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Houston, TX  
(281) 784-5500  
Bakersfield, CA  
(661) 328-1595  
New Iberia, LA  
(337) 364-2322  
Anchorage, AK  
(907) 561-2465

# MUDLOG TVD

**COMPANY** ExxonMobil Production  
**WELL** FRU 197-33A7  
**FIELD** PICEANCE CREEK  
**REGION** ROCKIES  
**COORDINATES** 39.915575000  
108.28575000  
**ELEVATION** GL 6386  
KB 6359  
**COUNTY, STATE** RIO BLANCO, CO  
**API INDEX** 05-103-1139-900  
**SPUD DATE** 02/16/2010  
**CONTRACTOR** HE  
**CO. REP.** R.T. OWENS  
**RIG/TYPE** 215/FLEX 3  
**LOGGING UNIT** MLU051  
**GEOLOGISTS** G.BAKER  
B.MARSH  
**ADD. PERSONS** D.CLAAR  
B.JOHANNING  
**CO. GEOLOGIST** MELANIE BIGGS

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 3,790' TO 12,375'  
**DATES:** 02/16/2010 TO 02/26/2010  
**SCALE:** 1"=100'

10.75" AT 3,808'  
7.00" AT 8,609'  
AT  
AT

## MUD TYPES

## HOLE SIZE

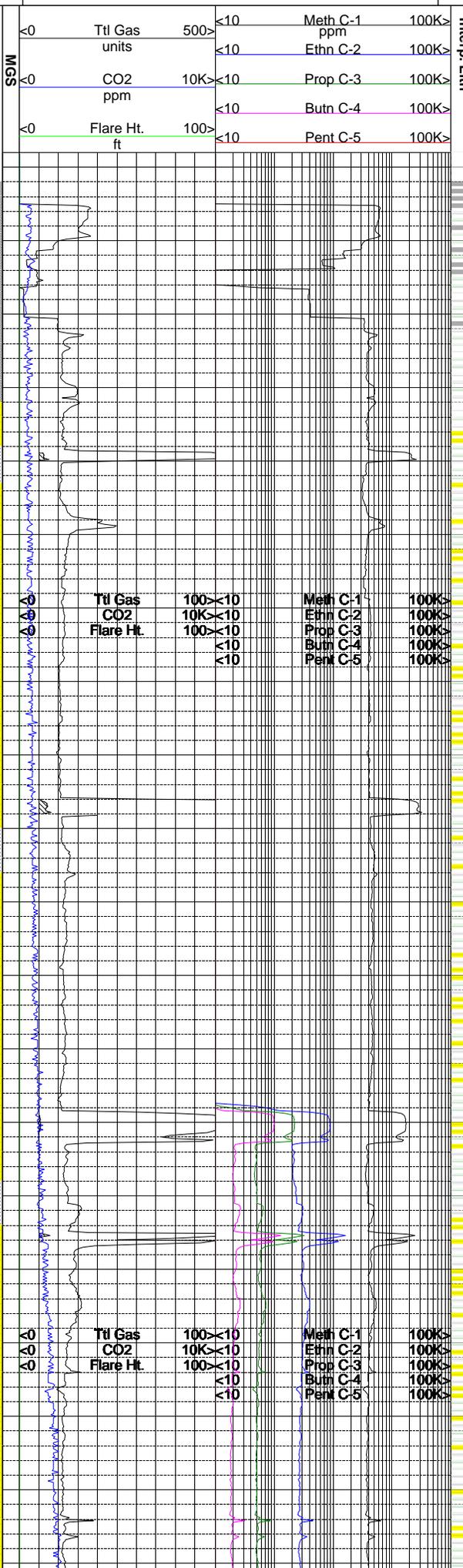
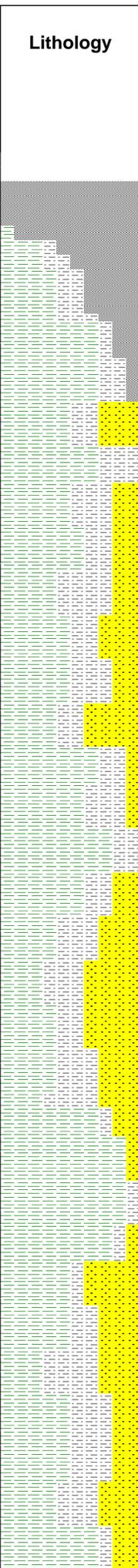
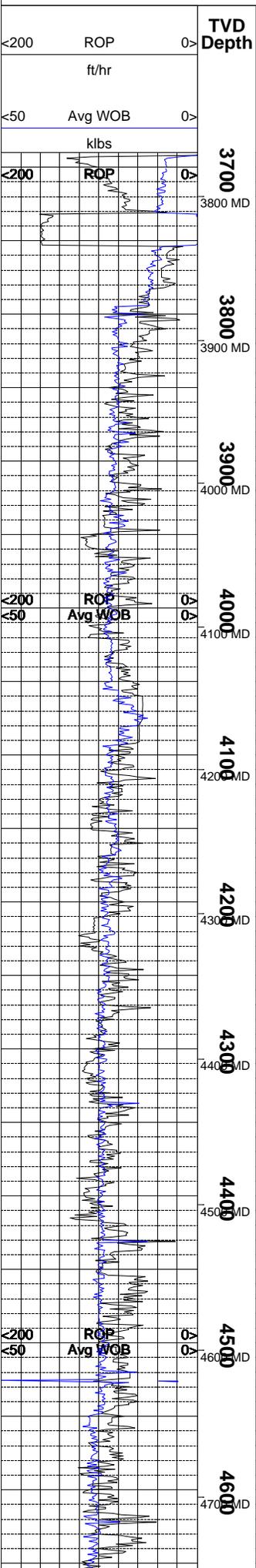
LSND TO 12,375"  
TO  
TO  
TO

9.875" TO 8,619'  
6.125" TO 12,375'  
TO  
TO

## 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	KAOLINITIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	



**Remarks**  
**Survey Data, Mud Reports, Other Info.**

ALL ROCK COLORS ARE REFERENCED TO THE GSA ROCK COLOR CHART. ROCK CONSTITUENTS ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT. ALL SAMPLE DEPTHS ARE REFERENCED TO RKB

CONNECTION GASES AS WELL AS TRIP AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUD LOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING GAS INTO THE BOREHOLE DURING CONNECTIONS.

GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF  
 METHANE = 10000 PPM  
 ETHANE = 1000 PPM  
 PROPANE = 1000 PPM  
 I-BUTANE = 1000 PPM  
 N-BUTANE = 1000 PPM  
 I-PENTANE = 1000 PPM  
 N-PENTANE = 1000 PPM

WHEN THE MUD IS RUN THROUGH THE GAS BUSTER THE INTERVAL IS MARKED ON THE MGS COLUMN AND SIZE OF FLARES NOTED.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE MUD LOG AS METAMORPHICS. KAOLIN PERCENTAGE IN SS INTERVALS IS ALSO NOTED

1 UNIT OF GAS = 200 PPM METHANE

EPOCH WELL SERVICES COMMENCED FULL LOGGING OPERATIONS ON 02/16/2010 @ 3890' MD

SHALE = PALE YELLOWISH BROWN, LIGHT BROWN, LIGHT GRAY; FIRM TO MODERATELY HARD; SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURE; WEDGELIKE TABULAR SLIGHT PLATY CUTTINGS HABIT; EARTHY DULL SLIGHT WAXY LUSTER; SILTY TO CLAYEY TEXTURE; SOME GRADING TO SILTSTONE, TRACE CALCAREOUS.

SANDSTONE = LIGHT YELLOWISH BROWN, SOME OFF WHITE/TAN, TRACE LIGHT GRAYISH BROWN; UPPER TO LOWER VERY FINE GRAIN; SUB ANGULAR IN PART SOME SUB ROUND; CLAY TO SILICA MATRIX CEMENT; WEAK HCL REACTION; TRACE SPECKLED BLACK LITHIC/CARBONACEOUS SHALE IMBEDDED; POOR TO FAIR INTERGRANULAR POROSITY.

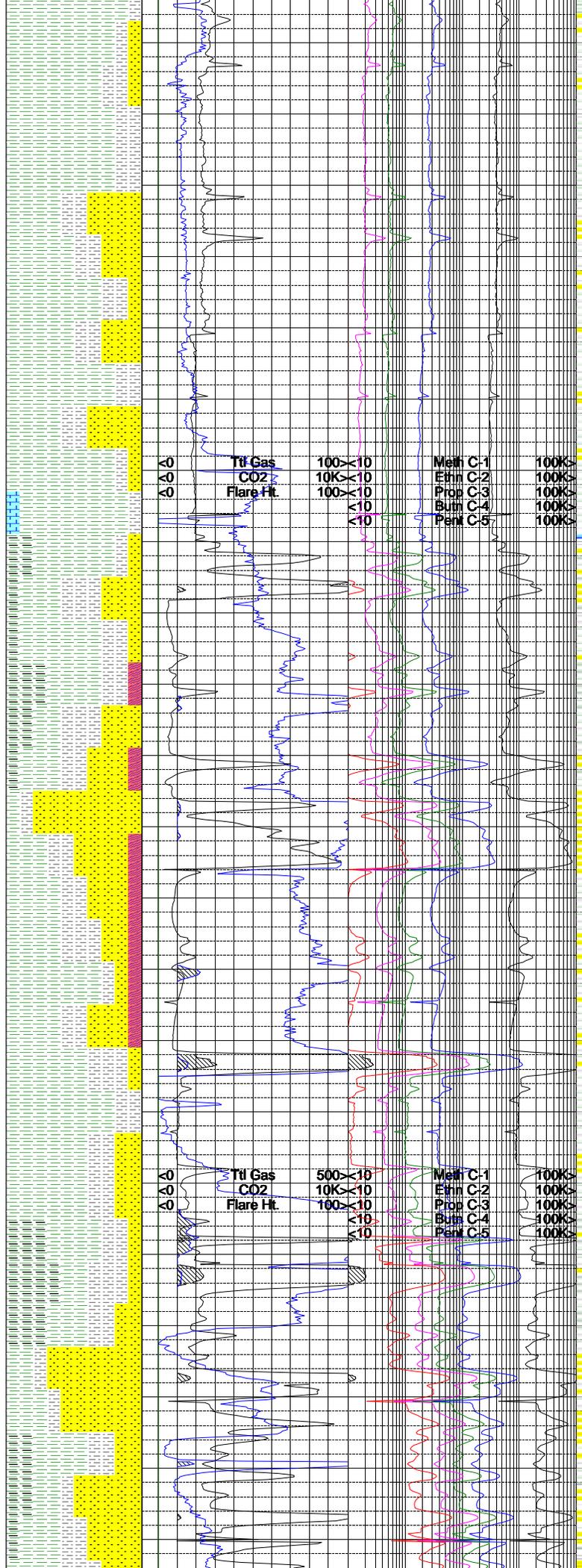
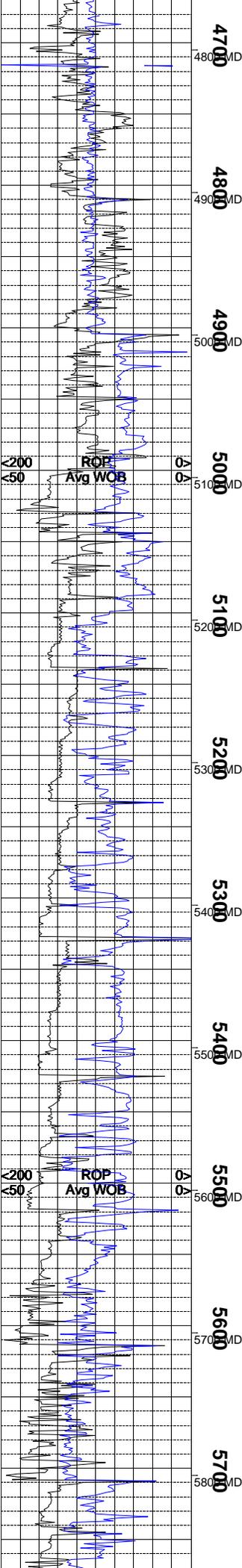
SILTSTONE = VARIED COLORS, LIGHT YELLOWISH BROWN, GRAYISH BROWN; CRUMBLY TO CRUNCHY TENACITY; PLATY TO SEMI MASSIVE CUTTINGS HABIT; SUB BLOCKY TO SLIGHT IRREGULAR FRACTURE; DULL RESINOUS LUSTER; GRITTY TO SILTY TEXTURE; TRACE CALCAREOUS; TRACE THINLY IMBEDDED GRAYISH SHALE.

