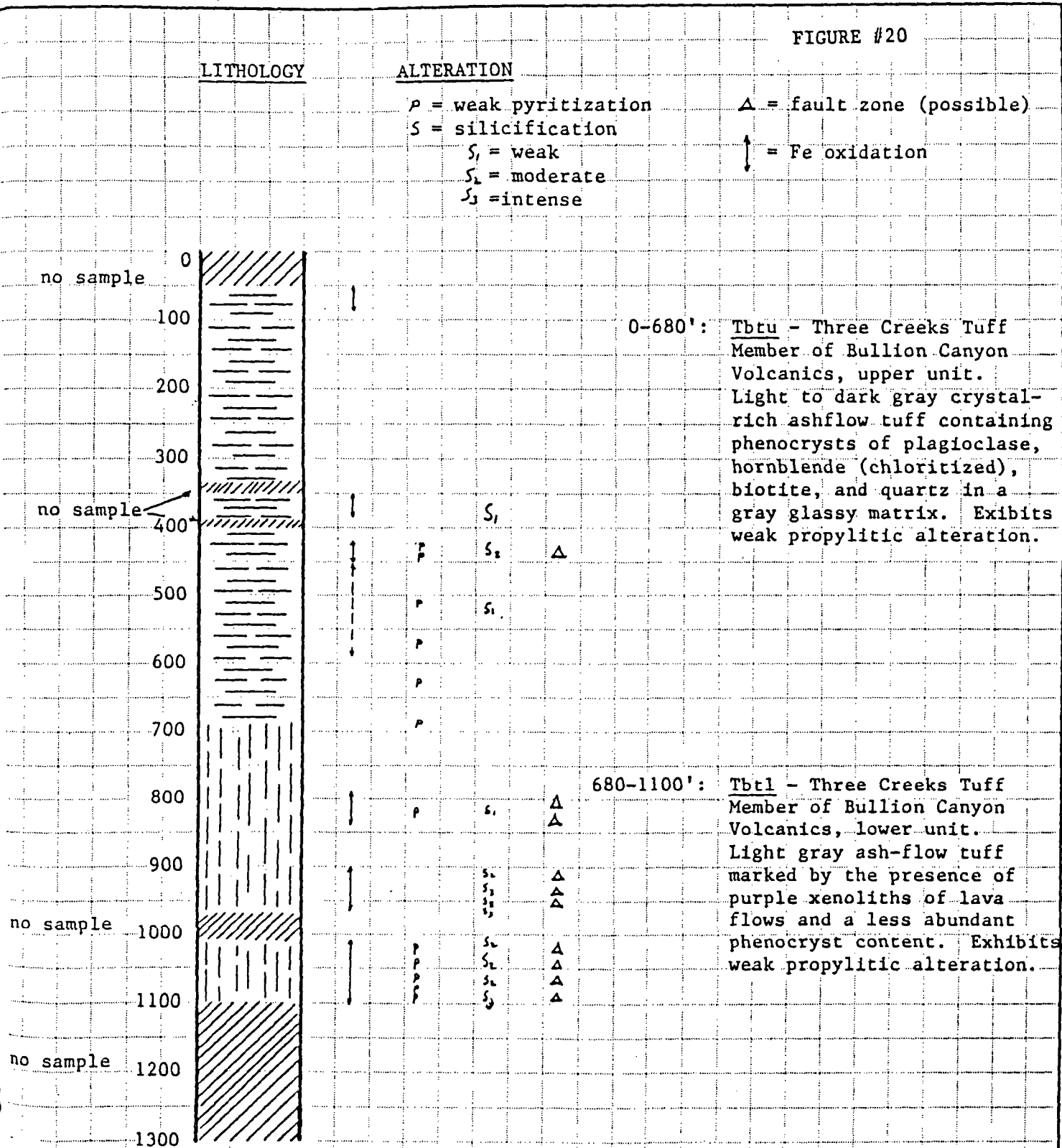
SHEET NO. 1 OF 1

CALCULATED BY KB & DAB DATE 3-9-85

CHECKED BY JAB DATE 3-11-85

SCALE 1"=400"

FIGURE #20



COVE FORT STRAT TEST

Well Plan Overview

Well: Cove Fort Strat Test
 Location: Beaver County, Utah

Depth	Hole Size	Mud System	Casing ¹	Cement ²	BOP Stack ³
0	9 7/8"	Spud Mud Gel - Water	7"	Cement Slurry: Class "G" or "H" Cement	Reference Attachment
±250'	6 1/4"	Air, Foam, or Gel/H ₂ O/Polymer			
1500'					

- ¹ 7" J-55 20[#] ST & C 8 rd. casing @ 350 degrees F;
 Burst= 2992 psi, Collapse= 1816 psi, Tension= 187,000#
- ² All Cement Jobs: TOC= ground level; Volume calculated with
50% to 100% excess in open hole.
- ³ All testing pursuant to GRO Order 2 with advance notice to
 BLM, Richfield, Utah, for witnessing.

PERTINENT DATA

Proposed TD : 1500'

Location :

Datum : All depths refer to RKB, unless otherwise indicated. KB height should be measured and reported on the first day of drilling.

Rig : Sierra Drilling Rig #

Estimated Cost : \$49,100

AFE # :

Objective : To obtain geological and temperature data.

Casing Program : +250' 7" J-55 20% ST&C 8rd. range 2 Surface casing.

Anticipated Problems :

1. Lost circulation anywhere below 1000'.
2. Possible H₂S (reference "H₂S Contingency Plan").

Pre-Spud Work :

1. Prepare location, build road, and dig reserve pit.
2. Modify 8" Starter Flange to fit 7" casing. The ID of the starter flange is 8.75". This must be done in such a way that collars will not hang on the edge of the starter flange as they enter the 7" casing, i. e., the top of the reducer must be beveled. It would also be desirable that the 7" casing enter the reducer only 4" and encounter a beveled reduction, so that it will sit level on top of the cut-off 7" casing while it is being welded (it needs to be beveled so that the 7" casing can be welded to it on top and the weld will not restrict the ID of the casing.) Be careful that the starter flange is welded perfectly true onto the reducer, so that the BOP stack will sit level. A 1/4" hole needs to be drilled 2" up from the bottom of the reducer so that a grease fitting can be installed to facilitate testing between the upper and lower welds. This hole should be threaded for 1/4" NPT. It would also be desirable for the reducer to be 14" in length so that 4" could be inserted into the starter flange, 4" could be slipped over the 7" casing, and this would leave 6" in the center. This would allow the boring of two 2" holes located

in the center of the reducer and spaced 180 degrees from each other. High pressure 2" LP collars could then be welded to the reducer over the 2" holes. These collars must have a working pressure of at least 1000 psi.. This would call for a reducer 1 1/4" in length, OD of 8 5/8", ID of 6 1/2" (bored to 7 1/8" for the bottom 4"), with the top of the 7 1/8" bore and the top of the 6 1/2" bore beveled.

- Environmental :
1. Line reserve pit to prevent seepage.
 2. Contain all drill cuttings and drilling fluids, as well as site drainage, to the reserve pit.
 3. Have H₂S absorbing drilling fluid products on hand (i.e., zinc carbonate and zinc chelate)(Sorb or H₂Less).
 4. If the reserve pit will be maintained for future purposes, then it should be fenced prior to rig release.
 5. Maintain enough fluid on hand (at least two hole volumes) and keep rig pump connected to the kill line during all drilling operations.
 6. Mud Engineer should be available at all times to help monitor for and control any threatened blow-out.
 7. Care should be taken that discharge from the blowout line, while air drilling, is never in the direction of any power lines.

Notification of Authorities :

- Prior to the following activities:
1. Moving in (1 to 2 days in advance).
 2. Prior to Spudding (24 hours in advance).
 3. Major change in procedure, i.e., casing point (ASAP).
 4. Testing EOPs (24 hour advance notice).
 5. Serious accident/mishap (ASAP)

Notify the following;

State of Utah - Water Rights Division(One of the following);

XXXXXXXXXXXX	XXXXXXXXXXXX
Gerald Stoker	586-4231
Stanley Green	533-7164

Bureau of Land Management (one of the following);

Don Pendleton	(801) 896-8221
John Branch	896-8221

XXXXXXXXXXXX	XXXXXXXXXXXX
-------------------------	-------------------------

Forrest Service (one of the following);

Del Randall	(801) 438-2436
Darwin Jensen	438-2436

Operations Manager

: Jay C. Hauth (801) 263-8300 ofc.
268-9369 res.

MOTHER EARTH INDUSTRIES, INC.

COVE FORT STRAT TEST

March 27, 1987

SEQUENCE OF OPERATIONS

1. Prepare location and sump as per design drawings. (Must be oriented so that rig is at least the mast height plus 25' from any powerlines).
2. Move in and rig up rotary drilling rig.
3. Pick up 9 7/8" drilling assembly and drill out using mud. Drill 9 7/8" hole to a total depth of +250', depending on geology. Take directional surveys every 100'. Maintain hole as straight as possible. Maximum deviation at total depth to be 4 degrees. Maximum rate of change to be 1 1/2 degrees per 100'. Monitor flowline mud temperatures every 20 feet. Catch formation samples every 10'.
4. Circulate hole clean. Make wiper trip. Circulate and condition mud to run casing. POOH and lay down 9 7/8" drilling assembly. Rig up to run 7" casing.
5. Run 7" J-55 20% ST&C, range 2, 8rd. surface casing to total depth and cement with API class "G" or "H" neat cement.
6. Install 7" X 8" ANSI 300 Series wellhead and 8" ANSI 300 series master gate (working pressure 680 psi at 300 degrees. Test pressure 1100 psi).
7. Nipple up blow out preventer stack and test same to 500 psi. with BLM representative present to witness test.
8. Pick up 6 1/4" drilling assembly and drill out 7" casing with 6 1/4" bit.
9. Drill 6 1/4" hole with air or mud to a total depth of 1500'. Take directional surveys every 100'. Maintain hole as straight as possible. Maximum rate of change to be 1 1/2 degrees per 100'. Monitor flow-line temperatures (both in and out) every 20' and log on Tour Sheet. Run maximum registering thermometers on each survey.
10. Lay down drill pipe and tools, nipple down BOPs, clean up location, rig down, and release rig.

COVE FORT STRAT TEST

March 27, 1987

SEQUENCE OF OPERATIONS

1. Construct location and sump as per attached design drawing.
2. Move in and rig up rotary drilling rig. Survey location with rig in place.
3. Mix spud mud as per attached drilling fluids program.
4. Visually inspect and note on tour sheet whether all drill pipe is white banded, specifying that it meets AAODC API Class II inspection as to the following;
 1. Electromagnetic inspection of tubes (Sconoscope or Scanalog).
 2. Wall thickness and cross sectional area (Ultrasonic or gamma ray).
 3. Tool joint inspection (Electronic or magnetic particle).Also check to see that all drill collar connections have been magnetic particle inspected and that all bottom hole assemblies have been magna-fluxed prior to delivery. Note condition on tour sheet.
5. Make sure 7" casing is on location and in position to run prior to spudding well. Make sure that all casing accessories, wellhead equipment, and circulating head are on hand.
6. Spud well with 9 7/8" bit and drill with mud to +250', depending on geology. Remove thread protectors, clean threads, drift and measure casing while drilling surface hole. Measure KB height and log on tour sheet. After casing point has been selected, drill any additional hole that might be required so that casing can be landed withing 1' of bottom, and still space out correctly on surface. Maintain hole as straight as possible while drilling. Take drift shots every 100'. Run maximum registering thermometers on each survey. Maximum angle at total depth to be 4 degrees. Maximum rate of change to be 1 degree per 100'. Monitor and record flow line temperature every 20'. Catch 2 sets of formation samples every 10'.
7. Upon reaching desired depth, circulate and condition mud until shaker screen is clean and viscosity is less than 45 sec/quart. Make wiper trip. Check for fill. If hole is in good condition, circulate bottoms up, POOH, and lay down 9 7/8" drilling assembly. If tight hole was encountered on the wiper trip, then make another wiper trip. It may also be necessary to further condition the mud.
8. Rig up and run 7" casing to total depth (as per attached 7" casing program). Run in hole slowly to avoid breaking down the formation and losing circulation. Circulate past any bridges encountered. Use proper make-up torque on casing. Use a good quality geothermal casing dope on threads.

9. Once casing has been run to total depth, circulate hole clean, while reciprocating casing, with at least two full circulations. Circulate until hole is clean, mud is in good shape, and viscosity of mud is less than 45 sec/quart. Check bottoms up time to be sure that mud is not channeling.
10. When mud is in good shape, cement casing as per attached program. Monitor and record cementation data as per cementation program. Catch cement samples during cementation as requested. Continue to reciprocate casing while pumping cement. Land casing within 1' of bottom. Center casing in rotary table.
11. Wait on cement for 8 hours. (check samples to see if additional time is required). Monitor cement in annulus. If it falls back, bring it back to the surface with 1" pipe.
12. Land and cut off 7" casing. Weld on 7" X 300 SR Starter Flange. Test between welds. Check with level to be sure flange is on correctly. If flange is not equipped with 2" outlets on each side, then install two weld-on collars, two 6" X 2" Sch. 80 LP nipples and two 800 psi. valves below the flange.
13. Make sure that BOP equipment has been inspected by the manufacturer or an authorized agent prior to arrival and that all equipment is proper and in good shape. Huddle up blow out preventer equipment as per attachment. Test 7" casing and blow-out equipment to 500 psi. with ELM representative present to witness test. Log test data and representatives name on Tour Sheet.
14. Trip in hole with 6 1/4" mill tooth bit and tag cement. Log top of cement on Tour Sheet. Drill out baffle plate, cement and float shoe from 7" csg. with spud mud. Drill 10' of formation and then trip to pick up button bit or hammer and hammer bit. If the decision is made to air drill, run float in bit sub and unload mud out of hole with air on the trip back in. If the decision is made to drill with mud, then displace the spud-mud out of hole with the gel/water/polymer system when you reach bottom with the bit. See attached program for mud system.
15. Drill 6 1/4" hole with air, foam, or mud to 1500'. Operate BOP each trip out of hole and log on tour sheet. Maintain hole as straight as possible. Take drift shots every 100'. Run maximum registering thermometers on each survey. Maximum rate of change to be 1 degree per 100'. Monitor and record flow-line temperatures, both in and out, every 20'. Catch formation samples (2sets) every 10'.
16. Upon reaching total depth, circulate hole clean, lay down drill string, nipple down BOPs, clean location and release rig.

