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(907) 561-2465

# MUDLOG TVD

**COMPANY** ExxonMobil Oil Corporation

**WELL** PCU 297-12A1-ST1

**FIELD** Piceance Creek

**REGION** Rocky Mountains

**COORDINATES** Lat: 39.8890710  
Long: 108.2372410

**ELEVATION** GL: 7183.6'  
RKB: 7213'

**COUNTY, STATE** Rio Blanco, Colorado

**API INDEX** 051031115701

**SPUD DATE** 09/22/2009

**CONTRACTOR** HE DRILLING

**CO. REP.** M. SADLER / J. WOODS

**RIG/TYPE** 326 FLEX FOUR

**LOGGING UNIT** CANRIG UNIT ML036

**GEOLOGISTS** Don Thibodeaux  
Brandon Laiche

**ADD. PERSONS** Huel Patti Strickland  
Linda Davison/Darryl Ebbert

**CO. GEOLOGIST** CHRIS ALBA

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 4111' TO 13338'

**DATES:** 6/16/2009 TO 9/24/2009

**SCALE:** 1" = 100'

16.000" AT 150'

10.750" AT 4111'

7.00" AT 9131'

4.50" AT 13338'

## MUD TYPES

## HOLE SIZE

WATER BASE TO 5730'

DSF TO 6200'

LSND TO 13338'

TO

14.250" TO 4111'

9.875" TO 9131'

6.125" TO 13338'

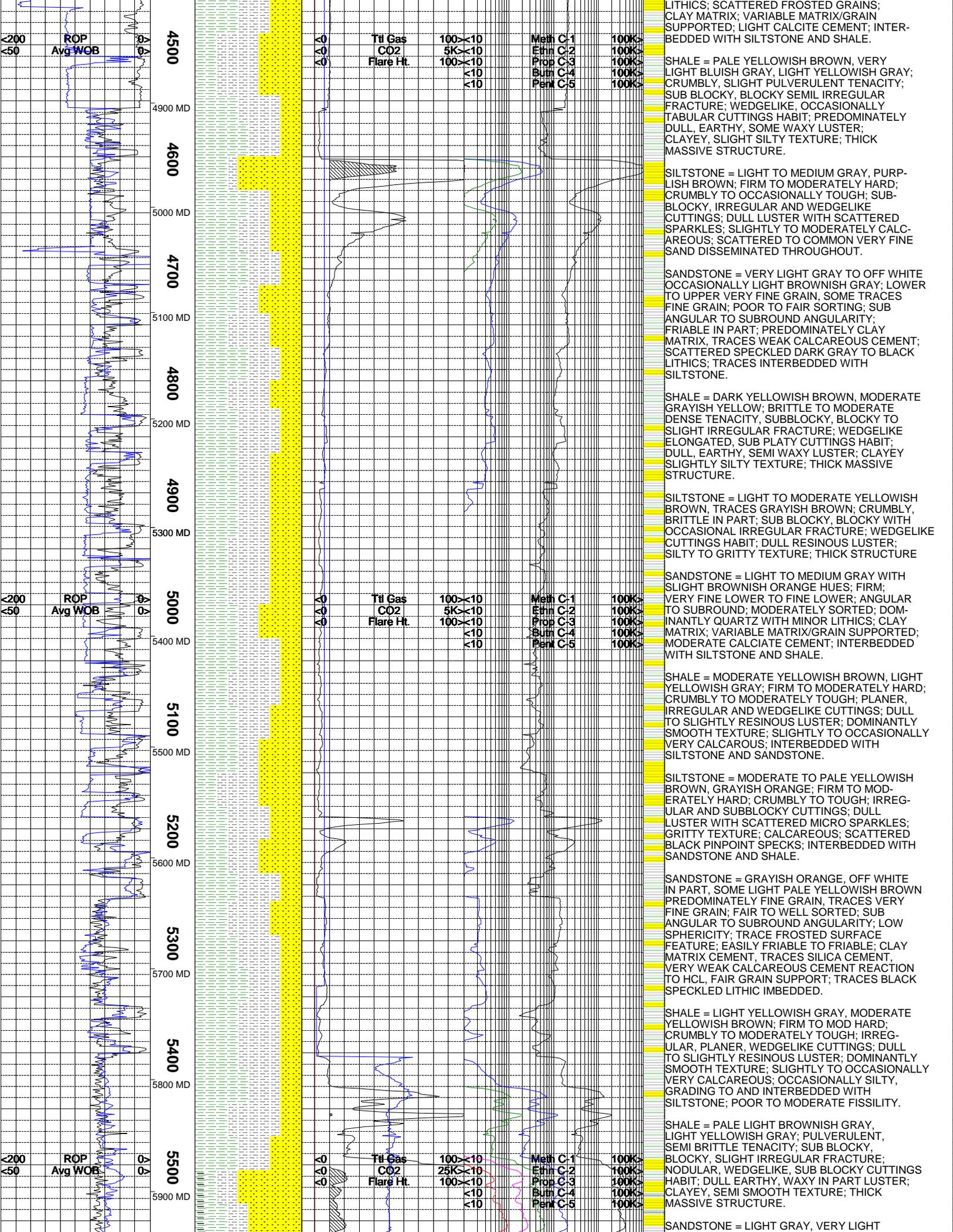
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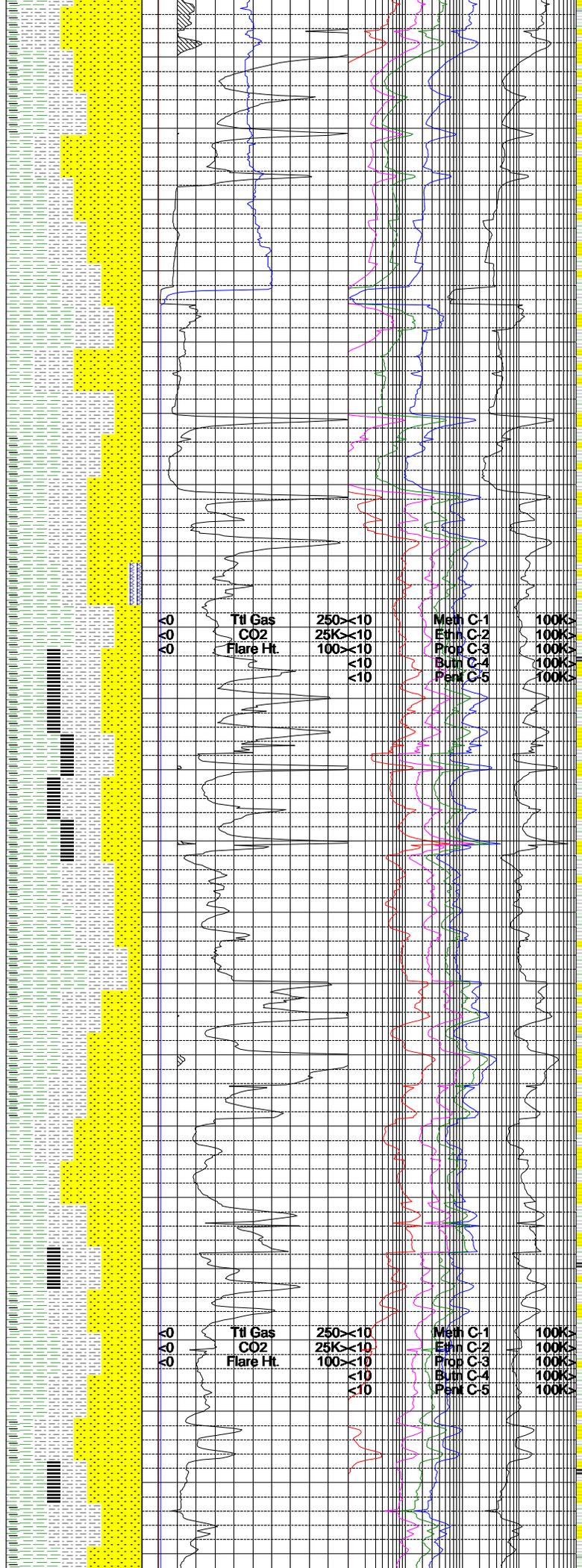
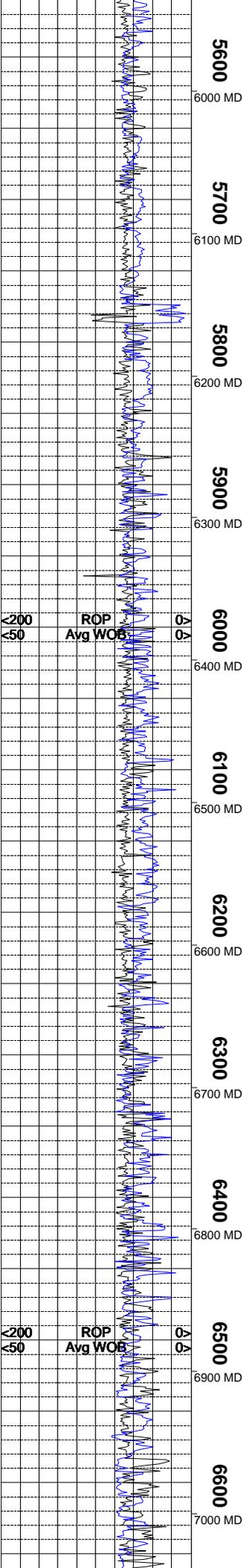
## ABBREVIATIONS