SILTSTONE = YLWISH GRAY, REDDISH BRWN, MED GRAY; OCC MOTTLED; FIRM TO DENSE TENACITY WITH MASSIVE TO OCC SUB TABULAR CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SUB SPARKLY LUSTER WITH GRITTY TO EARTHY TEXTURE; SLIGHTLY CALC IN PLACES; COMMONLY GRADING TO AND INTERBEDDED WITH SHALES AND SANDSTONES.

SHALE = PALE YELLOWISH BROWN, LIGHT GRAYISH BRWN, GRAY MOTTLED APPEARANCE; FIRM TO DENSE TENACITY WITH SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SMOOTH TEXTURE WITH DULL EARTHY TO WAXY LUSTER; GRADES TO SILTSTONE IN PLACES; COMMONLY INTERBEDDED WITH SILTS AND SANDSTONE. SLIGHT REACTION TO DILUTE HCL IN PLACES.

SANDSTONE = LT GRAY, GRAYISH GRN, GRAY WITH HUES OF YLW; INDIVIDUAL GRAINS ARE TRANSP TO OPAQUE; SUB ANGULAR TO SUB ROUND WITH LOW TO OCC MODERATE SPHERICTY MODERATELY SORTED; GRADES TO AND INTERBEDDED WITH SILTSTONES AND SHALES; DOMINANTLY CONSOLIDATED WITH CLAY OCC CALCAREOUS MATRIX; SLIGHT TO NO INCREASE IN DITCH GAS.

SHALE = PALE YLWISH GRAY; LIGHT GRAYISH PURP, GRAY MOTTLED APPEARANCE;



FIRM TO DENSE TENACITY WITH SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SMOOTH TEXTURE WITH DULL EARTHY TO WAXY LUSTER; GRADES TO SILTSTONE IN PLACES; COMMONLY INTERBEDDED WITH SILTS AND SANDSTONE.

SILTSTONE = LIGHT YLWSH BRWN; GRYISH BRWN, REDDISH PURP; CRUMBLY TO CRUNCHY TENACITY; SUB BLYK TO MASSIVE CUTTINGS HABIT; IRREGULAR TO SLIGHTLY HACKLY FRACTURE; DULL TO SUB SPARKLY LUSTER; GRITTY TO SILTY TEXTURE.

NOTE: TRIP OUT OF HOLE AT 4998' TO LAY DOWN DIRECTIONAL TOOLS. ACHIEVED VERTICAL AT 4996' MD 4901.16' TVD ON 02-17-2010 AT 12:17 HRS  
 MAXIMUM TRIP GAS 214u  
 FINAL SURVEY DATA FROM SCHLUMBERGER MD: 4996  
 TVD: 4901.16  
 AZIMUTH: 131.49  
 INCLINATION: 0.09

LIMESTONE = VERY LT BRWN TO BUFF; FIRM TO DENSE TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR FRACTURE SL FLAKY SCALY IN PLACES; SMOOTH SCALY WITH DULL TO SUB WAXY LUSTER; STRONG VIOLENT REACTION TO DILUTE HCL; GRADES TO A LIMY SHALE IN PLACES.

SHALE = GRY, GRY WITH DARK CARBONACEOUS MATERIAL AND OR LITHIC CLASTS; GRY WITH HUES OF YLW; FIRM TO SUB MALLEABLE TENACITY WITH IRREGULAR FRACTURE; SMOOTH TO SL EARTHY TEXTURE; WAXY TO SUB GREASY LUSTER; SL MOTTLED IN PLACES; SUB TABULAR/SUB MASSIVE TO WEDGELIKE CUTTINGS HABIT; BECOMES LIMY IN PLACES;

CARBONACEOUS SHALE = DARK BRWN, BRWN, HUES OF BLACK; BRWN WITH DARKER BRWN TO BLACK CARBONACEOUS LAMINATIONS; OCC PYRITIC IN PLACES; SMOOTH TO OCC SUB ABRASIVE TEXTURE WITH WAXY TO OCC SUB RESINOUS LUSTER; SUB TABULAR TO TABULAR CUTTINGS HABIT WITH IRREGULAR TO SUB PLATY FRACTURE; CRUNCHY TO DENSE TENACITY; GRADES TO SHALE IN PLACES INTERBEDDED WITH SHALES AND SANDSTONES.

SANDSTONE = GRY, LT GRY, GREEN; HARD NON FRIABLE; SUB ANGULAR TO ANGULAR OCC SUB ROUND; CONSOLIDATED; SILICEOUS/ SL CALC CEMENT; GREEN HUES ARE MOST LIKELY A RESULT OF CHLORITIZATION.

