ROCKY MOUNTAIN GEO–ENGINEERING CORP.
2450 Industrial Boulevard
Grand Junction, CO 81505 U.S.A.
(970) 243–3044

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OPERATOR: NW NATURAL
WELL: 22dH–22–65
LOCATION: SECTION 22, T6N, R5W
COUNTY: COLUMBIA COUNTY
STATE: OREGON
SPOT: 2286.4'N03Deg,03',15
SPOT: 1915.6' S86Deg,56',45
FIELD: CALVIN CREEK GAS STORAGE FIELD

SPUD DATE: 12/12/97
TD DATE: 1/22/98 @ 0610 HOURS
DATES LOGGED: 12/12/97 – 1/22/98
DEPTHS LOGGED: 20' – 2745'
LOGGERS: ED PERRY, ERIC HELLER
DRILLING FLUID: SPUD MUD/LOW SOLIDS POLYMER
DRILLING RIG: TAYLOR RIG NO. 4
ELEVATION: KB 596.9', GL 580.9'

LOG TYPE: MUD LOG

SCALE: 1:240 (5.0 INCH/100 FT)

REMARKS:

LITHOLOGIES

▨ SANDSTONE	SILTSTONE	▨ SHALE	■ COAL	▨ BENTONITE
▨ LIMESTONE	▨ DOLOMITE	ANHYDRITE	CHERT	▨ SALT
▨ CONGLOMERATE	TUFF	ALLUVIUM	METAMORPHIC	▨ GLACIAL TILL
DARK CHERT	WELDED TUFF	▨ ARGILLACEOUS LIMESTONE	▨ LIME MUDSTONE	▨ CRYSTALLINE LIMESTONE
▨ LIME BOUNDSTONE	▨ LIME GRAINSTONE	▨ LIME PACKSTONE	▨ LIME WACKESTONE	▨ DOLOMITIC LIMESTONE
▨ CALCAREOUS DOLOMITE	▨ ARGILLACEOUS DOLOMITE	▨ DOLOMITIC MUDSTONE	▨ CRYSTALLINE DOLOMITE	▨ DOLOMITIC BOUNDSTONE
▨ DOLOMITIC GRAINSTONE	▨ DOLOMITIC PACKSTONE	▨ DOLOMITIC WACKESTONE	▨ SHALY SANDSTONE	▨ CLAYSTONE
▨ GRAY CLAYSTONE	▨ COLORED CLAYSTONE	VOLCANICS	■ BRIGHT COAL	▨ INTERMEDIATE COAL
▨ DULL COAL	▨ COALY SHALE	▨ NON COAL	GRANITE	▨ BRECCIA
▨ MARL	▨ DOLOMITIC MARL	▨ CARBONACEOUS SHALE	▨ CHALK	GYPSUM
▨ UNABLE TO INTERPRET	☒ NO SAMPLE	▨ BLACK SHALE	▨ COLORED SHALE	▨ GRAY SHALE
▨ SILTY SHALE	SHALY SILTSTONE			

MODIFIERS

	ANHYDRITE STRINGERS	//	ANHYDRITIC	–	ARGILLACEOUS	/	ARGILLITE GRAIN		ALGAE, LAMINATED		ALGAE, NON-DESCRIPT
	ALGAE, OOTOID		ALGAE, SKELETAL		AMPHIPORA		BELEMNITE	B	BENTONITE	⌒	BIOCLAST/ FRAGMENTAL
◇	BRACHIOPOD		BRECCIA		BRYOZOA	⊥	CALCAREOUS	■	CARBONACEOUS FLAKES		CEMENTING BITUMINOUS
	CEPHALOPOD	▲	CHERT, DARK	△	CHERT, LIGHT	⊠	CHERT, TRIPOLITIC	▬	COAL		CORAL
⊙	CRINOID	✳	CRYSTALS		DOLOMITE STRINGERS		DOLOMITIC	♡	ECHINOID	+	FELDSPAR
	FERRUGINOUS	●	FERRUGINOUS GRAINS		FERRUGINOUS STRINGERS		FISH REMAINS		FORAMINIFERA	F	FOSSILS
	FRACTURES		GASTROPOD	∿	GLAUCONITE	\\	GYPSIFEROUS		GYPSUM STRINGERS		HEAVY/DARK MINERALS
	INTRACLASTS	K	KAOLIN		LIMESTONE STRINGERS	L	LIMONITE	π	MARLSTONE, CALCAREOUS	π	MARLSTONE, DOLOMITIC
◡	MICACEOUS		NODULES	⌽	OOLITES		OSTRACOD		PEBBLES	▽	PELECYPOD
ø	PELLETS	●●	PHOSPHATE PELLETS		PISOLITE		PLANT REMAINS	P	PYRITE	⊞	SALT CAST INFILL
○	SAND GRAINS	⊡	SANDSTONE STRINGERS		SANDY		SCAPHOPOD	—	SHALE LAMINAE	Λ	SILICEOUS
	SILTSTONE STRINGERS	■■	SILTY		SLICKENSIDE	S	SPORES	Ш	STROMATOPOROID		STYLOLITE
V	TUFFACEOUS										

POROSITY/SORTING/ROUNDNESS SYMBOLS

X	INTERCRYSTALLINE INTERGRANULAR	V	VUGGY	F	FRACTURE	ϕ	INTEROOLITIC	P	PINPOINT		ORGANIC
O	MOLDIC	e	EARTHY	⊡	FENESTRAL						
A	ANGULAR	a	SUBANGULAR	R	ROUNDED	r	SUBROUNDED				
W	WELL	M	MEDIUM	P	POOR						

ENGINEERING SYMBOLS

	BIT CHANGE	^	LOST CIRCULATION	◢	CASING	◣	CASING	◀	SIDEWALL CORE	▶	SIDEWALL CORE
▷	WIRELINE TEST	◁	WIRELINE TEST		GAS TO SURFACE		OIL TO SURFACE		WATER TO SURFACE	●	EVEN STAINING
◑	SPOTTED STAINING	D	DEAD OIL	○	QUESTIONABLE	•	OIL SHOW	☼	GAS SHOW	✹	OIL AND GAS SHOW
CG	CONNECTION GAS	TG	TRIP GAS	▨	MIDNIGHT DEPTH	▧	MIDNIGHT DEPTH		CONNECTION	—	OFF BOTTOM
	NORMAL FAULT		REVERSE FAULT		OVERTURNED STRATA						

