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TO: Patent Counsel
DOE/NV

Regarding the enclosed Information Product (IP) identified as follows:

DOE/ET/C-08-1592
GEOTHERMAL RESERVOIR ASSESSMENT CASE STUDY
NORTHERN BASIN AND RANGE PROVINCE

FINAL REPORT
AUGUST 1, 1979

Earl G. Hoff
W.R. Benoit
W.L. Desormier

Contract No. ET-78-C-08-1592

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1. The identified IP has been reviewed for "subject inventions", as defined in the contract, and no subject inventions are disclosed therein.

2. There are no subject inventions disclosed in this IP and consequently none have been or will be reported to NV Patent Counsel.

3. Contractor has no objection to the immediate publication of this IP and is aware of no reason why this IP should not be published.

PHILLIPS PETROLEUM COMPANY

Contract No. ET-78-C-1592

By: C.W. Berge

C.W. Berge

Manager, Geothermal Development Branch
Title

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GEOTHERMAL RESERVOIR ASSESSMENT CASE STUDY NORTHERN BASIN AND RANGE PROVINCE

FINAL REPORT

AUGUST 1, 1979

PHILLIPS PETROLEUM COMPANY
GEOTHERMAL OPERATIONS
P.O. BOX 239
SALT LAKE CITY, UTAH 84110

PREPARED FOR
DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
UNDER CONTRACT NO. ET-78-C-08-1592

ABSTRACT

Campbell "E" No. 2 well in the Humboldt House geothermal field in central Pershing County, Nevada was drilled to a depth of 8,061 feet in order to confirm the existence of a commercial reservoir. This well offsets the field discovery well which was drilled in 1977 and completed at a depth of only 1,835 feet.

Desert Peak B-23-1 well was likewise drilled in order to help evaluate a previously discovered geothermal field located in northwestern Churchill County, Nevada. The Desert Peak B-23-1 well was drilled to a depth of 9,641 feet as compared to the deepest of three earlier wells drilled to 7,662 feet.

This report describes the drilling and completion of both these wells including the daily drilling reports, drill bit records, descriptions of the casing and cementing programs, drilling fluid descriptions including methods of combating lost circulation, wellhead equipment descriptions and logging programs.

CONTENTS

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

Bbl.	barrel (42 gallons)
BHC	bore hole compensated
BOP	blow out preventer
BT&C	buttress threaded and coupled
CDL	compensated density log
Chl.	chlorides
circ.	circulate
Cmt.	cement
CN	compensated neutron log
compl.	completed
csg.	casing
cu. ft.	cubic feet
DC	drill collar
deg.	degrees
displ.	displace
DDNLL	dual detector neutron lifetime log
DP	drill pipe
drlg.	drilling
EUE	external upset end
°F	degrees Farenheit
FC	filter cake
GL	ground level
GR	gamma ray
hr.	hour
IEL	induction electric log
jts.	joints
KB	Kelly bushing
LASL	Los Alamos Scientific Laboratory
LCM	lost circulation material
LT&C	long threaded and coupled
max.	maximum
MI	move in
min.	minute
ml.	milliliter
MOR	move out rotary rig
MR	maximum reading
OD	outside diameter
POOH	pull out of hole
PPCo.	Phillips Petroleum Co.
ppm	parts per million
prep.	prepare
psi	pounds per square inch
psig	pounds per square inch guage
PV	plastic viscosity
RKB	Kelly bushing
rmd.	reamed
rpm	revolutions per minute
RUR	rig up rotary equipment
sec.	second
sd	sand
sx.	sacks
TD	total depth
temp.	temperature
thds.	threads
TV	true vertical depth
vis	viscosity
WL	water loss (mud filtrate)
WOC	waiting on cement (to set)
YP	yield point

1. INTRODUCTION

This report describes as Phase I and Phase II, the drilling of two deep geothermal confirmation wells in the Humboldt House and Desert Peak fields located in northwest Nevada in the Northern Basin and Range Province. In response to a Request for Proposal No. Et-78-R-08-0003, Geothermal Reservoir Assessment Case Study, Northern Basin and Range Province, Phillips submitted a proposal dated May 30, 1978. Phillips' proposal involved two phases; each representing the drilling of one geothermal well. Phase I was the drilling of a 8,000 ft. well, Campbell "E" No. 2, NE SW Sec. 15, T-31-N, R-33-E, MDM, Pershing County, Nevada. Phase II was the drilling of a 10,000 ft. well, Desert Peak "B" 23-1, SW SW NW, Sec. 23, T-22-N, R-27-E, MDM, Churchill County, Nevada.

The Campbell "E" No. 2 well is located approximately 7,500 feet north-northeast of the Campbell "E" No. 1 well which was completed in December, 1977 as a productive geothermal well. The No. 2 well was proposed as a means to help define limits of the reservoir, to see if the observed temperature gradient in the first well would continue to a greater depth, and to assist in determining commercial potential of the field.

Desert Peak B-23-1 was proposed for similar reasons and is the deepest of four wells drilled in that geothermal field. Although well B-23-1 would not sustain flow on a test while the drilling rig was on the hole, a future attempt will be made to flow the well. It is a potential candidate well for doing field evaluation work on down-hole pumping systems. A static fluid level measurement taken on August 22, 1979 indicated fluid to be at 495 feet below ground level.

Copies of all well logs were transmitted to the University of Utah Research Institute and DOE Nevada Operations Office on August 3, 1979 and copies of all "prior data" on the two geothermal fields required under the contract were sent to the same offices on August 28, 1979, see Appendix D. Tables 3 and 4 give a complete list of all logs for both wells.

2. PHASE I, HUMBOLDT HOUSE CAMPBELL "E" NO. 2 WELL

2.1 GEOLOGY

The Humboldt House geothermal prospect is located in Pershing County, Nevada along highway I-80 about halfway between Lovelock and Winnemucca (Figure 1). The prospect is mostly within the Humboldt River Valley graben which is situated between horst blocks of the Humboldt Range on the east, the Eugene Mountains on the north, the Antelope Range on the west and the Trinity Mountains on the southwest.

The dominant structures of the area are the normal faults which resulted in the uplift of the Humboldt Range. Within the geothermal prospect the trend of these faults changes from north-south to northeast-southwest. A second, and possibly significant, fault in the area is the Humboldt City thrust. This fault is well exposed in the Humboldt Range where intensely deformed Middle and Upper Triassic carbonate and clastic rocks are thrust over Lower and Middle Triassic carbonate rocks.

The geothermal area is located east of Rye Patch Reservoir and appears to extend into the eastern portion of the Humboldt Range (Figure 2). The eastern portion of the Humboldt House geothermal prospect is covered by the geologic map of the Imlay Quadrangle (GQ-666). Although a geologic quadrangle map of the Rye Patch area to the west is not available, the surface geology consists of Quaternary alluvial fan and lacustrine sediments. These quaternary sediments and the underlying Tertiary lacustrine deposits fill a basin several thousand feet deep. The finer lacustrine sediments are concentrated near the center of the valley and interfinger with the coarser debris found along the basin margins.

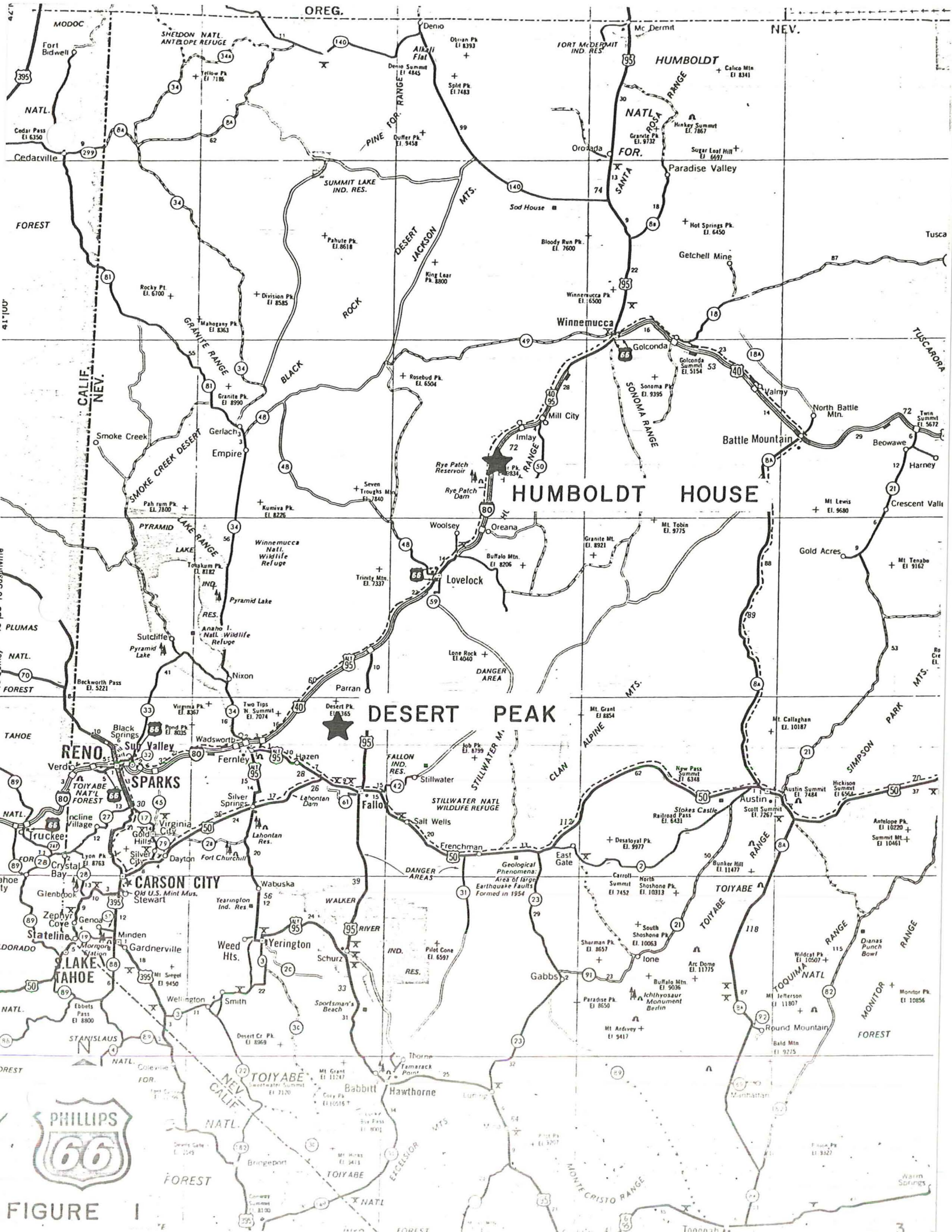

HUMBOLDT HOUSE
DESERT PEAK
OREG.
NEV.
CALIF.
NEV.
RENO
SPARKS
CARSON CITY
LAKE TAHOE
Reno
Sparks
Carson City
Lake Tahoe
Fallon
Lovelock
Winnemucca
Battle Mountain
Austin
Eureka
Fernley
Yerington
Hawthorne
Gabbs
Ione
Round Mountain
Tonopah
Gerlach
Empire
Nixon
Parran
Woolsey
Oreana
Mill City
Golconda
Valmy
Paradise Valley
Orovada
McDermit
Denio
Cedarville
Fort Bidwell
Alkali Flat
Denio Summit El. 4845
Obrien Pk El. 8393
Split Pk El. 7483
Duffer Pk El. 9458
Yellow Pk El. 7186
Sheldon Natl. Antelope Refuge
Fort McDermit Ind. Res
Calico Mtn El. 8341
Hinkey Summit El. 7867
Granite Pk El. 9732
Sugar Loaf Hill El. 6697
Pine Forest Range
Santa Rosa Range
Natl. For.
Summit Lake Ind. Res.
Sod House
Pahute Pk El. 8618
Bloody Run Pk El. 7600
Hot Springs Pk El. 6450
Getchell Mine
Tuscarora
Jackson Mts.
Desert
Rock
Black
Granite Range
Rocky Pt El. 6700
Division Pk El. 8585
Mahogany Pk El. 8363
Granite Pk El. 8990
King Lear Pk. 8800
Winnemucca Pk El. 6500
Rosebud Pk El. 6504
Sonoma Pk El. 9395
Sonoma Range
Golconda Summit El. 5154
Twin Summit El. 5672
North Battle Mtn.
Beowawe
Harney
Crescent Valley
Mt. Lewis El. 9680
Mt. Tobin El. 9775
Granite Mt. El. 8921
Gold Acres
Mt. Tenabo El. 9162
Smoke Creek
Smoke Creek Desert
Pah rum Pk El. 7800
Kumiva Pk El. 8226
Pyramid Lake
Lake Range
Winnemucca Natl. Wildlife Refuge
Toiyabe Pk El. 8182
Pyramid Lake Ind. Res.
Anaho I. Natl. Wildlife Refuge
Sutcliffe
Beckworth Pass El. 5221
Seven Troughs Mtn El. 7840
Rye Patch Reservoir
Rye Patch Dam
Imlay
Trinity Mtn. El. 7337
Buffalo Mtn. El. 8206
Lone Rock El. 4040
Danger Area
Plumas Natl. Forest
Tahoe Natl. Forest
Virginia Pk El. 8367
Two Tips N. Summit El. 7074
Desert Pk El. 6365
Job Pk El. 8799
Stillwater Mts.
Fallon Ind. Res.
Stillwater
Stillwater Natl Wildlife Refuge
Salt Wells
Frenchman
Lahontan Dam
Lahontan Res.
Fort Churchill
Silver Springs
Wadsworth
Fernley
Hazen
Black Springs
Sun Valley
Verdi
Truckee
Incline Village
Crystal Bay
Virginia City
Gold Hills
Silver City
Dayton
Carson City
Old U.S. Mint Mus.
Stewart
Wabuska
Yerington Ind. Res
Walker River
Weed Hts.
Schurz
Pilot Cone El. 6597
Minden
Gardnerville
Genoa
Zephyr Cove
Glenbrook
Stateline
Mormon Station
Mt. Siegel El. 9450
Ebbetts Pass El. 8800
Wellington
Smith
Sportsman's Beach
Desert Cr. Pk El. 8969
Stanislaus Natl. Forest
Toiyabe Natl. Forest
Mt. Grant El. 11239
Thorne
Tamarack Point
Babbitt
Bridgeport
Mt. Hicks El. 9413
Excelsior Mts.
Monte Cristo Range
Mt. Grant El. 8854
Mt. Callaghan El. 10187
Simpson Park Mts.
New Pass Summit El. 6348
Austin Summit El. 7484
Hickison Summit El. 6562
Stokes Castle Railroad Pass El. 6431
Scott Summit El. 7267
Antelope Pk El. 10220
Summit Mt. El. 10461
Desatoyal Pk El. 9977
Bunker Hill El. 11477
Carroll Summit El. 7452
North Shoshone Pk El. 10313
South Shoshone Pk El. 10063
Sherman Pk El. 8657
Arc Dome El. 11775
Buffalo Mtn. El. 9036
Ichthyosaur Monument Berlin
Paradise Pk El. 8650
Mt. Ardivey El. 9417
Toiyabe Range
Toquima Natl. Forest
Wildcat Pk El. 10507
Mt. Jefferson El. 11807
Dianas Punch Bowl
Monitor Range
Monitor Pk El. 10856
Bald Mtn El. 9275
Manhattan
Alpine
Clan
Geological Phenomena: Area of large Earthquake Faults Formed in 1954
Danger Areas
Phillips 66

FIGURE 1

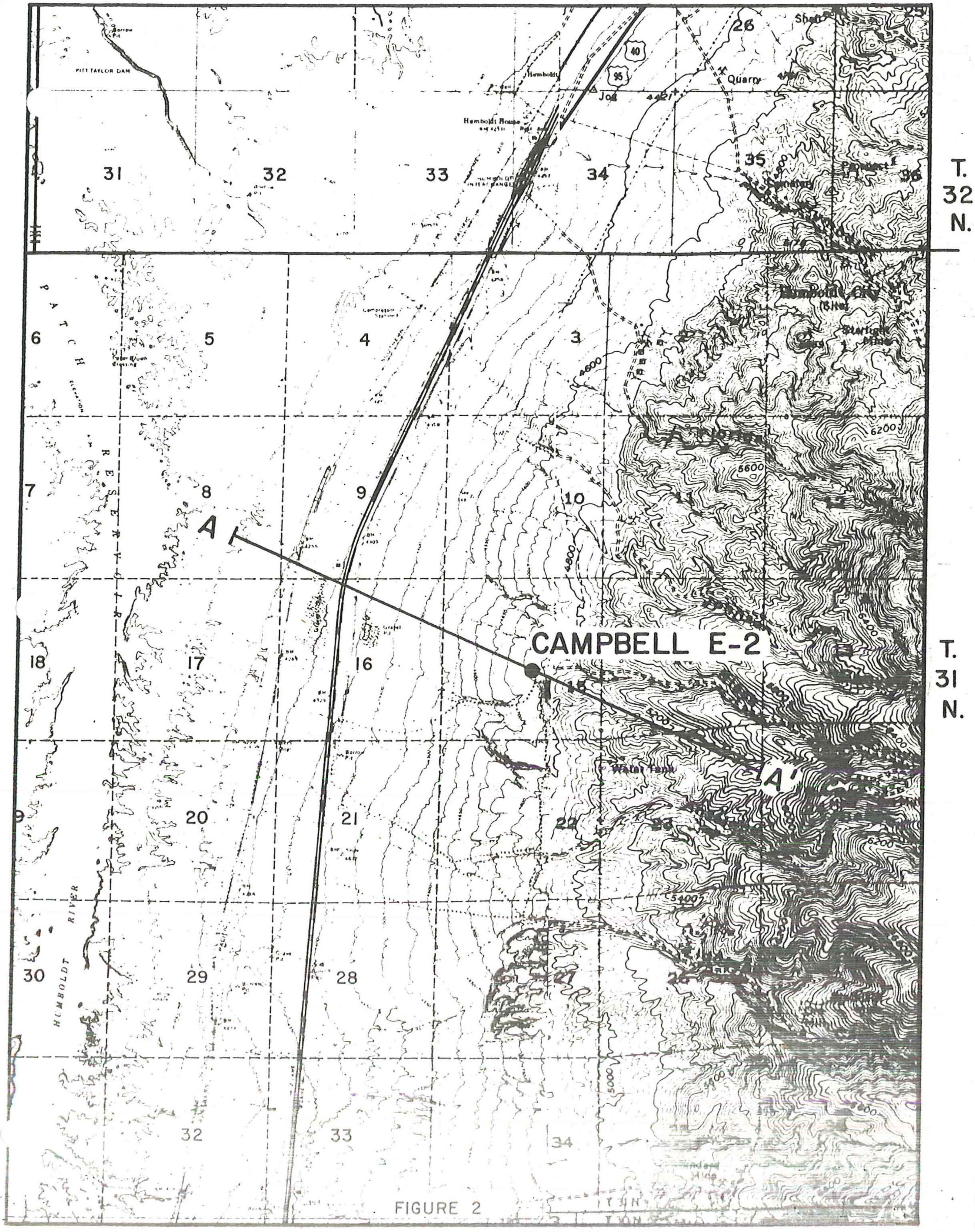
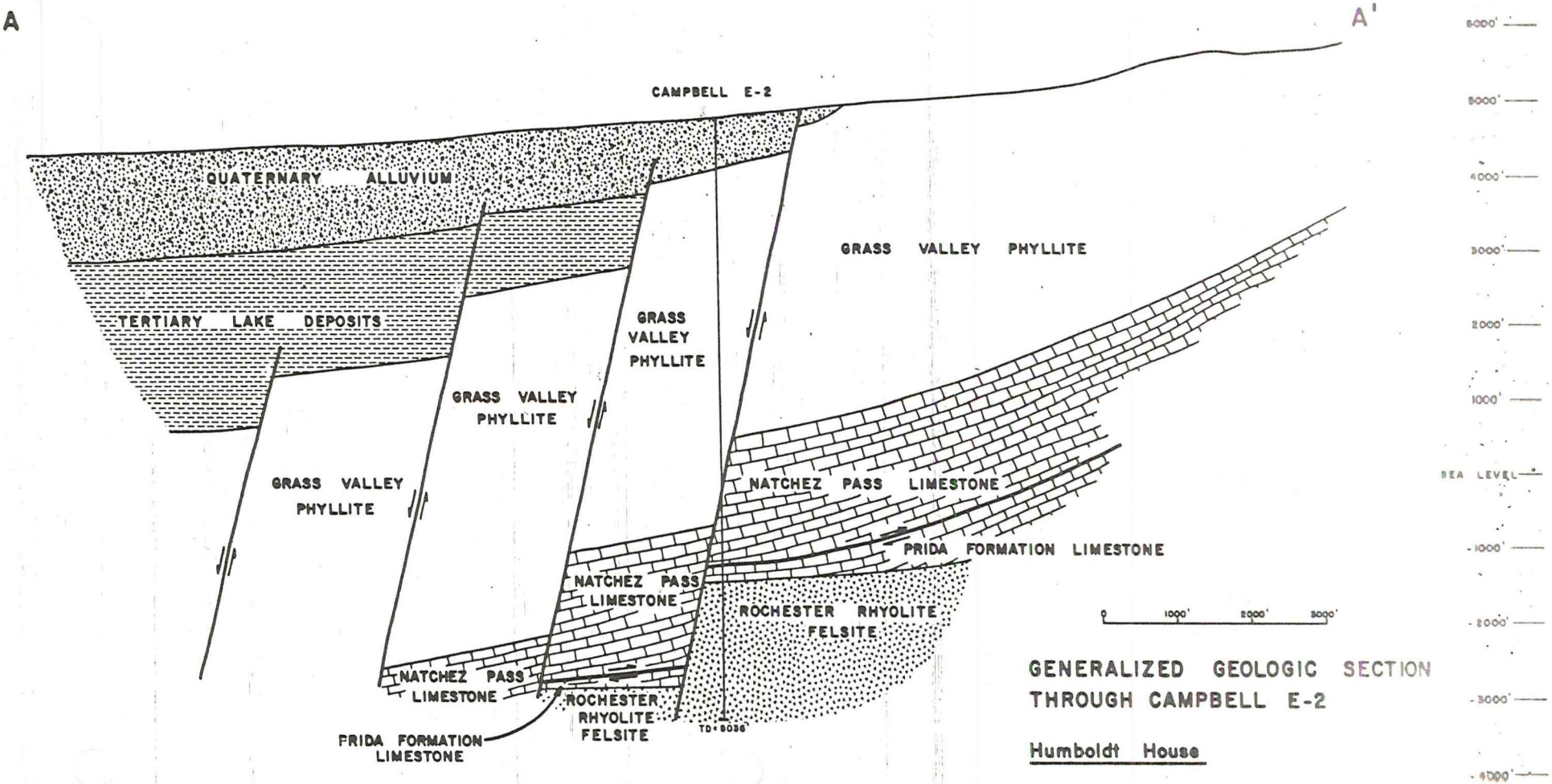


FIGURE 2

R. 33 E.



GENERALIZED GEOLOGIC SECTION THROUGH CAMPBELL E-2

Humboldt House

FIGURE 3

Bedrock underlying the eastern part of this basin is the same as that exposed and mapped in the Humboldt Range (Figure 3). The geologic sequence in the Campbell E-2 well is Quaternary alluvium, Upper Triassic Grass Valley Formation, fault zone, Upper and Middle Triassic Natchez Pass Formation, fault zone, Middle and Lower Triassic Prida Formation and Permian rhyolite felsite.

