TECTON GEOLOGIC

GEOTHERMAL DATA LOG

Company	ANADARKO PETROLEUM CORPORATION
Well name	PUEBLO VALLEY 52-22A
Field	Pueblo Valley
County	Harney
State	Oregon
Location	SEC 22, T37S, R33E, W B & M From NW Corner, 875' S, 2800' E
Elevation	4086' GL
Contractor/Rig	Tonto Universal No. 022002
Spud Date	11-15-93
TD Date	12-4-93
TD	2520' GL
True Vertical Depth	Not Surveyed
Bottom Hole Location	
Well Status	Shut In for Observation
Company Representative	R.C. Edmiston

LOGGED INTERVAL

Date Logged	11-15-93	to	12-4-93
Depth Logged	0'	to	2520' GL
Mud Drilling	0'	to	2520' GL
Air Drilling		to	

Temperature Instrument Type T TYPE THERMOCOUPLE

Log Scale 1:300 Unit Number A-1

Log Prepared By Doug Goodwin

HOLE SIZE / CASING

HOLE SIZE			CASING		
12.25"	to	46'	9.625"	at	46'
8.5"	to	333'	7.0"	at	332'
6.125"	to	1325'	4.5"	at	1322'
3.83"	to	2520'		at	
	to			at	

WATER ENTRIES

2205'

ANADARKO
PETROLEUM CORPORATION
PROPRIETARY DATA

LOST CIRCULATION ZONES

No returns below 2194' except during intermittent well flow.

REMARKS

Log is prepared based on depth below ground level. Geologic descriptions based on cuttings to 1325', on core to T.D.

LITHOLOGY SYMBOLS

▨	Xtl Lithic Tuff	▨	Ash	▨	Ash Tuff
▨	Xtl Pum Lap Tuff	▨	Tuff Breccia	▨	Basalt
▨	Sand	▨	Claystone	▨	Clay
▨	Sandstone	▨	Siltstone	▨	Xtl Ash Tuff

LOG SYMBOLS

Wireline Log	⚡	Casing Shoe	◢
Steam/Water Entry	◀	Orifice/Flow Test	⋈
Deviation Survey	→	Cored Interval No Recovery	▮

SECONDARY MINERALS

Q = Quartz
C = Calcite
P = Pyrite
E = Epidote
Cl = Chlorite

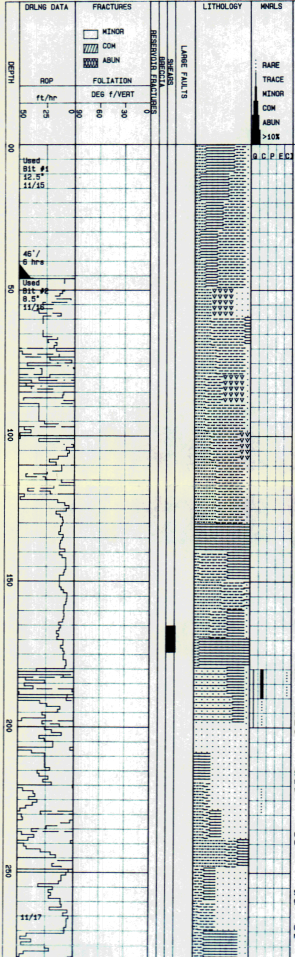
rare	<< 1%
trace	< 1%
minor	1% up to 4%
common	4% up to 7%
abun	7% up to 10%
	> 10%

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

TECTON GEOLOGIC

ANADARKO PETROLEUM CORPORATION
PUEBLO VALLEY 52-22A
Scale 1 : 300



DESCRIPTIONS

ANADARKO
PETROLEUM CORPORATION
PROPRIETARY DATA

Claystone: gryorange, pred clayst w/subord slty clys+uncons slt, unlithd, uncons-mod cons, mnr-com multicolored uncons volc rock frag + qtz snds (gry, pnk, blu, or, yel, grn, rd), rx pred rhyo-bslt-silica, tr-mnr pyrolusite.

Spud-in on 11/15/93. Set 9-5/8" conductor to 46'. Drill ahead on 11/16/93 with 8-1/2" rotary bit.

Siltstone: ltgry, mod cons, unlithd, w srtd, mas?, ibds uncons rnd-ang volc snds a/a, com chips unwlded pl orange silic tuff.

Claystone: gryorange+grygrn, modcomp, +/-slty, unlithd, tr pyrolusite, 5% ibded uncons rd-blk bslt sand.

Silt: lt grygrn, com ibded w/Clayst above, uncons-pr cons, w srtd.

Claystone: pl grygrn, com ibded w/grygrn Sltst, comp, unlithd, mas, up to 10% uncons subang-subrnd pred volc snds obsid-bslt+clr qtz.

Ash Tuff: lt gry-pl grygrn, w srtd, silic, vitric, unwlded, comp, fol.

Siltstone: pl grngrn, uncons, com ibded w/ grngrn Clyst+ash tuff lyrs, uncons, w srted, mas, mnr uncons obsid + qtz snd.

Claystone: pl grngry, comp, mod cons, mas, ibded w/Sltst a/a, tr bslt + obsid snds.

Clay: med gry, sft, sticky, sample mixed w/lith material from upper hole.

Claystone: med gry-med grygrn, sft+sticky t/mod comp, subord pl grygrn Sltst, mnr tan Clyst w/pyrolusite (= slough ?).

Claystone: ltgry-pl grygrn, sft+sticky t/mod comp, subord ibded ltgry-ltbrngry Sltst.

Siltstone: ltgry-ltbrngry, comp, unlithd, w srtd, grds t/vf snds w/pred volc rfs + silica + qtz xtals.

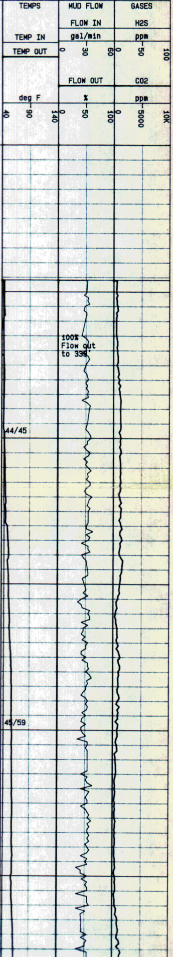
Sand: multicolored, mix vf-f uncons snd, pred tan-gry-blk-red-yel-or bslt + cndrs w/loc amygds sil, tr-mnr chrt + opl frags, ibd pr-mod cons, w srtd Sandst, tr 2ndry calc, mnr rewrkd sil, r cly.