▨	CORE RECOVERED	☐	CORE LOST	☐	DST INTERVAL	☐	ROTATING	▥	SLIDING	▦	CANISTER

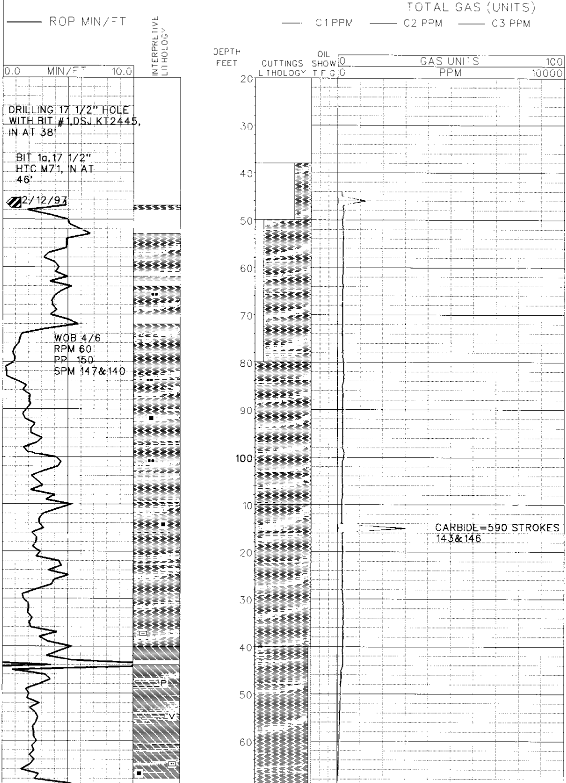
ABBREVIATIONS

CB – CORE BIT
CG – CONNECTION GAS
CO – CIRCULATE OUT
SPM STROKES/MIN

DST – DRILL STEM TEST
DTG – DOWNTIME GAS
LAT – LOGGED AFTER TRIP
TG – TRIP GAS

NR – NO RETURNS
NS – NO SAMPLE
PP – PUMP PRESSURE
WOB – WEIGHT ON BIT

RPM – REVOLUTIONS/MIN
RR – RE-RUN
SLM – STEEL LINE MEASURE



LITHOLOGY DESCRIPTIONS

RMGE FID/PAL UNIT #28 ON
LOCATION 1400 HOURS 12/11/97

SPUD IN 1600 HOURS
12/12/97 AT 38'.

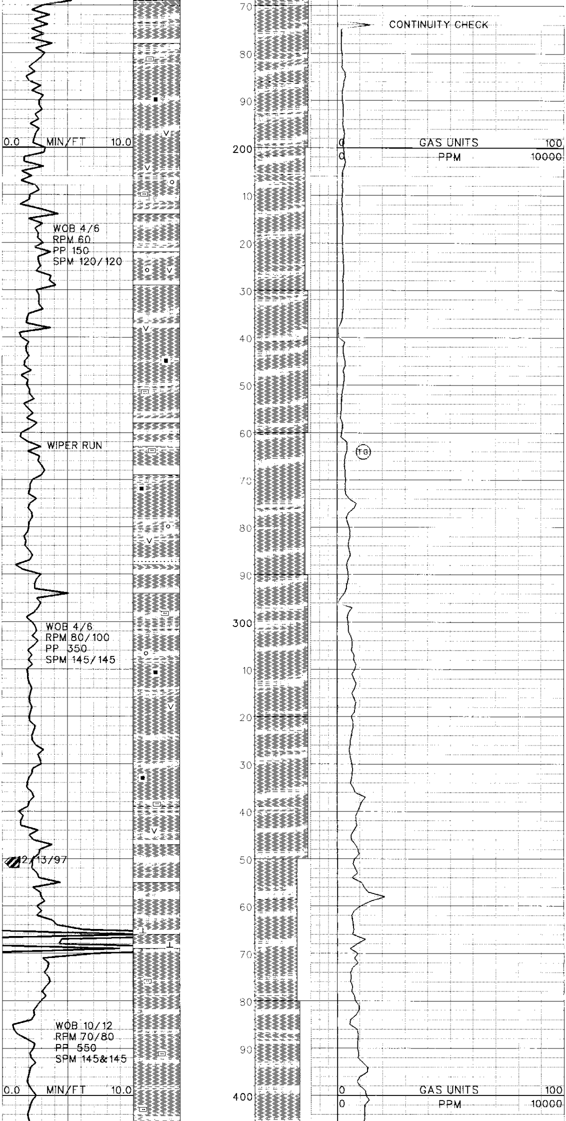
TUFF pred gn,scat var co,m snd to vf pbl grs,p-m srt,snd grs subarg, pbls w rnd,sft to sl frm,scat f gr w rnd g sy qtz,sme brngy cly mat washed from sample,r calc

CLYSTN [illegible]

SLTYCLYSTN brn to gybrn,v sft gummy cly mtx,scat slt-vf snd w rnd qtz grs,comm carb frags,scat lithic/ volc frags,abnt cly mat washed from sample,sl calc ip

SLTYCLYSTN brn to gybrn,v sft gummy cly mtx,scat slt-vf snd w rnd qtz grs,comm carb frags,rr lithic/ volc frags,abnt cly mat washed from sample,sl calc ip

SLTYSH/CLYSTN tan & gybrn, v sft clayey & gummy,pred non-calc [illegible] w/ abnt colloidal mat washed from samp,residue is pred aphan tuff/mineral frags,sme scat carb mat,common pyr clusters,v fine dism silty debris



SLTY CLYSTN brn to gybrn, v sft gummy cly mtx, scat slt–vf snd w rnd qtz grs, comm carb frags, scat volc frags, abnt cly mat washed from sample, sl calc ip, mnrl calc rhombs, tuff debris

SLTYSH brn tan & gybrn, v sft–clayey & gummy, pred non–calc cly w/ abnt mat washed from samp, resd is pred aphan tuff/mineral frags, pyr clusters, v fine dism silty debris, increasing – abnt carb frags & thn lamanae

SLTY CLYSTN lt gybrn tan of sme ambr, pred v sft cly&gummy mat washed from sample, non–calc, resd– tuff debris, sbrd glasy qtz, mod–abnt carb flakes & mat, decr – rr pyr, sme gn–vcol volc debris

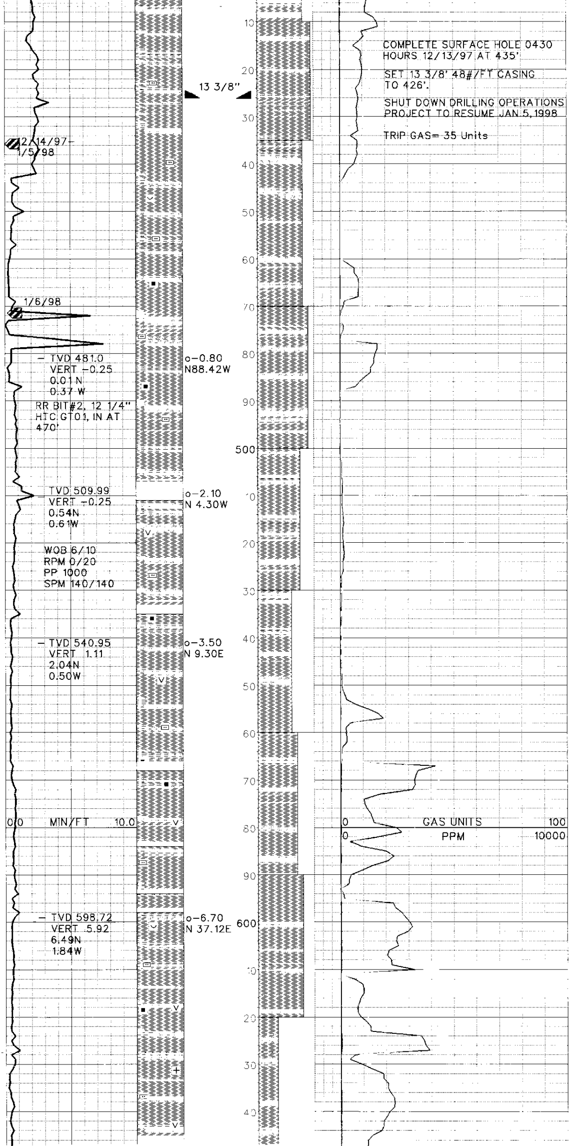
SLTYSH brn tan & gybrn, v sft–clayey & gummy, pred non–calc cly w/ abnt mat washed from samp, resd is pred aphan tuff/mineral frags, pyr clusters, v fine dism silty debris, increasing – abnt carb frags

SLTYCLYSTN brn to gybrn, v sft gummy cly mtx, scat slt–vf snd w rnd qtz grs, comm carb frags, scat volc frags, abnt cly mat washed from sample, sl calc ip, mnrl calc rhombs, tuff debris

SLTSTN ltgy, ltbrn lb, mott, s&p, slty to vf sndy grs, pred subang occ subrnd, w srt, sme lithic grs (volc?), abnt clay mat washed from sample, scat carb flks, v calc

Wt=9.4
Vis=57

SLTYCLYSTN brn to gybrn, v sft gummy cly mtx, scat slt–vf snd w rnd qtz grs, comm carb frags, incr sltstn frags, abnt cly mat washed from sample, sl calc.