DRILLING FLUIDS PROGRAM

9 7/8" surface hole; 0 - ±250'

mud system; gel, lime, water, LCM (spud mud).
mix 15 - 20 lb./bbl. bentonite in fresh water.
flocclulate with lime.

weight; As low as possible with mechanical solids control equipment.

viscosity; 45 - 55 sec/qt or as needed to clean the hole.

water loss; no control

Total Hardness; no control

ph; mix lime through chemical barrel to maintain 9.5 - 10.5 ph.

Comments; Lost circulation through this interval is possible. No formation pressures are anticipated. keep plastic viscosity down and yield point up. Run solids control equipment continuously. Break circulation slowly and trip slowly. Use Desco to thin mud if necessary.

6 1/4" Hole; ±250' - T. D.

mud system; polymer, gel, soda ash, Desco, high temp thinner. Drill out cement with spud mud and then dump spud mud. Build new system. Mud up in clean steel pits by mixing, with fresh water, 1/2 lb/bbl caustic soda and a ratio of 8 bentonite to 1 drispac regular. mix bentonite first and then slowly add (30 min/sk) drispac. (Substitute a high molecular weight anionic liquid polymer such as magcobars rapid mud for drispac if so desired.

weight; As low as practical with water and mechanical solids control equipment.

viscosity; 38 - 45 sec/qt with bentonite and drispac (8:1 ratio of bentonite:drispac), stay on this ratio to maintain viscosity after mud-up.

water loss; no control

Total Hardness; below 300 ppm with soda ash.

ph; 9.5 - 10.5

6 1/4" Hole; ±250' to T. D. (Cont'd.)

Rheology; Control flow properties at reasonable levels with Desco thinner. If downhole temperatures increase to where Desco is not effective, then use high temperature thinner.

Torque, drag, hole stability, and high temp lubricant:

Add 2ppb Soltex additive as necessary.

Lost Circulation (Applies to depths from Surface to TD);

The methods used to control lost circulation are as follows;

- 1; Lost circulation materials such as nut plug, cotton seed hulls, saw dust, medium Kwik-seal, etc.
2. Gunk Squeezes
3. Cement
4. Lighter than water drilling fluids.

Abnormal Pressure;

Weight material (Barite) should be on location at all times.

Corrosion;

Add corrosion inhibitors such as oxygen scavengers or scaling amines to control corrosion.

Stable Foam make-up;

Mix 1/2 - 2 ppb drispac in water

1 - 2 ppb soda ash

5 - 10 % foamer just before use (use alpha olefin sulfonate for high temp foamer.)

Air - Mud ratio required = 100:1 to 300:1

Hydrogen Sulfide Monitoring and Abatement;

Hydrogen sulfide monitoring should be maintained during the drilling of the well. Detectors should be placed on the rig floor, cellar area, and flowline region to detect and announce the presence of hydrogen sulfide. Hydrogen sulfide abatement equipment and materials, i.e., pumps, hydrogen peroxide, and caustic soda, should be maintained on location when drilling with lighter than water drilling fluids, ie, air or aerated mud systems. Escape breathing equipment, as well as resuscitators should be available on the site.

Special Considerations;

1. Drilling recorder to monitor rate of penetration.
2. Catch drill cutting samples(2 sets) every 10', to be cleaned and sacked.
3. All lost circulation zones encountered shall be recorded in Tour Book, recording both the depth at which the loss occurred, as well as the amount of fluid lost.
4. In and Out temperatures, both of mud and air, shall be recorded in the Tour Book every 20'.
5. Temperatures should be taken with every directional survey by running a maximum registering thermometer in the survey instrument.

CASING PROGRAM

7" Surface Casing: +250' X 7" J-55 20% ST & C Range 2 Casing

Torque; 3200 ft-lbs

Drift ID; 6.331

Strength Ratings;

Yield = 2992 psi

Collapse= 1816 psi

Tension = 187,200%

Accessories;

Float equipment - flapper type conventional float shoe on bottom of string and baffle plate installed one joint up from bottom.

Centralizers - 2 centralizers installed in the middle of the bottom 2 joints (7" X 9 7/8" Bow Type).

Wellhead Equipment - 7" X 300 SR weld-on starter flange for wellhead. 300 SR Gate Valve for master valve. (pressure rating 700 psi @ 560 degrees F.).

Instructions;- tackweld shoe; also, top and bottom of couplings on bottom three joints.

- Note:
1. Lower casing in hole slowly to avoid formation breakdown and lost circulation.
 2. Use geothermal grade thread dope on casing threads.

CEMENTING PROGRAM

+250' X 9 7/8" hole X 7" casing surface job;

Slurry description;

API Class "G" or "H"
cement mixed with 5.0
gal/sk water.

Requires;

.2301 sk/linear ft in
9 7/8" annulus.

.1976 sk/linear ft in
7" casing.

Slurry weight =

15.8 lbs/gal or 118 lbs/cu.ft.

Yield =

1.15 cu.ft./sk

Water requirement =

5.0 gal./sk or 0.67 cu.ft/sk

Pump time =

1 - 2 hours

24 hour compressive strength= 2915 psi.

7" J-55 20% ST & C casing displacement = .0404 bbls. per linear feet or .2273 cu. ft. per linear feet.

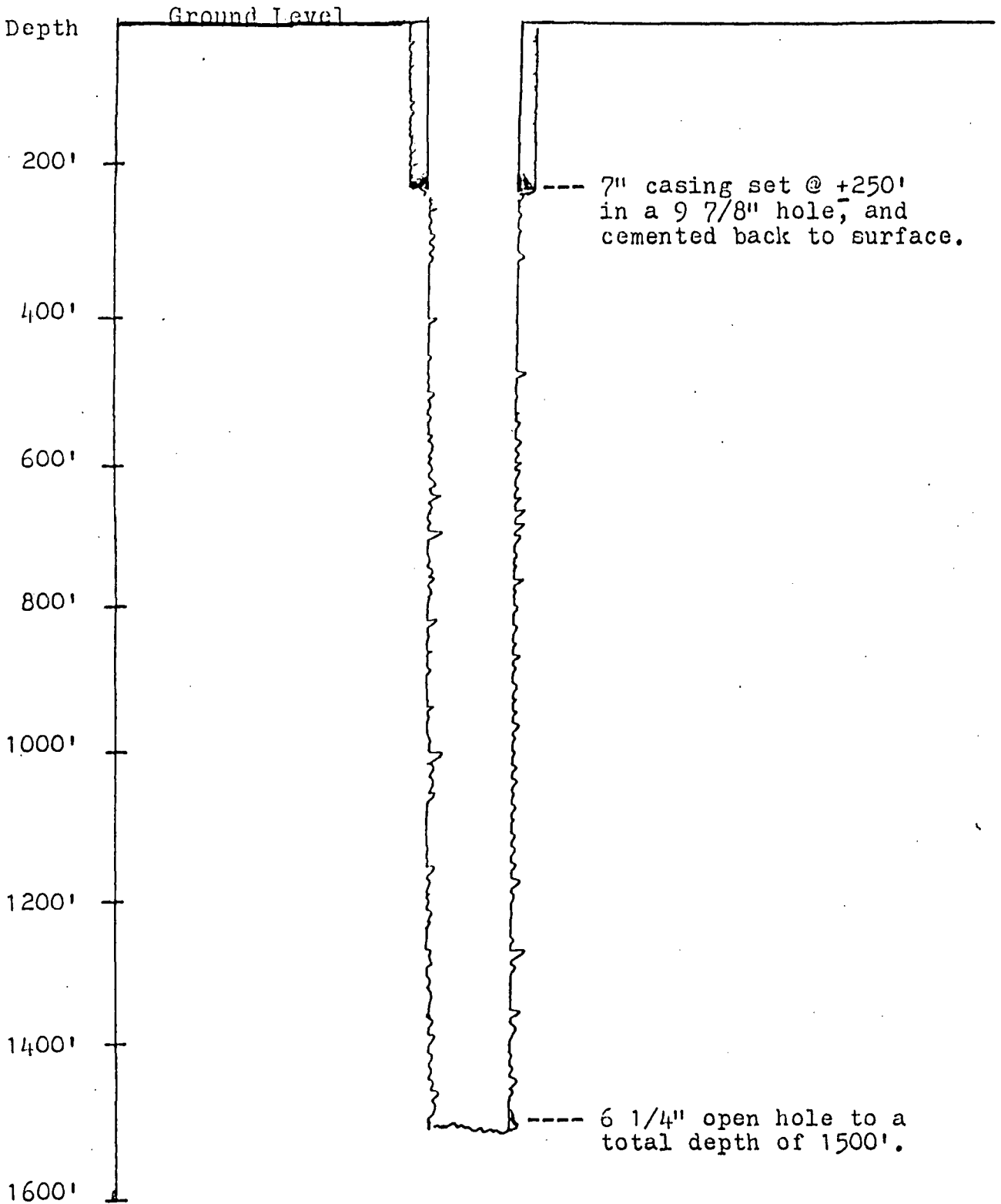
Note; Cement job should be calculated with 50% to 100% excess in open hole.

CEMENTING PROGRAM (cont'd)

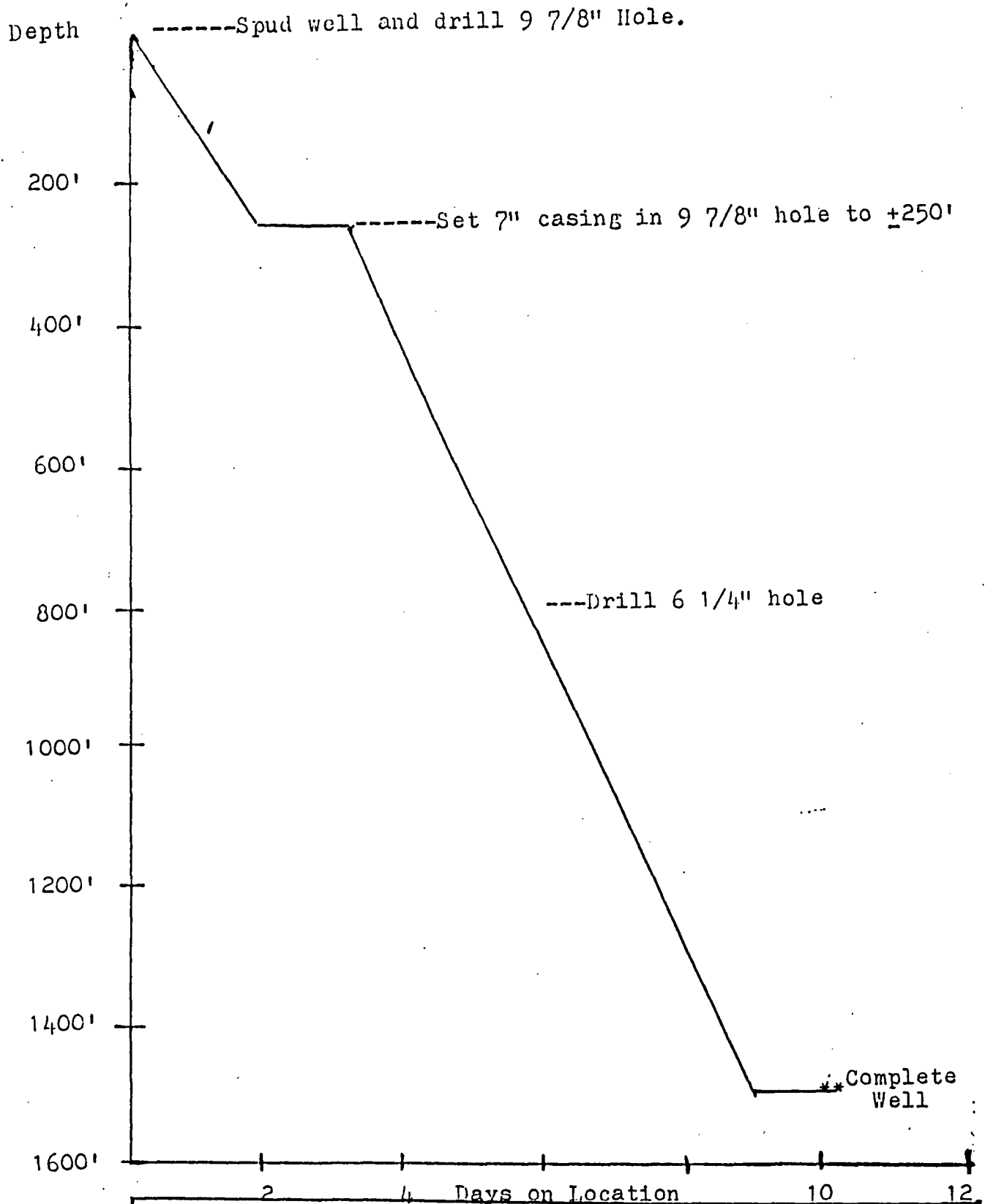
+250' X 9 7/8" hole X 7" casing surface job;(cont'd.)