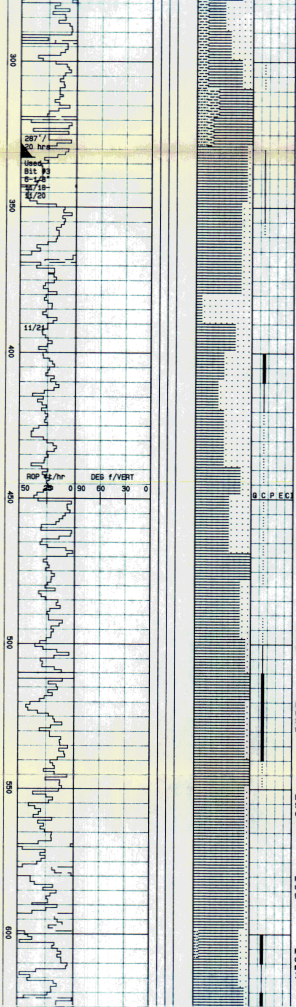
Sandstone: ltbrngry, c snd-f grvl, w srtd, mas, wkly lithd-unlithd, pred rock frags w/subord sil-qtz sand, gen subrnd-rnd, pred bslt+cndrs w/rhyo-obsid-chrt-silic-qtz, com ibded sft sticky ltbrngry Cly.

Claystone: grygrn, comp, unlithd, w/ibded sft ltbrngry sft + sticky Cly, uncon Sandst w/pred silic+bslt clsts, ltbrngry Siltst.

Siltstone: ltgrybrn, w srtd, comp, unlithd, loc com hem staining, ibded grngry Clayst + mnr volc Sandst.

Clay: ltgrybrn, sft, sticky, uncons, ibded uncons bslt/cndrs-dom c-vc rnded volc snds w/subord qtz+silic.





Claystone: ltgrygrn, comp, unlithd, subord to sft brngry Cly + subequal t/grygrn Sltst + multicolored bslt/silic dom uncons c-vc volc sands.

Sand: multicolored, mix f-vc uncons volc snd, mod-w srtd, pred gry-blk-red bslt + cndrs, tr-com chrt frags + qtz, ibd sticky brn Cly + comp grygrn Clayst, loc com hem.

Drill 8-1/2" hole to 333'. Set 7" casing to 333'. Install BOPE. Drill ahead with 6-1/8" rotary bit.

Clay: ltgrybrn-ltbrn, sft, sticky, uncons, ibded bslt/cndrs-dom (m)-grd sbrnded volc snds w/subord clr qtz+silic+buff tff+sltst+cmt, mod-w srtd.

Sand: multicolored, pred (m-vc) grd uncons volc snd, mod-w srtd, pred dk gry-blk-red bslt + cndrs, com chrt frags + qtz, ibd sft + sticky ltbrn Cly.

Sand: yelbrn, uncons, slty, pred (f-m) grd w/mnr (c) snd-(f) pebs, pred mafc volcs - bslt+cndrs, subord qtz + misc other volc rx, pred subrnd w/mod-pr srtg, mnr ibd sft ltbrn Cly.

Clay: ltbrn, sft, uncons, slty, ibd uncons multiclrd Sand pred (c) grd gry bslt/red cndrs + (f-m) grd yelgry-yelbrn qtz, tr friabl mod-wel srtd Sndst + ltgry Tuff.

Clay: ltbrn-plyelbrn, slty, sft, calcareous, small samples due to ease of material washing away and remaining in suspension in mud system, creamy consistency, ibed uncons Sand, pred bslt + cndrs w/qtz, chert+others, (m-c) grd, mod-wel srtd, subrnd-rnd grains.

Clay: pl-dkyelbrn, slty, sft+creamy, r-mnr calc, small samples - material remaining suspended in mud system, tr-com ibed uncons Sand, pred bslt + cndrs w/qtz, chert+others, pred (m-c) grd, pr-mod srtg, subrnd grains, occas (vf) bslt pebs/granules, loc tr chips friabl (vf) Sndst/(c) Sltst.

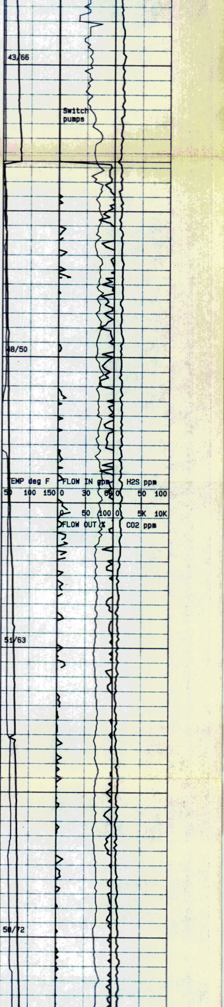
Sand: pred med-dkgry bslt, red cndrs, clr silic+qtz, (vf-vc), comly (c) grd, subrnd grns, mod srtd, ibded in sft + creamy med-dk yelbrn slty Mud.

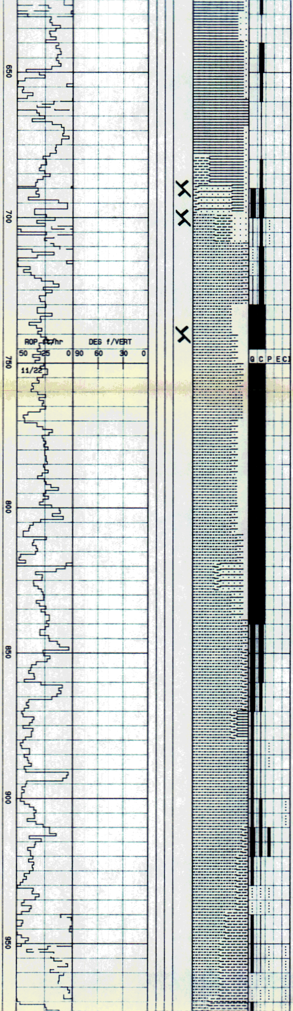
Mud: med-dkyelbrn, slty, sft+creamy, abst-mnr calc, small samples - material remaining in suspension in mud system, tr-com ibed uncons Sand, pred bslt + cndrs w/qtz, chert+others, pred (m-c) grd, subrnd, pr-mod srtg.