COMPLETE SURFACE HOLE 0430 HOURS 12/13/97 AT 435'

SET 13 3/8' 48#/FT CASING TO 426'.

SHUT DOWN DRILLING OPERATIONS PROJECT TO RESUME JAN 5, 1998

TRIP GAS= 35 Units

12/14/97–
1/5/98

1/6/98

– TVD 481.0
VERT –0.25
0.01 N
0.37 W
o–0.80
N88.42W

RR BIT#2, 12 1/4"
HTC GT01, IN AT
470'

TVD 509.99
VERT –0.25
0.54N
0.61W
o–2.10
N 4.30W

WOB 6/10
RPM 0/20
PP 1000
SPM 140/140

– TVD 540.95
VERT 1.11
2.04N
0.50W
o–3.50
N 9.30E

– TVD 598.72
VERT 5.92
6.49N
1.84W
o–6.70
N 37.12E

CLYSTN tan & gybrn,v sft–clayey & gummy,muddy w/ abnt cly mat washed from samp,scat sltstn frags,sme scat carb mat,tr volc/tuff frags,v fine silty debris,non calc

SHLYSLTSTN m–dk gy,occ brn,sl mott,v sft,s&p,pred slty grns rr vf sndy grns,sub ang,abnt mica flks,scat carb frags,abnt brn cly/gummy mat washed from sample,abnt cemtent frags,sl calc–v calc ip

CLYSTN lt–m gy gybrn,v sft–clayey & gummy,most washed from sample,gran–blky text–pred non silty,sme very finely gran qtz resd,dk brn carb strk ip,vcol tuff debris,scat mica,non–mod calc

SHLYSLTST bf lt brn mot,sml v fri clstrs ip–vf qtz grs bri gr tuff mat ip tr mica sme felds,carb strks or thn lam ip,pred v sft clay mat–mostly washed from sample,sl calc mtx

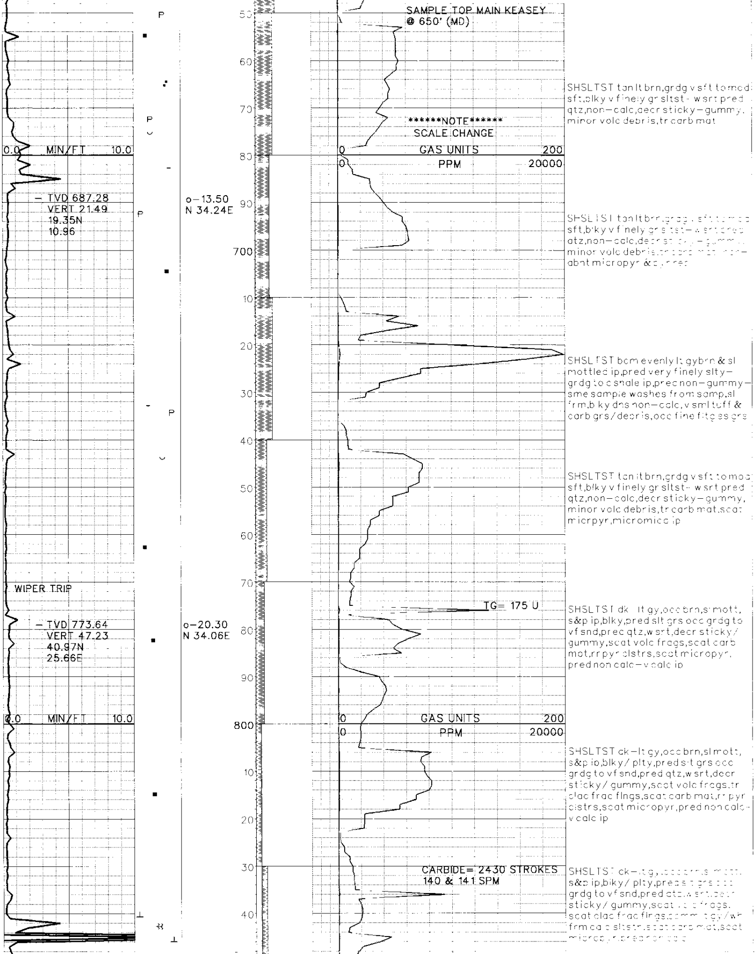
SHLYSLTST m–dk gy,occ brn,sl mott,v sft,pred slty grs rr vf sdy grs,subang,abnt mica flks,scat carb frags,abnt brn cly/gummy mat washed from sample,abnt cemt frags,sl calc–v calc ip

Wt=8.8 Vis=41 Wl=6.8 pH=10
Cl=900 Ca=40 Sol=3.4 Ck=2/32

CLYSTN tan & gybrn,v sft–clayey & gummy,pred non–calc cly w/ abnt colloidal mat washed from samp,residue is pred aphan tuff/mineral frags,sme scat carb mat,common pyr clusters,v fine dism silty debris

SLYSLTST offwn bf lt brn mot gybrn,mtx is pred v sft cly–sticky slyst non–sl calc w/ minor insol residue–mostly vf sandy qtz w/ sme tuff debris & carb flks grs,tr mica,tr [illegible] mat

SHYLYSLTST tan lt brn,grdg v sft to mod sft,blky v finely grs tst–w srt pred qtz,non–calc,decr sticky–gummy,minor volc debris,tr carb mat



SHSLTST tan lt brn,grdg v sft to mod sft,blky v finely gr sltst- w srt pred qtz,non-calc,decr sticky-gummy, minor volc debris,tr carb mat

SHSLTST tan lt brn,grdg v sft to mod sft,blky v finely gr sltst- w srt pred qtz,non-calc,decr sticky-gummy, minor volc debris,tr carb mat,non-abnt micropyr & [illegible]

