MUDLOGS

EXLOG SMITH
GEOTHERMAL DIVISION

R. F. SMITH CORP.

GEOTHERMAL DATA LOG

Company U N O C A L

Well Name GLASS MOUNTAIN FEDERAL UNIT #87-13

Field GLASS MOUNTAIN

County SISKIYOU State CALIFORNIA

Location N813095.62, E2118847.72, T43N, R3E, (MDM)

Elevation 6728'

Contractor/Rig LOFFLAND BROS. RIG #28

Spud Date 10/11/89 TD Date 10/28/89

TD 3010' True Vertical Depth N.A.

Bottom Hole Location N.A.

Well Status COMPLETED

Company Representative TOM HAAS

LOGGED INTERVAL

Date Logged 10/11/89 to 10/30/89

Depth Logged 36' to 3010'

Mud Drilling 36' to 3010'

Air Drilling NONE to

Temperature Instrument Type T THERMOCOUPLE

Log Scale 1:600 Unit No. 2097

Log Prepared By MIKE KRAMER, KURT LEINHAUPEL

KEVEN McNAMERA, DAVID MYHER

HOLE SIZE / CASING

HOLE SIZE	CASING
to	30" at 36'
17.50" to 217'	13.38" at 216'
12.25" to 873'	9.625" at 870'
8.75" to 2374'	7" LNR at 2355'
6.25" to 3010'	4.5LNR at 3010'

STEAM ENTRIES

NONE

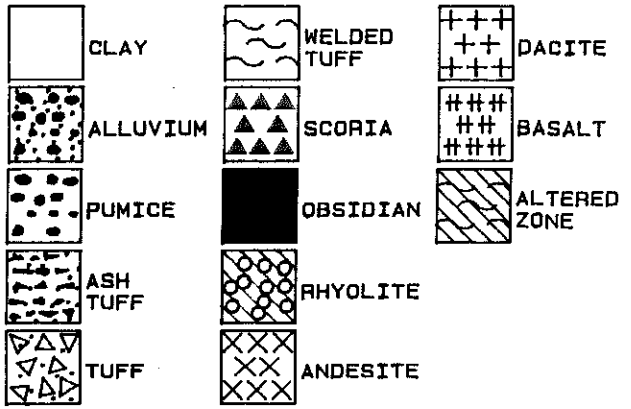
LOST CIRCULATION ZONES

331' TTL (230BBL)	2565' (60BBL/HR)
720' (11BBL/HR)	2572' TTL (2148~
1408' (81BBL)	BBL F/2572-3010'
1704' TOTAL	
1750' (90BBL)	

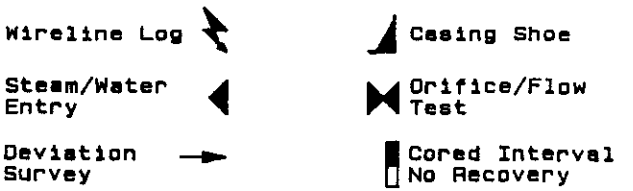
REMARKS

FLOW AND INJECTION TEST WELL

LITHOLOGY SYMBOLS



LOG SYMBOLS



SECONDARY MINERALS

Q	=	Quartz	rare << 1%
C	=	Calcite	trace < 1%
P	=	Pyrite	minor 1% up to 4%
E	=	Epidote	common 4% up to 7%
Ch	=	Chlorite	abun 7% up to 10%
Cl	=	Clay	> 10%
Z	=	Zeolite	

ABBREVIATIONS

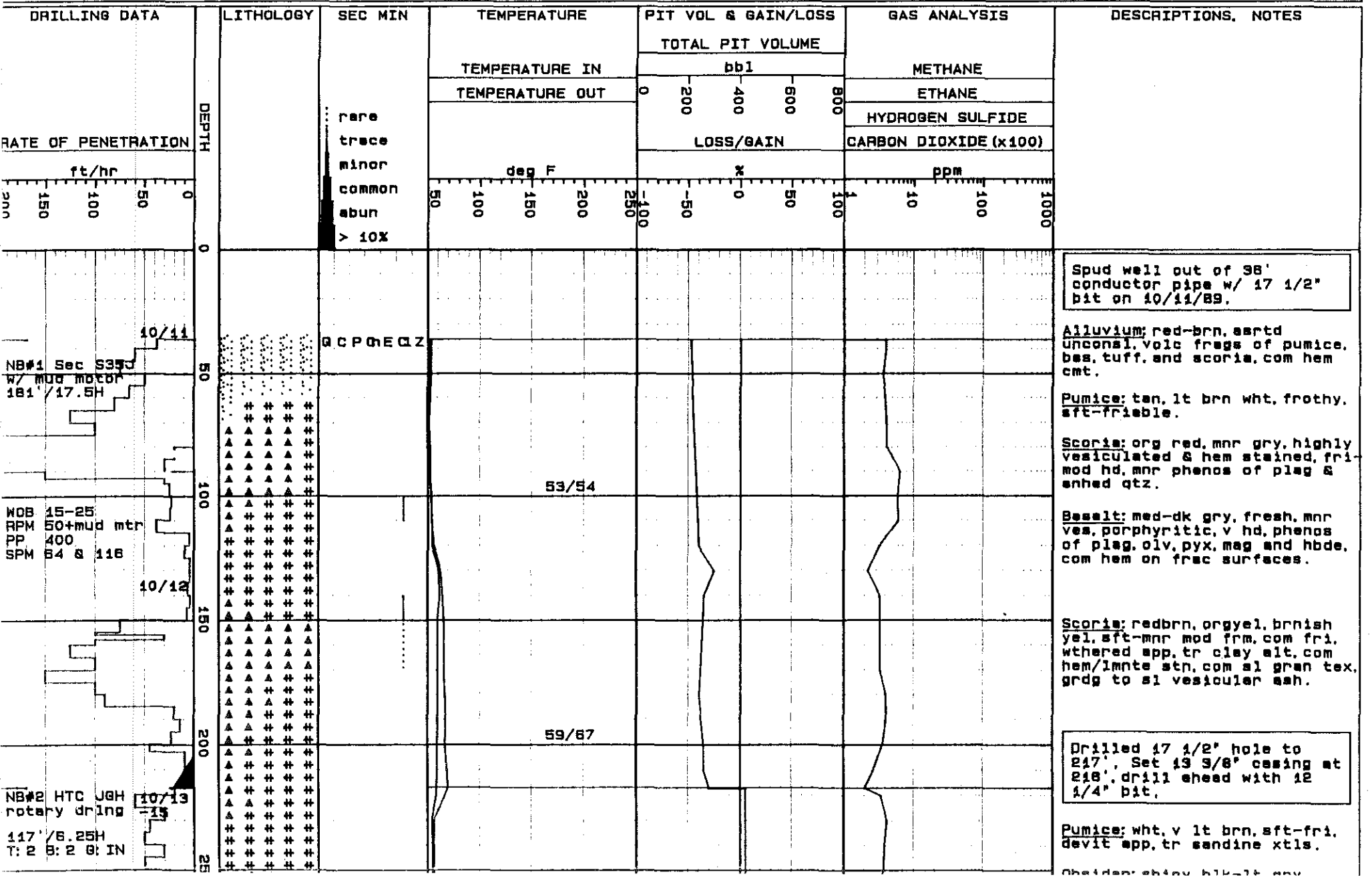
NB	New Bit	BHT	Bottom Hole Temp
RRB	Re Run Bit	C	Carbide Test
CB	Core Bit	NR	No Returns
WOB	Weight On Bit	LAT	Logged After Trip
SPM	Strokes/Minute	CFM	Cubic Feet/Minute