The Campbell E-2 well was completed in March 1979 to a total depth of 8036 feet below ground level. A lithologic log (Figure 4) was constructed for this well. As the lithologic log indicates the upper 720 feet of the well is Quaternary alluvium which consists mainly of boulders, finer gravel, sand and silt. This alluvium overlies the Upper Triassic Grass Valley Formation.

As can be seen on the lithologic log, rocks of the Grass Valley Formation occur in the 720-5225 foot interval and consist mainly of phyllite with some sandstone lenses, some slate, and some schist. The upper 170 feet of this unit is weathered and hydrothermally altered. The 4900-5225 foot interval commonly has thin quartz and calcite veins which fill fractures and faults. The faults are thought to occur in this interval since there was a substantial increase in drill rate and since the drill string was stuck in a fracture at the depth of 5090 feet below ground level. This 4900-5225 foot interval represents the range-front fault or the main Basin and Range fault.

Rocks of the Middle to Upper Triassic Natchez Pass Formation occur in the 5225-6055 foot interval (Figure 4). This unit consists mainly of limestone with minor dolomite and an interval that is dominantly calcareous argillite. The argillite occurs in the 5510-5740 foot interval.

The 5950-6055 foot interval is fractured and represents the thrust fault zone that is seen in the Humboldt Range. The evidence for this interpretation is that within this zone calcite as fracture filling is common, there was a substantial decrease in the resistivity of the drilling fluid, there were substantial increases in the silica content (Appendix E) and the salinity of the drilling fluid, and there was a substantial increase in the drilling rate.

Below the thrust zone, in the 6055-6250 foot interval, are limestones and dolomites which are similar to the limestones and dolomites of the Natchez Pass Formation. However, this unit is placed within the Lower and Middle Triassic Prida Formation since it is in fault contact with the overlying unit and appears to lie conformably on Permian Rhyolite felsite as the Lower Prida Formation does.

The rhyolite felsite occurs in the 6250-8036 foot interval. Within the rhyolite there are two diabase dikes. They occur in the 7160-7230 and 7960-7970 foot intervals.

2.2 DRILLING SUMMARY

The road and locations were constructed and 30" diameter conducter casing was set 18 feet below ground level and cemented to the surface with 5 1/2 cubic yards of ready-mix cement. Peter Bawden Drilling Company, Inc. moved in Rig No. 11 and rigged up (Table 1 shows a description of rig and equipment). A 17 1/2" diameter hole was commenced at 8:30 PM, January 5, 1979. Appendix A contains a complete daily drilling report for the well.

Difficult drilling was encountered immediately in the form of loss of mud returns in drilling loose boulders. After reaching 215', the hole was reamed to 26" diameter to 177 feet without returns. Four joints, 160 feet, of 20", 94#/ft. X-52 casing with Vetco threads was set at 165' KB and cemented with 400 sacks of Class G cement with no returns to the surface. After waiting 4 hours, 300 sacks of the same type cement were placed around the casing from the top. See Figure 5 and Section 2.3 of this report for details of the casing and cementing programs.

Drilling of a 17 1/2", 14 3/4" and 12 1/4" diameter hole continued to 1930' KB with a maximum hole deviation of 3°. Mud temperatures into the drill pipe and out of the mud discharge line were measured. At 1930' of depth the following logs were run: Gamma Ray-Sonic, Dual Induction-Laterolog and a directional survey. Table 2 lists all logs run in this well. The hole was reamed to 17 1/2" diameter and 33 joints of 13 3/8" diameter, 54-5#/ft., K-55, Buttress thread casing was run and set at 1414' KB with 2000 cubic feet of Class G cement.

TABLE 1

DRILLING RIG AND EQUIPMENT

Rig No. 11 owned by Peter Bawden Drilling, Inc. of Garden Grove, California was used in drilling both wells covered in this contract. Description of drilling equipment is as follows:

DRAWWORKS - Continental - Emsco A-800

ENGINES - Three, D-398 Caterpillar driven GE752 generators

MUD PUMPS - Emsco F-800 Triplex driven by GE7542 motor

DERRICK - Continental - Emsco AB133', 620,000# load capacity

SUBSTRUCTURE - 37' 6" long, 28' wide, 21' high

DRILL PIPE - 4 1/2" Grade E, Range 2

DRILL COLLARS - 18 - 8", 21 - 6"

BLOW-OUT PREVENTERS - 12" - 3,000 psi Shaffer double gate BOP;

12" - 3,000 psi Hydril Model GK BOP, Shaffer rotating head

DESILTER - 12 cone SWECO

As drilling of the hole progressed below 1930', hole deviation increased rather rapidly:

Depth (ft.)	Deviation
2,190	3 1/2°
2,617	4 3/4°
2,866	7°
3,034	10°
3,440	11°
3,870	14°
5,537	19°

Figure 6 is a plan view of the horizontal displacement of the hole in feet versus hole depth in feet and Appendix B is a tabulation of the deviation survey data.

At a depth of 3491' while drilling, the top box on the lower stabilizer broke, leaving one stabilizer, one drill collar, 6-point reamer and the bit in the hole. The fish was recovered using an overshot and bumper sub. Drilling progressed to a depth of 3501' at which time another twist-off occurred. This time six drill collars were left in the hole. After the fish was recovered, all drill collars and stabilizers were magnafluxed and nine drill collars and four stabilizers were found to be defective.

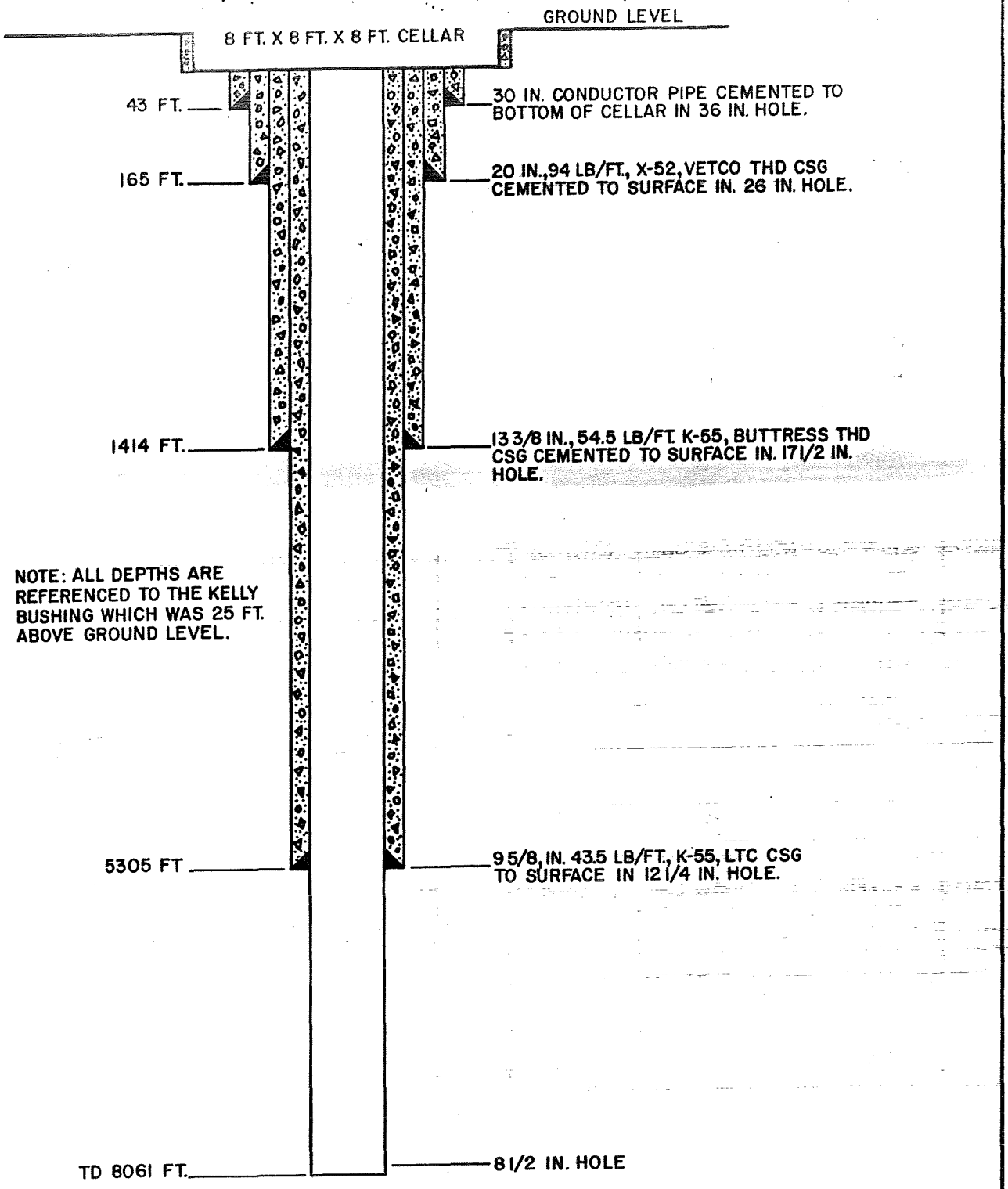
Rather slow drilling continued in slate and phylite to a depth of 5270'. Then at 5537' in limestone and dolomite, the following logs were run: Compensated Density-Neutron, Sonic & Directional Logs. A dipmeter log was attempted but the tool failed. 130 joints of 9 5/8" 40 and 43.5, K-55

casing were run and cemented at 5305' KB in two stages with 3720 cubic feet of cement with good cement returns at the surface.

Drilling commenced below the 9 5/8" casing shoe with water and an 8 1/2" diameter bit. Moderate water loss was experienced from 6842' to the final total depth of the well at 8061'. Figure 7 shows drilling time vs. depth for this well. At TD a Dual Induction Log and a Temperature Log were run: maximum temperature was 366°F after 22 minutes. The well was blown down with air through the drill pipe at 2295', 3215', 3943', 4687' and 5239' but only a small amount of water was recovered. Appendix C contains a detailed record of bits used in drilling this well. Formation fluid samples along with a complete set of cuttings were sent to the University of Utah Geothermal Sample Library (See Appendix D).

259 joints of 2 7/8" EUE tubing were run in the well and set a 7950' KB; then filled with water. The drilling rig was released at 10:00 AM, March 11, 1979. The well is not to be plugged at the present time, but will be held as a temperature observation hole.

On April 30, 1979, a temperature log was run which showed a maximum temperature of 380.5°F at 8055'.



CAMPBELL "E" NO. 2, HUMBOLDT HOUSE
SUBSURFACE WELL PROFILE

FIGURE 5

TABLE OF LOGS
CAMPBELL "E" NO. 2

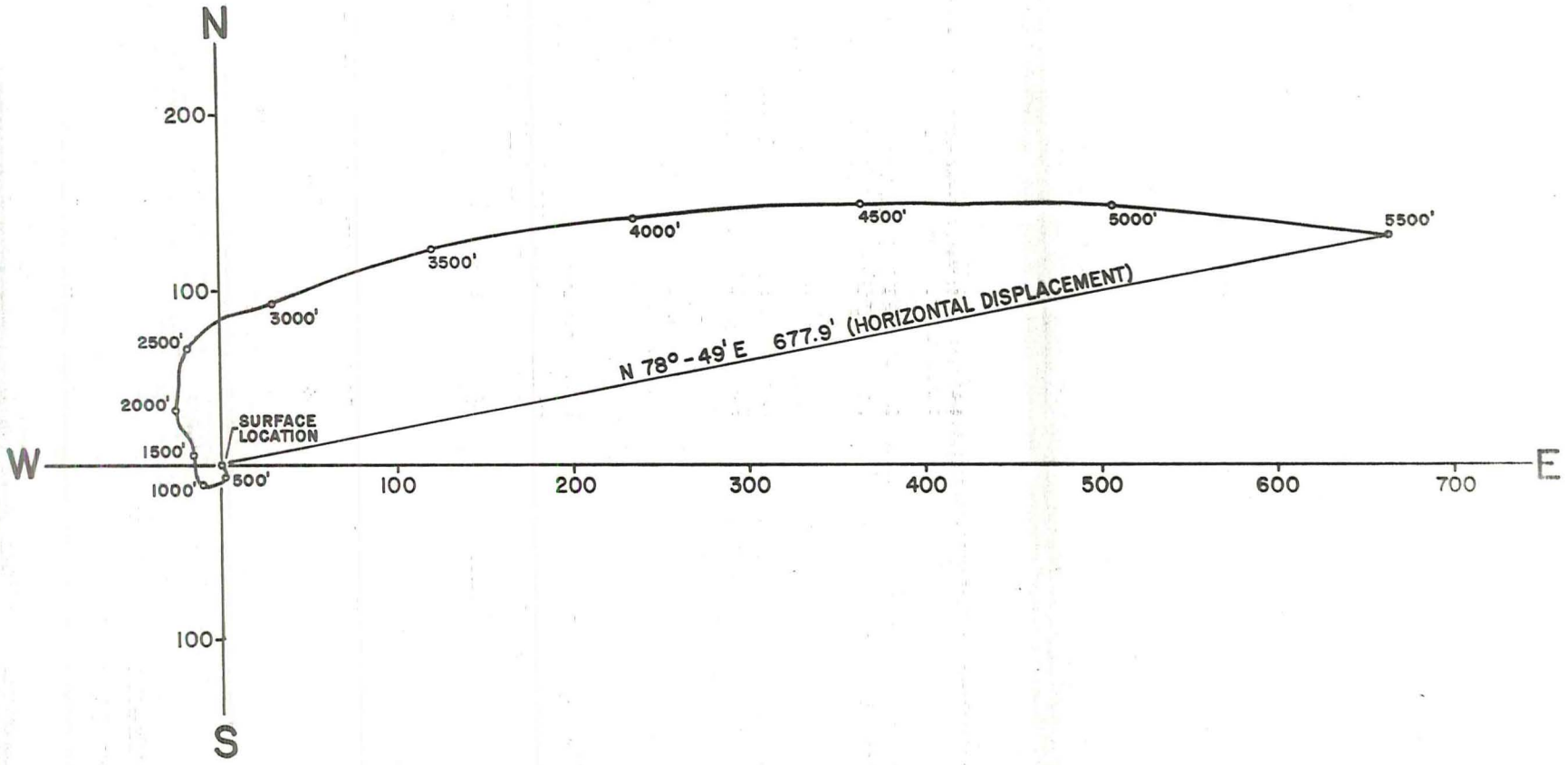
DATE	COMPANY	TYPE OF LOG	INTERVAL LOGGED-FT
1-5 to 3-5-79	ENERGY WELL LOGGING SERVICE	ENERGY LOG	45-8061
1-19-79	GO WIRELINE SERVICES	B.H.C. SONIC	165 - 1919
1-19-79 (1)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG	165 - 1927
1-19-79 (2)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG WITH LINEAR CORRELATION LOG	165 - 1927
2-16-79	GO WIRELINE SERVICES	COMP. DENSITY NEUTRON	1559 - 5530 (a)
2-16-79 (1)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG	1559 - 5530
2-16-79 (2)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG WITH LINEAR CORRELATION LOG	1559 - 5530
2-17-79	GO WIRELINE SERVICES	B.H.C. SONIC	1414 - 5514 (a)
3-6-79 (1)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG	5303 - 8060
3-6-79 (2)	GO WIRELINE SERVICES	DUAL INDUCTION-LATEROLOG WITH LINEAR CORRELATION LOG	5303 - 8060
3-7-79	AGNEW AND SWEET	TEMPERATURE	100 - 8061
4-30-79	AGNEW AND SWEET	TEMPERATURE	100 - 8055

(1) Combined as a single log

(2) Combined as a single log

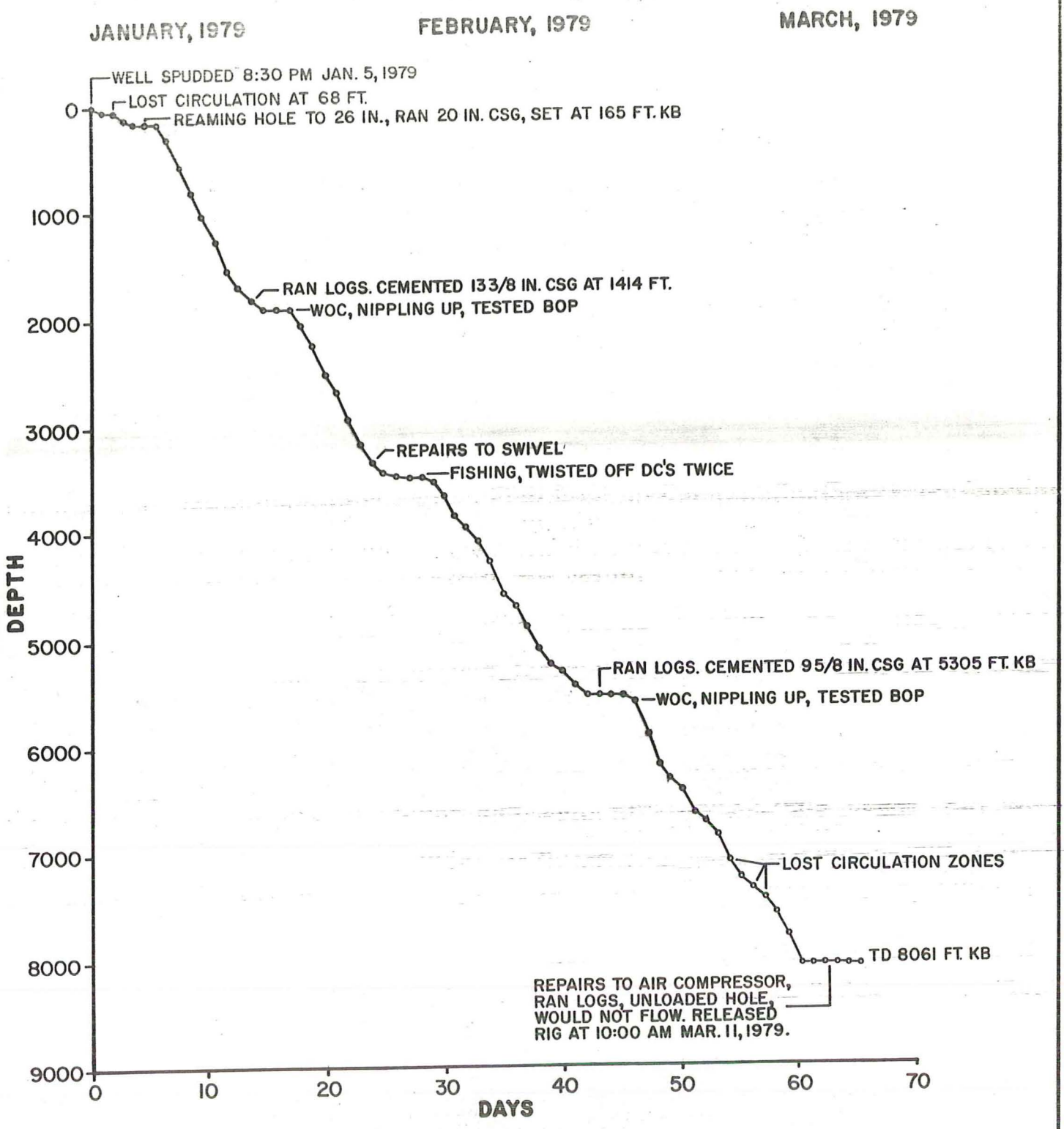
(a) Individual logs were made for 2"=100' and 5"=100' scales.

TABLE 2



CAMPBELL "E" NO. 2 HUMBOLDT HOUSE
HORIZONTAL DISPLACEMENT OF HOLE IN FEET VERSUS DEPTH IN FEET

FIGURE 6



CAMPBELL "E" NO. 2 HUMBOLDT HOUSE
DRILLING TIME VERSUS WELL DEPTH

FIGURE 7

2.3 CASING AND CEMENTING PROCEDURES

Figure 5 is a schematic cross-section of the casing program of this well.

Prior to moving in the drilling rig, 30" diameter conducter pipe was set 18 feet below ground level and cemented to the surface with 5 1/2 yards of commercial redimix cement.