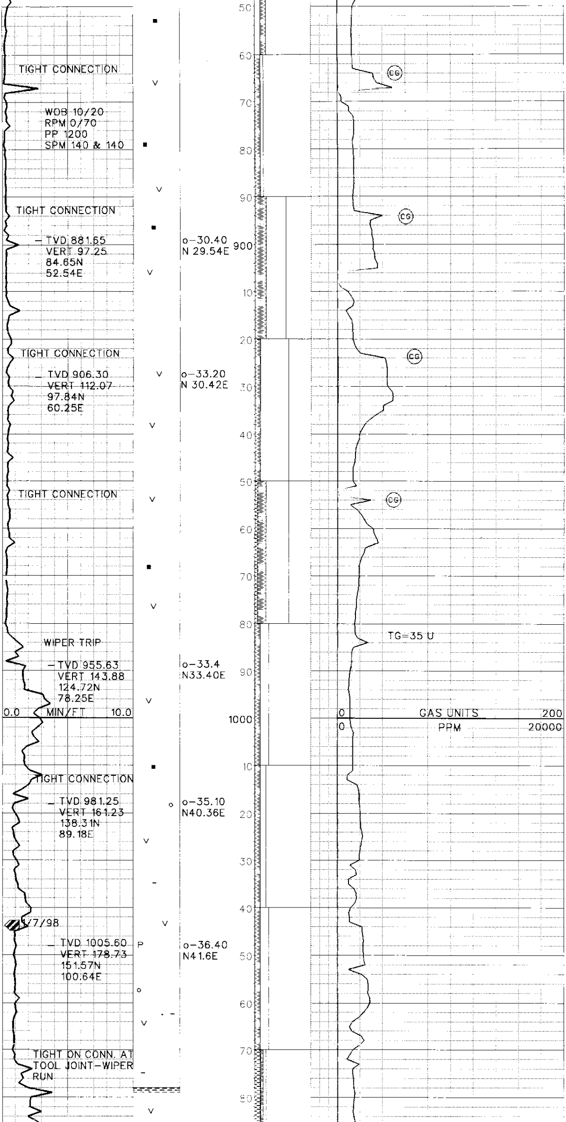
SHSLTST bcm evenly lt gybrn & sl mottled ip,pred very finely slty-grdg to c shale ip,prec non-gummy-sme sample washes from samp,sl frm,blky dns non-calc,v sml tuff & carb grs/debris,occ fine flt glass grs

SHSLTST tan lt brn,grdg v sft to mod sft,blky v finely gr sltst- w srt pred qtz,non-calc,decr sticky-gummy, minor volc debris,tr carb mat,scat micrpyr,micromica ip

SHSLTST dk lt gy,occ brn,sl mott, s&p ip,blky,pred slt grs occ grdg to vf snd,prec qtz,w srt,decr sticky/ gummy,scat volc frags,scat carb mat,rr pyr clstrs,scat micropyr, pred non calc-v calc ip

SHSLTST dk-lt gy,occ brn,sl mott, s&p ip,blky/ plty,pred slt grs occ grdg to vf snd,pred qtz,w srt,decr sticky/ gummy,scat volc frags,tr clac frac flngs,scat carb mat,rr pyr clstrs,scat micropyr,pred non calc-v calc ip

SHSLTST dk-lt gy,occ brn,sl mott, s&p ip,blky/ plty,pred slt grs occ grdg to vf snd,pred qtz,w srt,decr sticky/ gummy,scat volc frags, scat clac frac flngs,comm lt gy/wh frm calc sltstn,scat carb mat,scat micropyr,pred non calc



SHSLTST dk gy,occ lt gy/gybrn,sl mott,s&p,blky,pred slt grs,w–m srt, scat calc frac flngs,rr foss frags, scat lt gy frm calc sltstn,incr lithic frags–gn sub rnd volc,scat carb mat,non calc

SHSLTST dk gy,occ m gy/gybrn,sl mott,s&p,blky,pred slt grs,w–m srt, scat calc frac flngs,incr gy/gn cly mat washed from sample,scat lt gy frm calc sltstn,abnt sub rnd blk–gn f–m volc frags,scat carb mat,non calc

TUFF dk gn,occ blk/var col,grdg from vf grs to pbl,ang–sub rnd,occ wthrd,v frm to hard,pred incl in sltstn, sme gy/gr cly mat washed from sample,scat calc frac flngs,non calc

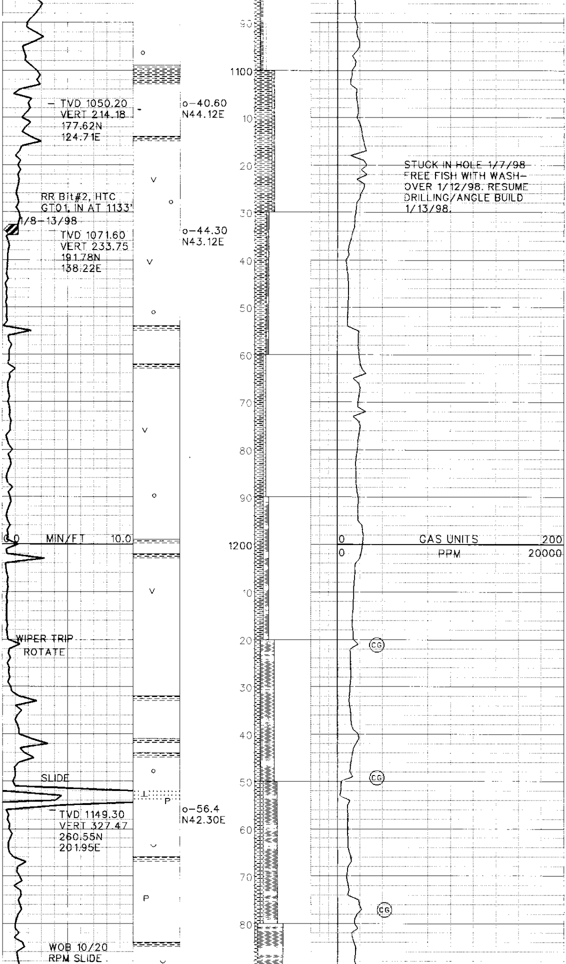
SHSLTST dk gy/blk,sl mott,s&p, blky,pred slt grs,w–m srt,scat calc frac flngs,sme gy/gn cly mat washed from sample,abnt subrnd–subang blk/gn f–m volc frags,scat carb mat,non calc

SHSLTST dk gy–blk,s&p,sft–sl frm, blky/plty,pred slty occ vf snd grs, w–m srt,decr dk gn f–m gr volc lithic frags,sme gy/brn cly mat washed from smple,tr micropyr,non calc

Wt=10.0 Vis=47 Wl=6.8 pH=8.5
Cl=600 Ca=40 Sol=10 Ck=2/32

SHSLTST dk gy–blk,sft–sl frm, blky/occ plty,pred slty,occ vf snd grs,w srt,decr dk gn f–m gr volc lithic frags,sme gy cly mat washed from smple,tr carb frags,tr micropyr,non calc

SHSLTST [illegible] sft–non clayey,pred hrd–[illegible] finely silty w/ sme org content, very finely dism gr–red [illegible] debris,scat fine fltg qtz(volc?) grs, pos glauc,dk carb grs/flks/ om



STUCK IN HOLE 1/7/98
FREE FISH WITH WASH-
OVER 1/12/98. RESUME
DRILLING/ANGLE BUILD
1/13/98.