Procedure;

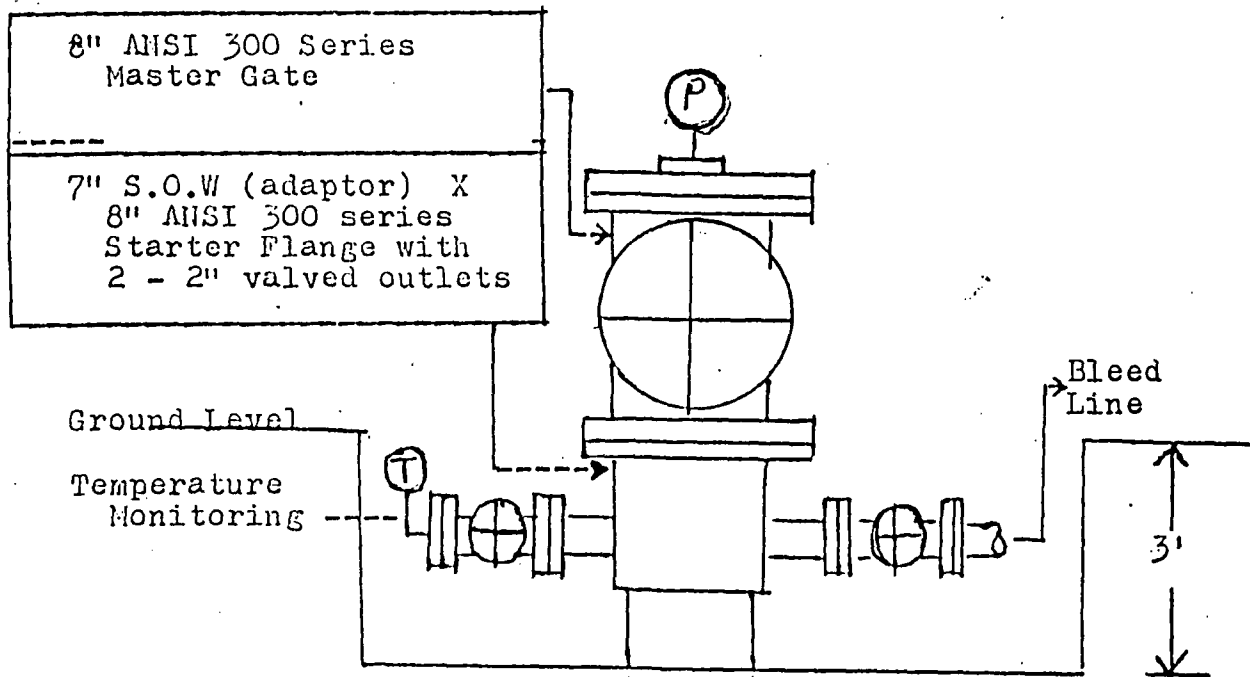
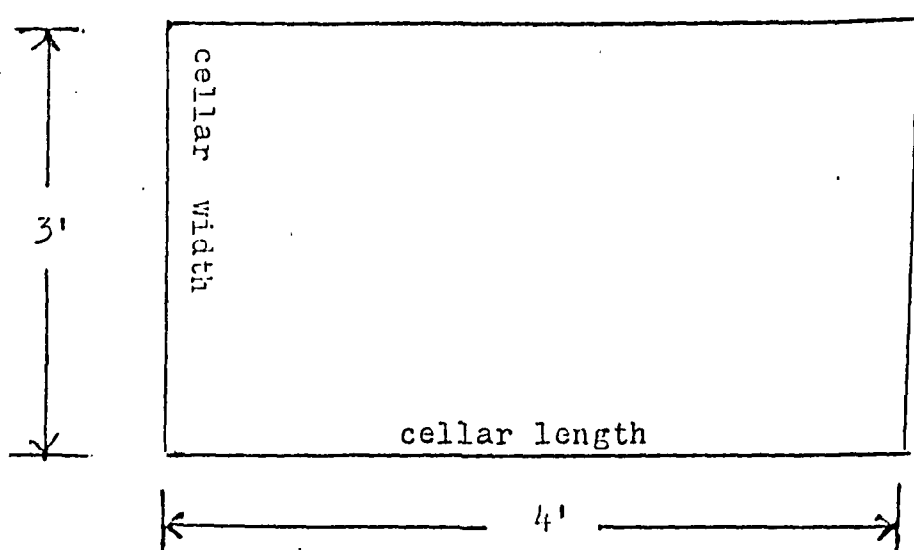
1. Make prior arrangements with Redi-Mix company to have required amount of class "G" or "H" cement on hand. Inquire as to how much notice they will require to load the cement and drive to the location. Advise them that you will need the truck clean and free of rocks or chunks of cement prior to loading. Tell them that you wish the cement loaded and hauled to the location dry, and that you will add the water on location just prior to pumping.
2. Make sure you have circulating head on location prior to running casing.
3. Call out Redi-Mix truck, giving required amount of advance notice, so that he will arrive on location before you are ready to cement.
4. While you are circulating, rig up 10 bbl. stock tank so that you can reach it with the rig pump suction and so that the Redi-Mix truck can unload into it. Have large mesh grating on hand so that you can screen out any large rocks from cement slurry prior to their reaching the rig pump suction.
5. When you are finished circulating and conditioning mud, rig up to cement, add the mixing water to the cement and mix up the cement slurry.
6. Pump 5 bbls. water down the 7" casing ahead of the cement. Start dumping the cement slurry from the Redi-mix truck into the stock tank (screening out large rocks with the grating) and begin pumping the slurry inside the 7" casing with the rig pump. Catch samples at various intervals.
7. When all the slurry has been pumped, drop the top plug and displace the slurry out of the 7" casing with mud. Bump the plug with 250 - 300 psi. Do not over-displace more than 1/2 the volume of the shoe joint to bump the plug. Note the following on the Tour Sheet;
 1. Time you began mixing cement.
 2. Time you began pumping cement.
 3. Time you began displacement.
 4. Time you received cement returns to the surface.
 5. Time the plug was bumped, or the time you finished displacing.Clean all cement out of rig pump, lines, and stock tank.
8. W. O. C. 8 hours. (check samples to see if extra time is required. Monitor the cement in the annulus. If it should fall back, bring same back to surface with 1" pipe.
9. Land 7" casing, cut off, weld on well-head, and start nipping up blow out equipment.



MOTHER EARTH INDUSTRIES, INC. COVE FORT PROJECT 6 1/4" open hole strat test drawing	DRAWN
	For : MEI
	By : EJ
	Date : 4/9/87
	Scale: 1"=200'
	Drawing No. 001

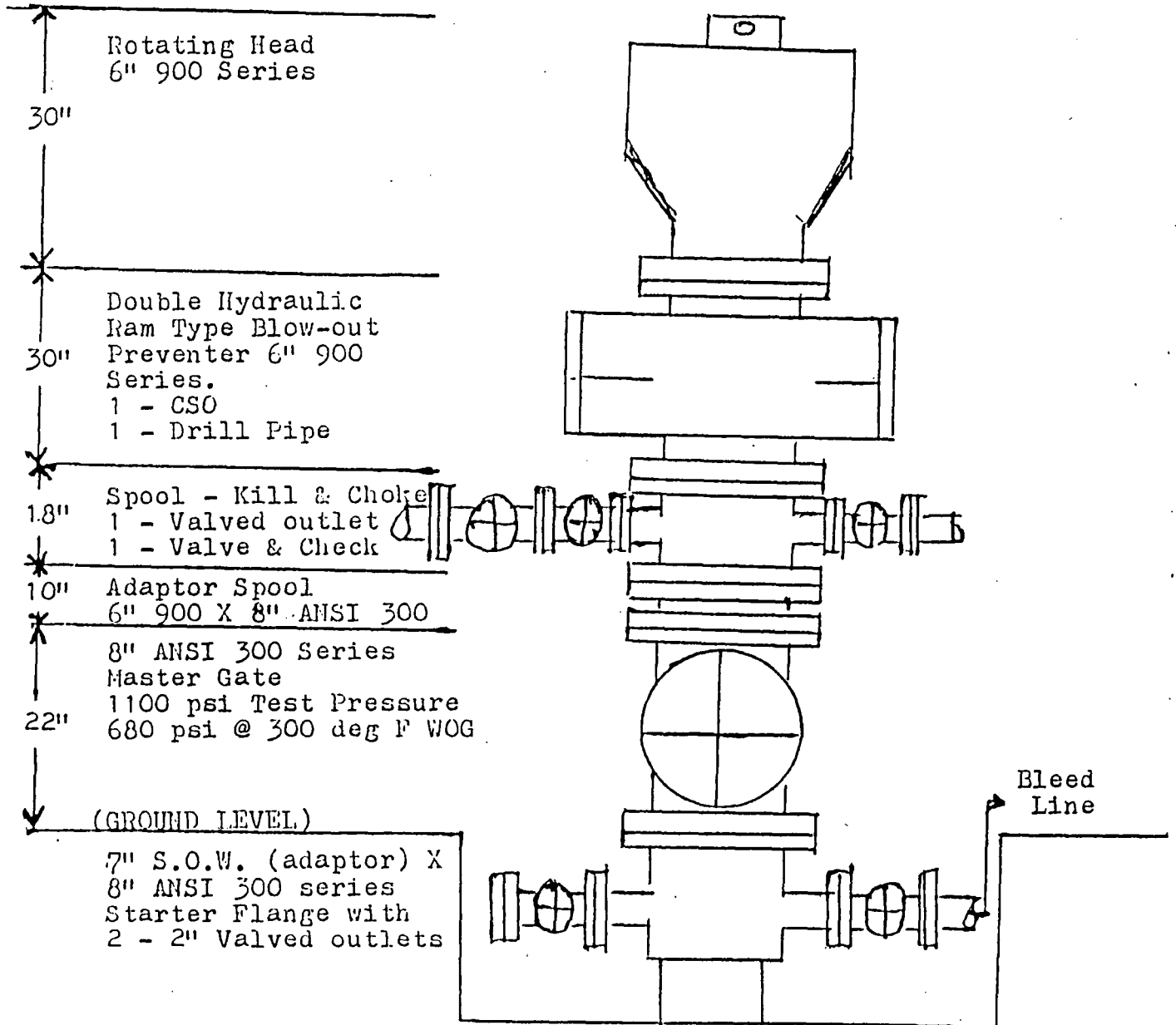


MOTHER EARTH INDUSTRIES, INC. COVE FORT PROJECT DRILLING CURVE	DRAWN
	For : MEI
	By : BJ
	Date : 4/9/87
	Scale: 1"=200'
	Drawing No. .002



MOTHER EARTH INDUSTRIES, INC. COVE FORT PROJECT	DRAWN
	For :MEI
WELLHEAD COMPLETION DRAWING and CELLAR DIMENSIONS	By :BJ
	Date :4/9/87
	Scale:NA
	Drawing No. 003

Total Stack Height = 110" or 9'



1. All BOP equipment should be ordered with H₂S trim.
2. Ram rubbers and rotating head rubbers must be high temperature rated.
3. Need accumulator with sufficient capacity, high pressure back up system, and dual controls. One at the drillers station and one at least 50' from the well.
4. Lines must be steel with a minimum working pressure of 1000psi.

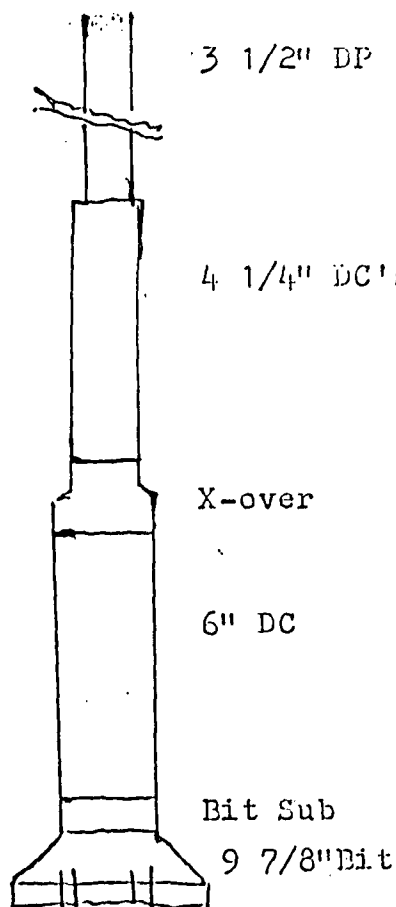
<p>MOTHER EARTH INDUSTRIES, INC.</p> <p>COVE FORT PROJECT</p> <p>BLOW OUT PREVENTER STACK</p> <p>to be installed on the 7" casing</p>	DRAWN
	For : MEI
	By : BJ
	Date : 4/9/87
	Scale : NA
	Drawing No. 004

