ROCKY MOUNTAIN GEO-ENGINEERING CORP.
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OPERATOR: NW NATURAL
WELL: IW 22H-22-65
LOCATION: SECTION 22, T6N, R5W
COUNTY: COLUMBIA COUNTY
STATE: OREGON
SPOT: 2291.5'N 3Deg. 03' 15
SPOT: 1907.87'S 86Deg. 56' 45
FIELD: CALVIN CREEK

LOG TYPE: MUD LOG

SPUD DATE: 10/14/97
TD DATE: 10/21/97
DATES LOGGED: 10/14/97-11/3/97
DEPTHS LOGGED: 45'- 1825'
LOGGERS: ED PERRY/ERIC HELLER
DRILLING FLUID: SPUD MUD/LOW SOLIDS POLYMER
DRILLING RIG: TAYLOR RIG #4
ELEVATION: GL 581.0, KB 597.0

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

REMARKS:

LITHOLOGIES

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

MODIFIERS

ANHYDRITE STRINGERS	ALGAE, LAMINATED	ALGAE, NON-DESCRIPT	ALGAE, OOTOID	ALGAE, SKELETAL	AMPHIPORA
// ANHYDRITIC	ARGILLACEOUS	/ ARGILLITE GRAIN	BELEMNITE	B BENTONITE	BIOCLAST FRAGMENTAL
BRACHIOPOD	BRECCIA	BRYOZOA	⊥ CALCAREOUS	■ CARBONACEOUS FLAKES	CEMENTING BITUMENOUS
CEPHALOPOD	▲ CHERT DARK	△ CHERT LIGHT	CHERT PEBBLE	■ 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	MARLSTONE CALCAREOUS	MARLSTONE DOLOMITIC
MICACEOUS	NODULES	OOLITES	OSTRACOD	PEBBLES	PELECYPOD
PELLETS	PHOSPHATE PELLETS	PISOLITE	PLANT REMAINS	P PYRITE	⊞ SALT CAST/INFILL
○ SAND GRAINS	SANDSTONE STRINGERS	SANDY	SCAPHOPOD	— SHALE LAMINAE	Λ SILICEOUS
SILTSTONE STRINGERS	■■ SILT	SLICKENSIDE	S SPORES	STROMATOPOROID	STYLOLITE
V TUFFACEOUS					

POROSITY/SORTING/ROUNDNESS SYMBOLS

X INTERCRYSTALINE INTERGRANULAR	V VUGGY	F FRACTURE	INTEROOLITIC	P PINPOINT	ORGANIC
MOLDIC	EARTHY	□ FENESTRAL			
A ANGULAR	SUBANGULAR	R ROUNDED	SUBROUNDED		
W WELL	M MEDIUM	P POOR			

ENGINEERING SYMBOLS

BIT CHANGE	^ LOST CIRCULATION	[illegible]	[illegible]	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
CONNECTION GAS	TRIP GAS	MIDNIGHT DEPTH	MIDNIGHT DEPTH	CONNECTION	— OFF BOTTOM
NORMAL FAULT	REVERSE FAULT	OVERTURNED STRATA			

CORE RECOVERED	▨ CORE LOST	DST INTERVAL	ROTATING	SLIDING	▤ [illegible]