SHSLTST evenly lt gybrn & sl mottled ip,pred very finely slty-grdg to c shale ip,pred non-gummy-sme sample washes from samp,sl frm,blky dns non-calc,v sm tuff & carb grs/debris,occ fine fltg ss grs

SH lt gy lt gngy occ gybrn,bcm m frm brit ip,prec smooth-dns-sl sbwxy, text,pt v sml & vf dism tuff & pyr, non-calc rr slty

Wt=9.8 Vis=47 Wl=6.8 pH=8.5
Cl=600 Ca=40 Sol=9.9 Ck=2/32

SHSLTST dk-mgy,sl mot ip,pred vf slty,grd to cshale ip,blky,sl-m frm, sme gummy/ cly mat washed from sample,sme vf volc debris,occ lse vf subrnd qtz snd grs,pred non calc-sl calc ip

SHSLTST dk-mgy,sl mot ip,pred vf slty,grd to cshale ip,blky,sl-m frm, sme gummy/ cly mat washed from sample,sme vf volc debris,decr lse vf subrnd qtz snd grs,pred non calc-sl calc ip

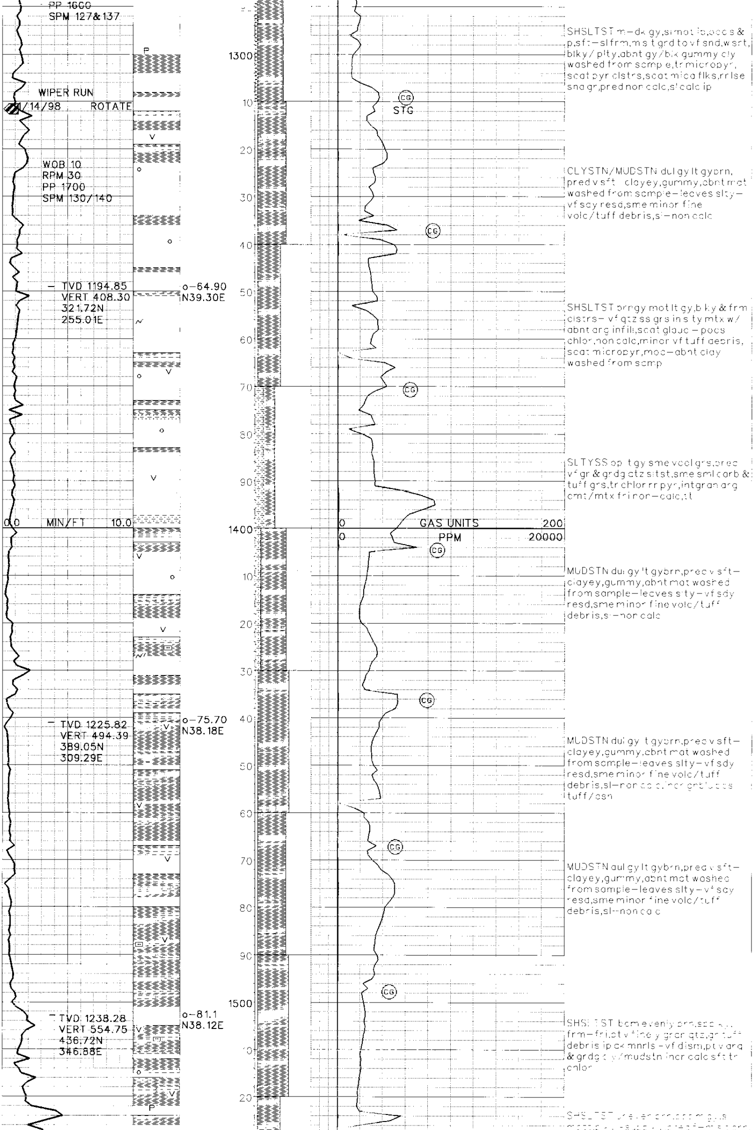
SHSLTST dk-mgy,sl mot ip,pred vf slty,decr cshale,blky,sft-sl frm, incr gummy/ cly mat washed from sample,sme vf volc debris,tr lse vf subrnd qtz snd grs,pred non calc-sl calc ip

Wt=9.8 Vis=52 Wl=6 pH=9.0
Sol=tr Ck=2/32

SHSLTST dk-mgy,occ mbr,sl mot ip,pred vf slty,occ c shale,blky,sft-sl frm,abnt gummy/ cly mat washed from sample,tr micropyr,tr micromica,scat vf volc debris,rr lse vf subrnd qtz snd grs,pred non calc-sl calc ip

SS lt gy/ wh,occ gl,vf gr,sub rnd-sub ang,w srt,scat mica/biot,scat gn volc frags/gr,comm micropyr/ pyr clstrs,tr calc frac flng,sl-v calc

CLAY BALLS COMMING
OVER SHAKER



SHSLTST m–dk gy,sl mot ip,occ s & p,sft–sl frm,m slt grd to vf snd,w srt, blky/ plty,abnt gy/blk gummy cly washed from sample,tr micropyr, scat pyr clstrs,scat mica flks,rr lse snd gr,pred non calc,sl calc ip

CLYSTN/MUDSTN dul gy lt gybrn, pred v sft clayey,gummy,abnt mat washed from sample–leaves slty–vf sdy resd,sme minor fine volc/tuff debris,sl–non calc

SHSLTST brngy mot lt gy,blky & frm clstrs– vf qtz ss grs in slty mtx w/ abnt arg infill,scat glauc – poss chlor,non calc,minor vf tuff debris, scat micropyr,mod–abnt clay washed from samp

SLTYSS op lt gy sme volc grs,pred vf gr & grdg qtz sltst,sme sml carb & tuff grs,tr chlor rr pyr,intgran arg cmt/mtx fri non–calc,tt

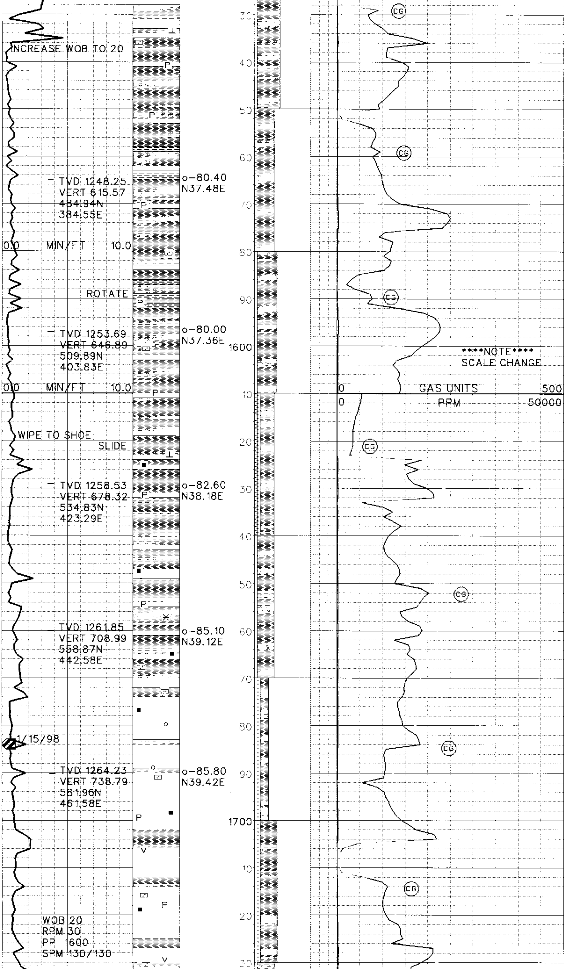
MUDSTN dul gy lt gybrn,pred v sft–clayey,gummy,abnt mat washed from sample–leaves slty–vf sdy resd,sme minor fine volc/tuff debris,sl–non calc

MUDSTN dul gy lt gybrn,pred v sft–clayey,gummy,abnt mat washed from sample–leaves slty–vf sdy resd,sme minor fine volc/tuff debris,sl–non calc,incr [illegible] tuff/asn

MUDSTN dul gy lt gybrn,pred v sft–clayey,gummy,abnt mat washed from sample–leaves slty–vf sdy resd,sme minor fine volc/tuff debris,sl–non calc

SHSLTST bcm evenly brn,sbblky, frm–fri,ct v fine y gran qtz,gr tuff debris ip dk mnrls –vf dism,pt v arg & grdg cly/mudstn incr calc sft tr chlor