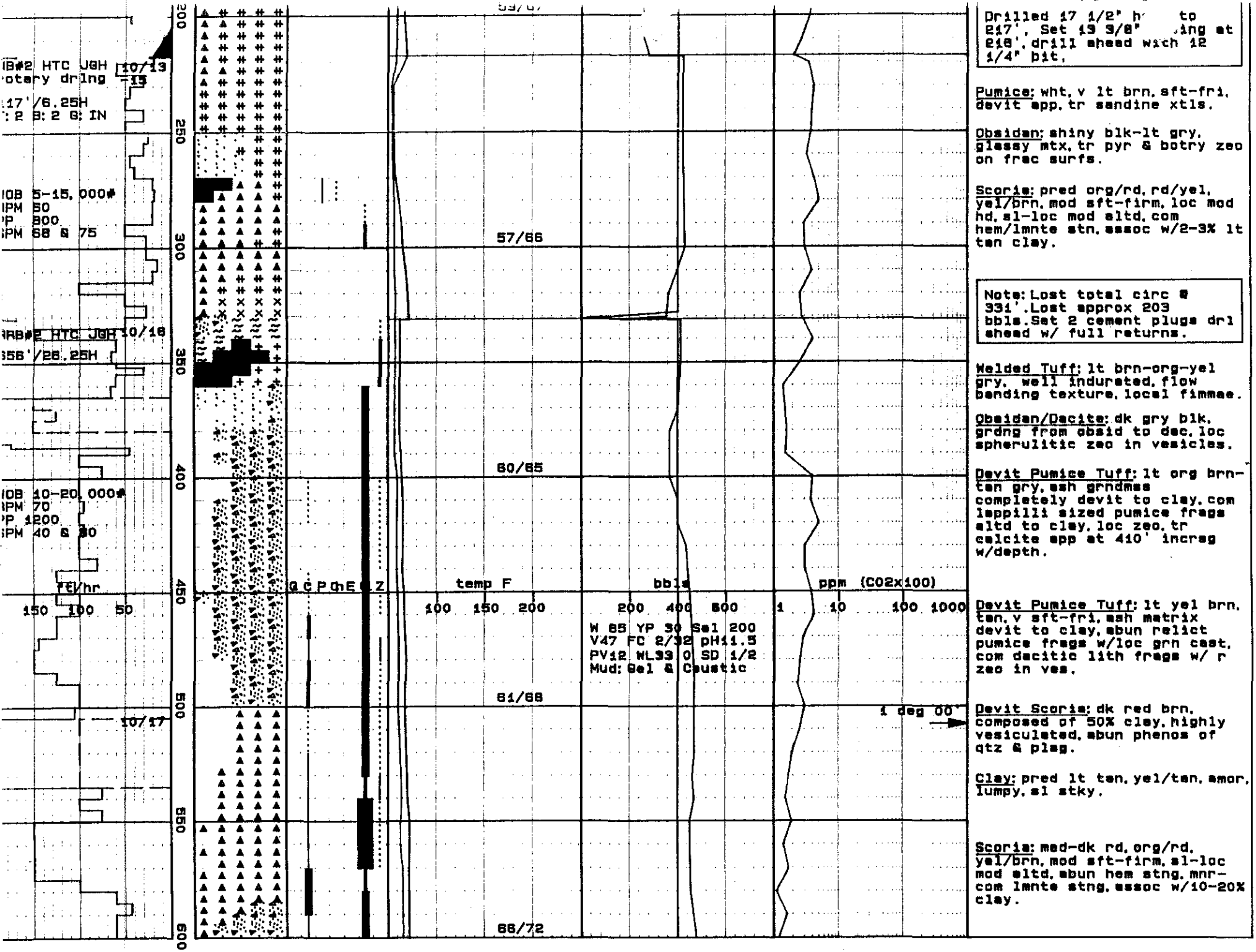
EXLOG SMITH
GEOTHERMAL DIVISION

UNOCAL

GLASS MOUNTAIN FEDERAL UNIT 87-13

Scale 1 : 600





Drilled 17 1/2" h to 217', Set 13 3/8" ing at 218', drill ahead with 12 1/4" bit.

Pumice: wht, v lt brn, sft-fri, devit app, tr sandine xtls.

Obsiden: shiny blk-lt gry, glassy mtx, tr pyr & botry zeo on frac surfs.

Scoria: pred org/rd, rd/yel, yel/brn, mod sft-firm, loc mod hd, sl-loc mod eltd, com hem/lmnte stn, assoc w/2-3% lt tan clay.

Note: Lost total circ @ 331'. Lost approx 203 bbls. Set 2 cement plugs drl ahead w/ full returns.

Welded Tuff: lt brn-org-yel gry, well indurated, flow banding texture, local fimmae.

Obsiden/Dacite: dk gry blk, grdng from obsid to dac, loc spherulitic zeo in vesicles.

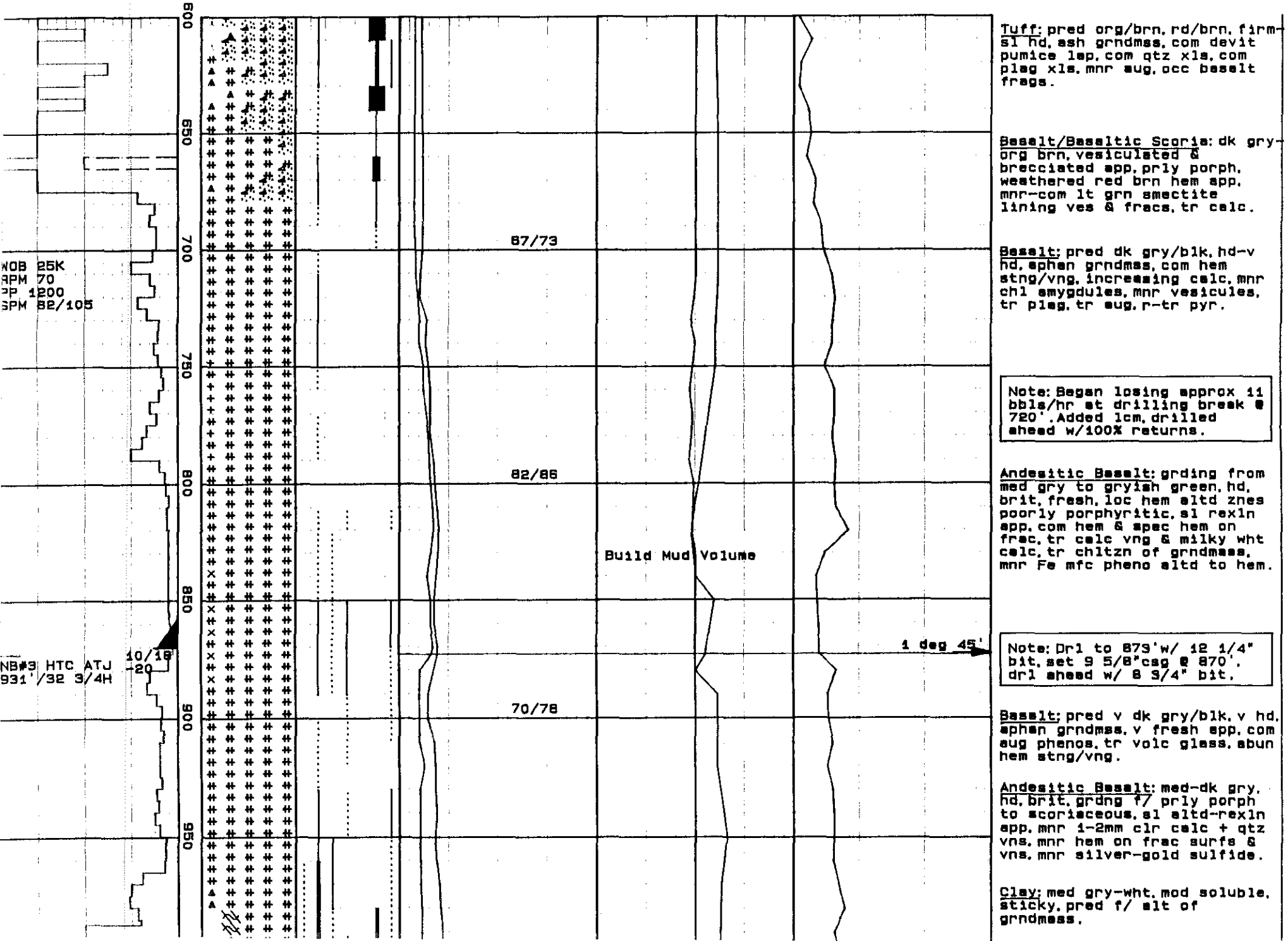
Devit Pumice Tuff: lt org brn-tan gry, ash grndmss completely devit to clay, com lappilli sized pumice frags eltd to clay, loc zeo, tr calcite app at 410' increag w/depth.

Devit Pumice Tuff: lt yel brn, tan, v sft-fri, ash matrix devit to clay, abun relict pumice frags w/loc grn cast, com dacitic lith frags w/ r zeo in ves.

Devit Scoria: dk red brn, composed of 50% clay, highly vesiculated, abun phenos of qtz & plag.

Clay: pred lt tan, yel/tan, amor, lumpy, sl stky.

Scoria: med-dk rd, org/rd, yel/brn, mod sft-firm, sl-loc mod eltd, abun hem stng, mnr-com lmnte stng, assoc w/10-20% clay.



Tuff: pred org/brn, rd/brn, firm-sl hd, ash grndmss, com devit pumice lap, com qtz xls, com plag xls, mnr aug, occ basalt frags.

Basalt/Basaltic Scoria: dk gry-org brn, vesiculated & brecciated app, prly porph, weathered red brn hem app, mnr-com lt grn smectite lining ves & fracs, tr calc.

Basalt: pred dk gry/blk, hd-v hd, aphan grndmss, com hem stng/vng, increasing calc, mnr chl amygdules, mnr vesicules, tr plag, tr aug, r-tr pyr.

Note: Began losing approx 11 bbls/hr at drilling break @ 720'. Added lcm, drilled ahead w/100% returns.