Mud: pred med-ltyelbrn, loc ltgry, slty, sft+creamy, tr-com ibed uncons Sand, pred med-dkgry bslt + red cndrs w/clr qtz, clr-wht chert+others, pred (m-c) grd, subrnd, pr-mod srtg.

Mud: yelbrn-ltgry, slty, sft+creamy, tr-mnr ibed uncons Sand, pred med-dkgry bslt + red cndrs w/qtz + silic + others, mainly (c) subrnd grns.

Mud: yelbrn-ltgry, slty, sft+creamy, tr-com ibed uncons Sand, pred (f-c) med-dkgry bslt + red cndrs w/qtz + silic + others, subrnd grns, mod srtg, com FeOx staining on qtz grains, r-mnr ibeded Sltst - ltgry-ltgrngry, calc, mas, mod comp.





Mud: plyelbrn, slty, sft+creamy, mnr ibed uncons Sand, pred med-dkgry bslt + red cndrs w/silic + wht xtal tuff, mainly (m-c) subrnd grns.

Mud: lt-medgry, ltbrn, plgrngry, olgry, dkgrngry, slty, sft+creamy, tr-com calc, small samples - material remaining in suspension in mud system, loc tr plyelbrn mas Sltst, loc tr ltgrngry Mudst, tr-com ibed uncons Sand, pred bslt + cndrs w/qtz + grn + wht tuffs, (vf-c) + pred (f-m) grd, subrnd, mod srtg.

Sandstone: ltgry, (vf-f), w srtd, comp, mas, mnr-com calc, loc sil cmt adj to clr-wht ltly oplscnt sil vng, mnr ibed ltgrngry-ltbrngry mas comp calc Mudst/Clyst, mnr (c) uncons volc Sand, pred bslt + cndrs, uncons snd pos = uphl contam.

Mudstone: ltgry-plgrngry, slt-dom Mudst, mas, comp, calc, v soluble, comly ibded with + grds to prly srtd lt gry Sltst/(vf) Sndst w/volc lith frags, com uncons (c) volc Snd - pred of bslt + cndrs, tr-mnr clr-wht calc vnlets, loc sparry calc cmting microbrec @ 730', mnr-abun intersti calc, tr-abun clr-wht bnded botry-drusy sil-calc vng, loc pl blu-clr opl/agat sil dendr + bxwrks.

730-840': 10-30% clr-wht lamd calc-sil vns, pred sil, sil = latest matrl depod, com botry surf, com fragl dendritic frags, loc oplsnt/agat, 2ndries genly smpld as chips of 100% 2ndry matrl - only r Mudst chips w/2ndry vnlts.

Mudstone: ltgry-plgrngry, slt-dom Mudst, mas, comp, calc, v soluble, comly ibded with + grds to prly srtd lt gry Sltst/ltgrngry-ltgrybrn-ltgry (vf) Sndst w/volc lith frags, com-abun (contam? </= 75% smpl) uncons (c-vc) volc Snd/(f) Pebs - pred of rnd-subrnd bslt + cndrs + chrt frags w/finer subrnd qtz xtals, tr-mnr clr-wht calc vnlets, mnr-abun intersti calc, tr-abun clr-wht bnded botry-drusy sil-calc vng, loc pl blu-clr opl/agat sil dendr + bxwrks, loc tr blu cly.

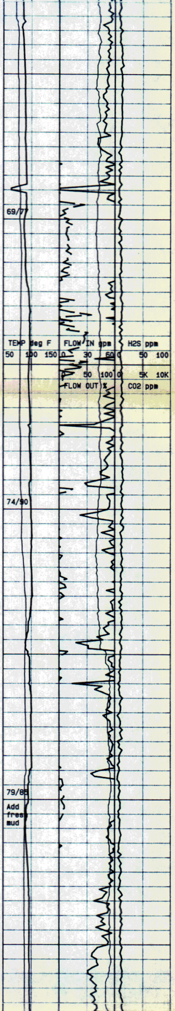
Sandstone: ltgrngry-ltgry, loc blchd wht + silid, (vf) grd, w srtd, grds f/(c) Sltst, mas, rfs-pl-qtz, w/bslt + cndrs pred rfs, comp but prly lithd, ibded w/Sltst + plgrngry Clyst, loc grn-blu clys, abun 2ndry sil + calc vng as prev noted.

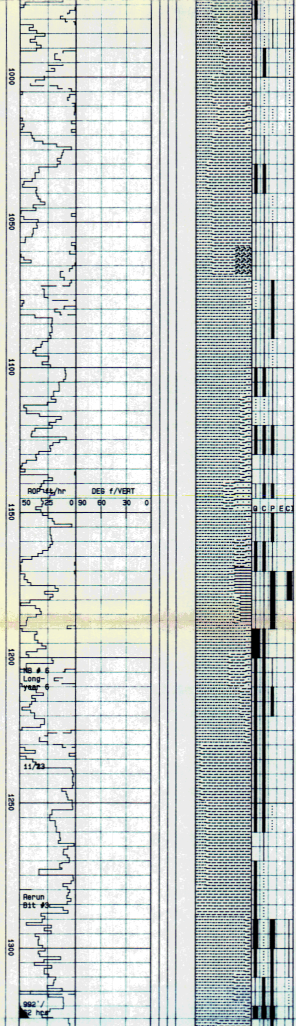
Siltstone: ltgry-ltgrngry, mod comp, calc, mas - loc lamd, str calc, grds t/(vf) Sndst + t/grngry-ltbrngry Clyey Mudst, com blchd whtish + silcfd, abun smpl contam to 75% uphl matrl - pred FeOx-stained bslt + qtz, tr chips tan silic Ash Tuff @ 870'.

Siltstone: ltgry-ltgrngry, pred comp but sft, str calc, mas, loc silic, mnr assoc sft lt gry Cly, ibded grngry-ltgrybrn Clyst + lt gry (vf) Sndst, r lamd clr-wht sil w/calc vng a/a - loc dendr + botry, loc clr sparry calc vng, rx comly altd pnkgry adj t/vng, abst-mnr v f dissem pyr.

Siltstone: ltgry-ltgrngry, mod comp, calc, pr lithd, mas - loc lamd, str calc, grds t/dkgrngry-ltbrngry Clyey Mudst, r-mnr lamd sil-calc vng, com abun uphl contam.

Claystone: med-dkgrngry, grybrn, mas, comp-sft, calc, comly cly-dom Mudst, ibded grngry-ltgry-medgry clyey Sltst, r chips buff silic Tuff @ 1000', r-mnr lamd sil-calc vng, r opl sil, r calc spar, abst-r dissem pyr, r-tr blu-blgrn 2ndry cly.