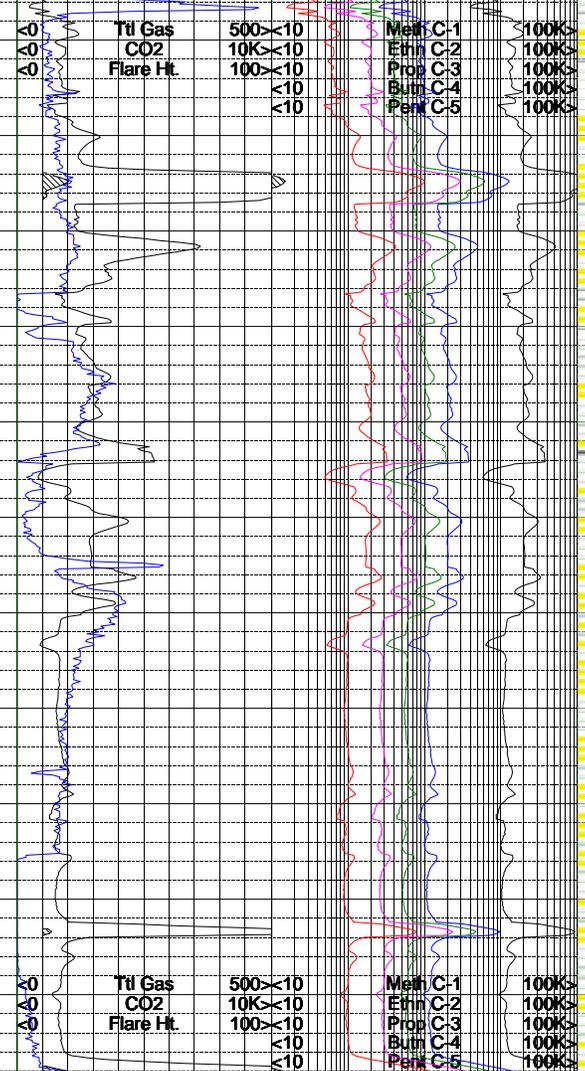
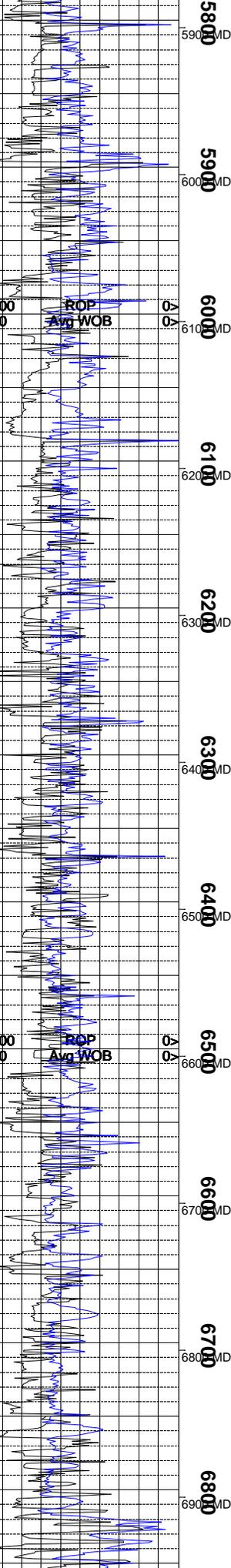
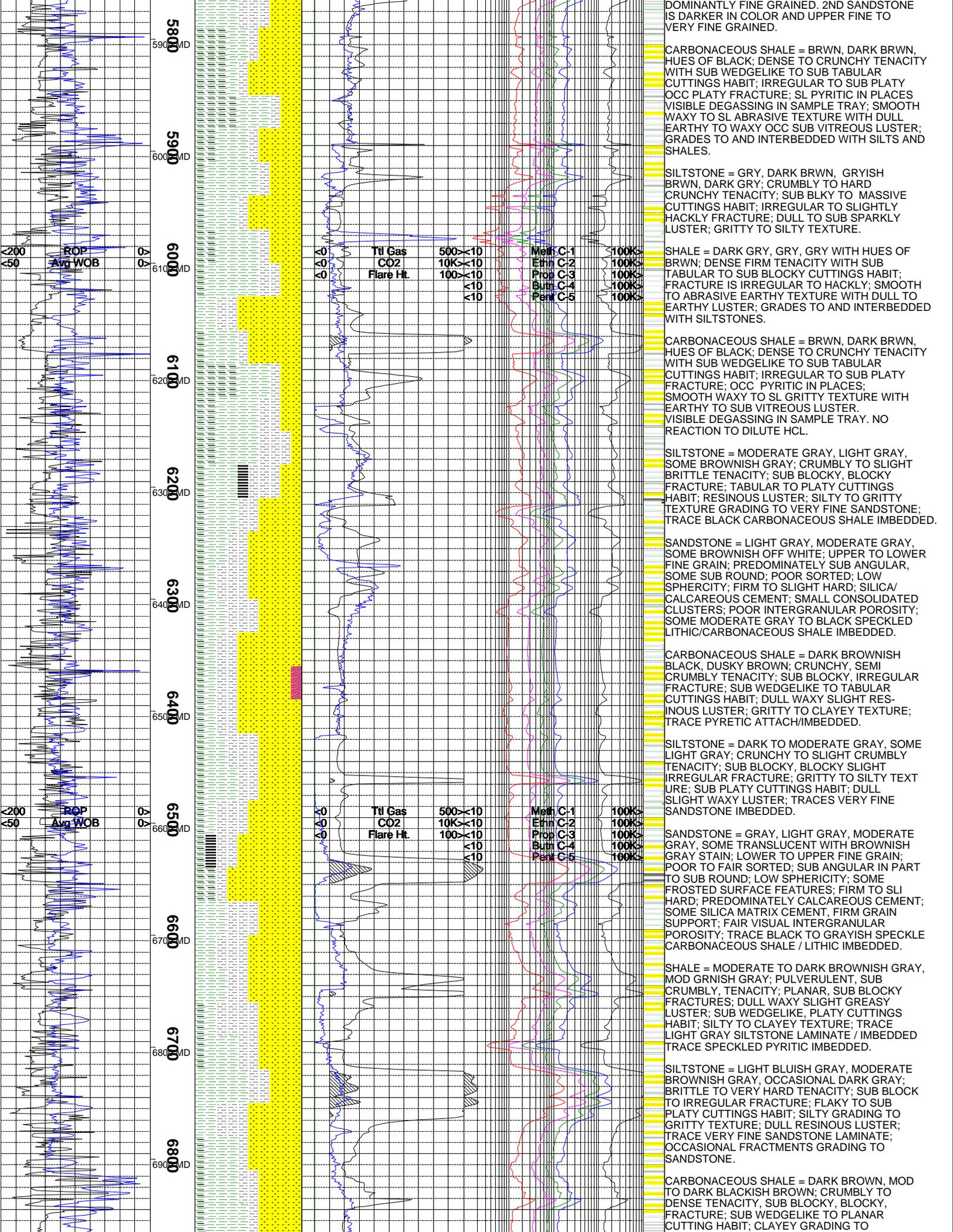
WASATCH G SANDSTONE = WHT, OFF WHT, VERY LT GRY; UPPER MEDIUM TO FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ANGULAR TO SUB ROUND TRANSPARENT TO TRANSLUCENT; MODERATELY TO WELL SORTED WITH LOW TO MODERATE SPHERICITY; FIRM BUT HIGHLY FRIABLE; DOMINANTLY UNCONSOLIDATED MOST LIKELY AS A RESULT OF BIT ACTION; CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; ACCESSORIES ARE LESS THAN 3 %. MARKED INCREASE IN DITCH GAS; NO REACTION TO DILUTE HCL.