<i>NB</i> NEWBIT	<i>PV</i> PLASTIC VISCOSITY	<i>LC</i> LOST CIRCULATION
<i>RRB</i> RERUN BIT	<i>YP</i> YIELD POINT	<i>CO</i> CIRCULATE OUT
<i>CB</i> CORE BIT	<i>FL</i> FLUID LOSS	<i>NR</i> NO RETURNS
<i>WOB</i> WEIGHT ON BIT	<i>CL</i> PPM CLORIDE ION	<i>TG</i> TRIP GAS
<i>RPM</i> ROTARY REV/MIN	<i>Rm</i> MUD RESISTIVITY	<i>SG</i> SURVEY GAS
<i>PP</i> PUMP PRESSURE	<i>Rmf</i> FILTRATE RESISTIVITY	<i>WG</i> WIPER GAS
<i>SPM</i> STROKES/MIN	<i>PR</i> POOR RETURNS	<i>CG</i> CONNECTION GAS
<i>MW</i> MUD WEIGHT	<i>LAT</i> LOGGED AFTER TRIP	
<i>VIS</i> FUNNEL VISCOSITY	<i>LAS</i> LOGGED AFTER SURVEY	

ALTERED ZONE	CHERT - GLASSY	FELSIC SILIC DIKE	MARL - CALC	SANDSTONE
ANDESITE	CHERT - PORCEL	FOSSIL	METAMORPHICS	SANDSTONE-TUFFACEOUS
ANHYDRITE	CHERT - TIGER STRIPE	GABBRO	MUDSTONE	SERICITIZATION
BASALT	CHERT - UNDIFF	GLASSY TUFF	OBSIDIAN	SERPENTINE
BENTONITE	CLAY	GRANITE	PALEOSOL	SHALE
BIOTITIZATION	CLAY-MUDSTONE	GRANITE WASH	PHOSPHATE	SHALE TUFFACEOUS
BRECCIA	CLYST-TUFFACEOUS	GRANODIORITE	PORCELANITE	SHELL FRAGMENTS
CALCARENITE	CHLORITIZATION	GYPSUM	PORCELANEOUS CLYST	SIDERITE
CALCAREOUS TUFF	COAL	HALITE	PYRITE	SILICIFICATION
CALCILUTITE	CONGLOMERATE	HORNBL-QTZ-DIO	PYROCLASTICS	SILTSTONE
CARBONATES	CONGL. SAND	IGNEOUS (ACIDIC)	QUARTZ DIORITE	SILTST-TUFFACEOUS
CARBONACEOUS MAT	CONGL. SANDSTONE	IGNEOUS (BASIC)	QUARTZ LATITE	TUFF
CARBONACEOUS SH	COQUINA	INTRUSIVES	QUARTZ MONZONITE	VOLCANICLASTICS SEDS
CEMENT CONTAM.	DACITE	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	







BLUIISH GRAY, TRACES LIGHT GREENISH GRAY; PREDOMINATELY QUARTZ FRAMEWORK; VERY FINE LOWER TO FINE UPPER GRAIN SIZE; FAIR TO WELL SORTED; LOW SPHERICITY; SUB ANGULAR TO SUB ROUNDED IN PART; PREDOMINATELY QUARTZ WITH SPECKLED LITHICS; SOME FROSTED SURFACE FEATURES; FRIABLE TO FIRM FRIABLE; DOMINATELY GRAIN SUPPORTED, SOME CLAY MATRIX, TRACES CALCITE CEMENT; TRACES BLACK SPECKLED CARBNACEOUS SHALE IMBEDDED.

SANDSTONE = VERY LIGHT GRAY, OFF WHITE, VERY PALE BLUIISH GRAY; PREDOMINATELY QUARTZ FRAMEWORK; LOWER VERY FINE GRAIN TO SOME UPPER FINE GRAIN; WELL SORTED; PREDOMINATELY SUB ANGULAR, TRACES SUB ROUND ANGULARITY; VERY LOW SPHERICITY; FROSTED SURFACE FEATURES IN PART; FRIABLE TO FIRM FRIABLE; SILICA MATRIX, TRACE CALCITE CEMENT; TRACES BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED.