After drilling through loose boulders and conglomerates with severe lost circulation problems, a string of 4 joints of 20", 94#/ft., X-52 casing with Vetco threads was set a 165' KB in a 26" diameter hole. Casing was cemented with 400 sacks Class G cement with 3% $CaCl_2$ with no returns. After waiting four hours, 200 sacks of Class G cement with 3% $CaCl_2$ was pumped in the annulus from the surface through 1" tubing resulting in good cement at the top of the casing.

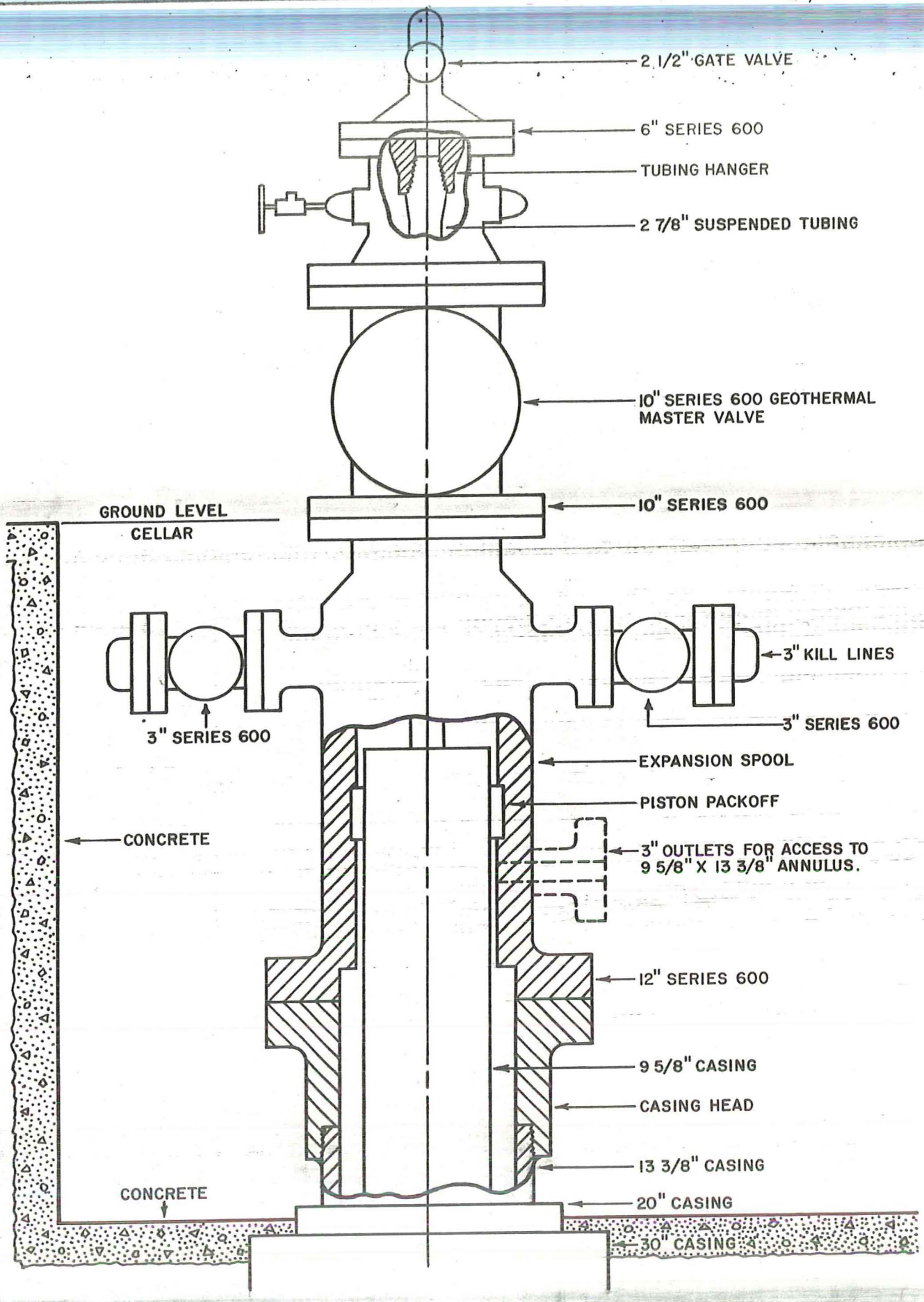
13 3/8", 54.5#/ft., K-55, Buttress thread casing (33 joints) was set at 1,414' KB in a 17 1/2" diameter hole. Casing was cemented with 2,000 cubic feet Class G cement with 1:1 Perlite, 40% silica flour, 2% gel, 3/4% D-31 (wt. 13.3#/gal.). Last 700 cubic feet of cement contained 3% $CaCl_2$.

27 joints of 9 5/8", 43.5#/ft., LT&C, K-55 and 103 joints of 9 5/8", 40 #/ft., K-55 Buttress thread casing was run and set at 5,305' KB with a stage collar at 4,213' KB. First (bottom) stage consisted of 750 cubic feet of Class G cement with 1:1 Perlite, 40% silica flour, 2% gel, 3/4% D-31, 0.5% R-11 and 0.1% R-6 with good returns. The second stage was cemented with 2,970 cubic feet of the same mixture. Good cement returns were observed at the surface.

2.4 WELLHEAD EQUIPMENT

Figure 8 illustrates the wellhead equipment installed on the Campbell "E" No. 2 well. It is a typical geothermal hookup provided by WKM Wellhead Systems and consists of a lower casing head attached to the 13 3/8" casing and supporting the 9 5/8" casing string, and an expansion spool which will allow for elongation of the 9 5/8" casing string as it heats during flow. This spool also provides kill lines for pumping into the 9 5/8" casing and also access ports for the 13 3/8" x 9 5/8" casing annulus.

A 10" series 600 WKM Pow-R-Seal gate valve serves as a master valve for the 9 5/8" casing. The tubing head provides a means to suspend a string of 2 7/8" EUE tubing which was installed to let the well serve as a temperature observation hole. If the well is ever produced, the 2 7/8" tubing and the tubing head will be removed.



CAMPBELL "E" NO. 2
WELLHEAD EQUIPMENT

FIGURE 8

2.5 DRILLING FLUIDS

A fresh water base gel mud was used to drill the hole for surface casing. Sawdust, cottonseed hulls, Kwikseal, cello flake, and paper were used in trying to maintain circulation at shallow depths (67 ft. - 117 ft.) Most of the 26" diameter hole to 215' KB was drilled with partial or no mud returns.

After drilling through the 20" casing shoe at 176 ft., mud properties were maintained at: 9.0 #/gal., viscosity 45 sec./qt., pH 9.5, filtrate 15 ml/30 min. Solids content was somewhat difficult to control as the desilter at times did not operate properly.

13 3/8" casing was set at 1,414' KB and mud characteristics remained reasonably constant with weight approaching 10 #/gal. and mud filtrate being reduced to 10-12 ml./30 min. Zones of mud loss were in the interval 4,800'-5,000' and spotty loss of returns occurred down to 5,537' KB.

9 5/8" casing was set at 5,305' KB and the balance of the hole was drilled with water with some caustic added to keep pH up to 9.5. Continual water loss was experienced from 6,800' to TD 8,061', sometimes getting as high as 30-40 barrels per hour. No heat exchanger was used in the mud system and cooling was obtained by circulating through the reserve pit. Highest mud temperatures while drilling near total depth was 151°F in and 160°F out.

Appendix E shows a chemical analyses of drilling fluids from samples taken throughout the drilling operations.

3. PHASE II. DESERT PEAK B-23-1 WELL

3.1 GEOLOGY

The general geology encountered in B-23-1 is shown on Figure 9. This lithologic log is generally based on cuttings recovered from the borehole. In general the cuttings recovered from the shaker table above depths of 4000 feet appear to be of fair to good quality in that lithologic changes show up quickly and distinctly. Below 4000 feet the quality of the cuttings ranges from poor to fair. There are several reasons for the generally poor quality. First, the well was drilled with essentially pure water. Therefore, much mixing of cuttings occurred during transport to the surface. Below 4000 feet it generally took 40 or more feet of drilling before the cuttings became homogeneous after crossing a lithologic contact. It was not possible to accurately pick lithologic contacts from the cuttings. Other compounding problems were reduced pumping capacity above a depth of 5300 feet due to a faulty mud pump, drilling with aerated water below 9370 feet and significant lost circulation problems below 8300 feet. Often the drilling water was circulated through the reserve pit where some previous cuttings were apparently picked up and recycled down the hole. No cuttings were recovered in the intervals 8950-8990, 9180-9260, and 9560-9641.

In spite of the often poor quality of the cuttings an acceptable litholog has been constructed with the assistance of the electric and gamma logs. No attempt was made to construct a highly detailed log based on thin section and x-ray studies. In general the chemical names of the rocks such as dacite, basalt, and granite are based on the gamma log.

The top 40 feet of the hole consists of sand, gravel and boulders. From 40 to 225 feet lacustrine sediments of the Pliocene Truckee Formation are present. This sequence is well exposed in the hills about one half mile south and east of B-23-1.

Between 225 and 1325 feet basalt, basaltic andesite, and andesite of the Chloropagus Formation are present. These rocks are primarily lava flows and breccias. Three lacustrine units are present between 380-400 feet, 495-570 feet, and 590-650 feet. These units are composed of white to green to brown fine-grained tuffaceous sediments which have been locally silicified. Pyrite was first observed at a depth of 340-350 feet. Below this depth pyrite is present throughout most of the hole in varying quantities. The top part of the Chloropagus Formation is well exposed lying beneath the Truckee Formation in the hills about one half mile south and east of B-23-1. This formation underlies much of the northern half of the Hot Springs Mountains, however, exposures are generally small, discontinuous, and appear homogeneous. No extensive marker horizons are known to exist in the Chloropagus Formation.

From 1325 to 4225 feet a series of andesitic to rhyolitic ash-flow tuffs and lava flows are present. These rocks were formerly part of the Hartford Hill rhyolites, a name which has recently been discontinued. These rocks are most probably Miocene in age. In Figure 9 seven major subunits have been defined. The gamma log suggests that several of these subunits can be further divided. The entire unit is generally dacitic in composition with lesser amounts of rhyodacite, rhyolite and andesite. Two thin basalt units were penetrated. It is believed that these are dikes which fed the Chloropagus flows. With additional thin-section work it may be possible to correlate some of these units with previously described ash flows in western Nevada. These rocks are exposed from one half to one and one half miles north and northwest of B-23-1. However, the exposures are small and only a small part of the section appears to be exposed on the surface.

From 4225 to 5640 feet regionally metamorphosed Mesozoic sedimentary rocks are present. Phyllite is the dominant lithology present. The phyllite is highly conductive and shows up clearly on the electrical logs. Interbedded

with the phyllite are layers or lenses of impure quantzite, argillite, chlorite schist, and possibly some metavolcanic rocks. These rocks are not exposed at the surface in the Hot Springs Mountains. However, the pelitic nature of the section suggests that this could be part of the Auld Lang Syne group.

From 5640 to 7270 feet the section consists of roughly equal amounts of granite and chlorite schist and hornfels. Near a depth of 6000 feet chips of biotite schist are common in the cuttings. The contacts between the granite and chlorite schist and hornfels is clearly shown on the gamma log. It appears that the granite contact is somewhat gradational. The first few granitic layers are probably dikes extending out into the Mesozoic sequence. The last few layers of chloritic schist and hornfels are probably roof pendants and/or large zenoliths and inclusions within the granite. The chlorite schist and hornfels series is part of a contact metamorphic aureole associated with the margins of the granite and were originally part of the Mesozoic sequence. In the Hot Springs Mountains no schist or hornfels is exposed, however, the Churchill County geologic map shows similar rocks to be present in the nearby Truckee and Trinity Ranges.

Below a depth of 7270 feet granite is the dominant lithology present. Above a depth of 8170 feet the granite appears to be fairly fresh. The biotite has been altered to chlorite and some of the feldspar has been partially altered. The granite is rich in quartz and poor in mafic minerals. No hornblende is present. A 32-gram chip of granite was recovered from a stuck drill bit at a depth of 8020 feet. This chip was examined by Terra Tek Inc. and the following measurements were made: effective porosity by nitrogen gas method 3.34%, grain density 2.63 g/cc, bulk density 2.56 g/cc. Nevada Bureau of Mines determined bulk density to be 2.65 g/cc.

Between a depth of 8170 and 9641 feet the rocks appear to consist of a mixture of relatively fresh granite, fault gouge, minor chloritic schist, and possibly some iron-stained granite. Many samples have a significant amount of

brown to orange iron staining. However, many of these samples contain abundant metal shavings from the casing, bit, or drill string. It is possible that some or all of the iron stain is a result of the metal shavings. The fault gouge is a highly sheared, soft, waxy-looking clay ranging in color from blue green to brown. Below a depth of 9120 feet fault gouge appears to be decreasing in abundance. No granite crops out in the Hot Springs Mountains. However, granite is common in the nearby ranges. These granite intrusives are generally believed to be Cretaceous in age and therefore, it is believed that the granite in B-23-1 is probably Cretaceous in age.

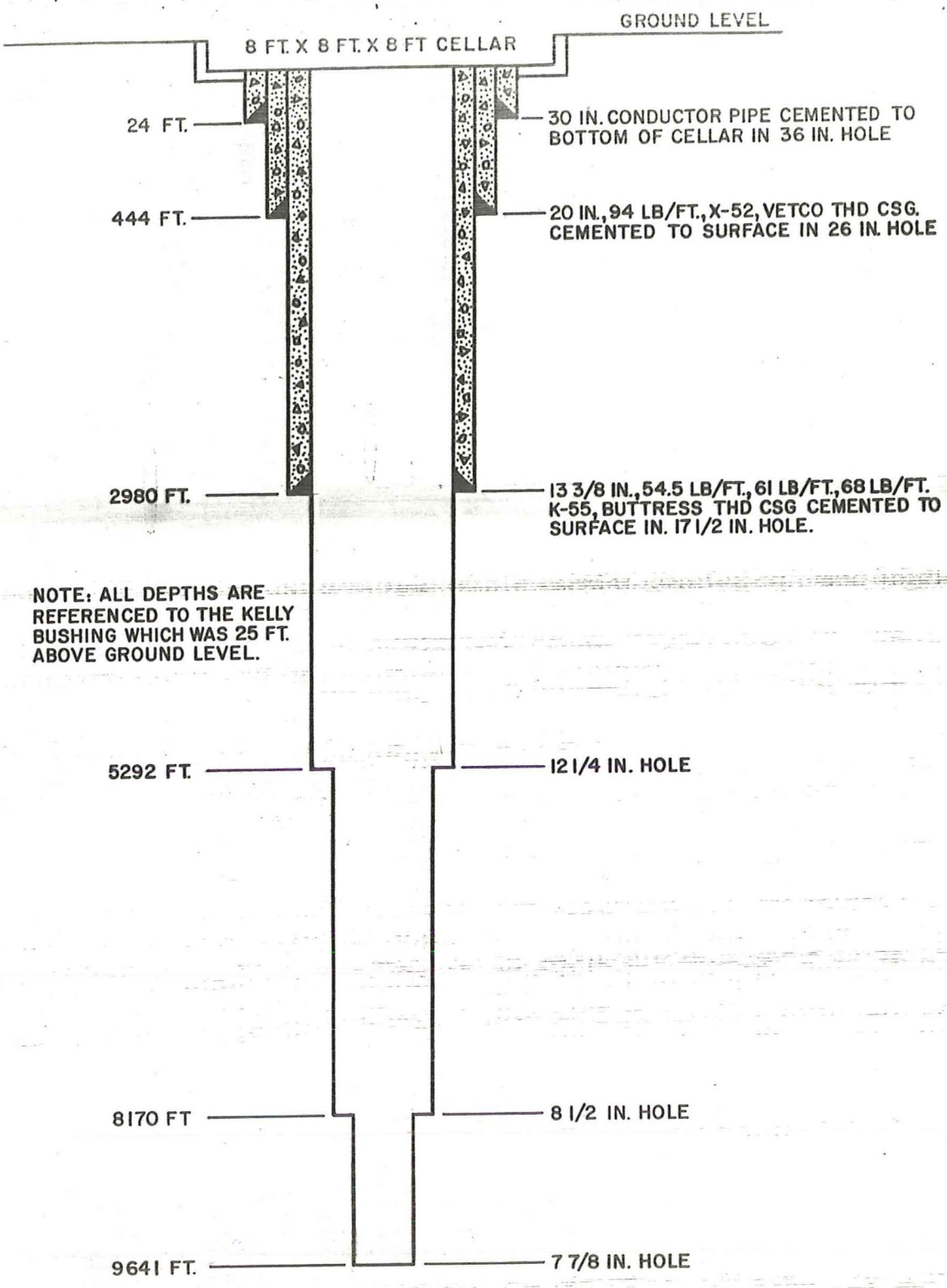
In summary, the oldest rocks penetrated in B-23-1 are sedimentary rocks which may be part of the upper Triassic to lower Jurassic Auld Lang Syne group. These sedimentary rocks were regionally deformed and metamorphosed prior to intrusion and contact metamorphism by the granite in the Cretaceous period. Then uplift and erosion occurred during the Cretaceous and early Tertiary periods. During the Miocene epoch abundant ash-flow tuffs and lava flows were deposited over the Mesozoic rocks. After a several-million-year hiatus during which the Basin and Range structure developed the mafic flows of the Chloropagus Formation filled a large depression and apparently lapped up onto the pre-existing rhyolitic rocks. After another fairly short hiatus, the sediments of the Truckee Formation were deposited in the Pliocene epoch. Since then the area near B-23-1 has generally been undergoing erosion.

3.2 DRILLING SUMMARY

Peter Bawden Drilling Company, Inc. rig No. 11 (Table 1) was moved to the location and a 12 1/2" diameter hole was spudded at 10:30 AM, March 19, 1979. 30" diameter conductor pipe had previously been set at 24 ft. below ground level and cemented to the surface with redimix cement.

The hole was drilled with fresh water-gel mud and reamed to 26" diameter to 660' KB, experiencing some loss of mud returns. Mud temperatures into the drill pipe and out of the mud discharge line were recorded throughout the drilling of the well. Rigged up casing tools and began to run 20" diameter casing, but hit a boulder at 55' KB. The casing was pulled and laid down and a 26" diameter flat bottom, 4 cone, bit was used to ream the hole from 55' to 118' KB. At this depth severe loss of mud occurred. Pulled the bit and ran drill pipe open ended to 646' KB and spotted 100 sacks of Class G cement, 4% $CaCl_2$ in a 16 #/gal. slurry. After waiting on cement to set, the hole was filled with drilling mud, the hole was reamed to 26" diameter to 150' KB and then washed to 457' KB. The hole was circulated with mud and casing tools again rigged up to run 26" casing. This time the casing would not go below 95' KB and the hole was reamed to 457' KB. On this attempt to run casing it was successful and 26" diameter casing was set at 444' KB and cemented with 1090 sacks of cement. (Figure 10 and Section 3.3 of this report show details of the casing and cementing programs.)

Blow-out preventer equipment was installed and tested and a 17 1/2" diameter hole was drilled to 3070' KB through volcanics, basalt and rhyolite tuff. Loss of mud return was experienced at 935' - 955'. While at 1192' KB a 250 sack Class G neat cement plug was squeezed in the hole.



DESERT PEAK WELL NO. B-23-1
SUBSURFACE WELL PROFILE

FIGURE 10

At 3068' KB severe mud loss was experienced, but by loading the mud with lost circulation material, full returns were obtained (see Section 3.5 of this report for a discussion of drilling fluids).

The first logging runs were made to a depth of 3070 feet in a 17 1/2" hole. Surface pipe was set to a depth of 444 feet and only a gamma-ray log was obtained in this part of the hole. Seven logging runs were made. The induction electrolog, BHC acoustilog, gamma ray, densilog, and three-arm caliper log were obtained by Phillips Petroleum Company. The Los Alamos Scientific Laboratory (LASL) obtained the dual detector neutron lifetime log, fraclog, four-arm caliper log, neutron log, and a partial spectralog. The logging progressed very efficiently, in part because borehole temperatures were not excessive. The highest temperature recorded on the maximum reading thermometers was 218°F. Table 3 lists all logs run in this well.

Maximum temperature recorded at 3070' KB was 212°F. After logs were run, mud with lost circulation material was mixed and circulated in the hole; a 50 ft. cement plug was spotted at the bottom of the hole. The top of the casing was run and set at 2980' KB and cemented in two stages with 638 and 1622 sacks of Class G cement with good circulation throughout both stages.

Drilling progressed below the 13 3/8" casing using water with only slight fluid loss. While going in the hole at 8168' KB with a new bit, the drill string became stuck with the bit at 8035' KB. Pulled 185,000# over string weight but was unable to pull loose. After running a string shot, the pipe backed off leaving the bit, float and Totco ring in the hole.