Claystone: dkgrngry, ltgrybrn, sft, comp, mas, calc, ibded + grds to ltgry-medgry Sltst, loc pnkgry silic altn, tr lamd clr-wht calc-sil vng, sil com botry, r calc spar vng, r-tr blu-grnblu cly.

Claystone: dkgrngry, ltgrybrn, sft, comp, mas, calc, pred slty occ as cly-dom Clyey Mudst, ibded + grds to ltgry-medgry Sltst, loc blchd pnkgry altn - comly assoc w/dissem euhed pyr; tr-mnr lamd clr-wht calc-sil vng, sil com botry, r calc spar vng, r-tr blu-grnblu cly, abst-tr dissem + aggr pyr.

Xtal Ash Tuff: ltgrybrn, wlded, hd, fol, vitrc, 4% 1mm plag xtals alt t/grn cly, thin unit/loc occ - poss bldr.

Siltstone: ltgry-ltgrngry, comp, sft, ashy, str calc, mas, grds to + ibded w/lt gry w srtd (vf) qtz/qtz-plag Sndst w/mnr volc rfs + lt-medgrngry-ltgrybrn Clyey Mdst/Clyst, r-mnr lamd + botry calc-sil vns, r-mnr loc pnkgry + blchd rx w/abun dissem pyr cubes, loc pyr vng, smpl com hily contamd w/uphl matrl.

Sandstone: ltgry, friabl-prly comp, w srtd, (vf) grd, ashy, volc rfs-plag-qtz, grds to ltgry-ltgrngry Sltst, tr-mrn lamd + botry calc-sil vng, r-mnr dissem + aggr + vn pyr.

Siltstone: ltgry-plgrngry, comp, sft, ashy, str calc, mas, grds to + ibded w/lt gry-wht w srtd (vf) qtz/qtz-plag Sndst w/mnr volc rfs + grngry Clyey Mdst, loc com-abun sft lt gry Cly, r-mnr clr-mlky lamd + botry calc-sil vns, r-mnr loc pnkgry + blchd rxln (c) Sltst?/silic tuff? rx w/abun dissem pyr cubes, loc pyr vng, smpl com hily contamd w/uphl matrl.

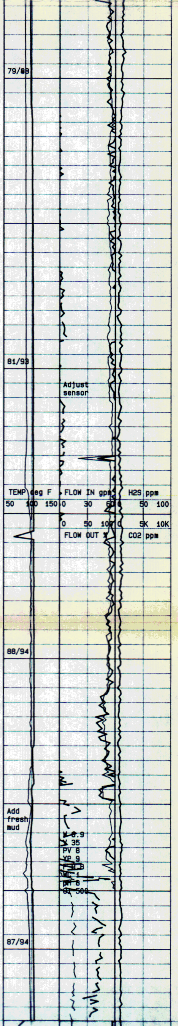
Siltstone: wht-ltgry-plgrngry, unlithd+sft, ashy, ltly mddy, str calc, mas, grds to + ibded w/lt gry-wht w srtd (vf) qtz Sndst w/mnr volc rfs + med-dkgrngry-ltbrngry Clyey Mdst, loc com-abun sft lt gry soluble Cly, r-mnr clr-mlky lamd/botry/dendr calc-sil vns, r-mnr loc pnkgry + blchd rxln (c) Sltst?/silic tuff? rx w/abun dissem pyr cubes, loc pyr vng, r blu cly.

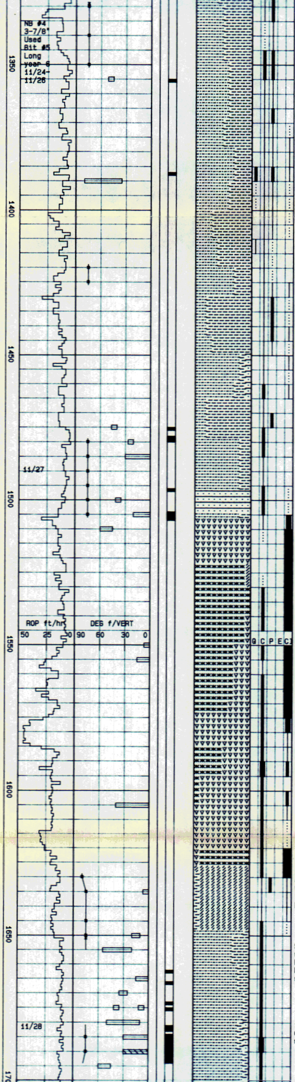
Claystone: lt-medgrngry-grybrn, loc blchd wht, prly indur, loc silic + comp, calc, pred Clyey Mudst + slty, ibded wht-lt gry-plgrngry Sltst/Slty Mudst, mnr clr-mlky lamd/botry/dendr calc-sil vng, abst-r pyr, smpls hily contamd w/uphl matrl - mainly w/(m-c) uncons bslt + cndr Snds + friabl brn-or brn ashy Sltst/(vf-f) Sndst w/volc snd rfs.

Claystone: wht-lt-medgrngry, loc pnkgry, prly indur, calc, slty, ibded wht-lt gry-plgrngry Mddy Sltst + mnr wht silic Ash Tuff @ 1270', mnr clr-mlky calc-sil vng a/a, abst-r pyr, smpls hily contamd w/uncons bslt + cndr Snds + friabl orbrn-brn ashy Sltst w/volc snd rfs.

Siltstone: wht-ltgry, loc plgrngry, comly altd (rxln?) pnkgry, comp + mod friabl, mas, clyey - pred Mddy Sltst, ibded ltgrybrn-plgrngry +/- slty Clyst, tr-mnr calc-sil vng, mnr-com dissem pyr.

Rotary drill 6-1/8" hole to 1325' and set 4" csg. Clean out cmt. Core 3.85"/HQ hole from 1325'.





Mudstone: lt-medolgry-grngry-yelgry-ltgry-dkyelbrn, variably clyey-slty, gen slty = lt colors, comp, sft, unfracd, calc, lamd-mas thick bds, pred grdtnl color/ text changes, loc (vf) sndy + r ilams-thin ibds plblugry-ltgry (vf-m) Sndst, loc sft sed defo strucs, loc intrafmal brec, loc blchd lt brn adj t/pyr aggr, com r dissem pyr, mnr-tr intrsti calc, loc com calc in sndy lyrs.