SHALE = MODERATE DUSKY BROWN, LIGHT PALE REDDISH BROWN, SOME GREENISH GRAY; PULVERULAENT TO CRUMBLEY TENACITY, SUB BLOCKY, BLOCKY WITH TRACE IRREGULAR FRACTURES; WEDGELIKE CUTTINGS HABIT; EARTHY DULL LUSTER; SILTY TO CLAYEY TEXTURE; MASSIVE TO SEMI THICK STRUCTURE.

SILTSTONE = DARK REDDISH BROWN, OCCASIONALLY DUSKY REDDISH BROWN; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR AND SUBBLOCKY CUTTINGS; MATTE LUSTER WITH SCATTERED SPARKLES; GRITTY TEXTURE; MODERATELY CALCAREOUS; LOCALLY COMMON VERY FINE SAND GRAINS; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = VERY LIGHT GRAY, LIGHT GRAY, VERY PALE BLUIISH GRAY; PREDOMINATELY QUARTZ WITH SCAT LITHICS; VERY FINE GRAIN TO SOME UPPER FINE GRAIN; MOD WELL SORTED; PREDOMINATELY SUB ANGULAR, TRACES SUB ROUND; CLAY MATRIX; CALCITE CEMENTED; ESTIMATED FAIR POROSITY AND PERMEABILITY.

SHALE = LIGHT TO MEDIUM GRAY, MEDIUM TO DARK BROWNISH GRAY, RARELY LIGHT GREENISH GRAY; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR, BLOCKY AND WEDGELIKE CUTTINGS HABIT; MATTE TO OCCASIONALLY SLIGHTLY RESINOUS LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; MODERATELY TO VERY CALCAREOUS; OCCASIONALLY VERY CARBONACEOUS; INTERBEDDED WITH SANDSTONE AND SILTSTONE.

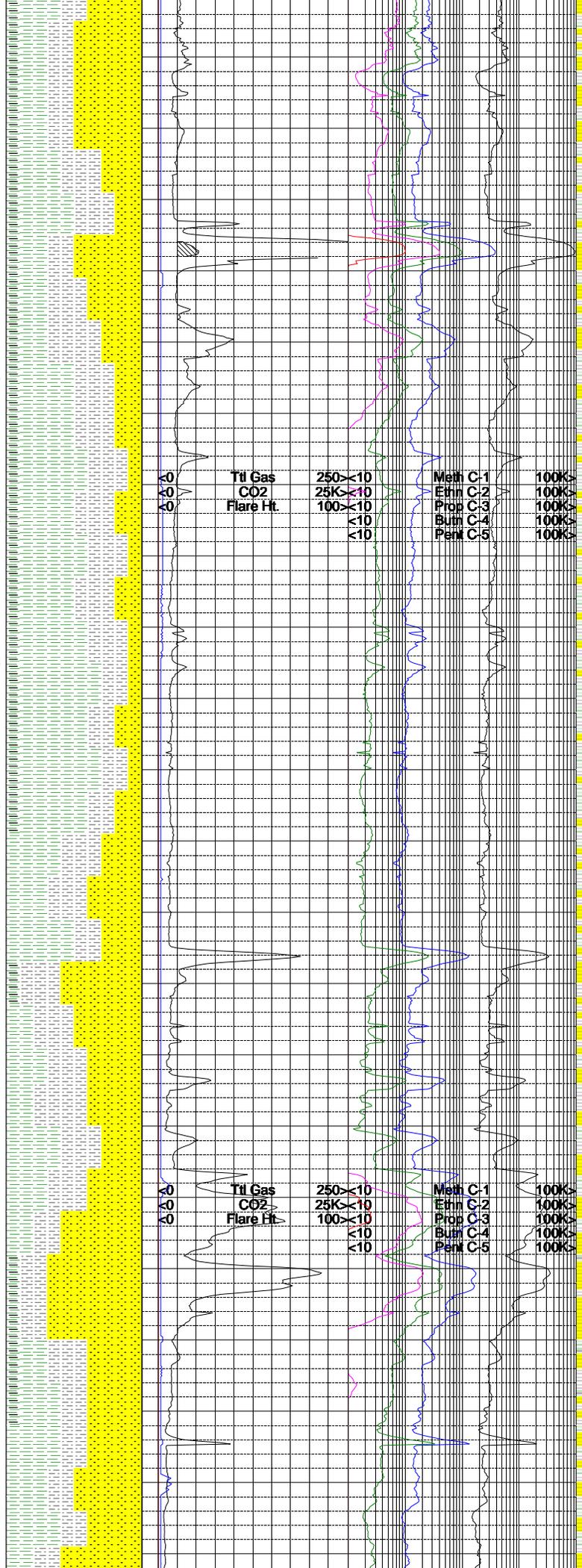
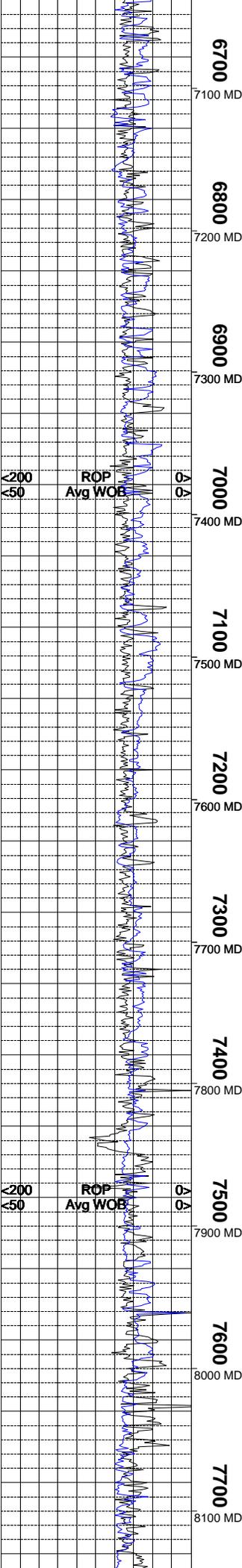
SILTSTONE = DARK TO DUSKY YELLOWISH BROWN, OCCASIONALLY DARK GRAYISH BROWN; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR AND SUBBLOCKY CUTTINGS; MATTE LUSTER WITH SCATTERED SPARKLES; GRITTY TEXTURE; MODERATELY CALCAREOUS; LOCALLY COMMON VERY FINE SAND GRAINS DISSEMINATED THROUGHOUT; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = LIGHT CHARCOAL GRAY, OFF WHITE, SOME VERY LIGHT BLUIISH GRAY; PREDOMINATELY QUARTZ FRAMEWORK; LOWER VERY FINE TO UPPER FINE GRAIN SIZE; POOR TO FAIR SORTED; DOMINATELY SUB ANGULAR, TRACES SUBROUNDED ANGULARITY; VERY LOW SPHERICITY; TRACE FROSTED IN PART; FIRM FRIABLE TO SLIGHTY HARD; CONSOLIDED SOME VERY TIGHT; CALCAREOUS CEMENT, SOME SILICA MATRIX; TIGHT GRAIN SUPPORT; FAIR HCL REACTION; DISSEMINATED FINE BLACK SPECKLED LITHIC IMBEDDED.