SHSLTST [illegible]



occ grdg to vf snd,fri—sl frm,abnt [illegible]
clstrs,comm micropyr,occ vf gr ss
cltrs w intrgran pyr / calc cmt,scat
clr clac/ qtz frac flgs,s — v calc ip,
abnt cly mat washed from sample

SHSLTST uneven brn,occ m gy,sl mott,blky—subblky,pred f—m slt grn, occ grd to vf snd,fri—sl frm,abnt clay mat,decr pyr clstrs,comm micropyr,decr vf gr ss cltrs w intrgran pyr / calc cmt,tr vf rose qtz ss,tr clr clac/ qtz frac flgs,s — v calc ip

SHSLTST brn,occ m—lt gy,mottld, fri—sl frm,sbblky,abnt cly mat washed from sample,f—m slt grs occ grdg to vf snd,comm micropyr, rr pyr clstrs,scat vf gr wh ss,scat mky calc frags,rr [illegible] frags,sl calc ip

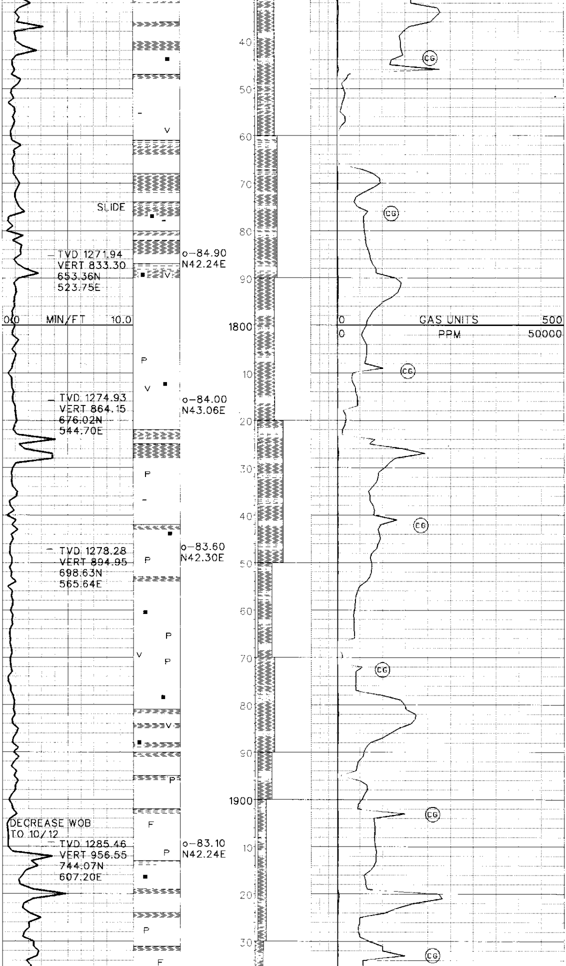
SH drk brn,frm dns sbwxy,—sub non calc,NOTE increase in gas background immediately below

SHSLTST lt—m brn,occ m—lt gy, mottld,fri—sl frm,sbblky,abnt cly mat washed from sample,rr fos frags,comm micropyr,rr pyr clstrs, rr mica flks,scat carb frags/lams, scat vf gr wh ss,scat mky calc frags, rr volc frags,sl—v calc ip

SHSLTST lt—m brn,occ lt gy,s&p ip, fri—sl frm,blky/plty,abnt cly washed from sample,comm carb frags/lams,comm micropyr,scat pyr clstrs,tr mica flks,scat vf gr wh calc cmt ss,tr calc frags/xls,tr tuff ss/frags,pred non calc—sl calc ip

SS brn mot brngy s&p—op ip vcol grs,pt vf gr slty drty arg chlor ip cbnt arg infill sl calc,pt op—trnslm c gr ang sml m cmt clstrs—lse grs ip, tr dk spotty stn,pyr clstrs on grs

CLYSTN/MUDSTN dul gy lt gy grn, pred v sft—clayey,gummy,abnt mat washed from sample—occ les slty— vf sdy resd,sme minor fine volc/tuff debris,sl—non calc,tr pyr, tr mnrl calc,decr carb lam,occ fltg qtz/ss grs



SHSLTST ltbrngy lt purpbrn tnt, slty–gran grading to pred slty sh w/ sme fltg qtz grs,thn & common dk brn – blk carb lam & occ grs, minor & v finely dism tuff debris, occ lrg pyr clstrs,sme mnrl calcite

CLYSTN dul gy lt gybrn,v sft–clayey, gummy,abnt mat washed from sample – leaves slty–vf sdy resd, sme minor fine volc/tuff debris,sl – non calc,tr pyr,tr mnrl calc,decr carb lam,occ qtz/ss grs

SHSLTST lt–m brn,lt gy,fri – sl frm, blky/plty,abnt cly washed from sample,comm carb frags/lams, comm micropyr,scat pyr clstrs,tr mica flks,scat vf gr wh calc cmt ss, tr calc frags/xls,tr tuff ss/frags, pred non calc–s

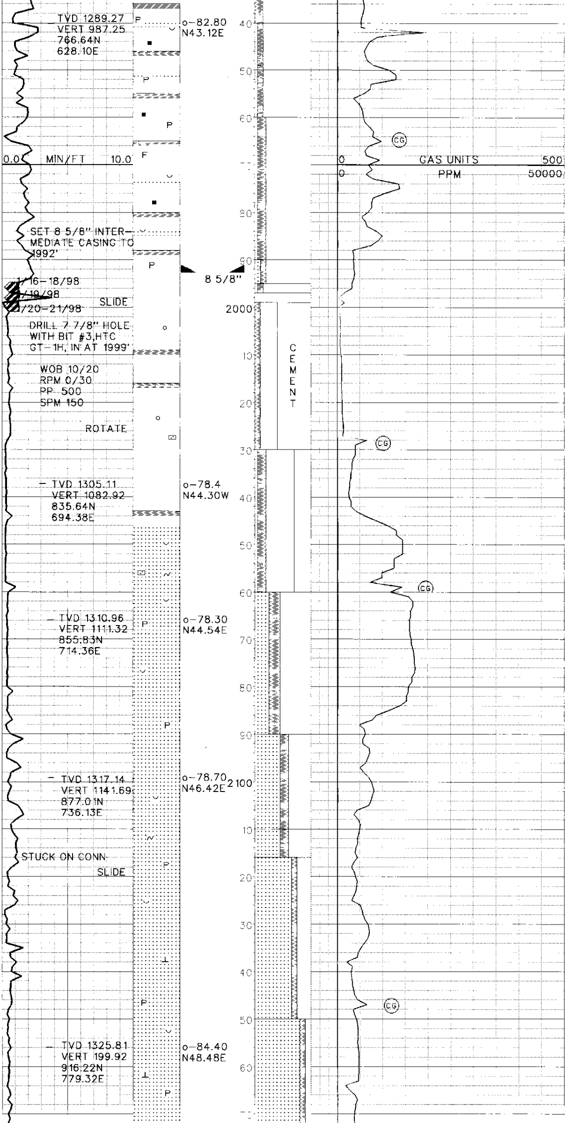
Wt=9.9 Vis=48 Wl=6.2 pH=9.0
Cl=550 Ca=60 Sol=10 Ck=2/32

SHSLTST lt gybrn & sl mottled ip, pred very finely slty–grdg to cl shale ip,pred non–gummy–sme sample washes from samp,sl frm, blky dns non–calc,v sml tuff & carb grs/debris,occ fine fltg ss grs,incr common micropyr & pyr clstrs

