# HORIZON WELL LOGGING

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| COMPANY: | ENERFIN RESOURCES NORTHWEST |
| WELL: | C.C. #22-26-65 (Hobbes) |
| LOCATION: | 1764'S & 2512'E from the NW corner of Section 26, T6N, R5W, W. B.& M. |
| ELEVATION: | G.L. 621 K.B 631' |
| FIELD: | MIST |
| COUNTY: | Columbia, Oregon |
| API NUMBER: | 36-009-00330 |
| SPUD DATE: | May 30, 1998 |
| LOGGING DATES: | 5-30-98 to 6-3-98 |
| LOGGING DEPTHS: | 50' to 1743' |
| GEOLOGIST: | Dave Buggins |
| COMPANY MAN: | Rob Lucas, Production Specialties |
| CONTRACTOR: | Taylor Drilling Inc. |
| RIG: | #7 |
| LOGGING GEOLOGISTS: | Bill Gilmour<br>Rick Jones |
| BIT SIZE: | 9.875" to 487'<br>6.25" to 1743' |
| CASING: | 7.0" 24#/ft to 487' |

CALIBRATION: 20 METHANE = 100 UNITS

## ABBREVIATIONS

| | |
|---|---|
| CO | Circulate Out |
| LAT | Logged After Trip |
| LAS | Logged After Survey |
| CG | Connection Gas |
| KC | Kelly Cut gas |
| WG | Wiper Gas |
| TG | Trip Gas |
| SG | Survey Gas |
| WR | Wiper Run |
| CORE | INTERVAL |
| NOR | (100, 000# full scale) |
| | TRIP |

## SYMBOLS

PEBBLES >2mm, SAND, SANDSTONE, SILTSTONE, MUDSTONE, SHALE, MARL, CLAY, CHERT, DOLOSTONE, LIMESTONE, VOLCANICS, TUFF, BASALT

## DRILL RATE

ROP

MOB

100K

## LITHOLOGY

Bucket Samples, Ditch Cuttings, Core Chips

## MINERAL

## GASES

DITCH GAS

OFFSCALE

CUTTINGS GAS

OFFSCALE

## CHROMATOGRAPH

METHANE

ETHANE

PROPANE

BUTANE

PENTANE

## REMARKS

DESCRIPTIONS

SURVEYS

MUD CHECKS

MISCELLANEOUS

NOTE: all gas events (MG SG, CG & carbide) recorded as above background. 0 is max reading. Gas units are wet unless otherwise noted. Gas equip calibrated to SPHL's standard gas. Depths are taken from drillers' pipe tally & measured from KB.

Commence logging @ 50' on 5-30-98 @ 1800hrs.

SILTSTONE: pl yelsh brn; occ frly fri to frangible; mod to v slty; v sl chlc; initially sdmy, com w/carb mtrl; occ fn soy; micaceous; rr shell frags com immature, transl brn organic debris; grds w/depth to slty clystn.

MW 8.7 Vis 39

NOTE: Fe change @ 195' to mod ok grnsh gry mudstone/siltstone w/occ soy lams grdng down to glauconite.

LIMESTONE: pl gry to yelsh gy; hard; sml to large blocky ctgs; dense; micritic; v soy grdg to limestone sprts & cemented ss.

SILTSTONE: med grnish gry; firm to brittle; fn soy; occ frlly lamd calc/carb mtrl; grdg to clyst in pt; v argil ss; com carb mtrl; occ pyritic; com fn glauc; occ foloic grs; tr ostracods, amn mica.

MUDSTONE: pl oly gry to med grnish gry; firm; resistent; v slty; com fn soy; spotty calc; dom massy, occ silt & sand lams; dull earthy lstr; variably tuffaceous; dom volcnc debris & grs; chlor; tr glauc; com scattered carb mtrl & pyrite; grds to argil siltstn.

CLAY: dk oly gry; med consis; lo cohesion & adhes, noncalc; mod soluble; tuffaceous; non-swelling; derived from mudstn & siltstn.