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

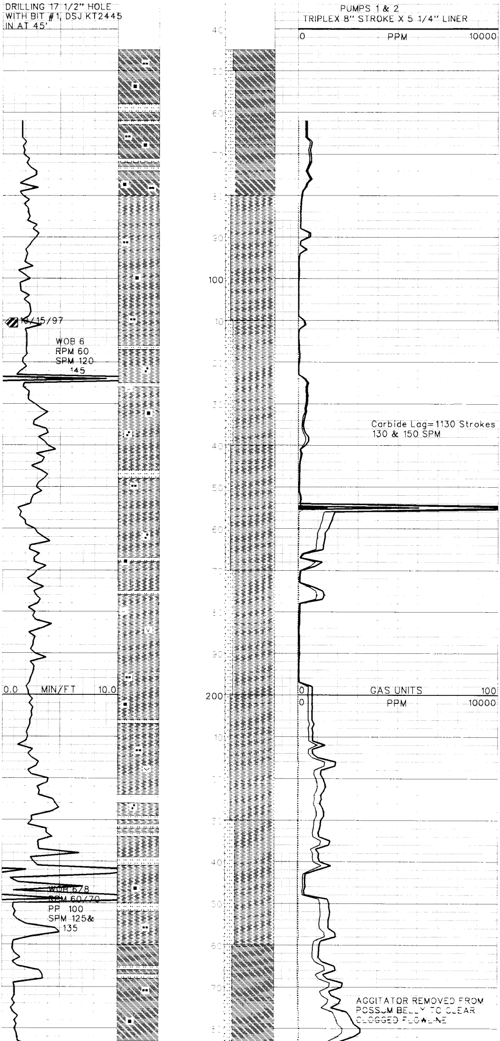
RPM – REVOLUTIONS/MIN
RR – RE–RUN
SLM – STEEL LINE MEASURE

—— ROP MIN/FT

—— TOTAL GAS (UNITS)

—— C1 PPM ········ C2 PPM ——— C3 PPM —·—·— C4 PPM

0.0 MIN/FT 10.0	INTERPRETIVE LITHOLOGY	DEPTH FEET	CUTTINGS LITHOLOGY	OIL SHOW T F G	0 GAS UNITS 100 0 PPM 10000	LITHOLOGY DESCRIPTIONS
		10				
		20				RMGE PAL/FID UNIT #28 ON LOCATION 10/14/97
		30				SPUD IN HOLE 1900 HRS AT 45' UNDER CONDUCTOR 10/14/97



DRILLING SAGER CREEK MEMBER
OF MAIN KEASEY

GYCLYSTN m dgy, tan, pred [illegible] slty, — vf sdy grns, comm — abnt carb frags, abnt tan/tan sltstn frags — slcalc, occ lt gr tuff frags, non calc

SH/MDSTN lt gy, brn, v sft clayey —

SLTY CLYSTN lt gy & gybrn, v sft — [illegible] &

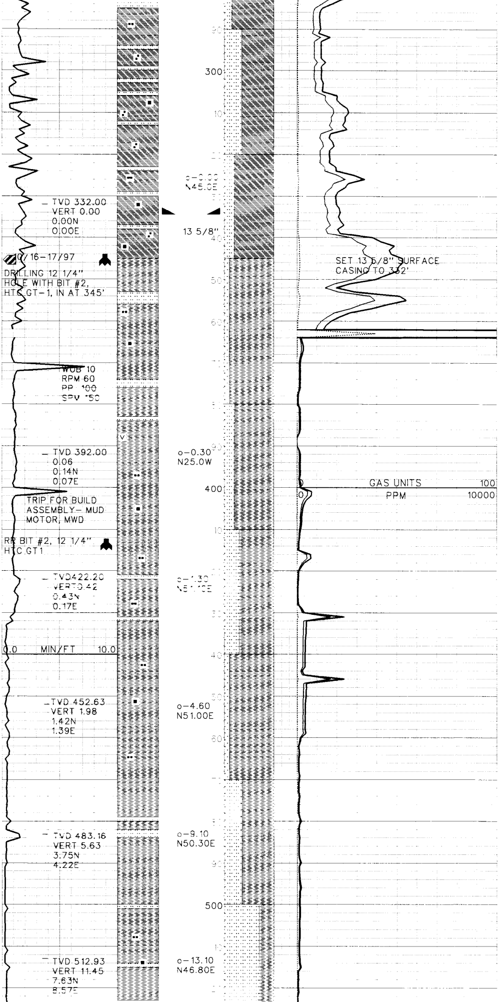
SHSLTST gy & gybrn, pred v sft & clayey — abundant mat washed from sample, residue is mostly vf sdy qtz — slty gran sme dk carb grs minor vf dism mica & tuff mat

SHSLTST lt gybrn, sft clayey slty cly, non-calc mostly washes from sample — slt, resd w/ scat & vf dism carb mica crm — tan pos tuff mat & vf qtz grs, ang glos, loose