SLTST/SHSLTST lt gybrn lt brn lt gngy tnt,m sft,blky clstrs,vf sdy ip abnt arg mat & grdg to mudstn,incr pyr,abnt carb flks–sme thn lam, minor vcol tuff debris,sme vf ss grs

MUDSTN gy lt gybrn,pred v sft–clayey,gummy,abnt mat washed from sample–leaves slty–vf sdy resd,sme minor fine volc tuff debris,sl–non calc,sme lsd,tr mnrl calc

SAMPLE CAUGHT ON DE–SANDER
PASSING THROUGH FINE MESH SIEV
250 MICROMETERS



SS lt-m gy,occ g,c slt-vf snd gr,v fri-se grs,w srt,subang,abnt mica, scat carb flks,sme ltn frags,occ pyr cmt,scat micropyr,sl calc ip

SHSLTST m-dk gy,vf snd ip,m-v sft, blky-occ plty,abnt carb flks-thin lams ip,comm micropyr,abnt pyr clstrs,sme gy cly mat washed from sample,comm fos frags,tr volc mat, predom calc,sl-v calc ip

SS lt gy/wh,occ g,c slt-vf snd gr,v fri-se grs,w srt,subang,abnt mica, scat carb flks,sl calc ip

Wt=10.3 Vis=40 Wl=6.2 pH=9.0
Cl=600 Ca=40 Sol=10.3 Ck=2/32

SHSLTST lt gybrn,pred very fine, slty-grdg to a shale,predom- gummy-sme sample washes from samp,sl frm,blky dns [illegible] sm tuff & carb grs/debris,occ fine frag ss grs,incr micropyr & [illegible] clstrs

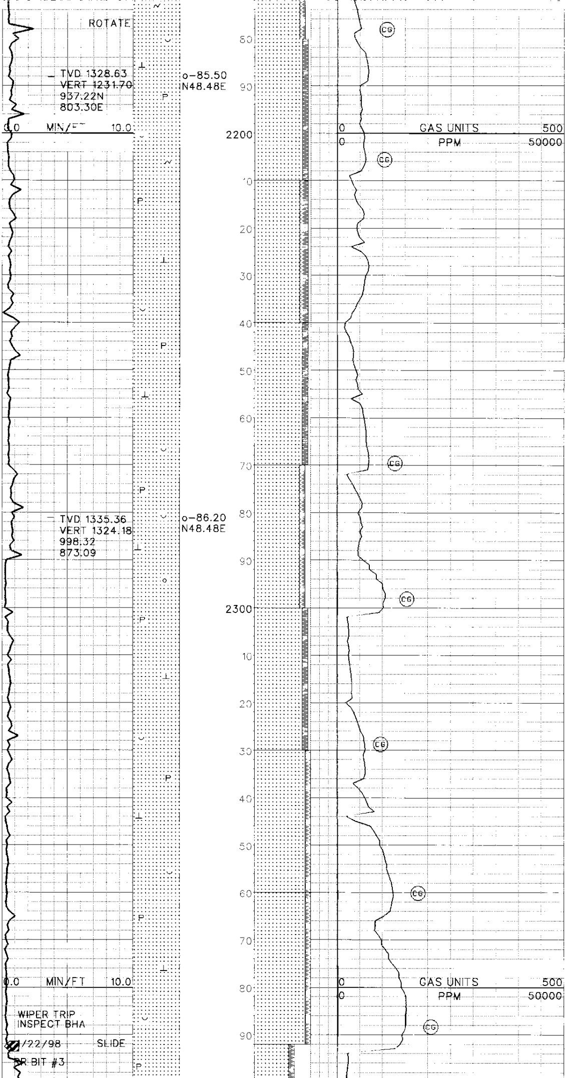
SS op s&p clr ip,Lvf-Uf gr,pred ang, small & fri clstrs v fri,imbdd sml micaplates,cln w/ rr-no org mat, occ dk carb specs,cln c strs in abnt sltst mtx?,tr chlor/glauc,rr pyr

SS op wh s&p clr ip,Lvf-Uf gr,m-w srt,sbang-ang,v fri w/ pred grain-support cmt no cly,incr lrg lt-trnsl micaplates,scat-abnt chlorite-pos glauc ip,minor carb grs/flakes, scat micropyr

SS op trnsl wh s&p clr ip,Lvf-Uf gr, m-w srt,sbang-ang,v fri w/ pred grain-support cmt rr-no cly,incr lrg lt-trnsl micaplates,scat-abnt chlorite-pos glauc ip,minor carb grs/flakes,scat micropyr & sml clstrs

SS op lt gy/wh,tr gl,pred vf-f gr,sub ang-ang,pred qtz grs,wsrt,sft-s frm,pred gr support,calc cmt,abnt mica bks/lrg flks,incr biot,tr chlor, comm pyr clstrs,scat carb flks,sl-v calc

SS op lt gy/wh,tr gl,pred vf-f gr, sme lse qtz grs,sub ang-ang,pred qtz grs,wsrt,frm,pred gr support, cmt pred calc occ pyr,abnt mica bks/lrg flks,scat biot,tr chlor,tr glauc,comm pyr clstrs,scat carb flks,scat coal frags,[illegible]



SS op lt gy/ wh,pred vf–f gr,sme lse cslt grs,sub ang–ang,pred qtz grs occ var col,wsrt,frm,pred gr support,cmt pred calc occ pyr,abnt mica bks/ lrg flks,scat biot,tr chlor,tr glauc,comm pyr clstrs,scat carb flks,scat calc frags,v calc

Wt=8.7 Vis=53 Wl=12.0 pH=8.0
Cl=11K Ca=100 Sol=2 Ck=Film

SS op lt gy/ wh,occ gl/ clr,vf–f gr,sme lse cslt grs,ang–sub ang,wsrt,pred qtz qtz occ var col,frm,gr support,pred calc cmt,incr pyr cmt,comm mica–biot/ chlor,tr glauc,tr carb frags,comm pyr clstrs,abnt calc frags,v calc

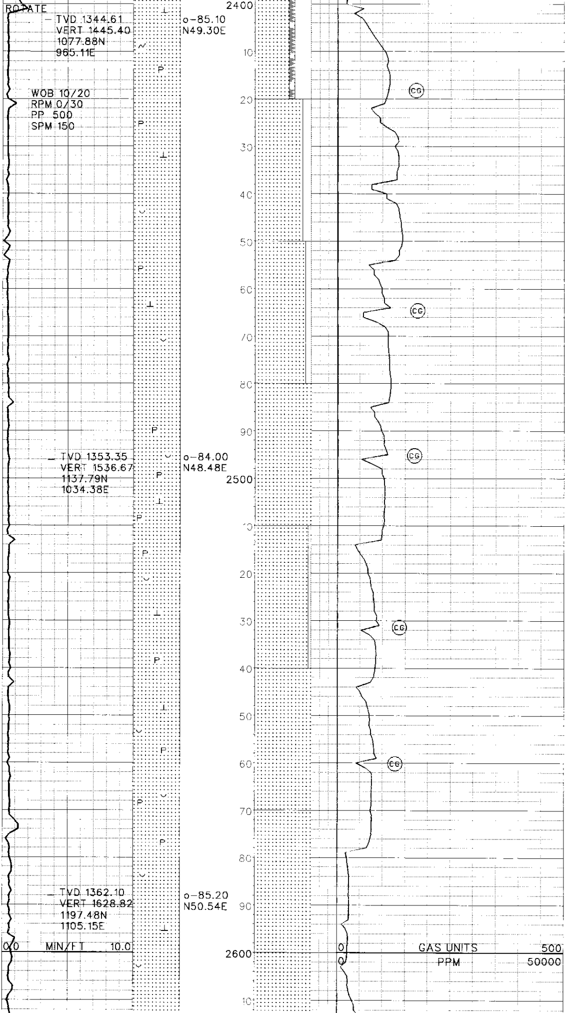
SS op lt gy/ wh,tan/ buf ip,occ gl/ clr,vf–f gr,sme lse c slt grs,ang–sub ang,w srt,pred qtz qtz occ var col,frm,gr support,pred calc cmt,incr pyr cmt,comm mica- biot/ chlor,tr glauc,tr carb frags,comm pyr clstrs,abnt calc frags,v calc