SHALE = MODERATE YELLOWISH BROWN, OCCASIONAL LIGHT GREENISH GRAY; CRUNCHY PULVERULENT, TRACE FIRM TENACITY; SUB BLOCKY, BLOCKY TO IRREGULAR FRACTURE; WEDGELIKE, ELONGATED, SUB BLOCKY CUTTINGS HABIT; DULL SEMI WAXY LUSTER; SILTY TO CLAYEY TEXTURE; SUB THICK TO MASSIVE STRUCTURE.

SILTSTONE = GRAYISH RED, DARK YELLOWISH BROWN; FRIABLE TO FIRM FRIABLE; SUB BLOCKY, BLOCKY, SOME IRREGULAR FRACTURE; WEDGELIKE, TABULAR CUTTINGS HABIT; DULL RESINOUS LUSTER; GRITTY SILTY TEXTURE, THICK STRUCTURE; TRACES VERY FINE SANDSTONE IMBEDDED.

SANDSTONE = LIGHT BLUIISH GRAY, MODERATE LIGHT GRAY, TRACE OFF WHITE; DOMINATELY QUARTZ FRAMEWORK; LOWER TO UPPER VERY FINE GRAIN; FAIR TO WELL SORTED; SUB ANGULAR TO SOME SUB ROUNDED



ANGULARITY; TRACES FROSTED SURFACE FEATURES; FIRM FRIABLE TO DENSE; SILICA MATRIX, TRACE CALCAREOUS CEMENT; SOME BLACK DISSEMINATED SPECKLED LITHIC.

SHALE = PALE LIGHT BLUISH GRAY, MODERATE MEDIUM BLUISH GRAY, TO MEDIUM LIGHT GRAY; CRUNCHEY, BRITTLE, SLIGHT DENSE TENACITY; SUB BLOCKY, BLOCKY FRACTURE; ELONGATED, WEDGELIKE CUTTINGS HABIT; DULL EARTHY SEMI WAXY LUSTER; SILTY SMOOTH TEXTURE; SEMI MASSIVE STRUCTURE.

SILTSTONE = MEDIUM TO DARK BROWNISH GRAY, OCC WITH SLIGHT GREENISH HUES; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR AND SUBBLOCKY CUTTINGS; DULL LUSTER WITH SCATTERED SPARKLES; GRITTY TEXTURE; MODERATELY CALCAREOUS; SCATTERED TO COMMON VERY FINE SAND DISSEMINATED THROUGHOUT; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = VERY LIGHT GRAY TO LIGHT GRAY OVERALL; "PEPPERED" APPEARANCE; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER; ANGULAR TO SUBROUND; MODERATELY SORTED; MOSTLY QUARTZ WITH COMMON DARK GRAY TO BLACK LITHICS; WHITE CLAY MATRIX; GRAIN SUPPORTED; LIGHT CALCITE CEMENT; ESTIMATED POOR TO FAIR POROSITY AND PERMEABILITY; INTERBEDDED WITH SHALE AND SILTSTONE.

SHALE = MEDIUM TO DARK BROWNISH GRAY, DARK REDDISH BROWN, OCCASIONALLY LIGHT GREENISH GRAY; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR, BLOCKY AND WEDGELIKE CUTTINGS HABIT; MATTE TO OCCASIONALLY SLIGHTLY RESINOUS LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; MODERATELY TO VERY CALCAREOUS; OCCASIONALLY VERY CARBONACEOUS; INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SILTSTONE = DARK REDDISH BROWN, LIGHT TO MEDIUM GRAY, OCCASIONAL GREENISH HUES; FIRM TO MODERATELY HARD; CRUMBLY TO TOUGH; IRREGULAR AND SUBBLOCKY CUTTINGS; EARTHY LUSTER WITH SCATTERED SPARKLES; GRAINY TEXTURE; MODERATELY CALCAREOUS; SCATTERED TO COMMON VERY FINE SAND DISSEMINATED THROUGHOUT; INTERBEDDED WITH SANDSTONE AND SHALE.

