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SAND90—1344 • UC—253
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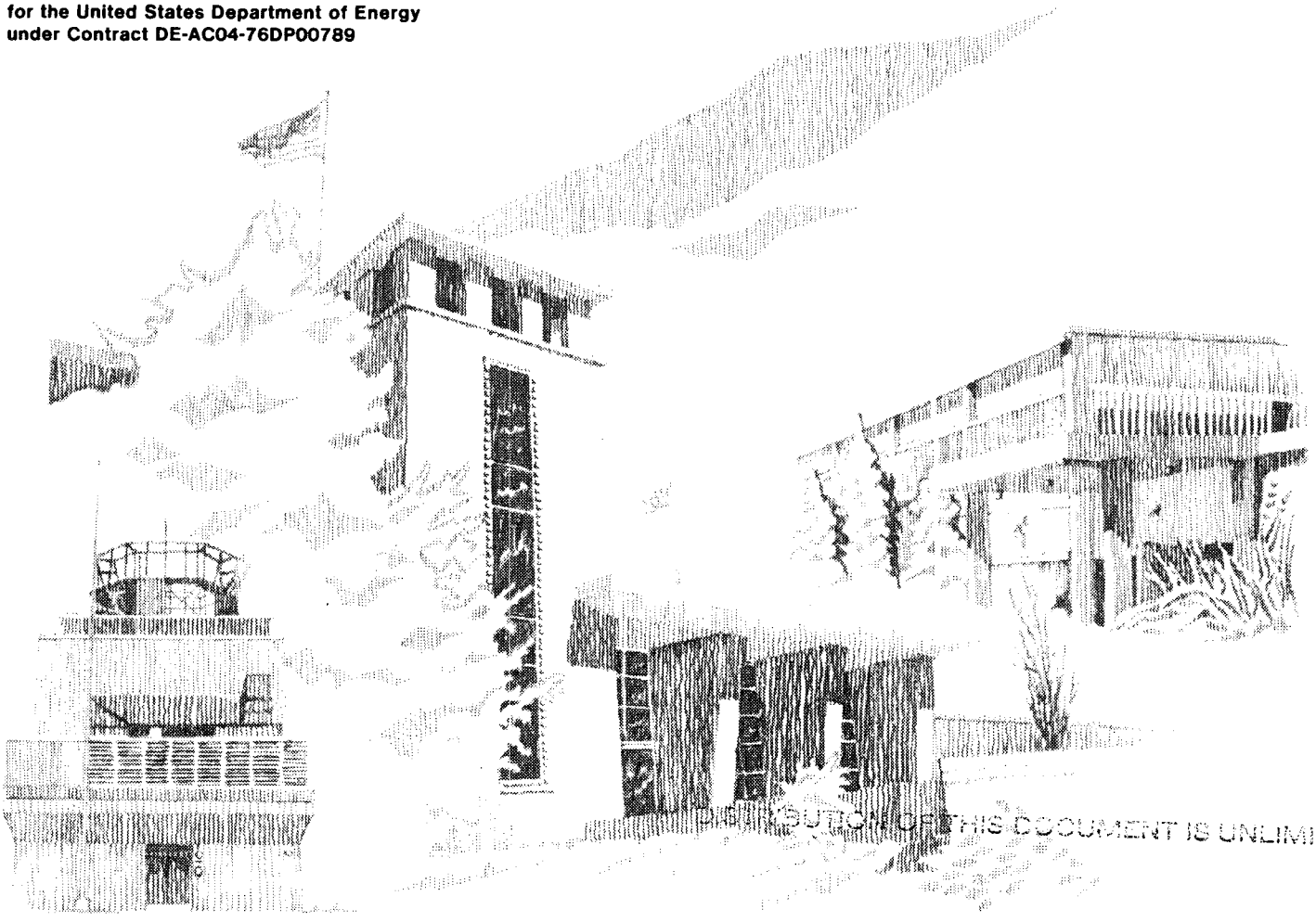
Phase I Drilling Operations at the Magma Energy Exploratory Well (LVF 51-20)

John T. Finger, Ronald D. Jacobson

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550
for the United States Department of Energy
under Contract DE-AC04-76DP00789



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PHASE I DRILLING OPERATIONS AT THE MAGMA ENERGY EXPLORATORY WELL (LVF 51-20)

John T. Finger
Ronald D. Jacobson

Geothermal Research Division 6252

ABSTRACT

This report describes the Phase I drilling operations for the Magma Energy Exploratory Well near Mammoth Lakes, California. An important part of the Department of Energy's Magma Energy Program, this well is designed to reach an ultimate depth of 20,000 feet or a bottomhole temperature of 500°C, whichever comes first. There will be four drilling phases, at least a year apart, with scientific investigations in the borehole between the drilling intervals.

Phase I of this project resulted in a 20" cased hole to 2558 feet, with 185 feet of coring beyond that. This document comprises a narrative of the daily activities, copies of the daily mud and lithologic reports, time breakdowns of rig activities, inventories of lost circulation materials, temperature logs of the cored hole, and a strip chart mud log.

This work was supported by the U. S. Department of Energy at Sandia National Laboratories under contract DE-AC04-76DP00789.

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INTRODUCTION

Molten rock, or magma, beneath the Earth's surface is an enormous energy resource. Estimates by the US Geological Survey suggest that magma less than six miles deep beneath the continental United States contains 50,000 to 500,000 quads of energy (1). For comparison, the total energy consumption in the US last year was about 80 quads.

The US Department of Energy, Geothermal Technology Division, sponsors a program managed by Sandia National Laboratories to examine the feasibility of extracting this energy for commercial power production. An earlier study by Sandia showed that tapping this magma energy is technically possible, but development engineering to make it a reality will be extremely challenging. This well will allow better evaluation of the continental magma resource and development of a magma energy extraction system.

We are drilling at this location because extensive geophysical evidence indicates the existence of a magma body at a depth of six to seven kilometers (2). Much of the evidence comprises seismic data, but an especially compelling observation is that the drill site has risen two feet in the last ten years. Scientists infer that this rise was caused by fresh magma injected into the underlying chamber. This location, in fact, was originally prepared by a commercial geothermal company for an exploratory well. Their drilling plans did not materialize, and they agreed to let Sandia use the site.

The magma energy concept requires the ability to predict the location of large quantities of shallow magma. Volcanologists believe, and geophysical measurements suggest, that regions like Long Valley contain these magma bodies, but their existence has not been directly verified by drilling. Resolving the question of a magma body's presence here will be the most important result of this exploratory well.

The ultimate goal of the Magma Energy Program is to drill into magma and insert a heat exchanger for long-term experiments. Although researchers from Sandia successfully used a small drill rig to penetrate and perform tests in a still-liquid lava lake in Hawaii (3), no long-term, large-scale experiment in molten rock has ever been done. The Magma Energy Exploratory Well is a precursor to an energy extraction experiment, and we believe that the experience of drilling in this unique environment that approaches, but does not contact, the magma chamber will be invaluable.

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1. Muffler, L.J.P., (Editor), "Assessment of Geothermal Resources of the United States", US Geological Survey Circular 790, 1979
2. Rundle, J.B., and D.P. Hill, "The geophysics of a restless caldera - Long Valley", Ann. Rev. Earth Planet. Sci., 16, 1988
3. Hardee, H.C., J.C. Dunn, R.G. Hills, and R.W. Ward, "Probing the melt zone of Kilauea Iki Lava Lake, Kilauea Volcano, Hawaii", Geophysical Review Letters, 8 no. 12, 1211-1214

NARRATIVE OF DRILLING OPERATIONS

The first of the four planned drilling phases, with a designed target depth of 2500 feet (see Figure 1) was completed in October 1989. The following narrative gives a day-by-day summary of the drilling and coring activities, and the problems encountered.

[A list of abbreviations used in this narrative is on page 23.]

8/1

Spud continues to approach, but slowly. Loffland is picking up the bottom hole assembly; mud is mixed; most welding is done.

2200 - Loffland ready to spud, but bit breaker does not fit their rotary table (it's for a 27 1/2" table, theirs is 37 1/2").

8/2

Temporary fix for the bit breaker problem is to weld pins on the bottom that will fit the rotary. New breaker will be fabricated in Bakersfield today.

0630 - Spudded, made 12 ft

0700 - Lost circulation. Mixing a 50 bbl LCM pill.

0930 - Some problems with rig equipment: there is a hole in one of the shale shakers, leaking mud; also down with one of the mud pumps. On maintenance time at 0930, off at 1300.

1300 - Lost circulation is extreme, have lost over 1000 bbl mud, including LCM. Drilling to about 90' (bottom of 40" mud riser is at 64' KB) with 26" bit and 36" hole opener - no returns; will set 125 sack (202 ft^3) cement plug. [125 sacks Class G cement, 40% silica flour, 3% CaCl]

1830 - Cement in place - plug #1 - at 1830 hrs, doesn't look good because only about 3' at the bottom of the rods shows cement on the outside.

2130 - Tag bottom, and find that plug extends about 2' up.

2400 - Mix and set another 202 ft^3 plug - #2.

8/3

0600 - Second cement plug has gone away completely; mixing another 125 sacks cement with 2:1 perlite for a lighter weight, higher yield mixture. Running Flo-Chek and calcium chloride water ahead of cement to gel up the formation.

0730 - Cement in place. Pumped plug in two equal parts -plugs #3 ana #4, total volume 310 ft^3. WOC

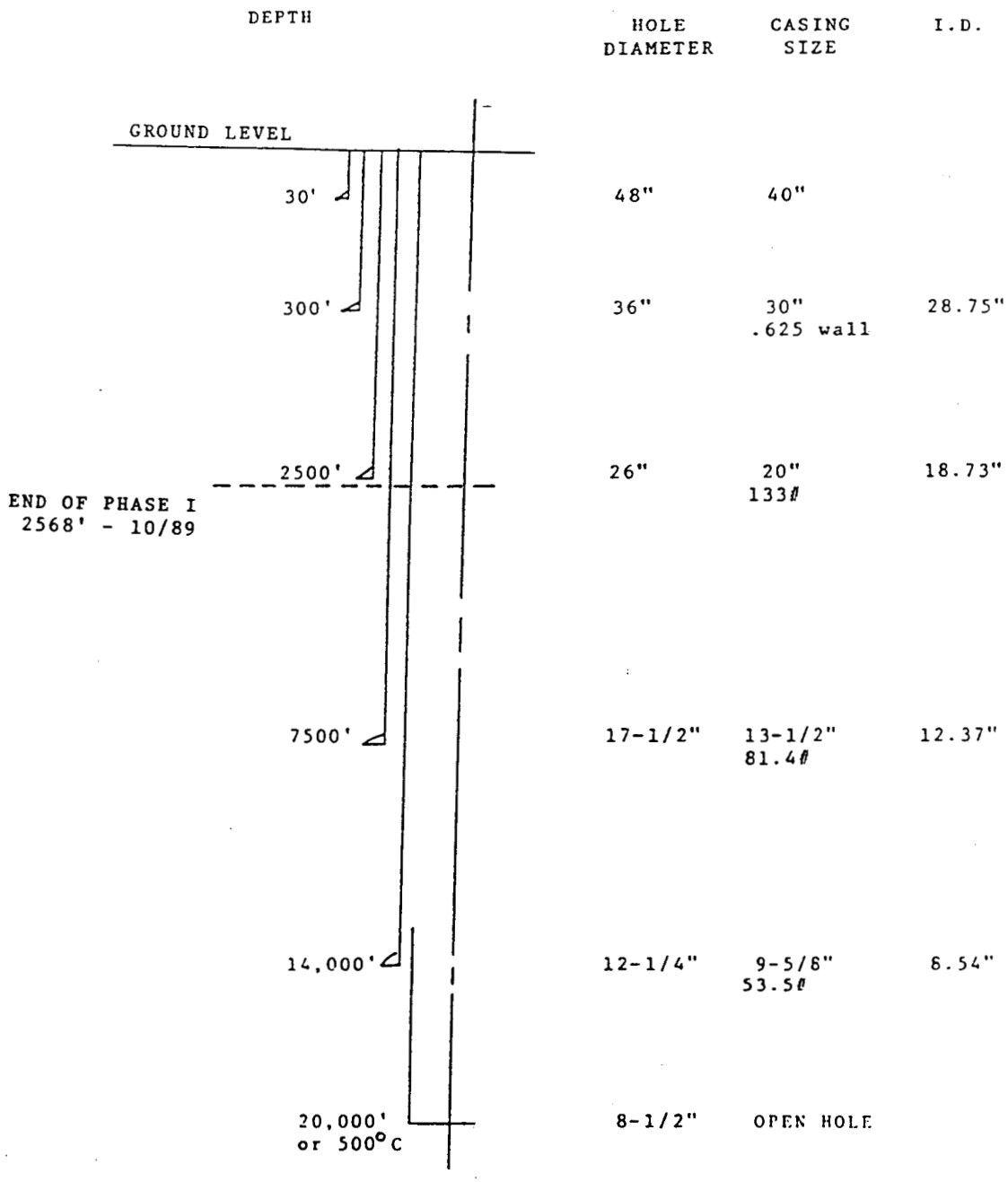


Figure 1 -- Diagram of well design, showing hole and casing sizes

1130 - Threw 10 sacks of bentonite, 6 bags of walnut shells, and approximately 450 empty mud and cement sacks in the hole. Regained circulation and pumped appr 400 bbl water through the hole to clean it up before circulating mud again.

1400 - Laid down the 36" hole opener and will drill ahead with the 26" bit; some concern that the h.o. might be causing deviation in the wellbore.

1730 - Drilled ahead to 96'. Partially lost circulation again (30-40% returns) and decided to set another plug. Spotted at the bottom of the 40" mud riser: 10 bbl calcium chloride, 10 bbl sodium silicate (Flo-Chek), and approx 310 ft^3 of 2:1 perlite/cement - #5.

1930 - Cement in place. WOC

8/4

0530 - Tagged top of cement at 57' (inside the 40") and found it still soft; will wait another couple of hours and drill it. Picked up 36" h.o. to center punch the hole.

0830 - Began drilling with good returns, but after getting through the cement into fresh rock started losing about 10-20 bbl per minute. Drilled ahead to 98' and decided to stop for another cement job

1200 - Pumped another plug - #6 - with 10 bbl calcium chloride ahead of 300 ft^3 2:1 perlite/cement. Will WOC until approximately 1900.

1915 - Tagged cement at 67', cleaned out cement to 78' with full returns, but the cement cuttings started appearing green, so will WOC until midnight.

8/5

0003 - Started rotating at 71' and got good cement with full returns.

0230 - Drilled kelly down with the 36" h.o. (96'), laid down the h.o. and picked up the 26" BHA. Drilling ahead with 26", holding back on WOB to limit ROP to about 40 ft/hr.

0730 - Depth is 143'; drilling is OK, although losing about 400 bbl/hr mud. There is some problem with the shale shakers, they will not take the full flow of 1000 gpm without overflowing.

1030 - Survey at 167'; inclination = 3/4°.

1300 - Survey at 230'; inclination = 1/4°.

1730 - Drilled ahead with 26" bit to 318', where returns were lost completely. Will set another plug, 310 ft^3 cement/perlite, as soon

as Halliburton can get here and driller can lay down BHA and run pipe back in hole for pumping cement.

2130 - Completed cement job - #7 - spotted at bottom. Will WOC about 8 hours.

8/6

0430 - Tagged top of cement at 264', but plug will not hold fluid. Pump 80 bbl LCM pill (6 sacks ea nut plug, Mud Seal, and cedar fiber); ineffective. Will set another plug.

0800 - Finished pumping second 310 ft^3 plug - #8. It brought the fluid level back to the flow line and the level seems to be holding. Will WOC until 1400, then tag the top of the second plug and probably begin drilling.

1400 - Begin drilling with the 36" hole opener at 94' (previous depth of 36" hole). Progress is pretty good, ROP is about 30 feet per hour, with little fluid loss.

1800 - Depth 190' with 36" hole.

2300 - Reached 291' with 36" hole; we will set casing at this point because of the lost circulation problem at 318'. This means that the 30" casing string will be only 7 joints instead of 8, ie, 280' instead of 320'. Circulating the hole clean, will run LCM pills as the pipe is coming out of the hole, rigged to run casing. Crane operator is on site to lift casing from the racks to the V-door slide.

8/7

0230 - Began running 30" casing, using the Dril-Quip stab-in connectors. Casing goes together easily, without the danger of cross-threading. Each joint takes about 25-30 minutes to run.

0530 - After third joint is added, string will not go down any farther. There is apparently an offset at 87' that will not pass the casing string. Begin calling tool companies to locate 36" reamers, stabilizers, or hole openers to make a stiffer drill string that we can use to ream the hole.

2030 - Receive 36" stabilizer from Bakersfield and 36" hole opener from Nevada Test Site. Hole opener appears to be very rugged and in good condition. Begin picking up both h.o.'s to run them piggyback.

2230 - Begin running in hole with BHA = 17 1/2" bit (already mounted on NTS h.o./36" h.o./36" h.o./26" reamer (for stiffness)/11" drill collar.

2400 - Reaming ahead at approximately 89' depth. Drilling is very rough from 85' to 89', indicating more irregularities in the wellbore.

8/8

0000-0430 - Reamed 80'-116' interval multiple times to insure smoothness.

0530 - Added another collar and drilled ahead to 113', where approximately 300 bbl circulation loss occurred. Mixed and spotted a 50 bbl LCM pill. Hole would still not hold fluid, so rigged for cementing.

0930 - Another 310 ft^3 cement/perlite plug - #9, will WOC until 1530.

1600 - Filled hole with mud to make sure that plug was holding pressure; it did. Will WOC another 2 hours and start to ream.

1730 - Tag cement at 97'. Reaming ahead at 110'.

2400 - Reaming at 270'. Have reamed each joint down twice and lowered once without rotation

8/9

0030 - Reamed to bottom at 285'. Began to lay down tools and rig to run casing.

0530 - Began going in hole with first joint of 30" casing.

0700 - Fifth joint hangs up, rig cables for pull-down and torque; pipe goes in.

0840 - Casing in hole, stab mandrel in float shoe, fill casing with mud for hold-down weight, rig for casing hold-down (buoyancy force) cables, and rig for cementing.

1630 - Cement to surface, wait 5 minutes to see if cement level falls back (it doesn't), and pump 5 more minutes (total of approx 1135 ft^3 Class G cement with 40% silica flour + 310 ft^3 2:1 perlite). Drop plug and displace cement in drill pipe. Disengage drill pipe from float shoe and put about 8' of cement in the bottom of the casing. Will WOC approximately 24 hours.

8/10

0600 - Tagged top of cement in casing annulus and found it at 62' KB; this was apparently a ring or the high side of a sloped surface, because the volume required to fill the annulus from 62' is 110 ft^3, and 272 ft^3 were actually required. This implies that the top of the original cement level was below the 40" shoe.

0900 - Top job completed.

1500 - Begin cutting off the 40" riser and the 30" casing to install the 30" diverter.

2100 - Casing and riser cut and removed.

2200 - Weld 30" wellhead and begin nippling up.

8/11

0700 - Diverter and flow line installed

1200 - Began trying to test the Hydril diverter, but it would not hold pressure. Displaced the mud in the diverter with water and re-tested at a slightly higher pressure. Test was successful, possibly because higher pressure helped diverter to seal. Test witnessed by BLM representative Frank Dalton.

2000 - Hooked up flow and kill lines, displaced water with mud, and began drilling cement.

8/12

0230 - Directional survey at 282'; angle was 1/4°.

0500 - Lost circulation at 355'. Drilled from 355' to 387' with partial returns; lost about 270 bbl drilling fluid.

1030 - Survey at 353'; angle was 1/2°.

1200 - 310 ft^3 cement plug - #10 - at 366'.

1830 - WOC and tagged top of cement at 317'; will WOC another 4 hours.

8/13

0030 - Began drilling out cement at 317'.

0230 - Severe loss at 360', apparently the same zone as before. Tried circulating, no returns

0430 - Re-cemented this zone with 300 ft^3 cement plug - #11; will WOC until 1230.

1300 - Begin drilling out cement at 293'.

1800 - Drilling ahead at 388' with no returns. Periodic gel and LCM sweeps.

2300 - Drilling ahead at 412' with no returns. Drilling has been very rough from 388' to 412'; estimate 3000 bbl fluid loss in this interval. Will circulate and work pipe.

8/14

0200 - Cement plug (210 ft^3 - #12) in place at 407'. When drill pipe was pulled out of the hole, fluid level was at 230', implying that the plug had all escaped into the formation.

0500 - Another cement plug (100 ft^3 - #13). WOC until 1200.

1200 - Tag cement at 357', very soft; pumped 500 bbl fluid with no returns.

1400 - Pumped cement plug - #14 - (300 ft^3 at 345').

2100 - Tagged cement at 311'; fluid level at 180'; filled hole.

8/15

0030 - Fluid level still at 180' (cement seems to be holding). Begin drilling out cement at 311'.

0400 - Directional survey at 379'; inclination was 3/4°.

0600 - Drilling ahead at 412'.

0700 - Lost circulation at 425'.

1400 - Drilling ahead at 475' with no returns. Rough drilling since 425' and have pumped away about 1550 bbl of fluid. Will set another plug.

1600 - Cement plug - #15 - in place. 319 ft^3 at 438'.

1730 - Tag cement at 426', fluid level at 311'. Pump 300 bbl fluid and get no fill.

2000 - Pump another 310 ft^3 plug - #16 - at 421'.

2400 - WOC

8/16

0400 - Tag cement at 409'; fluid level at 274'

0600 - Drilled to 430', so that we can set another plug (#17) in a cleaned out hole.

1100 - Cement - #17 - in place (319 ft^3 at 425'). Will WOC until 1430.

1430 - Tagged cement at 419', it was still not cured. Will WOC three more hours.

1730 - Tried to run temperature tool to find out if low temperature is hindering the cement cure, but the tool would not go through the

tool joints of the drill pipe. Abandoned that idea and began drilling out cement.

2300 - Drilled out cement to 475' and did a directional survey at 446'; inclination was 1 1/2°.

8/17

0500 - Drilled new formation to 518', drilling extremely hard; did directional survey at 472', inclination was 3 1/4°.

0630 - Circulated the hole and did another directional survey at 503'. Survey required 3 tries because of the difficulty of reading the picture. Last result showed an inclination of 3°. Have sent to Bakersfield for an Eastman survey tool to confirm these results (it seems unlikely that a very stiff assembly could have built that much angle in only 30 ft.) Eastman tools, including a motor for possible directional drilling should arrive about 1100.

1230 - Eastman tools arrive; log complete well, repeating previous surveys. Upper angles are repeatable, but new reading at 472' was 2 1/2°, and 503' was 3 1/4°. That is, instead of building angle and then dropping back, the deviation was continuously building from approximately 350'. Will plug back to approximately 325' and directionally drill to straighten out the hole.

1700 - First stage of the cement plug (#18 - 343 ft^3) ready to go in the hole.

2400 - WOC

8/18

0400 - Tagged top of first cement plug at 398', polished top of plug to 412', circulated hole clean and laid second stage - #19 - of plug. Cement for the second plug (500 ft^3) is mixed to be harder than the first stage.

1400 - Tagged top of second plug at 315'; circulated/drilled about 5' off top of plug.

1630 - Cement appears hard enough to drill. Began pulling drill pipe out of hole and picking up motor for directional run.

2130 - Started in hole with Dyna-Drill motor; drilling at about 325' with 1.5° bent sub. Drill string is rotating at about 25 rpm; this is an attempt to keep a straight hole without kicking off in a specific direction. BHA is bit/roller reamer/12" Dyna Drill/bent sub/monel DC/stabilizer/shock sub/3-11" DC/2-10" DC.

2400 - Drilling at 355'.

8/19

0530 - Have drilled to 417′; survey at 357′ (because of the motor, reamer, and subs the survey tool can only get to within 60′ of the bit) shows no deviation.

0800 - Drilled to 448′, survey at 388′ shows 3/4° deviation. Pulling drilling assembly out of the hole to make a survey nearer bottom.

1130 - Very slow coming out of the hole from 448′; basic problem is wrong inserts for the slips, making it difficult to handle the large diameter tools (e.g., the 11" drill collars).

1430 - Finally get a survey at 426′, deviation is 3/4°. Will lay down the Dyna-Drill and bent sub, and pick up a Christensen Navidrill motor and straight hole drilling assembly. Christensen motor turns at slower speed than the DD (less than 200 rpm, as opposed to 300 rpm), which is desirable.

1500 - Work on rotary inserts, change BHA, and run in hole.

2030 - Ream from 342′ to 448′.

2400 - Drilling at 464′.

8/20

0730 - Drilling new formation at 518′; lost 450 bbl at 510′, no returns. Cuttings from this interval (before returns lost) contain quartz crystals that only form in open caverns, confirming the presence of large voids. Pull motor out of hole to get survey at 489′; inclination is 1/2°. Rig for cementing. Sandia logging truck arrives on site.

1030 - Cement plug (#20 - 200 ft^3) in place at 504′. Will try to fill with fluid at 1300, tag at 1630.

1300 - Hole will not hold fluid. Use logging truck to find top of cement at 465′ and attempt to find a loss zone by looking at temperature changes. Get several temperature discontinuities, but they appear to be caused by the separated flow of the cold water going into the hole and the warmer mud already there. Fluid level is at 275′ and dropping when logging tool comes out of the hole. Conclude that fluid loss is at the bottom.

1700 - Rig for cementing. Second plug (#21 - 111 ft^3 at 460′) in place at 1720. Echometer shows fluid level holding steady at 279′.

2000 - Tag top of second plug at 449′, but hole still will not hold fluid. Temperature survey shows loss zone at about 365′. Will spot cement at about 355′ and try to flow it into the loss zone.

8/21

0830 - Spotted 160 ft^3 cement - #22 - (class G, 40% silica flour) at 347'. This will be a slow cure, will do a temperature log at 1400.

1400 - Temperature log showed water level at 140' and cement bridge at 337'. Ran in with drill pipe, and apparently knocked loose whatever was at 337' (it was fragile, weight indicator showed no force). Fluid level sank, and hole would not fill up.