SS op lt gy,wh ip,occ tan,vf–f gr,subang–subrnd,wsrt,comm lse clr subang vf–f qtz grs,pred qtz occ var col,gr support,w cmt–pred calc occ pyr,comm mica,tr biot,tr chlor,scat calc frags,abnt pyr clstrs,v calc

SS op lt gy/ wh,tan/ buf ip,occ gl clr,vf–f gr,sme lse c slt grs,ang–sub ang,wsrt,pred qtz qtz occ var col,frm,gr support,pred calc cmt,incr pyr cmt,comm mica–biot/ chlor,tr glauc,comm carb lams in sltst,abnt pyr clstrs,abnt calc frags,

SS lt gy–wh,op–clr,rr tan,vf–f gr,wsrt,subang,sft–sl frm,pred qtz,gr support,m–w cmt–pred calc tr pyr,comm lrg mica flks,tr biot/ chlor,sme vf–f lse subang qtz grs,scat carb frags,abnt pyr clstrs,tr micro pyr,comm calc frags,v calc

SS lt gy–wh,op–clr,rr tan,vf–f gr,wsrt,subang,sft–sl frm,pred qtz,gr support,m–w cmt–pred calc tr pyr,comm lrg mica flks,tr biot/chlor,decr f lse subang qtz grs,scat carb frags,abnt pyr clstrs,tr micro pyr,comm calc frags,rr fos,v calc



SS op wh s&p clr ip,Uvf–Uf gr,m–w
srt,sbang–ang,v fri w/ pred grain–
support cmt no cly,incr rglt–trns
mica plates,scat–abnt chlorite,
minor carb grs/flakes,abnt
micropyr & pyr clstrs,NOTE: poor
sample–cavings from trip

SS op s&p lt gy,vf–f–Uf gr,m–w srt,
sbang–ang occ rd grs,v fri calc cmt,
scat–abnt sm mica flks,carb
grs/flks,scat chlor/glauc incl,no
org content,micropyr & pyr clstrs,
minor cvgs

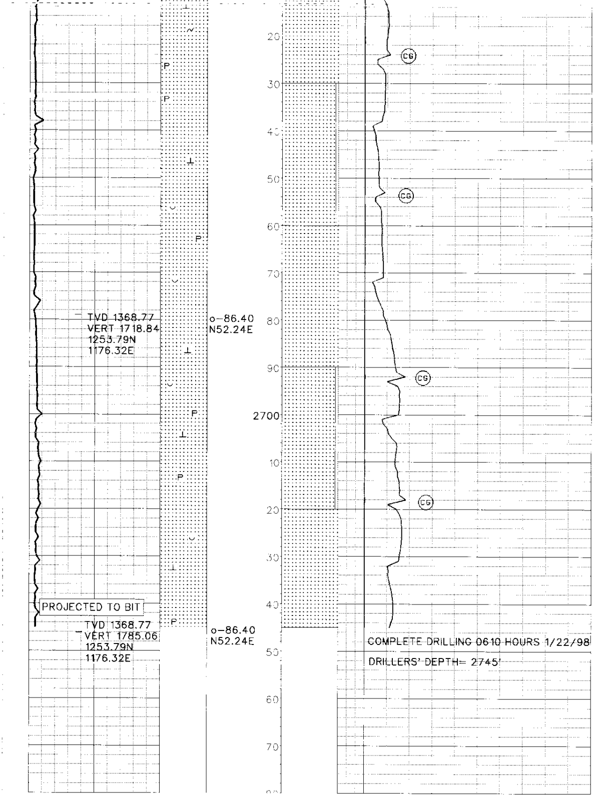
SS op lt gy,wh ip,occ tan,vf–f gr,
subang–subrnd,wsrt,comm loose
subang vf–f qtz grs,pred qtz [illegible]
var col,gr support,w cmt–pred calc
occ pyr,comm mica,tr biot,tr chlor,
scat calc frags,abnt pyr clstrs,[illegible]

SS op s&p lt gy lt ambr stn ip,bcm f–
Uf gr,sbang–ang scat sbrd vc gr qtz
pbls–lse,minor–scat mica,incr–
abnt pyr clstrs,v fri calc cmt rr–no
org contere,sme vis intgran por,
scat chlor

SS op s&p lt gy,vf–f–Uf gr,m–w srt,
sbang–ang occ rd grs,v fri calc cmt,
scat–abnt sm mica flks,carb
grs/flks,scat chlor/glauc incl,no
org content,micropyr & pyr clstrs,
minor cvgs

SS op wh s&p clr ip,Uvf–Uf gr,m–w
srt,sbang–ang,v fri w/ pred grain–
support cmt no cly,incr rglt–trnsl
mica plates,scat–abnt chlorite,
minor carb grs/flakes,abnt
micropyr & pyr clstrs,sme vc gr qtz
pbls–lse sbang

SS s&p op lt gy,bcm Uf–m gr ip vf gr
ip,m srt,sbang,v fri calc–grain
supported cement,mica throughout,
abnt pyr,rr–no org infl,trace–
scat chlor. sme vis intgran por,carb
grs/flks



SS op lt gy/wh,pred vf–f gr,sme lse cslt grs,sub ang–ang,pred qtz grs occ var col,wsrt,frm,pred gr support,cmt pred calc occ pyr,abnt mica bks/lrg flks,scat biot,tr chlor,tr glauc,comm pyr clstrs,scat carb flks,scat calc frags,v calc

SS s&p op lt gy,bcm Uf–m gr ip vf gr ip,m srt,sbang,v fri cclc–grain supported cement,mica throughout,abnt pyr,rr–no org infill,trace–scat chlor. sme vis intgran por,carb grs/flks,trace hole cavings

SS op lt gy/wh,tr gl,pred vf–f gr,sme lse cslt grs,sub ang–ang,pred qtz grs,wsrt,frm,pred gr support,cmt pred calc occ pyr,abnt mica bks/lrg flks,scat biot,tr chlor,tr glauc,comm pyr clstrs,scat carb flks,scat calc frags,v calc carb

SS lt gy s&p op tr ambr,vf–f–Uf gr,m srt,pred ang sbang ip,v wk & fri calc cmt thru,abnt mica flks,decr thn carb lam/grs,tr chlor/glauc,abnt pyr thru,minor dk debris,minor hole cavings

SS op wh s&p clr ip,Uvf–Uf gr,m–w srt,sbang–ang,v fri w/ abnt grain–support cmt no cly,incr lrg lt–trns mica plates,scat–abnt chlorite,minor carb grs/flakes,abnt micropyr & pyr clstrs,sme vc gr qtz pbls–lse sbang