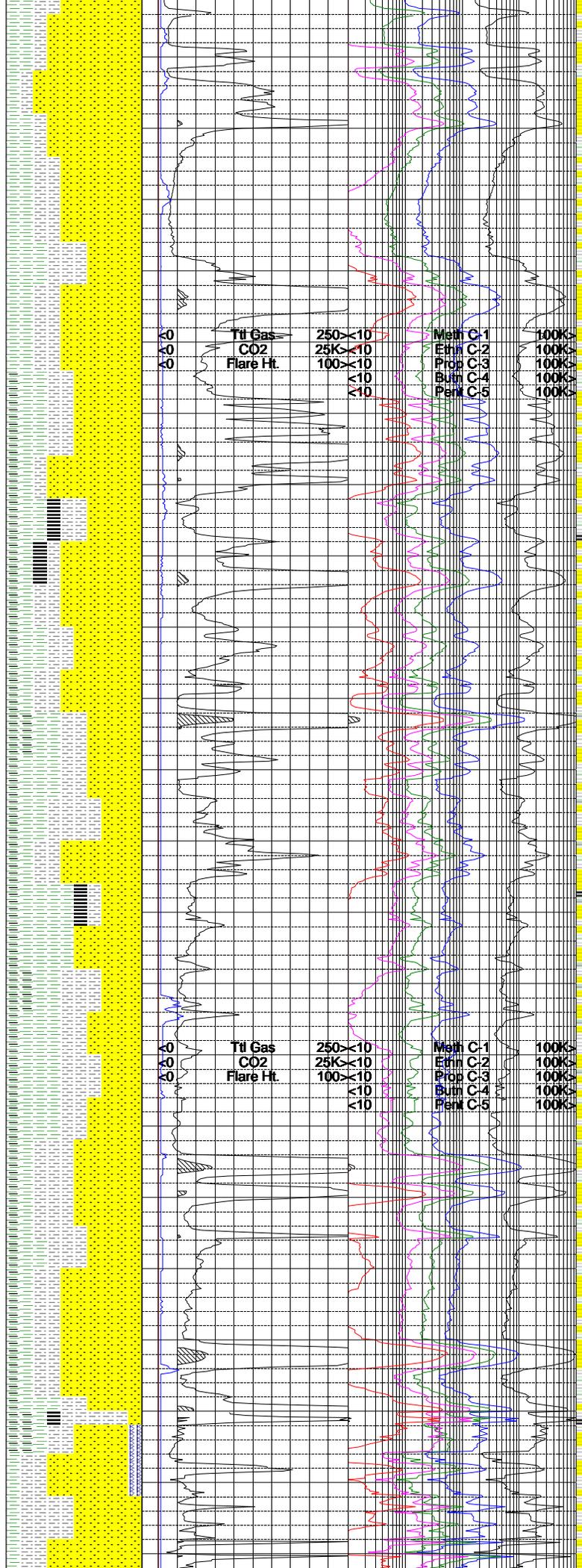
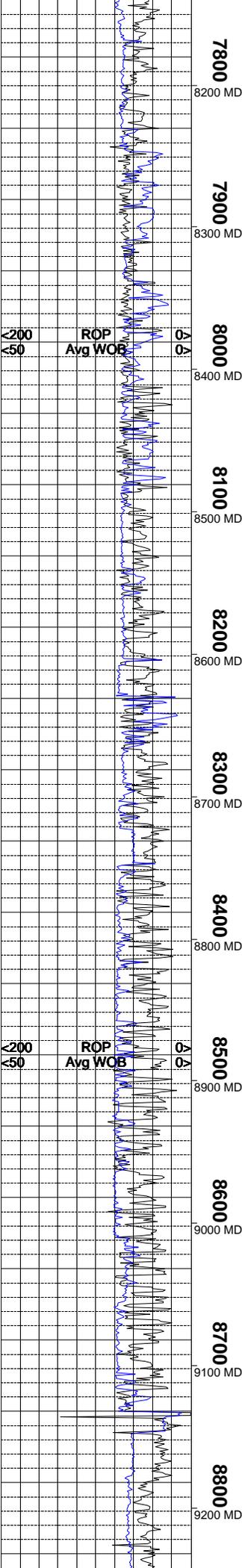
SANDSTONE = LIGHT GRAY TO VERY LIGHT GRAY OVERALL; "PEPPERED" APPEARANCE; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER; ANGULAR TO SUBROUND; MODERATELY SORTED; DOM QUARTZ WITH COMMON DARK GRAY TO BLACK LITHICS; WHITE CLAY MATRIX; GRAIN SUPPORTED; LIGHT CALCITE CEMENT; ESTIMATED POOR TO FAIR POROSITY AND PERMEABILITY; INTERBEDDED WITH SHALE AND SILTSTONE.

SHALE = LIGHT TO MEDIUM BROWNISH GRAY, LIGHT TO MEDIUM OLIVE GRAY; OCCASIONALLY GREENISH GRAY; MODERATELY HARD TO FIRM; TOUGH TO CRUMBLY; BLOCKY, IRREGULAR AND WEDGELIKE CUTTINGS HABIT; MATTE TO OCC SLIGHTLY RESINOUS LUSTER; SMOOTH TO MOD GRAINY TEX; MOD CALCAREOUS; FAIR FISSILITY.

SANDSTONE = LIGHT GRAY, VERY LIGHT GRAY OFF WHITE; PREDOMINATELY QUARTZ FRAMEWORK; LOWER VERY FINE SOME UPPER FINE GRAIN; POOR TO WELL SORTED; ANGULAR TO SLIGHT SUB ROUNDED ANGULARITY; TRACE FROSTED SURFACE FEATURES; EASILY FRIABLE, SEMI FRIABLE; CLAY MATRIX, TRACE CALCITE CEMENT; TRACE BLACK SPECKLED LITHIC INTERBEDDED; POOR VISUAL INTERGRANULAR POROSITY.

SILTSTONE = MODERATELY DARK GRAY, SOME DARK OLIVE BLACK, GREENISH BLACK; FRIABLE TO FRIABLE FIRM, BRITTLE IN PART SUB BLOCKY, BLOCKY SEMI IRREGULAR FRACTURES; WEDGELIKE, ELONGATED CUTTINGS HABIT; DULL, EARTHY, SLIGHT RESINOUS SPARKLING LUSTER; GRITTY SILTY TEXTURE; MASSIVE STRUCTURE; TRACES SANDSTONE AND SHALE INTERBEDDED.

SANDSTONE = VERY LIGHT GRAY, OFF WHITE, CLEAR TO TRANSLUCENT; PREDOMINATELY QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE, WELL TO VERY WELL SORTED; ANGULAR, SUB ANGULAR, TO SOME SUB ROUND ANGULARITY; TRACES FROSTED SURFACE FEATURES; EASILY FRIABLE; PREDOMINATELY SILICA CEMENT, TRACE WHITE CLAY CEMENT; VERY WEAK GRAIN SUPPORTED; BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED.



SHALE = LIGHT TO MEDIUM BROWNISH GRAY, LIGHT TO MEDIUM OLIVE GRAY; OCCASIONALLY GREENISH GRAY, OCCASIONALLY DARK REDDISH BROWN; FIRM TO MODERATELY HARD; BLOCKY, TABULAR AND WEDGELIKE CUTTINGS; CRUMBLY TO TOUGH; MATTE TO SLIGHTLY RESINOUS LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; CALCAREOUS; INTERBEDDED WITH SANDSTONE AND SILTSTONE; MODERATELY FISSILE.

SANDSTONE = LIGHT GRAY, PALE GREENISH GRAY; COMMON "PEPPERED" APPEARANCE; EASILY FRIABLE TO FIRM; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER; ANGULAR TO SUBROUND; MODERATELY WELL SORTED; DOMINANTLY QUARTZ WITH SCATTERED TO COMMON DARK GRAY AND BLACK LITHICS; WHITE CLAY MATRIX; MOSTLY GRAIN SUPPORTED; CALCITE CEMENT.

SILTSTONE = LIGHT TO MEDIUM BROWNISH GRAY, LIGHT GREENISH GRAY; FIRM TO MODERATELY HARD; MODERATELY TOUGH; IRREGULAR, SUBBLOCKY AND WEDGELIKE CUTTINGS; DULL, EARTHY LUSTER WITH SCATTERED SPARKLES; GRITTY, ABRASIVE TEXTURE; CALCAREOUS; SCATTERED BLACK PINPOINT SPECKS; SCATTERED TO COMMON VERY FINE SAND GRAINS DISSEMINATED THROUGHOUT; INTERBEDDED WITH SHALE AND SANDSTONE.