1800 - Ran in hole with drilling assembly to polish the top of the plug at 448'. Found all the uncured cement from this morning's plug at the bottom of the hole. Circulating with little loss of fluid, have circulated out the last plug. Will run in with the motor after polishing the plug (this plug, which should be well-cured, is not very hard).

2400 - Have reamed out cement to 514' and drilled new hole to 528'.

8/22

0900 - Have drilled from 528' to 638' since midnight. Have lost and regained circulation twice (total loss about 800 bbl). Lost circulation again at 638'. Spotted LCM pill. Dry drilled to 646' and spotted LCM.

1200 - Drilled with no returns to 674', built mud volume, and spotted a lost circulation pill. Still not holding fluid.

1330 - Pulling out of hole with mud motor; will run back in with a monel DC and bit with nozzles pulled. When bit is on bottom, will take a directional survey and then pump a pill of the rubber LCM.

1530 - Pumped a 60 bbl LCM pill with 20#/bbl of type 095 rubber; hole still will not hold fluid, but keep pumping into it as we run open-end pipe in for cementing. Will do Echometer to check fluid level (170').

1630 - Cement plug (#23 - 319 ft^3) spotted at 629 ft.

1900 - Tagged top of cement at 665' (9' fill); i.e., most of the cement went into the formation.

2200 - Tried to run temperature log, looking for other loss zones, but cable failure in the logging truck prevented this.

8/23

0200 - Spotted another cement plug (#24 - 319 ft^3) at 617'; came back and tagged top of cement at 549'.

0500 - Spotted an LCM pill of 20#/bbl 095 rubber, 8#/bbl nut plug at 545'. Hole will not hold fluid.

0800 - Pumped another LCM pill of (8# stringy rubber + 8# chunky rubber + 6# Kwick-seal medium)/bbl, chased with 60 bbl water. This appeared to hold water for quite a while (30 min) but then fluid level began dropping.

1100 - Closed diverter and began squeezing LCM. After pumping for approximately 1.5 hours, the hole was holding pressure. Stopped pumping and opened diverter; fluid level began dropping.

1300 - Pumped another cement plug - #25 - (319 ft^3 at 534'); after pumping that plug, fluid dropped drastically, to about 274'.

1800 - Tagged cement at 474'; pumped another LCM plug of 11#/bbl 020 rubber, 9#/bbl sawdust, and 9#/bbl Kwick-seal coarse. Pumped mud after this pill, and hole held fluid.

2400 - Reaming cement with mud motor (table locked) at 514'.

8/24

0200 - Cleaning out cement at 540', lost circulation. Continued cleaning to 570' with no returns. Pumped 60 bbl LCM pill (5#/bbl stringy rubber, 10#/bbl coarse rubber, 10#/bbl Kwick-Seal coarse) at 558'.

0500 - Rig to cement - #26 - at 560'; 319 ft^3 - 2:1 perlite, 12% Cal-seal, 3% CaCl.

1200 - Tagged top of cement at 511'.

1500 - Cleaned out cement from 511' to 580'; lost circulation at 580'.

1800 - Continued cleaning out cement to 658' (no returns). Stopped to rig for cementing.

2100 - Cement - #27 - with diverter tool at 655' while working d-tool from 628' to 658'; run 60 bbl water, 60 bbl sepiolite, 421 ft^3 cement (1:1 perlite, 40% silica flour, 6% Cal-seal, 3% CaCl). Pulled up out of cement 110' and laid on 30 bbl mud.

2310 - Cement in place.

8/25

0400 - Tagged top of cement plug at 590', but hole would not hold fluid (fluid level at 390').

0730 - Set 434 ft^3 cement plug - #28 - (2:1 perlite, 12% Cal-seal) at 590'. Hole is holding fluid.

1200 - Tagged top of plug at 500', indicating that some of the cement went into the formation. RIH with mud motor.

1600 - Drilled about 7' of cement and it was still soft; will wait for 2 hours.

1800 - Drilled from 507' to 563'; complete loss of returns. Continued drilling to 582'.

1930 - Pumped 60 bbl LCM plug, loaded 60 bbl water on top, waited 20 minutes and resumed circulation with no returns.

2300 - Pulled out of hole, ran in with open-ended drill pipe, and spotted 20 bbl CaCl water and 20 bbl "Super Plug" in a 10C-10SP-10C-10SP sequence with water spacers between each pill. At the same time, pumped 5 bbl/min water in the annulus to try to drive the LCM into the formation. Wait 30 minutes and try to fill hole, with no success.

8/26

0030 - Rig for cementing; led cement - #29 - with 2000 gal Flo-chek, then 256 ft^3 1:1 perlite, 12% Cal-seal, 3% CaCl at 569'. Pumping 5 bbl/min water into annulus at the same time.

0700 - Tagged top of cement at 515', pumped 400 bbl water, and hole would not hold fluid.

0800 - Rigged logging truck to do temperature survey, but hole was full. Rig crew had continued pumping through the fill line to make room in the mud tanks for an LCM mix; this additional fluid had been retained for some unknown reason. (The additional pumping, which we had not known about, would have made the temp log meaningless anyway.)

0900 - Mixing approximately 1000 bbl mud with 35% medium Kwick-Seal. Will lay the motor down, and try to drill ahead with the drilling assembly and circulate the hole clean of the cement and other non-cutting materials.

1400 - Have not tried to drill yet, but are doing another cement job - #30 - just above the previous plug (356 ft^3 of Class G, 3% CaCl).

1700 - Run in hole with drilling assembly, tag top of cement at 431'. WOC

2300 - Begin drilling out cement at 431'.

2400 - Drilling cement at 440'.

8/27

0800 - Have drilled out cement from 440′ to 497′. Two directional surveys; 411′ = 1°, 442′ = 3/4°. Circulating mud over shakers to clean up mud system.

1100 - Drill to 534′, directional survey at 506′ = 1/2°.

1400 - Drilling cement at 635′ (no cement or fill in the hole from 572′ to 600′); directional survey at 600 = 1/2°

1730 - Drilling new formation at 675′

2100 - Drilling at 698′; directional survey at 663′ = 1°. Pulling out of hole to lay down drilling assembly and pick up Eastman motor because of low ROP = 8 ft/hr.

8/28

0400 - Drilling at 765′; directional survey at 695′ = 3/4°.

0800 - Drilling at 828′; directional survey at 758′ = 1/2°.

1000 - Drilling at 891′; directional survey at 831′ = 1°.

1200 - Drilling at 923′; 235 bbl circulation loss at 929′. Drill ahead, build mud volume, pump LCM pill, regain normal circulation.

1410 - Drilling at 984′; complete loss of returns. Continue drilling and regain returns - steady loss of fluid, because we are constantly building mud volume. Water level is rising in the water well, indicating that the wells are communicating.

1600 - Drilling at 1016′; directional survey at 926′ = 3/4°. Still losing fluid at 1048′, will stop drilling and pump cement.

2000 - Spotted cement plug - #31 - at 1044′; led with 20 bbl CaCl, then 2000 gal Flo-chek, 300 sks Class G, 3% CaCl, then 135 sks 1:1 perlite with 12% Cal-seal, 3% CaCl. Total volume = 676 ft^3.

8/29

0030 - Ran temperature log to find top of cement and check for crossflow. Tagged top of cement at 934′, but it appeared to be soft.

0600 - Tagged top of cement at 945′ with drill pipe, and it seemed hard.

1300 - Completed drilling cement at 1048′.

1600 - Drilled to 1118′; directional survey at 1039′ = 1°. Rig is temporarily down because one of the mud pumps is not working.

1800 - Mud pump repaired, drilling ahead.

2130 - Drilling at 1207'; directional survey at 1139' = 3/4°. Have lost and regained circulation several times in this interval.

8/30

0200 - Drilled to 1302'; survey at 1233' = 1°

0600 - Drilled to 1397'; survey at 1324' = 1 1/4°

1200 - Drilled to 1491'; survey at 1431' = 1°

1800 - Drilled to 1573'; lost all rig electrical power as both diesel/generator sets failed. Probably caused by a loose wire on one governor, resulting in power surges and overheating. Power surge also apparently killed water well pump.

2000 - Power restored. Drilling assembly was on bottom for at least 20 minutes with no movement or circulation, but came free when power returned. Drill to 1585', survey at 1525' = 1 1/8°

2400 - Drilled to 1604'; rate of penetration is relatively low (around 15 ft/hr) because driller cannot put much weight on bit without deviation. With less than 10,000#, deviation stays under 1°, but weight increases consistently bring deviation increases.

8/31

0530 - Drill to 1690'; survey at 1620' = 1 1/4°

0700 - First load of 20" casing arrives on site, remainder will follow at approximately 1 hour intervals. Eight loads (67 joints total).

1100 - Drill to 1774'; survey at 1714' = 1 1/4°

1600 - Drill to 1803'; pull out of hole to run wireline temperature log. Log showed some temperature variation, but the average was around 123°F. Most of this heat probably came from the mechanical work of the mud pumps and the mud motor. That is confirmed by the fact that the temp probe was cooling as it rested on bottom.

2100 - Drilled to 1835', lost 400 psi pump pressure and suspected a washout. Pulled drillstring to examine it, found no damage, and located a blockage in the mud pump suction line. Ran back in hole.

9/1

0530 - Drill to 1840'; circulate thick mud that is building up from the fines of drilling in the ashy formation.

0800 - Drill to 1866'; directional survey = 1 1/4°

1400 - Drill to 1961'; directional survey = 1 1/4°

1600 - Talked with Wayne Jackson (Jackson Equipment Co) and Boyd Green, M-I, about using Jackson's equipment to clean up the solids-laden fluid in #2 sump. This process stirs up the sludge with a small dredge, chemically flocculates it, centrifuges it to separate the solids, and returns clear water to the sump. Estimated cost to process the waste is $7/bbl, but there aren't any feasible alternatives.

2400 - Drill to 2044'.

9/2

0100 - Deviation survey at 1984' = 1 1/4°

0300 - Pressure oscillations and reduced drilling rate indicate that mud motor may be washed out. Lay down Eastman motor and pick up Dyna-Drill. Stage back to bottom, trying to reduce wall cake.

0900 - Back on bottom, but rate of penetration is very low (3 ft/hr). At least two possibilities: we are now in the harder Bishop Tuff, and the bit may be balled from the excessive wall cake. Will try circulating some Nut-plug to clean up the bit.

1200 - Rate of penetration has picked up some, to about 8 ft/hr, and we are definitely in Bishop Tuff at 2060'.

2000 - Drilled to 2125'; directional survey = 1 1/2°

2200 - Begin pulling out of hole to lay down mud motor.

9/3

0200 - Laid down mud motor and made up new BHA. Will ream back to bottom with "new" bit (previously used, laid down to repair lubricant leak).

0800 - Drilling at 2134', still at less than 10 ft/hr.

1130 - Drill to 2165' with 30-35 Klb WOB, survey at 2124' = 1 5/8°. Appear to be drilling through inhomogeneous formation, drilling rate is fluctuating with constant weight on bit.

1500 - Drilling at 2195'; rate of penetration is down to 5 ft/hr, may be in a glass flow. Survey at 2145' = 1 1/8°

1700 - Coming out of hole to pick up more drill collars.

1800 - Laid down old three-point reamer (severely worn); picked up new reamer and new shock sub. Picked up 5 ea 10" drill collars.

2400 - Drilled to 2207'.

9/4

0200 - Drill to 2251'; survey at 2211' = 1 1/2°

0600 - Drill to 2314'; survey at 2254' = 1 1/2°. Rate of penetration has picked up to about 20 ft/hr with 35-40 Klb, rock is showing more quartz crystals (i.e., more like the Bishop Tuff should look).

1000 - Drill to 2377'; survey at 2337' = 1°.

1700 - Drill to 2503'; survey at 2463' = 3/4°.

2100 - Drilling rate is erratic, varying from 6 to 30 ft/hr. Do not want to spend too much time getting deep enough to use all the casing, so will stop at the next even joint.

2345 - TD at 2568'.

9/5

0100 - Survey at 2511' = 3/4°.

0300 - Strap out of hole; measurement shows depth indicator 1.5' off. Run back in hole and drill 2' to true 2568'.

0600 - Circulate hole and pull out tools. Rig for logging; will do dual induction with gamma, sonic, caliper, and temperature.

1000 - Begin logging runs.

2000 - End logging; sonic logs are doubtful, apparently no returns in some sections of the hole. Could be caused by tool problems, large hole, and/or garbage formation (cement pockets, washouts). Run back in and begin circulating to condition hole.

9/6

0500 - Out of hole; begin rigging to run casing.

0800 - Float shoe and float collar screwed and welded in place, two joints apart. Begin running in casing, using a casing stabber yoke to align casing when it is screwed together. Seems to be working well, averaging about 6 minutes per joint.

1430 - Last joint of casing in place. Begin unrigging casing crews and rigging cementing. Will run drill pipe into float collar at bottom of casing and begin circulating mud to make sure annulus is clear before cementing.

1815 - Halliburton cementing tree assembled; will stab into float collar and begin circulation. Casing shoe at 2559'.

2030 - Two hours circulation gives clear returns. Will pull drill pipe, centralize casing, re-run drill pipe with new O-rings on stab-in adaptor, and begin pumping cement.

9/7

0600 - Cementing complete, 7243 ft^3 total; lost returns twice, but regained them. Full returns to surface at the end of the job. Will let cement begin curing and wait to see if the top of cement falls back.

1200 - Logged water well; good news is that it shows no change in temperature since baseline log last night (i.e., no cement in water well. Nipple down 30" diverter stack.

1430 - Cement level in annulus has fallen back to approximately 160-180 ft. Will do a top job, pumping through fill line. Temperature logging wellbore.

1600 - Top job complete; 277 ft^3 1:1 perlite with 40% silica flour, then pumped 296 ft^3 Class G with 40% silica flour. Will WOC until 0600.

9/8

0500 - Cut off 20" casing, nipple down diverter and cut off 30" spool and casing.

1000 - Weld on 20" flow nipple and flow line.

1400 - Pick up 17-1/2" bit and run in hole to drill out cement and float collar in preparation for wireline coring.

1800 - Drill cement from 2474' to 2522'.

2300 - Pull out of hole and lay down drill pipe and collars.

9/9

1000 - Pick up 5-7/16" SHR core bit, 17-1/2" nonrotating stabilizer and special Ocean Drilling Program 5" drill pipe.

1600 - Circulate mud out of hole with water.

1800 - Drill cement with core bit to anchor drill pipe from 2527' to 2534'.

2200 - Circulate to clean hole.

9/10

0000 - Pull drill pipe from hole to remove stabilizer and nipple down flow line.

0300 - Install and weld 20" wellhead using "Hot-Head" pre-heat and post-heat tools. Test welds with gas to 200 psi at 750°F after post-heat.

1400 - Install 20"x10" companion flange and 10" tubing hanger spool.

1600 - Ran in hole with SHR core bit on 5" ODP drill pipe. Landed drill pipe in the tubing spool with a double box hanger. This leaves the core bit at 2532', 5' into and 2' off bottom of anchor hole.

1800 - Nipple up 10" 3000 psi master valve.

1900 - Clean mud tanks.

9/11

1000 - Pressure test casing and wellhead to 800 psi for 15 minutes, no leaks. Continue cleaning mud tanks and location.

9/12

1600 - Finished cleaning tanks and location. Released rig and crew, Jackson equipment still cleaning waste sumps. Will start rigging up for coring on 9/25. Location shut down except for Jackson's sump cleaning.

9/25

0800 - Tonto Drilling CP-50 electric/hydraulic core rig on site. This rig will be powered by a 200 hp electric power pack powered by the Loffland rig. It will be mounted on the Loffland rig floor and will use a sheave wheel suspended from the traveling block to allow rod handling with the CR-50 drill hoist. See Figure 2 for a schematic of core rig operation.

0900 - Crane on site to set power pack, core rig, core rods and tools on rig floor. Welder on site to tie core rig down to rotary table and floor. Crane also setting core rig mud pumps and tanks on drill pad below rig floor.

1400 - Check out CP drill and mud system, all check OK. Rig up complete. This went very well.

1600 - Nipple up 4" Hydril, choke and kill lines.

1800 - Run core barrel in hole and test BOP equipment. Will shut down until tomorrow daylight tour. Then will start 24 hour operation. Each tour will consist of a two man crew; one Tonto core driller, with a Loffland driller to operate Loffland equipment and help the core driller. A Loffland rig superintendent will also be on duty.

9/26

0800 - Start tripping in coring rods in 10' lengths.

1000 - Test BOP and rig equipment. Test witnessed and approved by BLM.

2000 - Finish tripping in and start coring and washing cement at 2522'.

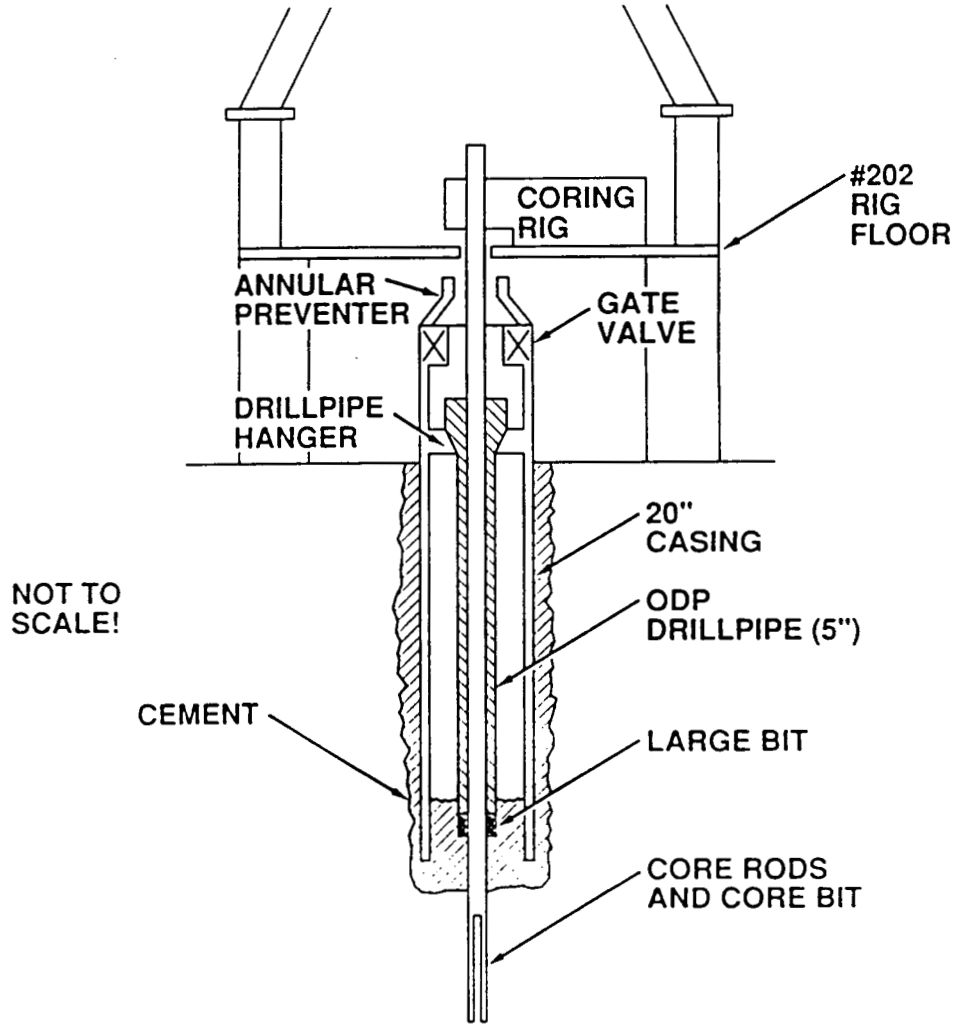


Figure 2 -- Schematic of core rig operation. Core rig is placed on large rig's floor; core rods travel inside ODP drill pipe, which acts as an "artificial wellbore".

9/27

0700 - Cored to 2572', retrieved float shoe valve at 2556' and new formation at 2568'.

0800 - Bit plugged, cannot break circulation, may have dropped some core. Will pull drill rods to unplug bit.

1430 - Out of hole, bit plugged with heavy coarse sandy material and LCM.

1500 - Start tripping in hole.

2100 - at 2550' start washing hole with fresh mud and wash to 2572'.

2200 - Start coring new formation, core from 2572' to 2576'. Cored 4" and recovered all of it.

9/28

0800 - Going good, cored to 2624' with complete recovery.

2000 - Core driller shift change, cored 60' to 2684'; got it all.

9/29

0130 - Still coring, at 2724' but losing some returns.

0800 - Now getting full returns. Cored to 2744' with better than 99% recovery. Change out mud to remove solids that are causing mud rings in pipe.

1100 - After coring to 2754' and pulling inner barrel the core pipe became stuck. Cannot circulate, rotate, pull up or push down. Core bit is 2' off bottom.

1800 - Working stuck pipe, will take some fluid at high pressure but no returns. Have tried pulling, pushing, surging and rotating, but cannot move. Will try just leaving them until 2400 hrs and then try again.

9/30

0300 - Still working stuck pipe, broke circulation with high pressure and are getting a very small return. Pipe moved down 1/2' but still stuck. Pumping down soap to help free pipe.

0900 - Applied reverse torque to core rod and unscrewed it about 400'down. Blew air down core rods to unload fluid above break. Made up core rod joint but still no luck. Continued working pipe and called out loggers to run free point log and cut pipe.

2130 - Loggers arrive. Rig for free point log.

2230 - Log indicates rods stuck at 2644' and free at 2634'. Will jet cut rods at 2520'. This will leave the top of the core rods in the ODP pipe above the cement level in the 20" casing.

10/1

0100 - Rig down loggers. Start tripping out and laying down core rods in 10' lengths.

1000 - Finished tripping out with core rods. Rod tally indicates top of jet cut at 2511.2' and cut was clean. The hole TD is 2754'. Left in the hole - bit at 2753' on a 13' HQ core barrel with the inner tube removed, 22 whole 10' HMQ core rods and one 8.5' cut HMQ rod. Cut is at 2511.2' KB.

1100 - Start displacing drilling fluid in hole with water and corrosion inhibitor. Start removing coring equipment from rig floor.

1400 - Corrosion inhibitor circulated through ODP pipe and casing. Air lifted fluid to leave fluid level at 234 ft. Shut in well and secure.

1800 - Finished highlining core rig, power pack, rods and tools from rig floor. Shut down operation until daylight shift tomorrow.

10/2

1000 - Finished packing coring equipment, cleaning core mud system, nippling down BOP, and securing equipment for the winter.

1100 - Released Loffland and Tonto rigs. Jackson equipment still cleaning sumps but we are not generating any more drilling fluids.

PHASE I COMPLETE

[See appendices for detailed listing of LCM, drilling fluid additives, rig time breakdown, bit records, and daily reports]

LIST OF ABBREVIATIONS

bbl - barrel; standard unit of fluid measure in drilling practice, equals 42 standard gallons.

BHA - bottom hole assembly; the combination of bit, stabilizers, drill collars, and other tools at the bottom of the drill string, i.e., everything below the drill pipe.

DC - drill collars; the heavy-walled tubular sections of the drill string used just above the bit to apply weight.

h.o. - hole opener; a cutter used above a bit to enlarge the hole diameter.

KB - kelly bushing; the reference level at the rig floor from which all depths are measured.

LCM - lost circulation material; particulate matter mixed with the drilling fluid to plug loss zones in the formation.

RIH - run in hole; tripping the drill string into the hole.

ROP - rate of penetration; the rate at which the bit is advancing.

WOB - weight on bit; the force applied to the bit by the weight of the drill string components.

WOC - wait on cement; time spent waiting for cement to cure.

APPENDIX A

DETAILS OF TIME FOR VARIOUS RIG ACTIVITIES (Coring not included)

ACTIVITY	HOURS	PERCENT
Drilling	187.50	22.94
Reaming	24.75	3.03
Tripping	65.00	7.95
Circulate/Condition Mud	19.00	2.32
Survey	21.00	2.57
Lost Circulation *	371.25	45.41
Run Casing	11.00	1.35
Cement Casing	3.50	0.43
Wait on Casing Cement	21.00	2.57
Install BOP	15.50	1.90
Test BOP	8.00	0.96
Maintenance	10.00	1.22
Wait on Tools	17.00	2.08
Temperature Logging	2.50	0.30
Direction Correction	40.50	4.95
Totals	817.50	100.00

* "Lost Circulation" includes all activities from the time circulation is lost at a given depth until drilling is resumed at that depth - see details below

DETAILS OF TIME FOR SPECIFIC LOST CIRCULATION ACTIVITIES

ACTIVITY	HOURS	PERCENT
Build Mud Volume	6.75	1.82
Circulate/Pump LCM	37.00	9.97
Trip	68.50	18.45
Rig Up/Mix Cement/Cement	28.25	7.61
Wait on Cement	154.25	41.55
Drill/Ream Cement	55.00	14.81
Log/Survey	12.00	3.23
Other	9.50	2.56
Totals	371.25	100.00

APPENDIX B

BIT RECORD

Bit footages are divided into four categories:

N = normal rotary, drilling rock
C = normal rotary, drilling cement
M = mud motor, drilling rock
CM = mud motor, drilling cement

BIT TYPE	FOOTAGE			
	N	C	M	CM
Smith DSJ	393	329		
Smith 2JS	508	243	507	649
Security S3SJ	44	296		
Security S84			1039	102

Note: In a hole with TD = 2568', total cement drilled = 1619'.

APPENDIX C

BRIEF SPECIFICATIONS FOR LOFFLAND RIG #202

The Loffland Brothers rig used for this drilling has drilled the two deepest holes (both below 30,000 feet, both in Oklahoma) in the United States. Some of the rig capacities are listed below.

* Mast capacity: 1000 tons
* Height to crown: 177 feet
* Maximum hook load: 750 tons as rigged (30,000 ft of 5" drillpipe); can be rigged for 1000 tons
* Pump capacity: 2 pumps; 736 gpm each at 3260 psi
* Drill pipe: 5-1/2"; 5-1/2" full hole tool joints
* Prime movers: 3 ea Catepillar D-399 1100 hp diesels
* Mud system: 1400 barrel capacity; shakers, desanders, desilters

BRIEF SPECIFICATIONS FOR THE TONTO CP-50 CORING RIG

The Tonto CP-50 is built as an underground diamond coring rig. Although it is often truck-mounted and used with a mast for surface drilling, it was mounted for this application on the Loffland rig floor and powered by the Loffland rig generators.