SHALE = DARK GRY, GRY, GRY WITH HUES OF BRWN; DENSE FIRM TENACITY WITH SUB TABULAR TO SUB BLOCKY CUTTINGS HABIT; FRACTURE IS IRREGULAR TO HACKLY; SMOOTH TO ABRASIVE EARTHY TEXTURE WITH DULL TO EARTHY LUSTER; GRADES TO AND INTERBEDDED WITH SILTSTONES.

SILTSTONE = GRY, DARK BRWN, GRYISH BRWN, REDDISH BRWN; CRUMBLY TO CRUNCHY TENACITY; SUB BLYK TO MASSIVE CUTTINGS HABIT; IRREGULAR TO SLIGHTLY HACKLY FRACTURE; DULL TO SUB SPARKLY LUSTER; GRITTY TO SILTY TEXTURE.

SHALE = DARK GRY, GRY, GRY WITH HUES OF BRWN; DENSE FIRM TENACITY WITH SUB TABULAR TO SUB BLOCKY CUTTINGS HABIT; FRACTURE IS IRREGULAR TO HACKLY; SMOOTH TO ABRASIVE EARTHY TEXTURE WITH DULL TO EARTHY LUSTER; GRADES TO AND INTERBEDDED WITH SILTSTONES.

SANDSTONE = LT GRY, GRYISH BRWN OCC HUES OF WHT; FIRM AND MODERATELY FRIABLE; INDIVIDUAL GRAINS ARE TRNSP TO OPAQUE; SUB ANGULAR TO SUB ROUND; MODERATELY TO WELL SORTED WITH MODERATE TO LOW SPHERICITY; DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/ KAOLIN CEMENT; MODERATE TO STRONG REACTION TO DILUTE HCL; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS AND SOME CARBONACEOUS MATERIAL; MARKED INCREASE IN DITCH GAS.



DOMINANTLY FINE GRAINED. 2ND SANDSTONE IS DARKER IN COLOR AND UPPER FINE TO VERY FINE GRAINED.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY OCC PLATY FRACTURE; SL PYRITIC IN PLACES VISIBLE DEGASSING IN SAMPLE TRAY; SMOOTH WAXY TO SL ABRASIVE TEXTURE WITH DULL EARTHY TO WAXY OCC SUB VITREOUS LUSTER; GRADES TO AND INTERBEDDED WITH SILTS AND SHALES.

SILTSTONE = GRY, DARK BRWN, GRYISH BRWN, DARK GRY; CRUMBLY TO HARD CRUNCHY TENACITY; SUB BLKY TO MASSIVE CUTTINGS HABIT; IRREGULAR TO SLIGHTLY HACKLY FRACTURE; DULL TO SUB SPARKLY LUSTER; GRITTY TO SILTY TEXTURE.

SHALE = DARK GRY, GRY, GRY WITH HUES OF BRWN; DENSE FIRM TENACITY WITH SUB TABULAR TO SUB BLOCKY CUTTINGS HABIT; FRACTURE IS IRREGULAR TO HACKLY; SMOOTH TO ABRASIVE EARTHY TEXTURE WITH DULL TO EARTHY LUSTER; GRADES TO AND INTERBEDDED WITH SILTSTONES.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; OCC PYRITIC IN PLACES; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. VISIBLE DEGASSING IN SAMPLE TRAY. NO REACTION TO DILUTE HCL.

SILTSTONE = MODERATE GRAY, LIGHT GRAY, SOME BROWNISH GRAY; CRUMBLY TO SLIGHT BRITTLE TENACITY; SUB BLOCKY, BLOCKY FRACTURE; TABULAR TO PLATY CUTTINGS HABIT; RESINOUS LUSTER; SILTY TO GRITTY TEXTURE GRADING TO VERY FINE SANDSTONE; TRACE BLACK CARBONACEOUS SHALE IMBEDDED.

SANDSTONE = LIGHT GRAY, MODERATE GRAY, SOME BROWNISH OFF WHITE; UPPER TO LOWER FINE GRAIN; PREDOMINATELY SUB ANGULAR, SOME SUB ROUND; POOR SORTED; LOW SPHERICITY; FIRM TO SLIGHT HARD; SILICA/ CALCAREOUS CEMENT; SMALL CONSOLIDATED CLUSTERS; POOR INTERGRANULAR POROSITY; SOME MODERATE GRAY TO BLACK SPECKLED LITHIC/CARBONACEOUS SHALE IMBEDDED.

CARBONACEOUS SHALE = DARK BROWNISH BLACK, DUSKY BROWN; CRUNCHY, SEMI CRUMBLY TENACITY; SUB BLOCKY, IRREGULAR FRACTURE; SUB WEDGELIKE TO TABULAR CUTTINGS HABIT; DULL WAXY SLIGHT RESINOUS LUSTER; GRITTY TO CLAYEY TEXTURE; TRACE PYRETIC ATTACH/IMBEDDED.