SHALE = DARK TO DUSKY YELLOWISH BROWN; LIGHT TO MEDIUM GREENISH GRAY, LIGHT TO MEDIUM GRAY, OCCASIONALLY DARK REDDISH BROWN; FIRM TO MODERATELY HARD; BLOCKY, TABULAR AND WEDGELIKE CUTTINGS; CRUMBLY TO TOUGH; MATTE TO SLIGHTLY RESINOUS LUSTER; SMOOTH TO MODERATELY SILTY TEXTURE; SLIGHTLY CALCAREOUS; MODERATELY FISSILE; INTERBEDDED WITH SILTSTONE AND SANDSTONE.

SANDSTONE = LIGHT GRAY, OCC PALE GREENISH GRAY; COMMON "PEPPERED" APPEARANCE; EASILY FRIABLE TO FIRM; CLASTS RANGE FROM VERY FINE LOWER TO FINE UPPER; ANGULAR TO SUBROUND; MODERATELY WELL SORTED; DOMINANTLY QUARTZ WITH SCATTERED TO COMMON DARK GRAY AND BLACK LITHICS; WHITE CLAY MATRIX; MOSTLY GRAIN SUPPORTED; CALCITE CEMENT.

SANDSTONE = LIGHT GRAY, LIGHT GREENISH GRAY, CLEAR TO TRANSLUCENT; PREDOMINANTLY QUARTZ FRAMEWORK; LOWER TO UPPER FINE GRAIN; FAIR TO WELL SORTED; DOMINATELY SUB ANGULAR , TRACE SUB ROUND, LOW SPHERICITY; FROSTED SURFACE FEATURES; EASILY FRIABLE, SOME UNCONSOILDED POSSIBLE DUE TO PDC BIT; SILICA MATRIX CEMENT, TRACE WHITE CLAY CEMENT, VERY WEAK GRAIN SUPPORT; DISSEMINATED BLACK SPECKLED CARBONACEOUS SHALE IMBEDDED.

SHALE = DARK GRAYISH RED, MEDIUM LIGHT GRAY, DARK YELLOWISH ORANGE; CRUMBLY, PULVERULENT, SEMI HARD TENACITY; SUB BLOCKY, BLOCKY, SLIGHT IRREGULAR FRACTURE; WEDGELIKE, TABULAR, SUB MASSIVE CUTTINGS HABIT; DULL, EARTHY, SLIGHT RESINOUS LUSTER; GRITTY TO SILTY SOME CLAYEY TEXTURE; SEMI MASSIVE STRUCTURE; GRADING TO SILTSTONE.

CARBONACEOUS SHALE= DUSKY REDDISH BROWN, DARK BROWNISH BLACK; CRUNCHY, FIRM TENACITY, PREDOMINATELY IRREGULAR FRACTURE; WEDGELIKE, FLAKY CUTTINGS HABIT; GRITTY, VITREOUS LUSTER; CLAYEY TEXTURE; THIN STRUCTURE.

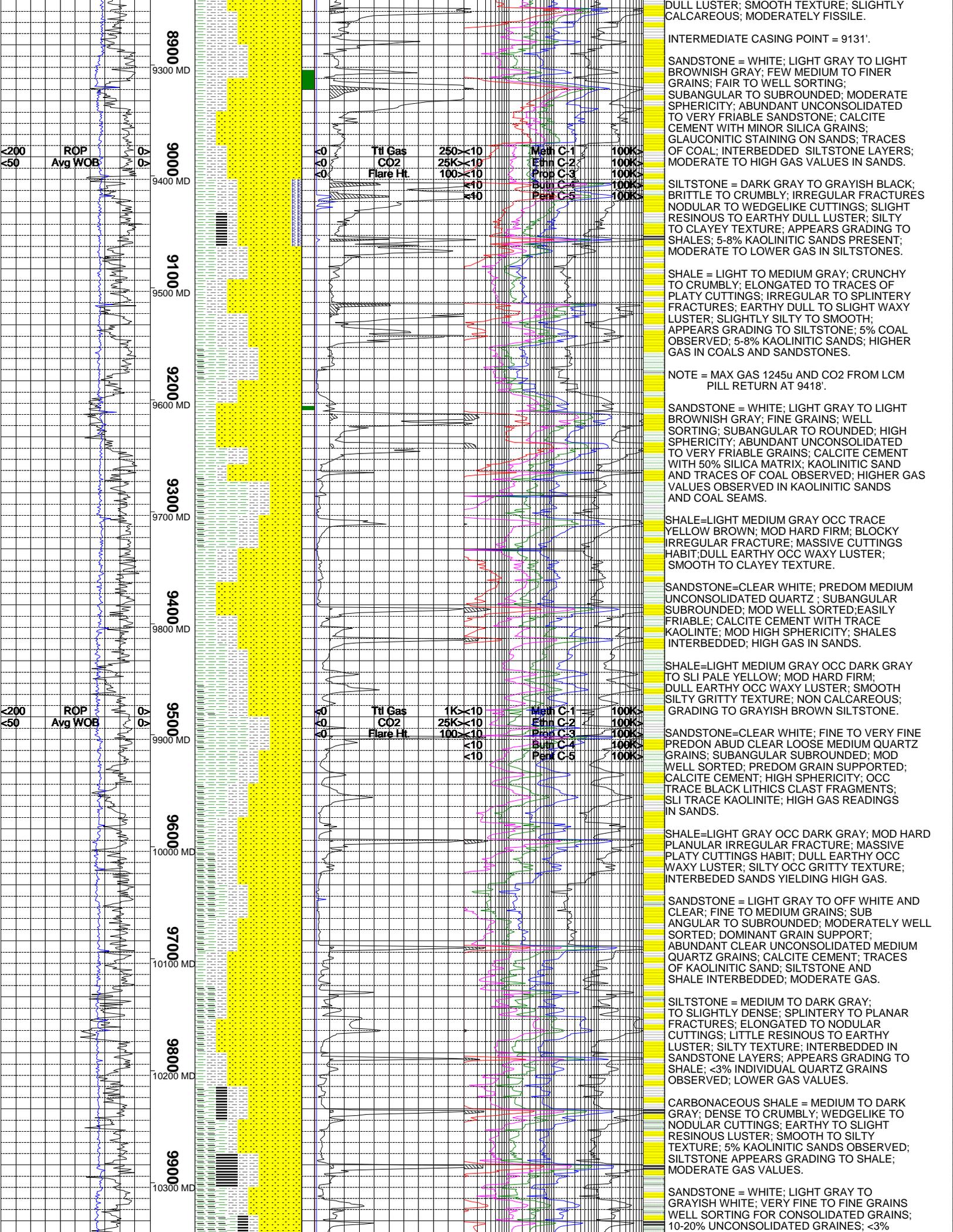
SANDSTONE = VERY LIGHT GRAY, OFF WHITE, LIGHT GRAYISH BROWN WITH DARK BROWN LITHICS; LOWER TO UPPER FINE GRAIN SIZE; POOR TO FAIR SORTED; SUB ANGULAR TO SUB ROUNDED ANGULARITY; V LOW SPHERICITY, FROSTED SURFACE FEATURES; FRIABLE TO FIRM FRIABLE, DENSE ; SILICA MATRIX CEMENT, TRACE CALCITE CEMENT; POOR VISUAL INTER GRANULAR POROSITY; DARK BROWN, BLACK SPECKLED LITHIC INTERBEDDED.