RECOMMENDED BITS AND HYDRAULICS PROGRAM

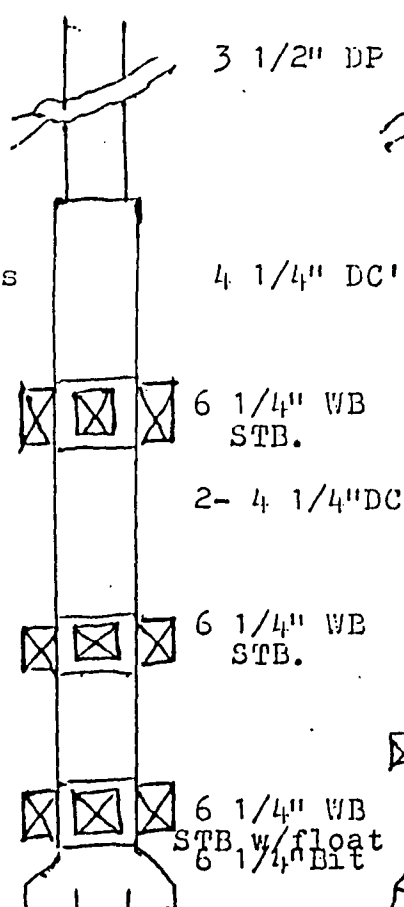
Depth	Hole	Type Bit	Jets	Pressure	GPM	WOB	RPM
0 ±250'	9 7/8"	Mill Tooth	3 X 16	300	150	18-30	50-70
1500'	6 1/4"	Insert	Open	500	150	15-25	45-55

BOTTOM HOLE ASSEMBLY RECOMMENDATIONS

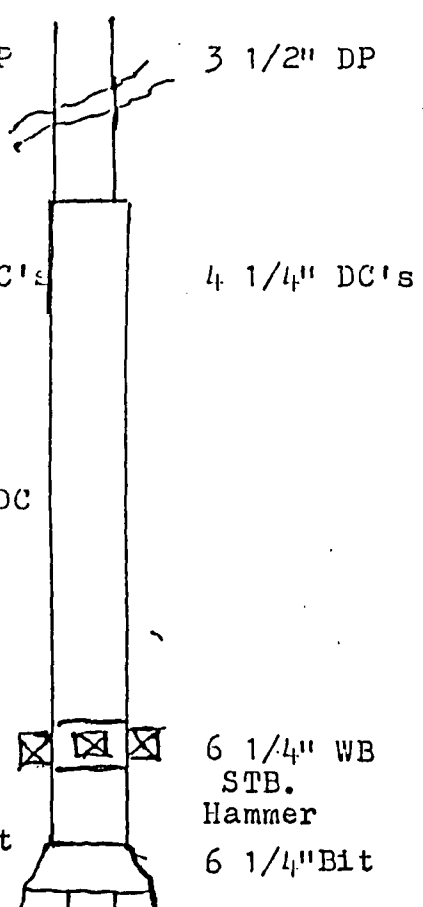
9 7/8" BHA

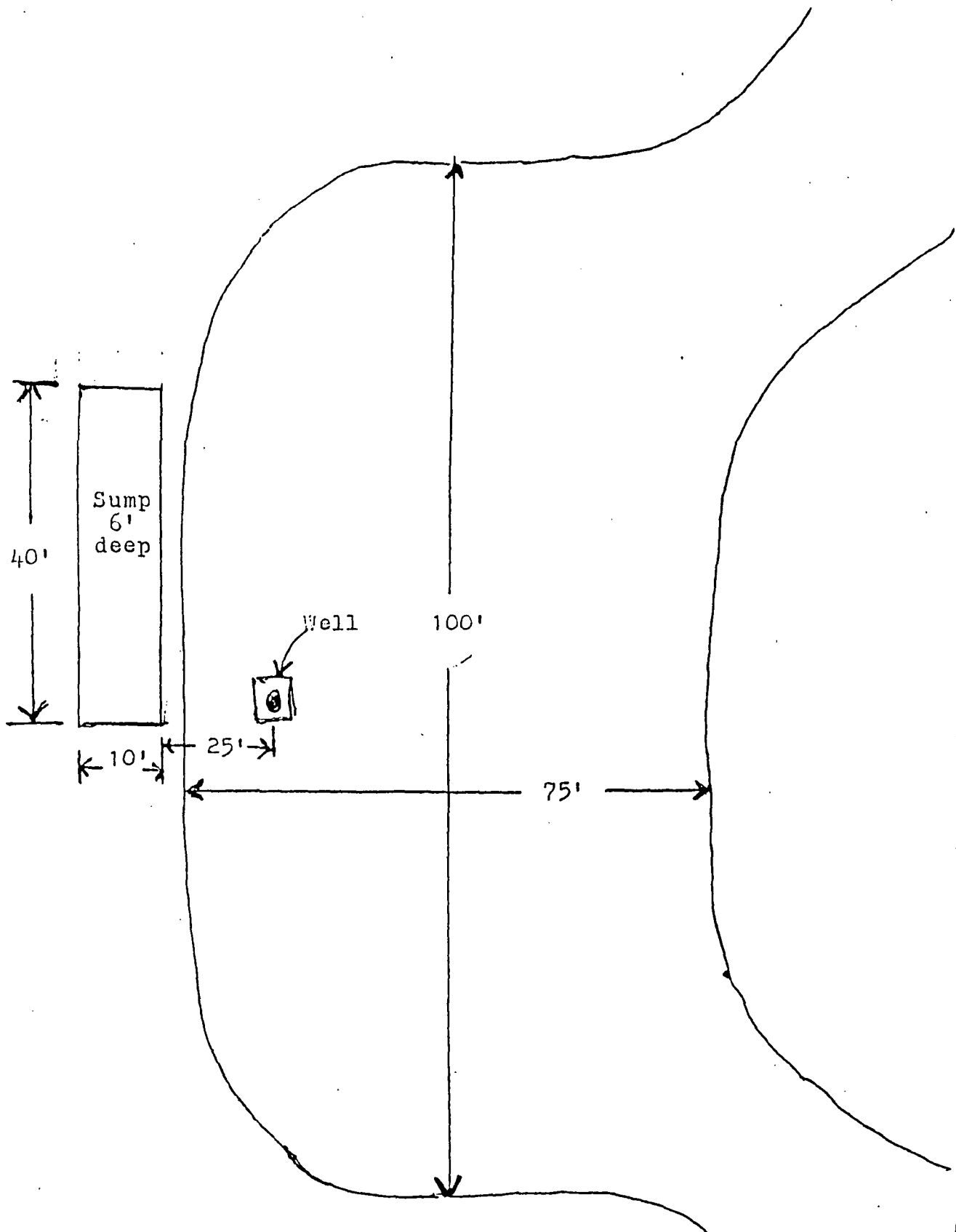


6 1/4" BHA



6 1/4" BHA (Hammer Drlg.)





Sump should be lined to prevent seepage	DRAWN
	For : MEI
MOTHER EARTH INDUSTRIES, INC. COVE FORT PROJECT DRILL PAD	By : EJ
	Date : 4/9/87
	Scale : NA
	Drawing No. 005



Cove Fort-Sulphurdale KGRA Drilling Operations
Emergency Contingency Plan
June 18, 1986

NOTIFICATION/PHONE LIST ATTACHED

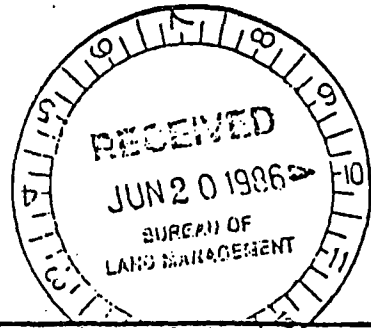
Prepared by: Jay C. Hauth
Operations Manager
Mother Earth Industries, Inc
3761 South 700 East
Salt Lake City, UT 84106

Introduction: This Emergency Contingency Plan is intended to replace and supercede section 5.0 of the "Plans of Operation of Geothermal Development", submitted March, 1985 by MEI. Certain information contained therein is updated in this document.

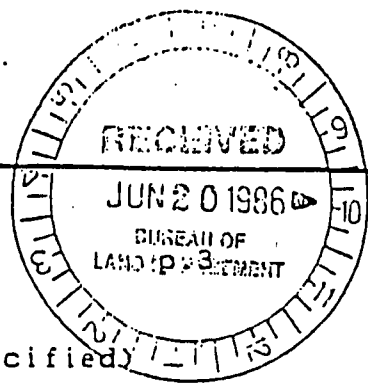
Policy: It is MEI's intent at all times to maintain strict standards of safety during all phases of drilling and field operations. It is recognized that unforeseen circumstances may occur requiring emergency action and/or notifications. In all cases, the priority of any action taken will be as follows:

1. Situations in which any persons have been injured or injury is imminent.
2. Situations which may potentially lead to personnel injuries.
3. Situations in which environmental damage is occurring or is imminent.
4. Situations in which equipment may be damaged.

Prior to performing any potentially hazardous operations, a safety meeting will be held with all operations personnel, detailing each person's responsibilities and emergency actions. In any emergency situation, maintain a calm alert attitude. In communicating with various parties, clearly state all pertinent details. When time permits, write down all details regarding "Who, what, when, where, how, why..."



(19)

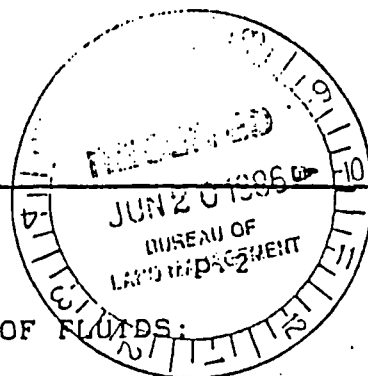


NOTIFICATION/PHONE LIST

(All numbers 801 area code unless otherwise specified)

Contact	Phone #	Comments
Mother Earth Ind. Jay C. Hauth	263-8300	ofc
	268-9369	residence
Wayne Portanova	(602) 488-3588	ofc
	(602) 252-1411	residence
Beaver Valley Hospital	438-2416	Hosp. and ambulance
Fillmore Community Medical Ctr.	743-5591	
Delta Community Medical Ctr.	864-5591	
Beaver County Sheriff	438-2862	
Millard County Sheriff (Fillmore)	743-5302	Ambulance
Millard County Sheriff (Delta)	864-2755	Ambulance
Utah Highway Patrol (Cedar City)	586-9445	
Delano Development Corp. Tom Canada	(812) 334-2618	Fee land
BLM (Richfield) Don Pendleton	896-8221	
John Branch		
BLM (Fillmore) Gerald Muhlesteen	743-6811	
Forest Service (Beaver) Del Randall	438-2436	
Darwin Jensen		
Bell Safety (Evanston) John Richter	(307) 789-4013	H2S Safety
Fox Construction (Circleville)	577-2668	Heavy Equip.
RHICO (Milford) Dick Rollins	387-2451	Equipment, welding,
	387-2202	roustabout
Cudd Pressure Control (OK. City)	(405) 681-2328	Well fighting

WILDER EARTH INDUSTRIES INC.



IN THE EVENT OF A BLOWOUT OR UNCONTROLLED RELEASE OF FLUIDS:

1. Administer first aid as required in case of personnel injuries. Arrange for transport to medical facilities by appropriate means. Notify medical facilities of situation details to allow for preparation of patient arrival.
2. If there may be a threat to local residents, contact the sheriff's office immediately.
3. If hydrogen sulfide release is suspected, immediately evacuate the location to an upwind area, and call out the H₂S safety company. Have Scott Air Packs available and brief personnel on their use. (Air Pack training will be part of normal rig crew training)
4. Restrict access to affected area by unauthorized persons.
5. Notify appropriate managing agencies: Forest Service, BLM, Utah Division of Water Resources. Obtain from agencies recommendations and requirements regarding the situation. Follow up by filing appropriate accident reports. Notify fee land operator if affected.
6. Call out various equipment on an as-required basis: bulldozer, backhoe, grader, water trucks, pumps, etc.
7. If situation warrants, call out well-fighting company.
8. Attempt to control blowout with personnel and equipment on location at the direction of MEI or MEI drilling representatives. pressure and temperature, mud volumes and pressures, BOP fluid reserves and pressures, etc.
9. Attempt to contain fluid releases by constructing retainer dikes, diversion channels, as required to minimize environmental or property damage.
10. Maintain constant vigilance on location for potential new problem areas: erosion of rig supports, dike overflows, road washouts, etc.
11. Following control of the situation, initiate work to return any adversely affected areas to their normal condition: reseeding, road repairs, grading, etc. as recommended and approved by the surface manager (Forest Service)

(24)

VENDOR CONTRACTS AND PHONE NUMBERS

Sierra Drilling -----	(801) 586-0673
Western Air Drilling Services -----	(800) 525-0803
National Supply Co. -----	(805) 589-5755
L. & L. Ltd -----	(303) 245-7030
J. R. Redi-Mix -----	(801) 438-2865
Bell Safety -----	(307) 789-4013
MMICO (Rollin's Machine Shop) -----	(801) 387-2451
Haus Vacuum Truck Service -----	(801) 259-5886
Northwestern Air Drilling Services -----	(303) 245-5610
Oilind -----	(307) 789-9791
N/L Baroid (Vernal) -----	(801) 789-1668
Texas Reamer -----	(307) 789-4045
Eastman Whipstock (Evanston) -----	(307) 789-5816
Wilson Downhole -----	(307) 789-4800
Burns Rathole (Evanston) -----	(307) 789-6678
DOTCO -----	(307) 789-8896
EJ Hughes -----	(303) 245-2906
The Dia-Log Company -----	(307) 789-0028
CRC-BICO Rental -----	(303) 858-3645
Oil Field Rental Tool Company -----	(307) 789-4491
Hughes Tool Company -----	(307) 789-6490
William H. (Bill) Jackson -----	(801) 254-2568