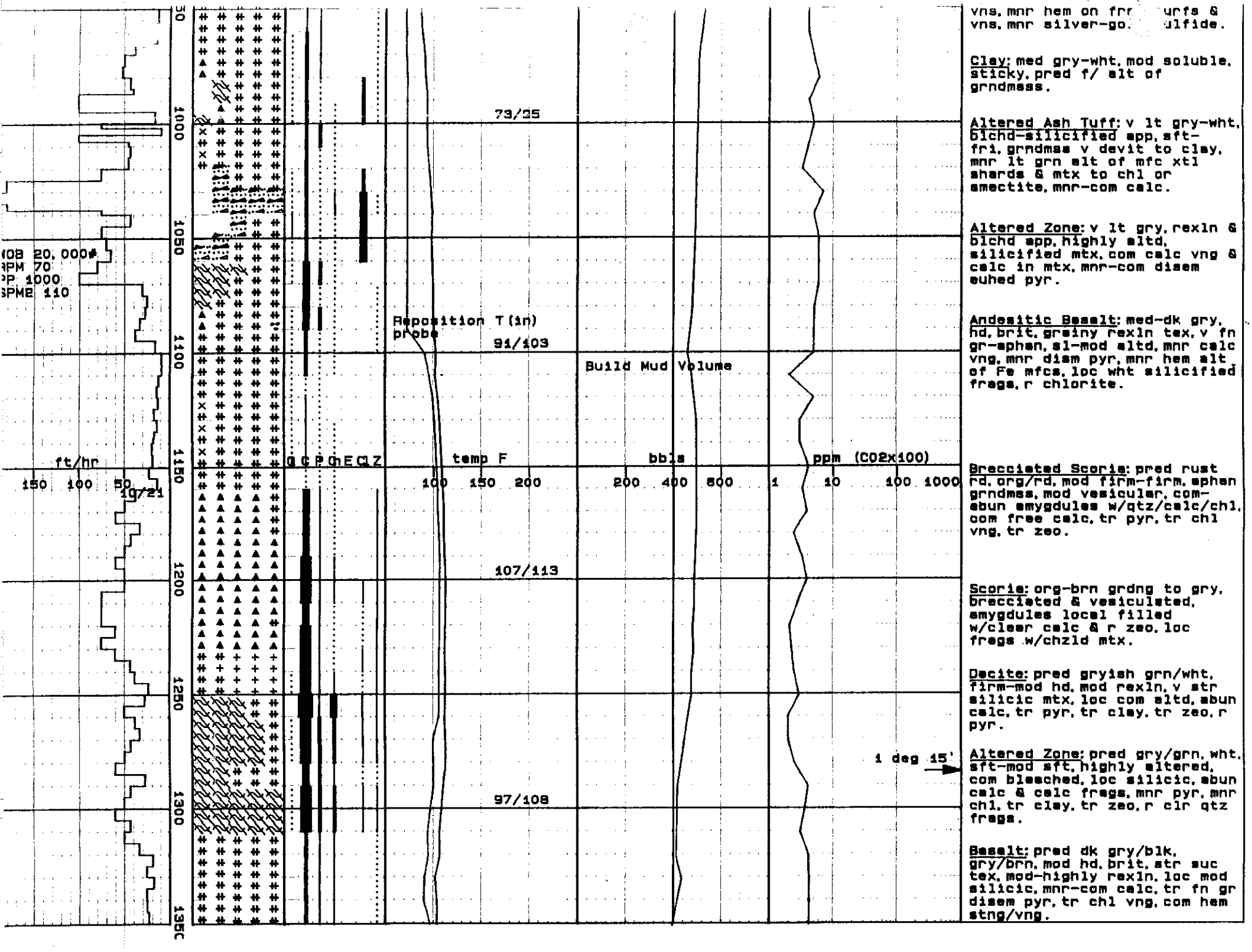
Andesitic Basalt: grdng from med gry to gryish green, hd, brit, fresh, loc hem altd znes poorly porphyritic, sl rexln app, com hem & spec hem on frac, tr calc vng & milky wht calc, tr chltzn of grndmass, mnr Fe mfc pheno altd to hem.

Note: Drl to 873'w/ 12 1/4" bit, set 9 5/8"csg @ 870'. drl ahead w/ 8 3/4" bit.

Basalt: pred v dk gry/blk, v hd, aphan grndmss, v fresh app, com aug phenos, tr volc glass, abun hem stng/vng.

Andesitic Basalt: med-dk gry, hd, brit, grdng f/ prly porph to scoriaceous, sl altd-rexln app, mnr 1-2mm clr calc + qtz vns, mnr hem on frac surfs & vns, mnr silver-gold sulfide.

Clay: med gry-wht, mod soluble, sticky, pred f/ alt of grndmass.



vns, mnr hem on frr urfs & vns, mnr silver-go. ulfide.

Clay: med gry-wht, mod soluble, sticky, pred f/ alt of grndmass.

Altered Ash Tuff: v lt gry-wht, blchd-silicified app, sft-fri, grndmss v devit to clay, mnr lt grn alt of mfc xtl shards & mtx to chl or smectite, mnr-com calc.

Altered Zone: v lt gry, rexln & blchd app, highly altd, silicified mtx, com calc vng & calc in mtx, mnr-com disem euhed pyr.

Andesitic Basalt: med-dk gry, hd, brit, grainy rexln tex, v fn gr-aphan, sl-mod altd, mnr calc vng, mnr dism pyr, mnr hem alt of Fe mfcs, loc wht silicified frags, r chlorite.

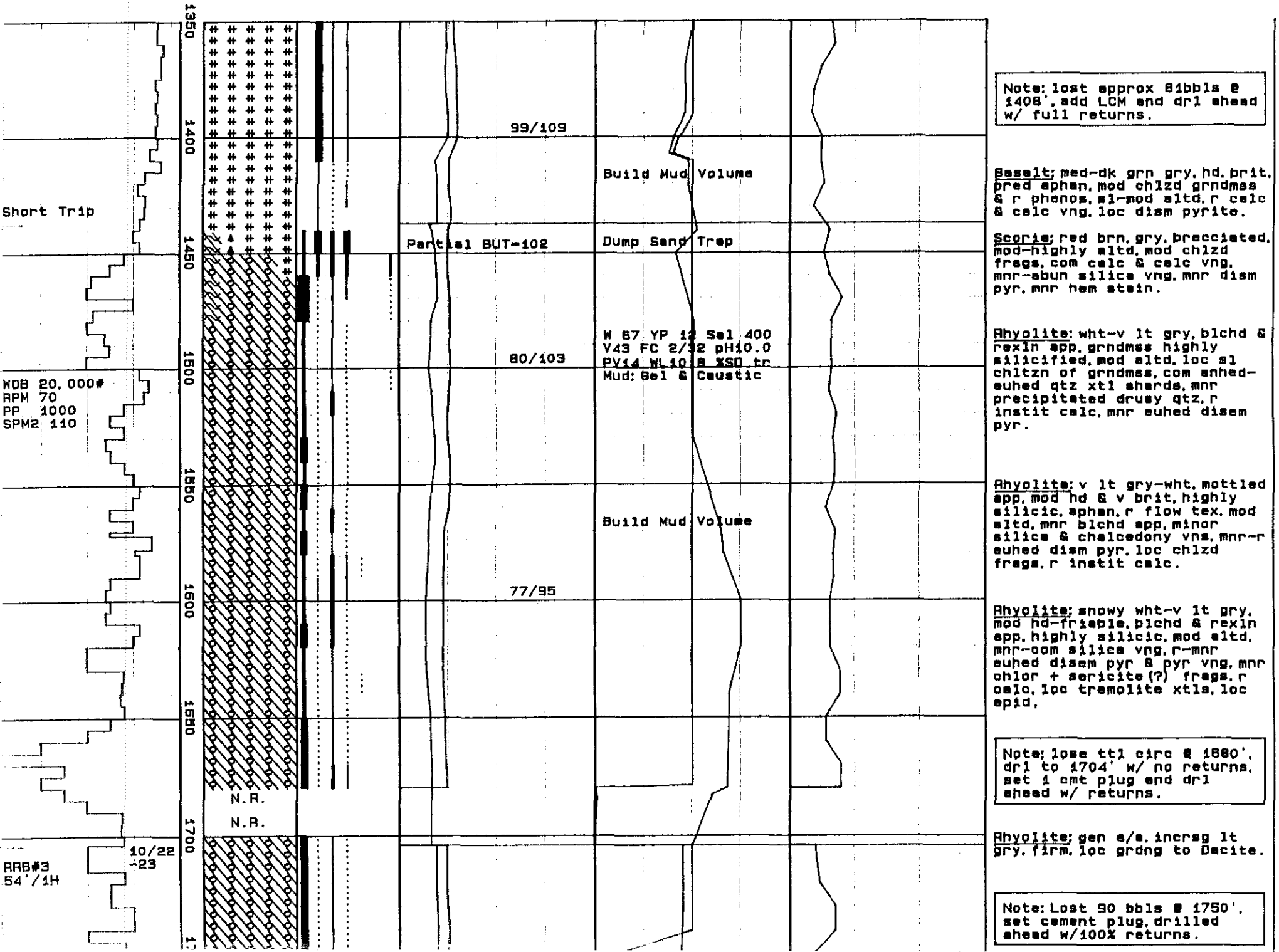
Breccieted Scoria: pred rust rd, org/rd, mod firm-firm, aphan grndmss, mod vesicular, com-abun amygdules w/qtz/calc/chl, com free calc, tr pyr, tr chl vng, tr zeo.

