GL02867-4 of 10

UNION 76 — GEOTHERMAL DIVISION

WELL 72-7 FEDERAL
FIELD CARSON LAKE
COMPANY UNION OIL CO.
COUNTY CHURCHILL
STATE NEVADA
LOCATION 734'S, 962'W of NE corner of Sec. 7, T17N, R30E — EL. 3916'
KB EL. 3921' — T.D. 2892'
BHL — (vertical hole)

SPUD DATE AUGUST 6, 1981
COMPLETION DATE AUGUST 19, 1981
DRILLING CONTRACTOR SOUTHWEST DRILLING
ENGINEERS ALLISON, BRAY
GEOLOGISTS BEHRMAN

CASING RECORD

DIA	INTERVAL	
13 3/8"	0'-38'	Good Returns
9 5/8"	0'-236'	Good Returns
7"	0'-701'	Poor Returns; top cement job required
2 7/8"	0'-T.D (tubing)	

LOGGING RUNS

DATE	INTERVAL	SERVICES	TEMPERATURES	TC
8/19/81	701'-2880'	DIL-SFL, S-P, G.R.	222, 222, 222°F	3 hrs
8/19/81	701'-2872'	SONIC, S-P	230, 230, 230°F	5.2 hrs
8/19/81	701-790'	F.D.	191, 192°F	7.2 hrs
8/19/81	50'-790'	CNL, G.R., Caliper	191, 192°F	[illegible]
8/19/81	701-2887'	Dipmeter, caliper	244, 245°F	2.5 hrs
9/1/81	0'-T.D.	TEMPERATURE LOG (Gy. U.O.C.)		13 days

PROPRIETARY

RIG TEST

DATE	TIME	SIP/TIME	WHP	FLP	ΔP	FLT	ORIFICE	RATE

REMARKS

REMARKS

EXPLANATION

DRILLING

NB	NEW BIT
RRB	RERUN BIT
CB	CORE BIT
DD	DIRECTIONAL DRLG.
BW	BIT WEIGHT
DEV	DEVIATION
KOP	KICK OFF POINT
DST	DRILL STEM TEST
LC	LOST CIRCULATION
PB	PLUG BACK
DP	DRILL PIPE
DC	DRILL COLLAR
KB	KELLY BUSHING

LITHOLOGY

SHALE; ARGILLITE (MICROGRAYWACKE)
MUDSTONE
GRAYWACKE SANDSTONE
CONGLOMERATE
LIMESTONE
DOLOMITE
EVAPORITE
CHERT
SERPENTINITE
GREENSTONE
METAMORPHIC
UNCONSOLIDATED GRAVEL & SAND
SILTSTONE

FELSIC INTRUSIVE
INTERMEDIATE INTRUSIVE
MAFIC INTRUSIVE
FELSIC EXTRUSIVE
INTERMEDIATE EXTRUSIVE
MAFIC EXTRUSIVE
TUFF
VOLCANIC BRECCIA
TUFFACEOUS SEDIMENTS (siltstone or sandstone)
Tuffaceous clay

MINERALS

Q	QUARTZ
C	CALCITE
E	EPIDOTE
CH	CHLORITE
F	FELDSPAR
M	MICA
Z	ZEOLITE
CY	CLAY
O	OPAL (CHALCEDONY)
L	LIMONITE
H	HEMATITE
P	PYRITE
S	SPHALERITE
G	GALENA
Cu	Copper Minerals (Silicates & Carbonates)

PHYSICAL-CHEMICAL

T	TEMPERATURE
BH	BOTTOM HOLE
DH	DOWN HOLE
FL	FLOW LINE
BU	BOTTOMS UP
TC	TIME SINCE CIRC
P	PRESSURE
WH	WELL HEAD
SI	SHUT IN
PPM	PARTS PER MILLION
MW	MUD WEIGHT
CR	CIRCULATION RATE
VIS	VISCOSITY
WL	WATER LOSS
GP	GALVANIC PROBE
CHL	CHLORIDES

PENETRATION / LITHOLOGY / PHYSICAL-CHEMICAL / MISC.