MOTHER EARTH INDUSTRIES
 COVE FORT GEOTHERMAL
 VENDOR LIST - BY NUMBER

<u>P.O. #</u>	<u>Company</u>	<u>Contact</u>	<u>Telephone</u>	<u>Vendor #</u>
Contract	Loffland Bros.	Dewey Milner	805-327-4695	015
Contract	ThermaSource, Inc.	Louis Capuano	707-523-2960	016
	L & H Trucking	Willard Lypscomb	707-987-2754	017
	Sullivan Rathole Drilling		307-382-6667	018
	Anatec Lags	Greg Anderson	707-526-7200	019
	Bill's Tong Service	Bill Cates	916-743-5225	020
	Dimitt Directional	Dave Dimitt	707-528-7988	021
	Geothermal Services, Inc. (formerly Dub's Welding)	Dub Hargis	707-433-6713	022
	Grant Oil Tools	Jim Hansen	707-433-6969	023
	H & H Oil Tools	Jim Turk	707-374-6493	024
	BJ Services	Joe Thomas	505-327-6288	025
	Thermchem	Paul Hirtz	707-575-1310	026
	L & L Muds, Inc.	Lad Lohrer	303-434-5527	027
	Midway Fishing Tools	Darrell Swisher	707-585-1457	028
	Nidway Wellheads		805-327-4471	029
	National Supply	Floyd King	805-589-5755	030
	Schlumberger Well Service		801-789-3392	031
	Tillett Tools & Supplies	George Tillett	707-523-1166	032
	W-K-M Division	Roger Bastian	707-838-4439	033
	Western Air	Craig Schweider	800-525-0803	034
	Wilson Supply	Larry Sutton	213-990-6355	035
	Continental Mfg. Inc.			036
	William Reed Welding	William Reed	801-489-7431	037
	NL Acme Tools			038
	J.R. Ready Mix		801-438-2865	039
	Ryerson & Son		415-653-2933	040
	Schaefer Valve		805-834-4738	041
	Bell Safety	John	307-789-4013	042
	Forminco Inc.	Gordon Ford	801-438-5693	043
	Jake's Crane & Rigging		702-736-4082	044
	O.K. Kile		805-324-4046	045
	Dresser Industries	Ken Deaking (Air)	707-433-6553	046
	RMICO (Rollins Machine)		801-387-2451	047
	Independent Pipe	Bruce Houpp	805-325-0398	048
	Cinco Pipe & Supply	Richard Slane	805-323-5464	049
	Delano Development Corp.	Steve Maycock	801-438-5569	050
	M & M Roust-A-Bout		801-759-2464	051
	Shurtleff & Andrews Corp. Lor, Inc.		801-973-9096	052
			713-999-8111	053
	Northwest Tool Company		707-374-5105	054
	R.W. Jones Trucking Co.		801-789-1231	055
	Erickson's Distributing Co.		801-438-5083	056
	Oilwell (Casing Purchase)	Dale Bingham	415-331-0555	057

MOTHER EARTH INDUSTRIES
COVE FORT GEOTHERMAL
VENDOR LIST - ALPHABETICALLY

<u>P.O. #</u>	<u>Company</u>	<u>Contact</u>	<u>Telephone</u>	<u>Vendor #</u>
	Anatec Labs	Greg Anderson	707-526-7200	019
	Bell Safety	John	307-789-4013	042
	Bill's Tong Service	Bill Cates	916-743-5225	020
	BJ Services	Joe Thomas	505-327-6288	025
	Cinco Pipe & Supply	Richard Slane	805-323-5464	049
	Continental Mfg. Inc.			036
	Delano Development Corp.		801-438-5569	050
	Dimitt Directional	Dave Dimitt	707-528-7988	021
	Dresser Industries	Ken Deakins (Air)	707-433-6553	046
	Dub's Welding (see Geothermal Services Inc.)			
	Erickson's Distributing		801-438-5083	056
	Forminco Inc.	Gordon Ford	801-438-5693	043
	Geothermal Services Inc.	Dub Hargis	707-433-6713	022
	Grant Oil Tool	Jim Hansen	707-433-6969	023
	H & H Oil Tools	Joe Turk	707-374-6493	024
	Independent Pipe	Bruce Houpp	805-325-0398	048
	J.R. Ready Mix		801-438-2865	039
	Jake's Crane & Rigging		702-736-4082	044
	R.W. Jones Trucking Co.		801-789-1231	055
	L & H Trucking	Willard Lypscomb	707-987-2754	017
	L & L Muds, Inc.	Lad Lahrer	303-434-5527	027
	Loffland Bros	Dewey Milner	805-327-4695	015
	Lor, Inc.		713-999-8111	053
	M & M Roust-A-Bout		801-759-2464	051
	Midway Fishing Tools	Darrell Swisher	707-585-1457	028
	Midway Wellheads		805-327-4471	029
	National Supply	Floyd King	805-589-5755	030
	NL Acme Tools			038
	Northwest Tool Company	Orville Neal	707-374-5105	054
	Oilwell	Dale Bingham	415-331-0555	057
	O.K. Kile		805-324-4046	045
	William Reed Welding	William Reed	801-489-7431	037
	RMICO (Rollins Machine)		801-387-2451	047
	Ryerson & Son		415-653-2933	040
	Schaefer Valve		805-834-4738	041
	Schlumber Well Service		801-789-3392	031
	Shurtleff & Andrews Corp.		801-973-9096	052
	Sullivan Rathole Drlg.		307-382-6667	018
	ThermaSource, Inc.	Louis Capuano	707-523-2960	016
	Thermochem	Paul Hirtz	707-575-1310	026
	Tillett Tools & Supplies	George Tillett	707-523-1166	032
	W-K-M Division	Roger Bastian	707-838-4439	033
	Western Air	Craig Schweider	800-525-0803	034
	Wilson Supply	Larry Sutton	213-990-6355	035

RIG SPECIFICATIONS

- Type : Porta-drill TKT or equivalent
- Mast : 100,000 lbs. capacity, capable of standing 1500 ft. of 3 1/2" drill pipe in 40' lengths.
- Substructure : 100,000 lbs. capacity; and giving a clearance under the rotary table of 9', w/ catwalk.
- Air Compressor : Capable of delivering 1200 SCFM at 800psig
- Mud pumps : Two 5X7 Gardner Denver or equivalent.
- Mud pit (steel) : To be provided by MEI
- Drill String : Square kelly for use in rotating head while air drilling. (4 1/4")
2000' of 3 1/2" grade E drill pipe (inspected prior to arrival).
15- 4 1/4" drill collars (inspected and with thread protectors installed).
1 - 6" drill collar (inspected and w/protector
Bit subs (bored for float) and all other necessary subs. Also, float for bit sub.
Mission Mega-drill hammer for drilling in 6 1/4" hole.
String float sub with float.
Lower Kelly Cock Valve, with wrench
All tools to handle the above, i.e., lift subs, chain tongs, safety clamps, elevators, slips, tongs with torque indicator and correct heads, spinning chain, etc.
- lighting : Generator and sufficient vapor proof lights to light up the entire work area.
- Piping : 1 joint of 10 3/4" csg. for use as riser and conductor while drilling 9 7/8" hole.(need only 15'.)
All necessary piping to hook up from stand-pipe to pump and air compressor, pump to pits, BOP to pits, kill line to pumps, and pumps to mixing facilities.
- BOPE : 6" 900 series hydraulic actuated double gate BOP with csg ram, 3 1/2" DP ram, ~~with high temp rubbers.~~
6" 900 series rotating head (capable of passing 6 1/4" bit)with 3 1/2" high heat rotating head rubbers.
6" 900 series mud cross with one two inch valve on each side and a check valve on the kill line side.
One 2" choke manifold, and piping.
Accumulator with dual stations and piping to rig it up 50' from the well.
One 6" API 900 series X 8" ANSI 300 series adaptor spool.

Water truck : 80 bbl. water truck with pump to load and unload.

Water Storage : Will be provided by MEI.

Bit breakers : For 9 7/8" and 6 1/4" bits.

Pipe dope : For drill pipe, collars, and casing.

Recorders : Geolograph for recording penetration rate.

Instruments : Potco w/ heat shield and sub for maximum registering thermometer (6 and 12 degree instruments).

Mud mixing : High pressure hopper, or centrifugal pump to operate the low pressure system of MEI's.

Solids control equip : Desander and desilter. (shale shaker to be provided by MEI, but will need screens.) Need centrifugal to operate MEI's des. and des.

Mud checking equipment : Vis cup and funnel. Mud scale.

Measurement : Steel tenths tape for measuring casing. Caliper for checking OD and ID.

Marking : Paint stick.

Fork lift : To be provided by MEI.

Fuel and fuel storage : to be provided by contractor.

Tools :: Chain tongs, casing tongs, slips, spider, elevator, and links for 7" casing.

Equipment and supplies :

2 rubbers for rotating head	-----	\$1000
366' of 7" 20# STEEL surface csg.		
@ 9.50 per/ft.	-----	2850
6 1/4" and 9 7/8" rerun button bits	-----	1750
Cement shoe, baffle plate and plug		250
2 - 7" X 9 7/8" bow type centralizers		
Sample bags.		
Spare 3 1/2" ram rubber for BOP		
Drilling products (mud)	-----	2000
Surface casing cement	-----	2000
Gas detection equipment	-----	200
8" ANSI 300 series starter flange and adaptor to 7" casing	-----	1000
8" ANSI 300 series master gate	---	1350
2 - 2" X 6" sch 80 nipples	-----	
2 - 2" gate valves (800 psi)		

Wind sock & air packs : MEI would provide wind sock and 5 air packs.

A LITHOLOGIC EVALUATION OF CUTTINGS FROM WELLS

S-87-1 AND S-87-4

J.N. Moore

Sept. 1987

SUMMARY AND CONCLUSIONS

S-87-1 and S-87-4 penetrated variably altered and faulted ash-flow tuffs belonging to the Three Creeks Tuff Member of the Bullion Canyon Volcanics. The ash-flow tuffs can be separated into two distinct stratigraphic units in S-87-1. The upper unit is characterized by coarse phenocrysts of biotite, quartz and andesine. The lower unit is finer grained but mineralogically similar. Only the upper unit was penetrated in S-87-4.

Steam production in S-87-4 appears to be controlled by the intersection of two distinct fault zones. The oldest of these fault zones is characterized by strong silicification and argillic alteration. Geologic relationships suggest that this fault zone is a steeply dipping, pre-geothermal structure that is disconnected from the underlying geothermal reservoir. Thus, this fault zone cannot represent the primary conduit that feeds the shallow portions of the steam cap. Instead, this fault zone may form a shallow steam trap where recent fracturing of brittle rocks has resulted in locally increased permeabilities. North trending faults bounding the eastern margin of the Sulphurdale pit are more likely zones of upwelling. These faults are younger than the gravitational glide blocks and control the present surface expression of the geothermal system at Sulphurdale.

Mercury surveys may provide additional information on the locations of these young fault zones. This technique may be particularly effective since reconnaissance studies of drill hole cuttings have shown that anomalous concentrations of mercury are

associated with geothermal alteration at Cove Fort and Sulphurdale (Ross and others, 1982). Exploratory holes drilled along these fault zones and at their intersections should, if possible, be planned to penetrate the base of the glide blocks (approximately 2000 feet) and the underlying reservoir.

STRATIGRAPHIC RELATIONSHIPS

The rocks penetrated in drill holes S-87-1 and S-87-4 consist entirely of the Three Creeks Tuff Member of the Bullion Canyon Volcanics. Within the Cove Fort-Sulphurdale area, the Three Creeks Tuff overlies a heterogeneous sequence of locally derived lava flows, flow breccias, and minor ash-flow tuffs. The Three Creeks Tuff is in turn overlain by silicic ash-flow tuffs and intruded by latite to quartz-monzonite dikes and stocks.

The Three Creeks Tuff was erupted from a caldera located in the southern Pavant Range 27 m.y. ago (Steven and others, 1977). Within the source caldera, the tuff can be divided into three cooling units which differ primarily in the degree of welding they exhibit. The lower and upper units consist of red to gray densely welded ash-flow tuff. The middle unit is poorly welded and white in color. The oldest unit is the most widely distributed and the only one recognized in the Cove Fort-Sulphurdale area (Ross and Moore, 1985).

The lower cooling unit penetrated in the wells consists of approximately 50% phenocrysts of andesine (33%), biotite (10%), quartz (5%), and minor hornblende, sphene, and magnetite in a

matrix of densely welded shards and ash. Near Sulphurdale, the lower cooling unit of the Three Creeks Tuff can be further divided into two parts. The upper part is dark gray when fresh and is characterized by plates of biotite up to several millimeters across, and euhedral quartz crystals with beta morphology. The lower part ranges from gray to red-brown in color, is much finer grained, more variable in the degree of welding (moderate to densely welded), and commonly contains numerous lithic fragments. The contact between the upper and lower units was encountered at a depth of 780 feet in S-87-1. Only the upper unit was encountered in S-87-4.

HYDROTHERMAL ALTERATION

The alteration in S-87-1 and S-87-4 is similar to that occurring in wells 42-7, 34-7 and 34-7B. Weak to moderate argillic alteration is the most common alteration type encountered in the wells. The rocks in these intervals are characterized by partial to complete replacement of the feldspar phenocrysts by clay minerals and carbonate, alteration of hornblende to chlorite and carbonate, and minor alteration of biotite to hematite and clays. More intense argillic alteration is characterized by the replacement of biotite by pyrite and clays. Increasing argillic alteration is typically accompanied by a progressive bleaching of the matrix of the ash-flow tuffs.