SHSLTST gy lt gy, abnt v sft — cly & gmy washed from samp, f — vf rd — sbang qtz grs, tan — crm tuffaceous frags w/ [illegible] & [illegible]

SLTY CLYSTN lt gy & gybrn, v sft — clayey, abnt mat washed from sample, slty text & sme vf sdy qtz resd, scat carb frags, vf dism mica & debris, tuff frags ip

SLTY CLYSTN lt gy & gybrn, v sft — [illegible]



SLTSTN ltbn,pred slty grns,w srt, frm to sl hard,tr carb frags/lams,rr tuff frags,sl arg,calc

[illegible] sft-[illegible] stky gumy,abnt mat washed from sample,occ-comm slty grns,comm f-m grn sndy qtz grns,abnt carb frags,scat mica,non calc

SHALE/SLTSTN gy & gy grn, sft-[illegible] washed from sample,slty text & sme vf sd, qtz resd,scat carb frags,vf dism mica & debris

SLTY CLYSTN lt-m gy & gy brn, sft-cly stky gumy,abnt mat washed from sample,occ-comm slty grns,comm f-m grn sndy qtz grns,abnt carb frags,scat mica,non calc

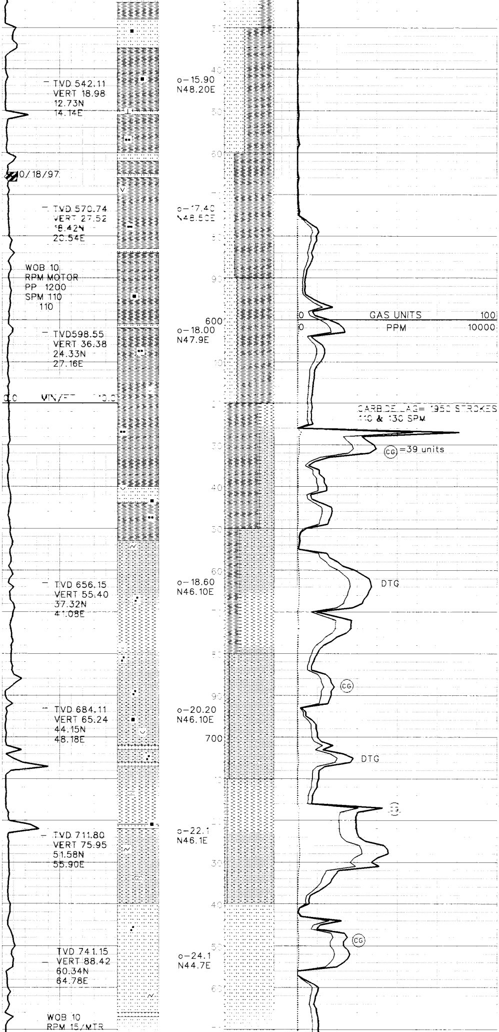
SLTY CLYSTN lt-m gy & gy brn, [illegible]

Wt=8.8 Vis=43 Wl=7.6 pH=11
Cl=20K Ca=20 Sol=3.5 Ck=2/32

SLTY CLYSTN grgrn & lt-m gy, sft-cly stky gumy,abnt mat washed from sample,occ-comm slty grns,tr carb frags,scat mica, non calc

[illegible] washed from sample,occ-comm slty grns,tr carb frags,scat mica, non calc

SLTSTN mbrn,m gy,sl mott,slty-vf sndy grns,abnt mat washed from sample,w srt,sub rnd,abnt carb frags [illegible]



SLTSTN lt–mgrn,gyorn,ocl lt gy,sl mott,abnt mat washed from sample, pred sltv grns ocl vf snd,m–w srt, subrnd,pred sft to mnor,abnt carb frags [illegible] pyr [illegible] strs,pred non calc [illegible]

SHALE–SLTST [illegible]

SHSLTST gy lt gy,abnt v sft–cly & gmy washed from samp,f–vf rd– sbang qtz grs,tan–grn tuffaceous frags w/ qtz [illegible] & grs [illegible]

