Missoula — B. Herroot Drilling Project

STATE: Montana	COMPANY: Bendix Field Engineering Corp.
COUNTY: Missoula	FARM: — WELL NO.: #2
BLOCK: SW¼ SW¼ SW¼	SURVEY: —
SEC.: Sec. 17	
T. 15 N R. 21 W	TOTAL DEPTH: 2510'
ALTITUDE: —	COMMENCED: Sept. 1, 1978
PRODUCTION: —	COMPLETED: —
	REMARKS: Logged by David Quattlebaum

Legend: conglom, gravel; sandstone, sand; Siltstone, silt; Claystone, clay; Coal; Siltite; P = tr Pyrite; ■ = organic Mat

CASING RECORD — SHOT — QUARTS — BETWEEN

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0-100: Sltst, cly (cons) wh, lt (gy) wh, org red; yel, lt-dk gy, (gy) brn, mic, pred. upper 10'; Clst, silty-(slty) lt-dk gy, lt gy, wh, lt brn, cons (cons), (calc) rom carb; uncons. Sand grs. med-crs (upper), Fine-v. fine (lower), ang-subang, at Qtz-clr-mky, mnr reddish and Fld, mnr, wh, mnr-ang-subangs, granocrys frags of Qtz, gn, gy, pu, wh @ 80-90 mnr muse, FIKs assoc w/ sand grs.

100-200: Pred Clst, com silty-(slty) (gy) wh, lt gy, lt-m brn, cons (cons) w/ com incl stngs carb mat, occas sltst, cly, lt gy-lt brn, mnr lt pk (calc), (cons), occas mic, wh-cons in lower 10', mnr uncons sandstone, clr-mky, mnr pk Qtz, mnr mky lt gy Fld, ang, fine-v. fine, w/ med mnr crs grs @ 190-80'; occas mnr ang-(ang) frags of Qtzt, mky, pu, gn, gy, pk, mnr coal + lig in parts; tr-mnr muse FIKs, assoc w/ sand grs.

200-300: Pred. slst, occas cly, occas mic, cons-(cons), wh, lt gy, lt brn, occas carb; comm. Clst, (slty) lt gy, lt-m brn (srct), cons-(cons), w/ incl stngs carb mat; ~10% coal in upper 10', v. mnr ang, mky Qtz grs at 220-30', tr. ang-subang wtz. frags in pts; tr. Muse.

300-400: mnr-vmnr slst + clst as above 200-270', pred uncons. ang-subang. mod srtd v. crs-fine grs Qtz clr-mky + mnr Fld, wh-lt gy; tr. ang Qtzt.

400-500: Clst (slty) (calc) (wh) gy-lt gy; lt-m brn, mnr gn, (srct), cons-(cons), occas carb, Sltst, cly, lt-gy-lt brn; cons-(cons), com mic, tr say, mnr ang (ang), gran-fine uncons grs of clr-mky Qtz + mnr wh Fld in upper 10'; v. mnr org, mky, gy, gn, pk; tr-v. mnr coal, gy.

500-600: Clst + Slst as above 300-50'; 10-60% ang (ang) v crs-med frags of Qtzt, gy, pk, pu, gn; mnr uncon grs of Qtz + Fld, clr-mky, ang, crs-med at 350'-60'; tr-v. mnr uncons sand, grs in other parts; tr. muse; tr. schist; tr-mnr coal.

600-700: Pred uncons med-crs, mnr v. crs, ang-(ang), mod srtd grs of Qtz, clr-mky + mnr Fld, wh-lt gy; 10% coal in upper 10', Clst, silty-(slty), (calc), (srct), lt (gy) wh, lt-m gy, m (gy) brn, com carb, pred in upper 10', mnr Sltst, cly; (cons), lt (gy) wh; mic; mnr ang Qtzt frags.

Pred Clst, silty-(slty), (calc), (srct), cons-(cons), lt (gy) wh, lt-m gy, occas brn, com carb stngs; mnr Sltst, cly (cons), mic, lt (gy) wh, v mnr coal in upp 10'; mnr uncons med-crs, ang Qtz-Fld grs; v. mnr ang Qtzt frags, pk, gy, gn; tr-v. mnr. muse.

Pred. Clst wh, lt gy, lt-m brn, mnr gn; silty-(slty), (calc), (srct), cons-(cons), occas carb, absent-mnr Sltst, wh, lt gy, lt brn, (calc), (mic), (cons); 540-50' + 570-80' pred uncons, ang-(ang), mod-well srtd, med-crs grs Qtz, clr-mky, + Plag, mnr wh-lt gy; mnr uncons. sand grs in other parts, 5-85% ang frags of Qtzt, mky, gn, gy, pk; tr-v. mnr coal; tr-mnr brn-blk org mat, tr-v. mnr. muse FIKs; tr Pyr; tr-v mnr lig.

600-700: Clst, often slty, cons-(cons), (srct), (gy) wh, buff, lt gy, gn, lt-m brn, mny dk brn; carb stngs com, tr say; Sltst, lt gy-wh; mic, cons-(cons), occas carb, pred at 620-30', absent-85% ang Qtzt pbl frags, pk, mky, gn, gy, wit+sug, red, pu; tr-20% Coal; ~10-15% ang; med-crs, mod well srtd; clr-mky grs of Qtz + mnr Plag at 680-90', tr-mnr lig; tr Pyr + Musc.

700-800: Pred Clst; silty (calc), srct, cons-(cons), wh, lt gy, lt brn, tr dk gn, mnr med-dk brn; carb stngs com; occas Sltst, wh-lt gy, cly, (cons), (mic), (calc), occas incl. carb mat, absent-30% Qtzt pbl frags, ang, wit+sug, pk, gy, pu, (gn) gy; tr Qtz, mky, ang; occas tr. lig; occas tr. coal; tr Pyr at 790-800'.

800-900: Upper 10' Clst + mnr Slst as above 700-800'; 810-900': 90->99% ang Qtzt frags, wit+sug, mky, pu, gn, gy; absent-5% Clst, as above 700-800'; absent-2% ang Qtzt, clr-mky; tr wh Fld at 810-20'; occas tr Pyr; absent-v. mnr. Coal; tr-v. mnr lig; 880-90': wh oly coating on all grains.

900-1000: Red ang Qtzt frags, occas (ang), wit+sug, pk, pu, gn, red, gy, mky, blk; v. mnr. Clst, com silty-(slty) (calc), lt (gy) wh, lt gy, lt-m brn, cons, occas srct com carb; 0-30% uncons ang Qtz clr-mky, mod well srtd, fine-v. fine; tr coal + lig; tr ppr, tr wh fr + Sltst.

Pred ang-(ang) frags of Qtzt, mky, red, gn, pk, pu, gy, brn + Argillite, gn, mnr gy; 0-5% ang Qtz clr-mky; tr-5% Clst, silty-(slty), occas (calc) lt (gy) wh, lt gy, lt brn, mnr dk brn; occas carb, tr Plag; tr coal + lig; tr Pyr, tr lig.

1000-1100: 70-95% ang frags of Qtzt, wit+sug, pu, mky, (red) brn, pink, lt gy, red, + Argillite (red) brn, gn, gy; 0-20% Clst, silty, lt-m gy, lt brn, dk brn (calc), cons-(cons), (srct) w/ occas incl carb mat; tr-20% sltst, cly (calc), occas (mic) wh-gy + fri (org) brn-brn + cons-(cons) w/ rare Qtz sd grs; tr-1% Qtz, ang mky; tr Gr; tr Pyr; tr Biot flks, tr v. soft yell Clst.

1100-1200: 30-99% ang frags of Qtzt, mky, gy, pu, pk + Argillite, gn, gy, blk, pu; tr-70% Sltst, cly, occas (calc), occas (mic), (org) brn-brn, lt gy, wh, fri-mod well cons; <1-30% Clst (slty) srct, mod cons lt gy-lt brn w/ occas incl carb mat; absent-<1% Qtz, mky; tr coal at 1180-1190'.

1200-1300: 40-98% ang frags of Qtzt, pk, mky, gy, pu + Argillite, pu, gy, gn; tr-35% Sltst, cly, srct, fri-mod cons, (yell) buff, lt gy, brn, (red) brn, buff, occas (calc); tr-25% Clst, (slty), mod cons, lt-dk gy, lt-m brn, lt (gy) wh, mnr dk brn, tr red, w/ occas incl. carb mat; tr-2% ang, mky, Qtz, occas tr. coal.

1300-1400: 60-78% ang-(ang) frags of Qtzt, pu, gy, pk, mky, red + Argillite, pu, gy, gn; <1-20% Clst, (slty), occas (calc) occas srct, fri-mod cons, lt (gy) wh, lt gy, lt-m brn; occas carb; tr-30% Sltst, cly, lt brn (red) brn, lt gy, mar wh, (calc), occas (mica), fri; tr-5% Qtz, mky, ang; tr coal.

1400-1500: 25-92% ang frags of Qtzt, mk, pu, pk, gy, + Argillite, gy, pu, gn, red; ~5-55% Sltst, cly, fri-mod cons, wh, lt gy, lt brn (org) brn, mnr (blu) gn, occas (mic), occas (calc); ~3-30% Clst (slty)-slty, lt gy, lt-dk brn, gn, cons-cons, occas wxy, occas (calc), occas srct, w/ occas incl carb mat; tr-1% Qtz, ang, mky; tr coal.

1500-1600: 60-90% ang-mnr (ang) frags of Qtzt, mky, pk, pu, lt-dk gy, gn, + Argillite, gn, pu, gy; ~3-25% Sltst, cly, fri-(cons), lt gy, wh, lt (org) brn, mnr (yell) buff, occas, (calc) occas (srct); ~2-10% Clst (slty) cons, -cons, lt gy (red) brn, med brn, occas wxy; 0-2% Qtz, ang, mky; tr-v. mnr coal.