Silicified and in places, brecciated ash-flow tuff is associated with the argillically altered rocks between 100 to 170

and 440 to 900 feet in S-87-4 and between 140 to 290 and 640 to 650 feet in S-87-1. In addition, intensely silicified breccias occur in the lower 40 feet of both wells and between 440 and 460 feet in S-87-4. With the exception of the interval between 440 and 460 feet in S-87-4, the silicified cuttings are characterized by variable quantities of pyrite (up to approximately 5%) and the complete replacement of all primary minerals by quartz. In contrast, the silicified cuttings from 440 to 460 feet in S-87-4 are characterized by strong hematite development which give the samples a deep red color. *derived from pyrite??*

Veins and aggregates consisting of variable proportions of carbonate + hematite + chlorite and quartz + pyrite + hematite + chlorite + carbonate occur in trace amounts throughout both wells. The aggregates of these minerals are interpreted as vein fragments. Textural relationships at the base of S-87-1 suggest that carbonate veining in these rocks in part postdates the silicification. Here, silicified fragments containing pyrite occur in a matrix consisting dominantly of carbonate.

SIGNIFICANCE OF THE SECONDARY MINERAL ASSEMBLAGES

Temperature and Age Relationships

Geologic mapping and analyses of cuttings from wells in the Sulphurdale area suggests that the hydrothermal alteration of the Three Creeks Tuff is controlled primarily by two factors, the temperature of the fluids during alteration and the distribution of faults and fractures (Moore and Samberg, 1979, Ross and Moore,

1985, Moore, unpub. rept. to MEI). In addition, Moore and Samberg (1979) recognized two distinct periods of hydrothermal alteration of the Three Creeks Tuff. The earliest alteration occurred approximately 24 m.y. ago and accompanied the intrusion of quartz-monzonite stocks beneath the Sulphurdale area. Alteration related to this thermal event is characterized by quartz-sulfide mineralization. More recent alteration, related to the present geothermal system is characterized by surficial acid alteration and possibly the formation of anhydrite in 42-7. Significantly, it has not yet been demonstrated that a high-temperature brine related to the present geothermal system ever reached the surface in the Sulphurdale area.

The hydrothermal alteration documented in S-87-1 and S-87-4 is typical of moderate to high-temperature thermal regimes. The presence of clays and chlorite, and the absence of epidote in these rocks suggests that temperatures were probably in the range of 175 to 250°C during alteration. Similar alteration assemblages, associated with base metal sulfides and fluorite, have been observed in 34-7 and 34-7B. While these observations indicate that high-temperature liquids circulated throughout this area in the past, the incompatibility of these assemblages with the modern, shallow thermal regime suggest that the alteration occurring the geothermal wells is related to the emplacement of the quartz-monzonite and not to the present geothermal system. Nevertheless, the association of steam with silicified zones in 34-7, 34-7B and S-87-4 demonstrates that zones of intense

silicification act as important conduits for the steam in the glide blocks capping the deeper portions of the geothermal reservoir.

Structural Relationships

Previous geologic and geophysical studies have demonstrated that the strongly silicified and argillically altered fault zones near Sulphurdale are steeply dipping and that the intensity of the alteration decreases with distance from the major fault planes (Moore and Samberg, 1979; Ross and Moore, 1985, Moore, unpub. rept to MEI). Although the number and directions of the faults encountered in S-87-1 and S-87-4 cannot be uniquely defined from an analysis of the cuttings, several inferences can be made with respect to their distribution, thickness, and direction of movement. The widespread occurrence of silicified cuttings and moderate to strong argillic alteration in S-87-4 suggest that the well closely followed a major, nearly vertical fault zone. The fault planes encountered within this zone are marked by silicified breccias. These breccias were intersected at depths of 150 to 160 feet, 430 to 460 feet and below 910 feet. Furthermore, the stratigraphic relationships in S-87-1 and S-87-4 indicate that S-87-4 penetrated a block that is downdropped relative to S-87-1. It is likely that this fault zone is part of the east-west trending zone of structures that is prominently developed near the production wells.

Hydrothermal alteration of the rocks in S-87-1 is significantly less intense, suggesting that the well was drilled primarily through the footwall of the fault zone penetrated by 34-7 and 34-7B. The only major fault planes penetrated in this well occur below a depth of 1050 feet.

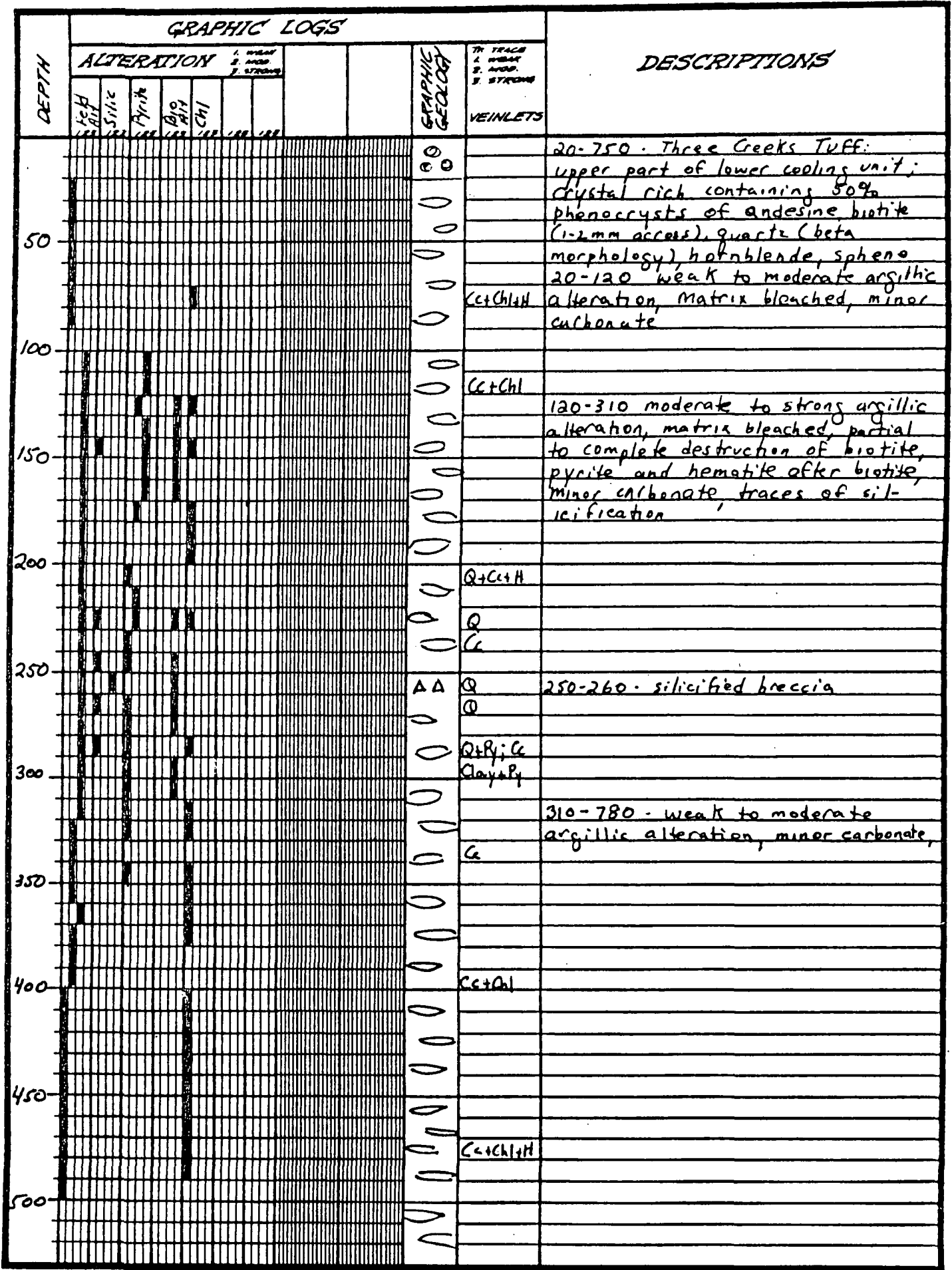
REFERENCES

Moore, J.N., and Samberg, S.M., 1979, Geology of the Cove Fort-Sulphurdale KGRA: Univ. of Utah Res. Inst. Rept. 18, 44p.

Ross, H.P., and Moore, J.N., 1985, Geophysical investigations of the Cove Fort-Sulphurdale geothermal system, Utah: Geophysics, v. 50. p. 1732-45.

Ross, H.P., Moore, J.N., and Christensen, O.D., 1982, The Cove Fort-Sulphurdale KGRA-a geologic and geophysical case study: Univ. of Utah Res. Inst. Rept. 90, 47p.

Steven, T.A., Cunningham, C.G., Naeser, C.W., and Mehnert, H.H., 1977, Revised stratigraphy and radiometric ages of volcanic rocks and mineral deposits in the Marysvale area, west-central Utah: U.S.G.S. Open-File Rept. 77-569, 45 p.



DRILL HOLE S-87-1
 LOCATION _____

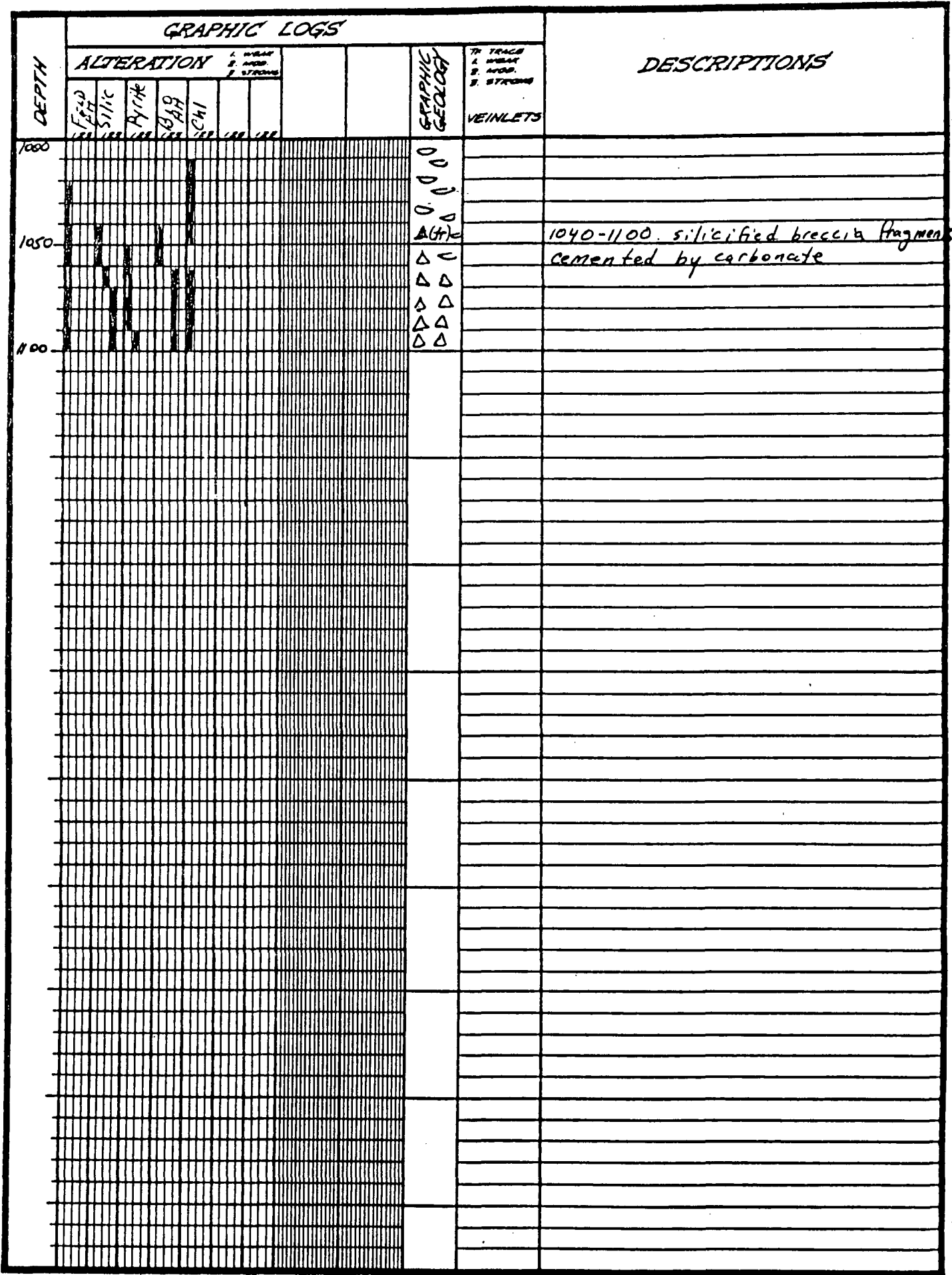
LOGGED BY _____

GRAPHIC LOGS										DESCRIPTIONS
DEPTH	ALTERATION					GRAPHIC GEOLOGY	VEINLETS	TRACE		
	1. WEAK	2. MOD.	3. STRONG	4. WEAK	5. MOD.			6. STRONG		
	KA	SI	Pyrite	Chl	Ill					
500										
550										
600										
650										
700										
750										
800										780-1100 - Three Creeks Tuff lower part of lower cooling Unit, gray to red-brown, similar in mineralogy to upper part but much finer grained; coarse grained biotite and quartz absent
850										780-1040 - weak to moderate argillic alteration, minor carbonate, minor hematite, traces of silicification
900										
950										
1000										