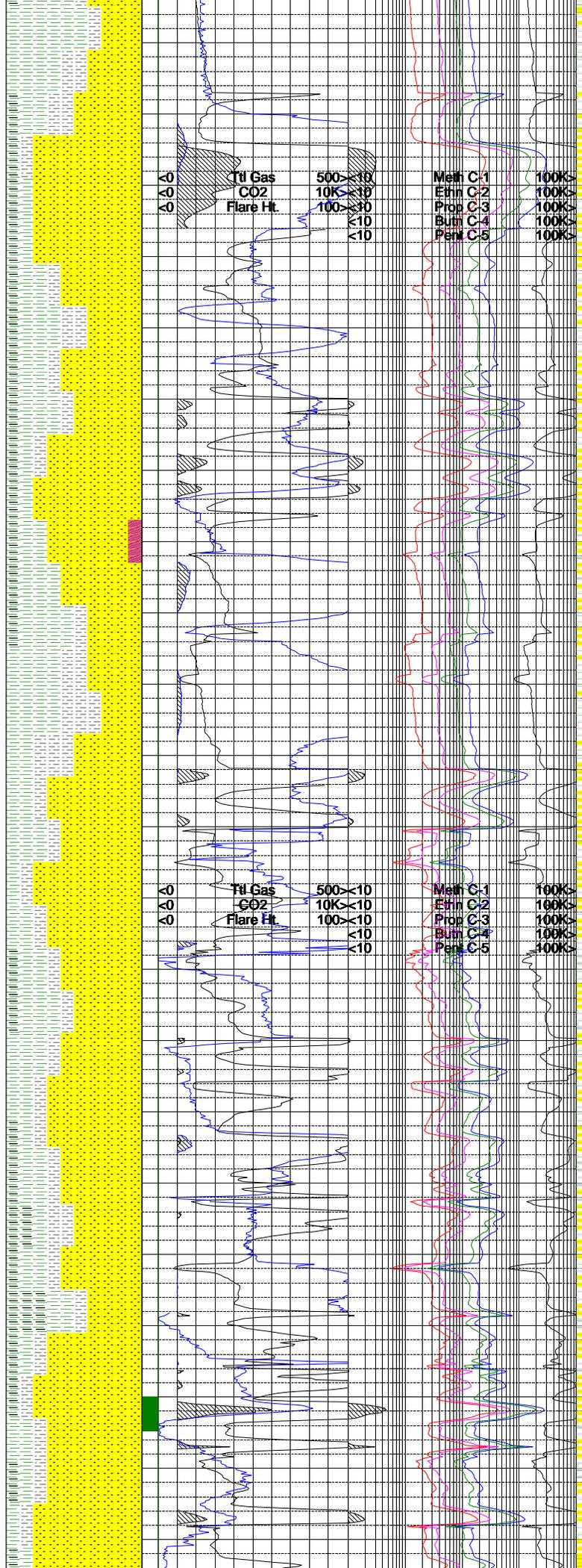
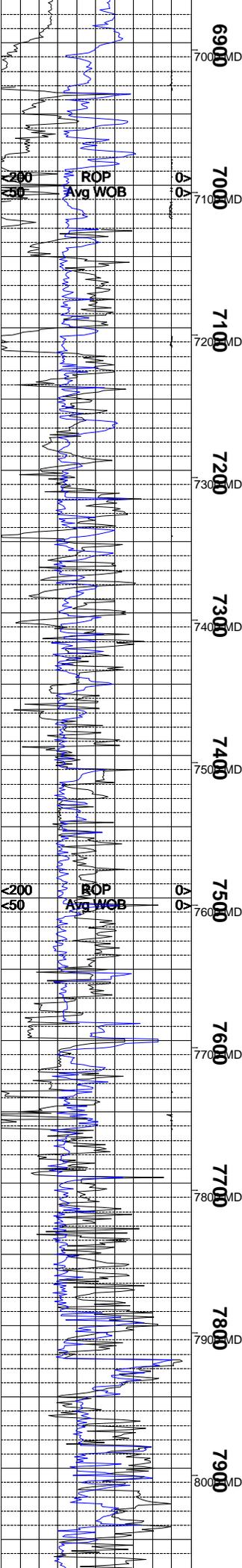
SILTSTONE = DARK TO MODERATE GRAY, SOME LIGHT GRAY; CRUNCHY TO SLIGHT CRUMBLY TENACITY; SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURE; GRITTY TO SILTY TEXTURE; SUB PLATY CUTTINGS HABIT; DULL SLIGHT WAXY LUSTER; TRACES VERY FINE SANDSTONE IMBEDDED.

SANDSTONE = GRAY, LIGHT GRAY, MODERATE GRAY, SOME TRANSLUCENT WITH BROWNISH GRAY STAIN; LOWER TO UPPER FINE GRAIN; POOR TO FAIR SORTED; SUB ANGULAR IN PART TO SUB ROUND; LOW SPHERICITY; SOME FROSTED SURFACE FEATURES; FIRM TO SLI HARD; PREDOMINATELY CALCAREOUS CEMENT; SOME SILICA MATRIX CEMENT, FIRM GRAIN SUPPORT; FAIR VISUAL INTERGRANULAR POROSITY; TRACE BLACK TO GRAYISH SPECKLE CARBONACEOUS SHALE / LITHIC IMBEDDED.

SHALE = MODERATE TO DARK BROWNISH GRAY, MOD GRNISH GRAY; PULVERULENT, SUB CRUMBLY, TENACITY; PLANAR, SUB BLOCKY FRACTURES; DULL WAXY SLIGHT GREASY LUSTER; SUB WEDGELIKE, PLATY CUTTINGS HABIT; SILTY TO CLAYEY TEXTURE; TRACE LIGHT GRAY SILTSTONE LAMINATE / IMBEDDED TRACE SPECKLED PYRITIC IMBEDDED.

SILTSTONE = LIGHT BLUISH GRAY, MODERATE BROWNISH GRAY, OCCASIONAL DARK GRAY; BRITTLE TO VERY HARD TENACITY; SUB BLOCK TO IRREGULAR FRACTURE; FLAKY TO SUB PLATY CUTTINGS HABIT; SILTY GRADING TO GRITTY TEXTURE; DULL RESINOUS LUSTER; TRACE VERY FINE SANDSTONE LAMINATE; OCCASIONAL FRACTMENTS GRADING TO SANDSTONE.