* Manufaturer: Chicago Pneumatic
* Powerpack: 200 hp, 460 volt, 3 phase electric motor
* Drive: Hydrostatic
* Maximum single line pull: 30,000 lb
* Depth capacity: 11,000 ft
* Drill pipe: HMQ wireline drill rods, 3-1/2" OD x 3-1/16" ID
* Pump capacity: 2 pumps; 35 gpm each at 1000 psi
* Mud system: 900 gallon mud tank, with 300 gallon mixing tank

APPENDIX D

DRILLING FLUID ADDITIVES AND LOST CIRCULATION MATERIALS

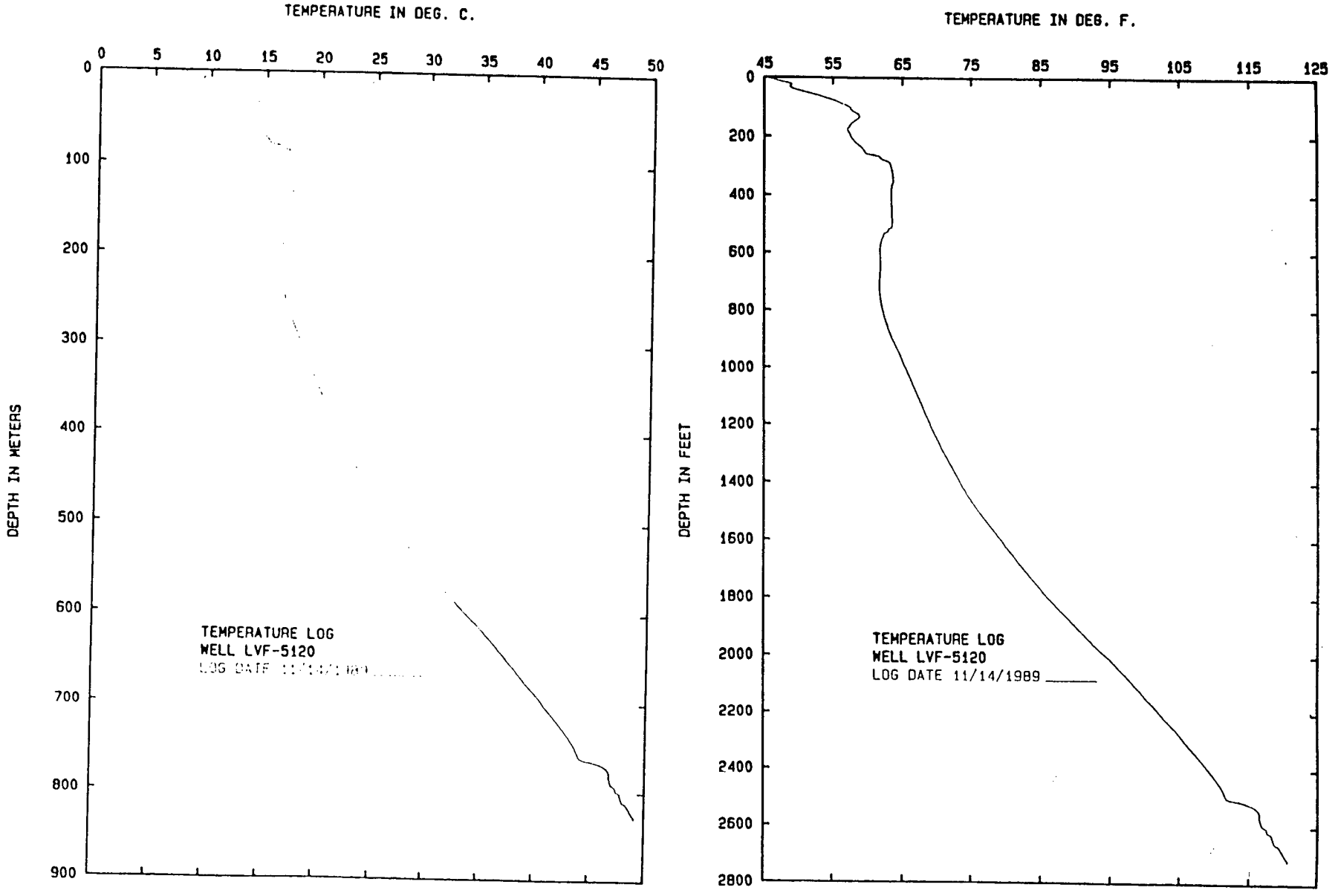
ADDITIVES:	QUANTITIES
VISCOSIFIERS-	
M-I GEL	451,500 lb
POLY PLUS	75 gal
FLUID LOSS ADDITIVE-POLYPAC	1000 lb
THINNER-TANNATHIN	14,000 lb
SURFACTANTS-	
DMS	480 gal
LUBE-106	130 gal
SURFAK M	55 gal
DEFOAMERS-	
ALUMINUM STEARATE	225 lb
DEFOAM-L	140 gal
DEFOAM-X	25 gal
OTHER COMMERCIAL CHEMICALS-	
CAUSTIC SODA	2450 lb
IMCO SAPP	2600 lb
LIME	3150 lb
M-I BAR	800 lb
SODIUM BICARB	39,200 lb

LOST CIRCULATION MATERIALS:	
ATLOS (ground truck tires)	
A020	1300 lb
A025	300 lb
A095	3650 lb
CEDAR FIBER	5800 lb
COTTONSEED HULLS	6400 lb
DICK'S MUD SEAL	4320 lb
KWIK SEAL, COARSE	4240 lb
KWIK SEAL, MEDIUM	20,000 lb
MICA, COARSE	4400 lb
MICA, FINE	3000 lb
NUT PLUG, MEDIUM	31,450 lb
SAWDUST	16,000 lb
TOTAL LCM	100,860 lb

APPENDIX E

TEMPERATURE LOGS

The following temperature logs were made after completion of the coring operation. That is, the temperature sensor was lowered inside the drill pipe and core rods that are still in the hole.


TEMPERATURE IN DEG. C.
0 5 10 15 20 25 30 35 40 45 50
0 100 200 300 400 500 600 700 800 900
DEPTH IN METERS
TEMPERATURE LOG
WELL LVF-5120
LOG DATE 11/14/1989
TEMPERATURE IN DEG. F.
45 55 65 75 85 95 105 115 125
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800
DEPTH IN FEET
TEMPERATURE LOG
WELL LVF-5120
LOG DATE 11/14/1989

APPENDIX F

DIRECTIONAL LOGS

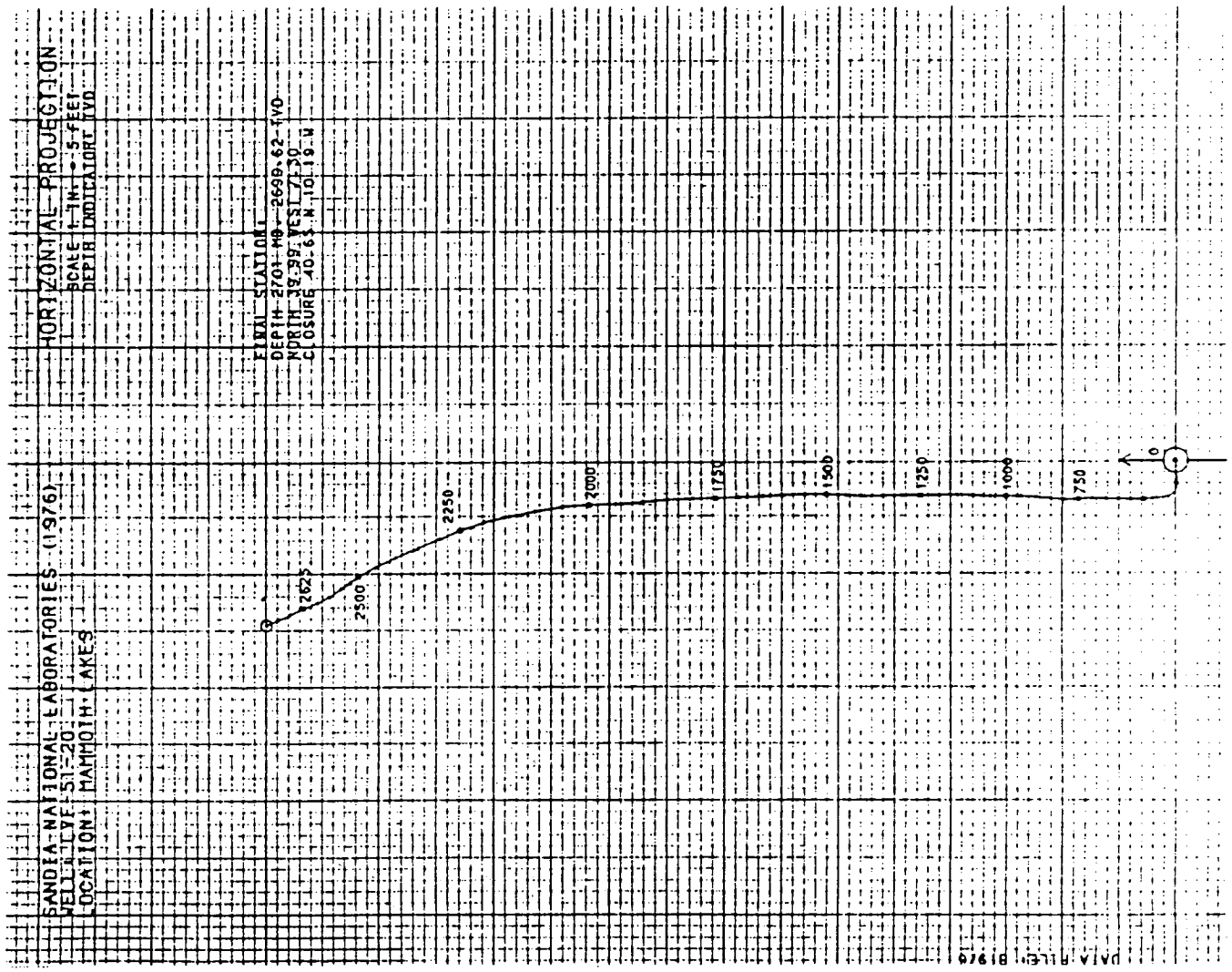
The following directional survey was done after the completion of coring. Survey tool travel was through the drill pipe and core rods.

SANDIA NATIONAL LABORATORIES (1976)
WELL: LVF-51-20
LOCATION: MAMMOTH LAKES
DATE: 13-NOV-1989
LATITUDE: 37.68
SURVEY TYPE: SEEKER GYROSCOPIC SURVEY
SURVEY BY: EASTMAN CHRISTENSEN
SURVEYOR: MARK PAHLER

VERTICAL SECTION CALCULATED IN PLANE OF BOTTOM HOLE CLOSURE

RECORD OF SURVEY

RADIUS OF CURVATURE METHOD



MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	COURSE LENGTH FEET	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		DOGLEG SEVERITY DG/100FT
0.	0 0	0 0	0.	0.00	0.00	0.00	0.00	0.00
50.	0 13	S 76 51 W	50.	50.00	-0.00	0.02 S	0.09 W	0.43
100.	0 13	N 76 11 W	50.	100.00	0.03	0.02 S	0.28 W	0.20
150.	0 20	S 78 47 W	50.	150.00	0.08	0.01 S	0.52 W	0.33
200.	0 20	S 84 8 W	50.	200.00	0.09	0.06 S	0.81 W	0.06
250.	0 18	N 80 58 W	50.	250.00	0.14	0.05 S	1.08 W	0.18
300.	0 15	N 87 12 W	50.	300.00	0.21	0.03 S	1.32 W	0.12
350.	0 16	N 60 24 W	50.	350.00	0.32	0.04 N	1.54 W	0.24
400.	0 31	N 3 29 W	50.	400.00	0.62	0.32 N	1.72 W	0.87
450.	0 38	N 9 48 W	50.	449.99	1.12	0.82 N	1.78 W	0.27
500.	0 40	N 0 2 E	50.	499.99	1.68	1.38 N	1.82 W	0.23
550.	0 36	N 0 4 W	50.	549.99	2.22	1.93 N	1.83 W	0.13
600.	0 40	N 3 5 E	50.	599.98	2.76	2.48 N	1.81 W	0.15
650.	0 41	N 0 40 E	50.	649.98	3.34	3.07 N	1.79 W	0.07
700.	0 40	N 0 24 E	50.	699.98	3.92	3.66 N	1.78 W	0.03
750.	0 43	N 5 59 W	50.	749.97	4.52	4.26 N	1.81 W	0.18
800.	0 40	N 1 25 E	50.	799.97	5.11	4.86 N	1.84 W	0.20
850.	0 46	N 8 14 E	50.	849.97	5.72	5.48 N	1.79 W	0.26
900.	0 47	N 2 29 E	50.	899.96	6.37	6.17 N	1.72 W	0.16
950.	0 44	N 3 47 E	50.	949.96	7.02	6.83 N	1.69 W	0.11
1000.	0 48	N 2 24 W	50.	999.95	7.67	7.49 N	1.68 W	0.21
1050.	0 52	N 1 34 E	50.	1049.95	8.39	8.22 N	1.68 W	0.18
1100.	0 49	N 4 50 E	50.	1099.94	9.12	8.97 N	1.64 W	0.14
1150.	0 53	N 0 59 W	50.	1149.94	9.84	9.71 N	1.62 W	0.22
1200.	0 55	N 1 29 W	50.	1199.93	10.62	10.50 N	1.63 W	0.07
1250.	0 59	N 1 36 E	50.	1249.92	11.44	11.33 N	1.63 W	0.17
1300.	0 57	N 1 43 W	50.	1299.92	12.28	12.19 N	1.63 W	0.13
1350.	0 56	N 1 32 W	50.	1349.91	13.09	13.00 N	1.66 W	0.03
1400.	0 57	N 0 28 E	50.	1399.90	13.91	13.83 N	1.66 W	0.07

MEASURED DEPTH FEET	DRIFT ANGLE D M	DRIFT DIRECTION D M	COURSE LENGTH FEET	TRUE VERTICAL DEPTH FEET	VERTICAL SECTION FEET	RECTANGULAR COORDINATES FEET		DOGLEG SEVERITY DG/100FT
1500.	1 1	N 0 57 E	50.	1499.89	15.56	15.53 N	1.57 W	0.18
1550.	1 0	N 1 43 W	50.	1549.88	16.49	16.47 N	1.58 W	0.25
1600.	1 1	N 3 2 W	50.	1599.87	17.41	17.41 N	1.62 W	0.24
1650.	1 9	N 3 15 W	50.	1649.86	18.35	18.35 N	1.67 W	0.27
1700.	1 11	N 2 5 W	50.	1699.85	19.36	19.36 N	1.72 W	0.08
1750.	1 7	N 2 5 W	50.	1749.84	20.35	20.36 N	1.75 W	0.13
1800.	1 13	N 0 25 E	50.	1799.83	21.35	21.38 N	1.77 W	0.22
1850.	1 15	N 6 17 W	50.	1849.82	22.41	22.45 N	1.82 W	0.30
1900.	1 21	N 4 25 W	50.	1899.81	23.54	23.58 N	1.93 W	0.22
1950.	1 18	N 3 41 W	50.	1949.79	24.70	24.74 N	2.01 W	0.11
2000.	1 18	N 0 21 W	50.	1999.78	25.82	25.87 N	2.05 W	0.15
2050.	1 22	N 9 22 W	50.	2049.77	26.98	27.03 N	2.15 W	0.44
2100.	1 22	N 9 9 W	50.	2099.75	28.17	28.21 N	2.34 W	0.01
2150.	1 15	N 13 25 W	50.	2149.74	29.31	29.33 N	2.56 W	0.30
2200.	1 19	N 11 13 W	50.	2199.73	30.43	30.42 N	2.80 W	0.17
2250.	1 11	N 23 41 W	50.	2249.71	31.51	31.46 N	3.13 W	0.60
2300.	1 6	N 22 55 W	50.	2299.70	32.48	32.38 N	3.52 W	0.17
2350.	1 10	N 23 9 W	50.	2349.70	33.45	33.29 N	3.91 W	0.13
2400.	1 17	N 23 31 W	50.	2399.68	34.49	34.27 N	4.34 W	0.33
2450.	0 58	N 27 3 W	50.	2449.67	35.44	35.16 N	4.75 W	0.65
2500.	1 0	N 28 43 W	50.	2499.67	36.25	35.91 N	5.17 W	0.09
2525.	1 0	N 41 31 W	25.	2524.66	36.64	36.26 N	5.40 W	0.89
2550.	1 21	N 27 4 W	25.	2549.66	37.11	36.68 N	5.67 W	1.00
2575.	1 29	N 43 35 W	25.	2574.65	37.67	37.19 N	6.04 W	1.71
2600.	1 22	N 8 30 W	25.	2599.64	38.26	37.74 N	6.31 W	3.46
2625.	1 40	N 32 10 W	25.	2624.63	38.90	38.35 N	6.54 W	2.75
2650.	1 18	N 20 49 W	25.	2649.62	39.52	38.93 N	6.83 W	1.07
2675.	1 10	N 24 37 W	25.	2674.62	40.08	39.45 N	7.05 W	0.34
2700.	1 20	N 24 1 W	25.	2699.61	40.63	39.97 N	7.28 W	0.14

FINAL CLOSURE - DIRECTION: N 10 DEGS 20 MINS W
DISTANCE: 40.63 FEET

EASTMAN CHRISTENSEN

APPENDIX G

DAILY REPORTS

The following pages comprise the daily reports submitted by the mud logger and the reports submitted by Sandia field personnel to a distribution list of approximately 75 persons and agencies, including DOE, universities, local government, BLM, and interested scientific investigators.

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 8-02-89 | Time of Report 08:00 | Days since spud: 0

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 74 ' | Depth Yest. 64 ' | Progress 10 ft | Rotating Hrs 1/2

Size and Depth of Last Casing: 40 " at 64 ft | Now Drilling 26" W/36" OPENR

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
1	26"	SEC	S3FJ4	64'	SIH	10'	1/2	18	70	10

Lithology:	Interval		Description
	64 - 74	ft	VESICULAR OBSIDIAN W OCC ALTERED RHYOLITE
	-	ft	AMYGDULES & ALTERED RHYOLITE INTERBEDS
	-	ft	
	-	ft	
	-	ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 67 cp | PV 7 cp | YP 23 lb/100ft2 | pH 11.4

Returns temp 62 F | Lost circulation 100 bbl

Flow rate 1040 gpm | Pump pressure 150 psi, strokes/min 120

Composition: bentonite , lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ lb/ft | Connection: | Grade:

Number of D.P. joints:

Drill Collars: 1 @ 11", @ ", @ " | DC wt. (in air) 90K lb

DC length 30 ft | Bottom Hole Assembly: Total length 49 ft

BHA Description: BIT/BIT-SUB/36" HOLE OPENER/ SUB/ COLLAR

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

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SUMMARY OF YESTERDAY'S OPERATIONS

RIG UP 0000 HRS TO 0630 HRS; DRILL 26" HOLE W/ 36" HOLE OPENER FROM 64' KB TO 74', LOST CIRCULATION, BUILD MUD VOLUME

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 **DAILY MUD LOG REPORT**

Report Date 8-2-89	Synopsis of Rig Activity, Last 24 Hrs: RIG UP; SPUD 26" HOLE W 36" HOLE OPENER @ 0630 HRS.; DRILL FROM 64' KB TO 74'; LOST RETURNS; BUILD MUD VOLUME.
Report Time 08:00	
Days Since Spud 0	
Present Depth 74'	
Prior Depth 64'	
24 Hr Footage 10'	Present Activity (08:00): BUILDING MUD VOLUME
Drilling Hrs 1/2	
Avg ROP by TIME 18	Next Significant Activity: REGAIN CIRCULATION & DRILL
ROP is in Feet/Hour	

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	40	73'	4	66'	22	by RATE
WOB	10		10		10	K-lbs
RPM	70		70		70	
TRQ						amps
PP	150	65'	125	74'	145	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	77	68'	26	66'	53	ppm
COND IN	1010	64'	992	72'	1000	ppm NaCl
COND OUT	872	64'	907	74'	894	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.6		8.6		8.6	lb/g
MW OUT	8.6		8.6		8.6	lb/g
pH IN	11.9	70'	11.8	74'	11.9	
pH OUT	11.8	70'	11.7	74'	11.77	
TEMP IN	65	65'	64.2	74'	64.7	deg F
TEMP OUT	63.3	73'	63	64	63.1	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
VESICULAR OBSIDIAN- LT OLIVE GRY TO BLACK GRY, HARD, MATTE TO DOM VITREOUS LUSTER, COM PERLITIC & DEVITRIFIED, TRANSLUCENT TO OPAQUE, CONCHOIDIAL, COM OBLATE & ELONGATE VESICLES TO 5MM, OCC W WHITE ALTERED RHYOLITIC LININGS AND LESS COM AMYGDULES OF SAME, OCC BANDED; APPROX 10% INTERBEDS OF WHT TO PALE PINKISH ORANGE VARIABLY ALTERED RHYOLITE

Sample Logging Conditions, other remarks: GOOD/ LOST RETURNS @ 74', SAMPLES FROM 71'-74' STILL IN HOLE.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
1	26"	SEC/S3FJ4	64'	10'	1/2	SIH

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-03-89 | Time of Report 08:00 | Days since spud: 1

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 91 ' | Depth Yest. 74 ' | Progress 17 ft | Rotating Hrs 3.5

Size and Depth of Last Casing: 40 " at 63 ft | Now Drilling 26"/36" Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
1	26 " 36"	SEC Hole	S3FJ4 opener	64'	91'	27	3.5	8	70	10

Lithology:

Interval			Description
	-	ft	LOST CIRCULATION, NO RETURNS TO SURFACE
	-	ft	
	-	ft	
	-	ft	
	-	ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 79 cp | PV 9 cp | YP 23 lb/100ft2 | pH 11.4

Returns temp 64 F | Lost circulation 1200 bbl

Flow rate 1040 gpm | Pump pressure 145 psi, strokes/min 120

Composition: bentonite , lignite

Other: lime, caustic soda

Drill String:

Drill Pipe OD/weight: 5.5 "/ lb/ft | Connection: | Grade:

Number of D.P. joints:

Drill Collars: 1 @ 30", @ ", @ " | DC wt. (in air) lb

DC length 30 ft | Bottom Hole Assembly: Total length 49 ft

BHA Description: BIT/BIT SUB/36" HOLE OPENER/SUB/COLLAR

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

BUILD MUD VOLUME, 3.5 HRS REPAIRING SHAKERS, DRILL FROM 74'-91', BUILD MUD VOLUME, LAY DOWN BHA, RIG UP & CEMENT 202 FT3 CEMENT PLUG, WAIT ON CEMENT, CEMENT PLUG #2 202 FT3, WOC, CEMENT PLUG #3 310 FT3 CEMENT W PERLITE, WOC

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-3-89	Synopsis of Rig Activity, Last 24 Hrs: BUILD MUD VOLUME. WORK ON RIG. DRILL W/ NO RETURNS
Report Time	24:00	FROM 74'-91', BUILD MUD VOLUME, LAY DOWN BHA, SET 202 FT3 CEMENT PLUG, WOC, SET #2 PLUG
Days Since Spud	1	OF 202 FT3, WOC, SET #3 PLUG OF 310 FT3 2-1 PERLITE, WOC
Present Depth	91'	
Prior Depth	74'	
24 Hr Footage	17'	Present Activity (08:00): WAITING ON CEMENT
Drilling Hrs	3	
Avg ROP by TIME	6	Next Significant Activity: TEST PLUG
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	124	76	12	90	33	by RATE
WOB	12	84'	10	76	10.4	K-lbs
RPM	70		70		70	
TRQ						amps
PP	175		145		150	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	82	79	63	87	71	ppm
COND IN	930	78	889	90	909	ppm NaCl
COND OUT	N/A					ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.6		8.6		8.6	lb/g
MW OUT	N/A					lb/g
pH IN	11.4		11.4		11.4	
pH OUT	N/A					
TEMP IN	69	91	68	75	68.5	deg F
TEMP OUT	N/A					deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
LOST CIRCULATION @ 74', DRILLED 71'-91' WITH NO MUD OR SAMPLE RETURNS

Sample Logging Conditions, other remarks: NO MUD OR SAMPLE RETURNS FROM 71'-91'

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units. SPM #1+2=120
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = 77, 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
1	26"	SEC S3FJ4	64'	27'	3.5	1-1-IN

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-04-89 | Time of Report 08:00 | Days since spud: 2

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 96' ' | Depth Yest. 91' ' | Progress 5 ft | Rotating Hrs 2.5

Size and Depth of Last Casing: 40 " at 63' | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
1	26/36"	SEC	SEC	54'	71'	REAMING CEMENT PLUG #4				
2	26"	SMITH	DSJ	91'	96'	5	2.5	3	45	15

Lithology:

Interval		Description
91' - 96'	ft	RHYOLITIC TUFF- PINK TO PINKISH GRY W/COM
-	ft	GRYSH GRN MOTTLING, COM VESICULES W XLN QTZ
-	ft	LININGS, POSSIBLY SLIGHTLY ALTERED.
-	ft	
-	ft	

Drilling Fluid:

Mud Wt. 8.4 lb/gal | Vis 69 cp | PV 6 cp | YP 34 lb/100ft2 | pH 11.4

Returns temp 63 F | Lost circulation 900 bbl

Flow rate 597 gpm | Pump pressure 55 psi, strokes/min 59

Composition: bentonite , LIME, CAUSTIC SODA

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ lb/ft | Connection: | Grade:

Number of D.P. joints:

Drill Collars: 1 @ 11", @ ", @ " | DC wt. (in air) 59K lb

DC length 30 ft | Bottom Hole Assembly: Total length 49 ft

BHA Description: BIT/BIT SUB/HOLE OPENER/SUB/COLLAR

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

WAIT ON CEMENT, PUMP 10 SKS GEL & EMPTY MUD SACKS AS LCM, CIRC HOLE CLEAN, P/U 36" HOLE OPENER, DRILL FROM 91'-93', LOST RETURNS, BUILD MUD VOLUME. DRILL TO 96', LOST CIRCULATION, CIRCULATE, POOH FOR CEMENT PLUG #4, CEMENT W 310 FT3 2-1 PERLITE, WAIT ON CEMENT, RIH TAG CEMENT @ 54', P/U 36" HOLE OPENER, DRILL SOFT CEMENT TO 71', CIRCULATE.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-4-89
Report Time	08:00
Days Since Spud	2
Present Depth	96'
Prior Depth	91'
24 Hr Footage	5'
Drilling Hrs	2.5
Avg ROP by TIME	3
ROP is in Feet/Hour	

Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CMT, PUMP 10 SKS GEL & EMPTY MUD SKS AS LCM TRIP FOR 36" HOLE OPENER, DRILL TO 93', LOST CIRC, BUILD VOLUME, DRILL 26" HOLE TO 96', LOST CIRC, TRIP FOR CEMENT PLUG #4, SPOT 310 FT3 OF 2-1 PERLITE, WAIT ON CEMENT, RIH & TAG SOFT CMT @ 54', OPEN TO 36" TO 71', CIRC, WOC.