DRILL HOLE S-87-1
LOCATION _____



LOGGED BY _____



DRILL HOLE S-87-1

LOCATION _____



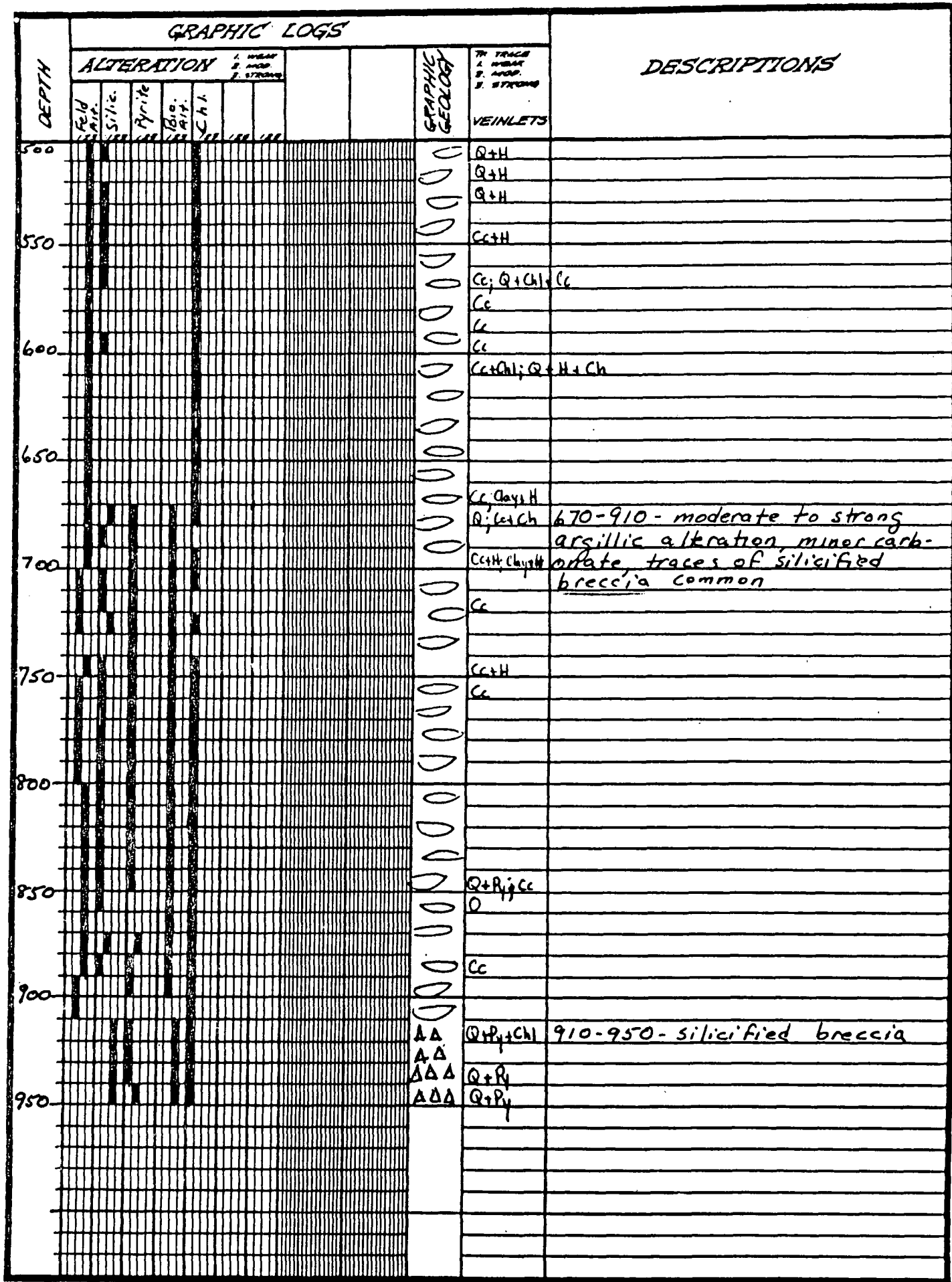
LOGGED BY _____

GRAPHIC LOGS										GRAPHIC GEOLOGY	TR. TRACE 1. WEAK 2. MOD. 3. STRONG	VEINLETS	DESCRIPTIONS
DEPTH	ALTERATION						GRAPHIC GEOLOGY	TR. TRACE	VEINLETS				
	Fs.B. ALT.	Silic.	Pyrit.	Chl. ALT.	Chl.								
0													
50													10-950 Three Creeks Tuff: upper part of lower cooling unit. crystal rich containing 50% phenocrysts of andesine, biotite (1-2mm across) quartz (beta morphology), hornblende, sphene
100													10-60 weak to moderate argillic alteration, matrix bleached
150													40-60 sample contaminated with gravel
200													80-190 moderate to strong argillic alteration, matrix bleached, partial to complete destruction of biotite, minor carbonate, minor silicification
250													
300													190-430 - weak to moderate argillic alteration, minor carbonate
350													
400													
450													440-460 - silicified, hematite stained breccia
500													460-670 - weak to moderate argillic alteration, minor carbonate, traces of silicified breccia common

DRILL HOLE S-87-4
 LOCATION _____



LOGGED BY _____



DRILL HOLE S-87-4
 LOCATION _____



LOGGED BY _____

MOTHER EARTH INDUSTRIES INC.

Appendix W-1

Donald L. Pendleton
District Manager
United States Department of the Interior
Bureau of Land Management
150 East 900 North
Richfield, UT 84701

June 16, 1987

Re: Cove Fort-Sulphurdale KGRA transmittals

Dear Don:

Attached for review/approval are the following items:

1. Proposed casing plan change for well S-87-1. The only change is the addition of 40 feet of 13 3/8" conductor pipe to be cemented with ready-mix. A correction is made to my letter to you dated 5/24/87. That letter requests separate approval of S-87-2 prior to S-87-1. The correct situation is as follows:

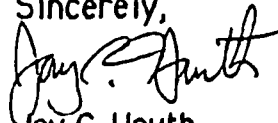
S-87-1 location is on previously disturbed land, and MEI requests approval of this primary target location. S-87-2 location is on undisturbed land, and MEI will submit a location drawing showing topsoil stockpiles, cuts/fills, etc., if this location becomes a priority again. Currently, S-87-2 is a low priority for MEI.

2. Geothermal Drilling Permits for two new wells: S-87-3 and S-87-4. These wells have an identical drilling program to S-87-1, including the 40' of 13 3/8" conductor. The locations for these wells were inspected by Toby Manzanaras/BLM and Fred Fuller/FS on June 4, 1987.

3. Submittal of data recorded from temperature gradient holes drilled this spring.

If there are any questions, please call. Thanks for your considerations of these GDP's.

Sincerely,



Jay C. Hauth
Operations Manager

INTERSEARCH

International Learning & Research, Inc.

Archeological Consultants

July 21, 1987

Dr. Richard Thompson,
President

Georgia Beth Thompson
Vice President - Administration

Barbara A. Walling
Vice President - Field Operations

Mr. John Branch
Richfield District
Bureau of Land Management
150 East 900 North
Richfield, UT 84701

(Note: 587-1 location
was entirely on 34B-7
wellpad - all disturbed area)

Dear Mr. Branch:

This letter summarizes the results of an archeological survey of two small drill sites located in the Mother Earth Geothermal Lease Tract near Sulphurdale, Utah in Beaver and Millard Counties. The project was authorized by BLM Antiquities Permit No. 87-UT-54955 and Utah State Antiquities Permit No. U-87-IG-259f. The field work was carried out by Barbara A. Walling while Richard A. Thompson was Principle Investigator for the project.

The two drill sites, designated 87-3 and 87-4, are plotted on the enclosed map. Both are found in the NW $\frac{1}{4}$ of Sec. 7, T26S, R6W (SLM) in Beaver County. A records search, conducted by the State Historic Preservation Office showed that no sites had previously been recorded within the two project areas.

Site 87-3 lies in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 7, T26S, R6W and is found just west of a dirt road on ground that has been substantially disturbed. The actual drill point is set only 5 meters from the existing road in a small dump of burned wood and ash. To the north and south of the drill point the surface drops down to a damp area that appears to have been impacted by livestock grazing and an old temperature gradient hole. North of the drill point, the ground rises slightly, moving up into a stand of pinon and juniper. The greater part of the ground cover is, however, composed of grass. A ten acre tract, approximately 110 meters on a side, was surveyed by walking a series of contiguous transects, each 15 meters wide, until the entire drill site had been examined.

Site 87-4 lies in the SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 7, T26S, R6W just east of the existing dirt road on a slope of from 5 to 15°. The vegetation consists of an overstory of juniper and pinon while some grass grows between the trees. The drill point is 10 meters east of the road on a relatively level area. A short access road, contained within the 10 acres, will provide access to the drill point. The 10 acres again measured 110 meters on a side and the area was surveyed by walking a series of contiguous transects each 15 meters wide, until the entire area was examined.

The survey of both parcels of land failed to identify evidence of prehistoric or historic occupation or use. Thus no cultural resources are endangered by the proposed drilling.

Sincerely,

Richard A. Thompson
Richard A. Thompson



STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

1636 West North Temple • Suite 220 • Salt Lake City, UT 84116-3156 • 801-533-6071

July 23, 1987

Mr. Jay C. Hauth, Operations Manager
Mother Earth Industries, Inc.
3761 South 700 East, Suite 200
Salt Lake City, UT 84106

RE: Request to Drill Geothermal Wells
Expiration Date: January 27, 1987

Dear Mr. Hauth:

Reference is made to your request of June 2, 1986, to drill two geothermal wells as part of MEI's continued field development program at the Cove Fort/Sulfurdale KGRA. The locations of these wells are to be:

- S 87-3 South 2160 feet and East 1400 feet from NW Corner
Section 7, T26S, R6W, SLB&M.
- S 87-4 South 2600 feet and East 1450 feet from NW Corner
Section 7, T26S, R6W, SLB&M.

By this letter you are hereby granted permission to drill, subject to the following conditions.

1. These wells are currently being approved as test wells. After completion and testing of the wells, if it is desired to use them for production wells the proper water rights may be obtained at a later date.
2. The driller must be bonded and have a current well driller's permit from the Division of Water Rights. A federal bond covering the wells will satisfy this requirement.
3. The wells may be drilled to a maximum depth of 1500 feet each, more or less. The applicant must obtain written permission from the State Engineer prior to drilling to a depth significantly beyond 1500 feet, i.e., to a depth requiring changes or additions to the Plan of Operations submitted to the State Engineer, or posing a threat to the safety of personnel or the structural integrity of the well.
4. The applicant must notify the division prior to 1) the commencement of drilling, and 2) testing the BOP equipment and the surface casing, so that a representative may be on site for inspections. The applicant must also notify the Division prior to testing the wells for flow or

resource characteristics so that a representative of the Division may observe the test.

5. The casing shall be installed according to the schedule in the Plan of Operations with the request to drill, summarized as follows:
 - A. The conductor casing (13 3/8") shall be installed to a depth of 40 feet and the annular space shall be cemented back solid to the surface.
 - B. The surface casing (7") shall be set at a depth of approximately 400 feet and cemented back to the surface. Blowout prevention equipment shall be installed and tested before drilling further.
 - C. The well may be drilled open-hole below the surface casing.

Any variances from the Plan of Operations must be approved by the State Engineer prior to their implementation, except in case of emergency.

6. The BOP Equipment and the surface casing shall be pressure tested in accordance with federal regulations as contained in Federal GRO Order No. 2. The applicant shall notify the Division prior to the test so that a representative of the Division may witness the test.
7. Mud return temperatures shall be monitored and recorded at least with the addition of each new drill pipe, or 30 feet, whichever is less. If the return temperatures reach 125 degrees Fahrenheit before the surface casing has been set, drilling shall cease immediately until casing has been set and/or BOP equipment has been installed and successfully tested.
8. The driller shall take all necessary precautions to prevent fires, blowouts, or other hazards and to conduct all activities in a safe and workmanlike manner. The driller shall be prepared with proper equipment and drilling techniques to handle either artesian or thermal pressure or both, particularly in the bedrock layers which apparently form the reservoir matrix. The driller shall utilize such equipment as is necessary to contain the well at any stage, whether above or within the bedrock layer. Appropriate H₂S warning devices shall be utilized during all drilling and testing operations, and personnel shall be instructed in proper emergency procedures and the use of emergency equipment.
9. The applicant shall provide for proper and safe disposal of any geothermal fluids produced during the drilling or testing of the wells. Plans for disposal pits or other facilities must be approved by the State Engineer prior to the commencement of testing. No more water may be diverted from any of the wells than is necessary to conduct the tests associated with drilling. Any extended flow test to determine the production capabilities of the wells must be approved in writing by the State Engineer prior to the commencement of testing.

10. In case of any emergency, the applicant shall immediately notify the Division at one of the numbers listed below:

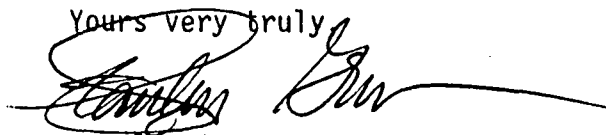
Gerald Stoker (801) 586-4231
Stanley Green (801) 533-7164

11. The applicant shall submit to the Division all drilling reports and logs at the completion of drilling, and geologic data, chemical analyses, and test results at the completion of testing or earlier if the State Engineer determines that the information is necessary for imminent decisions regarding the management of the resource. This information will, at the request of the applicant, be held confidential until it is released by the applicant.

This is permission for the licensed driller to begin drilling these wells. Note that the expiration date of this letter is January 23, 1987.

Please notify Stanley Green at 533-7164 or Gerald Stoker, the Area Engineer, at 586-4231 prior to the commencement of drilling operations so that a representative of the Division may be on site when drilling is begun. It is the responsibility of the applicant to obtain proper water rights and other necessary permits.

Yours very truly



Stanley Green, P.E.
Directing Appropriations Engineer

SG:rc

cc: Gerald W. Stoker

cc: Fishlake National Forest
Att: Mr. Kay Shurtz
115 East 900 North
Richfield, UT 84701

GEOOTHERMAL DRILLING PERMIT

The U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operation.