TABLE OF LOGS

DESERT PEAK B-23-1

DATE	COMPANY	TYPE OF LOG	INTERVAL LOGGED-FT
3-19 to 5-28-79	ENERGY WELL LOGGING SERVICE	ENERGY LOG	48-9617
4-5-79 (1)	DRESSER ATLAS	INDUCTION ELECTROLOG	444-3068 (a)
4-5-79	DRESSER ATLAS	FRACLOG	444-3062
4-5-79	DRESSER ATLAS	CALIPER LOG	444-3071
4-5-79	DRESSER ATLAS	SPECTRA LOG	470-3070
4-5-79	DRESSER ATLAS	COMP. DENSILOG-COMP. NEUTRON	444-3071 (a)
4-5-79 (2)	DRESSER ATLAS	GAMMA RAY-BHC ACOUSTILOG	444-3062 (a)
4-6-79	DRESSER ATLAS	DUAL DETECTOR NEUTRON LIFETIME LOG	440-3065 (a)
4-13-79	SCHLUMBERGER	DIRECTIONAL SURVEY-CALIPER	150-2900
5-18-79	PRUETT WIRELINE SERVICE	TEMPERATURE	0-8750
5-24-79 (3)	DRESSER ATLAS	TEMPERATURE	3000-9635
5-24-79 (1)	DRESSER ATLAS	INDUCTION ELECTROLOG	2980-9642 (a)
5-24-79 (2)	DRESSER ATLAS	GAMMA RAY-BHC ACOUSTILOG	2990-9635 (a)
5-25-79 (3)	DRESSER ATLAS	TEMPERATURE	800-8400
5-25-79	DRESSER ATLAS	FRACLOG	2980-9637
5-28-79	PRUETT WIRELINE SERVICE	TEMPERATURE	0-9435
*6-27-79	DRESSER ATLAS	DENSILOG	2980-9641
7-6-79	PRUETT WIRELINE SERVICE	TEMPERATURE	0-9470
8-9-79	PRUETT WIRELINE SERVICE	TEMPERATURE	0-9465

(1) Combined as a single log
(2) Combined as a single log
(3) Combined as a single log

(a) Individual logs were made for 2"=100' and 5"=100' scales.

* This is a computerized copy of a log originally run 5-25-79.

TABLE 3

A magnet was run three times with the only recovery being the top half of the float. Went in the hole with open ended drill pipe and washed down to the fish. Ran fishing tools and screwed on to the fish, jarred loose and came out of the hole with the fish.

A 7 7/8" diameter hole was started at 8168' KB and while drilling to 9215' KB severe lost circulation was encountered, losing up to 2600 barrels of water on some days. Upon coming out of the hole for a new bit at 9125' KB, it was found that the tool joint box on the top of the 16th stand had washed out, but the string had not parted.

While at 9215' KB an attempt was made to unload the hole using compressed air. The well was blown down to 2910' KB using 850 psi pressure and some steam reached the surface, but flashing could not be sustained without use of the compressor. Maximum flow line temperature was 265°F. A temperature survey ran to 8750' KB (top of a bridge) recorded a temperature of 380°F at that depth.

The well was drilled below 9215' KB in quartz diorite using aerated water. The well reached drillers TD of 9620' KB, the hole was circulated with water-gel mud in preparation for logging.

The logging operation run at total depth was not as successful as the one conducted at 3070'. This operation was plagued by high borehole temperatures and several tool failures. The first log run was the induction electrolog and temperature log. The temperature log showed a maximum temperature of 342°F while maximum-reading thermometers in a sealed case gave readings of 324, 324 and 325°F. Maximum-reading thermometers in partially open cases gave readings of 365, 365, 365, and 375°F. These high temperatures on the first run clearly ruled out the possibility of running some of the lower temperature tools later in the sequence. The second log run was the acoustilog and gamma-ray log. The logging engineer had trouble with a weak signal on the sonic log. The sonic log repeated poorly

and has a highly irregular character which is possibly the result of using aerated water for drilling fluid. As a result, the sonic log is of poor quality.

The third log obtained was to be the densilog and neutron log, however, tool problems consumed several hours and no log was obtained. Next two runs were made for the fraclog.

After the fraclog was obtained additional attempts were made to obtain the densilog and neutron log without success, as the tool failed while running it in the hole. Then the high temperature densilog tool was installed and a densilog was finally obtained. The maximum temperature recorded on this run was 408°F.

Two attempts were made to run high-temperature, temperature logs in the hole but both high temperature tools failed before any data was obtained. Next a 400°F temperature tool was run in the hole. This tool reached 400°F at a depth of 8400 feet and the run was terminated before the tool burned out. On this run the maximum-reading thermometers all recorded temperatures between 372 and 380°F.

After this logging run it was decided that the hole was too hot to probe to total depth with the available tools. Also, it was felt that the most useful logs had already been obtained, therefore, logging operations were terminated. During the second logging operation only the fraclog was obtained by LASL. On July 6, 1979 a temperature log was run inside tubing and a maximum bottom-hole temperature of 414.3°F was recorded at 9470 feet. A later temperature survey was run on August 9, 1979 which recorded the same bottom-hole temperature.

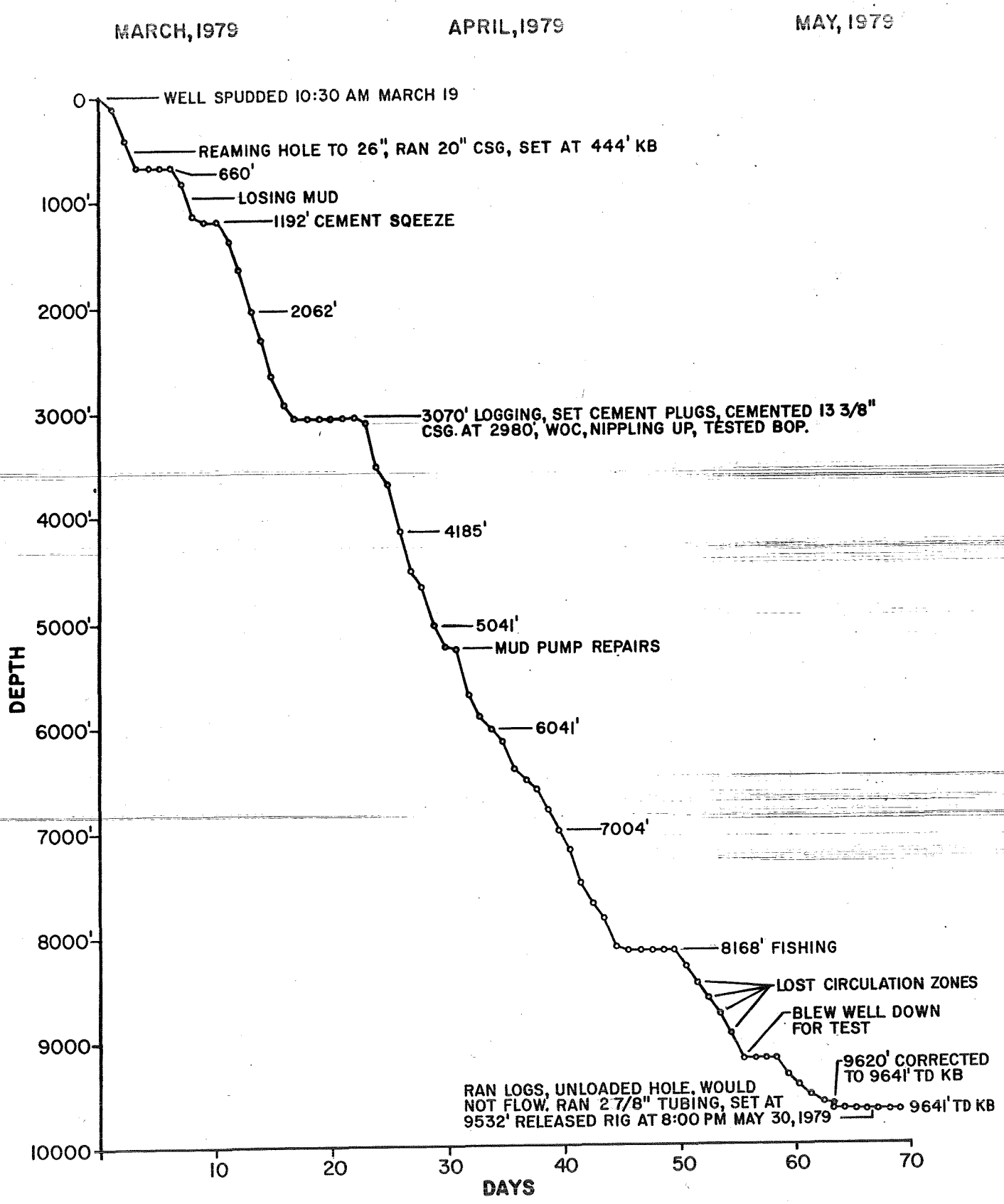
Total depth of the well was corrected from 9620' to 9641' KB as a result of drill pipe strapping. Figure 11 shows drilling time vs. depth for this well, and Appendix C includes details of bits used in the drilling of this well.

Two attempts were made to flow test B-23-1. On both occassions compressed air was injected into the well through the drill pipe. This air lifted both drilling fluids and formation water to the surface where water samples were collected.

The first flow test took place on May 16, 17, and 18. During this test compressed air was injected through drill pipe set at a depth of 2910 feet. During the flow test a mixture of air, steam and water was ejected from the flow line. The air and steam were found predominately at the top of the flow line and water was concentrated at the bottom of the flow line. The samples were generally taken by simply holding a plastic pitcher in front of the bottom part of the flow line. The collected fluid was then poured into containers without any acidification, dilution or addition of preservatives. Most of the samples were not filtered, however, due to abundant sediment in many of the samples, some were decanted several days later after most of the sediment had settled. During this first flow test two steam samples were collected from the sampling port. This port was simply a hole on the top of the flow line. The samples from the port were condensed in a copper tube and should represent the total flow at the top of the flow line. At 10:30 a.m. on May 18, 1979 the first flow test was terminated. At 10:30 a.m. both filtered and unfiltered water samples were collected from the end of the flow line. During the first flow test the temperature of the flow line gradually increased in a highly irregular fashion to a maximum of about 280°F.

The second flow test began at 4:00 a.m. May 26 after the well had been drilled to 9641' TD and continued until 9:35 a.m. May 28. During this test water samples were collected from the end of the flow line. Analyses of these samples are shown in Appendix F. Flow was sustained with compressed air at 750 psi but died in 45 minutes after the compressor was shut down. Maximum flowline temperature was 305.7°F.

2 7/8" EUE tubing was run and set at 9532' KB (9509' GL) and filled with



DESERT PEAK WELL NO. B-23-1
DRILLING TIME VERSUS WELL DEPTH

FIGURE 11

fresh water. The well will be held as a temperature observation hole and for possible future use to field test a down-hole Thermal Pumping Unit manufactured by Sperry Vickers. An attempt is planned for the fall of 1979 to unload the well to determine if the well can sustain flow with a minimum of back pressure.

A directional survey was run to a depth of 2900 feet and showed a very gradual increase in hole deviation to 7° at 2900 feet. One Totco deviation was reported later of 9° at 5928 feet.

3.3 CASING AND CEMENTING PROCEDURES

Before moving in the drilling rig, 30" diameter conductor pipe was set 24 feet below ground level and cemented to the surface with commercial redimix cement. Figure 10 is a schematic cross-section of the casing program of this well.

After considerable difficulty in getting casing to the bottom of a 26" diameter hole at 660' KB, 11 joints of 20" diameter, 94 #/ft., X-52, range 3 casing with Vetco threads were set at 444 ft. KB and cemented with 1,090 sacks of Class G neat cement, 15.9 #/gal. slurry; approximately 90 sacks of good cement were circulated to the surface.

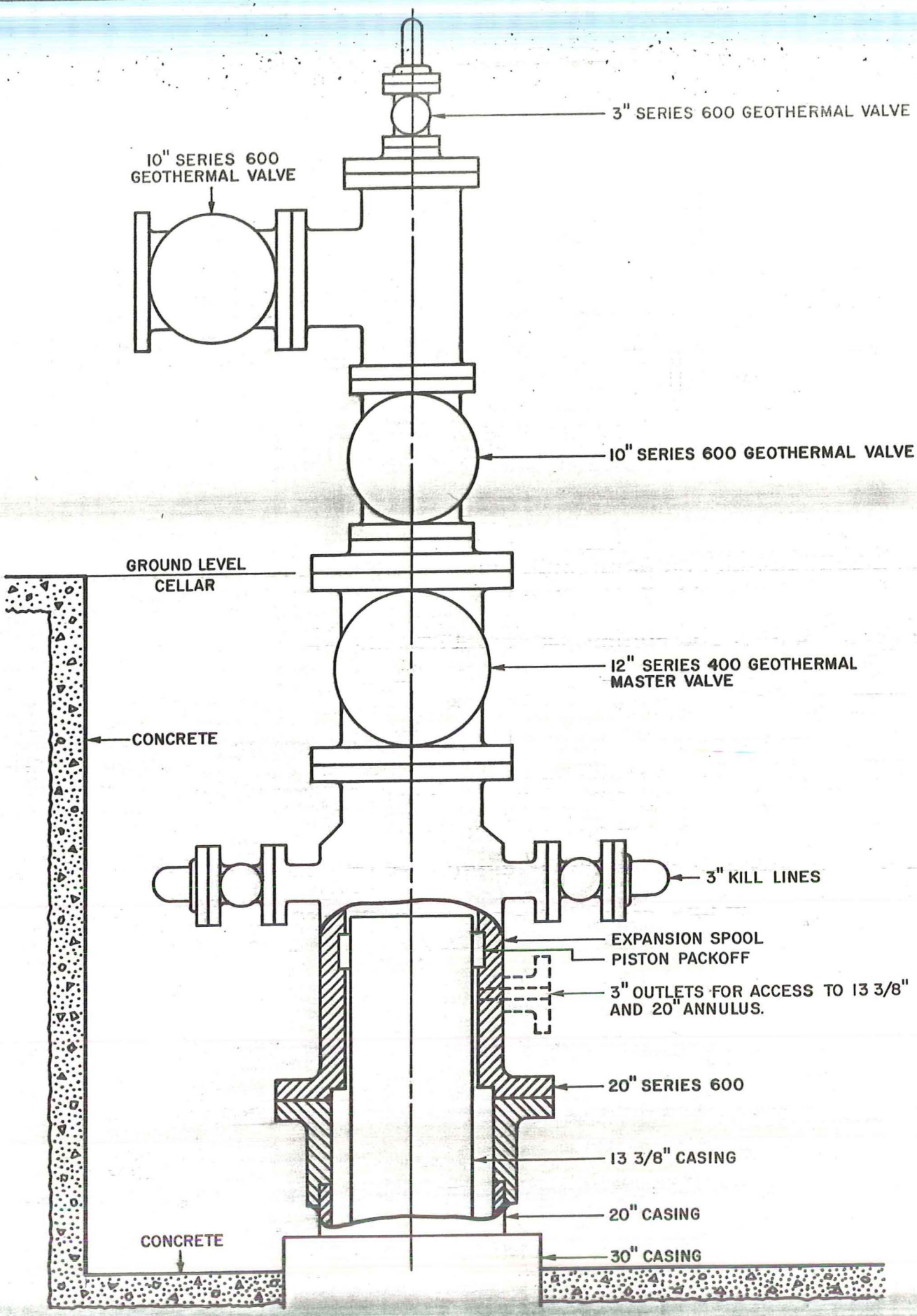
After drilling a 17 1/2" diameter hole to 3,070' KB, the following string of 13 3/8", K-55 casing was run: 15 joints 68"/ft., Buttress thread; 20 joints, 61 #/ft. Buttress thread; and 38 joints 54.5 #/ft. LT&C. The casing was set at 2,980 ft. KB. The first (lower) stage cement consisted of 638 sacks Class G, 1:1 Perlite, 40% silica flour, 2% gel, 0.75% D-31 and 0.4% R-11; circulated out 20 barrels excess cement. Second stage was 1,622 sacks of the same cement mixture. Good circulation was observed throughout both stages and good cement was returned to surface.

No production casing was run in the well and there is an interval of 6,661 feet of open hole below the 13 3/8" casing shoe.

3.4 WELLHEAD EQUIPMENT

Figure 12 illustrates the wellhead equipment installed on the Desert Peak B-23-1 well. It is a somewhat specialized installation in that the 13 3/8" casing series as a production string. This size casing was selected so as to accommodate down-hole pumping equipment if the producing capability of the well could justify a pump installation. The expansion spool will allow for elongation of the 13 3/8" casing as it is heated during production. It also provides kill lines for pumping into the 13 3/8" casing and access ports to the 13 3/8" x 20" casing annulus.

A 12" series 600 WKM Pow-R-Seal geothermal gate valve serves as a master valve for the 13 3/8" casing. Some modification of wellhead equipment will be necessary if a down-hole pump is placed in the well.



DESERT PEAK B-23-1
WELLHEAD EQUIPMENT

FIGURE 12

3.5 DRILLING FLUIDS

A fresh water base gel mud was used to drill the hole for 20" diameter surface casing. Some lost circulation problems were encountered and 10 sacks of lost circulation material was spotted at the bottom of the hole (660' KB) prior to running surface casing. Two attempts to run to 20" casing were unsuccessful and 100 sacks of cement were then placed on bottom and on the third attempt, casing was lowered to 444' KB and cemented at that depth.

While drilling with a 8.8 #/gal., 35 sec. viscosity mud, 90 barrels of mud were lost at 935' - 955' and at 1,192' the hole was squeezed with 250 sacks cement mixed with 9 sacks of lost circulation material. Another zone of lost circulation occurred at 3,068 ft. Circulation was regained by mixing lost circulation material and the mud built up to 9.3 #/gal., 55 sec. viscosity for running logs and setting 13 3/8" diameter casing at 2,980' KB in a 17 1/2" diameter hole.

Drilling below the 13 3/8" casing shoe was done with fresh water with a pH of 9.5. A fishing job for removal of a bit and float was conducted at 8,168' KB with the curculation of a mud (gel) pill: fish recovery was successful. Severe lost circulation began at 8,400' KB and continued at 9,215' KB getting as high as 2,600 barrels of water in 24 hours.

At 9,215 an attempt was made to unload the hole; also a temperature log was run. Drilling the remainder of the hole to a TD of 9,641' KB was done with aerated water. No heat excahnger was used in the mud system and cooling was obtained by circulating through the reserve pit. Highest mud temperatures after circulating 24 hours at TD was 126°F in and 139°F out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 1

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
3-20-79	105	Reaming 26" hole at 45', limestone. Loc: 560.33' N 52° 45' East of NW corner of SW/4 Section 23-22N-27E, Churchill County, Nevada. 10,000' geothermal exploratory well. AFE PE-5514. PPCo will operate and pay 50% of drilling costs (U.S. Dept. of Energy will pay 50%). PPCo will own 100% WI, 90% Revenue Int. Peter Bawden Drilling, Inc. contr. Built road, location, and pits. 30" conductor pipe set at 24' below GL, cemented to surface. MI & RUR. Elev: GL 4595, RKB 4613. Spudded 12 1/4" hole at 10:30 AM 3-19-79. Drilled to 105'. Reamed to 17 1/2" & started reaming to 26".
3-21-79	405	Drilling basalt. Mud 9.0, Vis 62. Trip for bit at 250'. Totco 0 Deg at 100'. Flow line temperature at 400' - 79° in, 82° out. Fresh water limestone to 100', tuff 100-215', basalt w/interbedded lake deposits 215-405'.
3-22-79	660	Volcanics, prep to pull out of hole to run casing. Mud 8.9, Vis 50. Drilled 26" hole to 457'. Started 17 1/2" hole at 457'. Drilled to 660', circulated 1/2 hour. Spotted 10 sx LCM on bottom. Totco 2 1/4 Deg at 457' & 2 1/4 Deg at 575'. Flow line temperature at 660' - 96° in, 97° out.
3-23-79	660	Reaming 26" hole. Pulled out of hole, rigged up casing tools. Ran 2 jts 20" casing, hit boulder at 55' RKB, unable to go deeper. Laid down casing and casing tools. Went in hole w/26" Reed flat bottom, 4-cone bit, 10' short drill collar & 4 1/2" DP, drld & reamed 55-118', started losing mud. Pulled out of hole, laid down bottom hole assy. Went in hole with 4 1/2" DP, open ended. Spotted 100 sx Class G cement, 4% $CaCl_2$ 16# slurry, 646' to 578'. Job complete at 7:30 PM 3-22-79. WOC 2 hrs., filled hole with mud, OK. Went in hole with bottom hole assy as above to 118'. Reamed 26" hole 118-150', washed to 457'. Circulated bottoms up and pulled out of hole. Rigged up casing tools. Ran 3 jts 20" casing, stopped at 95' RKB. Laid down casing and tools. Went in hole with same bottom hole assy, reamed 76-96'.
3-24-79	660	Prep to nipple up 20". Reamed hole 26" to 457'. Circ. 1 hr. & POOH. Ran 11 jts, 20" OD, 94#, X-52, R-3 csg w/Vetco thds- Baker shoe set @ 444' RKB. Circ. 1/2 hr. Cemented w/1090 sx Class G neat cement, 15.9# slurry, circ. est 90 sx good cement. Displaced plug to around 385'. Job complete 9:30 PM, 3-23-79. WOC.
3-25-79	660	Prep to test 20" Hydril. Cut off 30" conductor and 20" casing off 65" below GL. Install 20" WKM Bradenhead and test w/1200# press - OK. Nipple up 20" Hydril & flowline.