Present Activity (08:00): CIRC/WOC

Next Significant Activity: OPEN HOLE TO 96', IF RETURNS ADEQUATE TRIP FOR 26" BIT & DRILL

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	11	93'	4	96	7	by RATE
WOB	15	96'	13	92'	14.4	K-lbs
RPM	51	94'	45	92	46	
TRQ						amps
PP	200	96'	170	92	175	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	289	95'	274	92	285	ppm
COND IN	956	96'	932	94	948	ppm NaCl
COND OUT	991	96'	986	93'	989	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.6		8.6		8.6	lb/g
MW OUT	8.6		8.6		8.6	lb/g
pH IN	11.44	96'	11.4	92'	11.4	
pH OUT	11.5	92'	11.45	96'	11.46	
TEMP IN	65.5	93	65	96	65	deg F
TEMP OUT	64.7	95'	64	92	64.4	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
RHYOLITIC TUFF- LT GRY & PINK MOTTLED, MOD HARD W SOFT, POSS ALTERED STREAKS, COM VESICLES COM W MICROXTLN DRUSE QTZ LININGS, OCC GRNSH BLK TO DK GRY VESICULAR OBSIDIAN INCLUSIONS.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
2	26"	SMITH/DSJ	91'	5'	2.5	1-1-IN

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Sample Logging Conditions, other remarks: ABNDT LCM CONTAMINATION, POOR SAMPLE RETURNS DUE TO LOST CIRC.

Report by: BILL GILMOUR

)E / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

ate: 8-05-89 | Time of Report 08:00 | Days since spud: 3

ell No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

epth Today 143 ' | Depth Yest. 96 ' | Progress 47 ft | Rotating Hrs 4.5

ze and Depth of Last Casing: 40 " at 63'KB | Now Drilling 26 " Hole

t Data:

lo.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
2	26"	STC	DSJ	96'	SIH	47'	4.5	11	60	18

thology:	Interval		Description
	96' - 115'	ft	RHYOLITIC TUFF, SEMI PERVEOUS, SLI VESICULAR
	115'- 143	ft	DOM BRIT BUT COMPETENT OBSIDIAN W <20 TUFF, RHY
	-	ft	
	-	ft	
	-	ft	

illing Fluid:
Mud Wt. 8.7 lb/gal | Vis 62 cp | PV 6 cp | YP 48 lb/100ft2 | pH 11.9
Returns temp 72 F | Lost circulation 560 bbl
Flow rate 850 gpm | Pump pressure 475 psi, strokes/min 85
Composition: BENTONITE , CAUSTIC SODA, LIME, LIGNITE
Other:

ill String:
Drill Pipe OD/weight: 5.5 "/ lb/ft | Connection: | Grade:
Number of D.P. joints:
Drill Collars: 2 @ 11", @ ", @ " | DC wt. (in air) 73 K lb
DC length 60 ft | Bottom Hole Assembly: Total length 96 ft
BHA Description: BIT/3 PT REAMER/BIT SUB/SHOCK SUB/ DC/STAB/DC/XO

rectional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

WAIT ON CMT, DRILL CMT & OPEN HOLE FM 71'-93', LOST 110 BBLS MUD, LD HOLE OPENER, PU 3 JTS DP, CEMENT 310 FT3, WOC, DRILL SOFT CEMENT, WAIT ON CEMENT, DRILL HARD CEMENT 78'-94', CHANGE BHA, DRILL FROM 96'-143'

port by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-5-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CEMENT, DRL CMT & OPEN HOLE TO 93', LOST 110 BBLS, LAY DOWN HOLE OPENER, P/U 3 JTS DP, PUMP CEMENT PLUG #5- 310 FT3 2-1 PERLITE, WOC, DRILL SOFT CMT TO 78', CIRC CMT, WOC 4 HRS, DRILL CEMENT TO 94', POOH LAY DOWN HOLE OPENER RIH & DRILL 26" HOLE TO 143'
Report Time	08:00	
Days Since Spud	3	
Present Depth	143'	
Prior Depth	96'	
24 Hr Footage	47	Present Activity (08:00): DRILLING
Drilling Hrs	4.5	
Avg ROP by TIME	11	Next Significant Activity: DRILL
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	102	122'	1	114'	17	by RATE
WOB	20	115'	10	109'	15	K-lbs
RPM	61	116'	47	98'	55	
TRQ						amps
PP	475	116'	370	114'	455	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	401	110'	3391	97'	388	ppm
COND IN	3291	108'	2355	142'	2667	ppm NaCl
COND OUT	2933	122'	2680	107'	2754	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7		8.7		8.7	lb/g
MW OUT	8.7		8.7		8.7	lb/g
pH IN	12.0	98'	11.9	143'	11.9	
pH OUT	12.1	97'	11.9	143'	11.9	
TEMP IN	77	142'	68	97'	72	deg F
TEMP OUT	78	143'	70	97'	73	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
RHYOLITE-GRNSH GRY W ORNGSH PNK TUFFACEOUS AMYGDULES AND LAMS, RHYOLITE IS HARD, OCC MICROBANDED, MICROSUCROSIC. W OCC VESICLES LINED & OCC FILLED W TUFF, OCC CARBONACEOUS INCLUSIONS, OVERALL MOD COMPETENT EXCEPT FOR TUFFACEOUS MATERIAL WHICH DISPLAYS PARTIAL DISSOLUTION, ABNDT CEDER FIBER ADDED AS LOST CIRCULATION MATERIAL.

Sample Logging Conditions, other remarks: ABNDT LOST CIRCULATION MATERIAL ADDED OBSCURES SAMPLE ANALYSIS

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
2	26"	STC DSJ	96'	47	4.5	SIH

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING RE**

Date: 8-06-89 | Time of Report 08:00 | Days since spud: 4

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 320'' | Depth Yest. 143'' | Progress 177 ft | Rotating Hrs

Size and Depth of Last Casing: 40 " at 63'KB | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
2	26"	SMITH	DSJ	96'	320	224'	8	27'/HR	60	10-2

Lithology:

Interval	Description
143'- 320 ft	TUFF- DOM V LT GRY TO GRYSH WHT; VITRIC TO
- ft	FINELY VESICULAR & PUMICEY, WITH OCC
- ft	PINKISH ORANGE RHYOLITIC TUFF INTERLA
- ft	OCC OBSIDIAN LAPILLI @ THE TOP OF THE
- ft	INTERVAL.

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 61 cp | PV 7 cp | YP 33 lb/100ft2 | pH 11.7

Returns temp 77 F | Lost circulation 550 bbl

Flow rate 809 gpm | Pump pressure 600 psi, strokes/min 80

Composition: bentonite , lignite, caustic soda

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/25.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. joints: 4

Drill Collars: 3 @ 11", @ ", @ " | DC wt. (in air) 76K lb

DC length 91' ft | Bottom Hole Assembly: Total length 135.74'

BHA Description: BIT/3 PT REAMER/BIT SUB/SHOCK SUB/DC/STAB/DC/STAB/DC/XO

Directional Survey

Measurement Depth	Angle	Azimuth	Dog Leg Severity
167'	3/4		
230'	1/4		
302'	1/4		

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLED FROM 143' TO 318' WITH THE 26" BIT. DRILLING WENT WELL, WITH DEVIA MEASURING 1/4 TO 3/4 DEGREES IN THIS INTERVAL. @ 318' FLUID RETURNS DISAP- PEARED COMPLETELY, SO ANOTHER CEMENT PLUG WAS SET AT THE BOTTOM OF THE HOL WAITED UNTIL 0500, TAGGED TOP OF CEMENT @ 246', PUMPED 100 BBLS OF MUD WIT NO RETURNS, PUMPED LOST CIRCULATION MATERIAL, AND RIGGED FOR ANOTHER CEMEN PLUG.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 — DAILY MUD LOG REPORT

Report Date	8-6-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL & SURVEY FROM 96'-320', LOST CIRCULATION, BUILD VOLUME & PUMP 100 BBL LOST CIRCULATION PILL; POOH; RIG UP HOWCO; PUMP PLUG #6, 310 FT3 2-1 PERLITE MIX; WAIT ON CEMENT; RIH & TAG CEMENT @ 264', CIRC W NO RETURNS; PUMP LCM PILL; POOH; RIG UP HOWCO FOR CEMENT PLUG #7.
Report Time	08:00	
Days Since Spud	4	
Present Depth	320'	
Prior Depth	143'	
24 Hr Footage	177'	Present Activity (08:00): RIGGING UP TO CEMENT LOST CIRC ZONE
Drilling Hrs	8	
Avg ROP by TIME	22	Next Significant Activity: CEMENT, WAIT ON CEMENT
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	80	167'	4	310	34	by RATE
WOB	28	245'	7	174'	13	K-lbs
RPM	75	275'	50	289'	56	
TRQ	5	244'	3	289'	3	amps
PP	1080	215	488	278	719	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	654	258'	355	180	457	ppm
COND IN	2839	149'	1375	310	2338	ppm NaCl
COND OUT	2772	182'	1268	304'	1889	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.8	202'	8.7	309'	8.8	lb/g
MW OUT	8.9	187'	8.7	313'	8.8	lb/g
pH IN	11.9	144'	11.6	320'	11.7	
pH OUT	11.9	144'	11.6	311'	11.8	
TEMP IN	85	320'	77	145'	81	deg F
TEMP OUT	87	318'	78	145'	82	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
DOM VITRIC TUFF- WT TO LT GRY, OCC MED GRY; PR TO MOD WELDED; FIRM TO MOD HARD; MATTE TO SUBVITREOUS; OCC DEVITRIFIED; COM TO V ABNDT ELONGATE TRANSLUCENT GLASS SHARDS & FRAGS; COM VESICLES GRADING TO PUMICE; TR TO OCC PINKSH RYHOLITIC TUFF. TRACES LAPILLI TUFF @ 150' WITH OCC SBRND DK GRY OBSIDIAN LAPILLI.

Sample Logging Conditions, other remarks: GOOD, LOST APPROX 550 BBLS OF MUD @ 320', NO RETURNS.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
2	26"	STC DSJ	96'	224	12.5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING RE**

Date: 8-07-89 | Time of Report 08:00 | Days since spud: 5

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 320 ' | Depth Yest. 320 ' | Progress 0 ft | Rotating Hrs

Size and Depth of Last Casing: 40 " at 63' KB | Now Drilling 36 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
1	26/36"	SEC	S3FJ4	96	291'	195'	8.5	20'/HR	55	10-1

Lithology:

Interval	Description
- ft	NO NEW LITHOLOGY
- ft	
- ft	
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 40 cp | PV 6 cp | YP 21 lb/100ft2 | pH 11.9
Returns temp 82 F | Lost circulation 400 bbl
Flow rate 809 gpm | Pump pressure 250 psi, strokes/min 80
Composition: bentonite , lignite
Others:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints: 4
Drill Collars: 3 @ 11", @ ", @ " | DC wt. (in air) 54 lb
DC length 91 ft | Bottom Hole Assembly: Total length 110 ft
BHA Description: BIT/HOLE OPENER/BIT SUB/SHOCK SUB/3 DC'S/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

SET SECOND CEMENT PLUG IN THE 26" HOLE. PICKED UP THE 36" HOLE OPENER AND DRILLED TO 291'. WE WILL SET ONLY 7 JTS. (280') OF THE 30" CASING INSTEAD OF THE @ (320') ORIGINALLY PLANNED. THIS WILL LEAVE THE BOTTOM OF THE CASING IN COMPETENT FORMATION INSTEAD OF THE LOSS ZONE ENCOUNTERED @ 318'. BEGAN RUNNING CASING INTO THE HOLE , BUT GOT STUCK ON A LEDGE @ 87'. AT 0800 WE ARE LOOKING FOR 36" REAMERS TO STRAIGHTEN OUT THE HOLE.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-7-89	Synopsis of Rig Activity, Last 24 Hrs: CEMENT W 310 FT3 2-1 PERLITE, WAIT 5.5 HRS ON CEMENT, M/U BHA, OPEN HOLE TO 36" FROM 96' TO 291', MIX & PUMP LCM PILL, RIG UP TO RUN CASING, RIH W 3 JTS 30" CASING AND COULD NOT GET PAST 87', PULL CASING OUT OF THE GROUND.
Report Time	08:00	
Days Since Spud	5	
Present Depth	320'	
Prior Depth	320'	
24 Hr Footage	0	Present Activity (08:00): PULL CASING OUT OF THE GROUND
Drilling Hrs	8.5 D/H	
Avg ROP by TIME	20	Next Significant Activity:
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			20	by RATE
WOB			11	K-lbs
RPM			55	
TRQ			5	amps
PP			250	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2			383	ppm
COND IN			1544	ppm NaCl
COND OUT			1438	ppm NaCl
H2S			0	ppm
HYDC GAS			0	units
MW IN			8.8	lb/g
MW OUT			8.8	lb/g
pH IN			11.9	
pH OUT			11.9	
TEMP IN			80	deg F
TEMP OUT			82	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
NO NEW LITHOLOGY

Sample Logging Conditions, other remarks: 400 BBLS OF MUD LOST OVER THE LAST 24 HRS.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide. Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
1	26/36	SEC S3FJ4	96'	195'	8.5	OPENED HOLE

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REP**

Date: 8-08-89 | Time of Report 08:00 | Days since spud: 6

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County

Depth Today 320'' | Depth Yest. 320'' | Progress 0 ft | Rotating Hrs (

Size and Depth of Last Casing: 40 " at 63'KB | Now Drilling 36" HOLE OPE

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
3	17.5	USED AS PILOT FOR 2-36" HOLE OPENERS & 26" 3-PT RMR							30	3

Lithology:

Interval	Description
– ft	
– ft	NO NEW LITHOLOGY
– ft	
– ft	
– ft	

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 41 cp | PV 7 cp | YP 18 lb/100ft2 | pH 11.7
Returns temp 75 F | Lost circulation 300 bbl
Flow rate 809 gpm | Pump pressure 0 psi, strokes/min 80
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/Weight: 5.5 "/25.6 lb/ft | Connection: S" | Grade: E
Number of D.P. joints: 0
Drill Collars: 2 @ 11", @ ", @ " | DC wt. (in air) 70k lb
DC length 60 ft | Bottom Hole Assembly: Total length 93 ft
BHA Description: 17.5" BIT/HOLE OPENER/XO/HOLE OPENER/26" 3-PT REAMER/ BIT SUB/2-11" COLLARS/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

LOCATED A 36" HOLE OPENER @ NEVADA TEST SITE AND ARRANGED TO HAVE IT TRUCKE TO THE DRILL SITE. IT ARRIVED AT APPROXIMATELY 2030 HRS AND WAS ASSEMBLED PIGGYBACK WITH THE ORIGINAL HOLE OPENER. THE HOLE WAS REPEATEDLY REAMED WI THIS ASSEMBLY DOWN TO 110' AND APPEARED TO BE SMOOTH AND STRAIGHT. ADDED ANOTHER DRILL COLLAR AND DRILLED AHEAD TO 113', WHERE SEVERE LOST CIRCULATI WAS ENCOUNTERED. RIGGING FOR CEMENT PLUG @ 0800 HRS.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-8-89	Synopsis of Rig Activity, Last 24 Hrs: PULL CASING FROM WELL, WAIT ON 36" HOLE OPENERS, MAKE UP BIT/36" HOLE OPENER/XO/HO/26" 3-PT RMR/BIT SUB/11" COLLAR/XO, RIH REAM TO 113', LOST CIRCULATION, 226 BBLS, REAM TO 116', BUILD MUD VOLUME & LCM PILL, PUMP 80 BBLS LCM PILL @ 102', BUILD MUD VOLUME
Report Time	08:00	
Days Since Spud	6	
Present Depth	320'	
Prior Depth	320'	
24 Hr Footage	0	Present Activity (08:00): BUILDING MUD VOLUME
Drilling Hrs	0	
Avg ROP by TIME		Next Significant Activity: SET CEMENT PLUG.
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			10	by RATE
WOB			3	K-lbs
RPM			30	
TRQ			4	amps
PP			0	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2			330	ppm
COND IN			1207	ppm NaCl
COND OUT			1172	ppm NaCl
H2S			0	ppm
HYDC GAS			0	units
MW IN			8.8	lb/g
MW OUT			8.8	lb/g
pH IN			11.8	
pH OUT			11.8	
TEMP IN			76	deg F
TEMP OUT			75	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
NO NEW LITHOLOGY

Sample Logging Conditions, other remarks: REAMING HOLE

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
3	17.5"	PILOT BIT W 2-36" HOLE OPENERS & 3 PT REAMER				

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL SILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REP**

Date: 8-09-89 | Time of Report 08:00 | Days since spud: 7

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County

Depth Today 320'' | Depth Yest. 320' | Progress 0 ft | Rotating Hrs

Size and Depth of Last Casing: 40 " at 63'KB | Now Drilling 36" OPEN HOL

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
	17.5	PILOT FOR THE TWO 36" HOLE OPENERS					6.5	30	40	0-6

Lithology:

Interval		Description
-	ft	
-	ft	NO NEW LITHOLOGY
-	ft	
-	ft	
-	ft	

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 52 cp | PV 10 cp | YP 28 lb/100ft2 | pH 12.20
Returns temp 77 F | Lost circulation bbl
Flow rate 809 gpm | Pump pressure 0 psi, strokes/min 80
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/25.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints: 5
Drill Collars: 2 @ 11", @ ", @ " | DC wt. (in air) 70 K lb
DC length 60' ft | Bottom Hole Assembly: Total length 93 ft
MHA Description: 17.5" BIT/36" HOLE OPENER/XO/36" HO/26" 5-PT REAMER/BIT
/2-11" DC'S/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

PUMPED ANOTHER 310 CU FT CEMENT PLUG @ 110' AND WAITED 6 HRS FOR IT TO CURE PUMPED FLUID IN HOLE TO TEST THE PLUG & IT HELD. SO BEGAN REAMING BACK TO BOTTOM (291') @ APPROXIMATELY MIDNIGHT, LAID DOWN THE REAMING ASSEMBLY, CONT RIGGED TO RUN CASING. CASING RAN IN WITH SOME MINOR HANG-UPS; LAST JOINT LANDED JUST AFTER 0800 HRS.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 **DAILY MUD LOG REPORT**

Report Date	8-9-89	Synopsis of Rig Activity, Last 24 Hrs: BUILD VOLUME, PUMP CEMENT PLUG #9, 310 FT3 @ 93'; WAIT ON CEMENT, RIH & TAG CEMENT @ 97', DRILL CEMENT & REAM TO 291.7', CIRC, MIX & SPOT LCM PILL, STRAP OUT OF HOLE & LAY DOWN 36" TOOLS, RIG UP & RUN 30" CASING.
Report Time	08:00	
Days Since Spud	7	
Present Depth	320'	
Prior Depth	320'	
24 Hr Footage	0	Present Activity (08:00): RUNNING 30" CASING
Drilling Hrs	0	
Avg ROP by TIME		Next Significant Activity: CEMENT 30" CASING
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			30	by RATE
WOB			3	K-lbs
RPM			40	
TRQ				amps
PP			0	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2			290	ppm
COND IN			1977	ppm NaCl
COND OUT			1864	ppm NaCl
H2S			0	ppm
HYDC GAS			0	units
MW IN			8.8	lb/g
MW OUT			8.8	lb/g
pH IN			12.3	
pH OUT			12.2	
TEMP IN			78	deg F
TEMP OUT			77	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
NO NEW LITHOLOGY

Sample Logging Conditions, other remarks:

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
PILOT	17.5		97'	194'	6.5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING RE**

Date: 8-11-89 | Time of Report 08:00 | Days since spud: 9

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 320 ' | Depth Yest. 320 ' | Progress 0 ft | Rotating Hrs

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB

Lithology:	Interval	Description
	- ft	
	- ft	NO NEW LITHOLOGY
	- ft	
	- ft	
	- ft	

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 42 cp | PV 8 cp | YP 5 lb/100ft2 | pH 12.25

Returns temp F | Lost circulation 0 lbl

Flow rate ' gpm | Pump pressure psi, strokes/min

Composition: bentonite , lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. joints: 0

Drill Collars: @ ", @ ", @ " | DC wt. (in air) lb

DC length ft | Bottom Hole Assembly: Total length ft

RHA Description:

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severit,

SUMMARY OF YESTERDAY'S OPERATIONS

WAITED ON CEMENT UNTIL 1500 AND BEGAN CUTTING OFF 40" MUD RISER & 30" CASI GOT WELLHEAD WELDED ON @ 2200 AND BEGAN TO NIPPLE UP. COMPLETE @ 0300, WA ING ON BLM REPRESENTATIVE TO WITNESS BOP PRESSURE TEST.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-11-89	Synopsis of Rig Activity, Last 24 Hrs: COMPLETE CEMENT TOP JOB, WAIT ON CEMENT, CUT 40",	
Report Time	08:00	30", INSTALL & WELD WELL HEAD, NIPPLE UP WELL HEAD.	
Days Since Spud	9		
Present Depth	320'		
Prior Depth	320'		
24 Hr Footage	0	Present Activity (08:00): NIPPLING UP	
Drilling Hrs	0		
Avg ROP by TIME		Next Significant Activity: MAKE UP BHA & DRILL OUT SHOE & NEW 26" HOLE	
ROP is in Feet/Hour			

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			by RATE	
WOB			K-lbs	
RPM				
TRQ			amps	
PP			PSI	

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2				ppm
COND IN				ppm NaCl
COND OUT				ppm NaCl
H2S				ppm
HYDC GAS				units
MW IN				lb/g
MW OUT				lb/g
pH IN				
pH OUT				
TEMP IN				deg F
TEMP OUT				deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY

Sample Logging Conditions, other remarks:

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REI**

Date: 8-12-89 | Time of Report 06:00 | Days since spud: 10

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 369 ' | Depth Yest. 320 ' | Progress 49 ft | Rotating Hrs

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
RR2	26"	STC	DSJ	320'		49'	3.5	14'/HR	40	15-2

Lithology:

Interval		Description
320 - 350	ft	DOMINANTLY RHYOLITE- PL RED TO ORNSH PINK,
-	ft	MOTTLED, APHANITIC, HARD, PARTIALLY DEVIT-
-	ft	RIFIED, TR VESICLES, OCC FRAC SURFACES
-	ft	EVIDENCED BY IRON STAINING, DECREASING
-	ft	AMOUNTS OF VESICULAR TUFF AND SBRNL OBSIDI

Drilling Fluid:

Mud Wt. 8.8 lb/gal | Vis 51 cp | PV 6 cp | YP 28 lb/100ft2 | pH 11.6
Returns temp 80 F | Lost circulation 300 bbl
Flow rate 770 gpm | Pump pressure 500 psi, strokes/min 78
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/20.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 53 Klb
DC length 91 ft | Bottom Hole Assembly: Total length 197.02'
BHA Description: 26"BIT/3-PT REAMER/SHOCK-SUB/XO/DC/STB/DC/STB/DC/DC.DC

Directional Survey	Measurement Depth	Angle	Azimuth	Deg Leg Severity
	282'	1/4 DG		

SUMMARY OF YESTERDAY'S OPERATIONS

MADE UP THE BOTTOM HOLE ASSEMBLY WHILE WAITING ON SLN REPRESENTATIVE TO WITNESS THE HYDRIL TEST. THE FIRST TEST TO 300 LBS. LEAKED AT APPROXIMATEL 5 LBS PER MINUTE. A TEST OF THE BACK SYSTEM CONFIRMED THAT THE HYDRIL WAS IN FACT LEAKING. A SECOND TEST OF THE HYDRIL HELD AND PASSED INSPECTION. WE THEN PROCEEDED TO DRILL OUT THE CEMENT, SURVEY AND DRILL NEW FORMATION TO 350' WHERE LOST CIRCULATION OCCURRED AND THE DRILLING STOPPED WHILE MORE MUD VOLUME WAS MIXED. DRILLING HAS RESUMED WITH PARTIAL RETURNS TO THE PRESENT DEPTH OF 369'.