1600-1700: 85-95% ang frags of Qtzt, lt-dk gy, pk, mky, pu, brn, gn, + Argillite, pu, lt brn, gn, 3-10% Slst, cly, fri (red) brn-(brn) org; mnr lt brn-yel, (calc), occas (srct); 0-5% Clst, silty-(slty), cons-(cons), lt-m brn, lt gy, (brn) org, (gn) blue, med-gy-dk gy, gn + wxy, occas w/ inc. blk org mat; ≤1% Qtz, ang mky; occas tr coal.

1700-1800: 65-97% ang frags of Qtzt, gy, pu, brn, mky, gn + Argillite, pu, gy; ~4-30% Sltst, cly, fri-cons, (org) brn, mnr lt brn + wh, occas (calc), occas (srct); <1-5% Clst, (slty), med brn, dk (red) brn, lt gy, occas wxy, cons-cons; occas tr Qtz, ang, mky; occas tr. coal + lignite.

1800-1900: 75-98% ang frags of Qtzt, pk, lt-dk gy, mky, pu, gn, + Argillite, gn, pu; 2-15% Sltst, cly, fri-mod cons, lt (gy) wh, lt-dk brn, lt-m (org) brn, occas mic; tr-10% Clst, (slty), lt gy, dk gy, lt (yell) brn, (red) brn dk brn, w/ occas incl carb mat; occas (calc); tr-1% Qtz, mky, ang; occas tr. coal.

1900-2000: 92-100% ang-mnr (ang) frags of Qtzt, vit+sug, mky, gn, pk, pu, brn, dk gy + Argillite, gn, pu, gy; 0-5% Sltst, cly (cly), mod cons, occas mic, lt-buff-lt (org) brn; med brn, wh, lt org-yell, pred (red) brn, occas w/ incl carb mat; 0-2% Clst, occas (silty) lt gy, dk brn, com srct, cons-(cons), wh, occas wxy, occas w/ incl carb mat, tr-1% Qtz, ang, mky; occas tr-mnr coal, tr lig, tr Gr; tr Pyr; tr(?) Sltst, wh, fri, occas mic.

2000-2100: 92-99% ang frags of Qtzt, mk, pk, pu, lt-dk gy + Argillite, pu, gn, gy, brn; tr-4% Sltst (cly), (red) brn, wh, lt brn, mod cons, occas (calc), com (srct); tr-3% Clst, (silty), lt gy, (red) brn, (srct), mod cons; occas tr. coal + lig; tr. Fld, mky; tr? Slst, wh-fri, ; tr. Qtz, ang, mky; tr pyr; note Qtzt + Arg. occas mic.

2100-2200: ~90-97% ang frags. of Qtzt, mky, pu, pk, gy, + Argillite, gy, gn, pu, brn; ~1-8% Slst, cly, cons (cons), occas mic, (red) brn, brn, buff, org, lt (gy) wh; tr-7% Clst, com (silty), lt-med gy, (red) brn, occas w/ incl strgs blk org mat; tr-1% Qtz, mky, ang; tr. coal + lig; tr fld; tr. musc flk.

2200-2300: ~85-98% ang frags of Qtzt, mky, pu, pk, gy, + Argillite, gn, gy, brn, pu, (red) brn; ~2-8% Sltst, com (cly) (red) brn-brn; lt-dk brn, cons (cons), occas (srct) ~0-5% Clst, occas (silty), (red) brn, lt-med gy, wh, mod cons, com (srct); occas tr. Qtz, ang, mky; tr. Fld, wh; tr. Pyr.; tr. Cu, tr. Biot flk, tr. coal.

2300-2400: ~90-100% ang-mnr (ang) frags of Qtzt, pk, mky, brn, (pu) brn, + Argillite, lt-dk gy, pu, brn; tr-5% Sltst, cly, lt (pk) brn, (org) brn, wh, buff, com (mic), fri-mod cons, 0-5% Clst, (slty), lt-med gy, mod cons, occas (srct); occas tr. Qtz, ang mky; tr. coal + lig; tr. musc flk; tr (?) Sltst, wh, fri.

2400-2500: 85-99% ang frags of Qtzt, mky, gy, brn, (brn) pu, pk, + Argillite, gn, gy; gy, pu, (red) bio; tr-10% Sltst, (cly), (red) brn, lt (org) brn, mnr (gn) brn, wh, + buff, fri-(cons), occas (srct) occas (calc); tr-5% Clst, occas (slty), med brn, (org) brn; lt gy, (cons) occas w/ incl blk carb mat; occas tr. Qtz frags, ang, mky, occas tr lig + coal.

2500-2510': ~90% ang. frags. of Qtzt, mky, pu, gn, pk, gy + Argillite, gn, gy, pu, brn, ~2% Sltst, (cly), brn, (red) brn, (org) brn, cons-(cons), com srct, ~8% clst, occas (slty) lt gy-lt (blu) gy, med. brn, cons, occas srct, occas w/ incl strgs blk carb mat; tr. lig.

Abbreviations: (cons) = poorly consolidated, cons = moderately consolidated, Cons = well consolidated; (gy) wh = grayish white; (red) brn = reddish brown; (slty) = slightly silty, slty = very silty; (srct) = slightly sericitic; tr = trace, mnr = minor; (cly) slightly clayey; ect

1

Missoula, Bitterroot Drilling Project

STATE: Montana	COMPANY: Bendix Field Engineering Corp
COUNTY: Ravalli	FARM: — WELL NO.: No. 8
BLOCK: NE¼, NE¼, NW¼	SURVEY
SEC.: #6	
T. 9 N R. 19 W	TOTAL DEPTH: 2720'
	COMMENCED: June 22, 1978
	COMPLETED
ALTITUDE	REMARKS
PRODUCTION	Logged by David Quattlebaum

CASING RECORD

Legend

- gravel, conglomerate
- sand, sandstone
- silt, siltstone
- clay, claystone
- granite, Basement Rk

SHOT — QUARTS — BETWEEN

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pbl-crs, ang-(rnd) frags of Qtz, vit-(mky); Fld, wh, mnr pk, Qtzt, vit+sug, lt-dk gy, red; Gr; mnr SS-cons-(cons), wh+red, f-f, srtd-srtd, mnr Clst, lt buff, sdy+slty; tr Mic

Gran-med, ang-(ang), mnr (rnd) frags of Qtz, vit-(mky); Fld, wh+mnr tr pk; Qtzt vit+sug, m-dk gy, blk, yell, mnr Gr+Gns; mnr Musc+(yell) brn Mic flks; mnr grs calc cmt, f-crs sd Cgl; tr vit red Qtz. Note: all uncons frags

100

gran-med, ang-(ang) mnr (rnd) frags of Qtz, vit-(mky); Fld, wh+mnr pk; Qtzt vit+sug, lt-dk gy, lt red, yell, brn; Gr+mnr Gns; mnr grs of (com) calc cmt, f-crs sd Cgl; mnr Clst, wh+buff (slty)-slty, (mic), (cons); tr Biot, Musc+(yell) brn mic flks; tr wood frags; tr Cly, gn

200

gran-med, ang-(ang, mnr (rnd) frags Qtz vit-mky, tr vit orng; Fld, wh, tr lt pk; tr-mnr Qtzt, vit+sug, yell, lt yell, blk, gy; Gr+Gns; tr Cly, wh, brn, lt brn; tr Biot flks; tr-mnr Musc flks; tr Clst, v lt gy, (mic), (slty), srtd; tr Clst, wh slty, mic; mnr calc cmt, f-crs sd Cgl grs

300

gran-m, ang-(ang), mnr (rnd) frags Qtz, vit-mky; Fld, wh; Gr+Gns; mnr Sltst, wh+lt buff, cly, (calc), (mic); mnr Clst, wh, (slty), (cons), (calc); mnr Qtzt, lt-dk gy, red, lt yell; mnr Musc flks, tr Cly, lt brn

380'-490' No SAMPLES

400

NO SAMPLES

340-380': gran-m, ang-(ang), mnr (rnd) frags Qtz, vit, clr-mky; Fld, wh; Gr; mnr Clst, (slty) (cons), (calc), (mic), lt buff, wh; tr-mnr Qtzt, vit clr+sug, m gy; tr Sltst, v sdy+cly, (cons), (calc), lt buff; tr Cly, wh; tr Musc+Biot flks

500

gran-m, ang+(ang) frags Qtz, vit-mky; Fld, Clst slty-(slty), wh, buff, lt gy, mic, (calc); Sltst, cly+sdy, buff, wh, (calc); ~40-60% Clst+Sltst; mnr Qtzt, lt-dk gy, brn, vit yell; mnr Gr+Gns; mnr Musc; mnr Cly, lt gy; tr Pyr

ang pbls+s frags Clst, lt gy, (calc), slty-sdy, mic, (cons)-cons; 50-70% Clst; w/ gran frags Qtz, vit-mky; Fld, wh; Qtzt, lt-dk gy

gran-crs, ang-(ang), mnr (rnd) frags Qtz, vit-mky; Fld, wh; Gr; mnr Qtzt, lt-dk gy; Clst, lt gy, buff, lt gn, wh, (slty)-slty, mnr sdy, mic, (calc), (cons)-cons; ~10-20% Clst; mnr Cly, brn, lt gy

600

s pbl-crs, ang-(ang), mnr (rnd) frags Qtz, vit-mky; Fld, wh; Sltst, cly+sdy, (calc), lt (wh) gy, (mic); Clst, wh, lt brn, lt gy, calc, slty, mic, ~25-42% Clst+Sltst; mnr Qtzt, lt-dk gy; mnr Gr; tr Cly, lt brn, gy

ang pbls+s frags of Cly, (cons), lt (yell) buff, lt gy, wh, slty-sdy, (mic), (calc); 65-85% Cly; abnt s pbl-med, ang-(rnd) frags Qtz, vit-mky; Fld, wh; mnr Gr; mnr Qtzt, lt-m gy; mnr Mic flks

pbl-crs, ang-(rnd) frags Qtz, vit-mky; Fld, wh; mnr Gr; mnr Qtzt, m gy; mnr Clst, sdy-slty, wh, lt buff (calc), pbly, ≤30%; tr Cly, lt brn/brn, (slty)