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DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 2

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
3-26-79	827	Drilling volcanics. Test hydril to 500#. Ran 17 1/2" bit & drld plug, cement & shoe 406-444'. Reamed 17 1/2" hole to 580', drilled plug 580-640' & reamed 640-660'. Mud 8.8, vis 35, WL 20, FC 2/32, pH 9.2, YP 14, PV 6, Gels 4 & 8, Chl 900. Flow line temp - 99° in, 100° out.
3-27-79	1140	Drilling volcanics. Lost 90 bbls mud 935-955'. Now losing small amount of mud. Flow line temperature @ 1130' - 80° in, 82° out.
3-28-79	1192	WOC. Drilled volcanics to 1192'. Losing mud-COOH to squeeze. BJ squeezed w/250 sx Class G neat cement w/9 sx LCM - top plug 646' - plug down @ 3:30 AM. 1° @ 1140'.
3-29-79	1192	Going in hole. Started running DP - found 2 pins broken on DC's. Magna-fluxed DC's - found 2 add'l bad boxes and bad box on lead collar.
3-30-79	1375	Drilling volcanics, some rhyolite. Mud 8.7, vis 35, pH 11.5, solids 3%. Drilled cement 768' to 870'. Flow line temp @ 1375' - 94° in, 95° out.
3-31-79	1640	Drilling rhyolite tuff. Mud 8.9, vis 35, FC 2/32, pH 10, solids 3%, Sd 1/4%. Top rhyolite tuff @ 1362'. Flow line temps: 1490' - 99° in, 100° out; 1550' - 102° in, 104° out; 1600' - 105° in, 107° out; 1640' - 106° in, 109° out.
4-01-79	2062	Drilling basalt w/rhyolite tuff. Mud 9.0, vis 35, FC 2/32, pH 10, solids 3%, Sd 1/4%. Pulled bit #7 @ 2062' - good cond., will rerun. Form change @ 1930' from rhyolite to basalt w/rhyolite. Flow line temps: 1700' - 108° in, 112° out; 1800' - 109° in, 114° out; 1900' - 110° in, 115° out; 2000' - 114° in, 118° out; 2050' - 115° in, 119° out. Totco 2° at 2062'.
4-02-79	2313	Drilling rhyolite tuff w/intersprsed lava flows. Mud 9.0, vis 34, FC 2/32, pH 10.0, solids 3%. Made trip to check bit, broke, checked & doped all DC's. Flow line temps: 2100' - 116° in, 118° out; 2200' - 114° in, 118° out; 2300' - 117° in, 122° out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 3

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
4-03-79	2679	Drilling rhyolite tuff. Mud 9.1, vis 34, FC 2/32, pH 10.2, solids 3%, sand 1/4%. Trip for bit at 2596', broke & doped all DC's. Picked up 8 units Methane at 2540', now running 5 units. Drilled andesite 2588-2612'. Totco 3 Deg at 2596'. Flow line temps: 2400' - 120° in, 124° out; 2500' - 120° in, 126° out; 2600' - 116° in, 122° out; 2650' - 119° in, 124° out.
4-04-79	2964	Drilling volcanics & rhyolitic tuff. Mud 9.2, vis 34, FC 2/32, pH 10.4, sand 1/4%, solids 4%. Methane & CO_2 5-8 units. Flow line temps: 2700' - 120° in, 126° out; 2800' - 123° in, 130° out; 2900' - 125° in, 135° out; 2950' - 132° in, 138° out.
4-05-79	3070	Coming out of hole to run logs. Drilled rhyolite to 3048', dacite to 3070'. Started losing mud at 3068', pulled up hole, mixed LCM, regained full returns. Mud 9.3, vis 55, FC 3/32, pH 10.3. Flow line temps: 3000' - 134° in, 139° out; 3050' - 135° in, 141° out.
4-06-79	3070	Logging. Ran Dresser Atlas Fracture log, BHC-Caliper, Spectro-log, IEL, CN-CDL-GR, DNLL. ELTD 3072'. Max temp on 1st run 158°, on 6th run at 2:30 AM 4-06-79 - 212°.
4-07-79	3070	Going in hole to clean out cement stringers. Finished logging. Went in hole w/DP, circulated hole, mixed mud & LCM. Attempted to spot cement plug, failed to displace, left cement stringers up hole.
4-08-79	3070	Mixing mud & conditioning hole. Cleaned up hole to bottom. Pulled out of hole, went in open ended. Spotted 50' cement plug on bottom. Came out of hole, WOC 3 3/4 hrs. Went in hole w/17 1/2" bit, top of cement plug at 3010'. Pulled out of hole. Ran 15 jts, 13 3/8" OD, K-55, 68#, BT&C; 20 jts, 13 3/8" OD, K-55, 61#, BT&C and 38 jts, 13 3/8" OD, 54.5#, csg with Baker stage collar, Lynes Packer, Baker fillup collar and guide shoe. Set casing at 2980' RKB, Packer at 1736'.
4-09-79	3070	WOC. Cemented 1st stage w/638 sx Class G cement, 1:1 Perlite, 40% silica flour, 2% Gel, 3/4% D-31 & 4/10% R-11, opened stage collar, circulated out 20 Bbls contaminated cement. Cemented 2nd stage with 1622 sx Class G cement, mixed as above, good circulation throughout both stages, circulated good cement to surface. Job complete at 10:40 PM 4-08-79.
4-10-79	3070	Nippling up. WOC 17 hrs., started nippling up.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 4

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
4-11-79	3070	Testing BOP's. Finished nippling up, pressured BOP and weld on WKM spacer spool blew out at 400#. Rewelded spool and started pressure test.
4-12-79	3129	Trip for bit. Tested BOP to 1000#, OK. Drilled cement, started 12 1/4" hole at 3070'. Drilling w/water. Flow line temp at 3125' - 111° in, 116° out.
4-13-79	3511	Drilling rhyolite & dacite. Drilling w/water, pH 10.5. Trip for bit at 3129'. Flow line temps: 3200' - 98° in, 105° out; 3300' - 107° in, 110° out; 3400' - 108° in, 111° out; 3500' - 114° in, 117° out.
4-14-79	3722	Trip for Deviation Survey & DC inspection. Laid down 4 bad DC's and bit sub. Flow line temps: 3600' - 110° in, 116° out; 3700' - 95° in, 98° out.
4-15-79	3845	Drilling dacite. After trip, bottoms up gas showed methane and 2 ppm H_2S. Flow line temps: 3750' - 98° in, 106° out; 3800' - 105° in, 108° out. Drilling w/water, pH 9.3.
4-16-79	4185	Drilling dacite & calcite. Drilling w/water, pH 11.0. Flow line temperature at 4150' - 107° in, 112° out.
4-17-79	4562	Drilling dacite. Drilling w/wtr, pH 10.2. Adding cold water while drilling. Flow line temps: 4200' - 108° in, 113° out; 4300' - 103° in, 107° out; 4400' - 94° in, 96° out; 4500' - 97° in, 99° out; 4550' - 98° in, 101° out.
4-18-79	4714	Drilling dacite. Drilling w/water. Drilled to 4688', circulated 1 hour. (25 sx Gel Pill) to clean hole, max temperature after 1 hr--118° in, 125° out. Totco 7 Deg at 4688'. Flow line temp at 4600' - 99° in, 102° out; 4700' - 103° in, 115° out; 4714' - 108° in, 118° out.
4-19-79	5041	Drilling metadacite. Drilling w/wtr, pH 9.5. Flow line temps: 4750' - 119° in, 128° out; 4850' - 118° in, 131° out; 4950' - 123° in, 128° out; 5000' - 120° in, 131° out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 5

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
4-20-79	5277	Drilling quartzite. Down 3 hrs. working on pump. Flow line temps: 5100' - 111° in, 125° out; 5193' - 119° in, 131° out; 5227' - 138° in, 149° out - started adding cold water; 5277' - 112° in, 129° out.
4-21-79	5292	Tripping in hole. Drilled to 5292 quartzite. Pulled out of hole, laid down 12 1/4" bottom hole assembly, picked up 8 1/2" bottom hole assembly. Wait on mud pump 16 1/2 hrs. Flow line temperature at 5292' - 112° in, 128° out.
4-22-79	5717	Drilling phylite. Drld w/water, pH 9.5. Started 8 1/2" hole at 5292'. Drilled limestone & dolomite 5450 - 5540'. Flow line temps: 5347' - 105° in, 120° out; 5442' - 111° in, 126° out; 5553' - 108° in, 125° out; 5652' - 105° in, 123° out; 5701' - 111° in, 125° out.
4-23-79	5928	Trip for bit. Drilled phylite to 5750', metavole to 5770'; quartzite & metamorphics, quartzite to 5928'. Flow line temps: 5796' - 119° in, 130° out; 5850' - 117° in, 129° out; 5928' - 107° in, 127° out.
4-24-79	6049	Drilling quartzite. Finish trip in hole, reamed 22' hole and washed 80' fill on bottom. Totco 9 Deg at 5928'. Flow line temps: 5955' - 108° in, 127° out; 6004' - 115° in, 121° out; 6049' - 113° in, 127° out.
4-25-79	6175	Drilling quartzite. Trip for bit at 6163'. Water truck broke down, circulated 4 hrs. at 6155' - after 1 hr 137° in, 149° out; 2 hrs 141° in, 156° out; 3 hrs 146° in, 162° out; 4 hrs 150° in, 165° out. Flow line temp at 6175' - 121° in, 135° out adding cold water.
4-26-79	6433	Drilling quartzite. Small drilling breaks 6285' - 6315' & 6330 - 6392'. Slight fluid loss. Flow line temps: 6200' - 128° in, 144° out; 6300' - 129° in, 143° out; 6399' - 136° in, 150° out; 6433' - 138° in, 152° out. Started adding cold water.
4-27-79	6511	Nippling up BOP. Drilled to 6511', dumped 7 loads of cold water to cool hole and install expansion spool. Down 12 hrs installing expansion spool & nippling up. Flow line temp at 6511' - 124° in, 138° out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 6

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
4-28-79	6610	Drilling quartzite. Finished nippling up BOP. Flow line temp at 6610' - 134° in, 150° out.
4-29-79	6804	Trip for bit. Drilled to 6804', quartzite & diabase. Flow line temps: 6654' - 121° in, 141° out; 6702' - 119° in, 142° out; 6804' - 130° in, 145° out.
4-30-79	7004	Drilling diabase & gabbro. Finished trip for bit, wash and ream 35' to bottom. Flow line temps: 6907' - 133° in, 146° out; 7004' - 132° in, 145° out.
5-01-79	7219	Drilling quartzite. Trip for bit 7078'. Flow line temps: 7057' - 123° in, 133° out; 7152' - 116° in, 130° out; 7219' - 122° in, 135° out. Adding cold water.
5-02-79	7506	Trip for bit. Drilling break 7470 - 80'. Flow line temps: 7257' - 123° in, 141° out; 7359' - 131° in, 145° out; 7454' - 124° in, 138° out; 7506' - 120° in, 137° out.
5-03-79	7725	Drilling quartzite. Finished trip. Flow line temps: 7596' - 125° in, 139° out 7697' - 121° in, 134° out; 7725' - 112° in, 135° out.
5-04-79	7860	Drilling metaquartzite. Trip for bit at 7821'. Flow line temps: 7747' - 118° in, 129° out; 7860' - 112° in, 123° out.
5-05-79	8127	Drilling metaquartzite. Flow line temps: 7896' - 118° in, 132° out; 7947' - 116° in, 134° out; 8000' - 120° in, 134° out; 8053' - 123° in, 143° out; 8127' - 108° in, 127° out.
5-06-79	8168	Waiting on fishing tools. Trip for bit at 8168'. Hit tight spot at 8035' while going in hole, stuck bit. Pulled 185,000# over string weight, unable to pull loose. Filled hole, started losing some fluid. Stuck 133' off bottom. Waiting on back-off tools.
5-07-79	8168	Waiting on magnet. Waited on GO-International 7 hrs. Ran string shot to 7977', unable to back off. Rigged up to run 2nd string shot, while taking torque, broke loose and backed off. Came out of hole, left bit, float and Totco ring in hole.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 7

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
5-08-79	8168	Fishing. Ran Temperature Survey (3 MR Thermometers) 28 hours after circulating, max temp 377°. Went in hole with magnet, no recovery. Ran magnet, recovered top half of float. Rerunnning magnet.
5-09-79	8168	Fishing. Made 2nd run with magnet, came out of hole, no recovery. Went in hole w/8 1/2" bit, reamed 7879 - 8022', 1' above fish. Circulated mud pill and started out of hole.
5-10-79	8168	Going in hole w/7 7/8" bit to ream hole to bottom. Reamed 8 1/2" hole 7879 - 8022' and came out of hole. Went in hole open ended, washed 1' to top of fish at 8023'. Screwed onto fish, jarred loose, came out of hole with fish. Magnafluxed bottom hole assembly, laid down 5 DC's with cracked boxes. Started in hole w/7 7/8" bit.
5-11-79	8310	Trip for bit. Reamed hole w/7 7/8" bit from 8022 - 8168', started 7 7/8" hole at 8168'. Flow line temps: 8168' - 110° in, 119° out; 8207' - 121° in, 135° out; 8254' - 124° in, 136° out; 8303' - 125° in, 137° out.
5-12-79	8485	Trip for bit. Drilled to 8485', quartz diorite, came out of hole for new bit. Flow line temps: 8346' - 102° in, 119° out; 8403' - 88° in, 131° out; 8449' - 123° in, 137° out; 8485' - 85° in, 127° out. Losing approx. 1500 bbls water per day.
5-13-79	8631	Drilling gabbro. Finished trip in hole, wash & reamed 88' to bottom. Flow line temps: 8549' - 106° in, 115° out; 8591' - 89° in, 103° out; 8631' - 108° in, 117° out. Losing approx 1500 bbls water per day.
5-14-79	8790	Drilling gabbro. Trip for bit at 8708', washed & reamed 72' to bottom. Flow line temps: 8652' - 111° in, 121° out; 8705' - 106° in, 109° out; 8746' - 98° in, 106° out; 8791' - 100° in, 107° out. Losing approx 1500 bbls water per day.
5-15-79	8971	Trip for bit. Drilled to 8971', quartz diorite, came out of hole. Losing 1500 - 1800 bbls water per day. Flow line temps: 8842' - 106° in, 111° out; 8904' - 107° in, 112° out; 8971' - 101° in, 108° out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 8

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
5-16-79	9215	Tripping. Finished trip in hole, 91' fill on bottom. Drilled to 9215' quartz diorite, started out of hole, found top box on 16th stand washed out. Lost approx. 2600 bbls water last 24 hrs. Flow line temps: 9040' - 95° in, 101° out; 9100' - 98° in, 106° out; 9151' - 101° in, 111° out; 9201' - 102° in, 110° out.
5-17-79	9215	Unloading hole. Staged in & blew well down @ 1381', 1935', 2397', & 2910'. At 2910' blowing down & letting hole refill. 800# to 850# press to blow well. Some flashing of steam since 3:00 AM - dies out. No flashing without aid from compressor. Max temp @ flow line 215°.
5-18-79	9215	Blowing well down with air. Max flow line temp 265° - gaining approx 1° per hour.
5-19-79	9215	Cleaning out. Test well 4 1/2 hrs. Ran temp logs to bridge @ 8750' - max temp 380°. Went in hole with DP & bit, CO to 8765'.
5-20-79	9370	COOH w/bit #27. Drilling w/wtr - quartz diorite. Washed & reamed 8765 - 9215'. Flow line temps - 9256' - 106° in, 118° out; 9307' - 103° in, 118° out; 9345' - 117° in, 129° out; 9370' - 102° in, 124° out.
5-21-79	9468	Drilling quartz diorite w/aerated wtr. Trip for bit at 9370'. Reamed 9215 - 9370'. LD 1 DC w/crack 18" from pin.
5-22-79	9541	Drilling quartz diorite w/aerated water. Trip for bit #29 @ 9470' - reamed 9405' to 9477'. Flow line temps: 9500' - 113° in, 142° out; 9520' - 123° in, 148° out; 9541' - 106° in, 149° out.
5-23-79	9610	Drilling quartz diorite w/aerated water. Trip for bit #30 @ 9567'. Reamed 9439' to 9567'. Flow line temps: 9581' - 79° in, 93° out; 9610' - 88° in, 96° out.
5-24-79	9620	COOH to log. Drilled 10' to TD at 9620' in quartz diorite. Reached TD at 10:00 AM, 5-23-79. Circ w/gel to clean hole. Flow line temp at 9620' - 95° in, 105° out; after circ 24 hrs - 126° in, 139° out.

DAILY REPORT DETAILED

LEASE DESERT PEAK B WELL NO. 23-1 SHEET NO. 9

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
5-25-79	9641	Logging. TD correction - strapped in TD 9641' - ELTD 9647'. Ran Temperature Survey and Induction Log - temp 340° max. (Dresser Max - Thermometer 324° - PPCo. Max Thermometer - 365°) Max reading thermometer on 2nd run 3 hrs. later - Dresser 338°, PPCo 377°.
5-26-79	9641	Test blowing well. Ran Dresser-Atlas logs. Ran 30 jts DP to 2800' - blew well. Ran additional 11 jts to 3800' - blew well with 1250 psi.
5-27-79	9641	Test blowing well.
5-28-79	9641	Test blowing well @ 3800'. Compressors down approx. 1 1/2 hours - took 1 hour at 1250 psi to flow well, then flowed w/approx. 700 - 800 psi assistance. Max temp recorded during flow test - 305°, avg temp 250 - 260°.
5-29-79	9641	LDDP. Shut compressor down at 9:30 AM, 5-28-79. Well died in 45 mins. Well will not flow without assistance. Ran temp survey to 9435' - max temp 396.7°.
5-30-79	9641	Running tubing. Finished LDDP & DC's. Nippled down BOP, master gate & expansion spool. RU & started running 2 7/8" OD EUE 6.5# J-55 tubing.
5-31-79	9641	TD & MOR. Released rig at 8:00 PM, 5-30-79. Ran 305 jts of 2 7/8" OD, EUE, 6.5#, J-55, 8R tubing set at 9532' RKB, 9509' GL. Well to be held as a temperature observation well pending decision to run pump. Filled tubing with water. FINAL REPORT

DAILY REPORT DETAILED

LEASE Campbell-E WELL NO. 2 SHEET NO. 1

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
1-05-79		Rigging up rotary. Location: 5650.9' N 32° W of NE corner of SE/4 of Sec 22-31N-33E Pershing County, Nevada. 8000' Geothermal Exploratory well. PPCo. will operate and pay 50% of drilling costs (U.S. Dept. of Energy will pay 50%). PPCo. 100% WI, 90% revenue interest. AFE PE-5522. Peter Bawden Drilling Inc., contr. Built road and location. Set 30" conductor pipe 18' below ground level. Cemented to surface w/5 1/2 yards redimix cement. Moved in rotary and started rigging up.
1-06-79	68	Mixing mud, lost circulation. Finished rigging up. Elev. GL 4725, RKB 4750. Spudded 17 1/2" hole at 8:30 pm 1-05-79. Drilled boulders to 68', lost full returns.
1-07-79	68	Lost circulation. Mixed mud, got full returns. Ran 26" bit, reamed hole to 60', wore out bit. Ran 26" hole opener, reamed to 68' and lost returns.
1-08-79	164	Drilling conglomerate. Mixed mud, pumped in mud and redimix cement. Went in hole, lost full returns at 68'. Ran 12 1/4" bit, drilled to 117', lost full returns. Drilled ahead, now have partial returns.
1-09-79	215	Reaming 26" hole at 84'. Drilled 12 1/4" hole to 215' with full returns. Reamed 17 1/2" hole to 215' w/full returns. Started opening hole to 26", lost returns at 68', reamed 84' w/partial returns.
1-10-79	215	Reaming 26" hole at 167'. Reamed 26" hole 84' to 167' without returns. FL 110-120'.
1-11-79	215	WOC & nippling up. Reamed 26" hole to 177', no returns. Ran 4 jts., 160', 20", 94#, X-52 with Vetco thds, set at 165' RKB. Cemented w/400 sx Class G cement, 3% $Cacl_2$, no returns. WOC 4 hrs., cemented from top w/200 sx Class G cement, 3% $Cacl_2$, good cement around top. Job complete at 7:30 pm 1-10-79. WOC 10 1/2 hrs.
1-12-79	300	Drilling conglomerate. Nippled up 20" Hydril. Tested BOP to 500#, 15 mins, OK. Drilled cement. Drilling 17 1/2" hole. Mud 8.9, Vis 50, WL 15, FC 2/32", PH 10.5, YP11, PV27, Gels 4 & 12. Flow line temp at 300' - 80° in, 68° out.

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DAILY REPORT DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 2

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
1-13-79	540	Drilling conglomerate. Mud 9.0, Vis 45, WL15, FC 2/32, pH 9.5, YP14, PV 39, Gels 6 & 17, chl 400. Flow line temperature at 530' - 93° x 95°. Totco 1 Deg at 396'.
1-14-79	805	Drilling shale, clay, and argillite. Mud 9.0, Vis 45, WL 15, FC 2/32", pH 9.0, YP 22, PV 47, Gels 5 & 27, chl 400. Flow line temperature at 800' - 101° x 102°. Totco 1 1/4 Deg at 619'.
1-15-79	1062	Drilling slate and phylite. Mud 9.1, Vis 41, WL 15, FC 2/32", pH 9.0, YP 12, PV 22, Gels 2 & 4, chl 400. Trip for bit at 818'. Flow line temperature at 1060' - 105° x 106°. Totco 1/4 Deg at 805', 1 Deg at 988'.
1-16-79	1364	Drilling slate and phylite. Mud 9.1, Vis 50, WL 15, FC 2/32", pH 9.5, YP 19, PV 38, Gels 4 & 11, chl 450. Trip for bit at 1090'. Flow line temperature at 1360' - 110° x 111°. Totco 2 Deg at 1190'.
1-17-79	1517	Drilling graywacke. Mud 9.2, Vis 45, WL 15, FC 2/32, pH 9.0, YP 11, PV 31, Gels 4 & 9, chl 400. Trip for bit at 1415', startd 14 3/4" hole at 1415'. Totco 2 1/4 Deg at 1415'. Flow line temperature at 1515' - 101° x 105°.
1-18-79	1675	Drilling slate and phylite. Mud 9.6, Vis 45, WL 15, FC 2/32, pH 8.5, YP 17, PV 39, Gels 5 & 15, chl 400. Trip for bit at 1547'. Totco 1 Deg at 1604'. Flow line temp at 1675' - 102° in, 106° out.
1-19-79	1884	Drilling slate and phylite. Mud 9.8, Vis 42, WL 15, FC 2/32, pH 8.5, YP 17, PV 39, Gels 4 & 17, chl 300, Solids 11, Sand 2%. Trip for bit at 1727'. Started 12 1/4" hole at 1727'. Totco 3 Deg at 1727'. Flow line temperature at 1884' - 111° in, 113° out.
1-20-79	1930	WOC. Drilled 12 1/4" hole to 1930'. Ran directional log, GR-Sonic, dual-induction-laterolog. Ran 33 jts, 13 3/8" O.D., 54.5#, K-55, BT & C, csg set @ 1414' RKB. Cmtd w/2000 cu. ft. Class G cement, 1:1 Perlite, 40% Silica Flour, 2% Gel, 3/4% D-31, 13.3#/gal. Had 3% $CaCl_2$ in last 700 cu. ft. Job complete at 5 am, 1-20-79. 3 3/4° @ 1930'. Flow line temp @ 1930' - 113° in, 116° out.
1-21-79	1414	WOC. Nipple up.