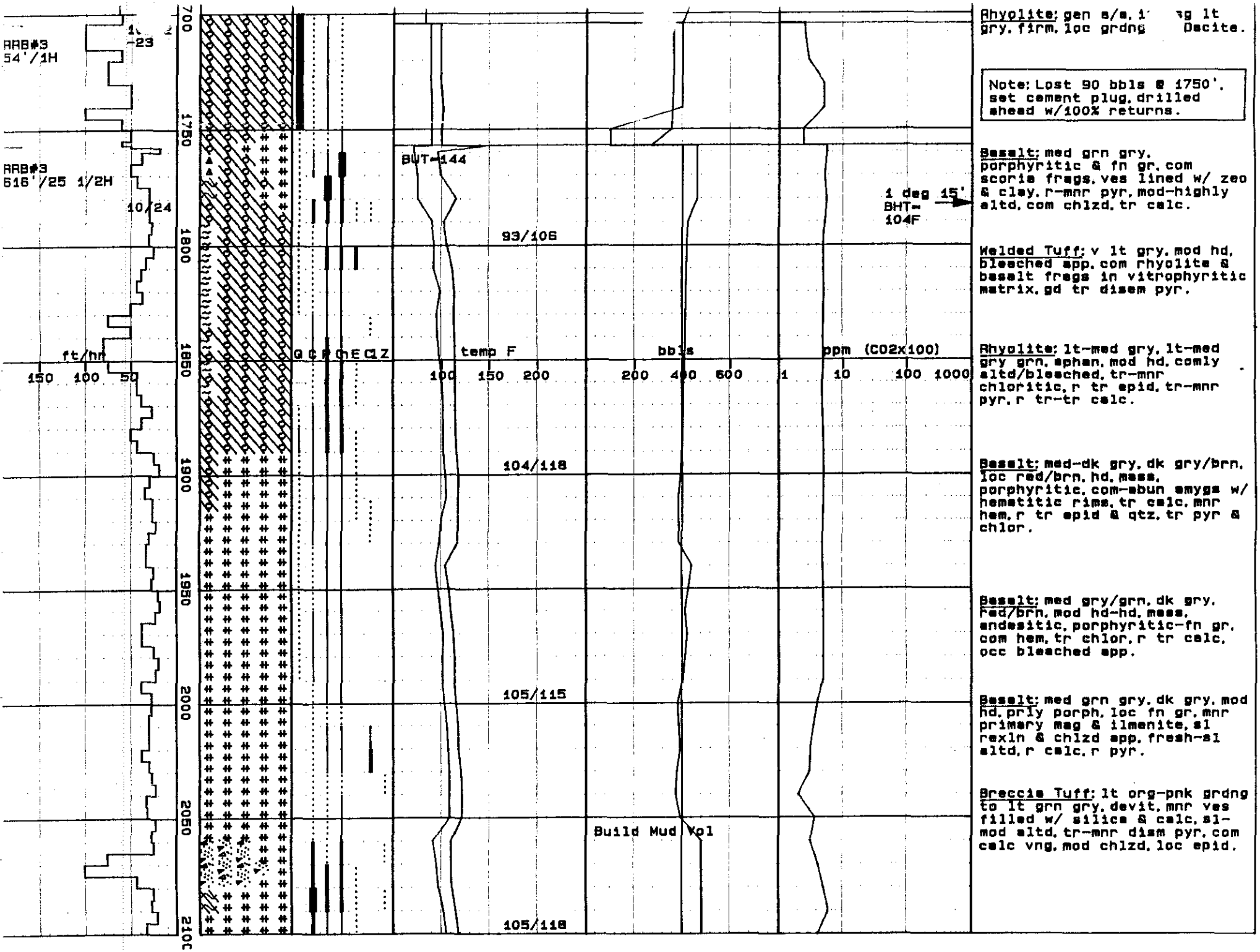
Scoria: org-brn grdng to gry, breccieted & vesiculated, amygdules local filled w/clear calc & r zeo, loc frags w/chzld mtx.

Decite: pred gryish grn/wht, firm-mod hd, mod rexln, v str silicic mtx, loc com altd, abun calc, tr pyr, tr clay, tr zeo, r pyr.

Altered Zone: pred gry/grn, wht, sft-mod sft, highly altered, com bleached, loc silicic, abun calc & calc frags, mnr pyr, mnr chl, tr clay, tr zeo, r clr qtz frags.

Basalt: pred dk gry/blk, gry/brn, mod hd, brit, str suc tex, mod-highly rexln, loc mod silicic, mnr-com calc, tr fn gr disem pyr, tr chl vng, com hem stng/vng.


1350
1400
1450
1500
1550
1600
1650
1700
Short Trip
WOB 20,000#
RPM 70
PP 1000
SPM2 110
RRB#3
54'/1H
10/22
-23
99/109
Build Mud Volume
Partial BUT-102
Dump Sand Trap
W 67 YP 12 Sal 400
V43 FC 2/32 pH10.0
Pv14 WL10.8 %SD tr
80/103
Mud: Gel & Caustic
Build Mud Volume
77/95
N.R.
N.R.
Note: lost approx 81bbls @ 1408', add LCM and drl ahead w/ full returns.
Basalt; med-dk grn gry, hd, brit, pred aphan, mod chlzd grndmss & r phenos, sl-mod altd, r calc & calc vng, loc dism pyrite.
Scoria; red brn, gry, brecciated, mod-highly altd, mod chlzd frags, com calc & calc vng, mnr-abun silica vng, mnr dism pyr, mnr hem stain.
Rhyolite: wht-v lt gry, blchd & rexln app, grndmss highly silicified, mod altd, loc sl chltzn of grndmss, com anhed-euhed qtz xtl shards, mnr precipitated drusy qtz, r instit calc, mnr euhed disem pyr.
Rhyolite; v lt gry-wht, mottled app, mod hd & v brit, highly silicic, aphan, r flow tex, mod altd, mnr blchd app, minor silica & chalcedony vns, mnr-r euhed disem pyr, loc chlzd frags, r instit calc.
Rhyolite; snowy wht-v lt gry, mod hd-frieble, blchd & rexln app, highly silicic, mod altd, mnr-com silica vng, r-mnr euhed disem pyr & pyr vng, mnr chlor + sericite(?) frags, r oslo, loc tremolite xtls, loc epid,
Note; lose ttl circ @ 1680', drl to 1704' w/ no returns, set 1 cmt plug and drl ahead w/ returns.
Rhyolite; gen s/s, incrsg lt gry, firm, loc grdng to Dacite.
Note: Lost 90 bbls @ 1750', set cement plug, drilled ahead w/100% returns.



Rhyolite: gen s/s, i[illegible]g lt gry, firm, loc grdng Dacite.

Note: Lost 90 bbls @ 1750', set cement plug, drilled ahead w/100% returns.

Basalt: med grn gry, porphyritic & fn gr, com scoria frags, ves lined w/ zeo & clay, r-mnr pyr, mod-highly altd, com chlzd, tr calc.

Welded Tuff: v lt gry, mod hd, bleached app, com rhyolite & basalt frags in vitrophyritic matrix, gd tr disem pyr.

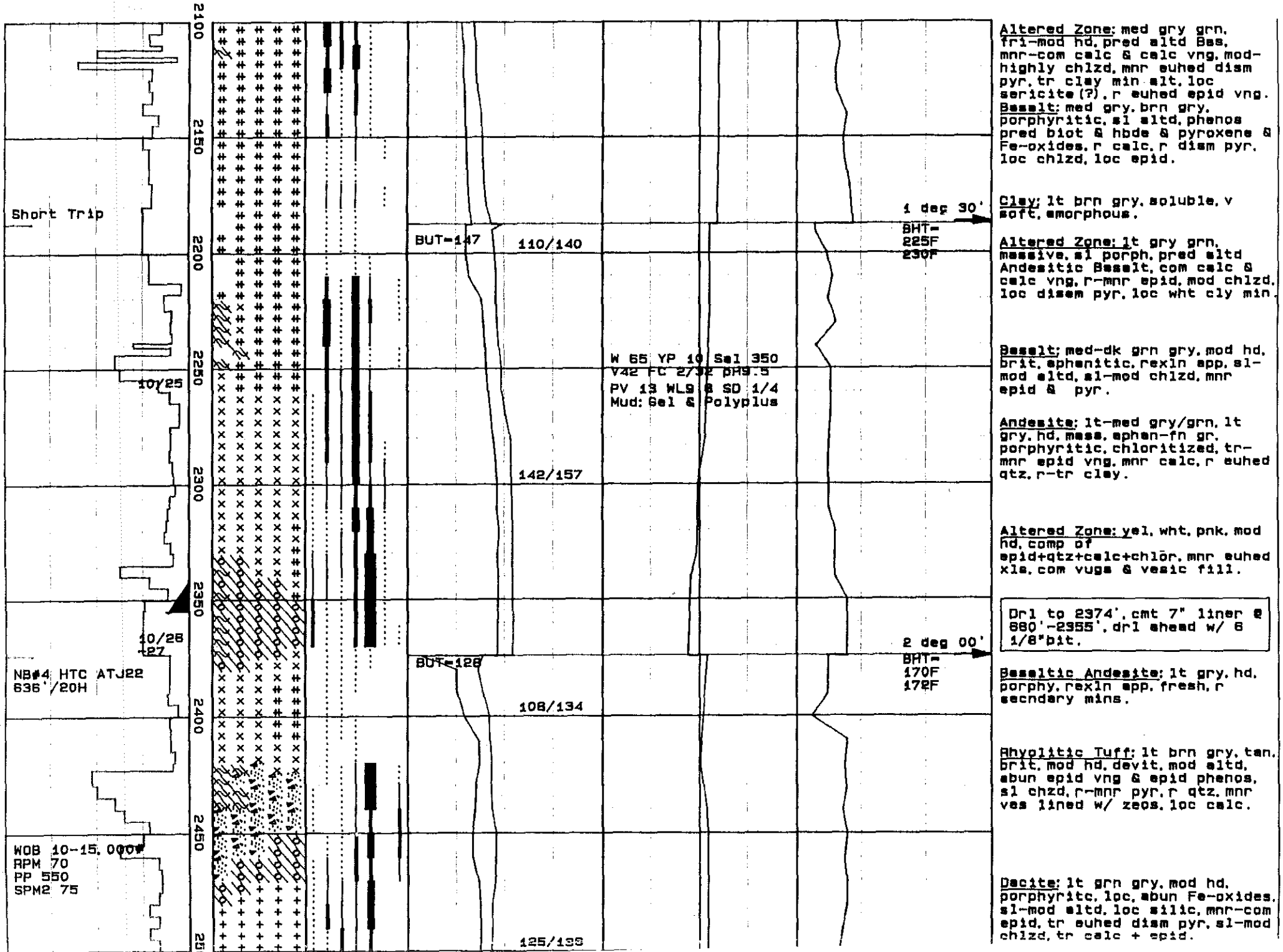
Rhyolite: lt-med gry, lt-med gry grn, aphan, mod hd, comly altd/bleached, tr-mnr chloritic, r tr epid, tr-mnr pyr, r tr-tr calc.