SLTST gy,brn mott,m frm [illegible] strs [illegible] pred v sft–clayey & gummy [illegible] mtx,vf sdy/slty qtz,mica calc cmt,abnt mica dk carb strks [illegible] frags,rr tuff mat

SAMPLE TOP MAIN KEASEY
AT APPROX. 653' (MD)

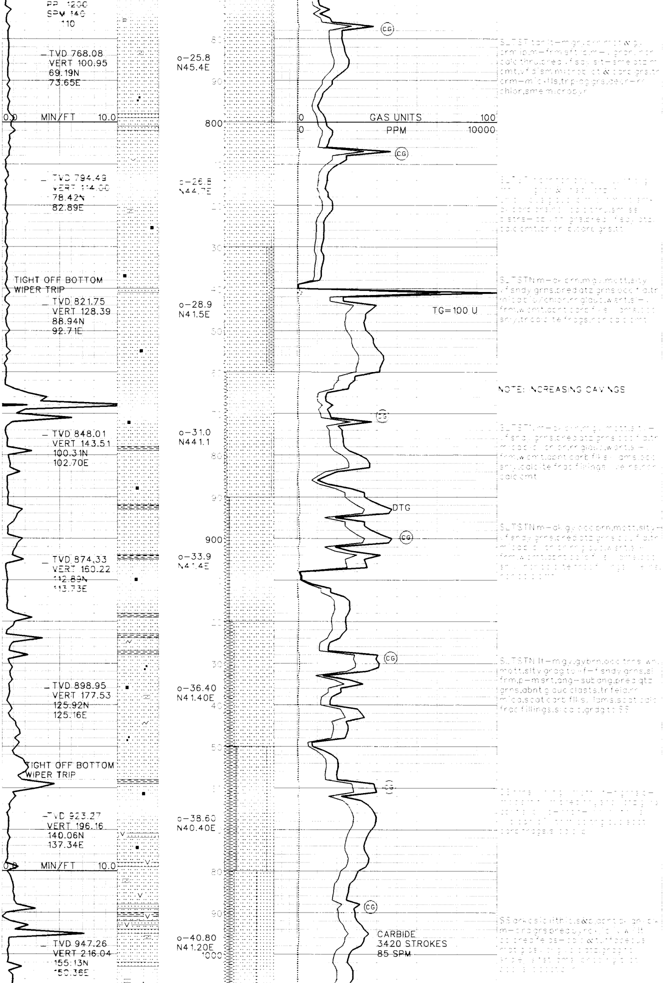
[illegible]

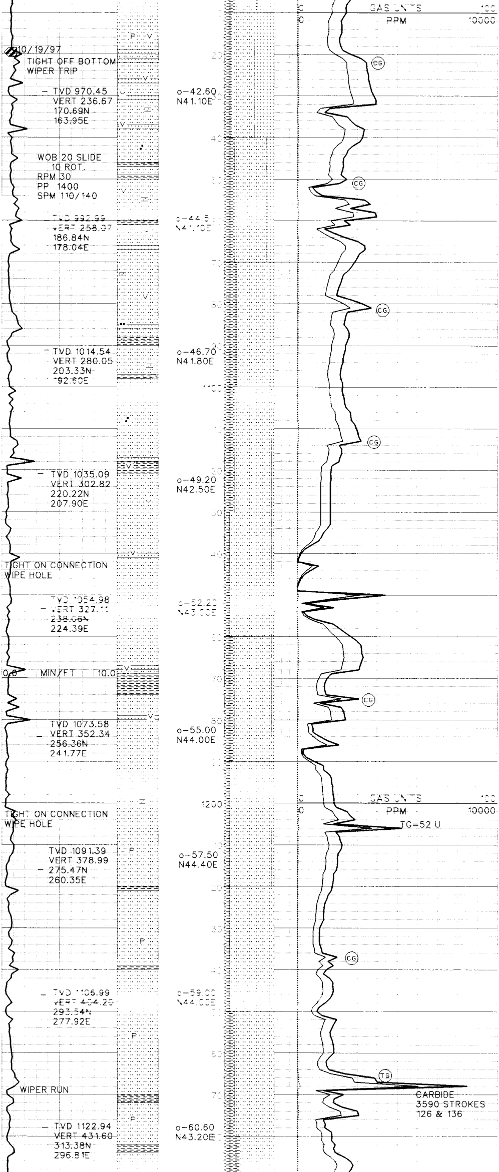
SLTST lt brn tan,dns blky,abnt arg mtx w/ gran & vf sdy qtz ip, chlor/pos glauc ip,microm [illegible] carb grs,non calc thru,SML SS CLSTRS– [illegible] grs,pred vf sdy qtz,calc cmt [illegible] grs