Report by: RON JACOBSON

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-12-89	Synopsis of Rig Activity, Last 24 Hrs: MADE UP BHA, TESTED THE HYDRIL WHICH FAILED THE FIRST
Report Time	08:00	ATTEMPT BUT HELD THE SECOND TEST. RAN IN AND DRILLED OUT CEMENT & SHOE, SURVEYED, DRILLED
Days Since Spud	10	NEW FORMATION TO 355' WHERE 120 BBLS OF MUD WAS LOST TO THE FORMATION, PULLED TO THE SHOE
Present Depth	369'	AND MIXED MORE MUD AND THEN RESUMED DRILLING WITH PARTIAL RETURNS TO 369'.
Prior Depth	320'	
24 Hr Footage	49'	Present Activity (08:00): DRILLING
Drilling Hrs	3.5	
Avg ROP by TIME	14	Next Significant Activity: DRILL.....
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	58	353'	3	368'	18	by RATE
WOB	24	361'	12	349'	19	K-lbs
RPM	43	357'	39	332'	40	
TRQ	19	368'	3	321'	8	amps
PP	620	350'	160	369'	500	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	377'	347'	304	362'	359	ppm
COND IN	1978	322'	877	369'	1437	ppm NaCl
COND OUT	2108	322'	1012	369'	1677	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.8	321'	8.7	368'	8.8	lb/g
MW OUT	8.8		8.8		8.8	lb/g
pH IN	12.2	321'	12.0	369'	12.1	
pH OUT	12.3	321'	11.9	369'	12.1	
TEMP IN	80	369'	77	321'	79	deg F
TEMP OUT	80	367'	76	321'	79	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
70% RHYOLITE, 20% PARTIALLY VESICULAR TUFF, 10% ANGULAR AND SUBROUNDED OBSIDIAN; THE PREDOMINANT RHYOLITE IS PALE RED TO PINKISH ORANGE, COMMONLY MOTTLED, OCCASIONALLY BANDED, HARD, APHANITIC, WITH OCCASIONAL VESICLES AND FRACTURE SURFACES THAT ARE COMMONLY IRON STAINED. DEVITRIFICATION AND ALTERATIONS ARE EVIDENCED BY DISCOLORATIONS AND DULL MATTE LUSTERS OF THIS ROCK TYPE.

Sample Logging Conditions, other remarks: VERY POOR, INTERMITTENT SAMPLE RETURNS FROM 355' TO 369'.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR2	26"	STC DGJ	320'	49'	3.5	SIH

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REI**

Date: 8-13-89 | Time of Report 08:00 | Days since spud: 11

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 387' | Depth Yest. 369' | Progress 18 ft | Rotating Hrs

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
RR2	26"	STC	DSJ	320'	387'	67'	5.5	12	40	22 K
RR2	26"	STC	DSJ	387'	360'	DRILLED CEMENT FROM 317' TO 360'				

Lithology:	Interval	Description
	369'- 387' ft	NO RETURNS
	- ft	
	- ft	
	- ft	
	- ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 54 cp | PV 6 cp | YP 47 lb/100ft2 | pH 11.3

Returns temp 78 F | Lost circulation 270 bbl

Flow rate 770 gpm | Pump pressure 250 psi, strokes/min 76

Composition: bentonite , LIME, CAUSTIC

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connections: 6" | Grade: E

Number of D.P. joints:

Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 70k lb

DC length 151 ' | Bottom Hole Assembly: Total length 197.02'

BHA Description: 26"BIT/3-PT REAMER/XO/STB/SHOCK SUB/DC/STB/DC/DC/DC/DC

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	353'	1/2 D		

SUMMARY OF YESTERDAY'S OPERATIONS

WE DRILED FROM 369' TO 387' WITH PARTIAL RETURNS. MINIMAL FLOW RETURNS NECESSITATED ANOTHER CEMENT PLUG WHICH WAS SET IN PLACE @ 1300 HRS. WE WAITED FOR THE CEMENT TO SET FOR 6 HOURS AND RAN IN AND TAGGED THE TOP @ 317' AND DECIDED TO WAIT ANOTHER 4 HOURS. DRILLED CEMENT FROM 317' TO 360' WHERE SEVERE CIRCULATION LOSS WAS AGAIN ENCOUNTERED AND IT WAS DECIDED TO RECEMENT THIS INTERVAL. CEMENT PLUG #11 WAS PUT IN PLACE @ 0200 HRS AND WE ARE PRESENTLY WAITING FOR THE CEMENT TO HARDEN.

Report by: RON JACOBSON

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 — DAILY MUD LOG REPORT

Report Date	8-13-89
Report Time	08:00
Days Since Spud	11
Present Depth	387'
Prior Depth	369'
24 Hr Footage	18'
Drilling Hrs	2
Avg ROP by TIME	9
ROP is in Feet/Hour	

Synopsis of Rig Activity, Last 24 Hrs: DRILL FROM 369' TO 387' WITH PARTIAL RETURNS, SURVEY, POOH, SET CEMENT PLUG #10, WAIT ON CEMENT, BUILD MUD VOLUME, RIH W DRILL PIPE & TAG CEMENT @ 317', WOC, MAKE UP BHA, TAG CEMENT AGAIN, WOC, RIH AND DRILL CEMENT FROM 317' TO 360', LOST CIRCULATION, POOH TO CEMENT PLUG #11, WAIT ON CEMENT.

Present Activity (08:00): WAITING ON CEMENT

Next Significant Activity: TEST AND DRILL OUT CEMENT & NEW FORMATION.

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	11	380'	3	370'	8	by RATE
WOB	20	381'	13	370'	17	k-lbs
RPM	41	373'	29	370'	39	
TRQ	21	382'	3	380'	5	amps
PP	263	381'	109	370	191	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
DOC	360	375'	325	379'	342	ppm
COND IN	1296	370'	743	381'	987	ppm NaCl
COND OUT	1526	370'	989	382	1192	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7	370'	8.6	383'	8.7	lb/g
MW OUT	8.8	370'	8.7	383'	8.7	lb/g
pH IN	12.0	370'	11.9	387'	11.9	
pH OUT	11.9	371'	11.8	383'	11.9	
TEMP IN	77	370'	69	382'	71	deg F
TEMP OUT	77	382'	76	386'	77	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
RHYOLITE- LT GRY TO PL RED & DRSSH PINK, HARD COMMONLY MOTTLED, OCC BANDED, OCC VESICULAR; COMMON IRON STAINING ALONG FRACTURES, LAMINATIONS AND WITHIN VESICLES, APHANITIC, OCC DEVITRIFIED AND ALTERED, ASSOCIATED WITH 5-8% SUBROUNDED POSSIBLY REWORKED OBSIDIAN.

Sample Logging Conditions, other remarks: VERY POOR, SPARSE SAMPLE RETURNS FROM 369'-387' NECESSITATING ANOTHER CEMENT PLUG.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR2	26"	STC	320'	67'	5.5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING RE**

Date: 8-14-89 | Time of Report 08:00 | Days since spud: 12

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 412'' | Depth Yest. 387'' | Progress 25 ft | Rotating Hrs

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Flg	Hrs	Avg ROP	RPM	WOB
RR2	26"	STC	DSJ	387'	412'	25'	5	5	40	10-3

Lithology:

Interval	Description
- ft	
- ft	NO RETURNS
- ft	
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.5 lb/gal | Vis 32 cp | PV 3 cp | YP 2 lb/100ft2 | pH 11.0
Returns temp F | Lost circulation 500 bbl
Flow rate 670 gpm | Pump pressure 100 psi, strokes/min 66
Composition: bentonite , lignite
Others:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 40 K lb
DC length 152 ft | Bottom Hole Assembly: Total length 197'
BHA Description: 26"BIT/3-PT REAMER/XO/DC/STB/SHOCK-SUB/DC/STB/3-DC S/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

WE WAITED FOR CEMENT PLUG #11 TO SET AND THEN RAN IN HOLE AND TAGGED FIRM CEMENT @ 293'. CIRCULATION HELD UNTIL NEW FORMATION WAS PENETRATED BELOW 387' AND ONCE AGAIN CIRCULATION WAS LOST WHILE DRILLING RESUMED TO 412 . WE THEN PULLED OUT OF THE HOLE TO SET YET ANOTHER CEMENT PLUG #12. PLUG #12 WAS IN PLACE @ 0205 HRS AND UPON EXTRACTION OF THE DRILL PIPE IN WAS NOTICED THAT THE FLUID LEVEL IN THE HOLE HAD DROPPED TO 230' BELOW THE FLO LINE WHICH WOULD HAVE MEANT THAT PLUG #12 WOULD HAVE TOTALLY ESCAPED INTO THE FORMATION. AS A PRECAUTION ANOTHER CEMENT PLUG WAS IMMEDIATELY SET @ 0500 HRS. WE ARE CURRENTLY WAITING FOR CEMENT PLUG #13 TO HARDEN.

Report by: RON JACOBSON

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-14-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CEMENT, M/U BHA & RIH TO 293', DRILL CEMENT TO 387', DRILL 26" HOLE AND LOST CIRCULATION, CONTINUE DRILLING TO 412', POOH FOR CEMENT PLUG #12, CEMENT, FLUID LEVEL DROPPED TO 230', RE-CEMENT PLUG #13, WAIT ON CEMENT.	
Report Time	08:00		
Days Since Spud	12		
Present Depth	412'		
Prior Depth	387'		
24 Hr Footage	25'	Present Activity (08:00): WAITING ON CEMENT	
Drilling Hrs	5		
Avg ROP by TIME	5	Next Significant Activity: WAIT ON CEMENT, DRILL CEMENT & NEW FORMATION.	
ROP is in Feet/Hour			

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	26	407'	2	399'	8	by RATE
WOB	32	406'	13	389'	26	K-lbs
RPM	51	411'	21	400'	39	
TRQ	15	407'	8	394'	11	amps
PP	494	389'	111	401'	107	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	NO RETURNS					ppm
COND IN	2025	389'	1762	396'	1794	ppm NaCl
COND OUT	N/R					ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7	388'	8.6	412'	8.6	lb/g
MW OUT	N/R					lb/g
pH IN	11.7	389'	11.6	412'	11.6	
pH OUT	N/R					
TEMP IN	79	390'	72.	411'	75	deg F
TEMP OUT	N/R					deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
NO NEW LITHOLOGY

Sample Logging Conditions, other remarks:
DRILLED FROM 387'-412' WITH NO RETURNS.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ , units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = . 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM #

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR2	26"	STC DSJ	387'	25'	5	5000

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING RE**

Date: 8-15-89 | Time of Report 08:00 | Days since spud: 13

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono Count

Depth Today 434' | Depth Yest. 412 ' | Progress 22 ft | Rotating Hrs

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
RR2	26"	HTC	DS3	412'	434'	22	2	11	49	37

Lithology:

Interval	Description
412'- 420' ft	RHYOLITE- PALE RED TO PNKSH GRY (WET), YEL
420'- 434' ft	GRY (DRY), HARD, COMPETENT, FINE PHANERIT
- ft	TEX DUE TO PARTIAL DEVITRIFICATION, THINNL
- ft	BANDED, IRON STAINED ON LAMS & OCC FRACTURE
- ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 31 cp | PV 3 cp | YP 11 lb/100ft2 | pH 11.5
Returns temp 76 F | Lost circulation 650 bbl
Flow rate 587 gpm | Pump pressure 400 psi, strokes/min 73
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: A" | Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 5 @ 10", @ " | DC wt. (in air) 40 klb
DC length 241 ft | Bottom Hole Assembly: Total length 286.46'
BHA Description: 26"RIT/3-PT REAMER/XO/DC/STB/SHOCK-SUB/DC/STB/DC/5 10"

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	379'	3/4 D		

SUMMARY OF YESTERDAY'S OPERATIONS

WE WAITED FOR THE CEMENT TO HARDEN AND RAN IN THE HOLE TO TEST IT @ 09:00 H THE CEMENT WAS DETECTED TO BE STILL SOFT @ 371' SO WE WAITED ANOTHER 3 HOU AND THEN RAN IN AND TAGGED CEMENT @ 357' AND TRIED CIRCULATING RETURNS WIT NO LUCK. IT WAS DECIDED THAT ANOTHER PLUG WAS NECESSARY & PUMPED CEMENT PL #14 IN PLACE @ 1500 HRS. WE TAGGED HARD CEMENT @ 311'. 0100 HRS AND DRILLE CEMENT AND NEW FORMATION DOWN TO 423' WHERE AGAIN WE LOST TOTAL RETURNS AN ARE PRESENTLY DRILLING WITHOUT RETURNS @ 434'.

Report by: RON JACOBSON

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-15-89	Synopsis of Rig Activity, Last 24 Hrs: RIH & TAG SOFT CEMENT @ 371', WAIT ON CEMENT, RIH TO
Report Time	08:00	357' TAG CEMENT PUMP 500 BBLS W/ NO RETURNS, POOH, PUMP CEMENT PLUG #14, WAIT ON CEMENT,
Days Since Spud	13	RUN IN HOLE AND TAG CEMENT @ 311', DRILL CEMENT TO 412', DRILL NEW FORMATION TO 434' LOSING
Present Depth	434'	CIRCULATION AND TOTAL RETURNS @ 423'.
Prior Depth	412'	
24 Hr Footage	22'	Present Activity (08:00): DRILLING WITH NO RETURNS
Drilling Hrs	2	
Avg ROP by TIME	11	Next Significant Activity: DRILL UNTIL IT HURTS WORSE
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	70	414'	4	425'	14	by RATE
WOB	40	434'	27	414'	36	K-lbs
RPM	49	434'	41	413'	47	
TRQ	22	424'	4	414'	14	amps
PP	880	416'	100	426'	300	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	415	421'	303	413'	354	ppm
COND IN	2074	434'	1568	414'	1775	ppm NaCl
COND OUT	1669	422'	0	423'	1477	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7	413'	8.6	434'	8.6	lb/g
MW OUT	8.7	415'	NO RETURNS		8.7	lb/g
pH IN	11.9	425'	11.6	434'	11.7	
pH OUT	12.0	413'	NO RETURNS		11.8	
TEMP IN	78	424'	65	434'	73	deg F
TEMP OUT	79	422'	NO RETURNS		76	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

RHYOLITE-PALE RED, PINKISH ORANGE TO LIGHT GRAY (WET) LIGHT PINKISH GRAY (DRY), HARD, BRITTLE, MODERATELY COMPETENT, THINNLY BANDED, SMALL HACKLY CUTTINGS, FINELY PHANARITIC DUE TO PARTIAL DEVITRIFICATION, COMMONLY IRON STAINED, INTERBEDDED WITH THIN CRYSTALLINE TUFFS.

Sample Logging Conditions, other remarks: X

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR2	26"	HTC DSJ	412	22	2	SIH

Sample Disposition and Transfers:
Date:
Interval: From to
Sent to/Received by:

Report by: BILL SILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REP**

Date: 8-16-89 | Time of Report 08:00 | Days since spud: 14

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County

Depth Today 475' | Depth Yest. 434' | Progress 41 ft | Rotating Hrs 5

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB K
RR2	26"	STC	DSJ	412'	475'	63'	7.5	8.3	45	38

Lithology:

Interval	Description
434' - 475' ft	
- ft	NO RETURNS
- ft	
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 34 cp | PV 3 cp | YP 3 lb/100ft2 | pH 10.5
Returns temp N/A F | Lost circulation 900 bbl
Flow rate 600 gpm | Pump pressure 150 psi, strokes/min 60
Composition: bentonite , lignite
Others:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints: 5
Drill Collars: 3 @ 11", 5 @ 10", @ " | DC wt. (in air) 45 K lb
DC length 241 ft | Bottom Hole Assembly: Total length 285'
BHA Description: 26"BIT/3-PT REAMER/XO/DC/STB/SHOCK SUB/DC/CTB/DC/3-PT'S

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

WE PROCEEDED TO DRILL AHEAD WITH NO RETURNS IN HOPES OF GETTING PAST THE LOST CIRCULATION ZONE ENCOUNTERED @ 425'. AT 475' WE HAD PUMPED AWAY A TOT OF APPROXIMATELY 1550 BBLS DRILLING FLUID AND DECIDED TO SET CEMENT PLUG # 15 WHICH WAS IN PLACE @ 1600 HRS. AFTER WAITING ON CEMENT WE TAGGED THE TOP @ 426' AND RECEIVED NO RETURNS. THE FLUID LEVEL WAS @ 311'. BECAUS OF THE LOW SETTLING OF THE CEMENT ANOTHER PLUG WAS REQUIRED AND PLUG # 16 WAS SET IN PLACE @ 2100 HRS. WE WAITED ON CEMENT 7 HOURS AND ARE CURRENTLY PREPARING TO RUN INTO THE HOLE AND POLISH OFF THE CEMENT.

Report by: RON JACOBSON

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-16-89
Report Time	08:00
Days Since Spud	14
Present Depth	475'
Prior Depth	434'
24 Hr Footage	41'
Drilling Hrs	5.5
Avg ROP by TIME	8.3
ROP is in Feet/Hour	

Synopsis of Rig Activity, Last 24 Hrs: DRILLED FROM 434' TO 475' WITHOUT MUN RETURNS, POOH TO SET CEMENT PLUG #15, WAITED ON CEMENT, RIH TAGGED CEMENT @ 426' WITH THE FLUID LEVEL DROPPING TO 311', WAITED ANOTHER 2 HOURS, THEN SET ANOTHER CEMENT PLUG # 16, WAIT ON CEMENT, MAKE UP BHA AND RIH TO POLISH OFF CEMENT.

Present Activity (08:00): MAKING UP BHA

Next Significant Activity: DRILL CEMENT

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	43	437'	2	457'	12	by RATE
WOB	31	444	10	447'	22	K-lbs
RPM	63	461'	32	457'	51	
TRQ	30	465'	10	447'	17	amps
PP	534	450'	34	459'	237	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	N/C					ppm
COND IN	1900	435'	823	449	893	ppm NaCl
COND OUT	N/C					ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.6		8.6		8.6	lb/g
MW OUT	N/C					lb/g
pH IN	11.4	437'	11.1	475'	11.2	
pH OUT	N/C					
TEMP IN	75	435'	66	464'	68	deg F
TEMP OUT	N/C					deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
NO MUD RETURNS, NO SAMPLES TO ANALYZE

Sample Logging Conditions, other remarks:
NO RETURNS, APPROXIMATELY 900 BBLS LOST/24 HRS

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR2	26"	STC DSJ	412'	63'	7.5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 8-17-89 | Time of Report 08:00 | Days since spud: 15

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 518' | Depth Yest. 475 ' | Progress 43 ft | Rotating Hrs 5

Size and Depth of Last Casing: 30 " at 284 'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Kip
3	26"	SEC	S33J	475'	518'	43	5	8.6	45	15

Lithology:	Interval		Description
	475'- 518'	ft	RHYOLITE- LT BRNSH GRAY OVERALL W OCC FINEISH
	-	ft	BANDING & DECREASED MOTTLING, HARD, MOD BRITT
	-	ft	OPAQUE, FINELY SUCROSIC, APHANITIC, RARE TUFF
	-	ft	INTERLAMS, RARELY ALTERED, TR DEVITRIFICATION
	-	ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 34 cp | PV 4 cp | YP 17 lb/100ft2 | pH 11.0

Returns temp 70 F | Lost circulation 0 bbl

Flow rate 718 gpm | Pump pressure 380 psi, strokes/min 71

Composition: bentonite , lignite

Other:

Drill String:

Drill Pipe OD/weights: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. joints:

Drill Collars: 3 @ 11", 5 @ 10", @ " | DC wt. (in air) 49 klb

DC length 91 ft | Bottom Hole Assembly: Total length 205.82

BHA Description: 26"RTT/3-PT REAMER/XO/DC/STB/SHOCK-SUB/DC/STB/DC/5-10"DC

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	379'	3/4		
	446'	1 1/2		
	472'	3 1/4		
	503'	3		

SUMMARY OF YESTERDAY'S OPERATIONS

WE TAGGED CEMENT CEMENT PLUG #16 @ 397' AND DRILLED CEMENT WITH ADEQUA E RE-TURNS TO A DEPTH OF 430' WHERE CIRCULATION WAS LOST. WE PULLED OUT OF THE HOLE AND SET CEMENT PLUG #17 @ 1130 HRS. AFTER WAITING FOR THE CEMENT TO SET WE RAN IN AND TAGGED FIRM CEMENT @ 413' AND DRILLED IT OUT TO 475' AND THEN CONTINUED DRILLING NEW FORMATION TO A DEPTH OF 518'. BECAUSE OF THE INCREAS-ING HOLE ANGLE IT WILL BE NECESSARY TO CORRECT THE DEVIATION BY ALTERING THE BOTTOM HOLE DRILLING ASSEMBLY.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-17-89	Synopsis of Rig Activity, Last 24 Hrs: RIH & DRILL CEMENT FROM 397' TO 430', POOH & SET CEMENT PLUG #17, WAIT ON CEMENT, RIH & TAG CEMENT @ 413', WAIT FURTHER ON CEMENT, RIH AND DRILL CEMENT FROM 413'-455', SURVEY, DRILL CEMENT TO 475' AND NEW FORMATION TO 518', SURVEYING @ 487' & 518', POOH FOR ANGLE CORRECTING BOTTOM HOLE ASSEMBLY.
Report Time	08:00	
Days Since Spud	15	
Present Depth	518'	
Prior Depth	475'	
24 Hr Footage	43'	Present Activity (08:00): CHANGING BHA
Drilling Hrs	5	
Avg ROP by TIME	8.6	Next Significant Activity: DRILL.....
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
ROP	59	476	2	489'	15	by RATE
WOB	18	476'	11	489'	15	K-lbs
RPM	74	500'	11	489'	58	
TRQ	29	477'	11	495'	17	amps
PP	469	490'	234	518'	360	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
CO2	401	509'	327	492'	365	ppm
COND IN	1132	500'	1011	513'	1111	ppm NaCl
COND OUT	1005	489'	904	513'	980	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7	507'	8.6	488'	8.6	lb/g
MW OUT	8.7	518'	8.6	476'	8.6	lb/g
pH IN	11.9	517'	11.6	476'	11.7	
pH OUT	12.0	516'	11.8	477'	11.9	
TEMP IN	72.1	493'	71	508'	72	deg F
TEMP OUT	71	494'	70	518'	71	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
90-100% RHYOLITE- LIGHT BROWNISH GRAY OVERALL WITH COMMON TO OCCASIONAL GRAYISH PINK BANDING AND DECREASING TUFFACEOUS INTERLAMINATIONS, DECREASED MOTTLING, HARD, MOD BRITTLE, COMPETENT, APHANITIC WITH RARE QUARTZ PHENOCRYSTS, FINELY SUCROSIC TEXTURE, RARE ALTERATIONS AND DEVIRTRIFICATION.

Sample Logging Conditions, other remarks: GOOD SAMPLE RETURNS WITH COMMON LOST CIRCULATION MATERIAL ADDED TO PRESERVE RETURNS.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
3	26"	SEC S33J	475'	43'	5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 8-18-89 | Time of Report 08:00 | Days since spud: 16

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 518 ' | Depth Yest. 518 ' | Progress 0 ft | Rotating Hrs 0

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB (K

Lithology: | Interval | Description

	– ft	
	– ft	
	– ft	
	– ft	
	– ft	

Drilling Fluid:

Mud Wt. 9.4 lb/gal | Vis 34 sp | PV 4 cp | YP 10 lb/100ft2 | pH 11.0

Returns temp F | Lost circulation 0 bbl

Flow rate gpm | Pump pressure psi, Strokes/min.

Composition: bentonite, lignite

Others

Drill String:

Drill Pipe OD/weight: 5.5 "/ 20.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. joints: 0

Drill Collars: @ 11", @ 10", @ " | DC wt. (in air) lb

DC length 91 ft | Bottom Hole Assembly: Total length:

BHA Description:

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
...	374'	45'		
CHECK SURVEYS...	438'	1 30'		
...	468'	2 30'		
...	499'	3 15'		

SUMMARY OF YESTERDAY'S OPERATIONS

INCLINATION SURVEYS OF THE WELLBORE SHOWED A SHARP INCREASE IN DEVIATION IN APPROXIMATELY THE LAST 100'. A NEW SURVEY TOOL WAS USED TO VERIFY THE ORIGINAL READINGS. THE MAXIMUM DEVIATION OF 3.25 DEGREES IS UNACCEPTABLE BECAUSE IT WOULD IMPOSE REVERSE BENDING AND FATIGUE LOADS ON THE DRILL PIPE IN ALL SUBSEQUENT DRILLING. OUR CHOICE IS TO PLUG THE HOLE WITH CEMENT BACK TO ABOUT 325' AND DIRECTIONALLY DRILL A STRAIGHT HOLE USING A MUD MOTOR. AT 0900, WE ARE WAITING ON THE CEMENT TO HARDEN; WHEN IT DOES WE WILL WASH THE MOTOR RUN.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-18-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON SURVEY TOOL, RE-SURVEY, POOH, RIH AND SET CEMENT PLUG @ 516', WAIT ON CEMENT, RIH & TAG CEMENT @ 412', POOH AND SET ANOTHER CEMENT PLUG @ 407', POOH & WAIT ON CEMENT,
Report Time	08:00	
Days Since Spud	16	
Present Depth	518'	
Prior Depth	518'	
24 Hr Footage	0	Present Activity (08:00): WAITING ON CEMENT
Drilling Hrs	0	
Avg ROP by TIME	0	Next Significant Activity: RIH ANG TAG CEMENT, THEN DIRECTIONALLY DRILL TO STRAIGHTEN THE WELL.
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			by RATE	
WOB			K-lbs	
RPM				
TRQ			amps	
PP			PSI	

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2				ppm
COND IN				ppm NaCl
COND OUT				ppm NaCl
H2S				ppm
HYDC GAS				units
MW IN				lb/g
MW OUT				lb/g
pH IN				
pH OUT				
TEMP IN				deg F
TEMP OUT				deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY DRILLED

Sample Logging Conditions, other remarks:

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-19-89 | Time of Report 08:00 | Days since spud: 17

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 448' | Depth Yest. 320' | Progress 128 ft | Rotating Hrs 9.5

Size and Depth of Last Casing: 30 " at 284' K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
4	26"	STC	2JS	320'	SIH	128'	9.5	13.5	25	[illegible]

Lithology:	Interval	Description
	330'- 390' ft	DOM CEMENT W UP TO 40% FRACTURED RHYOLITE
	390'- 440' ft	50% CEMENT & 50% COMPETENT & FRACTURED RHYOLI
	440'- 448' ft	25% CEMENT & 75% BANDED, COMPETENT RHYOLITE
	- ft	
	- ft	

Drilling Fluid:
Mud Wt. 8.7 lb/gal | Vis 39 cp | PV 4 cp | YP 19 lb/100ft2 | pH 11.0
Returns temp 85 F | Lost circulation 70 bbl
Flow rate 911 gpm | Pump pressure 800 psi, strokes/min. 90
Composition: bentonite, lignite
Other:

Drill String:
Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection of [illegible], Grade [illegible]
Number of D.P. joints: 5
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. in air [illegible] Klb
DC length 152 ft | Bottom Hole Assembly: Total length 246.[illegible]
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/KICK SUB/PONY DC/STB/SHOCK SUB/ 3-11"DC/STB/2-10"DC/STB/XO

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	325'	0 DEG		
	337'	0 DEG		
	358'	0 45'	N50E	

SUMMARY OF YESTERDAY'S OPERATIONS

Waited on cement until approximately 1600 hrs, having tested it for hardness several times. Began making up the bottom hole assembly with the mud motor and ran it into the hole just after 2100 hrs. Began drilling @ 320', achieving rate of penetration at about 10-15 feet per hour. Mud motor turns the bit at 300 rpm, but the drill string is also turning at about 25 rpm. This will produce a larger diameter hole (casing goes in easier) and will tend to cut the low side of the hole. Drilling at 448' at 0800 hrs; surveys at 325' and 337' showed zero deviation.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-19-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CEMENT, RIH & TAG CEMENT @ 310', POLISH OFF TO 315', WAIT ON CEMENT, POLISH OFF TO 319', POOH, M/U MUD MOTOR BHA, DIRECTIONALLY DRILL FROM 319' TO 448', SURVEYING @ 325' & 357'
Report Time	08:00	
Days Since Spud	17	
Present Depth	448'	
Prior Depth	320'	
24 Hr Footage	128	Present Activity (08:00): CIRCULATE FOR A SURVEY
Drilling Hrs	9.5	
Avg ROP by TIME	13.5	Next Significant Activity: CONTINUE DRILLING
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	62	321'	4	375'	19	by RATE
WOB	13	346'	2	433'	6	K-lbs
RPM	26	409'	24	412'	25	
TRQ	14	333'	3	389'	8	amps
PP	1073	347'	299	386'	821	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	557	409'	314	329'	456	ppm
COND IN	3760	414'	3012	327'	3439	ppm NaCl
COND OUT	2924	393'	2429	333'	2715	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.6		8.6		8.6	lb/g
MW OUT	8.7	345'	8.6	414'	8.6	lb/g
pH IN	12.0	432'	11.8	322'	11.9	
pH OUT	12.1	320'	11.8	424'	11.9	
TEMP IN	80	414'	75	333'	77	deg F
TEMP OUT	77	419'	73	321'	76	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
RHYOLITE - PALE RED TO LT BRNSH GRAY W OCC REDDISH ORANGE MOTTLING AND BANDING, MOD HARD, APHANITIC, WITH OCC QUARTZITIC INTERLAMS BOUNDED BY REDDISH ORANGE K-FELDSPAR BANDS, RARE QUARTZ PHENOCRYSTS, OCC PARTIALLY DEVITRIFIED, COMMON FRACTURES WITH IRON OXIDE STAINING WITHIN THE UPPER DRILLED INTERVAL DECREASING WITH DEPTH.