1380-84': mnr intermit rbbl, sft dkgrngry clys occ w/i mas cly-dom Mudst.

1387': mnr irreg shr @ 35-80 deg assoc w/pyr-sil altn.

Mudstone: lt-dkolgry, dom slty loc grdg t/clyey, mas, comp, sft, calc, @ 1395': occas thin bds (m) Sndst w/ sharp btms + pillar tops (sft sed struct) w/assoc tr grngry clys, pyr vng, blchg, poss loc silic.

Mudstone: olgry, mas, calc, clyey, loc ibded yelgry Slty Mudst w/ (vf) plblugry Sndst ptgs + thin ibds, com r grngry 2ndry cly spks + r ptgs assoc w/blchd cor, tr pnkgry altn w/pyr aggr.

Siltstone: lt-medolgry-yelgry-lt-medgry-plyelbrn, clyey/Slty Mudst, comp, sft, ashy, str calc, pred mas, loc lamd, loc intrafmal brec lams, ibded w/+ grdg t/Clyey Mudst, r rewrkd mddy ash w/plag phens, loc thin blchd wht-plgrngry w srtd (vf-m) Sndst ibds/ilams - often w/assoc pyr + occas w/wht-grngry intersti cly, loc aggr + vn pyr - comly w/pnkgry altn, r calc vnlets.

1466': 6" lyr drty whtgry pum ash+lpli w/dkgry cly dikes abov 6" plgrnblu Sndst bd w/sft sed defo strucs + abun calc.

Claystone: brngry-olblk, mas, calc, comp, sft, ilamd Clyey Sltst a/a, loc r cly-calc shrs, @ 1477'- calc fls mm ang cavs, @ 1481'-3" zon anas 0-20deg calc vnlts.

Sandstone: ashy-loc tufcs/Sndy Ash: lt-medgry-grngry, qtz-glas, w srtd, (vf-m), comp, ltly indur, loc <1mm plag t/5%, lamd-thnly bded, loc x-lamd w/brngry cly ptgs, @ 1503'- 6" bd plyelbrn pum lpli, H2O-laid ash w/occas pum/rewrkd, tr calc-cly shrs @ 35+75deg @ Tuf cntct.

Ash Tuff: plyelbrn t/1509', wht-plgrngry, rhyo, comp, sft, unwlded, ptl devit, clyey, pred (m) ash, 1-3% 1-2mm plag phens altd t/wht cly, 2-3% flt grngry argd ash tuff liths, fol, 3-5% eq-flt argd pum lpli, mnr empty cavs t/5mm, mnr rhyo lith lpli bsl 4', abun wht-grngry cly, r-mnr intersti calc.

Lith Lpli Tuff: ltgry-ltgrngry, rhyo, comp, sft, unwlded, ptl devit, (f-c) ash, calc, mas, 1-2% <1mm argd plag phens, redbrn cndr-gry rhyo-dkgry bslt liths t/10cm, pred 5-10mm, up t/80% liths w/15% avg, mtrx- + clst-supd, below 1550': ibded 6"-3' grded bds w/abun bsl lith lpli + lith-free ashy tops, r calc vng incr t/mnr bel 1570' + assoc w/pnkgry blchg adj t/subhor vns @ 1573', abun wht-plgrngry mtrx cly, unit top mrkd by 1' Lith Lpli Tuff + Ash Tuff lyrs w/tr cly-calc vng.

Ash Tuff: ltgrngry-lt-medgry, rhyo, comp, sft-mod hd, unwlded, tr-mnr clyey, calc, (f-c) sndy ash, lamd-xlamd-bded, mas Ash Tuff bds grd t/+ ibded w/subord Lith Ash Tuff + Lith Lpli Tuff, lith clsts pred gry vitrc rhyo-blk bslt-redbrn cndrs, liths com (c) ash - (f) lpli + 20-30% of bds w/liths, loc dkgrngry cly ptgs sug occas H2O-depo, tr-com intersti wht cly + calc incr in (c) ash intrvls, @ 1601-08': r loc 0-40deg calc vnlets.

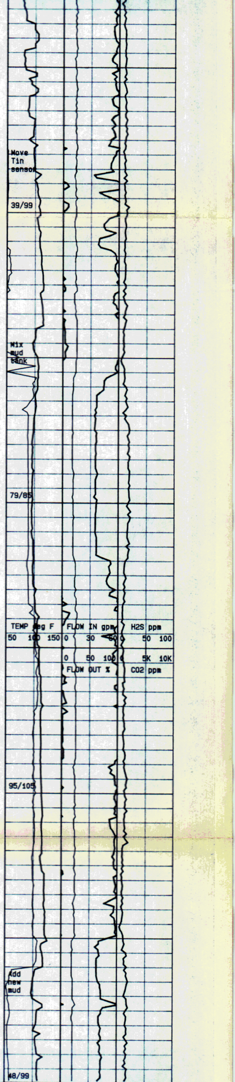
1610-21': lt-med gry lamd-xlamd Ash w/grn cly ptgs.

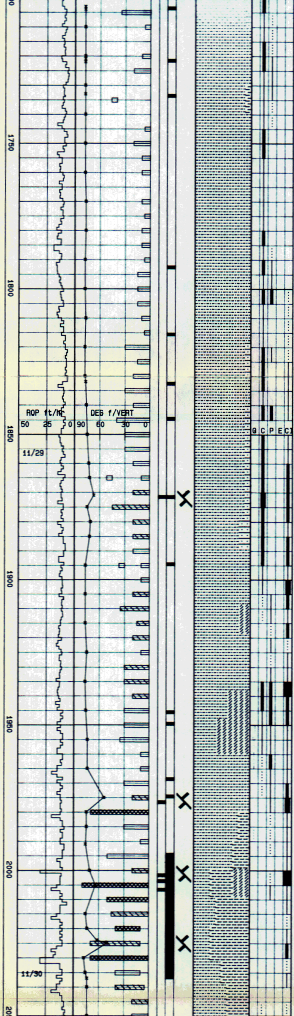
1621-28': grngry Lith Lpli Tff loc grdg t/Ash Tff.

Ash: wht-medblugry-ltgry-lt-dkgrngry, rhyo, comp, mod hd, calc, lamd, com w/diffus bndrs, (vf-f), w srtd, variably clyey - w/loc ilamd + r thin ibds dkgrngry Clyst, r subvrt calc vnlts, bsl 5' ilamd medblugry-pnkgry, grds t/lower H2O-laid ash-dom Sltst unit.