Wt=9.8 Vis=48 W =7.0 p-=10.5
C =1300 Ca=80 Sc =8.5 Ck=2/32

SLTST [illegible] gy,brn [illegible] sft arg sl gran–calc,pred vf sdy qtz,m–v frm sl–mod calc cmt [illegible] gy/op w cemented vf–f gr ss stringers,scat chlor incr mica [illegible], scat dk carb grs & lam

SLTST even lt gy,brn thru,blky m– occ v frm,gran–gritty,pred vf sdy & qtz ip arg–shy ip,sl calc,tr [illegible] decr biot & carb [illegible] stringers,m–w srt





SLTSTN lt-m gy,gybrn,occ trnsl wh, mott,slty grdg to vf-f sdy grns,sl frm,p-m srt,ang-sbang,pred qtz grs,abnt glauc grs,tr feld,tr mica, scat carb f [illegible] grns,scat [illegible] frags fillings,sl [illegible] grdg [illegible]

[illegible]

SLTSTN lt-m gy,gybrn,occ trnsl wh, mott,slty grdg to vf-f sndy grns,sl frm,p-m srt,ang-subang,pred qtz grns,[illegible]

Wt=9.9+ Vis=40 W =5.2 pH=9
Cl=1200 Ca=60 Sol=10 Ck=2/32

SLTST m gy lt gy & gybrn,pt frm grs [illegible] &rthy [illegible] calc,bcm pt grdn-slty & occ vf sdy,micromica tuff mat calc [illegible] qtz grs,[illegible]

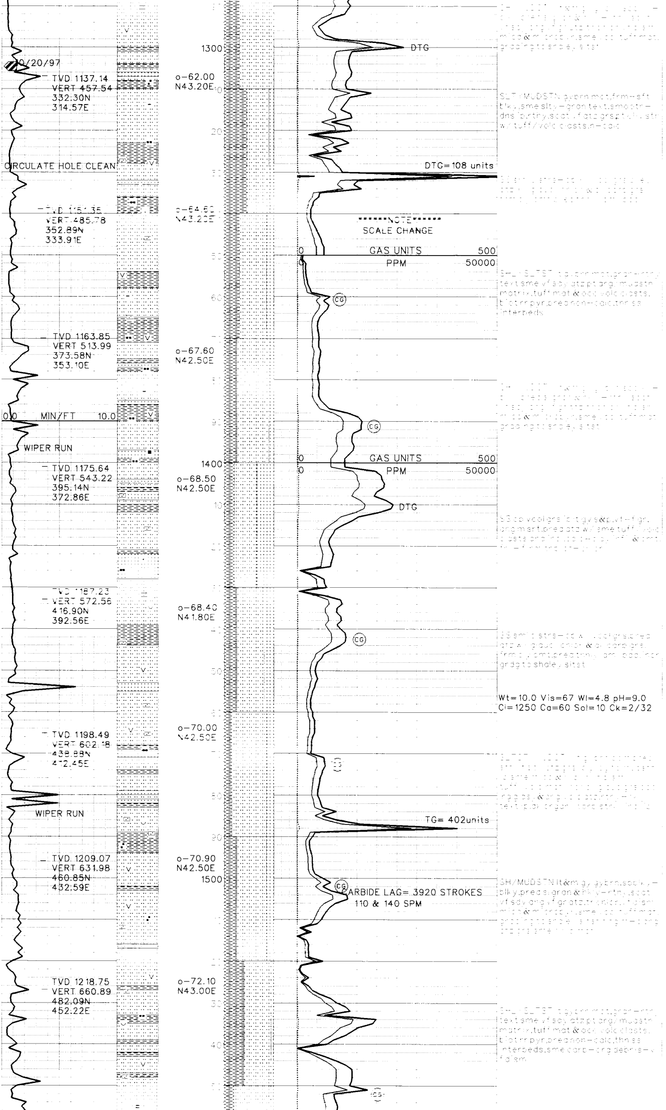
SLTSTN m-dk gy,occ gybrn,s frm, pred slty grns,occ vf sndy grns,w srt, [illegible]