40% FORMATION @ 380'
50% FORMATION @ 400' - 440'
75% FORMATION @ 448'

Sample Logging Conditions, other remarks: 50% CEMENT CONTAMINATION.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
4	26"	STC 2JS	320'	128'	9.5	SIH

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-21-89 | Time of Report 08:00 | Days since spud: 19

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 514 ' | Depth Yest. 514 ' | Progress 0 ft | Rotating Hrs 0

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb

Lithology:	Interval	Description
	- ft	
	- ft	NO NEW LITH
	- ft	
	- ft	
	- ft	

Drilling Fluid:
Mud Wt. 8.7 lb/gal | Vis 32 cp | PV 3 cp | YP 1. lb/100ft2 | pH 11.5
Returns temp F | Lost circulation bbl
Flow rate gpm | Pump pressure psi, strokes/min
Composition: bentonite , lignite
Other:

Drill String:
Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection 6" , Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 5 @ 10", 8 " | ID wt. (in air) [illegible]
DC length ft | Bottom Hole Assembly: Total length
BHA Description:

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	459'	0 15'	N55W	
	499	0 30'	N03W	

SUMMARY OF YESTERDAY'S OPERATIONS

CHECKED SURVEY @ 499', DEVIATION WAS 1/2 DEGREE. LAID CEMENT PLUG AT [illegible]. WAITED ON CEMENT UNTIL 1430 HRS, AND TRIED TO FILL HOLE. IT WOULD NOT HOLD FLUID, SO DID A TEMPERATURE SURVEY WITH THE SANDIA LOGGING TRUCK AND FOUND A SHARP DISCONTINUITY AT ABOUT 360'. SPOTTED ANOTHER PLUG OF CLASS G CEMENT AT 355'.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-21-89	Synopsis of Rig Activity, Last 24 Hrs: POOH, RIH & TAKE CHECK SURVEYS. POOH & RIG UP HOWCO &	
Report Time	08:00	CEMENT PLUG #20, WAIT ON CEMENT, LOG FOR FLUID LEVEL AND CEMENT TOP, F.L. @ 279', RIH & TAG	
Days Since Spud	19	CEMENT @ 474', RIG UP & CEMENT PLUG #21, WAIT ON CEMENT, LOG FOR FLUID LEVEL & CEMENT TOP,	
Present Depth	514'	F.L. @ 276', CEMENT @ 449', WAIT ON CEMENT TRUCK FOR DIFFERENT CEMENT, RIG UP HOWCO.	
Prior Depth	514'		
24 Hr Footage	0	Present Activity (08:00): RIGGING UP TO CEMENT PLUG #22	
Drilling Hrs	0		
Avg ROP by TIME	0	Next Significant Activity: CEMENT PLUG # 22	
ROP is in Feet/Hour			

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP				by RATE
WOB				K-lbs
RPM				
TRQ				amps
PP				PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2				ppm
COND IN				ppm NaCl
COND OUT				ppm NaCl
H2S				ppm
HYDC GAS				units
MW IN				lb/g
MW OUT				lb/g
pH IN				
pH OUT				
TEMP IN				deg F
TEMP OUT				deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY

Sample Logging Conditions, other remarks:

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ , units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud WIB out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION

Sample Disposition and Transfers:
Date:
Interval: From to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-22-89 | Time of Report 08:00 | Days since spud: 20

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 614' | Depth Yest. 514' | Progress 100 ft | Rotating Hrs 9

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB K1b
RR4	26"	STC	2JS	514'	SIH	100	9	12.5	30+MM	8-10K

Lithology:

Interval		Description
514 - 550	ft	RHYOLITE-BRNSH GRY W 20 RED MOTTLING, HARD
550 - 590	ft	RHYOLITE-DOM PALE RED, ALTERED, DEVIT
590 - 610	ft	TUFF-ORANGE, VESICULAR TO PSTLN W DEVIT LATIL
-	ft	
-	ft	

Drilling Fluid:

Mud Wt. 8.7 lb/gal | Vis 41 cp | PV 4 cp | YP 24 lb/100ft2 | pH 11.6
Returns temp 74 F | Lost circulation 450 bbl
Flow rate 1012 gpm | Pump pressure 800 psi, strokes min 100
Composition: bentonite, lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 20.6 lb/ft | Connections: e" | Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) lb
DC length 153 ft | Bottom Hole Assembly: Total length 255.16'
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/MONEL/STB/SHOCK SUB/
3-11"DC/2-10"DC/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity
	549'	0 30'		

SUMMARY OF YESTERDAY'S OPERATIONS

SPOTTED CEMENT @ 340' TO TRY AND FILL LOSS ZONE @ 350'. TEMPERATURE LOG SHOWED THAT THER WAS A CEMENT BRIDGE AT 338 . BUT WHEN DRILLER RAN IN THE DRILL PIPE THER WAS NO RESISTANCE AT THAT DEPTH. CONCLUSION WAS THAT LITTLE CEMENT WAS IN PLACE, REINFORCED BY THE FACT THAT LOTS OF GREEN CEMENT WAS ON TOP OF THE PLUG AT 455'. DRILLED THE CEMENT AND CONTINUED INTO NEW FORMATION WITH THE MUD MOTOR. DRILLING AT 614 AT 0300 HRS.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-22-89	Synopsis of Rig Activity, Last 24 Hrs: RIH & PUMP CEMENT PLUG #22, WAIT ON CEMENT, RUN FLUID
Report Time	08:00	LEVEL & TEMP LOG, RIH & TAG CEMENT, POOH, RIH & REAM TO 453', POOH CHANGE BHA, DRILL CEMENT
Days Since Spud	20	TO 514', DRILL NEW FORMATION TO 583', LOST CIRC, SPOT LCM PILL, WAIT 1/2 HR, DRILL TO 614'
Present Depth	614'	
Prior Depth	514'	
24 Hr Footage	100	Present Activity (08:00): SURVEYING
Drilling Hrs	8	
Avg ROP by TIME	12.5	Next Significant Activity: DRILLLLLLL
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
ROP	40	559'	3	515'	17	by RATE
WOB	17	524'	4	552'	9	K-lbs
RPM	30	553'	28	552'	29	
TRQ	12	552'	4	526'	9	amps
PP	1105	558'	656	583'	907	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
CO2	397	519'	0	575	341	ppm
COND IN	2516	581'	2057	515'	2435	ppm NaCl
COND OUT	2296	546'	0	575'	1967	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.7	535'	8.6	590'	8.7	lb/g
MW OUT	8.8	601'	8.6	516'	8.7	lb/g
pH IN	11.9	521'	11.7	583'	11.8	
pH OUT	11.9	515'	11.7	570'	11.8	
TEMP IN	78	566'	73	515'	77	deg F
TEMP OUT	77	571'	71	515'	76	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

514'-550' RHYOLITE - MOD TO LT BRNSH GRY. COMMON (25%) REDDISH MOTTLING, MOD HARD, SEMI-SENSE. APHANITIC. W OCC LIMONITE STNG, OCC QUARTZ PHENOCRYSTS AND DRUSE QUARTZ ALONG TRACE FRACTURE SURFACES, PARTIALLY DEVITRIFIED, DOM WELL PRESERVED, OCC BANDING, TR BIOTITE INCLUSIONS.

550'-590' RHYOLITE - BECOMING INCREASINGLY ALTERED AND RED (70%). COMMON MOTTLING. SOFTER TO VERY FIRM, OCC VUGGY, OCC PINK MICRO-XSTLN ZEOLITE MATERIAL, INCREASE IN DRUSE QUARTZ.

590-610' TUFF - DK YELLSH BRN TO FL BRN, LINEAR/VESICULAR. DOM CRUSHED, COMN GLASS SHARDS & TOP DECREASING W/ DEPTH. COMN VITRIC BANDS, LIMONITE & IRON STAINES DECREASING W/ DEPTH, COMN (10%) OBSIDIAN LAPILLI TO 4 MM DECREASING IN SIZE AND OCCURRENCE W/ DEPTH.

Sample Logging Conditions, other remarks: LOST 450 BBLS @ 582', PUMPED LOST CIRCULATION PILL AND REGAINED CIRCULATION

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM & =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide. Minutes Duration
Theoretical Lag minutes @ w/SPM & =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 20S	514'	100	8	SIH

Sample Disposition and Transfers:
Date: 8-22-89
Interval: From 520 ' to
Sent to/Received by: EPOCH BY DON ASH TO B.C.

Report by: BILL BILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-23-89 | Time of Report 08:00 | Days since spud: 21

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 674'' | Depth Yest. 614'' | Progress 60 ft | Rotating Hrs 2.5

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	F'g	Hrs	Avg ROP	RPM	Wt
RR4	26"	STC	23S	320'	674'	354'	27.5	12.8	30+MM	8 K

Lithology: | Interval | Description

Interval		Description
610'- 620'	ft	TUFF - PL ORANGE TO ORGSH WHT, PUMICY, CLAY
-	ft	GLASS SHARDS, OCC OBSIDIAN LAPILLI, CRUSHED
-	ft	VESICULAR.
-	ft	
625'- 674'	ft	NO FLUID RETURNS

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 38 cp | PV 9 cp | YP 7 lb/100ft2 | pH 9.5

Returns temp F | Lost circulation 500 bbl

Flow rate 1012gpm | Pump pressure 900 psi, strokes/min 109

Composition: bentonite, lignite

Others

Drill String:

Drill Pipe OD weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. joints: 9

Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 85 klb

DC length 152 ft | Bottom Hole Assembly: Total length 250.10

BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STAB/XO/MONEL/STB/SHOCK SUB/ 3-11"DC/2-10"DC

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	549'	0 15'	N61E	
	659'	0 13'	N44W	

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLING PROGRESSED TO 674' BY 1030 HRS. WITH NO RETURNS SINCE 638'. PUMPED 2 LCM PILLS IN THAT INTERVAL. PUMPED 2 MORE CEMENT PLUGS FOLLOWED BY LCM PILLS. HOLE IS HOLDING FLUID AND WILL RESUME DRILLING CEMENT @ 549'.

Report by: JOHN PINNER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-23-89	Synopsis of Rig Activity. Last 24 Hrs: DRILL TO 638'. LOST RETURNS. PUMP LCM PILL. DRILL TO
Report Time	08:00	650', PUMP LCM PILL, DRILL TO 674' W NO RETURNS. PUMP LCM PILL, TRIP FOR ON BOTTOM SURVEY,
Days Since Spud	21	PUMP LCM PILL, POOH, RIG UP & PUMP CEMENT PLUG # 23. WAIT ON CEMENT. RIH & TAG CEMENT @ 665'
Present Depth	674'	FLUID LEVEL @ 301', WAIT ON CEMENT, RIH TO 376', RUN E/MITER, LOG SANDIA TEMP LOG, PUMP 250
Prior Depth	614'	BBLS NO RETURNS, RIH & CEMENT PLUG #24. WAIT ON CEMENT, PUMP LCM PILL, WAIT ON CEMENT.
24 Hr Footage	60	Present Activity (08:00): WAITING ON CEMENT
Drilling Hrs	2.5	
Avg ROP by TIME	24	Next Significant Activity: RIH & DRILL OUT CEMENT AND FORMATION
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
ROP	164	672'	7	627'	56	by RATE
WOB	9	627'	2	662'	6	K-lbs
RPM	32	674	26	652'	30	
TRQ	20	655'	6	631'	11	amps
PP	1503	668'	178	640'	1240	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
CGC	364	617'	0	674'	323	ppm
COND IN	1239	625	179	674	913	ppm NaCl
COND OUT	1441	631	0	674'	290	ppm NaCl
H2S	0		0		0	ppm
H2S GAS	0		0		0	units
MW IN	8.7	615'	8.6	674'	8.6	lb/g
MW OUT	8.8	620'	0	674'	8.7	lb/g
pH IN	11.7	620	11.1	674'	11.5	
pH OUT	11.8	617'	0	674'	11.6	
TEMP IN	79	640'	73	674'	75	deg F
TEMP OUT	73	624'	0	674'	72	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
@ 590 ENCOUNTERED TUFFACEOUS INTERVAL; TUFF - DK YELLOWISH ORANGE TO VERY PALE ORANGE. MOD HARD & BRITTLE TO PUNKY & POROUS. COMMON PUMICE, COMMON 2-3 MM GLASS SHARD INCLUSIONS. VERY FINE CRUSHED VESICLES, LINEATED, IRON STAINED. GRADES TO OCCASIONAL VITRIC TUFF, OCCASIONAL 4 MM OBSIDIAN LAPILLI.

Sample Logging Conditions, other remarks: LOST CIRCULATION @ 637', NO RETURNS FROM 626 TO 674'

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud WTS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
6R4	12"	HTC J33	320	354'	27.5	GOOD

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-24-89 | Time of Report 08:00 | Days since spud: 22

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 674'' | Depth Yest. 674'' | Progress 0 ft | Rotating Hrs 0

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
RR4	26"	STC	2JS	320	674'	354'	27.5	12.8	30+MM	8K

Lithology:	Interval	Description
	- ft	
	- ft	
	- ft	NO NEW LITHOLOGY
	- ft	
	- ft	

Drilling Fluids

Mud Wt. 8.8 lb/gal | Vis 50 cp | PV 20 cp | YP 63 lb/100ft2 | pH 11.6
Returns temp F | Lost circulation 730 bbl
Flow rate gpm | Pump pressure psi, strokes/min.
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connections 6" | Grade E
Number of D.P. joints:
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 45K lb
DC length 152 ft | Bottom Hole Assembly: Total length 255.10'
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/MONEL/STB/SHOCK SUB/
3-11"DC/2-10"DC/XO

Directional Survey	Measurement Depth	Angle	Azimuth	Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

RAN LCM PILLS AND SQUEEZED THEM AT ABOUT 1200 HRS; HOLE STILL WOULD NOT HOLD FLUID, SO PUMPED ANOTHER CEMENT PLUG AT 534'. TAGGED TOP OF CEMENT AT 474' AND PUMPED AN LCM PILL ON TOP OF IT. DRILLED OUT CEMENT FROM 474' TO 540', WHERE LOST CIRCULATION. DRILLED AHEAD TO 570', PULLED OUT DRILLING ASSEMBLY, AND SPOTTED CEMENT PLUG AT 560'.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-24-89	Synopsis of Rig Activity, Last 24 Hrs: MIX & PUMP LCM PILL, CLEAN OUT LCM FROM PUMPS, SQUEEZE LCM, RIH & CEMENT PLUG #25, WAIT ON CEMENT, RIH & TAG CEMENT @ 478', FLUID LEVEL @ 94', SPOT LCM PILL @ 474', POOH, M/U BHA, RIH & DRILL CEMENT FROM 474' TO 540', LOST RETURNS, DRILL CEMENT TO 570', POOH, SET BACK BHA, RIH W/ D.P., PUMP LCM PILL, SET CEMENT PLUG #26, POOH, WAIT ON CEMENT.
Report Time	08:00	
Days Since Spud	22	
Present Depth	674'	
Prior Depth	674'	
24 Hr Footage	0	Present Activity (08:00): WAITING ON CEMENT.
Drilling Hrs	0	
Avg ROP by TIME	0	Next Significant Activity: WAIT ON CEMENT & DRILL SAME TO NEW FORMATION.
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			by RATE	
WOB			K-lbs	
RPM				
TRQ			amps	
PP			PSI	

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2			ppm	
COND IN			ppm NaCl	
COND OUT			ppm NaCl	
H2S			ppm	
HYDC GAS			units	
MW IN			lb/g	
MW OUT			lb/g	
pH IN				
pH OUT				
TEMP IN			deg F	
TEMP OUT			deg F	

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY..

Sample Logging Conditions, other remarks: LOST APPROX 730 BBLS DRILLINIG FLUID WHILE DRILLING CEMENT @ 540'.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 23S	320'	354'	27.5	1NC

Sample Disposition and Transfers:
Date:
Interval: From to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-25-89 | Time of Report 08:00 | Days since spud: 23

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 674'' | Depth Yest. 674'' | Progress 0 ft | Rotating Hrs 0

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB (Klb
RR4	26"	STC	23S	320	674'	354'	27.5	12.9	30+MM	6K

Lithology:

Interval	Description
- ft	
- ft	
- ft	NO NEW LITHOLOGY
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 32 sp | PV 3 cp | YP 5 lb/100sf2 | pH 11.5

Returns temp 63 F | Lost circulation bbl

Flow rate gpm | Pump pressure psi, circulating

Composition: bentonite, lignite

Other:

Drill Strings:

Drill Pipe OD/weights: 5.5 "/ 25.6 lb/ft | Connections: | Grade: E

Number of D.P. joints:

Drill Collars: 3 @ 11", 2 @ 10", @ " | DC Wt. in air) 40k lb

DC length: 152 ft | Bottom Hole Assembly: Total length: 250.10'

BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/PTB/XO/MONEL/STB/SHOCK SUB/ 3-11"DC/2-10"DC/XO

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

Tagged the top of the previous cement at 511', circulated Mud to the shaker, and began drilling out the cement from 511' to 580'. Lost circulation at 580', but continued drilling cement to 650'. Laid 421 cu ft cement plug at 650' at 2310. Waited on cement until 0500, tagged top at 590', but fluid level was at 390'. Indicating that the hole was not holding water. Pumped another 424 cu ft cement plug at 590'.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-25-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CEMENT; RIH & TAG CEMENT @ 511'; TOH; RIH W/
Report Time	08:00	MONEL & BIT; CIRCULATE; DRILL 2' CEMENT; CLEAN OUT CEMENT TO 658'; TOH; RIH; PUMP WASTE
Days Since Spud	23	WATER, FRESH WATER, & CEPALITE; SET CEMENT PLUG #27; WAIT ON CEMENT; RIH & TAG CEMENT @
Present Depth	674'	590'; TOH; RIH; PUMP WATER & HOWCO PILL; SET CEMENT PLUG #28 AT 590'.
Prior Depth	674'	
24 Hr Footage	0	Present Activity (08:00): SET CEMENT PLUG #28
Drilling Hrs	0	
Avg ROP by TIME	0	Next Significant Activity: WAIT ON CEMENT & DRILL SAME TO NEW FORMATION.
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			by RATE	
WOB			K-lbs	
RPM				
TRQ			amps	
PP			PSI	

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2				ppm
COND IN				ppm NaCl
COND OUT				ppm NaCl
H2S				ppm
HYDC GAS				units
MW IN				lb/g
MW OUT				lb/g
pH IN				
pH OUT				
TEMP IN				deg F
TEMP OUT				deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY..

Sample Logging Conditions, other remarks: LOST CIRCULATION AT 582' AFTER CEMENT PLUG #26; PLUG #27 WOULD NOT HOLD FLUID.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 2JS	320'	354'	27.5	INC

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: DOUG MILHAM

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 8-26-89 | Time of Report 08:00 | Days since spud: 24

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 674'' | Depth Yest. 674'' | Progress 0 ft | Rotating Hrs 0

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Flg	Hrs	Avg ROP	RPM	WOB Klb
RR4	26"	HTC	2JS	500'	600'	DRILLING & CIRCULATING OUT CEMENT				

Lithology:

Interval		Description
–	ft	
–	ft	
–	ft	
–	ft	
–	ft	

Drilling Fluids:

Mud Wt. 8.6 lb/gal | Vis 40 cp | PV 3 cp | YP 7 lb/100ft2 | pH 9

Returns temp F | Lost circulation LCM

Flow rate gpm | Pump pressure psi, strokes/min

Composition: bentonite , lignite

Others:

Drill String:

Drill Pipe OD weight: 5.0 "/ 25.6 lb/ft | Connection: 6" | Grade: E

Number of D.P. Joints:

Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 47K lb

DC length 152 ft | Bottom Hole Assembly: Total length 234.00

PHA Description: 26"BIT/6-PT REAMER/MUD MOTOR/STD/XO/MONEL/UTP/SHOCK SUB/
3-11"DC/2-10"DC

Directional Survey | Measurement Depth | Angle | Azimuth | Dog Leg Severity

SUMMARY OF YESTERDAY'S OPERATIONS

LAST CEMENT PLUG FILLED HOLE TO 500', AND WOULD NOT HOLD FLUID. BEGAN DRILLING CEMENT FROM 500', AND LOST RETURNS AT 583'. CONTINUED DRILLING TO 600' WITH NO RETURNS. RIGGED CEMENT TOOL AND PUMPED A HALLIBURTON PORTLAND MATERIAL CALLED "SUPER PLUG". WAITED 30 MINUTES, BUT THE HOLE STILL WOULD NOT HOLD WATER. SPOTTED ANOTHER CEMENT PLUG @ 569'. TAGGED TOP OF THIS PLUG AT 515'; PUMPED 400 BBLS OF WATER ON TOP OF IT AND THE HOLE WOULD NOT FILL; BUT CONTINUED PUMPING EVENTUALLY FILLED THE HOLE.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-26-89	Synopsis of Rig Activity, Last 24 Hrs: WAIT ON CEMENT, RIH & TAG CEMENT @ 500', CIRC &
Report Time	08:00	CONDITION MUD, RIH WITH BHA, DRILL CEMENT TO 582', LOSSING CIRCULATION @ 563', PUMP LCM PILL
Days Since Spud	24	DRILL CEMENT TO 600', POOH, RIH & SET POLYMER PLUG, WAIT ON POLYMER,PUMP 350 BBLS FLUID INTO
Present Depth	674'	HOLE, NO FILL, PUMP CEMENT PLUG #30, WAIT ON CEMENT, RIH TAG CEMENT @ 516', ATTEMPT TO FILL
Prior Depth	674'	HOLE, POOH.
24 Hr Footage	0	Present Activity (08:00): PREPARING TO RIH & CEMENT
Drilling Hrs	0	
Avg ROP by TIME	0	Next Significant Activity: CEMENT PLUG # 31
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
ROP			by RATE	
WOB			K-lbs	
RPM				
TRQ			amps	
PP			PSI	

MUD + GAS PARAMETERS ANALYSIS

	MAX @ DEPTH	MIN @ DEPTH	AVERAGE	
CO2			ppm	
COND IN			ppm NaCl	
COND OUT			ppm NaCl	
H2S			ppm	
HYDC GAS			units	
MW IN			lb/g	
MW OUT			lb/g	
pH IN				
pH OUT				
TEMP IN			deg F	
TEMP OUT			deg F	

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

NO NEW LITHOLOGY

Sample Logging Conditions, other remarks:

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 2JS	500'	100'/		DRILLING CEMENT

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-28-89 | Time of Report 08:00 | Days since spud: 26

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T38, R28E, Mono County C

Depth Today 844 ' | Depth Yest. 674 ' | Progress 170 ft | Rotating Hrs 8

Size and Depth of Last Casing: 30 " at 284 'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB
RR4	26"	STC	33S	700'	SIH	170	9	21	25+MM	6 K

Lithology:

Interval	Description
674'- 830' ft	TUFF - VERY PALE ORANGE; SHARDS; GLASSY; SUB-
- ft	TRANSLUCENT; OFTEN LINEAR/VESICULAR, PUMICEOUS
- ft	GRADING TO COMPACT PUMICE; COMMON CRYSTAL.
- ft	ROPEY LAMINATIONS; OCC BROWN. OBSIDIAN SPILL
- ft	

Drilling Fluid:

Mud Wt. 9.9 lb/gal | Vis 45 sp | PV 9 cp | YP 42 lb/100ft2 | pH 10.5

Returns temp 86 F | Lost circulation 0 bbl

Flow rate 911 gpm | Pump pressure 1100 psi, strokes/min 90

Composition: bentonite, lignite

Other:

Drill String:

Drill Pipe OD, weight: 5.5 " / 25.6 lb/ft | Connection: ' | Grade:

Number of D.P. joints: 17

Drill Collars: 3 @ 11", 3 @ 10", @ " | DC wt. in air: 47 lb

DC length 132 ft | Bottom Hole Assembly: Total length 340.5

BHA Description: 26"HIT/3-PT REAMER/MUD MOTOR/STB/NO/MONEL/NTB/SHORT SUB/

3-11"DC/3-10"DC/XO

Directional Survey | Measurement Depth | Angle | Direction | Deg Leg Severity

Measurement Depth	Angle	Direction	Deg Leg Severity
506'	0 30'	N05W	
600'	0 30'	N01E	
663'	1 00		
695'	0 45'	N11E	

SUMMARY OF 24 HR OPERATIONS

START THE TIME FROM 0600 - 1730: DRILLING OUT CEMENT FROM TOP TO 674'. DRILLED NEW FORMATION FROM 674' TO 695'. BIT RATE OF PENETRATION WAS FAIRLY LOW (2-3 FT/HR), SO LAID DOWN THE DRILLING ASSEMBLY AND PICKED UP THE MUD MOTOR. DRILLED AHEAD TO 844' WITH DIRECTIONAL SURVEYS AT 506', 600', 663', 695'; ALL DEVIATIONS WERE 1 DEGREE OR LESS. AVERAGE RATE OF PENETRATION WITH MOTOR WAS 24 FT/HR.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-28-89
Report Time	08:00
Days Since Spud	26
Present Depth	844'
Prior Depth	674'
24 Hr Footage	170'
Drilling Hrs	8
Avg ROP by TIME	21
ROP is in Feet/Hour	

Synopsis of Rig Activity, Last 24 Hrs: DRILL CEMENT TO 509', SURVEY, DRILL CEMENT TO 635', SURVEY, DRILL CEMENT TO 674', DRILL FORMATION TO 698', SURVEY, DRILL TO 700', POOH, CHANGE BHA, PICKING UP STRIAGHT HOLE MUD MOTOR, RIH, REAM FROM 626' TO 700', DRILL NEW FORMATION TO 765', SURVEY, DRILL TO 828', CIRCULATE AND SURVEY, DRILL TO 844'

Present Activity (08:00): DRILLING

Next Significant Activity: DEEPEN THE 26" HOLE

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	68	722	4	703'	40	by RATE
WOB	12	702	2	766'	6	K-lbs
RPM	27	799	20	703'	27	
TRQ	14	764	2	703	9	amps
PP	1519	714'	477	702'	1220	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
BGG	495	708'	450	782'	472	ppm
COND IN	648	701	614	708	628	ppm NaCl
COND OUT	817	796'	760	709'	775	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.8	809'	8.6	678'	8.7	lb/g
MW OUT	8.9	703'	8.9	806'	8.8	lb/g
pH IN	11.6	677'	11.5	822'	11.7	
pH OUT	11.9	681'	11.7	827'	11.8	
TEMP IN	90	800'	86	702'	88	deg F
TEMP OUT	86	796'	86	700'	87	deg F

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 20S	674'	170	8	INC

Report by: BILL GILMOUR

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
TUFF - VERY PALE ORANGE BECOMING LIGHTER W/ DEPTH. FIRM, BRITTLE, PUNKY, BLASSY, VERY FINELY VESICULAR, OFTEN LINEARVESICULAR, COMMONLY SCORIACEOUS, PUMICEOUS, GRADING TO COMPACT PUMICE, SUBVITREOUS TO SILKY LUSTER, VERY ABRASIVE TEXTURE, OCCASIONAL SMOOTH. SUBROUNDED MED GRAY OBSIDIAN LAPILLI. WHEN DRIED APPROXIMATELY 10% OF TUFFACEOUS ROCK WILL FLOAT.