Siltstone: modyelbrn-gryor loc grdg t/dkgry-brnblk Slty Clyst + w/thin ibds yelgry-wht Sndst, pred H2O-laid rhyo ash, comp, sft-mod hd, mod-str calc, variably clyey, lamd, com-abun bioturb + fossil burrows - esp in mddy bds adj t/Sndst lyrs, occas mnr cly +/-calc shrs, r-loc mnr calc vng.

1685-90': com wht calc vng/gash flgs t/3mm @ 0-30deg, loc obliq-slip cly + cly-calc shrs w/slks plunging @ <45deg, main shr @ 15 deg, cm-scal offsts evident, mnr rbbl.





1704': mnr cly shrs w/assoc calc @ 0-35deg.

1720+': r-tr vf dissem + vn pyr along slct lams.

Siltstone: modyelbrn-gryor loc grdg t/dkgry-brnblk Slty Clyst + w/thin ibds yelgry-wht Sndst, pred rhyo ash, comp, sft-mod hd, lt-str calc, variably clyey, lamd, com-abun bioturb + trace fossils, v r org tar matrl, occas mnr cly +/-calc shrs, r-loc mnr calc vng.

1748': mnr trace blk tar in 5X1mm frac.

Siltstone: pl-dkyelbrn, comp, mod hd, lt-str calc, lamd w/shrp bndrs, ilams/thn ibds dskyyelbrn-brnblk Slty Clyst + more comly vplor-lt-medgry w srtd (vf-m) qtz Sndst, com tr blk carb matrl, com-abun varied trace fossils, r-tr clr-wht calc vnlts - loc assoc w/r cly shrs, r subhor intersti aggr pyr w/i dkgrnblk Sndst lams, r loc sft sed defo strucs.

Siltstone: pl-dkyelbrn, comp, mod hd, lt-str calc, ashy, variably mddy, lamd w/shrp lam bndrs, mnr ilams dskyyelbrn-brnblk Slty Clyst + com ilams/thn ibds vplor-lt-medgry w srtd (vf-m) qtz Sndst, com tr blk carb matrl, com-abun trace fossils but no ptygm traces below Sndst bds, r sft sed strucs, r-tr clr-wht calc vnlts - calc assoc w/r cly shrs, abst-mnr subhor intersti aggr pyr w/i dkgrnblk Sndst lams, r-mnr dkyelor-dkgrybrn waxy cly assoc w/calc vng as frac flg, r loc rust specks + FeOx orbrn staing.

Siltstone: pl-dkyelbrn, comp, mod hd, lt-mod calc, ashy, var mddy, lamd w/mnr ilams dskyyelbrn-brnblk Slty Clyst + com ilams/thn ibds vplor-lt-medgry qtz Sndst, com tr blk carb matrl, com-abun trace fossils, r sft sed strucs, r-tr clr-wht calc vnlts, loc mnr stratbnd intersti aggr + r dissem euh pyr w/i pnkgry blchd ltly silic Sndst, r-mnr dkyelor-dkgrybrn waxy cly assoc w/calc as frac flg.

1871-72': 4" wide brec zon w/shrs @ 45deg + frags cmtd by calc, adj subvrt fracs fld w/dkyelbrn-brn-plor wxy cly t/2mm. Lams offst t/1cm ax fracs.

Siltstone: pl-dkyelbrn, comp, mod hd, abst-lt calc, ashy, var mddy, lamd w/ilams/thn ibds dkyelbrn-brnblk Slty Clyst + vplor-lt-medgry qtz Sndst+ltblugry (vf-m) silic Ash, mnr loc rbbl, com tr blk carb matrl, abun trace fossils, r-tr clr-wht calc+/-cly vns, loc mnr stratbnd aggr + r dissem pyr - com occ in pnkgry-ltgry blchd ltly silic brttl ashy Sndst + Ash lyrs, r-mnr sft wht + wxy plor cly frac flg.

1921-24': intnsly burrowd + loc rbbly w/sft yelbrn cly, com irreg fracs w/tr wht-plor cly.

Ash: plblugry, sft, (vf), grds t/Sndst, loc pyr, calc, cly.

1950': r oplsct sil vnlet w/i wht Sndst lyr.

Ash: wht-yelgry-pnkgry, (vf) grds t/(m)/Sndst @ bas, sft, lamd-mas, loc grds t/ltly clyey H2O-laid Sltst, loc pyr pods assoc w/dkgry silic altn.

Shears: pred hi ang shrs w/cm-scal offsts ax fracs, loc listric rotation, tr-com sft wht + wxy yelor cly + abst-tr calc flgs.

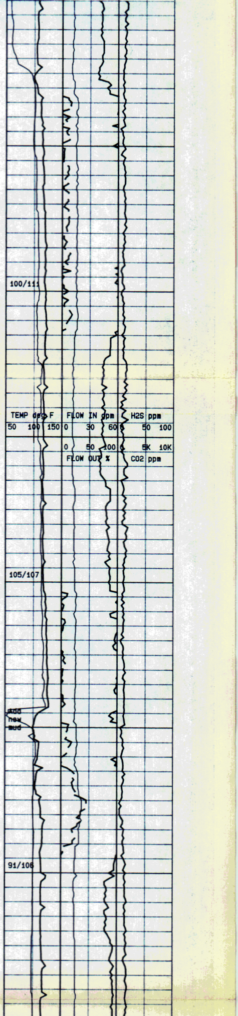
1976-77': Brec zon, rbbly, com yelor cly shrs @ 30-70deg.

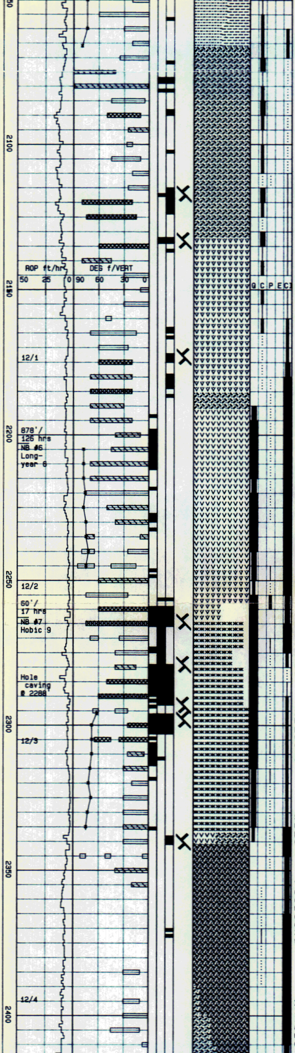
Mudstone: a/a w/subtl incr (vf) clyey ash - w/cly- + slt-dom **intrvls**: pl-dkyelbrn, comp, sft-mod hd, lamd w/ilams/thn ibds varvd lt-medblugry Clyst + wht-medgry qtz Sndst+ltblugry (vf-m) silic Ash, loc rbbl, com shrs + sml-scal listrc blk rot, loc brec, tr blk carb matrl, abun trace fossils, abst-tr pyr, r-abun sft wht + dkyelbrn clys.