1. TYPE OF WORK: DRILL NEW WELL REDRILL () DEEPEN () PLUG BACK () DIRECTIONALLY DRILL () OTHER ()

1b. WELL TYPE: PRODUCTION () INJECTION () HEAT EXCHANGE () OBSERVATION WATER SUPPLY () OTHER ()

1c. WELL STATUS: To be drilled

2. NAME OF LESSEE/OPERATOR
Mother Earth Industries, Inc

3. ADDRESS OF LESSEE/OPERATOR
3761 S. 700 E. SLC, UT 84106

15. LOCATION OF WELL
At surface *2600' S. 1450' E. from NW Cor Sec 7, T26S, R6W
At proposed prod. zone Same

16. DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE
~ 130' W. To F.S. / Fee Boundary

17. DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE
~ 400' NW. to well 34A-7, Sec 7, T26S, R6W

18. DRILLING MEDIA AND CHARACTERISTICS: AIR WATER MUD FOAM Other ()

19. PROPOSED DEPTH
MEASURED: 1500'
TRUE VERTICAL: 1500'

20. ELEVATIONS: ESTIMATED FINAL ()
- 6300'
REFERENCE DATUM: GR () MAT DP () KB () RT ()
CASINGHEAD PLATE () OTHER ()

21. EXISTING AND/OR PROPOSED CASING AND CEMENTING PROGRAM (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
17 1/2"	13 3/8"	61 ppf	TBT+C	J-55	0	40±	28 Ft ³
9 7/8"	7"	20 ppf	ST+C	J-55	0	250±	80 Ft ³
6 1/4"	Open Hole	-	-	-	250±	1500±	-

22. PROPOSED WORK SUMMARY

See Attached program, incl. BOP configuration

* Wellhead location will be surveyed on completion +
plats submitted (Use additional space on reverse side of form)

23. SIGNED Jay R. Smith TITLE Operations Manager DATE 6-16-87

APPROVED BY [Signature] TITLE Associate Dist Mgr DATE 7-31-87

CONDITIONS OF APPROVAL ATTACHED
TO OPERATOR'S COPY

This permit is required by law (30 U.S.C. 1023), regulations, and the terms and conditions of the Mineral Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

UT-050-87-G-064

CONDITIONS OF APPROVAL FOR NOTICE TO DRILL

Company: Mother Earth Industries Well No.: S-87-4
Location: T.26S., R.6W., sec 7 SENW Lease No.: U-29557

All lease operations shall be conducted in accordance with: The Geothermal Steam Act of 1970, as amended; applicable regulations, Geothermal Resources Operational Orders; lease terms and conditions; and applicable conditions of approval attached to the plans of operation approved for lease operations.

A. DRILLING PROGRAM

1. All fresh water and water zones encountered during drilling shall be recorded by depth and adequately protected. If water is encountered and the casing program must be modified to protect the zone, the District Manager (DM), or his representative, shall be notified immediately to determine required remedial corrective action.
2. A qualified H₂S safety company shall be onsite and rigged up with standard safety equipment and procedures during the drilling of the well.
3. There will be no deviation from the proposed drilling and completion program without prior approval of the DM, or his representative. "Geothermal Sundry Notice" (Form 9-1958) shall be filed for approval for all changes of plans and other operations in accordance with 43 CFR 3264.2-2.
4. Prior to drilling out the surface casing shoe, the ram type preventers shall be tested to rated working pressure if isolated by test plug or to 70 percent internal yield pressure of casing if BOP stack is not isolated from casing.

All BOPE and testing procedures shall be consistent with GRO No. 2. Pressure tests shall be conducted before drilling out from under all casing strings which are set and cemented in place. BOP controls shall be installed prior to drilling the surface casing plug and will remain in use until the well is completed or abandoned. Preventers will be inspected and operated at least daily to assure good mechanical working order, and this inspection shall be recorded on the daily drilling report. Preventers shall be pressure tested before drilling casing cement plugs.

5. The DM, or his representative, shall be notified, with sufficient lead time, in order to have a BLM representative on location while testing BOPE, running all casing strings and cementing.
6. Daily drilling and completion progress reports shall be submitted to the Richfield District Office on a weekly basis.
7. The spud date shall be reported orally to the DM within 48 hours after spudding. If the spudding occurs on a weekend or holiday, the report shall be made on the following regular work day. The oral report shall be followed up with a sundry notice.
8. No well abandonment operations shall be commenced without prior approval of the DM, or his representative. In the case of failures or emergencies, oral approval shall be obtained from the DM, or his representative. In the event after hours approvals are necessary, contact one of the following individuals:

John Branch	(801) 896-8583
Howard Lemm	(801) 486-5820
Robert Hendricks	(801) 484-2294

B Surface Use Program

1. Topsoil is to be removed from areas requiring excavation for drilling activities, roads, and other activities connected with these operations. The topsoil is to be stockpiled and protected for use in reclaiming the disturbed areas.
2. Detailed drawings showing all new cuts and fills, the location of stored topsoil--old and new--and the well site in relation to existing well pads, roads and other surrounding features is required to be submitted to the Richfield District Office within 30 days of permit approval. These drawings shall be submitted in triplicate.

MOTHER EARTH INDUSTRIES INC.

Appendix D-5

J. Casper

October 2, 1987

Donald L. Pendleton
District Manager
United States Department of the Interior
Bureau of Land Management
150 East 900 North
Richfield, Utah 84701

Re: Transmittal of Location Drawings for wells S87-1 and S87-4

Dear Don:

Attached for file/information are well location and wellhead survey drawings for the referenced wells. Included as required are surveyed casing head locations, topsoil stockpiles, and cut/fill contours.

MEI is now using the following uniform basis for survey coordinates:

The basis for all bearing coordinates is North $00^{\circ}54'14''$ East between the Southwest and Northwest Corners of Section 7, Township 26 South, Range 6 West, Salt Lake Base and Meridian.

SW Corner= 44703.67042 N
49916.43333 E

NW Corner= 50000.00000 N
50000.00000 E

The coordinates for the new wells are as follows:

S87-1: 47793.90393 N
51682.29962 E

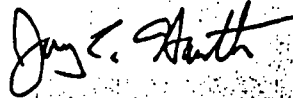
S87-4: 47420.77242 N
51333.86176 E

and additionally,

24-7: 47862.71492 N
50867.94752 E

MEI's commitment earlier this year to compiling a uniform data base for field survey data is now starting pay off. If there is a desire for different types, sizes, or configurations of drawings, please let me know and I will try to accommodate.

Sincerely,



Jay C. Hauth
Operations Manager

JCH/

GEOHERMAL WELL COMPLETION REPORT

U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in case with requisite attachments with the Supervisor within 30 days after completion of permitted operations.

1a. WELL TYPE: PRODUCTION () INJECTION () DISPOSAL () WATER SUPPLY () OBSERVATION
COLD () HEAT EXCHANGE () OTHER ()

1b. COMPLETION: NEW WORKOVER () DEEPEMED () PLUGBACK () REDRILL ()
RECOMPLETED () DRILLED & ABANDONED () OTHER ()

2. NAME OF LESSEE/OPERATOR
MOTHER EARTH INDUSTRIES, INC.

3. ADDRESS OF LESSEE/OPERATOR
3761 S. 700 E. SLC, UT. 84106

18. LOCATION OF WELL
At Surface: 2560 ft. south, 1333 ft. East of low cor. Sec. 7 T26S, R6W SLB4H
At Top of Production Zone: same
At Total Depth: same

19. TOTAL DEPTH
Measured: 1038 True Vertical: 1038

20. PLUGBACK TOTAL DEPTH
Measured: N/A True Vertical: N/A

21. ELEVATION: ESTIMATED () FINAL 6277.5
REFERENCE DATUM: GR () MAT DP () KB () RT () CASINGHEAD FLANGE () OTHER ()

22. DRILLING MEDIA: AIR WATER () MUD FOAM OTHER ()
List Characteristics: BITRITE, GEL, LCM - HV. WT 8.2 #/gal - MUD.
FOAM: Detergent.
AIR @ 50-150 PSIG.

23. LOG TYPE & INTERVALS
N/A

4. LEASE SERIAL NO.
U-29557

5. SURFACE MANAGER: BLM () FS
Other ()

6. UNIT AGREEMENT NAME
N/A

7. WELL NO.
5-87-4

8. PERMIT NO.
U-650-87-6-06

9. FIELD OR AREA
CFS KGRA

10. SEC. T., R., B. & M.
Sec 7, T26S, R6W SLB4H

11. COUNTY
Beaver

12. STATE
Utah

13. SPUD DATE
8-1-87

DATE T.D. REACHED
8-12-87

14. COMPLETION DATE (Ready to produce)
N/A

15. DIRECTIONALLY DRILLED INTERVALS
N/A

16. SURVEYED INTERVALS
N/A

17. CORE SIZE AND INTERVALS
N/A

CASING RECORD							
Size	Weight	Grade	Collars & Threads	Depths Set		Hole Size	Cementing Record (slurry volume)
				Top	Shoe		
13 3/8	61 #/ft	J-55	BT & C	0	33	17 1/2"	23 ft 3
7"	20 #/ft	J-55	ST & C	0	250	9 7/8"	80 ft 3
OH	-	-	-	250	1038	6 1/4"	-

LINER RECORD							
Size	Weight	Grade	Collars & Threads	Top	Bottom	Perforated Intervals	Cementing Record (slurry volume)
None							

TUBING RECORD					27. CEMENT SQUEEZE, ACID, FRACTURE, ETC. (detail type, amount, interval)
Size	Weight	Grade	Depth Set	Packer Depth	
None					None

PERFORATION RECORD				
Type	Total No.	Density (No./ft)	Size	Intervals
None				

29. ATTACHMENTS & PREVIOUS SUBMITTALS: List all reports, surveys, tests and logs, not listed in item 23, which have resulted from drilling and completion operations. List relevant previously furnished data with date of submittal referenced.
None

30. WELL STATUS: PRODUCING () SHUT-IN SUSPENDED () INJECTION () DISPOSAL () HEAT EXCHANGE () ABANDONED () WATER SUPPLY () OTHER ()

31. DO YOU CONSIDER THE WELL TO BE COMMERCIAL? NO EXPLAIN: - This well is a slim hole intended for observation, though it indicates commercial quantities of steam can be produced. An offsetting large diameter well will be required.

32. I hereby certify the information on this report and the attached information is complete & accurate according to the best of my knowledge.

SIGNED: _____ TITLE _____ DATE _____

Report is required by law (30 U.S.C. 1023); regulations: 30 CFR 270.37, 30 CFR 270.73; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. Failure to report in a timely prescribed manner can result in shutting down operations, suspension and or recommendation of cancellation of lease (30 U.S.C. 1011, 30 CFR 270.80, 43 CFR 3244.3). The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

INSTRUCTIONS

GENERAL: This form is designed for submitting a complete and accurate geothermal well completion report, and should be accompanied by a detailed chronological history of well operations and final copies of the results of any logs, surveys or tests performed on the well, which have not previously been submitted. The report shall be submitted within 30 days after the date of completion of continuous well activities, as determined by the District Geothermal Supervisor. The completion date in many cases will be the day the drilling rig is released. The Supervisor may postpone the required report submittal date if adequate justification is presented by the lessee.

ITEM 18: Show the surface location coordinates from the nearest section corner or tract line. Show production zone and total depth coordinates if surface location if the well is directionally drilled.

ITEM 34: If the well is immediately placed into operation without testing, this section should reflect the first month's production data.

ITEMS 35 & 36: Indicate the depth(s) of subsurface pressure and temperature measurement, and include the reference datum.

33. TEST DATE <i>Aug 13 1987</i>		WELL TEST PRODUCTION METHOD: FLOWING (<input checked="" type="checkbox"/>) PUMPING () - include size, type, intake depth, etc. OTHER ()	
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34. PRODUCTION				ENTHALPY (Btu/lb) <i>1.163</i>
HOURS TESTED <i>83 hrs</i>	TOTAL LIQUIDS (lb) <i>35,000 #/hr</i>	STEAM (lb) <i>35,000 #/hr</i>	WATER (lb)	

35. STATIC TEST DATA				
DEPTH <i>1038 ft</i>	SURFACE PRESSURE (psig) <i>51</i>	SUBSURFACE PRESSURE (psig) <i>—</i>	SUBSURFACE TEMPERATURE (°F) <i>—</i>	WATER ANALYSIS Total Dissolved Solids PH <i>5.5</i> <i>Comments</i>

36. FLOWING TEST DATA						
SURFACE PRESSURE WELLHEAD: <i>15 psig</i> SEPARATOR:		SUBSURFACE PRESSURE at <i>—</i> feet	SURFACE TEMPERATURE <i>± 250°F</i>	SUBSURFACE TEMPERATURE at top of peris. <i>—</i>	AVE. TOTAL MASS FLOW RATE PER HOUR	
					TOTAL (lb/hr) <i>35,000</i>	STEAM (lb/hr) <i>35,000</i>
					WATER (lb/hr) <i>0</i>	

37. SUMMARY OF POROUS ZONES: Show all important porous zones and contents of each; cored intervals with recoveries, drill stem or formation tests with depth of interval tested, time open, cushion used, and flowing and shut-in pressures, temperatures and recoveries.

38. GEOLOGIC MARKERS (TOP)

FORMATION	TOP	BOTTOM	DESCRIPTION OF DETAILS	NAME	MEASURED DEPTH	TRUE VERTICAL DEPTH
<i>T7b</i>	<i>0</i>	<i>1038</i>	<i>Grey, densely welded tuff. Fractured, silicified, argillically altered. Pyritized.</i>	<i>T7b</i>	<i>1038</i>	<i>1038</i>