CARBONACEOUS SHALE = DARK BROWN, MOD TO DARK BLACKISH BROWN; CRUMBLY TO DENSE TENACITY, SUB BLOCKY, BLOCKY, FRACTURE; SUB WEDGELIKE TO PLANAR CUTTING HABIT; CLAYEY GRADING TO



GRITTY TEXTURE; DULL EARTHY, SLIGHT WAXY LUSTER; TRACE SPECKLED PYRITIC IMBEDDED, TRACE BLACK LITHIC IMBEDDED.

SANDSTONE = OFF WHITE, BLUISH WHITE, OCC CLEAR TO TRANSLUCENT, SOME SMALL CLUSTER VERY FINE TO LOWER FINE, OCC MEDIUM GRAIN; FAIR TO WELL SORTED' DOMINANTLY SUB ANGULAR IN CLUSTERS, SUB ROUND INDIVIDUAL GRAINS; FRIABLE TO FIRM; SILICA/CALCAREOUS CEMENT, SOME WEAK GRAIN SUPPORT; FAIR TO GOOD INTER GRANULAR VISIBLE POROSITY, ABUNDANT INDIVIDUAL VERY FINE TO FINE GRAINS IN 7090' SAMPLE TRAY, TRACE BLACK SPECKLED CARBONACEOUS

SHALE = MODERATE BLUISH GRAY, LIGHT GRAYISH BROWN, OCCASIONAL MODERATE REDDISH BROWN; BRITTLE TO SUB DENSE TENACITY; SUB BLOCKY TO IRREGULAR FRACTURE; SUB WEDGELIKE, TABULAR OCC PLATY CUTTINGS HABIT; DULL EARTHY, SLI WAXY, LUSTER; SMOOTH, CLAYEY, OCC SILTY TEXTURE; TRACE SPECKLED PYRITIC IMBEDDED.

SANDSTONE = ABUNDANT INDIVIDUAL GRAINS, CLEAR TO TRANSLUCENT, SMALL CLUSTERS, LIGHT BLUISH GRAY; FINE GRAIN TO OCC UPPER MED GRAIN; SALT AND PEPPER APPEARANCE WITH MOD GRAY SPECKLED LITHIC; FAIR TO WELL SORTED; OCC FROSTED SURFACE FEATURE; DOM SUB ROUND INDIVI GRAINS, OCC SUB ANGULAR, FRIABLE TO FIRM SILICA/CALCAREOUS CEMENT, OCC WHITE KAOLITE CLAYEY CEMENT; FAIR TO GOOD INTER GRANULAR POROSITY;

CARBONACEOUS SHALE = DARK BROWNISH BLACK, OCC DARK BLACKISH GRAY; CRUMBLY, CRUNCHY TENACITY; SUB BLOCKY, PLANAR FRACTURE; SUB WEDGELIKE TO PLATY CUTTING HABIT; DULL EARTHY, SLI WAXY LUSTER; SILTY TO GRITTY TEXTURE; TRACE BLACK COAL LAMINATED STRINGERS.

SANDSTONE = WHT, LT GRY, LT GRY WITH SL GRNISH HUES; UPPER MEDIUM TO FINE GRAINED; WELL SORTED WITH MODERATE TO LOW SPHERICITY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANG TO SUB ROUND SOME ANGULAR; SLIGHTLY FIRM AND MODERATELY TO EASILY FRIABLE; MIX OF CONSOLIDATED AND UNCONSOLIDATED CLUSTERS CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; NO REACTION TO DILUTE HCL; MARKED INCREASE IN DITCH GAS; UNCONSOLIDATION IS MOST LIKELY A RESULT OF BIT ANK; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3-5%.

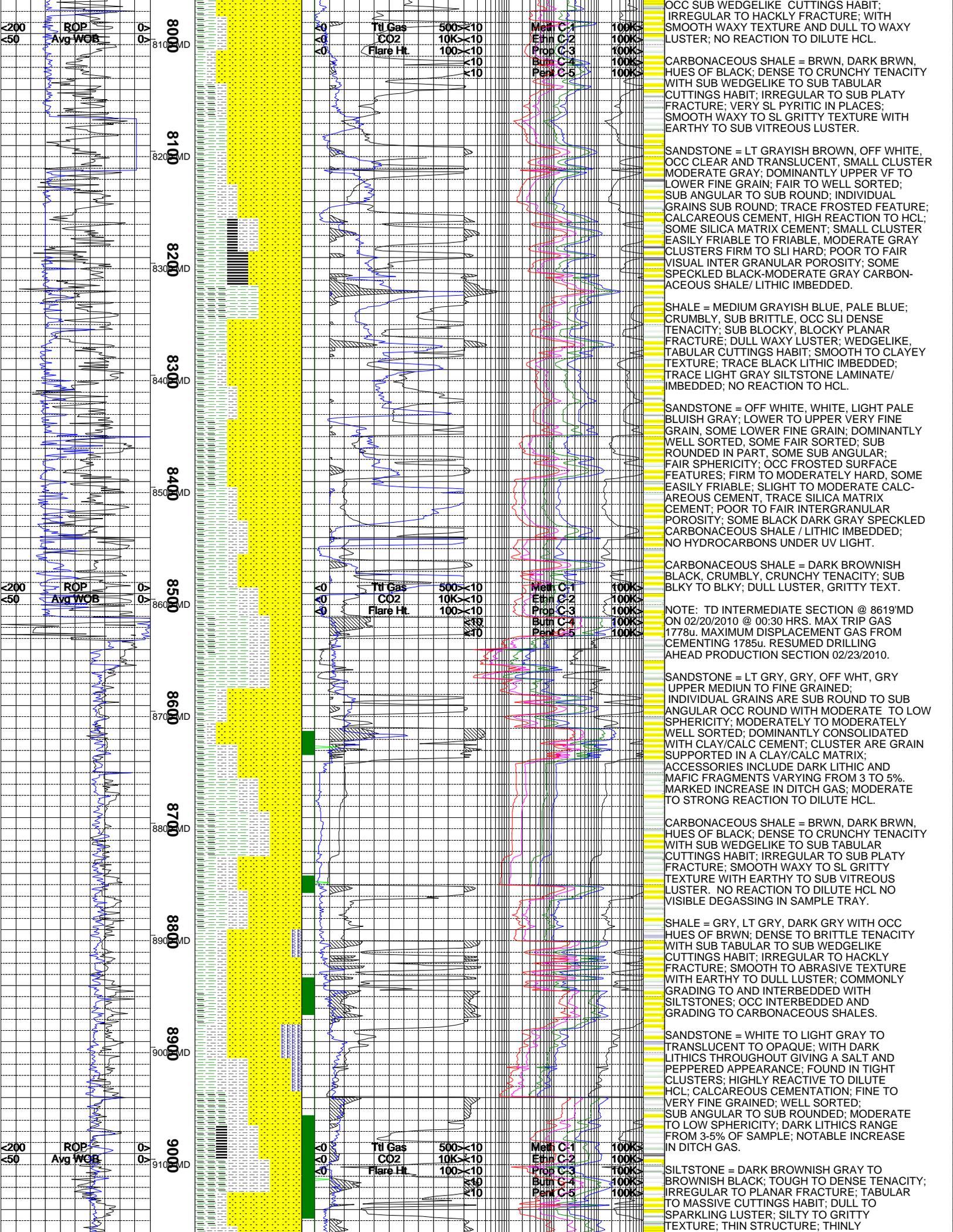
CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; OCC VERY SL PYRITIC IN PLACES; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. NO REACTION TO DILUTE HCL.