2001-02': shrd rbbl, sft dkyelbrn-wht cly w/ rfs - ? attitude. Shr @ 2004' @ 45deg.

Ash: lt-medblugry-pnkgry, (vf) grds t/(f)/Sltst @ bas, sft, lamd-mas, H2O-laid, loc varvd, com shrd fracs w/listrc rotation, fracs barren exc r wht cly.

Siltstone: pl-dkyelbrn, comp, sft-mod hd, ashy, var mddy + loc varvd, lamd w/ilams/thn ibds dkyelbrn-brnblk Slty Clyst + vplor-lt-medgry qtz Sndst + yelgry (f-m) Ash, tr blk carb matrl, abun trace fossils, r-mnr clr calc vns, r-mnr sft wht + wxy yelor clys, bioturbd muddy depositional basal contact.





Xtal Ash Tuff: lt-medgrybrn (Top 3')-lt-medblugry-ltgry, comp, sft, unwlded, mas-grded, (f-m) w/<2% (c) yelgry pum + gry lith clsts, calc, ptly devit t/cly, 3-5% <1mm argd plag phens - decr w/depth, tr-mnr clr calc vns, abst-tr pyr vns, loc shrd brn-grn cly + clr calc, fracs pred barren-ltly minrlzd.

2075': 2cm shrd calc vn @ 45deg w/adjac 10deg shrs.

2077-79': rbbly, brecd, cly shrs @ 0-80deg.

2115-21': Shr zon, com shrd cly + calc vns @ 20-80deg, pred obliq-slp shrs @ 30-50deg, vng t/2cm, intnsly shrd @ 2117-18' w/flt gouge, abst-tr wht-grygrn 2ndry clys, adjac rx w/perv micrfracs + friabl.

2128-32': mottld ltgry-grngry, mas, apps H2O-laid, (f) ash grds t/(m) ash w/dpth, medial shrd calc vn @ 45deg, lamd bas w/10% argd mm plag phens + shrd cly.

2132-34': Shr zon, pred oblq-slp cly shrs @ 20-60deg, main trend 30deg, intnsly shrd @ 2133', adjac calc vng t/3mm @ 0-10deg (top) + 30-40deg (btm).

Ash Tuff: lt-medblugry-ltgry, loc dskyblugrn, comp, sft, unwlded, ptl devit t/cly, mas-grded (f-m) bds, calc, 0-5% <2mm argd (wht) plag phens, r-mnr clr calc vns, few fracs.

Ash Tuffs: Ash Tuff w/ibded Xl Lith Tuff, lt-medblugry-ltgry, loc dskyblugrn, plblu-gryblu-medblugry-grypurp @ bas, comp, sft, unwlded, ptl devit t/cly, pred 2-4' mas-grded (f-m) ash bds w/loc thin bds, infreq bds w/3-6% (c) ash pum + liths, calc, <1mm argd (wht) plag phens t/10% - comly <2%, r-mnr clr calc vns + v r varioles, loc shrs, loc micrfracd + friabl.

2172-75': loc mirror dkgrn-dkbrn cly/serp? slks. Same @ 2179-84' w/ loc ang rbbl + r dissem pyr.

Xtal Lith Tuff: (top 1' volc brec/argd grygrn, btm 6' argd a/a), dkrdbrn, r blchd redor, wlded, hd, brttl, rhyo, vitric, mas-wk fol, 5-10% san+qtz, 15-35% 1-4mm grn argd felds+tff liths, 1-4% argd+fltnd pum lpli, mnr ang bslt+rhyo lpli, com-abun clr+lamd (clr, grys, grns, blk) sil vns + frac lngs, tr-com opn fracs t/5mm-r >1cm, loc botry-agat-drsy-wvy sil/qtz, r-com plblugry sft flocd sil, loc brec frag props, tr-mnr sft wht cly, r-mnr grygrn cly vns, r-tr dis pyr.

Fracs: 2193.5' -drsy sil lnd opngs t/5mm X 25 + 40deg fracs; 2198-2212' -com drsy-lnd fracs @ 0-40deg w/5deg >1X25cm frac @ 2210', incr sft floct + dendr sil w/dpth, bxwrk lamd refracd vng t/1.5cm @ 2203-5'; 2224-27'-0-10deg lamd refracd sil vn t/2.5cm w/mm sil+pea grvl; 2234'-refracd sil vn @ 25deg t/3cm; 2237 -loc opl-agat.

Ash Tuff: dkyelbrn (top 1")-lt-medgrngry-gryrdpurp-plrd-gryblu, comp, mas, ptl wld, ptl devit, 1% plag, mnr-abun sil vng, abst-mnr pyr, lt opn drusy fracs t/5mm.

2259-2303': Brec zon. Top 5': ang frags uppr+lowr Tffs in mtrx clr-mlky sil t/50%, refracd w/wvy-drusy sil lng subvrt fracs t/4mm f/2259-65', com flocd sil.

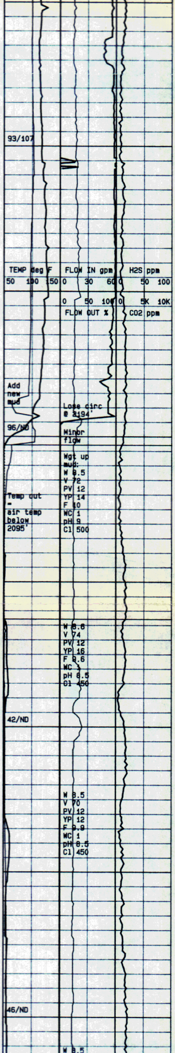
Xtal Pum Lpli Tuff: sim t/2193' w/o ash liths+w/10% phens & gd fol. 2264-79' -crsly brecd + silic w/1-10cm blx lnd by >10% sil w/com pits t/2mm; 2279-90'-Reactvtd Brec Zon: rnd-ang, pred <1cm brec frags in rdbrn silic mtrx refracd alng 25-40deg shrs + ltly cmtd w/drsy sil t/form bxwrk propd ang cavs t/5mm; 2290-6'-flt blk, healed brec t/2293'; 2296-2303'-brecd w/com ang 5mm cavs, sim app t/2279-90' but rx not refracd brec. Min 3 fracg-sil vng events. Mnr wht cly + flocd sil, r dis pyr.