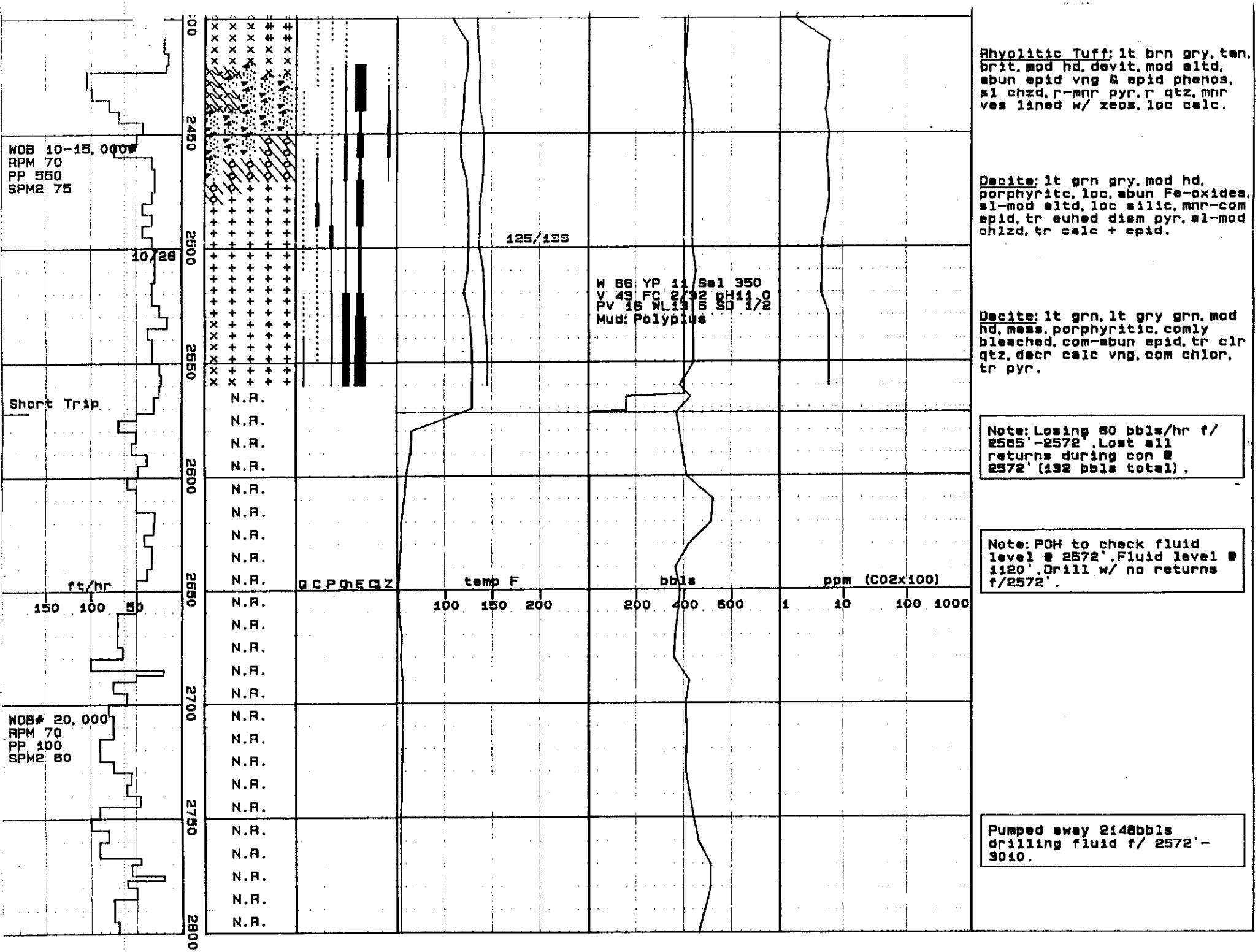
Basalt: med-dk gry, dk gry/brn, loc red/brn, hd, mass, porphyritic, com-abun amygs w/ hematitic rims, tr calc, mnr hem, r tr epid & qtz, tr pyr & chlor.

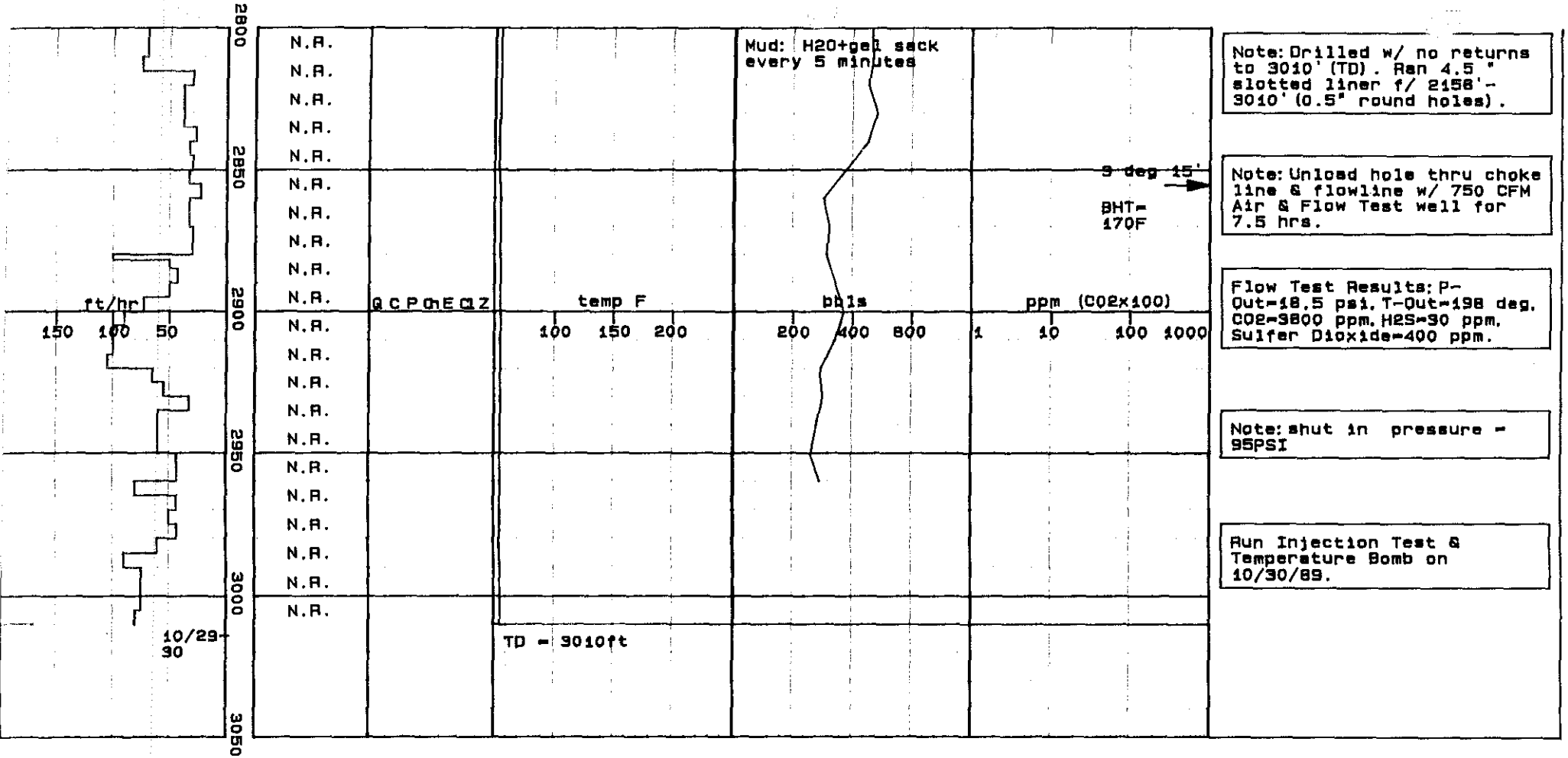
Basalt: med gry/grn, dk gry, red/brn, mod hd-hd, mass, andesitic, porphyritic-fn gr, com hem, tr chlor, r tr calc, occ bleached app.

Basalt: med grn gry, dk gry, mod hd, prly porph, loc fn gr, mnr primary mag & ilmenite, sl rexln & chlzd app, fresh-sl altd, r calc, r pyr.

Breccia Tuff: lt org-pnk grdng to lt grn gry, devit, mnr ves filled w/ silica & calc, sl-mod altd, tr-mnr dism pyr, com calc vng, mod chlzd, loc epid.