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A11

DAILY REPORT DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 3

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
1-22-79	1414	WOC. Nipple up - prepare to test BOP equipment.
1-23-79	2008	Drilling slate and phylite. Mud 9.4, Vis 34, WL 14, FC 1/32, pH 9, YP 2, PV 8, Gels 2 & 5. TOC 1369'. Tested all BOP equipment to 1000# for 15 mins. - OK. Flow line temp @ 2008' - 105° in, 108° out.
1-24-79	2250	Drilling slate and phylite, frac'd. Mud 9.4, Vis 38, WL 12.3, FC 3/32, pH 11, YP 6, PV 12, Gels 3 & 13, chl 200, solids 6, sand 1. Totco 3 1/2° @ 2190'. Rig down 4 1/2 hours - electrical problems. FL temps - 114° in, 117° out.
1-25-79	2510	Drilling slate and phylite. Mud 9.5, Vis 38, WL 12.2, FC 3/32, pH 11, YP 5, PV 12, Gels 2/11, Chl 180, Solids 8, Sand 1/2. Totco 4 1/2° @ 2403'. FL temps - 113° in, 118° out. Blizzard @ 8:00 am.
1-26-79	2682	Drilling schist & phylite. Mud 9.5, Vis 39, WL 11.0, FC 2/32, pH 11.2 YP 5, PV 13, Gels 2 & 10, chl 150. Trip for bit at 2528'. Totco 4 3/4° @ 2617'. Flow line temperature at 2680' - 120° in, 124° out.
1-27-79	2956	Drilling slate & phylite. Mud 10.0, Vis 38, WL 12, FC 2/32. Totco 7° at 2763', 9° at 2866'. Flow line temperature at 2950' - 125° in, 130° out.
1-28-79	3165	Drilling slate & phylite. Mud 10.2, Vis 28, WL 11.5, FC 2/32, pH 11.5, YP 5, PV 11, Gels 2 & 24, chl 150. Totco 10° at 3034', 10° at 3135'. Flow line temperature at 3165' - 120° in, 136° out.
1-29-79	3355	Drilling phylite, pyrite & quartz. Mud 10.2, Vis 39, WL 12.2, FC 2/32, pH 11.5, YP 8, PV 15, Gels 2 & 12, chl 1600. Totco 10 1/2° at 3120', 10 3/4° at 3320'. Flow line temperature at 3355', 125° in, 134° out.
1-30-79	3435	Drilling phylite, pyrite & quartz. Mud 9.9, Vis 40, WL 12, FC 2/32, pH 10.5, YP 8, PV 16, Gels 2 & 10, chl 1600. Trip for bit at 3380'. Down 5 1/2 hrs. Repair swivel. 490 ppm CO_2. Flow line temperature at 3435' - 130° in, 138° out.

DAILY REPORT DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 4

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
1-31-79	3491	Tripping. Twisted off at top box on bottom stabilizer. Left 1 - stabilizer DC, 6-point reamer & bit in hole. Went in hole with o'shot & bumper sub, recovered fish. Mud 9.9, Vis 40, WL 12.2, FC 2/32, pH 10.5, YP 6, PV 15, Gels 2 & 10, Chl 1600. Totco 11 3/4 at 3440'.
2-01-79	3501	Fishing. Laid down fish, broke out & doped all DC's. WIH, washed to bottom, drilled 2 hrs., twisted off. Pulled out of hole, left 6 DC's in hole. Went in w/o'shot. Unable to get over fish, started out of hole. Mud 10, Vis 39, WL 11.8, FC 2/32, pH 10.5, YP 5, PV 16, Gels 2 & 4, Chl 1500. Flow line temperature at 3500' - 130° in, 140° out.
2-02-79	3501	Magnafluxing DC's. Waited on fishing tools 4 1/2 hrs. Went in hole, latched onto fish, pulled 65,000#, worked fish loose and came out of hole. Laid down fish and started inspecting DC's, found 2 cracked collars. Mud 10, Vis 39, WL 11.8, FC 2/32, pH 10.5, YP 5, PV 16, Gels 2 & 4, Chl 1500.
2-03-79	3523	Drilling slate and quartz. Mud 9.8, Vis 38, WL 11.8, FC 2/32, pH 10.5, YP 4, PV 12, Gels 2 & 16, Chl 1500. Check all DC's and stabilizers. Found 9 DC's and 4 stabilizers bad. Shipped 9 DC's to shop. Strapped in hole, started drilling at 2:45 am, 2-03-79. Flow line temp at 3523' - 131° in, 139° out.
2-04-79	3690	Drilling slate and phylite. Mud 9.8, Vis 42, WL 11.8, FC 2/32, pH 10.5, YP 9, PV 17, Gels 2 & 8, Chl 1500. Flow line temp at 3685' - 131° in, 140° out.
2-05-79	3856	Drilling slate and phylite. Mud 9.9, Vis 40, WL 12, FC 2/32, pH 10.5, YP 8, PV 15, Gels 2 & 10, Chl 1500. Flow line temperature at 3850' - 139° in, 145° out.
2-06-79	3971	Drilling slate, phylite, and quartz. Mud 9.9, Vis 42, WL 12.0, FC 2/32, pH 10, YP 8, PV 16, Gels 2 & 8, Chl 1500. Trip for bit at 3870'. Totco 14 Deg at 3870'. Flow line temperature at 3970' - 141° in, 152° out.
2-07-79	4136	Drilling slate and phylite. Mud 9.8, Vis 42, WL 11.6, FC 2/32, pH 10.5, YP 8, PV 18, Gels 2 & 6, Chl 1500. Flow line temperature at 4125' - 144° in, 153° out.

DAILY REPORT DETAILED

LEASE Campbell - E WELL NO 2 SHEET NO. 5

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
2-08-79	4359	Drilling slate and phylite. Mud 9.7, Vis 40, WL 11.4, FC 2/32, pH 11.0, YP 8, PV 16, Gels 2 & 6, Chl 1500. Flow line temperature at 4350' - 146° in, 158° out.
2-09-79	4620	Drilling slate and phylite. Mud 9.8, Vis 42, WL 11.6, FC 2/32, pH 10.5, YP 9, PV 17, Gels 2 & 6, Chl 1500. Flow line temperature at 4620' - 150° in, 160° out.
2-10-79	4713	Drilling slate and sand. Mud 9.9, Vis 43, WL 11.6, FC 2/32, pH 9.5, YP 10, PV 23, Gels 2 & 4, Chl 1500, solids 11, Sd 1/2. Sand @ 4660'. Flow line temp @ 4713' - 151° in, 161° out.
2-11-79	4871	Drilling slate and phylite. Mud 10, Vis 42, Wl 11.2, FC 2/32, pH 9.5, YP 11, PV 24, Gels 2 & 4, Chl 1500, solids 11, sand 1/2. Flow line temp @ 4870' - 158° in, 168° out.
2-12-79	5044	Drilling slate and phylite. Mud 9.7, Vis 42, WL 12, FC 2/32, pH 10, YP 7, PV 18, Gels 2 & 4, Chl 1500, solids 10, Sd 1/4. Flow line temp at 5040' - 153° in, 165° out.
2-13-79	5214	Drilling slate and phylite. Mud 9.6, Vis 36, WL 12.6, FC 2/32, pH 9.5, YP 2, PV 12, Gels 2 & 3, Chl 1500, solids 9, sand trace. Drilling break at 5115' - pipe stuck 1 hour. Flow line temp @ 5212' - 150° in, 160° out.
2-14-79	5320	Drilling slate and phylite. Mud 9.5, Vis 35, pH 9.5, YP 2, PV 10, Gels 2 & 4, FC 2/32, Chl 1500, solids 9, sand trace. Flow line temp @ 5320' - 137° in, 158° out.
2-15-79	5486	Drilling lime, sand, and dolomite. Mud 9.5, Vis 36, WL 12.2, FC 2/32, pH 8.5, YP 4, PV 12, Gels 2 & 3, Chl 1200, solids 8, sand trace. Hit limestone @ 5270'. Flow line temp @ 5485' - 153° in, 166° out.
2-16-79	5537	Circulating to log. Drilled lime and dolomite to 5537'. Mud 9.4, Vis 38, WL 12.0, FC 2/32, pH 8.5, YP 6, PV 14, Gels 1 & 3, Chl 1200, solids 8, sand trace. Flow line temp @ 5537' - 153° in, 164° out.
2-17-79	5537	Logging. Ran Compensated Density-Neutron log, Dirctional log, Sonic log. Max. Deviation 19°, Max. Temp. 280°F. Started running Dipmeter.

A14

DAILY REPORT, DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 6

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
2-18-79	5537	WOC. Dipmeter failed. Ran 130 Jts, 9 5/8" OD casing (27 Jts. 1134', 43.5, LT&C, K-55 & 103 Jts, 40#, BT&C, K-55, 4159'). Set casing at 5305' RKB, stage collar at 4213'. Cemented bottom stage with 750 cu. ft. cement, 1:1 perlite, 40% silica flour, 2% Gel, 3/4% D-31, 5/10% R-11 & 1/10% R-6, good returns throughout. Cemented second stage w/2970 cu. ft. same mixture as above, good cement returns to surface. Job complete at 1:00 am 2-18-79. WOC.
2-19-79	5537	Nippling up. WOC, cleaned all mud pits. Cut off 9 5/8" casing at 12 midnight. Installed expansion spool & started nippling up.
2-20-79	5552	Drilling lime & dolomite. Finished nippling up. Testd all BOP's with 1000#, 15 mins, OK. Drilled cement & started 8 1/2" hole at 5537'. Flow line temperature at 5550' - 110° in, 150° out.
2-21-79	5910	Drilling lime & phylite. Drilling w/water. Flow line temperature at 5908' - 142° in, 151° out.
2-22-79	6218	Drilling lime. Drilling w/water, pH 10.5, Chl 1500. Flow line temperature at 6217' - 138° in, 150° out.
2-23-79	6330	Drilling quartzite. Drilling w/water, pH 9.5, Chl 1500. Trip for bit at 6235', washed and reamed 100' to bottom. Flow line temperature 136° in, 149° out.
2-24-79	6460	Drilling rhyolite. Drilling w/water, pH 10.0, Chl 1500. Flow line temperature at 6460' - 145° in, 155° out.
2-25-79	6565	Drilling rhyolite. Drilling w/water, pH 10.5, Chl 1500, trip for bit at 6480'. Flow line temperature at 6565' - 147° in, 158° out.
2-26-79	6738	Drilling rhyolite. Drilling w/water, pH 9.5, Chl 1500, flow line temperature at 6738' - 148° in, 161° out.
2-27-79	6855	Drilling rhyolite. Drilling w/water, pH 10.5, Chl 1500. Trip for bit at 6748'. Drilling break at 6842', drilling 12'/hr. Appears to be some fracturing. Flow line temperature at 6855' - 146° in, 158° out.

DAILY REPORT DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 7

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
2-28-79	7080	Drilling rhyolite & tuff. Lost approximately 400 Bbls water while drilling breaks. Water pH 9.5, Chl 1500. Flow line temperature at 7080' - 141° in, 153° out.
3-01-79	7227	Drilling rhyolite (green speckled). Water pH 10, Chl 1500. Trip for bit at 7083'. Picked up 7 ppm H_2S at 7205', losing some water. Drilling 8-10'/hr. Flow line temperature at 7227' - 142° in, 159° out.
3-02-79	7338	Drilling rhyolite. Water pH 9.5, Chl 1500. Trip for bit at 7330'. Lost approximately 400 BBls water last 24 hrs. (Diabase dyke 7185-7255'), drilling break 7336-38'. Flow line temperature at 7338' - 130° in, 144° out.
3-03-79	7495	Drilling rhyolite. Water pH 10.0, Chl 1500. Drilling break 7390-95', lost approximately 100 Bbls water. CO_2 60-180 ppm. Flow line temperature at 7495' - 145° in, 160° out.
3-04-79	7638	Drilling rhyolite. Water pH 10.0, Chl 1500. Trip for bit at 7535'. At 7630' - H_2S 8 ppm, CO_2 90-210 ppm. Lost approximately 200 Bbls wtr. Flow line temperature at 7638' - 149° in, 160° out.
3-05-79	7812	Tripping. Drilled to 7812', trip for bit. Flow line temperature at 7770' - 151° in, 162° out. Lost 200-300 Bbls water last 24 hrs.
3-06-79	8015	Drilling rhyolite. Finished going in hole. Drilled fractures at 7985', lost 30-40 Bbls water/hr for 4 hrs., still losing water. H_2S - 10 ppm. Flow line temperature at 8015' - 151° in, 162° out.
3-07-79	8061	Waiting on repairs for air compressor. Drilled 8 1/2" hole to 8061' at 11:30 am 3-06-79. Circulated 1 1/2 hrs. Ran Dual Induction Log, max. temp. 312°F. Went in hole w/DP, unloaded at 2395', 3215', 3943', 4687', and air compressor broke down at 4:30 am 3-07-79. Started out of hole, will run Agnew & Sweet while waiting on air compressor repairs.
3-08-79	8061	Repairing air compressor. Ran Agnew & Sweet. Maximum temperature 366°F after 22 mins at 8061'.

DAILY REPORT DETAILED

LEASE Campbell - E WELL NO. 2 SHEET NO. 8

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
3-09-79	8061	Blowing down with air. Repaired air compressor. Started unloading at 8:00 pm. Staged in hole, blew down at 2295', 3215', 3943', 4687', 5239'. Temperature 155°F. Recovering small amount of water.
3-10-79	8061	Nippling down BOP. Laid down drill pipe and drill collars. Started nippling down BOP.
3-11-79	8061	Tearing down rotary. Finished nippling down BOP. Ran 259 Jts, 2 7/8" OD, 6.5#, EUE, J-55 tubing. Set tubing at 7950'. RKB. Filled tubing with water.
3-12-79	8061	Tearing down rotary. Released rig at 10:00 am 3-11-79. Dry hole, not P & A, held for temperature observation. FINAL REPORT.

PHILLIPS 66 CO.
CAMBELL NO. E2
HOMOLT
PERISHING COUNTY NEVADA
GYROSCOPIC MULTISHOT

PAGE 1
DATE OF SURVEY JANUARY 19, 1979
VERTICAL SECTION DIRECTION
SUB-[illegible]

SPERRY-SUN, INC.
RECORD OF SURVEY

MEASURED DEPTH	TRUE VERTICAL DEPTH	SUB SEA TVD	COURSE INCLINATION DEG MIN	COURSE DIRECTION DEG	DOG-LEG SEV DEG/100	TOTAL RECTANGULAR COORDINATES NORTH/SOUTH	EAST/WEST	VERTICAL SECTION
0	0.	0.	ORIGIN AT SURFACE			0. N	0. E	0.
100	99.99	99.99	1 10	S 48 E	1.17	0.68 S	0.76 E	-1.01
200	199.97	199.97	1 25	S 22 E	0.63	2.51 S	1.98 E	-3.19
300	299.94	299.94	1 10	S 8 E	0.40	4.66 S	2.58 E	-5.19
400	399.93	399.93	1 0	S 13 W	0.43	6.52 S	2.53 E	-6.53
500	499.91	499.91	1 10	S 47 W	0.65	8.07 S	1.59 E	-7.05
600	599.89	599.89	1 5	S 81 W	0.66	8.91 S	0.09 W	-6.54
700	699.86	699.86	1 50	S 72 W	0.78	9.55 S	2.55 W	-5.37
800	799.81	799.81	1 40	S 81 W	0.32	10.27 S	5.51 W	-3.02
900	899.77	899.77	1 30	S 77 W	0.20	10.79 S	8.22 W	-2.49
1000	999.74	999.74	1 25	S 82 W	0.15	11.26 S	10.72 W	-1.16
1100	1099.71	1099.71	1 40	N 25 W	1.84	10.11 S	12.56 W	0.92
1200	1199.67	1199.67	1 50	N 18 W	0.27	7.28 S	13.66 W	3.77
1300	1299.60	1299.60	2 25	N 30 W	0.73	3.93 S	15.21 W	7.29
1400	1399.48	1399.48	3 5	N 7 W	1.28	0.57 N	16.59 W	11.55
1500	1499.34	1499.34	3 10	N 9 W	0.14	5.96 N	17.35 W	16.07
1600	1599.15	1599.15	3 45	N 18 W	0.80	11.80 N	18.80 W	21.36
1700	1699.00	1699.00	2 35	N 24 W	1.21	16.97 N	20.72 W	26.49
1800	1798.85	1798.85	3 35	N 23 W	1.00	21.91 N	22.86 W	31.58
1900	1898.67	1898.67	3 20	N 17 W	0.44	27.56 N	24.93 W	37.17

** THE CALCULATIONS ARE BASED ON THE MINIMUM RADIUS OF CURVATURE METHOD **

HORIZONTAL DISPLACEMENT = 37.17 FEET AT NORTH 42 DEG. 8 MIN. WEST (TRUE)

APPENDIX B

PHILLIPS PETROLEUM CO.
CAMBELL NO. E-2
HOMOLI FIELD
PERISHING COUNTY NEVADA
GYROSCOPIC MULTISHOT

DATE OF SURVEY FEBRUARY 16, 1979
VERTICAL SECTION DIRECTION CLOSURE

SU3-14459

SPERRY-SUN, INC.
RECORD OF SURVEY

MEASURED DEPTH	TRUE VERTICAL DEPTH	SUB SEA TVD	COURSE INCLINATION DEG MIN	COURSE DIRECTION DEG	DOG-LEG SEV DEG/100	TOTAL RECTANGULAR COORDINATES NORTH/SOUTH	EAST/WEST	VERTICAL SECTION
1900	1898.67	1898.67	ORIGIN AT 1,900 FT.			28.20 N	24.93 W	-18.98
2000	1998.60	1998.60	3 50	N 6 W	3.83	31.53 N	25.28 W	-18.68
2100	2098.40	2098.40	3 20	N 3 E	0.75	37.75 N	25.48 W	-17.67
2200	2198.21	2198.21	3 40	N 6 E	0.38	43.84 N	24.99 W	-16.01
2300	2297.95	2297.95	4 35	N 12 E	1.01	50.93 N	23.83 W	-13.49
2500	2497.24	2497.24	5 10	N 24 E	0.59	66.97 N	18.50 W	-5.15
2600	2596.92	2596.92	4 0	N 50 E	2.35	73.32 N	14.00 W	0.50
2700	2696.56	2696.56	5 45	N 61 E	1.98	78.00 N	6.94 W	8.32
2800	2795.99	2795.99	6 30	N 65 E	0.86	82.82 N	2.57 E	18.59
2900	2895.12	2895.12	8 35	N 71 E	2.22	87.64 N	14.76 E	31.48
3000	2993.89	2993.89	9 25	N 68 E	0.96	93.13 N	29.40 E	46.81
3100	3092.38	3092.38	10 30	N 67 E	1.10	99.76 N	45.37 E	63.87
3200	3190.69	3190.69	10 35	N 71 E	0.74	106.31 N	62.44 E	81.83
3300	3288.90	3288.90	11 10	N 73 E	0.69	112.13 N	80.38 E	100.61
3400	3386.85	3386.85	12 5	N 75 E	1.00	117.67 N	99.75 E	120.60
3500	3484.54	3484.54	12 35	N 77 E	0.66	122.83 N	120.48 E	142.02
3600	3582.04	3582.04	13 5	N 78 E	0.55	127.63 N	142.16 E	164.23
3700	3679.40	3679.40	13 20	N 80 E	0.52	131.99 N	164.59 E	187.07
3800	3776.51	3776.51	14 15	N 82 E	1.03	135.70 N	188.13 E	210.89
3900	3873.54	3873.54	13 45	N 82 E	0.50	139.07 N	212.09 E	235.05
4000	3970.59	3970.59	14 10	N 83 E	0.48	142.22 N	236.01 E	259.12
4100	4067.51	4067.51	14 20	N 84 E	0.30	145.00 N	260.46 E	283.65
4200	4164.29	4164.29	14 50	N 86 E	0.71	147.19 N	285.54 E	308.68
4300	4260.94	4260.94	14 55	N 87 E	0.27	148.75 N	311.16 E	334.12
4400	4357.38	4357.38	15 45	N 89 E	0.99	149.66 N	337.59 E	360.21
4500	4453.78	4453.78	15 5	N 90 E	0.72	149.90 N	364.17 E	386.34
4600	4550.06	4550.06	16 15	S 89 E	1.20	149.66 N	391.17 E	412.78
4700	4646.17	4646.17	15 50	N 89 E	0.69	149.65 N	418.80 E	439.88
4800	4742.05	4742.05	17 10	N 90 E	1.36	149.89 N	447.20 E	467.78
4900	4837.47	4837.47	17 40	S 88 E	0.78	149.36 N	477.12 E	497.04