Sample Logging Conditions, other remarks: GOOD, ABUNDANT LCM ADDED TO PREVENT MUD LOSS.

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-29-89 | Time of Report 08:00 | Days since spud: 27

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 1048' | Depth Yest. 844' | Progress 204'ft | Rotating Hrs 8

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
RR4	26"	STC	23S	674'	1048'	374'	16	24	126+MM	6 K

Lithology:

Interval		Description
830'- 920	ft	TUFF - LT GRY, INCS DENSITY. COMPACT, OCC OBSID
920'- 1025'	ft	TUFF - WHT TO V LT GRY. INCRSD FROTHY PUMICEOUS TEXTURE, DCRSD GLASSY, RUFFY OBSIDIAN W/ DEPTH.
-	ft	
-	ft	
-	ft	

Drilling Fluid:

Mud Wt. 8.9 lb/gal | Vis 42 cp | PV 10 cp | YP 16 lb/100ft2 | pH 11.8
Returns temp 86 F | Lost circulation 1000 bbl
Flow rate 911 gpm | Pump pressure 1100 psi, strokes/min 90
Composition: bentonite , lignite
Other :

Drill String:

Drill Pipe OD/weight 5.5 " / 25.6 lb/ft | Connections 6" | Grade E
Number of D.P. joints: 25
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 10 31
DC length 152 ft | Bottom Hole Assembly: Total length 240.21'
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/MONEL (DROP)SUB/ SUB/ 3-11"DC/2-10"DC

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	758'	0 30'	N05E	
	831	1 00'	N10E	
	926'	0 45'	N04E	

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLED AHEAD FROM 844 TO 928'. WHERE WE TEMPORARILY LOST CIRCULATION. CONTINUED DRILLING WITH LCM PILL, AND REGAINED CIRCULATION WITH A STEADY LOSS OF 10-20 BBL/HR. DRILLED AHEAD TO 966', WHERE LOST RETURNS COMPLETELY. DRILLED TO 1048' WITH NO RETURNS, PULLED OUT OF THE HOLE TO CEMENT. SPOTTED PLUG JUST OFF BOTTOM (20BBL CaCl, 2000 GAL FLO-CHEK, 300 SACKS CLASS G, 125 SACKS OF 1:1 PERLITE WITH 12% CAL-SEAL AND 3% CaCl). IT FILLED BACK TO 945 , COMPARED TO A THEORETICAL FILL TO 866', SO THE FORMATION TOOK THE CEMENT. TAGGED CEMENT AND PREPARED TO RESUME DRILLING AT 0800.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-29-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL TO 891', SURVEY, DRILL TO 986', LOST RETURNS,
Report Time	08:00	DRILL W/ NO RETURNS TO 1000', DRILL TO 1016', SURVEY, DRILL TO 1048', POOH, SET BACK BHA,
Days Since Spud	27	P/U DRILL PIPE. RIH. CEMENT PLUG #31, WAIT ON CEMENT, RUN TEMP LOG. WAIT ON CEMENT. RIH
Present Depth	1048'	TAG CEMENT @ 945' CIRC, SET LCM PILL, POOH.
Prior Depth	844'	
24 Hr Footage	204'	Present Activity (08:00): TRIPPING FOR DRILLING ASSEMBLY
Drilling Hrs	8	
Avg ROP by TIME	25	Next Significant Activity: DRILL OUT CEMENT FROM 945'
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	90	1021'	8	917'	36	by RATE
WOB	12	851'	2	916'	5	k-lbs
RPM	28	955'	20	876'	26	
TRQ	42	935'	9	997'	16	amps
PP	1650	932'	892	992'	1264	PSI

MUD & GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	511	937'	0	1030'	421	ppm
COND IN	693	955'	644	869'	677	ppm NaCl
COND OUT	787	846'	0	1048'	689	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.9	922'	8.7	1040'	8.8	lb/g
MW OUT	8.9	903'	8.8	1020'	8.8	lb/g
pH IN	11.8	854'	11.5	1033'	11.7	
pH OUT	11.8	876'	11.7	1022'	11.8	
TEMP IN	99	940'	81	1031'	93	deg F
TEMP OUT	98	938'	(	1048'	86	deg F

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ , units. SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud WIS out = , 500 grams Carbide. Minutes Duration
Theoretical Lag minutes @ #/SPM #

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTS	CUM HRS	CONDITION
RR4	26"	STC J33	674'	374'	16	GOOD

Report by: BILL GILMOUR

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
DOMINANTLY TUFFACEOUS TEPHRA UNIT - TUFF, VERY LIGHT GRAY TO PALE YELLOWISH ORANGE; FIRM TO HARD; PUMICEOUS, INCREASING WITH DEPTH BEYOND 920'. ABOVE 920' OCCURS COMMON AMOUNTS OF DENSE, ROPEY, LIGHT GRAY SILICA AND COMMON AMOUNTS OF MEDIUM DARK GRAY SUB-ROUNDED OBSIDIAN LAPILLI AND TRACES OF MICROCRYSTALLINE RHYOLITE THE TUFF IS MICRO-LINEARVESICULAR GRADING TO DENSE PUMICE; OCCASIONALLY IRON STAINED; OCCASIONAL BANDING DISPLAYS FLOW CHARACTERISTICS.

Sample Logging Conditions, other remarks: HIGH AMOUNTS OF LCM CONTAMINATING SAMPLES. LOSS OF CIRCULATION @ 986'

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

Sample Disposition and Transfers:
Date:
Interval: From to
Sent to/Received by:

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 8-30-89 | Time of Report 08:00 | Days since spud: 28

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 1414' | Depth Yest. 1048' | Progress 366 ft | Rotating Hrs 15

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
5	26"	SEC	S84	1048'	IHC	366	15	24	25+MM	0-10 K

Lithology:

Interval	Description
1048' - 1120 ft	TUFF- V LT GRY, MICROVESICULAR, BRIT, GLASSY
1120' - 1400 ft	TUFF- A/A W/ 20% WHT ASH AND LITHIC CLASTS
- ft	
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.6 lb/gal | Vis 45 cp | PV 6 cp | YP 35 lb/100ft2 | pH 10.5
Returns temp 96 F | Lost circulation bbl
Flow rate 1113gpm | Pump pressure 1440 psi, strokes/min [illegible]
Composition: bentonite, lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6 5/8 | Grade: E
Number of D.P. joints:
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt (in air) 45 [illegible]
DC length: 152 ft | Bottom Hole Assembly: Total length 255.10'
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/MONEL/STB/SHOCK SUB/ [illegible]
3-11"DC/2-10"DC

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	1039'	1 00'	N31E	
	1138'	0 45'	N10W	
	1233	1 00	N22E	
	1324'	1 15'	N14E	

SUMMARY OF YESTERDAY'S OPERATIONS

WE TAGGED CEMENT @ 940' AND DRILLED IT DOWN TO NEW FORMATION AT 1048'. CIRCULATION DROPPED FROM 40% OF FLOWLINE TO 14%, BUT EVENTUALLY RETURNED TO NORMAL. DRILLED AHEAD TO 1414' AT 0800, WITH DIRECTIONAL SURVEYS AT 1039' = 1 DEGREE, 1138' = 3/4 DEGREE, 1233' = 1 DEGREE, AND 1324' = 1 1/4 DEGREE.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-30-89	Synopsis of Rig Activity, Last 24 Hrs: RIH & TAG CEMENT @ 945', DRILL CEMENT TO 1048'. LOST
Report Time	08:00	RETURNS, DRILL NEW FORMATION TO 1107', CIRC & SURVEY, CHANGE SEAT IN PUMP #1, DRILL TO 1207'
Days Since Spud	28	CIRCULATE & SURVEY, DRILL TO 1233', SURVEY, DRILL TO 1357', SURVEY, DRILL TO 1414'.
Present Depth	1414'	
Prior Depth	1048'	
24 Hr Footage	366'	Present Activity (08:00): DRILLING
Drilling Hrs	15	
Avg ROP by TIME	24	Next Significant Activity: KEEP ON KEEPING ON DRILLING
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	100	1086	10	1267	32	by RATE
WOB	12	1211'	1.2	1297'	4	K-lbs
RPM	25	1380'	23	1211	25	
TRQ	35	1068'	7	1337	8	amps
PP	1719	1302'	710	1267	1328	PSI

MUD & GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
DC2	432	1098'	347	1292'	375	ppm
COND IN	700	1081	535	1058'	634	ppm NaCl
COND OUT	2672	1189	967	1350'	1673	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.8	1377'	8.7	1055	8.8	lb/g
MW OUT	8.9	1297'	8.8	1167'	8.9	lb/g
pH IN	11.2	1075'	10.7	1340'	10.9	
pH OUT	11.5	1174'	11.0	1350'	11.3	
TEMP IN	97	1380'	83	1059'	89	deg F
TEMP OUT	99	1391'	82	1139'	92	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
LITHIC TUFF - WHITE TO PALE YELLOW ASH MATRIX THAT IS HIGHLY SOLUBLE, SOFT, CHALKY, WITH VARIABLE AMOUNTS OF MINOR SHARDS AND PREDOMINANT 1-2.5 MM MEDIUM LIGHT GRAY, ROUNDED, SPERICAL, CLASTS OF OCCASIONAL OBSIDIAN AND DOMINANTLY PERLITE LAPILLI THAT OFTEN DISPLAY CONCENTRIC RINDS AND CRACKED INTERNAL STRUCTURE. THESE CLASTS INCREASE WITH DEPTH FROM 20% @ 1250' TO 45% @ 1410'. THE DOMINANT LITHOLOGY FROM 1000' TO 1300' WAS A TUFFACEOUS MICRO-VESICULAR VERY LIGHT GRAY GLASS THAT OFTEN DISPLAYED ARGONATE, ROPEY TEXTURE WITH A CHATOYANCY AND HARDNESS THAT SUGGESTS A HYDRATED COMPOSITION.

Sample Logging Conditions, other remarks: GOOD. MINOR AMOUNTS OF LCM IN SAMPLES.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ . units. SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
5	12	SEC S84	1048	366	15	INC

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 8-31-89 | Time of Report 08:00 | Days since spud: 29

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County [illegible]

Depth Today 1718' | Depth Yest. 1414' | Progress 304 ft | Rotating Hrs 21

Size and Depth of Last Casing: 30 " at 234'K.B. | Now Drilling 26 " hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
5	26"	SEC	S84	1048'	BIH	670	36	18	[illegible]	[illegible]

Lithology:

Interval	Description
1400- 1450 ft	LITHIC TUFF - W ABNDT AMTS OF [illegible]
1450- 1580 ft	OBSIDIAN FLOW - PERLITIC, DEVITRIFIED, LT GR[illegible]
1580- 1590 ft	RHYOLITE - YEL ORG MOTTLED, [illegible]
1590- 1630 ft	ASH FLOW - YEL ORNG, STICKY, [illegible]
1630- 1700 ft	VITRIC TUFF - DENSE, TRANSL GREEN, [illegible]

Drilling Fluid:

Mud Wt. 9.0 lb/gal | Vis 42 cp | PV 7 cp | YP 18 lb 100ft2 | pH 10.6

Returns temp 120 F | Lost circulation [illegible]

Flow rate [illegible] gpm | Pump pressure 1600 psi, strokes min [illegible]

Composition: Bentonite , Lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: [illegible]

Number of D.P. joints: 46

Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) [illegible]

DC length 152 ft | Bottom Hole Assembly: Total length 248.[illegible]

BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/[illegible]

3-11"DC/2-10"DC

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	1431'	1 00'	N10W	
	1525	1 07.5'	N01W	
	1620'	1 15'	N05W	

SUMMARY OF YESTERDAY'S OPERATIONS

YESTERDAY WAS FAIRLY CONSISTENT DRILLING FROM 1414' TO 1718'. FORMATION WAS PRIMARILY TUFF, BUT NOT THE BISHOP TUFF THAT WAS EXPECTED AT THIS DEPTH. RATE OF PENETRATION IS RELATIVELY LOW (AROUND 15'/HR) BECAUSE THE DRILLER CANNOT PUT MUCH WEIGHT ON THE BIT WITHOUT CAUSING DEVIATION. ALL THREE DIRECTIONAL SURVEYS IN YESTERDAYS DRILLING INTERVAL WERE 1 1/4 DEGREE OR LESS.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	8-31-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL TO 1491', SURVEY, DRILL TO 1573', WORK ON MOTORS
Report Time	08:00	DRILL TO 1585', SURVEY, DRILL TO 1690', SURVEY, DRILL TO 1718'.
Days Since Spud	29	
Present Depth	1719'	
Prior Depth	1414'	
24 Hr Footage	304'	Present Activity (08:00): DRILLING
Drilling Hrs	21	
Avg ROP by TIME	15	Next Significant Activity: DRILL.....
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	32	1581'	4	1588'	17	by RATE
WOB	9	1464'	2	1580'	6	K-lbs
RPM	36	1670'	24	1461'	33	
TRQ	28	1556'	8	1647'	9	amps
PP	2011	1608	802	1548'	1760	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	454	1513'	330	1465	385	ppm
COND IN	627	1425	527	1507	580	ppm NaCl
COND OUT	929	1433	796	1658	871	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.9	1663'	8.7	1559'	8.8	lb/g
MW OUT	8.9	1680'	8.8	1477'	8.9	lb/g
pH IN	10.4	1467'	10.0	1700'	10.2	
pH OUT	10.7	1415'	10.2	1715'	10.5	
TEMP IN	116	1664'	102	1425'	111	deg F
TEMP OUT	120	1666'	106	1420'	117	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
LITHIC TUFF - YEL WHT ASH W/ ABNDT 1-3 MM PERLITE LAPILLI, INCREASING W/ DEPTH TO 1580' WHERE PERLITIC OBSIDIAN LAPILLI COMPRISE UP TO 95% OF THE TOTAL LITHOLOGY. @ 1590' A 10' YELLOW ORANGE RHYOLITE FLOW COMPRISES ALL OF THE SAMPLE. BELOW THE WELL PRESERVED RHYOLITE FLOW EXISTS A YELLOW-ORANGE ASH ZONE WITH INCREASING PERLITE TO 1650' WHERE A THICK UNIT OF A YELLOW GREEN DENSE VITRIC TUFF UNIT DOMINATES TO 1700'. THE YELLOW GREEN VITRIC TUFF IS DENSE, GLASSY, TRANSLUCENT, VITREOUS WITH LESSER CHALKY, ASHY, MICROVESICLES, RARE BANDING, POSSIBLY COLORED DUE TO CHLORITIC STAINING.

Sample Logging Conditions, other remarks: INTERMITTENT LCM ADDED.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
5	26"	SEC 884	1048	670'	36	INC

Sample Disposition and Transfers:
Date:
Interval: From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 9-01-89 | Time of Report 08:00 | Days since spud: 30

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County C

Depth Today 1865' | Depth Yest. 1718' | Progress 147 ft | Rotating Hrs 13

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Flg	Hrs	Avg ROP	RPM	WOB Klb
5	26"	SEC	S84	1048	SIH	017	49	17	135+MM	6-10

Lithology:

Interval	Description
1700- 1725 ft	VITRIC TUFF - GLASS FLOW, YEL-ORG, HARD DENSE
1725- 1850 ft	PERLITE - LT GRY, 1-3MM SBRND LAPILLI, W/TUFF
- ft	
- ft	
- ft	

Drilling Fluid:

Mud Wt. 8.9 lb/gal | Vis 38 cp | PV 8 cp | YP 16 lb/100ft2 | pH 10.5
Returns temp 123F | Lost circulation NIL bbl
Flow rate 1113gpm | Pump pressure 1750 psi, strokes/min 110
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" , Grade: E
Number of D.P. joints: 51
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 45 k lb
DC length 152 ft | Bottom Hole Assembly: Total length 348.31'
BHA Description: 26"BIT/3-PT REAMER/MUD MOTOR/STB/XO/MONEL/STB/SHOCK SUB/ 3-11"DC/2-10"DC

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	1714'	1 15'	N05W	

SUMMARY OF YESTERDAY'S OPERATIONS

YESTERDAY'S DRILLING (1718'-1865') WAS PREDOMINANTLY IN A LIGHT, ASHY TUFF. THE DRILLING RATE AVERAGED 14'/HR. BUT THE CUTTINGS ARE EXTREMELY FINE AND ARE LOADING UP THE MUD SYSTEM. WIRELINE TEMPERATURE LOG SHOWED THE MUD IN THE HOLE TO AVERAGE ABOUT 120 DEGREES, BUT MOST OF THIS HEAT CAME FROM THE MECHANICAL WORK OF THE PUMPS AND THE MOTOR (I.E. THE FORMATION IS COOLER THAN THE MUD).

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	9-01-89	Synopsis of Rig Activity, Last 24 Hrs:	DRILL TO 1774', CIRCULATE & SURVEY, DRILL TO 1803',
Report Time	08:00		POOH. RUN SANDIA TEMPERATURE LOG, RIH, CIRCULATE, DRILL TO 1835'. LOST 400 PSI, POOH LOOK
Days Since Spud	30		FOR WASHOUT. DRILL TO 1840', CIRCULATE THICK ASH CUTTINGS OUT OF HOLE. DRILL TO 1865', SURVEY
Present Depth	1865'		
Prior Depth	1718'		
24 Hr Footage	147'	Present Activity (08:00):	SURVEYING
Drilling Hrs	13		
Avg ROP by TIME	11	Next Significant Activity:	DRILLLLLL
ROP is in Feet/Hour			

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	42	1799'	4	1830'	14	by RATE
WOB	13	1743'	2	1794'	6	K-lbs
RPM	36	1774	27	1725	34	
TRQ	14	1743'	7	1830'	10	amps
PP	2072	1814	1545	1719'	1910	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	541	1814'	354	1745'	413	ppm
COND IN	601	1822'	542	1804	588	ppm NaCl
COND OUT	838	1817'	798	1791'	816	ppm NaCl
H2S	0		0		0	ppm
TOTAL GAS	0		0		0	units
MW IN	8.9	1804'	8.7	1722'	8.8	lb/g
MW OUT	9.0	1806'	8.8	1798'	8.9	lb/g
pH IN	10.3	1838'	9.9	1758'	10.1	
pH OUT	10.3	1808'	10.2	1722'	10.3	
TEMP IN	123	1799'	112	1805'	118	deg F
TEMP OUT	127	1790'	117	1804	122	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)
1720' TO 1850' IS PREDOMINANTLY A LITHIC TUFF COMPOSED OF 50-60% LIGHT GRAY, SUBROUNDED, SUBSPHERICAL PERLITE THAT IS CRACKED, TRANSLUCENT, GLASSY, DISPLAYING CONCENTRIC ONION SKIN RIND; ASSOCIATED W/VARING AMOUNTS OF PUMICEOUS LIGHT GRAY TUFF AND LESSER AMOUNTS OF WHITISH ASH MATERIAL.

Sample Logging Conditions, other remarks: LARGE VOLUMES OF YELLOWISH, CLAYEY ASH SQUEEZES INTO THE HOLE DURING TRIPS AND THICKENS UP THE MUD CLOGGING THE SHAKERS UPON CIRCULATING BOTTOMS UP.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud WT out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 % #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
5	26'	SEC 884	1048'	817	49	INC

Sample Disposition and Transfers:
Date:
Interval From ' to '
Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 9-02-89 | Time of Report 08:00 | Days since spud: 31

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 2044' | Depth Yest. 1865' | Progress 179 ft | Rotating Hrs 15.5

Size and Depth of Last Casing: 30 " at 284' K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB Klb
5	26"	SEC	S84	1048'	2044	996	64.5	15.4	130-NM	6-10

Lithology:

Interval	Description
1860- 2000 ft	TUFF-GLASSY, PUMICEOUS, PERLITIC, LT GRY
2000- 2040' ft	ASH TUFF-ALTERED, KAOLINITIC, SOLUBLE
2040- 2045' ft	POSS TOP BISHOP TUFF-DOM SOLUBLE (SLOUGH ?)
- ft	BUT W/ ODC XSTLN TUFF AND STRONG TRACES OF
- ft	FREE HEXAGONAL DIPYRAMIDAL QUARTZ.

Drilling Fluid:

Mud Wt. 9.1 lb/gal | Vis 62 cp | PV 23 cp | YP 15 lb/100ft2 | pH 10.0
Returns temp 122F | Lost circulation NIL bbl
Flow rate 981 gpm | Pump pressure 1900 psi, strokes/min 97
Composition: bentonite , lignite
Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | Grade: E
Number of D.P. joints: 56
Drill Collars: 3 @ 11", 2 @ 10", @ " | DC wt. (in air) 45.0 lb
DC length 152 ft | Bottom Hole Assembly: Total length 254.50'
BHA Description: 26"BIT/3-FT REAMER/MUD MOTOR/STAB/XO/MONEL/STAB/SHOCK SUB/
3-11"DC/2-10"DC

Directional Survey

Measurement Depth	Angle	Direction	Dog Leg Severity
1806'	1 15'	N66W	
1901'	1 15'	"N"	
1984'	1 15'	N04E	

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLING WAS FROM 1865' TO 2044', STILL IN THE PREDOMINANTLY ASHY TUFF. SOME LITHOLOGY CHANGE JUST AT 2040' INDICATES THE POSSIBLE TOP OF THE BISHOP TUFF. ALL DEVIATION SURVEYS WERE A CONSISTENT 1.25 DEGREES, TREND-ING ALMOST DUE NORTH. AT THE END OF THIS LAST DRILLING PERIOD, RATE OF PENETRATION HAD SLOWED, PROBABLY CAUSED BY HARDER FORMATION AND/OR BIT BALLING.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	9-02-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL TO 1961', SURVEY, DRILL TO 2044', CIRCULATE
Report Time	08:00	BOTTOMS UP, SURVEY, POOH FOR NEW MUD MOTOR, STAGE IN HOLE CIRCULATING @ 536', 1043', 1513'
Days Since Spud	31	AND 2044'.
Present Depth	2044'	
Prior Depth	1865'	
24 Hr Footage	179	Present Activity (08:00): CIRCULATING BOTTOMS UP
Drilling Hrs	15.5	
Avg ROP by TIME	15.4	Next Significant Activity: DRILL AHEAD
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
ROP	39	1888'	2	1976'	15	by RATE
WOB	17	1912'	2	1882'	8	K-lbs
RPM	50	2027'	20	1994'	36	
TRQ	17	1948'	4	1983'	9	amps
PP	2047	2031'	963	1968'	1917	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX @	DEPTH	MIN @	DEPTH	AVERAGE	
CO2	550	1938'	331	1908	410	ppm
COND IN	682	1978'	339	2017'	575	ppm NaCl
COND OUT	817	1917'	572	2032'	749	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	8.9	2033'	8.8	1968'	8.9	lb/g
MW OUT	9.0	2040'	8.8	1868'	8.9	lb/g
pH IN	10.1	1877'	9.8	2041'	9.9	
pH OUT	10.1	1916'	9.7	2038'	9.8	
TEMP IN	121	1974'	109	1867'	117	deg F
TEMP OUT	126	1960'	114	1865'	121	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

1865' TO 2000' PREDOMINANTLY TUFFACEOUS GLASS FLOW MATERIAL COMPOSED OF LIGHT GRAY PERLITE, MICROVESICULAR PUMICEOUS GLASS, WITH MINOR AMOUNTS OF ASH AND ASH ALTERATION MATERIAL.