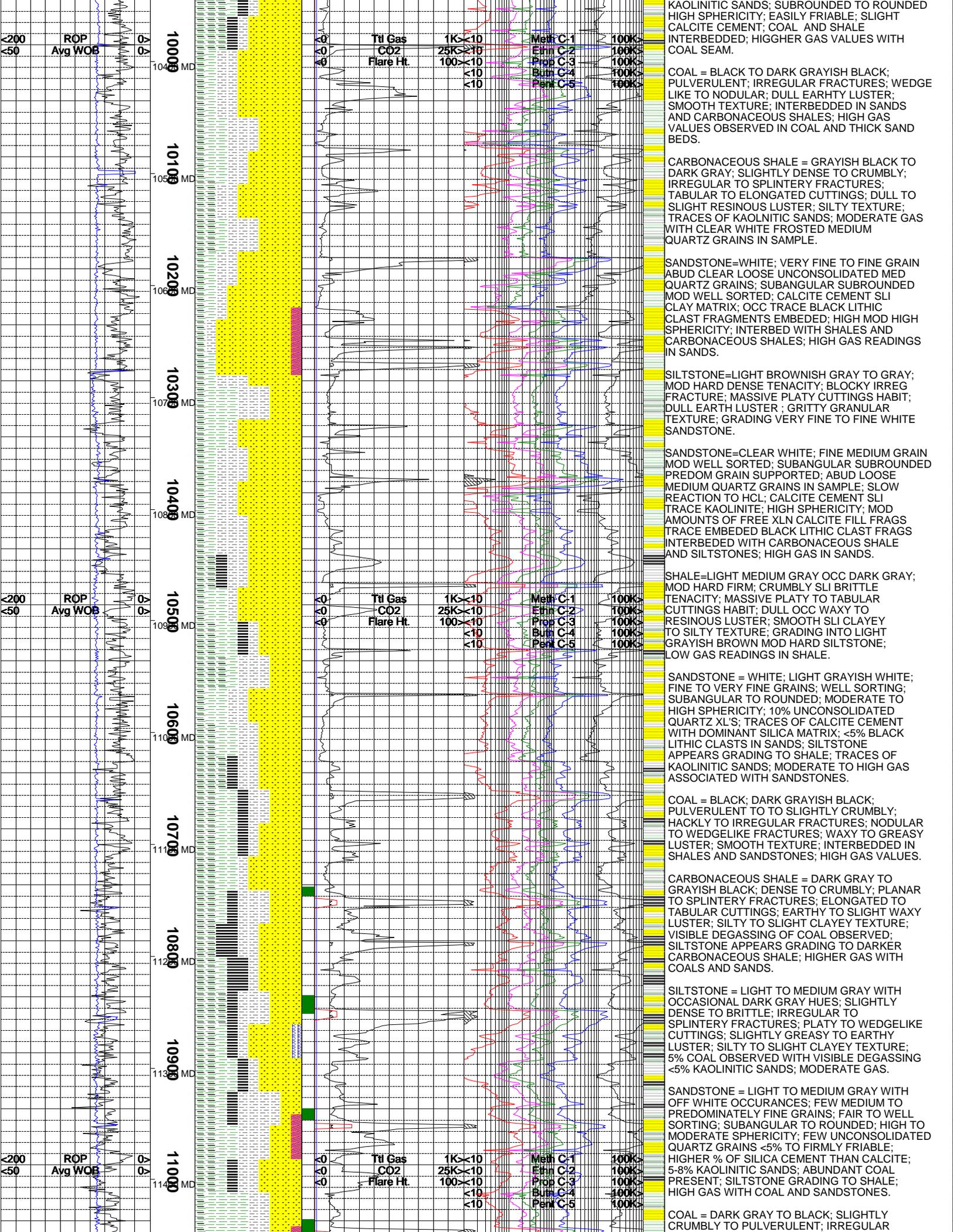
SILTSTONE = LIGHT TO MEDIUM GRAY, LIGHT TO MEDIUM BROWNISH GRAY; FIRM TO MODERATELY HARD; MODERATELY TOUGH; IRREGULAR, SUBBLOCKY AND WEDGELIKE CUTTINGS; DULL, EARTHY LUSTER WITH SCATTERED SPARKLES; GRITTY, ABRASIVE TEXTURE; CALCAREOUS; SCATTERED BLACK PINPOINT SPECKS; SCATTERED TO COMMON VERY FINE SAND GRAINS DISSEMINATED THROUGHOUT.