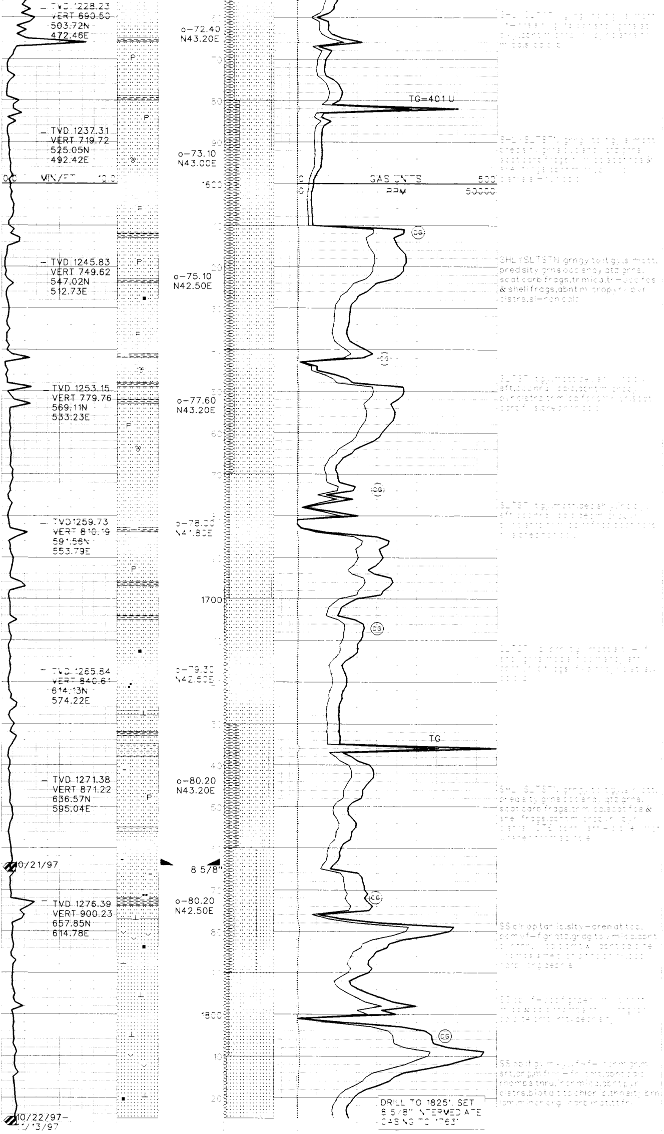
SLTSTN m-dk gy,occ gybrn,s frm, pred slty grns,occ vf sndy grns,w srt, incr carb frags,scat calcite frags, tr micropyr,tr mica,s org,sl calc

[illegible]

SLTSTN m-dk gy,occ gybrn,s frm, pred slty grns,occ vf sndy grns,w srt, incr carb frags,scat calcite frags, [illegible] calc

[illegible] scat carb frags,[illegible] scat pyr clstrs,non-sl calc





CEMENTING INTERMEDIATE CASINGFAILS. ATTEMPT TWO CEMENT SQUEEZE JOBS IN CASING. PACKER STUCK IN CASING ON RETRIEVAL AT APPROX. 600'. FREE-POINT AND BACK OFF TO APPROX. 490'. DRILL STRING CEMENTED IN CASING. MILL ON FISH TO APPROX. 499'.

DRILL THROUGH CASING. ATTEMPT TO RETRIEVE CASING TO/PAST FISH AND PATCH. PLUG AND ABANDON WELL.