700

s pbl-f, ang-(ang), mnr (rnd) frags Qtz, vit+mky, tr vit orng; Fld, wh, tr lt pk; Qtzt, vit+sug, pk, vit gn, brn, (brn) yell, (red) brn, lt-dk gy; mnr Clst, wh-lt gy, slty-sdy, (cons), (calc), <5-20%; tr Cly, lt gy; tr-mnr wood frags; Gr+Gns; tr Musc+Biot flks

800

gran-med, ang-(ang) mnr (rnd) frags Qtz, vit-mky; Fld, wh, mnr lt gy+pk; mnr Gr+Gns; mnr Qtzt, vit+sug, lt-dk gy, brn, gn, blk; mnr Clst, wh, buff, (yell) buff, slty, (calc); mnr Sltst, cly+sdy, wh, lt gy, (cons), (calc); ~3-10% Clst+Sltst; tr Cly, lt gn, (yell) wh, v lt buff; tr Musc+Biot flks

900

gran-m, ang-(ang), mnr (rnd) frags Qtz vit-mky, tr vit red+yell; Fld, wh, tr pk, Gr+Gns; Qtzt, lt-dk gy, blk, gn, (brn) red, tr vit+sug; mnr calc cmt, (cons), f-crs sd Cgl; ≤5% Sltst, cly+sdy, lt buff, (mic), (cons), (calc); tr Pyr; tr Cly, brn, wh, lt gy; tr Cly, dk brn, (calc), fis; tr Musc+Biot; 960-970' as above w/ 40-50% Sltst, lt gy, (calc), cly+v sdy, (cons), (mic); 990'-1000' as above w/ abnt pk Fld

1000

gran-m, ang-(ang) frags Qtz, vit, clr-mky, tr vit red; Fld, wh, mnr (yell) wh+pk Gr; mnr Qtzt; vit+sug, lt-dk gy, blk, yell (orng) pk, (gn) brn; mnr Musc, (gld) brn Mic flks; mnr grs calc cmt, (cons), f-crs sd Cgl; v mnr Sltst, cly+sdy, lt (gy) wh, mic, (calc), (cons); v mnr Clst, wh, lt brn, (slty), (mic), (cons); tr Cly, gn, wx

1100

gran-f, ang-(ang) frags of Qtz, vit clr-mky; Fld, wh; mnr Gr; mnr Qtzt, vit wh+sug, lt-dk gy, red; mnr lt brn-wh grs calc cmt, (cons), f-crs sd Cgl; mnr Musc+Biot flks; v mnr Sltst, cly+sdy, (cons), wh, (mic), calc; v mnr Clst, lt buff, (slty), (cons), (calc); tr Cly, wh, v lt gy, brn; tr Pyr; s tr metal flks

1200

ang pbls+frags Clst, sdy, slty, lt gy-buff, dk brn, (cons) calc; 55-85%; uncons ang-(ang) frags Qtz, vit, clr-mky; Fld, wh; Qtzt, lt-dk gy; 15-45%; mnr Cly, lt buff-gy, lt+dk brn; mnr Clst, buff, (slty), (cons), (mic); mnr Mic; tr Pyr; calc cmt, crs sd Cgl

1300

ang pbls-frags of Clst, lt gy, v sdy+slty, calc (cons); w/ mnr ang-(ang) gran-f frags of Qtz, Fld, Qtzt+Cly

pred ang pbls-s frags Clst, lt gy, (cons), v sdy+slty, (calc); w/ uncons ang-(rnd), gran-f frags Qtz; Fld; Qtzt; Clst (slty); mnr Cly; tr blk org mat.

gran-f, ang-(rnd) frags Qtz, vit, clr-mky; Fld; wh, tr lt gy; Qtzt, lt-dk gy, blk, tr vit+sug; mnr Gr; mnr Clst, v sdy+slty, lt gy, lt buff, (calc), (cons); mnr Clst, (slty), (mic), (cons), (calc), wh-lt buff; mnr Cly, brn, lt buff, lt brn; tr Cly, blk+fis; tr Mica flks; tr Pyr

1400

gran-f ang-(ang) mnr (rnd) frags Qtz, vit clr-mky; Fld, wh, tr lt pk, tr lt (gy) wh; Qtzt, lt-dk gy, red; mnr Gr+Gns; v mnr Sltst, cly+sdy, (cons), (calc), lt gy-lt buff; mnr grs calc cmt, (cons), f-crs sd Cgl; mnr Cly, wh lt (gy) brn, lt yell, lt buff; tr Musc+Biot flks; tr Pyr; tr blk (?) org mat; tr Clst (slty), (mic), (calc), wh; tr Qtzt, pk; tr metal flks

1500

pbl-f, ang-(ang), mnr (rnd) frags Sltst, abnt-mnr, lt (gy) buff-(yell) buff, v sdy+cly, (cons), (calc), (mic); Qtz, vit clr-mky; Fld, wh, tr lt gy, tr pk; Clst, (slty), (calc), buff-lt gy; mnr Gr; mnr Qtzt, lt-dk gy; tr-mnr Cly, lt (brn) buff, v lt gy, lt (gy) gn; tr Pyr; tr Musc+Biot flks; tr blk Qtzt

Note: 1520'-1560' no samples

1600

gran-med, ang-(ang), mnr (rnd) frags Qtz, vit, clr-mky, tr vit pu; Fld, wh; mnr Gr; mnr Qtzt, lt-dk gy; mnr-absent Sltst, v sdy+cly, (cons), (calc), (wh) buff; mnr-absent Clst, (slty), (calc), (cons), v lt gy, lt brn, lt buff; mnr-com Cly, lt buff, lt brn, brn, v lt gy, wh; tr Pyr; tr Musc+Biot flks; tr wood frags; tr blk org mat; tr metal flks

1700

gran-f, ang-(ang), mnr (rnd) frags Qtz, mnr-abnt, vit clr-mky, tr vit pk; Fld, mnr-abnt, wh, tr (gy) wh; Clst, mnr-abnt, (slty), (calc), (mic), (cons), lt (gn) buff; mnr-com Sltst, cly+sdy, buff, wh, brn, (cons), (calc); mnr-com Cly, (calc), lt-m brn, dk brn, lt (wh) gy, lt gy; mnr Qtzt, lt-dk gy, tr vit wh+sug; mnr Gr, tr Mica flks; tr Pyr; tr wood frags; tr blk org mat; tr metal flks

1800

pred s pbl-med, ang-(rnd) frags Sltst, lt buff, v sdy+cly, (cons), (calc); Clst, (slty), cons-(cons), (calc), lt gy, lt brn; Cly m-lt brn, lt gy, lt gn, tr (blu) gn, calc; mixed w/ mnr-abnt, crs-f, ang-(ang) frags Qtz, vit, clr-mky; Fld, wh; mnr Qtzt, lt-dk gy; mnr Gr; tr Musc, Biot+(red) brn Mic flks; tr dk org mat; s tr metal flks

6.5'

1900

gran-f, ang-(ang), mnr (rnd) frags Qtz, mnr-abnt, vit, clr-mky, tr vit red; Fld, mnr-abnt, wh; Sltst, mnr-abnt, v sdy+cly, lt buff, (cons), (mic), (calc); Clst, mnr-abnt, lt buff, lt (gy) brn, (slty), (cons), (calc); mnr-com Cly, lt buff, (gy) brn, m brn, dk brn+fis; mnr Gr; mnr Qtzt, lt-dk gy; tr Musc, Biot+(brn) red Mic flks; tr Pyr, tr metal flks

2000

gran-f, ang-(ang) frags Qtz, vit clr-mky, tr vit pk; Fld, wh; Sltst, lt buff, v sdy+cly, (cons), (calc); Clst, lt buff-lt (yell) buff, (slty), (cons), (mic), (calc); Cly, v lt gy, wh, lt-dk brn, tr lt (blu) wh, (calc); mnr Gr, mnr Qtzt, lt-dk gy; tr Pyr; tr Musc, Biot+metal flks. note: 2040'-2100' pred Clst+Cly w/ mnr Qtz, Fld, Sltst, Gr+Qtzt

2100

gran-slt, ang-(ang), mnr (rnd) frags Qtz, vit clr-mky; Fld, wh; Clst, (slty), (calc), wh, lt buff, lt brn, (cons), (mic); Cly, lt gy, lt buff, lt-dk brn, v lt (gy) wh, tr wh, (calc); Sltst, v cly+sdy, lt buff, lt (yell) buff, (cons), (calc); [These vary from abnt-mnr]; mixed w/ mnr Qtzt, lt-dk gy, gn; mnr Gr; tr Musc, Biot+metal flks; tr Pyr; tr blk org mat

2200

crs-slt, ang-(ang), uncons frags Qtz, vit, clr-mky; Fld, wh; mnr Qtzt, lt-dk gy; mixed w/ gran-f, ang-(rnd) frags of Clst, (slty), (cons), (calc), (mic), lt gy, lt buff; Cly, lt-dk brn, lt gy, (gn) wh, lt (wh) gy; Sltst, v sdy+cly, (cons), (calc), lt gy-lt (brn) gy; tr Pyr, Musc, Biot; tr blk org mat; tr Gr; tr metal flks; 2220'-2280' pred Clst, cly, sdy Sltst; 2290'-2300' abnt dk brn-blk org mat

2300

s pbl-m, ang-(ang), mnr (rnd) frags Cly, lt-dk gy, lt-dk brn, wh, lt buff, lt (gn) gy, lt gn, buff, (calc); Clst (slty), (calc), cons-(cons), (mic), lt brn, lt buff, lt gy, wh, lt gn, m brn, mnr-com; Qtz, mnr-abnt, vit clr-mky; Fld, tr-com, wh, tr pk; Gr+Gns, tr-mnr, Qtzt absent-mnr, lt-dk gy; Sltst, tr-mnr, cly+sdy, (calc), (cons), (mic), lt buff-wh; tr-com dk brn-blk org mat; tr-mnr yell+blk Mic flks; tr Pyr; 2320'-2330': abnt rnd Cly pbls+grns