PHILLIPS PETROLEUM CO.
CAMBELL NO. E 2
HOMOLT FIELD
PERISHING COUNTY NEVADA
GYROSCOPIC MULTISHOT

DATE OF SURVEY FEBRUARY 16, 1979
VERTICAL SECTION DIRECTION
CLOSURE

SU3-14459

SPERRY-SUN, INC.
RECORD OF SURVEY

MEASURED DEPTH	TRUE VERTICAL DEPTH	SUB SEA TVD	COURSE INCLINATION DEG MIN	COURSE DIRECTION DEG	DOG-LEG SEV DEG/100	TOTAL RECTANGULAR COORDINATES NORTH/SOUTH	EAST/WEST	VERTICAL SECTION
5000	4932.55	4932.55	18 25	S 86 E	0.97	147.73 N	508.04 E	527.05
5100	5027.27	5027.27	19 0	S 85 E	0.67	145.21 N	540.02 E	557.93
5200	5121.87	5121.87	18 50	S 84 E	0.36	142.10 N	572.29 E	588.99
5300	5216.67	5216.67	18 15	S 83 E	0.66	138.51 N	603.88 E	619.28
5400	5311.64	5311.64	18 15	S 84 E	0.31	134.96 N	635.00 E	649.12
5500	5406.97	5406.97	16 55	S 83 E	1.37	131.55 N	665.01 E	677.90

** THE CALCULATIONS ARE BASED ON THE MINIMUM RADIUS OF CURVATURE METHOD **

HORIZONTAL DISPLACEMENT = 677.90 FEET AT NORTH 78 DEG. 49 MIN. EAST (TRUE)

BIT RECORD - CAMPBELL "E" NO. 2

BIT. NO.	MAKE	SIZE	TYPE	JETS 32nd IN.	HOLE IN	DEPTH OUT	FOOTAGE	HOURS	WEIGHT 1000 LBS	RPM	PUMP PRESSURE	RATE GAL/MIN	BIT CONDITION
1 RE-TIP	—	17 1/2	V-7	OPEN	40	67	27	6 1/2	5	90	150	337	6-7-1
HO-1	HUGHES	26"	OSC3A	OPEN	40	57	17	6 1/2	5	80	150	290	6-8-1
2 RE-RUN	SMITH	17 1/2"	3-J-S	16-16-16	57	68	18	6	5	75	150	290	2-2-1
3	SMITH	12 1/4"	F-2	OPEN	68	215	147	12 1/2	5	50	150	210	—
HO-2	SMITH	17 1/2"	3-J-S	16-16-16	68	215	147	11	7	50	150	210	—
HO-1 RE-RUN	HTC	26"	OSC3A	OPEN	57	177	120	9	10	50	150	210	—
4 RE-RUN	SMITH	17 1/2"	4-J-S	16-16-16	159	818	659	53 3/4	20	45	500	255	4-4-1
5	REED	17 1/2"	2-1-J	18-18-18	818	1090	272	20 3/4	18	80	1000	250	4-8-1
6	REED	17 1/2"	13 J	14-20-20	1090	1415	325	20 1/2	18	80	1000	180	—
7	SECURITY	14 3/4"	M4NJ	OPEN	1415	1547	132	19 1/2	22	80	300	280	6-6-1
8	SECURITY	14 3/4"	M4NJ	OPEN	1547	1727	180	21 3/4	25	110	300	251	4-6-1
9 #3 RE-RUN	SMITH	12 1/4"	F-2	16-16-16	1727	2528	801	74 1/2	22	45	1000	250	2-2-1
10	HUGHES	12 1/4"	J-22	16-16-16	2528	3380	852	87 1/2	12	80	800	240	4-2-0
11	HUGHES	12 1/4"	J-22	18-18-18	3380	3870	490	84 1/4	15	60	800	265	4-4-1
12	HUGHES	12 1/4"	J-22	20-20-20	3870	4647	777	94 1/2	15	60	1000	270	5-6-1
13	HUGHES	12 1/4"	J-33	20-20-20	4647	5225	578	81	15	60	1000	270	5-7-1
14	HUGHES	12 1/4"	J-33	20-20-20	5225	5537	312	48 1/2	15	60	1000	270	—
15	HUGHES	8 1/2"	J-33	20-20-20	5537	6235	698	51 1/2	18	60	1000	250	6-4-1
16	HUGHES	8 1/2"	J-33	20-20-20	6235	6480	245	40	20	60	1000	250	2-3-0
17	HUGHES	8 1/2"	J-55	20-20-20	6480	6748	268	38	20	60	1000	255	—
18	HUGHES	8 1/2"	J-55	20-20-20	6748	7083	335	40 1/2	20	50	1000	255	3-1-0
19	HUGHES	8 1/2"	J-44	20-20-20	7083	7330	247	31 3/4	20	50	1000	255	—
20	HUGHES	8 1/2"	J-44	20-20-20	7330	7535	205	30 1/2	20	50	1000	255	5-5-1
21	HUGHES	8 1/2"	J-55	20-20-20	7535	7812	277	28	20	50	1000	255	5-4-1
22	HUGHES	8 1/2"	J-55	20-20-20	7812	8061	249	26 1/2	20	50	1000	255	5-4-1

BIT RECORD-DESERT PEAK B-23-1

BIT NO.	MAKE	SIZE	TYPE	JETS 32nd IN.	HOLE IN	DEPTH OUT	FOOTAGE	HOURS	WEIGHT 1000 LBS	RPM	PUMP PRESSURE	RATE GAL/MIN	BIT CONDITION
1	SMITH	12 1/4"	F-2	——	40	78	38	6	—	120	—	337	—
2 RE-RUN	SMITH	17 1/2"	3-JS	16-16-16	40	84	44	9 1/2	—	120	500	337	—
3 RE-RUN	HUGHES	26"	OSC-3	——	40	457	417	27 1/2	20	50	300	337	3-3-1
4	SMITH	17 1/2"	2-JS	24-24-24	457	660	203	12	15	50	500	320	4-4-4
5 RE-RUN	REED	26"	4-CONE	OPEN	76	457	381	10 1/2	—	50	200	270	—
4 RE-RUN	SMITH	17 1/2"	2-JS	24-24-24	660	1138	478	35 1/2	15	50	500	250	2-2-1
6	SMITH	17 1/2"	3-JS	24-24-24	1138	2596	1458	102	15	50	500	288	—
7	SMITH	17 1/2"	3-JS	24-24-24	2596	3068	472	47 1/2	20	50	500	300	—
8	REED	12 1/4"	T-5	20-20-20	3068	3129	61	7	15	50	400	—	—
9	HUGHES	12 1/4"	J-33	20-20-20	3129	3722	593	43	15	50	500	288	—
10	HUGHES	12 1/4"	J-33	20-20-20	3722	4688	966	72	15	50	500	266	3-3-1
11	HUGHES	12 1/4"	J-33	20-20-20	4688	5292	604	50	15	50	600	288	—
12	SMITH	8 1/2"	4-JS	OPEN	5292	5928	636	46	25	50	600	288	—
13	SMITH	8 1/2"	F-4	OPEN	5928	6163	235	28	25	50	600	310	4-2-0
14	HUGHES	8 1/2"	J-55	OPEN	6163	6511	348	33	25	50	600	310	3-4-0
15	HUGHES	8 1/2"	J-55	OPEN	6511	6807	296	32	25	50	600	310	—
16	HUGHES	8 1/2"	J-55	OPEN	6807	7078	271	26	25	50	600	310	—
17	SMITH	8 1/2"	SS-4	OPEN	7078	7506	428	32	25	50	600	300	—
18	SMITH	8 1/2"	F-5	OPEN	7506	7821	315	29 1/2	25	50	650	310	7-4-0
19	REED	8 1/2"	FP-72	OPEN	7821	8170	349	32	25	50	700	168	8-8-5
20	REED	8 1/2"	FP-53	OPEN	8170	8170	0		FISHING AND			—	—
21	SECURITY	8 1/2"	M-88	——	8170	8170	0		REAMING OPERATIONS			—	—
22	SMITH	7 7/8"	F-6	OPEN	8170	8310	140	19 1/2	16	50	700	293	—
23	SMITH	7 7/8"	F-6	OPEN	8310	8490	180	17 1/2	16	50	800	300	—
24	SMITH	7 7/8"	F-6	OPEN	8490	8708	218	21	16	50	600	284	—
25	SECURITY	7 7/8"	H-88	OPEN	8708	8971	263	21	16	50	800	306	—
26	SECURITY	7 7/8"	H-88	OPEN	8971	9215	244	18 1/2	16	50	700	288	—
27	REED	7 7/8"	FP-62	OPEN	9215	9370	155	15 1/2	15	50	800	310	—
28	HUGHES	7 7/8"	J-77	OPEN	9370	9477	107	12	18	50	900	300	2-1-0
29	HUGHES	7 7/8"	J-77	OPEN	9477	9567	90	11	18	50	800	288	0-0-2
30	HUGHES	7 7/8"	J-77	OPEN	9567	9620*	53	5 1/2	18	40	700	244	—
				* TD WAS CORRECTED TO 9641 BY STRAPPING PIPE									

P. O. BOX 6256
RENO, NEVADA 89513

March 14, 1979

Mr. M. Bullett
Geothermal Sample Library
University of Utah Research Institute
391 Chipeta Way
Salt Lake City, Utah 84108

Dear Mr. Bullett:

These samples were taken during the Campbell E-2 flow test. The well did not flow on its own and all samples were blown from the well by air while the bottom of the drill pipe was at various depths. The samples are unfiltered and were not altered in any manner. The following is a list of sampling information:

Date	Time	Sample #	Depth	Temperature (°F)	pH
3-6-79	0400	1155	5270'	170	8.9
3-8-79	2115	1156	3215'	155	8.05
3-8-79	2230	1157	3943'	172	8.8
3-8-79	2355	1158	4679'	183	8.3
3-9-79	0130	1159	5239'	185	8.9
3-9-79	0645	1160	5239'	161	---
3-9-79	0650	1161	5239'	161	9.0
3-9-79	0655	1162	5239'	161	---
3-9-79	0705	1163	5239'	184	7.9

If any questions arise please do not hesitate to contact me. Thank you.

Sincerely,

William L. Desormier

WLD:df

cc: E. Hoff

PHILLIPS PETROLEUM COMPANY
SALT LAKE CITY, UTAH 84110
BOX 239 TELEPHONE: 801 364-2083

NATURAL RESOURCES GROUP
Energy Minerals Division
Geothermal Operations

August 3, 1979

Dr. Howard P. Ross
Earth Sciences Laboratory
University of Utah Research Institute
391 Chipeta Way
Salt Lake City, Utah 84108

Dear Dr. Ross:

Delivered herewith are sepias and two copies of each downhole log run in connection with our drilling of the Humboldt House Campbell "E" No. 2 and Desert Peak B - 23-1 wells in western Nevada under DOE contract ET-78-C-08-1592. These logs represent full compliance with Article 3 Deliverables, Appendix A, Paragraph D(1), Items e(1) through e(5).

Tables listing the logs are attached. If you have any questions, do not hesitate to call.

Very truly yours,

Earl G. Hoff

Earl G. Hoff

EGH/lw

Attachments

cc: Mr. Joe Fiore
U.S. Dept. of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, Nevada 89114
(one print of each log)

R. T. Forest
John Whitmire

D2

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
420 CHIPETA WAY, SUITE 120
SALT LAKE CITY, UTAH 84108
TELEPHONE 801-581-5283

August 10, 1979

Mr. Earl G. Hoff
Phillips Petroleum Company
Natural Resources Group
Box 239
Salt Lake City, UT 84110

Dear Mr. Hoff,

I have completed an inventory of your August 3, delivery of downhole logs for the Humboldt House Campbell "E" No. 2 and Desert Peak B-23-1 wells completed under DOE contract ET-78-C-08-1592. The deliverables were found to be complete as indicated and represent a full delivery of Items e(1) through e(5) Paragraph D (1), Appendix A.

Thank you very much for the well organized data package and tabulation of logs.

Sincerely,

Howard P. Ross

Howard P. Ross
Project Manager

HPR:ls

cc: Joe Fiore,
DOE/NVO

PHILLIPS PETROLEUM COMPANY
SALT LAKE CITY, UTAH 84110
BOX 239 TELEPHONE: 801 364-2083

NATURAL RESOURCES GROUP
Energy Minerals Division
Geothermal Operations

August 28, 1979

Dr. Howard P. Ross
Earth Sciences Laboratory
University of Utah Research Institute
420 Chipita Way
Salt Lake City, Utah 84108

Re: DOE Contract ET-78-C-08-1592

Dear Dr. Ross:

Delivered herewith are sepias and two copies of each of the following items listed in Article 3, Deliverables, Appendix A, Paragraph D(2), Existing Data from Prior Investigations under subject contract:

Phase I - Humboldt House

a. Surface Map
b. Lithological log of Campbell E-1
c. Subsurface temperature survey of Campbell E-1
d. Subsurface temperature survey of Stratigraphic Test No. 4
e. Geologic cross-section
f. Magnetotelluric slice map
g. Directional well survey of Campbell E-1 (no sepia)
h. Daily drilling report of Campbell E-1 (no sepia)

Phase II - Desert Peak

a. Geologic map
b. Geologic cross-sections (2)
c. Subsurface temperature survey of Stratigraphic Test No. 7
d. Equilibrium temperature profile, Stratigraphic Test No. 2
e. Equilibrium temperature profile, Stratigraphic Test No. 5
f. Magnetotelluric slice map
g. Water analyses, Desert Peak 21-1 (no sepia)
h. Mud log, Desert Peak 21-1 and 21-2
i. Temperature surveys, Desert Peak 21-1 and 21-2
j. Daily drilling reports, Desert Peak 21-1, 21-2, and 29-1 (no sepias)
k. Ground magnetics map, Carson Sink Area
l. Gravity map, Carson Sink Area

If you have any questions, do not hesistate to call.

Very truly yours,

Earl G. Hoff

Earl G. Hoff

EGH/lw
Attachments

cc: Mr. Joe Fiore
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, Nevada 89114
(one print of each item)

R. T. Forest
John Whitmire

DS

CAMPBELL "E" NO. 2 - HUMBOLDT HOUSE

CHEMICAL ANALYSIS OF DRILLING FLUID

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
40 - 100					160	Quantab 78		.69
100 - 200					144	70		.98
200 - 300					144	246		1.15
300 - 400					120	228		.87
400 - 500					140	96		.71
500 - 600					168	78		1.05
600 - 700					176	78		.78
700 - 800					152	78		.98
800 - 900					148	78		.71
900 - 1,000					160	60		.87
1,000 - 1,100					168	78		.71
1,100 - 1,200					140	78		.71
1,200 - 1,300					116	78		.87
1,300 - 1,400					98	78		.98
1,400 - 1,500					28	96		.71
1,500 - 1,600					16	105		.78
1,600 - 1,700					3	78		.98
1,700 - 1,800					7	96		.71
1,800 - 1,900					1	15		.98
1,940 - 1,960	759.0	18.4	0.090	1.182	112	129	.730	2.25
1,960 - 1,980	736.0	32.8	0.090	1.182	130	114	.740	2.1
1,980 - 2,000	616.4	29.3	0.090	1.603	100	129	.960	2.3
2,000 - 2,020	855.6	54.7	0.090	1.804	116	144	.880	1.3
2,020 - 2,040	736.0	46.1	0.090	1.303	96	159	.820	1.35
2,040 - 2,060	791.2	46.1	0.090	1.202	96	114	.740	1.15

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
2,060 - 2,080	920.0	21.2	0.090	2.064	95	174	3.000	
2,080 - 2,100	910.8	20.5	0.090	1.824	95	129	.740	
2,100 - 2,120	851.0	20.2	0.090	1.202	85	129	1.080	
2,120 - 2,140	805.0	28.2	0.090	1.202	100	129	.700	
2,140 - 2,160	775.1	18.7	0.090	1.082	95	96	.820	
2,160 - 2,200	690.0	28.2	0.090	0.802	90 - 112	129-210	4.400-.740	1.3
2,200 - 2,220	713.0	18.0	0.090	1.403	70	114	.740	
2,220 - 2,240	759.0	35.3	0.090	1.202	136	144	2.800	1.15
2,240 - 2,260	>920.0	25.0	0.090	1.804	105	162	1.000	
2,260 - 2,280	825.7	36.8	0.090	1.102	120	159	1.600	2.3
2,280 - 2,300	809.6	18.8	0.090	1.483	98	174	.800	
2,300 - 2,320	731.4	17.1	0.090	1.824	83	114	.740	
2,320 - 2,340	853.3	21.8	0.090	1.583	93	144	2.100	
2,340 - 2,360	736.0	18.7	0.090	2.465	75	66	1.390	
2,360 - 2,380	853.3	20.3	0.090	1.383	100	144	1.360	
2,380 -2,400	828.0	19.6	0.090	1.403	88	48	.360	
2,400 - 2,420	837.2	18.8	0.090	1.403	95	66	.360	
2,420 - 2,440	897.0	19.5	0.090	1.403	95	129	1.000	
2,440 - 2,460	slightly >920.0	21.0	0.104	1.804	85 - 98	87	.510	
2,460 - 2,480	slightly >920.0	19.6	0.111	1.242	88	192	1.800	
2,480 - 2,500	>920.0	23.4	0.125	1.603	115	96	.510	
2,500 - 2,525	>920.0	26.6	0.139	2.004	108	84	.490	
2,525 - 2,540	>920.0	23.5	0.139	2.405	75	144	2.200	
2,540 - 2,570	>920.0	21.1	0.104	1.623	100	78	.490	
2,570 - 2,580	slightly >920.0	16.4	0.097	1.222	98	19	.680	
2,580 - 2,600	851.0	16.4	0.111	1.603	95	72	.500	

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
2,600 - 2,626	855.6	16.7	0.097	1.964	93	78	.800	
2,626 - 2,678	slightly >920.0	16.4	0.104	1.403	98-113	13	2.800	
2,678 - 2,730	>920.0	18.0	0.118	1.363	108-128	13-123	1.550	
2,730 - 2,770	>920.0	24.4	0.139	2.405	104-128	41-120	3.000	
2,770 - 2,780	>920.0	22.8	0.139	1.844	120	120	2.800	
2,780 - 2,800	>920.0	62.0	0.312	4.389	130		.640	
2,800 - 2,825	>920.0	54.3	0.278	3.848	125		1.120	
2,825 - 2,875	>920.0	21.2	0.118	1.804	125	96	.250	
2,875 - 2,880	>920.0	21.3	0.104	1.804	110	108	2.800	
2,880 - 2,900	>920.0	36.8	0.201	2.625	130		.250	
2,900 - 2,925	>920.0	25.7	0.139	2.004	130		2.800	
2,925 - 2,940	>920.0	21.8	0.125	1.603	125	114	2.800	
2,940 - 2,970	>920.0	27.8	0.139	2.004	110-130		.260	
2,970 - 2,980	>920.0	21.9	0.118	1.643	125	108	2.800	
2,980 - 3,000	>920.0	24.2	0.132	1.804	130		.260	
3,000 - 3,030	>920.0	29.7	0.160	3.006	123		2.800	
3,030 - 3,070	>920.0	21.1	0.090	1.784	120	Electrode 113	2.600	
3,070 - 3,170	>920.0	21.0	0.090	1.403	95-120	100	1.350	
3,170 - 3,220	906.2	17.4	0.090	1.403	105-115	100	2.900	
3,220 - 3,230	>920.0	18.8	0.097	1.603	140	103	3.100	
3,230 - 3,280	862.5	17.6	0.090	1.583	110	97	2.500	
3,280 - 3,325	908.5	18.0	0.069	1.603	120-135	97	2.700	
3,325 - 3,370	828.0	15.8	0.069	1.503	115	97	2.000	
3,370 - 3,420	754.4	14.9	0.069	1.202	100	97	1.200	
3,420 - 3,470	816.5	15.7	0.069	1.222	95	86	.760	

CAMPBELL "E" NO. 2 - HUMBOLDT HOUSE

CHEMICAL ANALYSIS OF DRILLING FLUID

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
3,470 - 3,500	678.5	12.4	0.069	1.202	95	55	.860	
3,500 - 3,525	736.0	13.7	0.069	1.363	70-140	120	1.950	
3,525 - 3,570	701.5	11.6	0.069	0.982	115	128	.450	
3,570 - 3,625	713.0	11.7	0.069	1.202	120	120	1.400	
3,625 - 3,675	660.1	10.2	0.069	0.982	105	128	.470	
3,675 - 3,730	676.2	10.2	0.069	0.982	90	106	1.560	
3,730 - 3,770	701.5	10.9	0.069	0.822	95	122	1.600	
3,770 - 3,830	664.7	10.9	0.069	0.982	90	122	1.350	
3,830 - 3,870	646.3	9.8	0.076	0.962	105	127	1.400	
3,870 - 3,930	667.0	10.9	0.076	0.802	85-100	120	2.400	
3.930 - 3,965	616.4	10.6	0.076	0.802	75	66	.630	
3.965 - 4,025	660.1	10.2	0.083	1.002	55	110	1.550	
4,025 - 4,075	701.5	10.6	0.076	0.802	90	122	1.800	
4,075 - 4,125	600.3	10.1	0.069	0.621	80	120	.640	
4,125 - 4,170	621.0	10.8	0.069	0.641	70	103	.650	
4,170 - 4,230	641.7	9.5	0.069	0.802	90	90	.680	
4,230 - 4,270	598.0	9.2	0.069	0.802	50	93	1.150	
4,270 - 4,325	526.7	9.4	0.056	0.621	50	110	1.400	
4,325 - 4,375	552.0	9.3	0.056	0.601	70	85	1.400	
4,375 - 4,425	572.7	8.6	0.069	0.601	85	90	1.800	
4,425 - 4470	563.5	9.1	0.056	0.541	75	113	1.500	
4,470 - 4,525	575.0	9.4	0.069	0.501	75		.950	
4,525 - 4,570	724.5	11.7	0.076	1.603	60	104	1.090	
4,570 - 4,625	595.7	11.7	0.062	1.002	60	100	1.550	
4,625 - 4,670	586.5	12.5	0.069	1.002	45	71	2.050	