SILTSTONE: med oly gry; firm to v frl brg; v sl indur; v argil; v sl soy; dom grds to slty mudstone; com scattered carb mtrl; occ foram; dull earthy lstr; mod sdrsv tex; structureless; frly carbonaceous; occ pyritd; sl chloritic; tr poss glauc; rr mica, tuffaceous/com volcnc debris & grs.

TUFFACEOUS CLAYSTONE: @ 420'; pl yelsh brn; firm; splty; v firm, noncalc; dull earthy lstr; frly sdrsv tex; massv.

MUDSTONE: grnish gry to oly gry; firm; v slty grdng to argil siltstn; noncalc; rr foram, microarch; tr mica, sml to large blky ctgs.

NOTE: drill to 487'. D/D /7" 24# csng to 487'. drill out w/6.25" bit.

SILTSTONE: med oly gry; argil to clayn w/depth; com fn soy grdng to v fn slty ss; mod calc; firm; mod indur; absnt volcnc debris/grs; tuffaceous mtrx; mnr carb mtrl; occ pyr replacement; chloritic.

LIMESTONE: lt gry to v pl org; hard; micritic; dom sdy grdng to limestone supported sd; prob tuffaceous mtrx; occ calcite veinlets, some calcite evidencing open surface.

NOTE: POOH @ 585' to P/U mud-motor.

MW 8.8 Vis 41

MARL: v pl org to pl yel gry; soft; mushy; dull chalky lstr; sdhy; v calc, occ harder streaks of LS.

MUDSTONE: gry oly grn; med soft, bcmg softer; dcrsngly slty; com fn volcnc debris & grs; dom sl calc, mssv, incrangly going into waking clay; incrsd glauconite.

CLAY: med oly gry; soft; tends tweep consis; lo cohes, mod expansion, mod soluble; slty; tr shell frags.

MUDSTONE: oly gry to grysh grn; soft to firk, argil; dcrsd silt, noncalc; slg incrs in 2-3mm nodular glauc; tr pyr assoc w/glauc, tr macro shell frags; dcrsd v fn carb mtrl.

MW 8.7+ Vis 41

SILTSTONE: med oly gry; soft; frlse, argil, grdng to slty mudstone; structureless; dcrsd fn sd; spotty calc; rr foram; com volcnc debris; incrsd glauc, rr mica; dcrsd carb mtrl & assoc pyr.

CLAY: med dk oly gry to grysh grn; bcmg thick; mod lumpy; slty; v sl calc; mod expansion; mod soluble; mod to high swelling upon rehydration; sl plasticity.

MUDSTONE: mod dk oly gry; firm to soft & mushy; com large clumps/clgs, dcrsd silt, v carb mtrl; dcrsd glauc; rr foram, grds to argil siltstn.

MUDSTONE: bcmg mod brnsh gry; soft to firm, slty; spotty calc; structureless; occ glauc rr mica; sl incrs in free foram, ostracods?, incrsng amt going into waking clay.

CLAY: dk oly gry, macro, frlly brnsh gry, micro; mod soft, mod thick consis; lo cohes; mod adhes, slty; plasticity mod to high; mod swelling; mnr carb mtrl; scattered volcnc debris/grs; sl expandable upon rehydration to swelling; mnr mica; tr free forams.

SANDSTONE: med brnsh gry to dusky brn; fn to med, v poly srtd; argil; often mtrx supptd; tuffaceous, grdg to sdmst; incrs to calc cmtd, com volcnc debris/grs; com glauc; mnr mica; grds to sdy argil siltst.

NOTE: POOH @ 984 to L/D mud-motor P/U semi-steerable assembly

SAND: clr, med grn, wht, pl org, blk; v fn to occ med, dom uncons, com frlse & mtrx supptd; v poly srtd, sbang to sbrnd; calc; dom fn volcnc debris; com glauc; mnr micas & shell frag.