DEPTH FEET (DATE) — PENETRATION: ☒ FT/HR. ☐ MIN/FT — OVER FLOW SCALE — PRIMARY SCALE 50 40 30 20 10

LITHOLOGY: PRIMARY LITHOLOGY — SECONDARY MINERALS (ABUNDANT / COMMON / TRACE / RARE) — BULK COLOR — DESCRIPTION

PHYSICAL-CHEMICAL: TEMP ☒°F ☐°C — CHEM PPM — FLOWLINE / SUCTION / SURVEY (BH) / MAX READ THERMO — H_2S PPM — CO_2 PPM

MISC.

No Sample

@2400 HRS 8/6/81

Depth	Secondary minerals	Bulk color	Description	Misc.
	P	Green to Tan to Brown	0-240' interbedded clay, siltstone, sandstone and conglomerate (gravel): (all rocks are poorly consolidated): clay: green color; poorly consolidated; v. fine grained siltstone: l. green, white, tan colors, v. fine gr.; some qtz & mica fragments are recognized sandstone: l. green to tan color; gr. size commonly <1.0 mm; silica cement; subangular to subrounded; framework clasts consist primarily of quartz & volcanics gravels: red color; fine sand to granule size; subrounded; composed primarily of volcanics	@40' Bit # 1-RR 17½" STC S8J 40'
	P			
	P			
	Q	grey to green		@243' Bit # 2RR 12¼" STC DTJ 203'/15
			240'-500' interbedded shale, siltstone,	

ESTIMATED BY DRILLER

GEOLOGIST ON @ 240'

@2400 HRS 8/7/81 SCALE CHANGE 100 90 80 70 60 50 40 30 20 10

Depth scale: 100, 200, 300

composed primarily of volcanics

240'-500' interbedded shale, siltstone, sandstone and minor gravels (all rocks moderately to well consolidated); shale is v. fine gr; siltstone contains locally abundant sand-size mica and quartz grains; sandstone contains primarily quartz and volcanic rock fragments, subrounded clasts, <1.0 mm; silica cement

red, white and green — 480'-560' interbedded conglomerate and clay (maybe mudflows): clay is unconsolidated; conglomerate is hematite-stained and consists of 1-6 mm size, well rounded volcanic, quartzitic and rare sedimentary clasts.

@565' WELL START to FLOW 20 gal/m OF 102°F

tan, grey, brown — 560'-760' Tuff/Tuffaceous sediments: well consolidated, v. fine grained (clay to siltstone size); quartz, feldspar, hematite-stained and rock fragments are locally common in the matrix; glass shards + "clay" pumaceous fragments comprise the matrix; vesicles are present (filled with quartz + chlorite) locally; abundant pyrite.

@725' Bit # 3RR 8 4/4 200 Reed Y113 482'

@725' WELL FLOWING WHILE SETTING TEMP. ESTIMATED

@ 2400 HRS ON 8/9/81

Tan — 760-820 Clay/Tuff - unconsolidated; sticky, gummy texture; v. fine grained; consists primarily of clay (altered glass) - abundant pyrite

tan to brown — 820-960 Tuff/Tuffaceous sediments (sat. to clay size): moderately to poorly indurated; v. fine grained; mica + feldspar grains locally abundant; locally laminated. Abundant pyrite.

Grey — 960-1000' Tuff - v. hard; contains abundant glass shards + pumice fragments; vesicles filled with qtz, chlorite + calcite; plagioclase crystals are abundant in the matrix

← diluted mud pits with cool H_2O

@ 2400 HRS ON 8/11/81

Brick red, dark green, dark grey — 1000'-1020' Volcanics (intermediate composition) - v. hard, plag. phenocrysts + plagioclase microlites set in a v. fine grained granular matrix

← MIXED NEW MUD

@1205' Bit # 4 6 1/8" and like [illegible]

1020'-1040' Tuff - consists of fine grained volcanic fragments, [illegible] are set in a matrix of glass shards; vole. clasts are pumaceous (vesicles filled with chlorite, qtz, calcite); also includes some very fine-grained tuff (nodules or rock fragments)