2400

gran-m, ang-(ang), mnr (rnd) frags Qtz, vit, clr-mky; Fld, wh, mnr lt (gy) wh, tr pk; Gr; Clst, (slty)-slty, (calc) (mic) (cons)-cons, wh, lt (wh) gy, lt gy, lt brn, cons; Cly (calc), lt-m brn, lt gy, wh, lt brn w/ thin bands of dk brn-blk org mat; Sltst mnr-absent, v sdy+cly, lt (gy) wh, (cons), (calc), (mic)-mic; abnt blk+com gold mic books; tr-mnr Pyr; tr dk brn-blk org mat; tr Qtzt, gy; brn stn on some grs. Note (lower): Qtz, Fld, Gr > Cly+Clst

2500

gran-m, ang-(ang) frags Qtz, vit, clr-mky, tr vit red; Fld, wh-lt (gy) wh; Clst, (slty), (calc), (mic), lt-m brn, lt gy, lt buff, yell; Cly, wxy, lt buff, lt-m brn, lt gn, m brn w/ thin bands of dk brn-blk org mat; mnr-com Gr; com-abnt blk+gold Mic books; tr dk brn-blk org mat; tr Sltst wh, v sft; Note: 2570'-2590' abnt (rnd) s pbl-gran frags; 2500'-2510' Cly+Clst ~30-40%; 2520'-2530' Cly+Clst ~15%; 2560'-2590' Cly+Clst ~2-5%; 2590'-2600' Cl+Clst tr

2600

gran-med, ang-(ang), mnr (rnd) frags Qtz vit, clr-(mky), tr vit red+yell; Fld, wh, tr (yell) wh+lt gy; Gr; abnt Biot books+mnr yell Mica books; mnr-com Clst, (slty), (calc), pk-red, lt-m gy, lt brn, lt buff, mic; mnr Cly, lt lt buff, lt-m brn, wh, lt (brn) yell, waxy (brn) red-red; tr-mnr Sltst, lt buff-wh, v sdy+cly (cons); tr dk brn-blk org mat, tr Qtzt, gn, gy; tr Pyr; pk-red stn on some grs; tr metal flks

2700

14'

2710-2720': Core Sample-cons Granite rk composed of Qtz, vit, clr; Fld, wh; Biot; Hrnb — sample shows slickensided surface w/ red+gn stain

2800

Core Sample: 1810-1830' includes:

a) Claystone, lt gy, slty, (calc), (mic), cons
b) Claystone, lt gy, (calc), cons
c) Claystone, lt gy, v slty+sdy, (calc), mic, cons-(cons)

2900

STATE	Bendix Field
Montana	COMPANY Engineering Co.
COUNTY Ravalli	FARM WELL NO. No 6
BLOCK	SURVEY
SEC. 33	
T. 10 N R. 20 W	TOTAL DEPTH
	COMMENCED
	COMPLETED
	REMARKS
ALTITUDE	
PRODUCTION	Logged by Sheila Fountain

Legend — CASING RECORD

- conglomerate, gravel
- sandstone, sand
- siltstone, silt
- Claystone, clay
- coal ■ organic matter

SHOT QUARTS BETWEEN

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100
- 35-60% Qtz.-ang. frags, wh, col. less, lim stn.
- 25-30% felds-ang frags wh, col. less, alt.
- 5-20% mica flks: biot = musc.
- 5-10% rock frags.
- <1% garnet, chlor.
- nearly all frags > 2mm. are rock frags.

200
- 25-45% Qtz-ang. frags, wh, col. less, lim. stn.
- 25-35% felds-ang frags, wh, col. less, alt.
- 5-15% vK. frags - qtz-felds-mica, dom p.K.
- 5-15% qtzite, sub rnd, blK, gn, mky,
- trace chlor, garnet, sillimanite
- larger frags. (>2mm) dom. vK. frags.

300
- ≈ 50% Qtz: ang. frags, wh., col. less, lim stn
- 25-35% felds: ang. frags, wh., col. less, alt.
- 5-15% mica flks: biot = musc.
- 1% gainet, sill. or trem. (?) chlor.
- a few crs. rnd. qtzite pebbles

400
- 0-50% silt - fine sand
- 5-100% med - v. crs. ang. rock frags: dom. qtz - felds ↓ biot, musc, chlor.
- mineral frags: dom qtz - wh, col. less - felds. wh, col. less.
- alt. mica flks - biot = musc lim stn.

500
- 20-50% silt + fine sand
- 50-80% med - v. crs: rock frags: dom qtz + felds ↓ biot., musc., chlor., sericite
- mineral frags: dom qtz - wh., col. less - felds - wh., col. less, alt.
- mica flks, musc biot, lim stn.

600
- ≈ 40% silt, sand + some clay
- 20-50% rock Frags, ang.
- 10-40% mineral frags - crs., ang: qtz., felds, mica flks.

700
- 30-60% silt - clay
- 50-15% rock frags., ang.
- ≈ 20% mineral frags, ang
- qtz - wh., col. less, lim. stn ≈ 15%
- felds - wh., col. less, alt, lim stn
- mica flks 5%
- other ≤ 1%

800
- 60-80% silt - clay
- 10% med - fine sand
- 10-30% crs - v. crs, ang: rock frags - dom qtz - felds ↓ biot, musc., chlor.
- mineral frags: qtz, felds, mica flks, felds, may be alt., lim. stn

900
- 40-80% silt, clay, v. fine sand
- 10-50% fine - crs. sand: dom qtz - felds, ang. frags mica flks (musc - biot.)
- 10% v. crs. ang. rock + min frags. as above

1000
- 50-80% silt, clay, v. fine sand many completly wthrd. plag. grns.
- 10-30% fine - crs. sand, dom. qtz - felds ang. frags; lg mica flks. (musc - biot.)
- 10% v. crs. ang rock - min frags many wthrd. - lim. stn. grns.

1100
- 40-70% silt, clay, v. fine sand
- 15-45% med - crs. ang sand dom. qtz - felds - some wthrd, lim. stn, mica
- ≈ 15% V. crs. ang: rock frags - qtz, felds, mica, sericite min frags - qtz, felds, mica

1200
- 30-80% silt, clay, v. fine sand
- 10-35% med - crs ang. sand dom qtz - felds ↓ mica
- 10-35% v. crs ang. rock - min frags as above - weathered felds, lim stn

1300
- 30-80% silt, clay, v. fine sand
- 10-20% fine - crs ang. Sand, dom qtz. - felds ↓ mica
- 10-50% V. crs. ang. rock + min. frags.
- much wthrd. felds. lim. stn.

1400
- 50-80% silt, clay, v. fine sand
- 5-15% med. qtz. sand
- 15-40% crs - v. crs. ang. min frags: dom qtz - wh, col. less, lim. stn, ≈ 5% musc. ↓ some biot. - felds - wh, wthrd. rock frags - dom. qtz. ↓ musc, biot., felds.

1500
- 20-50% silt, clay, v. fine sand
- 10-40% fine - med. qtz sand
- 30-70% crs - v. crs. ang. min. frags: qtz > felds - gr, wh, perthitic, altered.
- 10% mica - musc > biot.

1600
- 20-80% silt, clay, v. fine sand
- 10-40% fine - med. sand
- 10-70% crs - v. crs ang. rock + min. frags (as above).
- Core shows granite gneiss boulders + green clay consisting of highly altered felds, biot, chlorite, ↓ musc flks.

1700
- 10-40% silt, clay, v. fine sand
- 10-20% fine - med sand
- 40-80% crs - extremely crs. ang rock + mineral frags as above, not quite as weathered appearing.

Missoula, Bitterroot Drilling Project, Summer '78

STATE	COMPANY	
Montana	Bendix Field Engineering Corp	
COUNTY: Missoula	FARM	WELL NO. No 4
BLOCK: NW¼, SE¼, NE¼	SURVEY	
SEC.		
T. 14 N	R. 20 W	TOTAL DEPTH 2907'
	COMMENCED July 20, 1978	
	COMPLETED	
	REMARKS	
ALTITUDE ≈ 3530'		
PRODUCTION	Logged By: David Quattlebaum	

CASING RECORD

Legend
- Conglom, gravel
- Sandstone, sand
- Siltstone, silt
- Claystone, clay
- Coal
- Siltite
- P = tr Pyrite
- • = organic Mat

SHOT — QUARTS — BETWEEN

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gran-f, ang-mnr (ang)+(rnd) frags Qtzt, vit, clr-wh + sug, red, pu, gn, lt-dk gy, yell, brn, orng, blk; Qtz, vit, clr-mky, pk, red, lt yell; Fld, wh-(wh)clr; tr-mnr Gr; tr Musc + Biot flks; tr Sltst, brn, lt(gy) wh; tr Schist; Tr Clst, slty, lt gy, lt pu, wh (calc)(mic); tr Clst, mic, lt buff, cons; tr Clst, slty, wh, sft

Qtzt, Qtz + Fld as above w/ 20-30% Sltst, Clst + Cly, lt-m brn, buff; tr Pyr; tr-com dk brn-blk org mat

abnt Qtz, clr-mky; Plag(wh) Sltst, lt gy-brn, mnr gd gy, red, mnr Cly; com dk-brn blk Coal; tr Pyr; mnr Musc flks

s pbl-crs, ang-(rnd) frags Sltst, sly, (calc), cons-(cons), lt-dk brn, lt gy-(gy) wh; tr-v mnr Qtzt; v mnr Qtz; tr-com Cly + Clst; tr-com dk brn-blk Coal + Lig