2000'-2040' INCREASED AMOUNTS OF ASH. KAOLINITIC CLAY COMPRISING UP TO 80% OF THE SAMPLING, LIGHT YELLOW GRAY, SOFT, MODERATELY SOLUBLE WITH MINOR AMOUNTS OF COMPETENT ASH TUFF CUTTINGS CONTAINING LITHIC FRAGMENTS OF LIGHT GRAY GLASS MATERIAL.

2040'-2045' POSSIBLE TOP OF BISHOP TUFF- FIRST OCCURRENCES OF FREE HEXAGONAL DIPYRAMIDAL QUARTZ AND MINOR AMOUNTS OF HARD VITRIC TUFF FRAGMENTS. THE HIGH AMOUNT OF SOLUBLE ASH CLAY, FROM THE OVERLYING INTERVAL, AND THE SHORT SECTION OF SLOWER DRILLING (POSS BISHOP TUFF), OBSCURES DEFINATIVE DETERMINATION UNTIL MORE FOOTAGE IS DRILLED.

SAMPLE LOGGING CONDITIONS AND OTHER REMARKS: HIGH AMOUNTS OF ASHY CLAY FROM 1590'-1630' AND 2000'-2040' CIRCULATED UP OUT OF HOLE AFTER TRIP.

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =

Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)

Mud WTS out = , 500 grams Carbide, Minutes Duration

Theoretical Lag minutes @ w/SPM # =

Sample Shaker Screen Size: #1=40(60) & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	SUM FTG	SUM HRS	CONDITION
5	26"	SEC 884	1043	996'	64.5	6000

Sample Disposition and Transfers:

Date:

Interval: From to

Sent to/Received by:

Report by: BILL GILMOUR

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 9-03-89 | Time of Report 08:00 | Days since spud: 32

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 2134' | Depth Yest. 2044' | Progress 90 ft | Rotating Hrs 10.5

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB K lb
3	26"	SEC	S84	1048'	2132'	1084	78	14	130+MM	10 K
RR4	26"	STC	20S	2132	INC	2	.25	8	55	30 K

Lithology:

Interval		Description
2040- 2050	ft	XSTLN TUFF-HARD, LT GRY, COM SUBHDRL QTZ, BASE-
-	ft	MENT FRAGS, OCC MICA, PYRITE, TRACES OF DIPYR-
-	ft	AMIDAL EUHEDRAL QTZ.
2050- 2130	ft	TUFF- LT BLUSH GRY, HARD, VITRIC, OPAQUE, DENSE
-	ft	

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 47 cp | PV 21 cp | YP 15 lb/100ft2 | pH 9.8

Returns temp 119F | Lost circulation Nil bbl

Flow rate 1010gpm | Pump pressure 1800 psi, shr/der/min 95

Composition: bentonite , lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connections & | Grade F

Number of D.P. Joints: 57

Drill Collars: 3 @ 11", 5 @ 10", & " | DC wt. (in air) 45 Klb

DC Length 182 ft | Bottom Hole Assembly: Total length 325.15'

BHA Description: 26"BIT/3-PT REAMER/XO/STB/XO/MONEL/STB/11" DC/STB/SHOCK-SUB/2-11" & 5-10" DC'S/XO

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	2065'	1 30'	N10W	

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLING BEGAN @ 2044 , SUSPECTED TO BE JUST AT THE TOP OF THE BISHOP TUFF. RATE OF PENETRATION WAS LOW. ABOUT 6-8 FT/HR. INCREASED WEIGHT ON BIT DID NOT SIGNIFICANTLY CHANGE PENETRATION RATE. DRILLED TO 2132' AND SURVEYED @ 2065'; DEVIATION WAS 1 1/2 DEGREE. LAID DOWN MUD MOTOR AND RESUMED ROTARY DRILLING TO 2134'.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	9-03-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL FROM 2044' TO 2125', SURVEY, DRILL TO 2132',
Report Time	08:00	POOH, LAY DOWN & PICK UP NEW BHA (ROTATING ASSEMBLY), RIH, BREAK CIRC @ 544', RIH, REAM FROM
Days Since Spud	32	1523' TO 1656', RIH REAM 1950' TO 2132', DRILL TO 2134'
Present Depth	2134'	
Prior Depth	2044'	
24 Hr Footage	90	Present Activity (08:00): DRILLING
Drilling Hrs	13.5	
Avg ROP by TIME	6.6	Next Significant Activity: DRILL
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	28	2053'	2	2062'	8	by RATE
WOB	25	2107'	5	2046'	14	K-lbs
RPM	54	2110'	23	2114'	36	
TRQ	21	2094'	6	2124'	10	amps
PP	2037	2106'	1000	2114'	1632	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	451	2059'	333	2047'	377	ppm
COND IN	679	2088'	418	2047'	566	ppm NaCl
COND OUT	625	2025'	572	2032'	616	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	9.0	2076'	8.9	2056'	9.0	lb/g
MW OUT	9.1	2048'	9.0	2122'	9.0	lb/g
pH IN	9.8	2042'	9.6	2132'	9.7	
pH OUT	9.7	2045'	9.6	2129'	9.6	
TEMP IN	123	2122'	114	2047'	120	deg F
TEMP OUT	128	2123'	119	2046'	125	deg F

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units. SPM # =
Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)
Mud VIS out = , 500 grams Carbide, Minutes Duration
Theoretical Lag minutes @ ' w/SPM # =

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
5	26"	SEC S84	1048'	1084'	78	GOOD

Report by: BILL GILMOUR

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

2040-2050' : CRYSTALLINE TUFF- MED LT GRY & TRANSLU (WET), LT GRY & OPAQUE (DRY); HARD, WELDED, W/ COMM PHENOCRYSTS OF ANHEDRAL QTZ, OCC GLASS FRAGS, OCC LITHIC FRAGS POSS DERIVED FROM BASEMENT, TRACES OF WELL DEVELOPED HEXAGONAL DIPYRAMIDAL QTZ, TRS BIOTITE, OCC DISSEMINATED PYRITE.- BISHOP TUFF-

2050-2130' TUFF- LT BLUSH GRY, HARD, COMPETENT, HOMOGENEOUS, BLOCKY TO SHARP FRACTURING, OPAQUE, SMOOTH, W/ OCC PYRITIC VEINLETS AND MORE COMMON DISSEMINATED PYRITE, RARE SUBHEDRAL QTZ PHENOCRYSTS..

Sample Logging Conditions, other remarks: GOOD

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

Sample Disposition and Transfers:
Date:
Interval: From ' to
Sent to/Received by:

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPORT**

Date: 9-04-89 | Time of Report 08:00 | Days since spud: 33

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County CA

Depth Today 2350' | Depth Yest. 2134' | Progress 216 ft | Rotating Hrs 15.5

Size and Depth of Last Casing: 30 " at 284'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Fty	Hrs	Avg ROP	RPM	[illegible]
RR4	26"	STC	2J8	2132'	SIH	219'	15.5	14	75	[illegible]

Lithology:	Interval	Description
	2130- 2170 ft	TUFF-WHT-GRY, HARD, OPAQUE, IRON STND, [illegible]
	2170- 2200 ft	DOM TUFF A/A, ABNDT TO 50% LITHIC FRAGS OF
	- ft	DOM DUSKY BRN OBSIDIAN, TR [illegible]
	2200- 2260 ft	TUFF-GRYSH WHT TO LT GRY, V FIRM, PYRTC, ALTRD
	2260- 2320 ft	TUFF-A/A BCMNG V IRON S'ND & [illegible]

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 43 cp | PV 14 cp | YP 7 [illegible] | pH 10.[illegible]

Returns temp 119F | Lost circulation 100 bbl

Flow rate 1064 gpm | Pump pressure 1900 psi, [illegible]

Composition: bentonite, lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.5 "/ 25.6 lb/ft | Connection: 6" | [illegible]

Number of D.P. joints: 58

Drill Collars: 3 @ 11", 10 @ 10", @ " | DC wt. (in air) 132 Klb

DC length 152 ft | Bottom Hole Assembly: Total length 473.56'

BHA Description: 26"BIT/3-PT REAMER/XO/STB/XO/MONEL/[illegible]/11" DC/[illegible]-SUB/2-11" & 10-10" DC'S/XO

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	2124'	1 30	N10W	
	2155'	1 15'	N16W	
	2211'	1 30'	N05E	
	2254'	1 30'	N26W	

SUMMARY OF YESTERDAY'S OPERATIONS

ALL DRILLING (2134'-2350') WAS IN BISHOP TUFF. DRILLING RATE WAS LOW [illegible] /HR SO PICKED UP 3 MORE DRILL COLLARS TO ADD WEIGHT. ALSO PICKED UP A NEW 3-PT REAMER TO REPLACE THE ONE THAT WAS SEVERELY WORN. DRILLING RATE INCREASED TO APPROXIMATELY 20 FT/HR WITH ADDITIONAL WEIGHT ON BIT. FOUR DIRECTIONAL SURVEYS WERE 1 1/2 DEGREES OR LESS.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	9-04-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL TO 2164', CIRCULATE & SURVEY, DRILL TO 2195', SURVEY, DRILL TO 2201', POOH TO ADD 5 10" DRILL COLLARS, RIH, DRILL TO 2251', SURVEY, DRILL TO 2314', SURVEY, DRILL TO 2350'.
Report Time	08:00	
Days Since Spud	33	
Present Depth	2350'	
Prior Depth	2134'	
24 Hr Footage	216'	Present Activity (08:00): DRILLING 26" HOLE
Drilling Hrs	15.5	
Avg ROP by TIME	14	Next Significant Activity: DRILL
ROP is in Feet/Hour		

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	71	2162	4	2196	17	by RATE
WOB	50	2247'	18	2151	36	K-lbs
RPM	75	2242	36	2154'	61	
TRQ	34	2162	7	2135'	21	amps
PP	2101	2218	837	2151	1838	PSI

MUD & GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	499	2210	349	2192	417	ppm
COND IN	696	2143	410	2289'	516	ppm NaCl
COND OUT	615	2155'	606	2290'	612	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	9.0	2201'	8.9	2290'	9.0	lb/g
MW OUT	9.1	2188'	8.9	2201'	9.0	lb/g
pH IN	9.9	2293'	9.7	2190'	9.8	
pH OUT	9.8	2300'	9.6	2156'	9.7	
TEMP IN	118	2202'	105	2204'	114	deg F
TEMP OUT	123	2196	111	2198'	119	deg F

Conn Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG a.m @ ', units, SPM # =

Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)

Mud VIS out = , 500 grams Carbide, Minutes Duration

Theoretical Lag minutes @ ' w/SPM # =

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC 2JS	2132'	219'	15.5	INC

Report by: BILL GILMOUR

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

2130'-2170', TUFF, WHT TO LT GRY, MOD HARD, MOD DENSE, MICRO-HOMEOCRYSTALLINE, STRUCTURELESS. OCC DISSEMINATED PYRITE, VARIABLE AMOUNTS OF IRON STAINING.

2170'-2210', TUFF AS ABOVE WITH UP TO 50% DUSKY BROWN OBSIDIAN THAT IS POSSIBLY REWORKED AND OCCASIONALLY BRECCIATED, TRACES OF RHYOLITE, META FRAGS, PYRITE AND VARIABLE AMOUNTS OF IRON OXIDE STAINING, THE TUFF WITHIN THIS INTERVAL IS COMMONLY ALTERED TO KAOLINITE.

2210'-2320', TUFF GRYSH WHT TO LT GRY, FIRM OCC V IRON STAINED, COM PYR, SOME XSTL RICH @ 2280' & V XSTL RICH (40%) @ 2320'.

Sample Logging Conditions, other remarks: BOOS. LCM ADDED @ 2180' TO INHIBIT LOST CIRCULATION.

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

Sample Disposition and Transfers:

Date:

Interval: From ' to '

Sent to/Received by:

DOE / SANDIA MAGMA ENERGY EXPLORATORY WELL **DAILY DRILLING REPOR**

Date: 9-05-89 | Time of Report 08:00 | Days since spud: 34

Well No. LVF 51-20 | Location: NW 1/4, NE 1/4, Sec.20, T3S, R28E, Mono County (

Depth Today 2568' | Depth Yest. 2350' | Progress 216 ft | Rotating Hrs 15

Size and Depth of Last Casing: 30 " at 204'K.B. | Now Drilling 26 " Hole

Bit Data:

No.	Size	Make	Type	In at	Out at	Ftg	Hrs	Avg ROP	RPM	WOB K
RR4	26	STC	23S	2132'	2568'	436'	30.5	14	66	59 K

Lithology:

Interval	Description
2740- 2540 ft	XSTLN TUFF- WHT TO LT GRY. V XSTL RICH TO 2510
- ft	DCRSNG IN AMT & SIZE TO 2568'
2540- 2568' ft	XSTLN TUFF- A/A W/ DCRSD XSTL SIZE & AMT W/
- ft	ABNDT LITHIC FRAGS OF GLASS & RHYOLITE. OCCUR
- ft	RING AS CLASTS, COM PYR, FRACTURES.

Drilling Fluid:

Mud Wt. 9.2 lb/gal | Vis 49 cp | PV 12 cp | YP 11 lb/100ft2 | pH [illegible]

Returns temp 120F | Lost circulation NIL bbl

Flow rate 1062 gpm | Pump pressure 20.0 psi, strokes/min. 104

Composition: bentonite , lignite

Other:

Drill String:

Drill Pipe OD/weight: 5.0 "/ 25.6 lb ft | Connection [illegible] | Grade E

Number of D.P. joints. 66

Drill Collars: 3 @ 11", 10 @ 10", 6 " | DC wt. (in air) 312 K#

DC length 398 ft | Bottom Hole Assembly: Total length 475.66'

BHA Description: 26"BIT/3-PT REAMER/XO/STB/XO/MONEL/STB/(11" DC'S)/SHOCK-SUB/(2-11" & 10-10" DC'S)/XO

Directional Survey	Measurement Depth	Angle	Direction	Dog Leg Severity
	2337	1 00'	N19W	
	2463'	0 45'	N26W	
	2511'	0 45'	N26W	

SUMMARY OF YESTERDAY'S OPERATIONS

DRILLING WAS FROM 2350 TO TARGET DEPTH OF 2568'. STILL APPEARED TO HAVE HARD SPOTS IN THE BISHOP TUFF, SINCE THE DRILLING RATE VARIED FROM 6 TO 30' PER HOUR WITH THE SAME WEIGHT ON BIT. THE DEPTH OF 2568 ALLOWS THE TOP OF THE CASING TO BE AT THE PROPER HEIGHT WITH ONE JOINT OF CASING IN RESERVE. PULLED OUT OF THE HOLE AND MEASURED ALL DRILL PIPE AND TOOLS FOR EXACT LENGTH RAN BACK IN HOLE FOR A WIPER RUN, PULLED OUT AGAIN AND RIGGED FOR LOGGING.

Report by: JOHN FINGER

EPOCH WELL LOGGING

DOE/SANDIA MAGMA ENERGY WELL LVF 51-20 DAILY MUD LOG REPORT

Report Date	9-05-89	Synopsis of Rig Activity, Last 24 Hrs: DRILL TO 2377', SURVEY, DRILL TO 2503', SURVEY, DRILL TO 2568', CIRCULATE, SURVEY, MEASURE DRILL PIPE OUT OF HOLE, RIH, CIRCULATE, POOH FOR E-LOGS.	
Report Time	08:00		
Days Since Spud	34		
Present Depth	2568'		
Prior Depth	2350		
24 Hr Footage	218'	Present Activity (08:00): PULLING OUT OF THE HOLE FOR E-LOGS	
Drilling Hrs	15		
Avg ROP by TIME	14	Next Significant Activity: LOG @ 2568' T.D.	
ROP is in Feet/Hour			

DRILLING PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
ROP	76	2395'	3	2559'	23	by RATE
WOB	53	2563'	12	2477'	30	K-lbs
RPM	74	2399'	33	2426'	61	
TRQ	39	2426'	13	2472'	22	amps
PP	2139	2440'	1873	2382'	2040	PSI

MUD + GAS PARAMETERS ANALYSIS

	MAX	@ DEPTH	MIN	@ DEPTH	AVERAGE	
CO2	466	2470	342	2501'	414	ppm
COND IN	564	2502'	271	2542	425	ppm NaCl
COND OUT	616	2401'	548	2529'	602	ppm NaCl
H2S	0		0		0	ppm
HYDC GAS	0		0		0	units
MW IN	9.1	2514'	8.9	2375'	9.0	lb/g
MW OUT	9.2	2508'	9.0	2389'	9.1	lb/g
pH IN	9.7	2411'	9.5	2517'	9.6	
pH OUT	9.7	2398'	9.6	2536'	9.6	
TEMP IN	119	2488'	111	2362'	117	deg F
TEMP OUT	124.7	2551'	117	2416'	122	deg F

LITHOLOGY

General Description: (See DIGITAL MUD LOG for details)

2350'- 2540' CRYSTALLINE TUFF-WHITE TO V LIGHT GRAY; FIRM TO OCCASIONALLY HARD; WELDED; CRYSTAL RICH, DULL CHALKY LUSTER, GRAINY TEXTURE; COMMON BROKEN ANHEDRAL & SUBHEDRAL QUARTZ; RARE DIPYRAMIDAL QUARTZ PHENOCRYSTS; TRACE TO COMMON PYRITE, USUALLY AS VEINLETS OR AGGREGATES; TRACE BLACK IRON OXIDE; SLIGHT DECREASE IN RED IRON OXIDE STAINING; TRACE BIOTITE; TRACE DENSE BLACK LITHIC FRAGMENTS.

2540'-2568' CRYSTALLINE TUFF-AS/ABOVE BUT BECOMING INCREASINGLY CRYSTAL POOR W/ DEPTH; STRONG OCCLARENCE (UP TO 40%), GREEN BROWN OCCASIONALLY MOTTLED, GLASS; LITHIC CLASTS; ANGULAR W/ COMMON ROUNDED, TUFF COATED SURFACES; OCCASIONAL DENSE BLACK METAMORPHIC CLASTS OCCASIONALLY TO 4 MM.; INCREASED PRECIPITATION.

Sample Logging Conditions, other remarks: THANKS FROM EPOCH WELL LOGGING!!!

Comm Gas / Trip Gas / Methane : No Hydrocarbons

CARBIDE LAG min @ ', units, SPM # =

Actual Lag = % Theor OPEN HOLE Lag (pres. % pump eff)

Mud VIS out = , 500 grams Carbide, Minutes Duration

Theoretical Lag minutes @ ' w/SPM # =

Sample Shaker Screen Size: #1=40/60 & #2=40/60 MESH

Latest Screen Size Change on: 8-2-89 (Start of well)

BIT RECORD

NO.	SIZE	MAKE/TYPE	IN @	CUM FTG	CUM HRS	CONDITION
RR4	26"	STC J3S	2132'	436'	30.5	GOOD

Sample Disposition and Transfers:

Date:

Interval: From to

Sent to/Received by:

Report by: BILL GILMOUR

DISTRIBUTION

David N. Anderson
Geothermal Resources Council
P. O. Box 1350
Davis, CA 95617

Roger Anderson
Lamont-Doherty Geological
Observatory
Borehole Research Group
Palisades, NY 10964

John Arestad
Santa Fe Geothermal
2 Galleria Tower
13455 Noel Rd., Suite 1100
Dallas, TX 75240

Don Ash
5376 Sharon Ct.
Santa Rosa, CA 95405

Roy A. Bailey
Geological Survey
345 Middlefield Rd., MS-910
Menlo Park, CA 94025

Bureau of Land Management (3)
Attn: Bob Kohlbush
Pat Gallagher
Hal Stoops
300 Federal Building
800 Truxton Ave
Bakersfield, CA 93301

Jay Cass
California Regional Water
Quality Control Board
15371 Bonanza Rd.
Victorville, CA 92392

Cheryl Closson
California Energy Commission
Development Division
1516-9th St., MS-43
Sacramento, CA 95814

Neal Davis
Chevron Service Co.
Drilling Technology Center
P. O. Box 4450
Houston, TX 77073

Robert Deputy
ARCO Oil & Gas Co.
2300 W. Plano Parkway
Plano, TX 75075

Epoch (3)
Attn: Bill Gilmour
Doug Milham
Mike Campbell
1884 Eastman Ave., #104
Ventura, CA 93003

Michael Ferguson
Bureau of Land Management
787 N. Main, Suite P
Bishop, CA 93514

Charles George
Halliburton Services
Drawer 1431
Duncan, OK 73536-0408

Barry Harding
Ocean Drilling Program
Texas A&M University
1000 Discovery Dr.
College Station, CA 77840

Charlena Harrel
Okie-Yoke
P. O. Box 105
Lindsay, OK 73052

John F. Hermance
Brown University
Dept. of Geol. Sciences
Providence, RI 02912

David P. Hill
U. S. Geological Survey
345 Middlefield Road, MS-977
Menlo Park, CA 94025

Stephen Howard
Ocean Drilling Program
Texas A&M University
1000 Discovery Dr.
College Station, CA 77840

A. P. S. (Tony) Howells
Atlas Wireline Services
P. O. Box 1407
Houston, TX 77251

Wayne Jackson
Jackson Equipment Co.
P. O. Box 669
Middletown, CA 95461

Mike Jarvis
Mammoth Times
P. O. Box 3929
Mammoth Lakes, CA 93546

James W. Langford
Security Division
Dresser Industries, Inc.
P. O. Box 210600
Dallas, TX 75211-0600

Tim Linscott
Santa Fe Geothermal
2 GAlleria Tower
Suite 1100
13455 Noel Rd.
Dallas, TX 75240=-6620

B. J. Livesay
1525 Elon Lane
Encinitas, CA 92024

Loffland (3)
Attn: Gene Anderson
Vern Miller
Duey Milner
P. O. Box 418
Bakersfield, CA 93302

William Lyons
New Mexico Institute of
Mining & Technology
Socorro, NM 87801

Daniel L. Lyster
Mono County Energy Mgmt.
P. O. Box 8060
Mammoth Lakes, CA 93546

M-I Drilling Fluids (4)
Attn: Sid Johnson
George Grundt
Larry Stiner
Boyd Green
3160 Telegraph Rd., Suite 207
Ventura, CA 93003

Doc McMillan
Halliburton
10816 Shellabarger Rd.
Bakersfield, CA 93312

Nic Nickels
Eastman Christensen
3636 Airway Drive
Santa Rosa, CA 95403

J. J. Papike
South Dakota School of Mines
and Technology
501 E. St. Joseph Street
Rapid City, SD 57701-3995

Steve Pye
Unocal Geothermal
P. O. Box 7600
Los Angeles, CA 90017

Ted Reeves
Chaffey High School
1245 N. Euclid Ave.
Ontario, CA 91762

Bill Rintoul
2721 Beech St.
Bakersfield, CA 93301

John Rundle
Earth Science Dept.
L-201, LLNL
Livermore, CA 94550

John H. Sass
Geological Survey
2255 North Gemini Drive
Flagstaff, AZ 86001

L. T. Silver
Division of Geological and
Planetary Sciences
California Institute of Technology
Pasadena, CA 91125

Michael Smith
Geothermal Program Manager
California Energy Commission
Development Division
1516-9th St., MS-43
Sacramento, CA 95814

Michael L. Sorey
Geological Survey
345 Middlefield Rd, MS-439
Menlo Park, CA 94025

Michael A. Storms
Ocean Drilling Program
Texas A&M University
College Station, TX 77843-3469

Gene Suemnicht
Unocal
3576 Unocal Place
Santa Rosa, CA 95406

William T. Taylor
The Town of Mammoth Lakes
P. O. Box 1609
Mammoth Lakes, CA 83546

Robert D. Tibbs
CE Exploration Co.
111 SW Fifth Ave., Ste 2150
Portland, OR 97204

Tonto Drilling Services (2)
Attn: George McLaren
Larry Pisto
P. O. Box 25128
Salt Lake City, UT 84125-0128

U. S. Department of Energy (2)
Geothermal Technologies Div.
Attn: Ted Mock
Gladys Hooper
Forrestal Bldg., CE-324
1000 Independence Ave., SW
Washington, DC 20585

U. S. Department of Energy
Office of Basic Energy Sciences
Attn: George A. Kolstad
Mail Stop J-309
Washington, DC 20585

U. S. Forest Service (3)
Attn: Tom Heller
Dean McAlister
Molly McCartney
Mammoth Lakes, CA 93546

Herbert F. Wang
University of Wisconsin
Lewis G. Weeks Hall
1215 W. Dayton St.
Madison, Wisconsin 53706

Dick Yarter
Northern CA Power Agency
P. O. Box 425
Healdsburg, CA 95448

Tommy Warren
Amoco Production Center
P. O. Box 3385
Tulsa, OK 74102

3141 S. A. Landenberger (5)
3141-1 C. L. Ward
For DOE/OSTI (8)
3151 W. I. Klein (3)
6000 D. L. Hartley
6200 V. L. Dugan
6233 J. C. Eichelberger
6233 V. S. McConnel
6250 P. J. Hommert
6252 J. C. Dunn
6252 J. T. Finger (20)
6252 R. D. Jacobson (10)
6252 G. E. Loeppke
6252 D. A. Glowka
6252 P. C. Lysne
6252 J. Gabaldon
6252 R. P. Wemple
6253 A. R. Sattler
8524 J. R. Wackerly