2100
2150
2200
2250
2300
2350
2400
2450
Short Trip
10/25
10/26
27
NB#4 HTC ATJ22
636'/20H
WOB 10-15,000#
RPM 70
PP 550
SPM2 75
BUT=147
110/140
142/157
BUT=128
108/134
125/133
W 65 YP 10 Sol 350
V42 FC 2/32 pH9.5
PV 13 WL9.8 SD 1/4
Mud: Gel & Polyplus
1 deg 30'
BHT=
225F
230F
2 deg 00'
BHT=
170F
172F
Altered Zone: med gry grn, fri-mod hd, pred altd Bas, mnr-com calc & calc vng, mod-highly chlzd, mnr euhed dism pyr, tr clay min alt, loc sericite(?), r euhed epid vng.
Basalt: med gry, brn gry, porphyritic, sl altd, phenos pred biot & hbde & pyroxene & Fe-oxides, r calc, r dism pyr, loc chlzd, loc epid.
Clay: lt brn gry, soluble, v soft, amorphous.
Altered Zone: lt gry grn, massive, sl porph, pred altd Andesitic Basalt, com calc & calc vng, r-mnr epid, mod chlzd, loc disem pyr, loc wht cly min.
Basalt: med-dk grn gry, mod hd, brit, aphanitic, rexln app, sl-mod altd, sl-mod chlzd, mnr epid & pyr.
Andesite: lt-med gry/grn, lt gry, hd, mass, aphan-fn gr, porphyritic, chloritized, tr-mnr epid vng, mnr calc, r euhed qtz, r-tr clay.
Altered Zone: yel, wht, pnk, mod hd, comp of epid+qtz+calc+chlor, mnr euhed xls, com vugs & vesic fill.
Drl to 2374', cmt 7" liner @ 880'-2355', drl ahead w/ 6 1/8"bit.
Basaltic Andesite: lt gry, hd, porphy, rexln app, fresh, r secndary mins.
Rhyolitic Tuff: lt brn gry, tan, brit, mod hd, devit, mod altd, abun epid vng & epid phenos, sl chzd, r-mnr pyr, r qtz, mnr ves lined w/ zeos, loc calc.
Dacite: lt grn gry, mod hd, porphyritc, loc, abun Fe-oxides, sl-mod altd, loc silic, mnr-com epid, tr euhed dism pyr, sl-mod chlzd, tr calc + epid.


WOB 10-15,000#
RPM 70
PP 550
SPM2 75
10/28
Short Trip
WOB# 20,000
RPM 70
PP 100
SPM2 80
ft/hr
150 100 50
2450
2500
2550
2600
2650
2700
2750
2800
N.R.
125/139
W 66 YP 11 Sol 350
V 49 FC 2/32 pH11.0
PV 16 WL13.5 SD 1/2
Mud: Polyplus
temp F
100 150 200
bbls
200 400 600
ppm (CO2x100)
1 10 100 1000
Rhyolitic Tuff: lt brn gry, tan, brit, mod hd, devit, mod altd, abun epid vng & epid phenos, sl chzd, r-mnr pyr, r qtz, mnr ves lined w/ zeos, loc calc.
Dacite: lt grn gry, mod hd, porphyritc, loc, abun Fe-oxides, sl-mod altd, loc silic, mnr-com epid, tr euhed dism pyr, sl-mod chlzd, tr calc + epid.
Dacite: lt grn, lt gry grn, mod hd, mass, porphyritic, comly bleached, com-abun epid, tr clr qtz, decr calc vng, com chlor, tr pyr.
Note: Losing 60 bbls/hr f/ 2565'-2572', Lost all returns during con @ 2572' (132 bbls total).
Note: POH to check fluid level @ 2572', Fluid level @ 1120'. Drill w/ no returns f/2572'.
Pumped away 2148bbls drilling fluid f/ 2572'-3010.

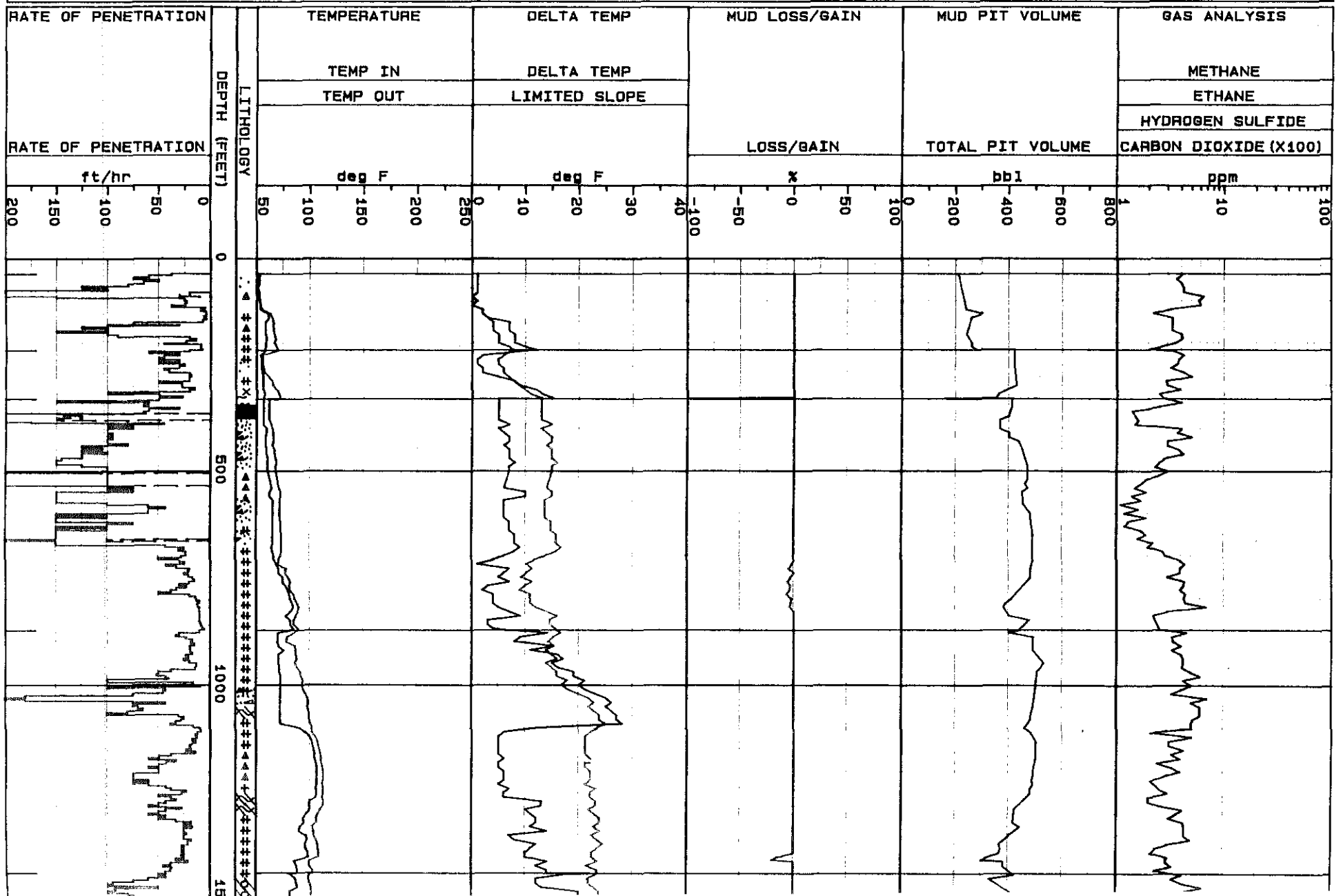

2800
2850
2900
2950
3000
3050
ft/hr
150 100 50
10/29-30
N.A.
QCPChECIZ
temp F
100 150 200
TD = 3010ft
Mud: H20+gel sack every 5 minutes
bbls
200 400 800
9 deg 15'
BHT= 170F
ppm (C02x100)
1 10 100 1000
Note: Drilled w/ no returns to 3010' (TD). Ran 4.5" slotted liner f/ 2158'-3010' (0.5" round holes).
Note: Unload hole thru choke line & flowline w/ 750 CFM Air & Flow Test well for 7.5 hrs.
Flow Test Results: P-Out=18.5 psi, T-Out=198 deg, C02=3800 ppm, H2S=30 ppm, Sulfer Dioxide=400 ppm.
Note: shut in pressure = 95PSI
Run Injection Test & Temperature Bomb on 10/30/89.