~65-70% Coal + Lig; ~25% Sltst, wh, gy, brn; ~5-10% Cly

pbl-crs, ang-(rnd) frags Sltst, cly, gy, brn, buff, (gy) wh, (calc); Clst, slty, gy, lt buff-brn, (calc); mnr-abnt Cly, brn, buff; tr-mnr Qtzt, gy, wh; tr-v mnr Coal + Lig

abnt Sltst + Clst as above; com; v mnr Qtzt; mnr Qtz; com cly; tr-mnr Coal

s pbl-crs, ang-(rnd) frags Sltst, cly, (mic), (calc), lt gy-brn, wh + sft; Clst (slty) (calc), lt gy, lt med brn; Cly, lt gy, lt gn, lt-med brn; tr-mnr Qtzt, vit + sug, mky, lt gy, pk, pu, dk gy; tr-com, dk brn-blk Coal + Lignite; Note: Qtzt absent in some samples. Qtz + Flds entirely absent. This interval pred Clst, slty + Sltst, cly

s pbl-med, ang-(ang) frags Sltst, cly, (calc), (mic), lt-gy-(gy) brn, (gy) wh-wh, (cons)-cons; Clst, (slty) (calc), lt gy-lt brn; mnr Cly, lt-med brn, tr gn; tr-mnr dk brn-blk Coal + Lignite; sm tr Qtzt, lt gy; tr (brn) bronze, shiny(?) metallic xls
Note: Clst often contains inclusions of blk org mat

s pbl-med, ang-(rnd) frags of Sltst, cly, (mic), (calc), cons, lt-m brn, lt-m gy, (gy) wh, tr dk brn; Clst, (slty), (calc), lt-m brn, lt-m gy; mnr Cly, m brn, lt gy; tr-mnr Coal + Lignite; tr Qtz, vit clr; tr Qtzt, red, wh, lt gy; tr wood frags; (yell) brn stn on some grs; 470-480': as above w/ abnt Cly, wh; 470-490': as above w/ abnt dk brn-blk Lig + Coal

s pbl-f, ang-(ang) frags Sltst, cly, (calc), (mic), lt gy-lt buff, (wh) gy-wh, m brn; Sltst, (gy) wh, cly + sdy, (calc), (cons); mnr-abnt Sltst; com-abnt Clst, (slty), (calc), lt gy-lt (brn) gy, wh, lt-m brn; mnr-com Cly, wxy, lt (brn) gy-lt buff, (gy) gn, (gn) brn, m brn w/ inclusions of blk org mat; tr-com Qtz, vit clr-mky, lt gy; tr-mnr Qtzt, lt-dk gy, gn, yell; tr-com Coal + Lig; Note: Qtz, Qtzt, Coal + Lig absent in some samples

s pbl-f, ang-(rnd) frags Sltst, cly, (mic), (calc), lt gy-lt (brn) gy, cons; Clst, (slty), lt (gy) wh-lt gy, (gy) brn; mnr-com Cly, lt gn, med brn, lt (gy) wh, buff, (calc); tr Qtz, vit, clr; tr Qtzt, lt yell; mnr Coal; tr Sltst, wh (cons), (calc), (sdy)

Sltst, Clst + mnr Cly as above; abnt Qtzt, vit + sug, clr-mky, pk, lt gy, brn; abnt Qtz, vit clr-mky; tr Fld, mky; tr Musc flks

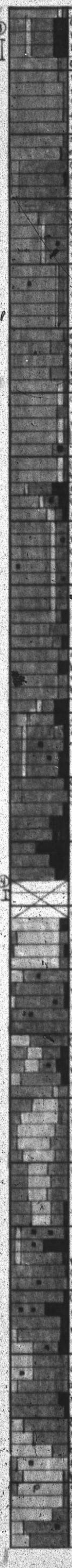
pbl-f, ang-(rnd); ~65-70% Qtzt, vit + sug, clr-mky, pk, lt-dk gy, pu; ~10-15% Qtz, vit clr-mky; ~5-10% Fld, wh; ~5% Clst, slty, lt buff-m brn, (mic), incl blk org mat; tr Cly, gn, brn; tr Gr; tr Musc flks; tr Pyr; tr Coal

700-718' Core

718-750: No Samples

s pbl-f, ang-(ang) frags Sltst, cly, (calc), (mic), lt-m gy; mnr Clst, (slty), buff, gn, lt-m brn; mnr Coal; mnr Musc flks; v mnr Qtzt, gy, gn; tr Qtzt, vit, mky

s pbl-f, ang-(ang), mnr (rnd) frags Qtzt, vit + sug, clr-mky, pk, pu, lt-dk gy; Qtz, vit clr-mky; Clst, slty, (calc), lt gy, buff-lt brn; mnr [illegible], wh; mnr Cly, gn, lt buff, m brn w/ incl blk org mat; tr Pyr, Coal, Gr + Musc flks; tr Sltst, wh, (cons)



Same as 840-900' below

Clst, slty, (calc), lt-m gy, lt-m brn; Coal + dk brn-blk org mat; Qtzt, vit, pk, mky; Qtz, vit clr-mky; mnr Cly, brn, (bn) gy; mnr Fld; tr Pyr + Musc + Biot flks

abnt s pbl-m, ang-(ang) frags Qtzt, vit + sug, clr-mky, pk, pu, lt-dk gy; mnr-abnt Qtz, vit clr-mky; mnr-com Fld, wh-(clr) wh; v mnr-mnr Clst, slty, lt gy, buff, lt-m brn; tr-mnr Cly, gn, buff, m brn; tr Musc flks; tr-absent Coal + dk brn-blk org mat

s pbl-m, ang-(ang) frags Qtzt; Qtz; mnr Fld, wh; v mnr-mnr Clst; v mnr Cly; tr Pyr + Gr; tr Coal + org mat

Clst, slty-(slty), lt gy-(gy) wh, lt gn, m brn, (calc); mnr Cly, (calc), lt-m gy, lt gy, m brn, (blu) gn; v mnr Qtz, vit, clr; v mnr Qtzt, pk + mky, blk; v mnr Coal; tr Fld, mky; tr Sltst, wh, (cons), (calc)

Clst + Cly AA w/ abnt Qtzt, com Qtz; v mnr Fld

Qtzt, vit + sug, clr-mky, pk, gn, lt-dk gy; Qtz, vit, clr-mky; Clst, slty; (mic), (calc), lt gy-buff; Cly, lt-m brn; v mnr Fld, wh; tr Coal + blk org mat

gran-f, ang-(ang), mnr (rnd) frags Qtzt, abnt, vit + sug, clr-mky, pk, pu, lt-dk gy, blk, yell; com Qtz, vit, clr-mky, tr vit pk; mnr Clst, (slty)-slty, lt-med gy, (gy) wh, lt brn, lt gn, (calc), (mic), cons-(cons); mnr-v mnr ? Sltst, wh, v sft, calc; v mnr Cly, lt-m brn, lt gn; tr-mnr dk brn-blk org mat; tr-v mnr Fld, (clr) wh; Clst, often w/ incl blk org mat

abnt Qtzt as above; abnt-mnr Qtz, as above; com-v mnr Clst as above; tr-mnr Fld, mky-lt (gy) wh; mnr-v mnr (?) Sltst, wh, v sft (calc); tr Coal; Musc flks + dk brn-blk org mat; mnr-v mnr Cly, m brn, lt buff, wh; tr Gr + Schist

gran-med, ang-ang frag abnt-v abnt Qtzt, vit + sug, clr-mky, pk, pu, lt-dk gy; com-abnt Qtz, vit, clr-mky; com-v mnr Clst, slty, lt-dk brn, lt gy, buff, (calc), (mic), cons, v mnr-absent Clst, m-dk brn w/ incl blk org mat; tr-v mnr Fld, wh; tr-absent Coal + dk brn-blk org mat; tr Gr; tr-absent Musc flks; v mnr ? Sltst, wh, v sft, calc-noncalc; tr Cly, gn, lt buff

abnt Clst, com Qtzt + Qtz; com Coal + org mat

abnt Qtzt; com Qtz; com-mnr Coal + org mat; com-mnr Clst; tr (?) Sltst, wh, sft; tr Musc flks

gran-med, ang-(ang), mnr (rnd) frags Qtzt, ~65-85%, vit + sug, clr-mky, pk, red, pu; lt-dk gy; com-mnr Qtz, vit, clr-mky; com-tr Fld, wh, tr pk; mnr Clst, slty-(slty), (mic), (calc), lt-m brn, lt gy, lt gn; mnr-tr Clst, (mic), (slty), m brn w/ incl blk org mat; tr-com Lig; mnr-absent Coal; tr Musc flks; tr Gr; Note: 1280-90' as above but w/ com Clst, cons-(cons); Fld absent in some samples; some samples contain mnr ? Sltst, wh, v sft

gran-m, ang-(ang) frags Qtzt, vit + sug, clr-mky, pk, brn, lt-dk gy; com-mnr Qtz, vit clr-mky; tr-mnr Flds wh; mnr ang-(rnd) Clst, (slty), (calc), (mic), lt-m brn, lt gy, buff; Clst, occas w/ incl blk org mat; tr-com Coal + Lig

Qtzt + Qtz as above, gran-f; com-abnt Clst as above; com Lig + Coal; tr Musc flks

Qtzt + Qtz as above; pred Clst as above; + mnr Clst, slty-sdy; (mic), (calc), lt brn-buff; tr Fld, wh; com-mnr Coal, Lig + dk brn org mat

gran-m, ang-(ang) frags Qtzt + Qtz, tr-com; abnt Clst, (slty), (mic), (calc), cons-cons, lt gy, lt-m brn; mnr Clst, slty-sdy, (cons), (mic), (calc), lt brn-gy; mnr Clst (mic), lt-dk brn w/ inc blk org mat; v mnr-mnr Coal + dk brn-blk org mat; tr Musc flks

Clst, (slty), (mic), (calc), cons, lt gy, lt-m brn; ~80-90%; com-abnt Coal + Lig; tr Qtzt + Musc; v mnr Cly, wxy, brn, gn, w/ incl blk org mat; 1480-1500: Coring

abnt gran-f, ang-(ang), Qtz, vit clr-mky; com Fld, wh-(clr) wh; mnr-v mnr Clst, (slty), (mic), (calc), lt gy (brn) gy; v mnr Qtzt, vit + sug, pk, gy, mky; v mnr dk brn-blk org mat + Lig; tr-v mnr Musc flks; gn Cly coating on many grs

pred Clst, slty-(slty), (mic), (calc), cons-cons, lt gy, lt-m brn, occas w/ incl blk org mat; v mnr-absent Qtzt + Qtz grs; tr-v mnr Lig + Coal; mnr dk brn-blk org mat; tr Musc flks