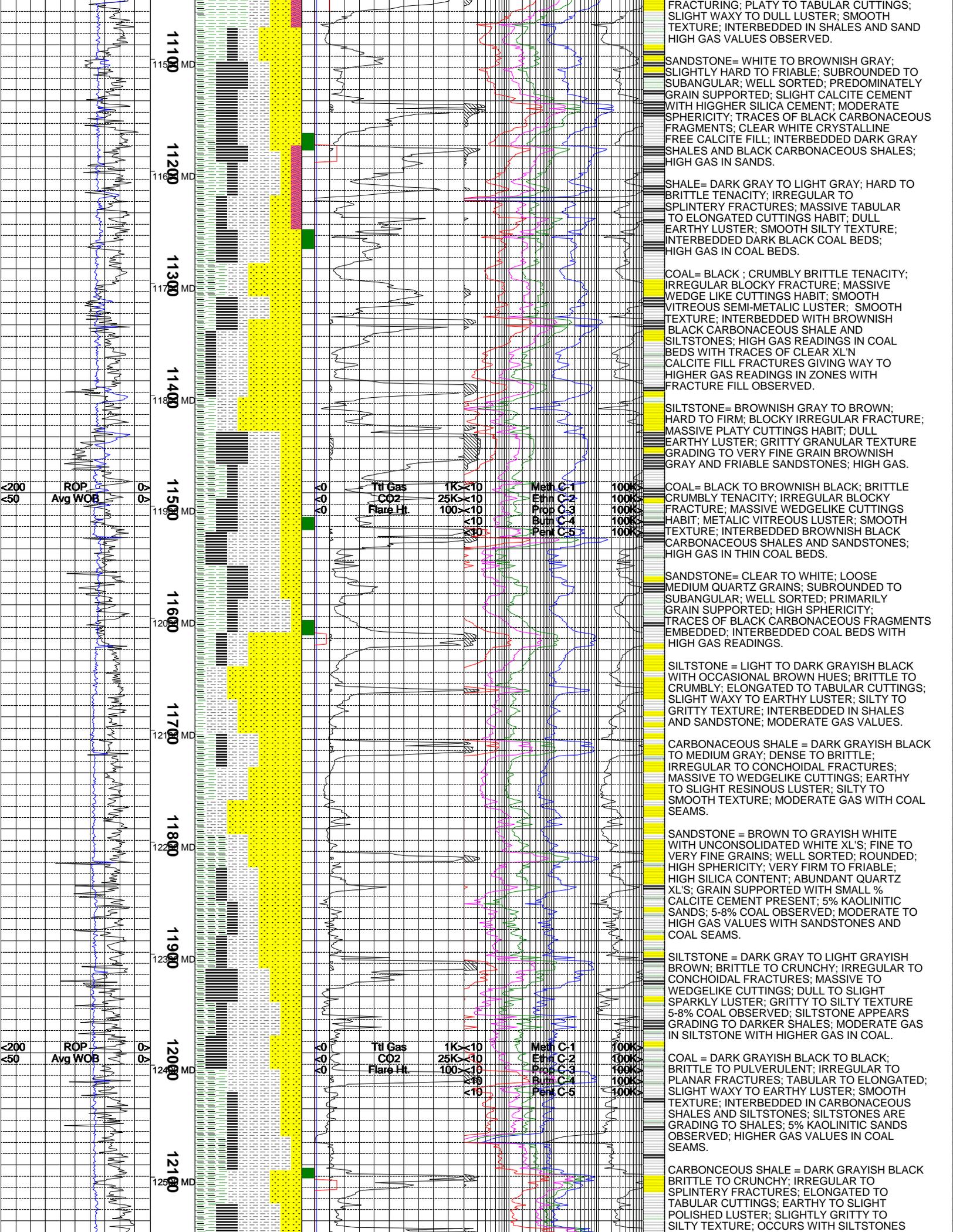
SHALE = MEDIUM TO DARK GRAYISH BROWN, OCC DARK REDDISH BROWN; FIRM TO MOD HARD; BLOCKY AND TABULAR CUTTINGS;

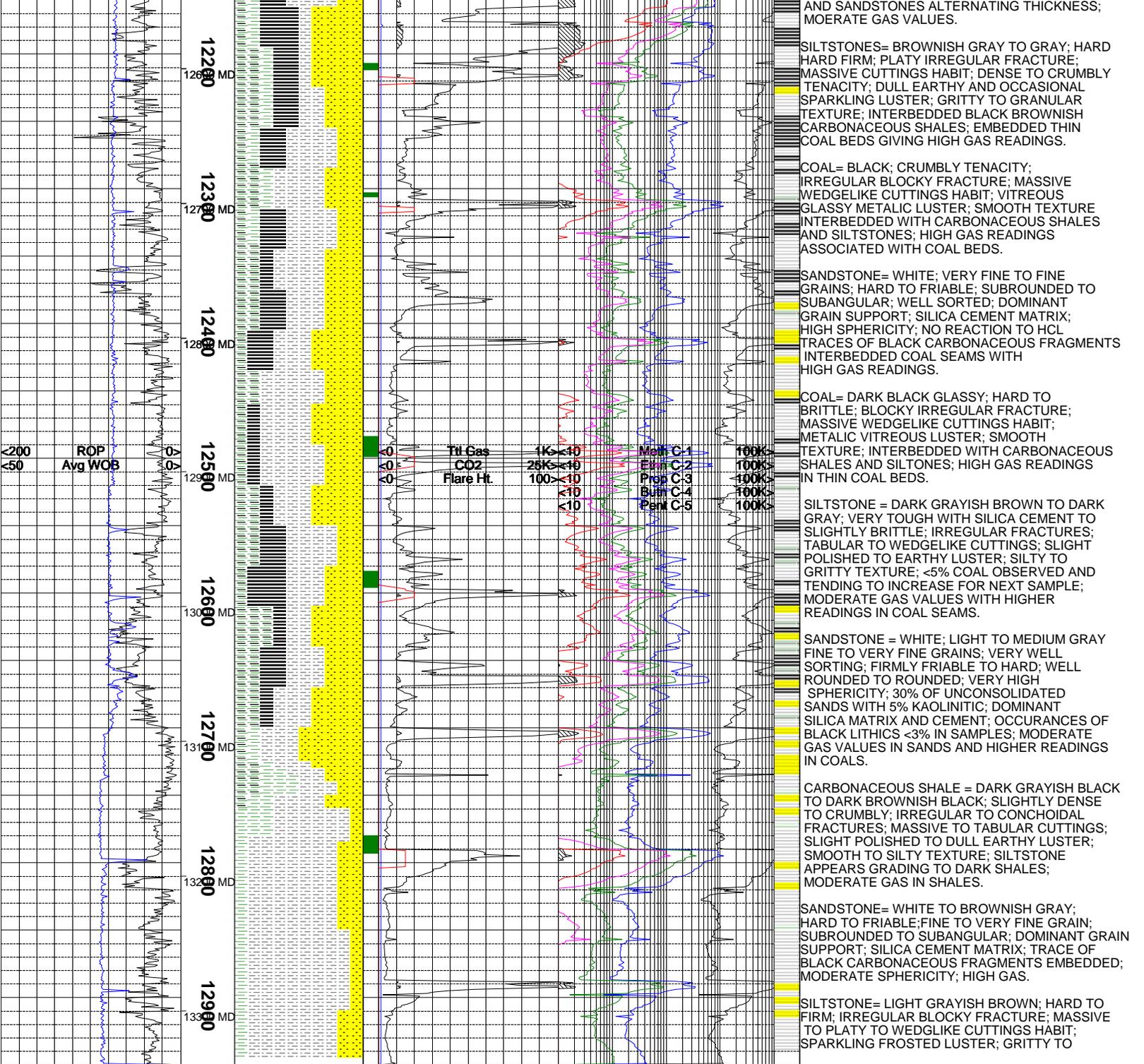
Ttl Gas	250	<10	Meth C-1	100%
CO2	25K	<10	Ethn C-2	100%
Flare Ht	100	<10	Prop C-3	100%
		<10	Sum C-4	100%
		<10	Pen C-5	100%

ROP	>200	<50
Avg WOB	>200	<50









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