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
4,670 - 4,735	609.5	11.7	0.056	1.202	50	117	1.210	
4,735 - 4,825	713.0	51.0	0.076	3.768	90	164	.840	
4,825 - 4,870	784.3	58.7	0.083	2.385	90	149	1.680	
4,870 - 4,920	699.2	26.6	0.076	1.623	80		.700	
4,920	703.8	33.6	0.076	2.224	85	97		
5,025 - 5,070	595.7	31.3	0.076	1.984	90	85	.820	
5,075 - 5,170	623.3	27.3	0.076	1.804	80	110	.610	
5,170 - 5,230	618.7	46.5	0.076	2.365	50	85	.700	
5,230 - 5,270	577.3	32.8	0.076	2.204	70	75	.590	
5,270 - 5,330	701.5	25.7	0.090	2.786	35	66	.520	
5,330 - 5,370	621.0	23.2	0.076	2.786	30		.510	
5,370	437.0	8.2	0.062	1.002	15	53		
5,430 - 5,470	432.4	10.2	0.056	1.603	8		.560	
5,470	434.7	8.8	0.056	1.603	15	58		
5,520 - 5,540	117.3	17.1	0.076	4.509	36	60	.690	
5,540 - 5,570	126.5	17.2	0.069	1.623	34	55	.700	
5,570 - 5,580	126.5	18.5	0.069	4.409	38	58	.900	
5,580 - 5,600	115.0	16.5	0.069	6.834	34	48	1.020	
5,600 - 5,620	117.3	16.4	0.083	6.212	38	58	1,000	
5,620 - 5,640	526.7	19.3	0.069	0.082	40	69	1.020	
5,640 - 5,670	434.7	20.0	0.069	2.385	40	69	1.000	
5,670	524.4	21.9	0.083	1.423	48	71	.850	
5,720 - 5,740	825.7	22.6	0.097	1.603	72	75	.810	
5,740 - 5,760	768.2	19.5	0.083	1.242	67	69	.900	
5,760 - 5,780	763.6	19.9	0.083	1.222	68	66	.700	

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DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
5,780 - 5,800	793.5	21.1	0.104	1.503	66	67	.650	
5,800 - 5,820	805.0	22.7	0.083	1.383	68	64	.810	
5,820 - 5,840	784.3	21.1	0.076	1.362	66	60	.660	
5,840 - 5,860	692.3	19.6	0.076	0.982	85	60	.610	
5,860 - 5,880	660.1	19.6	0.076	0.802	85	66	.720	
5,880 - 5,900	673.9	20.3	0.076	1.002	90	67	.940	
5,900 - 5,920	685.4	20.7	0.083	1.002	105	66	.860	
5,920 - 5,940	648.6	21.1	0.083	0.802	100	66	.500	
5,940 - 5,960	639.4	21.0	0.083	0.802	108	60	.540	
5,960 - 5,980	637.1	21.3	0.090	0.882	120	64	.580	
5,980 - 6,000	627.9	21.1	0.076	0.802	115	64	.540	
6,000 - 6,020	625.6	20.7	0.083	0.782	120	64	.780	
6,020 - 6,040	646.3	21.7	0.076	0.962	115	62	.740	
6,040 - 6,060	572.7	19.7	0.083	0.601	130	58	.630	
6,060 - 6,080	531.3	18.8	0.104	0.782	120	57	.690	
6,080 - 6,100	471.5	17.9	0.083	0.802	110	55	.690	
6,100 - 6,120	476.1	18.0	0.069	0.701	120	57	.750	
6,120 - 6,140	457.7	17.8	0.062	0.641	110	55	.700	
6,140 - 6,160	469.2	18.1	0.062	0.802	120	53	.630	
6,160 - 6,180	416.3	16.4	0.069	0.621	110	50	.600	
6,180 - 6,200	409.4	17.1	0.049	0.200	110	53	.640	
6,200 - 6,220	409.4	18.0	0.069	0.401	110	55	.680	
6,220 - 6,240	414.0	17.6	0.049	0.401	110	51	.760	
6,240 - 6,260	361.1	16.4	0.069	0.601	100	48	.630	
6,260 - 6,280	331.2	15.7	0.049	0.200	100	48	.580	

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
6,280 - 6,300	303.6	14.8	0.049	0.281	95	46	.560	
6,300 - 6,320	287.5	14.9	0.049	0.200	95	46	.600	
6,320 - 6,340	296.7	16.4	0.049	0.200	95	50	.740	
6,340 - 6,360	345.0	18.0	0.049	0.200	100	53	.760	
6,360 - 6,380	395.6	19.6	0.049	0.200	90	53	.540	
6,380 - 6,400	379.5	19.2	0.049	0.200	90	60	.580	
6,400 - 64,20	386.4	20.5	0.049	0.200	95	35	.590	
6,420 - 6,440	393.3	21.9	0.062	0.381	93	53	.430	
6,440 - 6,460	368.0	21.1	0.049	0.200	95	53	.480	
6,460 - 6,480	400.2	24.1	0.049	0.220	95	51	.480	
6,480 - 6,500	384.1	22.7	0.049	0.240	95	42	.460	
6,500 - 6,520	384.1	23.4	0.049	0.220	95		.420	
6,520 - 6,540	460.0	25.4	0.056	0.381	100		.500	
6,540 - 6,560	457.7	24.2	0.49	0.541	105	48	.460	
6,560 - 6,580	487.6	25.8	0.056	0.601	110	51	.510	
6,580 - 6,600	423.2	23.3	0.049	0.240	110	48	.510	
6,600 - 6,620	391.0	21.1	0.049	0.200	95	44	.480	
6,620 - 6,640	349.6	21.1	0.042	0.120	95	44	.440	
6,640 - 6,660	345.0	20.9	0.049	0.100	90	43	.400	
6,660 - 6,680	322.0	21.1	0.035	0.060	85	38	.510	
6,680 - 6,700	317.4	21.5	0.035	0.100	85	38	.500	
6,700 - 6,720	312.8	22.7	0.042	0.060	85	43	.820	
6,720 - 6,740	317.4	23.5	0.049	0.060	85	46	.550	
6,740 - 6,760	464.6	27.4	0.049	0.200	113	51	.580	

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
6,760 - 6,780	365.7	25.0	0.049	0.060	105	44	.500	
6,780 - 6,800	351.9	24.4	0.042	0.100	105	46	.460	
6,800 - 6,820	340.4	25.8	0.042	0.060	98	38	.500	
6,820 - 6,840	340.4	25.8	0.042	0.160	98	40	.490	
6,840 - 6,860	345.0	27.4	0.042	0.061	100	44	.460	
6,860 - 6,880	335.8	27.8	0.042	0.040	100	43	.510	
6,880 - 6,900	340.4	28.9	0.042	0.100	95	43	.590	
6,900 - 6,920	289.8	28.8	0.069	0.020	90	38	.590	
6,920 - 6,940	259.9	27.3	0.049		85	37	.640	
6,940 - 6,960	299.0	27.3	0.049	0.020	95	43	.780	
6,960 - 6,980	354.2	29.7	0.049		100	43		
6,980 -7,000	345.0	29.3	0.042	0.040	110	43		
7,000 - 7,020	342.7	29.7	0.042		110	43		
7,020 - 7,040	322.0	30.5	0.049	0.180	105	38		
7,040 - 7,060	331.2	30.6	0.035	0.080	110	40		
7,060 - 7,080	324.3	31.3	0.035	0.040	110	39		
7,080 - 7,100	324.3	31.3	0.049		110	43		
7,100 - 7,120	312.8	36.8	0.076	0.100	100	43		
7,120 - 7,140	278.3	34.0	0.097	0.120	90	40		
7,140 - 7,160	271.4	33.2	0.069	0.040	90	38		
7,160 - 7,180	276.0	33.8	0.069		85	37		
7,180 - 7,200	285.2	26.4	0.035		85	34		
7,200 - 7,220	289.8	27.4	0.035		85	34		
7,220 - 7,240	287.7	27.9	0.035	0.040	85	40		

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
7,240 - 7,260	292.1	27.7	0.035	0.202	85	36		
7,260 - 7,280	282.9	25.8	0.035		90	38		
7,280 - 7,300	250.7	24.2	0.035		90	34		
7,300 - 7,320	195.5	20.3	0.035		55	28		
7,320 - 7,340	202.4	22.8	0.035		70	31		
7,340 - 7,360	197.8	23.4	0.035		65	31		
7,360 - 7,380	308.2	22.7	0.049		75	32		
7,380 - 7,400	315.1	24.3	0.056		80	34		
7,400 - 7,420	372.6	27.4	0.076	0.180	70	37		
7,420 - 7,440	358.8	23.5	0.083	0.180	70	37		
7,440 - 7,460	342.7	29.6	0.083	0.200	70	32		
7,460 - 7,480	340.4	35.1	0.069		65	31		
7,480 - 7,500	328.9	34.4	0.069		65	36		
7,500 - 7,520	303.6	32.8	0.076		65	30		
7,520 - 7,540	343.9	32.1	0.069		70	34		
7,540 - 7,560	317.4	30.5	0.076		80	30		
7,560 - 7,580	303.6	32.1	0.069		75	31		
7,580 - 7,600	301.3	30.3	0.076		75	32		
7,600 - 7,620	305.9	31.3	0.076		80	36		
7,620 - 7,640	292.1	32.1	0.083		80	32		
7,640 - 7,660	294.4	31.3	0.090		75	32		
7,660 - 7,680	289.8	34.8	0.083		80	33		
7,680 - 7,700	273.7	35.2	0.083		75	28		
7,700 - 7,720	257.6	32.1	0.069		75	32		

DEPTH, FEET (INTERVAL)	Na^+ (ppm)	K^+ (ppm)	Li^+ (ppm)	CA^{++} (ppm)	SiO_2 (ppm)	Cl^- (ppm)	NH_3 (ppm)	B (ppm)
7,720 - 7,740	280.6	36.1	0.069	0.202	75	31		
7,780 - 7,800	218.5	46.9	0.069	2.204	75	27		
7,800 - 7,820	207.0	31.3	0.069	2.204	75	31		
7,820 - 7,840	161.0	23.5	0.069	2.004	75	31		
7,840 - 7,860	161.0	22.7	0.069	2.004	80	30		
7,860 - 7,880	161.0	23.5	0.069	2.004	83	30		
7,880 - 7,900	161.0	23.5	0.069	2.104	83	29		
7,900 - 7,920	138.0	22.7	0.069	3.006	75	28		
7,920 - 7,940	218.5	23.5	0.069	2.645	88	31		
7,940 - 7,960	230.0	23.5	0.069	2.605	90	33		
7,960 - 7,980	276.0	24.2	0.069	2.004	95	31		
7,980 - 8,000	230.0	31.3	0.069	0.401	98	30		
8,000 - 8,020	230.0	23.5	0.083	0.401	100	30		
8,020 - 8,040	276.0	31.3	0.083	0.581	103	30		
8,040 - 8,060	287.5	24.2	0.083	0.421	115	29		

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1155

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.31	mmoles/L	3.3	ppm
	CALCIUM	Ca	0.200	meq/L	4.0	ppm
	MAGNESIUM	Mg	0.012	meq/L	0.14	ppm
	POTASSIUM	K	1.64	meq/L	64.0	ppm
	SODIUM	Na	35.3	meq/L	812.	ppm
	LITHIUM	Li	0.32	meq/L	2.19	ppm
	AMMONIUM	NH_4	2.58	meq/L	46.5	ppm
	CHLORIDE	Cl	24.2	meq/L	857.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.017	meq/L	1.05	ppm
*	SILICA	SiO_2	0.017	mmoles/L	1.0	ppm
	SULFATE	SO_4	3.90	meq/L	187.	ppm
	CARBONATE BICARBONATE	CO_3 HCO_3	6.90	meq/L	421.	ppm ppm
	FLUORIDE	F	0.080	meq/L	1.52	ppm
	pH				8.19	
	CONDUCTIVITY @ 25° C				3978. (1:37)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Silica was determined in the brown bottle sample. This sample was diluted 20:1 therefore to make silica values compatible with other species they should be multiplied by 20.

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1156

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.35	mmoles/L	3.8	ppm
	CALCIUM	Ca	0.898	meq/L	18.0	ppm
	MAGNESIUM	Mg	0.037	meq/L	0.45	ppm
	POTASSIUM	K	1.87	meq/L	73.3	ppm
	SODIUM	Na	38.3	meq/L	880.	ppm
	LITHIUM	Li	0.44	meq/L	3.08	ppm
	AMMONIUM	NH_4	27.72	meq/L	500.	ppm
	CHLORIDE	Cl	34.4	meq/L	1220.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.012	meq/L	0.75	ppm
*	SILICA	SiO_2	0.028	mmoles/L	1.7	ppm
	SULFATE	SO_4	2.88	meq/L	138.	ppm
	CARBONATE BICARBONATE	CO_3 HCO_3	5.56	meq/L	339.	ppm ppm
	FLUORIDE	F	0.15	meq/L	2.78	ppm
	pH				7.93	
	CONDUCTIVITY @ 25° C				5081.(1:45)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Silica was determined in the brown bottle sample. This sample was diluted 20:1 therefore to make silica values compatible with other species they should be multiplied by 20.

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1157

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.37	mmoles/L	4.05	ppm
	CALCIUM	Ca	0.175	meq/L	3.5	ppm
	MAGNESIUM	Mg	<0.0082	meq/L	<0.10	ppm
	POTASSIUM	K	2.506	meq/L	98.0	ppm
	SODIUM	Na	43.1	meq/L	990.	ppm
	LITHIUM	Li	0.50	meq/L	3.47	ppm
	AMMONIUM	NH_4	5.54	meq/L	100.	ppm
	CHLORIDE	Cl	37.5	meq/L	1330.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.011	meq/L	0.66	ppm
*	SILICA	SiO_2	0.11	mmoles/L	2.0	ppm
	SULFATE	SO_4	2.56	meq/L	123.	ppm
**	CARBONATE BICARBONATE	CO_3 HCO_3	0.43 6.32	meq/L	13. 359.	ppm ppm
	FLUORIDE	F	0.043	meq/L	2.61	ppm
	pH				8.49	
	CONDUCTIVITY @ 25° C				5333. (1:45)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Silica was determined in the brown bottle sample. This sample was diluted
**Carbonate/Bicarbonate was determined by titration.
*Silica(con't) - 20:1 therefore to make silica values compatible with other species they should be multiplied by 20.

Laboratory Director

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1158

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.46	mmoles/L	5.0	ppm
	CALCIUM	Ca	0.634	meq/L	12.7	ppm
	MAGNESIUM	Mg	0.354	meq/L	4.30	ppm
	POTASSIUM	K	3.09	meq/L	121.	ppm
	SODIUM	Na	51.8	meq/L	1190.	ppm
	LITHIUM	Li	0.65	meq/L	4.48	ppm
	AMMONIUM	NH_4	34.4	meq/L	620.	ppm
	CHLORIDE	Cl	47.7	meq/L	1690.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.0085	meq/L	0.53	ppm
*	SILICA	SiO_2	0.14	mmoles/L	2.5	ppm
	SULFATE	SO_4	2.50	meq/L	120.	ppm
	CARBONATE BICARBONATE	CO_3 HCO_3	6.87	meq/L	419.	ppm ppm
	FLUORIDE	F	0.037	meq/L	2.22	ppm
	pH				8.35	
	CONDUCTIVITY @ 25° C				6678.(1:60)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Silica was determined in the brown bottle sample. This sample was diluted 20:1 therefore to make silica values compatible with other species they should be multiplied by 20.

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1159

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.57	mmoles/L	6.11	ppm
	CALCIUM	Ca	2.05	meq/L	4.1	ppm
	MAGNESIUM	Mg	<0.0082	meq/L	<0.10	ppm
	POTASSIUM	K	2.97	meq/L	116.	ppm
	SODIUM	Na	49.6	meq/L	1140.	ppm
	LITHIUM	Li	0.62	meq/L	4.31	ppm
	AMMONIUM	NH_4	33.8	meq/L	610.	ppm
	CHLORIDE	Cl	46.0	meq/L	1630.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.0097	meq/L	0.60	ppm
	SILICA	SiO_2	0.88	mmoles/L	53.1	ppm
	SULFATE	SO_4	2.42	meq/L	116.	ppm
**	CARBONATE BICARBONATE	CO_3 HCO_3	0.60 6.94	meq/L	18. 387.	ppm ppm
	FLUORIDE	F	0.13	meq/L	2.50	ppm
	pH				8.64	
	CONDUCTIVITY @ 25° C				6655.(1:58)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

**Carbonate/Bicarbonate were determined by titration.

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LABORATORY NO. 0252-79
DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1160

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.53	mmoles/L	5.7	ppm
	CALCIUM	Ca	0.324	meq/L	6.5	ppm
	MAGNESIUM	Mg	<0.0082	meq/L	<0.10	ppm
	POTASSIUM	K	3.04	meq/L	119.	ppm
	SODIUM	Na	51.8	meq/L	1190.	ppm
	LITHIUM	Li	0.69	meq/L	4.76	ppm
	AMMONIUM	NH_4	N.A.	meq/L	N.A.	ppm
	CHLORIDE	Cl	48.8	meq/L	1730.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.0081	meq/L	0.5	ppm
	SILICA	SiO_2	1.25	mmoles/L	75.1	ppm
*	SULFATE	SO_4	1.92	meq/L	92.2	ppm
**	CARBONATE BICARBONATE	CO_3 HCO_3	1.70 4.13	meq/L	51. 252.	ppm ppm
	FLUORIDE	F	0.14	meq/L	2.72	ppm
	pH				8.91	
	CONDUCTIVITY @ 25° C				6626.(1:59)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Sulfate was determined gravimetrically.
**Carbonate/Bicarbonate was determined by titration.

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IDENTIFICATION 1161

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.49	mmoles/L	5.3	ppm
	CALCIUM	Ca	0.32	meq/L	6.5	ppm
	MAGNESIUM	Mg	<0.0082	meq/L	<0.10	ppm
	POTASSIUM	K	2.99	meq/L	117.	ppm
	SODIUM	Na	51.3	meq/L	1180.	ppm
	LITHIUM	Li	0.67	meq/L	4.68	ppm
	AMMONIUM	NH_4	129.	meq/L	2325.	ppm
	CHLORIDE	Cl	48.2	meq/L	1710.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.016	meq/L	1.0	ppm
	SILICA	SiO_2	1.16	mmoles/L	70.0	ppm
*	SULFATE	SO_4	1.92	meq/L	92.2	ppm
**	CARBONATE BICARBONATE	CO_3 HCO_3	1.67 4.36	meq/L	50. 266.	ppm ppm
	FLUORIDE	F	0.13	meq/L	2.55	ppm
	pH				8.92	
	CONDUCTIVITY @ 25° C				6566.(1:58)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Sulfate was determined gravimetrically.
**Carbonate/Bicarbonate was determined by titration.

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IDENTIFICATION 1162

CAMPBELL "E" NO. 2

	SPECIES		VALUE FOUND		VALUE FOUND	
	BORON	B	0.55	mmoles/L	6.0	ppm
	CALCIUM	Ca	0.32	meq/L	6.4	ppm
	MAGNESIUM	Mg	<0.0082	meq/L	<0.10	ppm
	POTASSIUM	K	2.76	meq/L	108.	ppm
	SODIUM	Na	46.5	meq/L	1070.	ppm
	LITHIUM	Li	0.62	meq/L	4.29	ppm
	AMMONIUM	NH_4	66.5	meq/L	1200.	ppm
	CHLORIDE	Cl	44.9	meq/L	1590.	ppm
	NITRATE NITRITE	NO_3 NO_2	0.016	meq/L	1.0	ppm
	SILICA	SiO_2	0.97	mmoles/L	58.6	ppm
*	SULFATE	SO_4	1.68	meq/L	80.7	ppm
**	CARBONATE BICARBONATE	CO_3 HCO_3	1.47 3.41	meq/L	44. 208.	ppm ppm
	FLUORIDE	F	0.12	meq/L	2.31	ppm
	pH				8.91	
	CONDUCTIVITY @ 25° C				6097.(1:54)	µmhos/cm
	BASIN NUMBER					
	TEMPERATURE					
	DATE COLLECTED					

*Sulfate was determined gravimetrically.
**Carbonate/Bicarbonate was determined by titration.

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DATE OF REPORT April 13, 1979
DATE RECEIVED March 20, 1979
IDENTIFICATION 1163

CAMPBELL "E" NO. 2

SPECIES		VALUE FOUND		VALUE FOUND	
BORON	B	0.42	mmoles/L	4.5	ppm
CALCIUM	Ca	0.474	meq/L	9.5	ppm
MAGNESIUM	Mg	0.016	meq/L	0.19	ppm
POTASSIUM	K	2.40	meq/L	94.	ppm
SODIUM	Na	36.1	meq/L	830.	ppm
LITHIUM	Li	0.51	meq/L	3.52	ppm
AMMONIUM	NH_4	42.1	meq/L	760.	ppm
CHLORIDE	Cl	38.6	meq/L	1370.	ppm
NITRATE NITRITE	NO_3 NO_2	0.0056	meq/L	0.35	ppm
* SILICA	SiO_2	<0.017	mmoles/L	<1.0	ppm
SULFATE	SO_4	2.04	meq/L	98.	ppm
CARBONATE BICARBONATE	CO_3 HCO_3	1.00	meq/L	61.	ppm ppm
FLUORIDE	F		meq/L	1.55	ppm
pH				7.37	
CONDUCTIVITY @ 25° C				4874.(1:45)	µmhos/cm
BASIN NUMBER					
TEMPERATURE					
DATE COLLECTED					

*Silica was determined in the brown bottle sample. This sample was diluted 20:1 therefore to make silica values compatible with other species they should be multiplied by 20.

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