CLAY: bcmg lt brnsh gry to med lt gry; soft; sticky; fn sdy, occ calc; fair adhes; lo cohes; pr solubility; sdhy; prob derived from reworkd tuff; mod swelling.

MW 9.2+ Vis 39

MUDSTONE: pl yelsh brn under accpt; soft to occ sl firm; silty; tuffaceous; tr bed plane partings; occ calc; scattered volcnc debris; tr carb mtrl; occ pyritd; v rr glauc; dcrsngly grds to argil siltstn; tr tuffaceous nodules surrounded w/pyrite.

MUDSTONE: dom pl to occ dk yelsh brn; soft & pliable to occ firm, sml to med sized sbrnd clgs; frlly lamd, occ bed partings, dcrsd silt, carb mtrl & mica; rr glauc, dull chalky lstr; tr tuffaceous interlams.

CLAY: dusky brn; mod thick; v lumpy consis; mod soluble; lo cohesion, mod adhes, dcrsd silt, incrsngly calc; tr free lams, occ micas; volcanics derived; mod swelling; sdhy.

MUDSTONE: pl to dk yelsh brn; soft; crumbly, often mushy; mod calc; mod silty; tr carb mtrl; tr forams.

NOTE: POOH @ 1248' to change BHA

MW 9.4 Vis 40

MUDSTONE: pl yelsh brn; soft, mushy; soluble; tuffaceous; mod silty; sl incrs in glauc; occ grds to argil siltstn; dom goes into waking clay; carbonaceous mtrl; occ tr free calcite.

CLAY: dk yelsh brn; thick; tough; splty; tuffaceous/volc; sl silty; lo cohesion, v lo adhes; fr to com prdy soluble; tr mica; occ glauc pellets

MUDSTONE: pl to occ dk yelsh brn; soft to occ firm; clayey; calc; massy, frly carb; mnr mica; tr glauc, tuffaceous.

SANDSTONE: wht, lt gry, fn to occ med, v poly srtd, sbang to sbrnd; clean to argil occ kaol matrix; tr calc cmt; tr pyr; occ large lignite frags; tr chlor.

MW 9.6 Vis 39

SAND: clr, cloudy, pl grn, blk v fn to med, dom uncons; argil & sil anlst, occ overgrths; calc cmtd, tight; occ plag; tr chlor; tr basalt grs, com mica; occ coal/carb frags(pl gry); occ pyritzd lignite or shell frags.

MW 9.6 Vis 39 PV 15 YP 5 FL 5.8 pH 7.0 Cl -650ppm

CLAY: med lt brnsh gry; soft; slightly sdy; occ wht kaol matrix; dcrsd cohesion to adhes; rr shell frags, mica; tr lignite.

SAND: clr, cloudy, pl grn, pl org, blk; v fn to med, dom uncons; going to v sbrnd; argil; calc overall sbang to sbrnd; dom qtz; com pl grs; occ volcnc grs; com lignite, tr coal frags; com mica; rr pyr; rr shell frags.

SANDSTONE: orgsh gry to med gry; fn to med; dom md, wl indurated; calc cmtd, tight; occnng ss bones; v poly srtd; gr & scrs sbang to sbrnd; v micaceous; often pyritized; lignitic; com volcnc grs; incrs in wht kaol clay matrix.

MUDSTONE: dk yelsh brn; soft to occ firm; lo cohes to v large, flakey ctgs; silty; spotty calc, shaley; incrsd lignite; mica.

SAND: clr, cloudy, tr pl grn, blk, rr pl org; v fn to med, bcmg finer; sbang to sbrnd; dom uncons; argil; mod srtd; dom calc cmtd ss; dom qtz; dcrsd volcnc grs; com mica; tr pyr; scatterd lignite.

LIGNITE: blk; firm, brittle; conch fracturing; sbvit; blky; crly pyritzd in sp.

SANDSTONE: med lt to lt gry; fn to med; sbang to sbrnd; calc cmtd; poly srtd; occ fria orth v mica, occ interstl pyr; carbonaceous.

TD 1743'