Clst, (slty), (calc), (mic), cons, lt gy-lt brn, buff, lt gy w/ occas incl blk org mat; Qtz, vit clr-mky, crs-f, ang-(ang); Qtzt, vit + sug, pk, pu, yell, mky, lt-dk gy; Fld, wh; tr-mnr Coal + Lig; tr Cly, lt buff; tr Musc flks; tr Fld, pk; 1630-1640' AA, pred Clst, mnr Qtzt + Qtz, mnr-com Coal + Lig; 1640-1650': AA, abnt Qtzt + Qtz crs-f; com-mnr Clst; 1660'-1670': AA, pred grs-f, ang-(ang) Qtz + Fld, mnr Qtz + Clst

Clst, slty, (calc), (mic), cons, lt-m brn, lt gy, buff-wh, occas w/ incl blk org mat; Clst, slty-sdy, (cons)-v sft, (mic), (calc), wh, mnr lt brn; Qtz, vit, clr, mky, ang-(rnd); Qtzt, vit + sug, clr-mky, lt-m gy, pk, ang-(ang); mnr Clst, (srct), gn, (blu) gn, lt (gy) wh, w/ v mnr inc blk org mat; tr Fld, wh; 1730-1750': AA pred Qtzt + Qtz grs, mnr Clst; 1750-1780': AA pred Clst, slty; mnr Qtzt + Qtz grs, mnr-v com Coal, Lig + dk brn org mat; 1780-1800': AA pred Clst, slty, tr Qtzt + Qtz

Clst, slty-(slty), (srct), (calc), cons-(cons), lt brn-lt gy, m brn, buff, w/ occas-com incl blk org mat; mnr Clst, (cons), v sft, slty, (calc), (mic), wh; com-mnr Coal, Lig + dk brn org mat; tr Clst, cons, gn-(blu) gn, wh, lt gy, lt brn; 1810-20': AA w/ abnt Coal, Lig + dk brn org mat; 1860-1870': AA w/ abnt Qtz grs, clr-mky, ang-(rnd); 1870-80': AA w/ only mnr Qtz grs; 1880-1900': Clst AA w/ com-v mnr Coal + Lig

Clst, slty-(slty), (calc), (srct), cons-(cons), lt gy, lt-m brn, lt buff, mnr dk brn w/ occas incl blk org mat; Clst, slty-slty, calc-(calc), (cons), (mic), wh-mnr lt brn, v sft, occas sdy; Qtz + Fld, clr-mky, ang-(rnd) + Qtzt, pk, mky; tr Lig; tr Musc flks

clr-mky, ang-(rnd); Fld, mky, wh; some Qtzt, vit + sug, mky, gy, pk; tr-mnr Clst AA; tr-v mnr Clst, cons, m gy; tr Musc; tr Coal; tr-mnr Lig; tr Pyr; tr Schist

Clst, AA 1900-20', pred, wh + (cons); tr-v mnr Clst, cons, lt gy, gn; mnr Lig; mnr-abnt Qtz + Fld grs + some Qtzt grs

Clst, slty-(slty), cons-(cons), some fri, (srct), (calc), lt gy-(wh) gy, lt-m brn w/ occas incl blk org mat; mnr Sltst, cly-v cly, fri, (mic), calc-(calc), wh-lt (gy) wh; mnr lt brn; tr Qtzt + Qtz grs in upper ½; tr-mnr Lig; tr Coal; 2030-40': AA w/ mnr-com Lig

Pred Clst, slty-(slty), cons-(cons), (calc), (srct), lt gy-(gy) wh, lt-m brn, mnr dk brn w/ occas incl blk org mat; mnr Sltst, wh, fri, cly-(sdy), (calc), (mic); tr Clst, cons, (blu) gn; tr-v mnr Qtzt; occas Qtz grs, vit clr-mky; 2110-20': abnt Qtz grs; 2120-30': ~½ Clst + Sltst; 2140-50': ~¾ Clst, ~¼ Qtz + Qtzt grs; 2150-2200': pred Clst + Sltst, v com-v mnr Coal + Lig

Clst, lt gy-lt brn, mnr dk brn, (calc), (srct), slty-(slty), cons-(cons), occas w/ thin stringers incl blk org mat +/or Coal; mnr Clst, wh + v sft; tr Clst gn + wxy; Clst occas slty; tr Qtz grs, ang-(rnd) vit + mky; tr-mnr Coal + Lig

Clst AA w/ com Qtz (ang), vit + mky, gran-f; tr Fld, lt gy; tr ss, poorly srtd w/ wh cly matrix; v mnr Qtzt, mnr [illegible]

Pred Clst AA; v mnr Qtzt + Qtz; tr Musc flks; tr-v mnr Lig + Coal

70-90% Clst, slty-(slty), lt gy, brn, w/ incl blk org mat; mnr-v mnr Qtz, vit, clr-mky, gran-f, ang-(rnd); tr-v mnr Fld, wh; tr-mnr Coal; tr Qtzt; tr Pyr

Clst, AA, ~40-65%; Sltst, (wh) gy, buff, cly, (calc), friable, ~15-50%; Qtz grs, ang-(rnd) gran-fine, ~10-40%; tr Fld, wh; tr-v mnr Qtzt; tr-mnr Coal; tr-com Lig; tr Pyr; tr Clst, waxy, blue

gran-m; Qtzt, ang-(ang), vit + sug, mky, pk, pu, lt gn, lt-dk gy, 5-70%; Clst, slty-(slty), (wh) gy, lt gy, lt-m brn, srct, mnr wxy, occas w/ incl strgs blk org mat, ~20-50%; Sltst, cly, lt gy, (wh) gy, wh + sft, srct, (calc), cons-(cons), ~10-50%; Qtz, ang-(ang), clr-mky, ~0-5%; absent-mnr blk org mat; absent-v mnr Lig; tr-absent Coal; tr Copper

Gran-med; Qtzt, vit + sug, ang, mk, wh, pk, gn, gy, ~15-60%, absent at bottom; Clst, slty-(slty), (calc), (srct), lt gy, lt-m brn, w/ occas incl blk org mat, ~20-50%; Sltst, cly, (calc), (srct), wh, lt gy, cons-(cons), ~30-50%; Qtz, ang, (ang), mky, absent-5%; tr-v mnr Coal + Lig; absent-v mnr brn-blk org mat
Note: Qtzt most abnt in upper 10' and middle 20'

gran-med; Qtzt, vit + sug, mky, pk, lt-dk gy, ang, ~5-40%; Clst, slty-(slty), lt gy-(wh) gy, gn, lt-m brn w/ occas incl blk org mat +/or Coal, 5-75%; Sltst, cly, (srct), (calc), wh, lt gy, occas w/ incl blk org mat, rarely w/ mnr f Qtz grs, 5-45%; Qtzt, ang-(ang), mky-clr, tr-3%; tr-v mnr Coal + Lig; tr-v mnr org mat; tr Copper

gran-m; Qtzt, vit + sug, mky, gn, lt-dk gy, brn, ang, ~tr-45%; Clst, slty-(slty), (calc), (srct), lt gy, lt brn, gn, cons, ~20-55%; Clst, orng w/ occas mottled w/, slty-slty, (calc), fri, ~20-50%; Sltst, cly, wh, fri, (srct), (calc), tr-5%; Qtz, ang-(ang), mky-clr, tr-5%; tr Fld, wh; absent-mnr Coal; tr-v mnr Lig + org mat

Qtzt, vit + sug, mky, lt-dk gy, gn, brn, pu, ang, ~25-70%; Clst, slty-(slty), (calc), (srct), lt gy, (gy) wh, lt-m brn, occas w/ incl blk org mat; occas orng + slty, cons-(cons); tr wxy + (red) brn, ~tr-50%; Sltst, cly, fri, wh, lt gy, srct, calc, ~5%; Qtz, ang, clr-mky, tr-3%; ? Sandstone f-f, cons-cons, wh, lt gy, (red) brn, ~5-25%
Note: 2850'-2890' pred. Qtzt + 20-55% Siltite; pu + (red) brn, tr Coal + Lignite; tr Pyr; tr Fld, wh; tr Musc

Abbreviations: (ang) = subangular, ang = angular, ang = very angular (also used for rnd = rounded, cons = consolidated, calc = calcareous, mic = micaceous, etc.); gn gy = greenish gray; tr = trace; mnr = minor

Bendix Field

STATE: Montana
COUNTY: Ravalli
BLOCK:
SEC.: 28
T.: 10 N
R.: 19 W
ALTITUDE:
PRODUCTION:

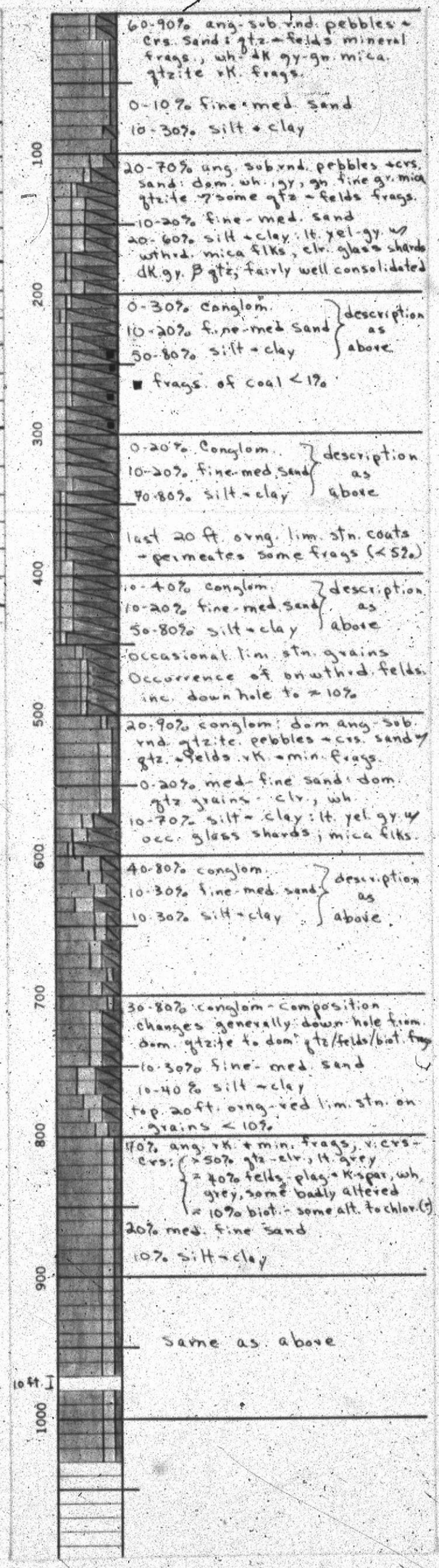
COMPANY: Engineering Co.
FARM: WELL NO.: No 9
SURVEY:
TOTAL DEPTH: 1030 ft.
COMMENCED:
COMPLETED:
REMARKS:

Logged by Sheila Fountain

Legend
- conglom, gravel
- sandstone, sand
- siltstone, silt
- claystone, clay
- organic matter

CASING RECORD
SHOT | QUARTS | BETWEEN

Kraftbilt 186 TULSA, OKLAHOMA 74101 PRINTED IN U.S.A.