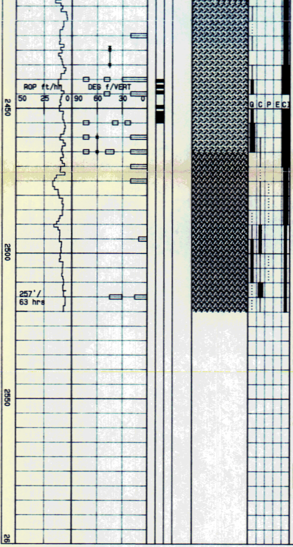
Xtal Pum Lpli Tuff: plyelbrn-gryor-(bsl 5': dkrdbrn-lgry-brngry), com blchd+mottled vplor, wlded, hd, brttl, vitrc, lt devit, gd fol, 4-8% frsh-ptly argd plag t/3mm, 1-2% qtz-san, <5% argd fltnd pum lpli, 0-4% ang dkgry bslt lith lpli, mnr-com clr-lamd (clr-blk-grygrns) botry-drusy sil vng/frac lngs t/5mm w/mm opngs - pred @ 0-30deg +/-w/tr flocd sil, loc hor lamd vng, loc brecd +/-rehealed, eg, 2cm vn @ 2314', tr-mnr grngry cly altn, r disem pyr, tr wht cly vng @ bas.

Shrd Tuffs: 2338-41': shrd thn ibds Xl Lith Ash Tuff + Xl Ash Tuff, med-dkbrngry-lt-medgrngry-gry, unwld, comp, sft, devit t/cly, plag phens, shrs+slkd @ 45 + 75deg, loc f rbbly gouge @ bas, com wht-grngry-brngry clys.

Volcanic Breccia: mttld dkrdbrn-lt-medgry-grngry-yelgry, plag rhy, unwld-ptlwld, comp, sf-mod hd, loc hd+brtl, ptl-comp devit t/cly, loc calc, com v diffus/digestd clst bndrys + % clasts = ?, pred ltgry mtrx, blx t/3' lt-dkgry +/-fol/bnded wld plag (2-5% t/4mm) rhyo tff, com micrfracd w/altn sim in app t/mtrx, apps whtrd, grds t/Xl Tff, com rdbrn-grngry cly flg irreg cavs+vns, loc grngry cly shrs-@ 35+65deg @ 2370' w/adjac rx lched wht & 60deg @ 2373', r-mnr tlcy wht frac clys, eg, 2348-52', v r opn fracs.

Xtal Tuff: grngry-medgry-yelgry, loc stained dkredbrn-dkyelor by limonite, comp, ptl wld, mod hd, mas-sbtl fol, 6-8% <3mm plag, tr gry liths, com loc perv ntwrk fracs w/digestd rk fbrc a/a - loc grds in app t/Volv Brec, com plgrngry-wht cly vns (pred 0-20deg) + cav flgs, r silic + jasprtc, mnr mttld rust @ 2424-33' assoc w/micrgashs + oxidtn hem spks, sil vng bel 2436', fracs+cavs fld w/cly +/-sil.





2427': ltgry cly-sil vn @ 45deg t/5mm, cly after sil

Brec Zons: 2440-41': fld fracs @ 0-70deg t/1cm, abun grngry cly, mnr plblu-wht-yelbrn (flnty) sil, r mm drusy-lnd pits; 2443': mnr brec w/ang cavs t/5mm w/botry-drusy sil lngs; 2445'; f brec, loc agat-opl, 0-40deg fld fracs, sil vns cut by wht cly-fld fracs.

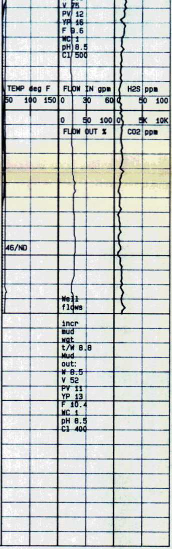
2443-2456': nar brec zon, t/5cm wd alng subvrt frac t/2450 + @ X 20-35-70deg fracs bel, hor lamd wht cly-clr sil cav flgs t/2cm + vng t/5mm, loc bxwrk vng, rx blched yelgry, mnr drsy-lnd cavs t/1cm nr bas.

Tuff Breccia: grdtnl f/+loc grds t/Xl Tff, pnkgry-ltmedgry-ltblugry (@ bas), loc rust-stnd+mttld, comp, wlded, silic, stony, lt devit, 6-8% ptl argd plag phens, 40-60% Xl Tff clsts pred <2cm in ltmedgry ash/perv silic mtrx-pos early post-dep tctnc brec (mtrx sil intrprtd as primry min), shrp-loc digestd clst bndry, ubiq mnr drsy-lnd ang mtrx cavs t/3mm, ubiq tr rdbrn rust spks aftr spec hem, loc mnr hi angl grngry cly-wht calc vns, absnt-tr opn fracs.

Volcanic Breccia: =coaarsr Tff Brec, grdtnl f/+com grds t/Tff Brec, dkrdbrn-(bel 2503') mttld rdbrn-yelgry-ltmedgry, rhyo, comp, wld/silic, stoney, hd, brttl, tr devitr, 30-40% >3cm plag Xl Tff blx t/3' diam, shrp-digestd bndrys, rdbrn silic f-c ash mtrx w/abun rfs, mnr-com vns t/2mm w/r-mnr grngry cly + r-mnr clr-mlky calc, tr-mnr mm pits +cavs t/5mm lnd w/drsy sil, abst-mnr clr-opl-yelbrn sil vng, bel 2503' ubiq tr spec altg t/rdbrn rust w/v loc assoc silicn, r-mnr opl-clr sil vng.

2511-15': subvrt frac lnd w/grngry cly + fld w/sft wht cly-calc, loc com calc fld gashs t/3mm @ 20-40+80deg.

Core 3.85" hole t/2,520' total depth at 23:00 12/4/93. Run T+P surveys. Test flow well 4 hrs 12/6/93.



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