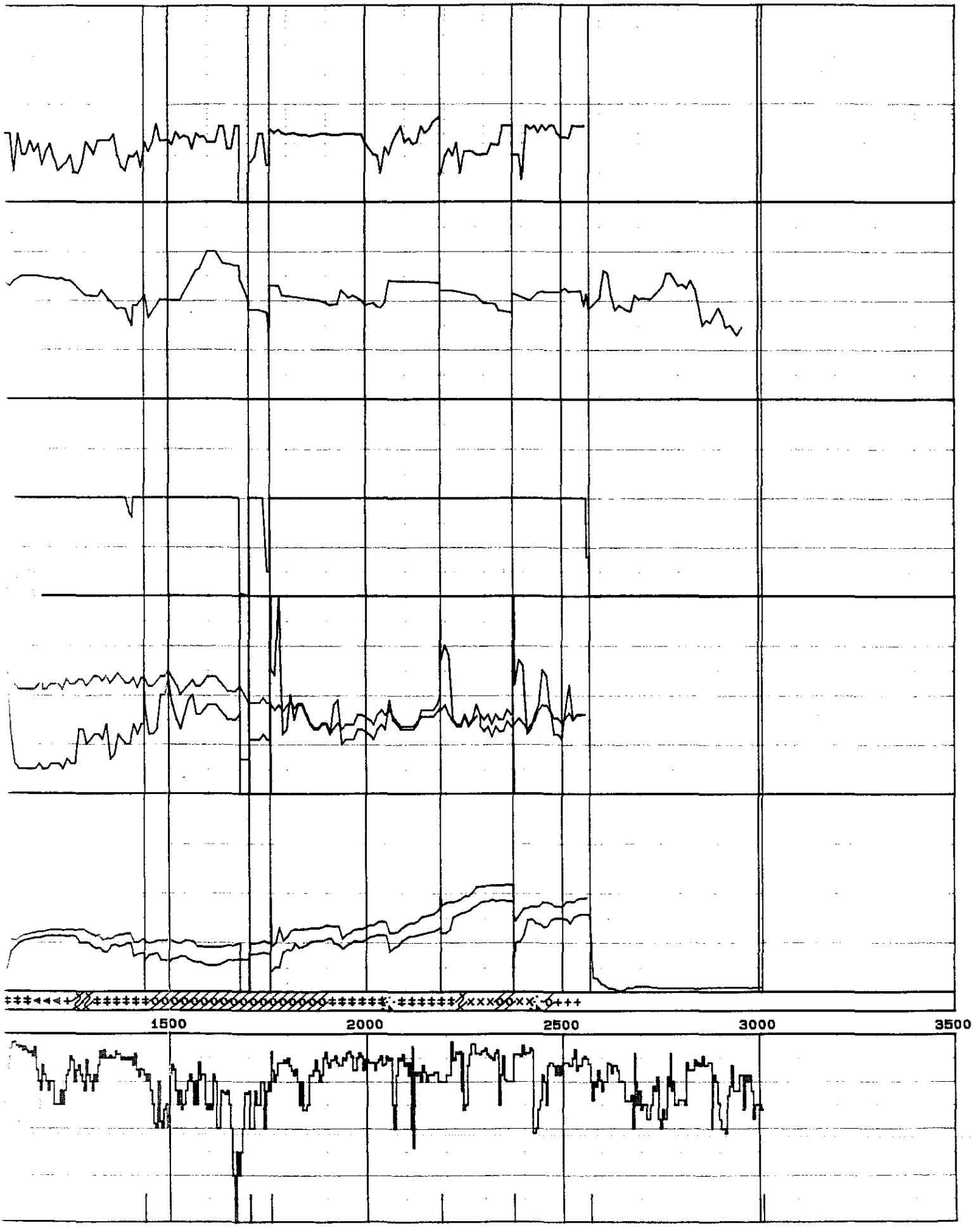
EXLOG SMITH
GEOTHERMAL DIVISION

GEOTHERMAL DATA LOG

UNOCAL Glass Mountain Federal Unit 87-13

Scale 1 : 3600




1500
2000
2500
3000
3500

UNION 76 GEOTHERMAL DIVISION

WELL GMF 87-13 Deepening
FIELD Glass Mountain Federal Unit
COMPANY Unocal GeoThermal Division
COUNTY Siskiyou
STATE California
LOCATION 3983 5's & 80.1'W of NE corner sec 13, T43N R3E EL. 6698'
KB EL. 6712' T.D. 5935'
BHL vertical hole

SPUD DATE 9-8-91
COMPLETION DATE 10-9-91
DRILLING CONTRACTOR Tonto
ENGINEERS Shelton, Furry, Warner, Uphold
GEOLOGISTS DeWitt, Molling

CASING RECORD

DIA	INTERVAL
3½"×3"	perforated HWL liner from 2949' to 5935'

LOGGING RUNS

DATE	INTERVAL	SERVICES	TEMPERATURES	TC

RIG TEST

DATE	TIME	SIP/TIME	WHP	FLP	Δ P	FLT	ORIFICE	RATE

REMARKS

REMARKS

REMARKS

EXPLANATION

DRILLING

NB	NEW BIT
RRB	RERUN BIT
CB	CORE BIT
DD	DIRECTIONAL DRLG.

LITHOLOGY

- SHALE, ARGILLITE (MICROGRAYWACKE)
- MUDSTONE
- GRAYWACKE SANDSTONE
- CONGLOMERATE
- FELSIC INTRUSIVE
- INTERMEDIATE INTRUSIVE
- MAFIC INTRUSIVE
- FELSIC

MINERALS

Q	QUARTZ
C	CALCITE
E	EPIDOTE
CH	CHLORITE

PHYSICAL-CHEMICAL

T	TEMPERATURE
BH	BOTTOM HOLE
DH	DOWN HOLE
FL	FLOW LINE

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
- FELSIC INTRUSIVE
- INTERMEDIATE INTRUSIVE
- MAFIC INTRUSIVE
- FELSIC EXTRUSIVE
- INTERMEDIATE EXTRUSIVE
- MAFIC EXTRUSIVE
- TUFF
- VOLCANIC BRECCIA

MINERALS

Q	QUARTZ
C	CALCITE
E	EPIDOTE
CH	CHLORITE
F	FELDSPAR
M	MICA
Z	ZEOLITE
CY	CLAY
O	OPAL
L	LIMONITE
H	HEMATITE
P	PYRITE
S	SPHALERITE
G	GALENA

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

NOTE: In this hole; alteration is generally pervasive and all the core, with rare sections excluded, have common-abundant quantities of the following: chlorite, clay (smectite), epidote, quartz. Alteration indicated are in excess of this quantity. – D.B. Dewitt   Level of alteration = phyllitic to argillic

DEPTH FEET (DATE)	PENETRATION ☐ FT/HR ☐ MIN/FT OVER FLOW SCALE PRIMARY SCALE	PRIMARY LITHOLOGY (100 % 0)	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.
	original hole TD – 3010′	v v v v v	e kao py qtz	pale grn.	andesite flow bxa, 80-85% lithics common fx		
9-8-91 3042′	bit #4 Hubby Orange " HQ bit	> > > > >		dk gry	andesitic intrusive, highly fractured common flow banding & bxa contact.		
		v v v v v		pale grn to rd brn	andesite flow bxa, 60-80% lithic mat'l. common to rare fractures; highly altered		
3100 9-9-91 3127′		v v v v v			matrix. Lithics are generally ¼" to 1" in dia, sl. rounded		
		> > > > >		dk grn	intrusive andesite dike?		

OVER ... W SCALE

PRIMARY SCALE

LITHOLOGY MINERALS (100 % 0) | ABUNDANT / COMMON / TRACE / RARE | BULK COLOR

□°F □°C CHEM PPM | SURVEY (BH) MAX READ THERMO | H_2S PPM | CO_2 PPM | △ □ | ●● H ●● | -- C --

(DATE) Depth	Notes	Minerals	Bulk Color	Description	Remarks
	Original hole T.D. 3000'	e kao py qtz	pale grn	andesite flow bxa, 80-85% lithics common fx	
9-8-91 3046'	bit #1 Hughes Orange HR Wt		dk gry	andesitic intrusive, highly fractured common flow banding + bxa contact.	
			pale grn to rd brn	andesite flow bxa, 60-80% lithic mat'l. common to rare fractures; highly altered matrix. Lithics are generally ¼" to 1" in dia, sl. rounded	
100 9-9-91 3127'			dk grn	intrusive andesite dike?	
			dkgry grn	amygdiloidal andesite lava flow; commonly vesiculated (~10%) heavily altered w/ chlt, smectite, qtz and epidote	
200 9-10-91 3237'				A/A	
				A/A	
				A/A	
				- intrusive andesite dike	
300			dk. gry-grn	amygdiloidal lava flow. commonly 10-20% vesicles/porosity. - highly fractured at 3296-3301	
9-11-91 3348'				- variable porosity (max at 3348' - 20%) extensive alteration w/ chlt, epidote smectite ± sericite "argillic alteration"	
				Amygdiloidal andesite lava	temp at 3388' 380°F
400			dk gry-grn	A/A	
				A/A	
9-12-91 3448'			dk gry-grn to pale grn	Andesite lava flow; commonly amygdiloidal porosity 2-5% occn. flow banding.	
				A/A abdt open spaces @ 3458'	
				"phyllic" alteration - pervasive chlt, smectite, epidote, qtz.	
500		- very little alteration	med gry to gry grn	Amygdiloidal lava flow; variable amts of vesicules; porosity 2-5%; minor fractures commonly dense, hard.	
9-13-91 3548'	bit #2 Hughes HO			A/A	
9-14-91 3590'				A/A	2' core barrel backed off; recovered fish
600				A/A	
				A/A - possible hot water entry @ 3618'	after 1 day
			gry grn	Andesite porphyry; 5-10 amyg.; 2-3% plag phenos	
9-16-91 3680'			lt. gry to rd brn	Porphyritic andesite flow; common amygdiloidal; occ'n. flow banding. Sl. fractures, occn flow tops	
700					temp at 3717' 465°F

1-13-91
548'

bit #2
Hubby HO

1-14-91
590'

600

1-16-91
680'

700

1-17-91
5788'

800

900

1-18-91
903'

1000

1-19-91
1018'

1100

1-20-91
4168

1200

1-21-91
298'

1300

	to	"commonly dense,"
	grey grn	N/A
		N/A
		N/A
		N/A - possible hot water entry @ 3618'
	grey grn	Andesite porphyry; 5-10 amyg.; 2-3% plag phenos
	lt. grey to red brn	Porphyritic andesite flow; common amygdaloidal; occ'n. flow banding. Sl. fractures; occ'n flow tops
	lt. grey	Andesite lava flow w/occ'n vesicular portions. Pervasively altered w/chl, qtz, epidote, ± pyr. Generally fg grey equigranular. Flow banding present in lower section. Common relict volcanic lithics.
	lt. tan	Andesite flow bxa; pervasively altered abdt volcanic lithics. Abdt open space filling.
	med dk grey	Andesite lava, porphyritic; commonly vesicular; commonly lithic rich. minor to commonly fractured on 1" centers. Pervasively altered.
		Andesite flow bxa; heavily bleached.
	med grey grn	Andesite lava flow; equigranular to sl. porphyritic; common flow banding; mod-pervasively altered; poor relict texture. At 4008', 25% porosity. Occ'n hematite stn on possible flow bxa 4001'-4025'
a kao. py qz	yell. grn	Pervasively altered andesite flow bxa. indistinct texture; common - abdt volc. lithics
	yell-grey grn	Andesite lava flow; sl. porphyritic; sl. fractured; spacing preserved relict flow texture; highly altered
	yell-grn.	Andesite flow bxa; pervasively altered lithics ≈ 20-30% common porph. andesite lava.
	med grey	"platey" andesite; mod. altered.
	yell. grn	Andesitic flow bxa; pervasively altered lithics ≈ 50%; poor relict texture porosity 5-10%; common fault bxa
	lt. grey	Dacitic ash flow? vesiculated flow top. bottom shows flattened trains.
	lt. grey grn.	Andesite flow; highly fractured; re-cemented w/alteration products. Highly altered. Common bleaching
		Basaltic Andesite? flow; fg to equigranular; sl to mod. fractured mod. altered. Minor open space fillings. Hard, dense, sl. altered
	med grey	