Missoula Bitterroot Drilling Project
Summer 1978

STATE Montana	COMPANY Bendix Field Engineering Corp.
COUNTY Ravalli	FARM / WELL NO. No. 11
BLOCK	SURVEY
SEC. 18	
T. 6 N R. 20 W	TOTAL DEPTH 2400'
	COMMENCED May 20, 1978
	COMPLETED
	REMARKS
ALTITUDE	Logged by:
PRODUCTION	David Quattlebaum

CASING RECORD

Legend: P = Pyrite (tr)
- gravel, conglom.
- sand, sandstone
- clay, claystone

SHOT | QUARTS | BETWEEN

Form 186 TULSA, OKLAHOMA 74101 PRINTED IN U.S.A.

Qtz, wh, vit, crs-crs, feld, wh, pk, ang, crs-crs; ~5-10% Gr, qtz, Fld; musc, biot, crs, ang

Gr + Gns, pbl-crs, ang-rnd

<1% Musc

med-crs ang, Qtz, wh + vit; Fld, wh; ~3% phlogopite

gran-crs; ang Qtz, vit-mky, ang, <1% rnd; Fld, wh, ang; Gr, ang-(ang), <5%; Musc ≤1%

100

gran-(med) crs; Clst, wh, mic, slt, (cons), (calc), rnd-(ang), ~65%; Qtz, vit-(mky), ang ~15%; Fld, ang-(ang), ~15%; Musc ~1-5%; Gr, ang ~5%

gran-crs; Clst, (gy) wh, mic, slty, (cons), (calc), rnd-(ang), ~10-50%; Qtz, vit + mky, ang, ~20-60% Fld, wh <1% pk, ang-(ang), ~20-30%; Gr + Gns, ang-(ang), qtz, fld, musc, biot, ≤10%; Musc, ≤2%; Pyr, ≤1%

P

Clst, 20-30%; Gr <5%, Qtz; Fld; as above

pbl-gran; Cgl (cons), gy, wh, rnd-ang, contains Qtz; Fld + Mic, matrix Clst, slty, mic; Clst, as above; Qtz, vit + mky, ang-rnd; Fld, wh, ang; Gr + Gns, ang-rnd

200

pbl-crs, ang-(rnd); Qtz, Fld, Musc, Gr + Gns (cons) Clst ...

s pbl-crs, Qtz, vit + mky, ang-(rnd); Plag, wh, ang-(rnd), crs-crs; Clst cmt, lt gy, (cons), slty, mic.

~15% Clst, as above, Qtz + Fld; Gr 20-25% mnr Qtzt, gy, gn

pbl-crs; ~40-50% rnd-(rnd); Qtz vit + mky, ang-rnd; Fld, wh, ang-rnd; Gr, ang-rnd; mnr Qtz + Clst + Qtzt

pbl-crs, ang-rnd; Gr + Gns; Qtz, vit + mky; Fld, wh; Qtzt, vit, buff, gy, (red) brn; mnr Musc flks + wood frags; tr Hrnb; Clst absent

300

Clst, lt gy, slty, (cons), (calc), mic with ang-(rnd) crs-gran frags of Qtz + Fld; mnr gy Qtzt, Musc

crs-crs, ang-(ang), uncons frags of ~40% Qtz, vit + mky; ~35% Fld, wh; ~20%, Clst, (gy), wh, (calc), slty; mnr Mic + Qtzt; tr pk Fld, Gr + Pyr

P

Clst; lt gy, slty, gran-crs, (rnd)-(ang), ~60-85%; Qtz, vit, mky, ang-(ang), crs-crs, ~10-20%; Fld, wh, gran-crs, ang-(ang), ~5-15%; Clst, (gy) wh, srtd (slty), gran-crs, ≤5%

400

gran-crs, ang-(ang) frags of Clst, (wh) gy, (srtd), slty, mic, cons, (calc); Qtz, vit, mky; Fld, wh; mnr Gr + vit Qtzt; mnr (rnd) grs; mnr Clst, (buff), wh, srtd, (slty), cons, gran-crs cons.

gran-crs; ang-(rnd) grs of Qtz, vit, mky; Fld wh; Gr + Gns; Clst (srtd), slty, mic; mnr Qtzt + Clst, srtd, (slty)

as above 450-70' w/ ~50-70% s pbls of Clst matrix Cgl, (cons)-cons; + Clst, slty, (srtd) + Clst, srtd, (slty)

500

s pbl gran, ang-(ang) frags of Clst, (gy) gn, slty, cons, srtd, (calc); Clst, buff, (srtd); tr ~20% Qtz, vit, Fld, wh, Gr + Musc

s pbl ang-(ang); lt buff, slty, sndy Clst; Qtz, s pbl-med vit, mky, ang-(ang); Fld, wh, tr pk; Gr + Gns; tr Qtzt, gy + Musc; mnr near pure Clst, (gn) buff, (calc), cmt.

~30-75% s pbl-gran, ang, (cons) Cly w/ Clst matrix, yell, lt (gy) gn; ang frags crs-med Qtz + wh Fld. 20-65% gran-crs, ang-(ang), Qtz, vit, mky; Fld; wh; Gr + Qtzt frags; Musc flks; var (gy) wh, slty + sdy Clst; tr wood frags + Pyr

P

600

s pbl-crs, ang-(ang)-(rnd); frags of Clst, (gn) gy-lt buff, slty, (calc), (srtd); Clst, lt buff, srtd, slty, (calc); Clst, lt (gn) yell, srtd + mnr (brn), red, (slty); Gr + Gns; Qtz, vit, (mky); Fld, wh; Qtzt, vit, m-dk gy; tr Musc, Biot flks + wood

ang s pbls (lt gy) sdy; Cly (cons) Slst; gran-med, ang-(ang) frags Clst, slty, lt buff; Qtz, vit, mky; Fld, wh; Gr; Qtzt

s pbl-crs, ang-(rnd); Cly, lt gn, lt tan, (orng) yell Clst, slty, brn-gy, buff, wh; Qtz, vit, mky; Fld, wh; Gr; Qtzt, m-dk gy; mnr Musc + wood frags

700

Small gran-crs, ang-(rnd) frags of Qtz, vit-(mky); Feld, wh, tr pk; Gr; Gns; Cly, gy, yell, lt gn; Clst, slty, (calc), (gy) wh-lt brn, (srtd); Qtzt, vit, dk-lt gy, tr red; tr Pyr; mnr Musc flks + lim stn on some grs, abnt metal flks

P

800

gran-med; ang-(ang) frags of Qtz, vit-(mky); Fld, wh; mnr Gr + Gns; mnr Qtzt, vit + sug, (blk) gy, lt-dk gy; mnr Musc + Biot flks; mnr Clst, slty (gy) wh, (srtd); mnr Clst, lt brn-buff, (slty), srtd; tr Cly, yell; tr Pyr; tr red, vit Qtz; up to 20% metal flks; many rust stn grs.

P

900

gran-crs, ang-(ang) frags of Qtz, vit-mky; Fld, wh; Gr; Qtzt, vit + sug, lt-dk gy, (gn) gy; Clst, slty, (calc), srtd-(srtd), wh, buff; mnr metal flks; tr Pyr; rust stn on many grs

P

gran, ang-(rnd); Qtz, vit-(mky); Fld, wh; Qtzt, vit, sug, lt brn, lt-dk gy; Gr; Clst, (gy) wh, slty, (srtd), (calc); Clst, (gy) wh (slty), srtd; mnr yell-(yell) wh cly

as above 950-990: gr-gn-grs; abnt met. flks

1000

gran-crs, ang-(ang) frags of Qtz, vit, (mky); Plag, wh-(gy) wh; Qtzt, vit + sug, lt-dk gy; Clst, lt buff, slty, mic, (srtd), (calc); Clst, (gy) wh, (slty), srtd; mnr Musc flks + metal flks; tr yell Cly + Pyr; rust stn on some grs

P

1100

gran-crs, ang-(ang) frags of Qtz, vit-(mky), Fld, wh; Gr + Gns; Qtzt, vit + sug, lt-dk gy, blk; mnr Clst, slty, (srtd) (calc) (wh) buff; mnr Clst, wh, srtd (slty); mnr metal flks; mnr (rnd) grs; tr Musc + Biot flks; bnd rust stn on many grs; tr wood frags

as above 1100-1180; pred med grs; mnr Musc + Biot flks

1200

gr-f ang frags of Qtz, vit-(mky); Fld, wh; Gr + Gns; Qtzt vit + sug, lt-dk gy, brn, blk; mnr Musc, Biot + metal flks; mnr grs of calc cmt, f-med sd Cgl; tr yell Cly + Pyr; mnr (rnd) grs; Clst absent; bnd rust stn on some grs

P

P

1300

gran-med, ang-(ang) frags of Qtz, vit-(mky) Fld, wh; Qtzt, vit + sug, gn, lt-dk gy, blk; Gr + Gns; grs of calc cmt, slty, f-crs sd Cgl; mnr Clst blk (slty), cal; tr Clst, wh, (srtd), slty, mic; tr Pyr, Musc + metal flks + wood frags; mnr (rnd) grs; tr Brec; bnd rust stn on many grs

P

1400

gran-crs, ang-(ang) frags of Qtz, vit, (mky); Fld, wh; Qtzt, vit, sug, lt-dk gy, blk, gn, red; Gr + Gns; mnr Musc + metal flks; tr ~2% Pyr; tr wh Cly; tr Clst, wh, slty, srtd; bnd rust stn on many grs

P

PP

1500

gran-med, ang-(ang) frags of Qtz, vit-(mky); Fld, wh, mnr lt yell + pk; Qtzt, vit, sug, lt-dk gy, blk, (gy) gn, brn, pk; Gr + Gns; mnr (rnd) grs; tr Musc, Biot + metal flks; tr Cly, lt gn; tr Clst, buff, slty, srtd; tr-mnr Pyr; tr wh Cly; bnd rust stn on few grs

PP

P

1600

gran med, ang-(ang), mnr (rnd) frags of Qtz, vit-(mky), tr vit red; Fld, wh; Qtzt, vit + sug, lt-dk gy, brn, gn, blk; mnr Gr + Gns; mnr grs of calc cmt, f-crs, sd Cgl; tr Clst, wh, slty, srtd, (calc); tr Clst, wh (slty) srtd; tr wh Cly; tr lt yell Cly; tr Musc, Biot + metal flks + Pyr; mnr rust stn.