← MIXED NEW MUD

@ 1205 Bit #5 NR 6 1/8" REED Y123 57 1/2 hrs

1040'-1680' Volcanics - mafic to possibly (?) intermediate composition; color primarily dark brown/dark green or where altered (chlorite-stained) brick red; locally contain plagioclase + pyroxene (?) phenocrysts; abundant microlites of plagioclase set in an aphanitic matrix; contains variable amount of vesicles which are primarily filled with chlorite, chalcedony, + calcite; chlorite veins are also common

← LCM + cool H_2O added to mud pits

← LCM + cool H_2O added to mud pit

@1395' Bit FELL about 6'; soon after we began to lose m[illegible] Lost ~25 bbls/mud [illegible]

@ 1455' Lost 25-30 bbls

@ 2400 HRS ON 8/12/81

1680'-1760' Primarily Tuff/Pumice + variable amounts of mafic volcanics (probably sloughing from upper part of hole); Pumice/Tuff has a light green to grey color, highly vesicular fragments (filled with chlorite + chalcedony) which contain abundant glass shards + locally feldspar crystals + microlites of plagioclase. Mafic Volcanics are identical to those described previously (1040-1680')

@1650'-1660' Fractures (condensed by forg[illegible]

L. green

Dark Brown to Dark Green — 1760' - 1900' Volcanics - Mafic composition; color primarily dark green/dark brown with locally brick-red; minor plagioclase phenocrysts; abundant plagioclase microlites set in an aphanitic matrix; abundant vesicles filled with chlorite + chalcedony

@1981' Bit #6 RR 6 1/8" 200°F STC F3 516/18

← STARTED ADDING COOL H_2O to MUD Pits

← PAN [illegible]

Dark Brown — 1900 - 2140 Volcanics [illegible] composition; dark brown color; very hard; pyroxene or (?) amphibole phenocrysts; commonly rare, but locally abundant vesicles which are filled

COOL H_2O TOPPED

@1899' Twist 360 RECOVERED [illegible]

1700 – 2140 Volcanics

composition; dark brown color; very hard; pyroxene & (?) amphibole phenocrysts; commonly rare, but locally abundant vesicles which are filled with chlorite, quartz, chalcedony, & 100 calcite; matrix is v. fine grained, but has a granular texture & appears to be rich in plagioclase & magnetite (?)

2140' – 2280' Volcanics – intermediate to felsic composition; dark grey color; very hard; abundant amphibole, quartz and plagioclase phenocrysts set in an aphanitic matrix; abundant vesicles which are filled with quartz, chlorite, chalcedony; quartz – calcite veins are not common; locally the matrix is hematite-stained

2280' – 2780' Mixture of the following rock types:

1) Volcanics – intermediate to felsic composition; hornblende, plagioclase and quartz (?) phenocrysts (granular crystals) set in an aphanitic matrix; locally vesicular (filled with chalcedony, calcite, chlorite) locally hematite-stained matrix

2) Volcanics – mafic to intermediate composition; rare plagioclase phenocrysts; abundant plagioclase microlites set in an aphanitic matrix; abundant vesicles which are filled with chalcedony, chlorite, calcite; commonly the matrix is hematite-stained

3) Tuff (intermediate to felsic composition); tan color; moderately indurated; includes very fine-grained rocks & coarser (sand-size tuff); in coarser rocks feldspar (quartz) crystals and abundant rock fragments are common; locally vesicular clasts (pumice) are present

2780' – 2992' Volcanics – felsic composition – white to light grey color; very hard; variable amounts (typically rare) of hornblende, biotite and plagioclase; aphanitic matrix which appears to be composed entirely of quartz – feldspar; minor amounts of Tuff & mafic to intermediate volcanics occur with these felsics, but they are probably Slough Material (description N/A)

T.D. 2892'

Dark Brown

Dark Grey

Dark Brown to Dark grey to reddish

White to light grey

@ 2400 HRS 8/14/81

@ 2400 HRS 8/15/81

@ 2400 HRS 8/16/81

@ 2400 HRS 8/17/81

@ 2400 HRS 8/18/81

T.D. @ 1100 HRS 8/19/81

Mixed New Mud

Add H2O to mud

Recovered

@ 2335' Bit #8 NB STC F3 3

@ 2070' Twisted Recovered