24' core barrel backed off; recovered fish after 1 day

temp of 3717' 465°F

temp @ 3828 470°F

survey at 3988' 1.5°, 480°F

temp at 4078' 475°F

temp 4208' 485°F

temp at 4338' 485°F

Depth	Lithology	Color	Description	Remarks
4158	v v v v v	yell. grn	Andesitic flow bxa [illegible] pervasively altered lithics ~50%; por. [illegible] texture porosity 5-10%; Common fault bxa	
200	≥ ≥ ≥ ≥ ≥	lt. gry	Dacitic ash flow? vesiculated flow top. bottom shows flattened fiamme	temp 4208' 485°F
	≥ ≥ ≥ ≥ ≥	lt. gry grn.	Andesite flow; highly fractured; re-cemented w/alteration products. Highly altered. Common bleaching	
9-21-91 4298'	≥ ≥ ≥ ≥ ≥	med gry	Basaltic Andesite? flow; fg to equigranular; sl. to mod. fractured mod. altered. Minor open space fillings. Hard, dense, sl. altered	
300				temp at 4338' 485°F
	v v v v v	rd brn	Andesite flow bxa; heavily oxidized common vesicular lithic mat'l. Common to intense bleaching.	
400	≥ ≥ ≥ ≥ ≥	dk gry	Basaltic Andesite; fg, equigranular to sl. porphyritic, mod-heavy fractured. (not altered)	
9-22-91 4423'	≥ ≥ ≥ ≥ ≥	rd brn	Vesicular Andesite; upper portion is heavily oxidized; heavily oxidized, becoming	
		med gry grn	fresher near bottom. Possible intrusive at 4421-4423'	
		lt. gry	Andesitic ash flow? - altered	
4500	≥ ≥ ≥ ≥ ≥	med gry to gry grn	Vesicular andesitic lava flow; mod to highly altered; mod. fractured; mod. porosity (5-10%); Interval 4506-4515' is highly oxidized	Survey at 4484' 1.25°, 505°F
9-23-91 4529'			A/A	
			A/A	
		med dk gry	Oxidized lithic andesitic ash flow	temp at 4575' 495°F
600	≥ ≥ ≥ ≥ ≥	gry grn	Vesicular andesite lava flow, highly altered common open space; mod. fractured.	
9-24-91 4635'		rd brn	Intrusive breccia; highly fractured, re-cemented w/alteration products	
	v v v v v	lt. grn	Andesitic flow bxa; heavily altered.	
	≥ ≥ ≥ ≥ ≥	med gry	Andesite lava flow; contains minor bxa	
	≥ ≥ ≥ ≥ ≥	dk gry to gry grn	Andesite lava flow; sl. vesicular; fg. equigranular. Abdt open space fillings. minor fractures. Minor flow banding	temp at 4685' 508°F
700	v v v v v	white	Andesite flow bxa; highly altered	
9-25-91 4746'	≥ ≥ ≥ ≥ ≥	lt gry	Andesite lava flow; sl. to common vesicular. mod. fractured; occ'n porphyritic. mod altered	
4800			A/A	temp at 4787' 508°F
800		med gry	A/A	
	≥ ≥ ≥ ≥ ≥		A/A	
	v v v v v	yell. grn.	Andesitic flow bxa; abdt vesicular frags heavily altered. Common open space fillings	
9-26-91 4858'	v v v v v	grn rd brn	Andesitic flow bxa - heavily altered	
	≥ ≥ ≥ ≥ ≥	med grn	vesicular andesite flow; mod. altered	
	v v v v v	red brn	Andesitic flow bxa; heavily altered	
900	≥ ≥ ≥ ≥ ≥	rd brn	Andesitic lava flow; common vesicular sl. porph. open space filling w/ chlt + qtz	
	v v v v v	lt. gry grn / yell. grn	Andesite flow bxa; heavily altered.	temp at 4908' 514°F
9-27-91	≥ ≥ ≥ ≥ ≥	lt. med grn.	Andesite lava flow; sl. porph; sl. vesicular; mod. altered. common open space fillings w/chlt epidote, qtz. Common	

Depth / date	Color	Lithology description	Notes
800	med gry	A/A	
		A/A	
	yell. grn.	Andesitic flow bxa; abdt vesicular frags heavily altered. Common open space fillings	
-26-91	grn rd brn	Andesitic flow bxa - heavily altered	
858'	med grn.	vesicular andesite flow: mod. altered	
	red brn	Andesitic flow bxa; heavily altered	
900	rd brn	Andesitic lava flow; common vesicular sl. porph. open space filling w/ chlt + qtz	
	lt. gry grn	Andesite flow bxa; heavily altered.	temp at 4908' 514°F
-27-91 / 973'	lt. med grn.	Andesite lava flow; sl. porph; sl. vesicular; mod. altered. common open space fillings w/chlt, epidote, qtz. Common "flow tops" included in section	
000			e loo of qtz
	lt. gry grn.	Andesite lava flow, vesicular; completely altered; some flow banding visible porosity - 5-10%	temp at 5038' 507°F
		5043-5059 - a/a but heavily brecciated	
-28-91 / 078'	dk gry	Basaltic andesite; appears to be intrusive w/near vertical contacts (baked)	
100	med gry	Andesite lava flow; sl. vesicular; generally equigranular. Occ'n hematite stain.	bit # 8 Longyear 9; temp 5098' 508°F
	rd brn	Andesitic flow bxa - heavily altered.	
-29-91	gry grn	Andesite lava flow - altered	
143'	rd brn	Andesitic flow bxa	
	med gry grn.	Andesite lava flow; massive, fractured but sealed w/ chlt, qtz, clay. Minor fractures. Common flow tops in sections	
200		A/A	temp at 5208' 510°F
-30-91	med gry	Andesite lava flow; mod altered	
258'		A/A	
	yell. grn	Andesite flow bxa, highly altered	
	yell. grn	Andesite lava flow; vesicular; equigranular	
300	lt. gry.	highly altered & bleached; poor fracturing	temp at 5298' 515°F
	lt. gry.	Dacite lava flow; very vesicular; sl. perlitic	
	med gry	"Platy" andesite lava flow; common vesicle minor fractures	
0-1-91	rd brn	Andesite lava; lithic rich; extensively altered and bleached. mod fractured	
383'	lt. gry	A/A	
400	rd brn / yell. grn	Andesitic flow bxa; lithic rich; extensively altered & oxidized. Soft, poorly fractured	temp. 5418' 510°F
	yell. grn	Andesite lava flows; highly vesiculated, extensively altered. Interval 5463-5480 is very porous. Abdt lithics (bxa?) Relict texture is very poor due to alteration	
500	med gry grn.	Andesite flow bxa; highly altered; abdt vesicular frags; poorly fractured	
-2-91 / 508'	rd brn.	Andesite lava flow; highly vesiculated highly altered	
	yell grn / rd brn.	Andesite flow bxa; heavily altered to clay; poor fractures; Lithic are more altered than matrix	temp at 5548' 525°F
600		Andesite lava flows; extensively oxidized and altered. Vesicles common filled	

5500				
10-2-91				
5508'		med. gry grn.	Relict texture is poor due to alteration Andesite flow bxa; highly altered; abdt vesicular frags; poorly fractured	
		rd brn.	Andesite lava flow; highly vesiculated highly altered	
		yell grn / rd brn.	Andesite flow bxa; heavily altered to clay; poor fractures; Lithic are more altered than matrix	Temp at 5548' 525°F
5600			Andesite lava flows; extensively oxidized and altered. Vesicles commonly filled w/ alteration products (calc, epidote, clay)	
10-3-91				
5635'		red brn	rock is soft; varely fractured; indistinct texture due to alteration	
			This unit is made up of several flows	
5700				Temp at 5708' 525°F
		lt. gry.	Andesitic flow bxa; pervasively altered abdt lithics; relict flow banding; bleached	
10-4-91		bleached lt grn	Andesitic lahar; extremely oxidized and altered. Lithics >50%. Rock is soft. Grades downward into heavily oxidized rock	
5768'				
5800		lt. gry grn.	Andesite lava flow; vesicular; fg to equigranular; mod. altered. mod-com. fracturing	
				Temp - 5818' 535°F
	poorly altered	dk gry grn	Andesite lava flow; massive; thick; mod altered; sl. vesicular; sl. purph; com-abdt high angle fractures. Common abdt lithics. Extensively bleached and altered at contacts.	
10-5-91				
5886'				
5900			N/A	
10-6-91			N/A	
5935		rd brn	Andesitic flow bxa; extensively altered s-ft; abdt lithics. Indistinct texture due to alteration.	
T.D.				Temp 5985' 535°F
			T.D. 5934'	Survey at 5938 2°
6000				
6100				
6200				