P

1700

Gran-crs, ang-(ang), mnr (rnd) frags of Qtz, vit, (mky); Fld, wh; Qtzt, vit + sug, lt-dk gy, gn; Gr + Gns; grs of brn calc cmt, (cons), f-crs sd Cgl; mnr Clst, wh, buff + (gy) wh, slty-(slty), (calc), srtd-(srtd); tr Cly; yell; tr Musc + metal flks; tr Pyr.

P

1800

Gran-med, ang-(ang), mnr (rnd) frags of Qtz, vit-mky; Fld, wh; Qtzt, vit + sug, lt-dk gy, gn, blk, red; mnr Gr; mnr grs of buff-brn slty calc cmt, (cons), f-crs sd Cgl; mnr Clst, wh-lt gn, slty, (calc), srtd-(srtd); tr Pyr; Biot + metal flks; Cly, yell; calc, brn, bnd stn on many grs.

1900

gran-med; ang-(ang), mnr (rnd) frags of Qtz, vit-mky; Fld, wh; Qtzt, vit + sug, lt-dk gy, pk, gn; many grs of buff-brn calc cmt, (cons), f-crs sd Cgl; tr Clst, wh, slty, (calc), (srtd) (mic); mnr Gr; tr Pyr; tr Musc + metal flks; brn, bnd stn on some grs

P

2000

gran-med; ang-mnr (ang) + (rnd) frags of Qtz, vit mky; Fld, wh, tr pk; Qtzt, vit + sug, lt-dk gy, red, blk, brn, gn; Gr + Gns; tr Clst, wh, (slty), srtd-(srtd); tr Clst, m gy, (slty), srtd; tr Musc + metal flks; tr Pyr; tr Cly, (wh + yell); bnd brn stn on many grs

2100

gran-crs; ang-(ang), mnr (rnd) frags of Qtz, vit-(mky); Fld, wh; Qtzt, vit + sug, lt-dk gy, blk, red, gn; Gr + Gns; mnr grs of calc brn cmt, f-crs sd Cgl; mnr Clst, wh, lt gn, lt yell, slty (calc), (srtd)-srtd, (mic); tr Pyr; tr Musc, Biot + metal flks; tr Cly, wh; orng rust stn on some grs.

P

2200

Gran-f, ang-mnr (ang) + (rnd) frags of Qtz, vit-mky, Plag, wh; Qtzt vit + sug, lt-dk gy, red, gn, blk, gy; mnr Clst, wh, lt brn, buff, lt yell, dk brn, slty, (calc), (mic), srtd-(srtd); tr Pyr; tr Musc flks; tr Cly, wh; tr abnt metal flks

P

2300

gran-med, ang-(ang), mnr (rnd) frags of Qtz, vit, (mky); Fld, wh; Qtzt, vit + sug, lt-dk gy, red, brn, pk, gn; Gr + Gns; mnr Clst, wh, lt gn, lt yell, (calc), slty, (slty), mic-(mic); tr Musc flks; tr Pyr; tr Cly, yell, wh; metal flks common, mnr grs of brn calc cmt, f-crs sd Cgl

P

2400

Note: All samples Unconsolidated

2500

Abbreviations: (slty) = slightly silty, slty = silty, slty = very silty, (rnd) = sub rounded, rnd = rounded, rnd = well rounded; (calc) slightly calcareous; crs = very coarse; (mky) slightly milky, mky = milky, mky = very milky; srtd well sorted, etc.

STATE: Montana	Missoula, Bitterroot Drilling Project
	COMPANY: Bendix Field Engineering Corp.
COUNTY: Ravalli	FARM: — WELL NO. #12
BLOCK	SURVEY
SEC. Sec 14 NW¼, NW¼	
T. 6 N R. 20 W	TOTAL DEPTH 1100 ft
	COMMENCED
	COMPLETED
ALTITUDE	REMARKS
PRODUCTION	Logged By Sheila Fountain

CASING RECORD

gravel, conglom.	Clay, Claystone
sand, sandstone	
Volcanic ash (tr: =)	∪ Bivalve
Silt, Siltstone	■ organic material

SHOT	QUARTS	BETWEEN

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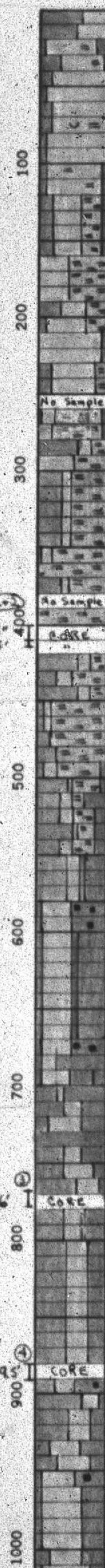

10-60% Pbls, <5mm, ang, (srtd): Qtz, clr, wh; Fld, wh, clr, occas wthrd; Hnbl; Granite; Qtzt, f grain, wh, pk, blk; Calc silicates(?) f grained, (yell) gn, lt gn-wh, brn, (olv) gn; tr volcanic ash.
35-90% Sand ang, crs-crs + mnr m-f, same comp as pbls + tr mica flks.
Com-50% yell, orng, (red) brn stn on pbls + sand.
0-20% Cly (pk) tan, mnr wh, (calc); coats grains; occas wxy, (mic), slty

10-30% Pbls similar to above
40-80% Sand as above, incl tr calcite crs-f, poorly srtd
tr-60% Ash lt (pk) tan - lt buff, tr lt brn, (calc), (mic); usu. sdy - slty, contains glass, f Fld xls, often vesicular, m. hard, occurs in sample as (rnd) - ang pbls + sand sized grains
0-10% Cly coats grains (calc)

0-60% Pbls, <5 mm (rnd) - ang, (srtd), Qtz, clr, gy, wh; Fld, wh, (gy) wh; Granite; tr-com Calc silicates as above; tr Biotite schist(?)
20-90% Sand fine - crs dom Qtz + Fld, mnr mica, calc silicates, tr calcite
0-10% Cly coats grains
tr-com yell (red) orng stn on grains
0-70% Ash as above

0-30% Pbls to 10 mm; dom calc silicates(?) + hornfels(?) wh w/ dk gn f-crs hnbl(?); + Qtz, Fld, Granite, tr red Sltst; (rnd)-ang
0-15% Sand, f-crs, comp. like pbls
35-100% Ash as above

10-60% Pbls rnd-ang, up to 10mm; Calc silicates Hornfels, speckled wh-lt gn w/ dk gn + blk + brn; Qtz, Fld, Granite; Biotite schist (or gneiss); tr pk Qtzt
0-20% Sand comp. like pbls + tr mic
20-80% Ash as above
0-10% Cly, grain coating (calc), tr-10% wh, wxy

30-50% Pbls as above 400-500'
10-40% Sand, comp. like pbls + tr. calcite, com yell, brn, (red) orng stn
10-30% Cly 1) wh, wxy, occas dk speckled; 2) com "brick" (red) brn w/ wh speckles, wxy, amount inc. downhole from <1%-10% of total sample; 3) lt-m brn, wxy, occas wh speckles

50% Cly, med (brn) gy, slty, calc, sdy, (mic); wood frags + org mat. Lower 1' incl red cly, less org.

10% Pbls as above } com yell, (red) orng, stn
40% Sand
10% Silt
40% Cly as above + tr yell, wxy, cons

similar to 580'-590' above

Similar to above 500'-580, dom Cly red + lt brn

0-60% Pbls up to 15mm, some v wthrd, comp similar to above 400-500'
10-40% Sand, fine-crs, ang, com (yell) orng stn (also on pbls); calcite tr; comp like pbls
10-100% Cly, as above cons, wxy, (red) brn, lt brn, tr lt gn, tr wh

30-45% Pbls, dom calc-silicates + hornfels(?) + other as above; up to 10 mm, (ang)-ang fresh + wthrd, com yell + orng stn
30% Sand, as above + com calcite,
25-40% Cly as above, lt brn - lt (red) brn most com + tr (red) brn, tr wh, tr gn

Similar to above 800'-900', %'s more varied.

Similar to 580'-590' above

10% Pbls calc silicates + Hornfels + Qtz, Granite
40% Sand unsrtd, (ang)-ang, Qtz + Flds content inc downhole
30% Cly dom lt brn - buff, tr (red) brn

10-30% Pbls (rnd) - ang, <10mm, calc silicates(?), Granite dom., (srtd)
40-80% Sand (ang) - ang, unsrtd, Qtz + Fld dom; com mica flks; com calc silicates + hnbl, com yell-orng stn (also pbls)
10-40% Cly (red) brn + lt-m brn dom, wxy, (calc)

similar to 580'-590' above

Note: all wxy Cly very expandable when wet

Note: possible buried soil horizons at 580'-590', 670'-680', 950'-960', and 1080'-1090' as indicated by org mats (brn) gy slty Cly