SANDSTONE = WHT, LT GRY, LT GRY WITH SL GRNISH HUES; FINE TO UPPER FINE GRAINED; WELL SORTED WITH MODERATE TO LOW SPHERICITY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANG TO SUB ROUND SOME ANGULAR; SLIGHTLY FIRM AND MODERATELY TO EASILY FRIABLE; MIX OF CONSOLIDATED AND UNCONSOLIDATED CLUSTERS CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; NO REACTION TO DILUTE HCL; ACCESSORIES INCL DARK LITHIC AND MAFIC FRAGMENTS LESS THEN 3%

SHALE = VERY LT GRNISH GRY; GRN WITH HUES OF GRY, GRY. SUB MALLEABLE TO DENSE TENACITY; BLOCKY MASSIVE TO SUB TABULAR OCC SUB WEDGELIKE OCC SCALY CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; SMOOTH WAXY TEXTURE WITH DULL TO WAXY LUSTER; COMMONLY INTERBEDDED WITH CARBONACEOUS SHALES AND SILTS.

SANDSTONE = LT GRY, GRY, OFF WHT, GRY WITH OCC BRWNISH HUES; FINE TO VERY FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ROUND TO SUB ANGULAR OCC ROUND WITH MODERATE SPHERICITY; MODERATELY TO MODERATELY WELL SORTED; DOMINANTLY CONSOLIDATED WITH CLAY/CALC CEMENT; CLUSTER ARE GRAIN SUPPORTED IN A CLAY/CALC MATRIX; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS VARYING FROM 3 TO 5%. MARKED INCREASE IN DITCH GAS; MODERATE TO STRONG REACTION TO DILUTE HCL.

SHALE = GRN, GRNISH GRY; GRN WITH HUES OF GRY, GRY. SUB MALLEABLE TO DENSE TENACITY; BLOCKY MASSIVE TO SUB TABULAR



ROP  
Avg WOB

ROP  
Avg WOB

ROP  
Avg WOB

Ti Gas 500 > 10  
CO2 10K < 10  
Flare Ht 100 < 10

Ti Gas 500 > 10  
CO2 10K < 10  
Flare Ht 100 < 10

Ti Gas 500 > 10  
CO2 10K < 10  
Flare Ht 100 < 10

Mat C-1 100K >  
Eth C-2 100K >  
Prop C-3 100K >  
Burn C-4 100K >  
Perk C-5 100K >

Mat C-1 100K >  
Eth C-2 100K >  
Prop C-3 100K >  
Burn C-4 100K >  
Perk C-5 100K >

Mat C-1 100K >  
Eth C-2 100K >  
Prop C-3 100K >  
Burn C-4 100K >  
Perk C-5 100K >

OCC SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; WITH SMOOTH WAXY TEXTURE AND DULL TO WAXY LUSTER; NO REACTION TO DILUTE HCL.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; VERY SL PYRITIC IN PLACES; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER.

SANDSTONE = LT GRAYISH BROWN, OFF WHITE, OCC CLEAR AND TRANSLUCENT, SMALL CLUSTER MODERATE GRAY; DOMINANTLY UPPER VF TO LOWER FINE GRAIN; FAIR TO WELL SORTED; SUB ANGULAR TO SUB ROUND; INDIVIDUAL GRAINS SUB ROUND; TRACE FROSTED FEATURE; CALCAREOUS CEMENT, HIGH REACTION TO HCL; SOME SILICA MATRIX CEMENT; SMALL CLUSTER EASILY FRIABLE TO FRIABLE, MODERATE GRAY CLUSTERS FIRM TO SLI HARD; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; SOME SPECKLED BLACK-MODERATE GRAY CARBONACEOUS SHALE/ LITHIC IMBEDDED.

SHALE = MEDIUM GRAYISH BLUE, PALE BLUE; CRUMBLY, SUB BRITTLE, OCC SLI DENSE TENACITY; SUB BLOCKY, BLOCKY PLANAR FRACTURE; DULL WAXY LUSTER; WEDGELIKE, TABULAR CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; TRACE BLACK LITHIC IMBEDDED; TRACE LIGHT GRAY SILTSTONE LAMINATE/ IMBEDDED; NO REACTION TO HCL.

SANDSTONE = OFF WHITE, WHITE, LIGHT PALE BLUISH GRAY; LOWER TO UPPER VERY FINE GRAIN, SOME LOWER FINE GRAIN; DOMINANTLY WELL SORTED, SOME FAIR SORTED; SUB ROUNDED IN PART, SOME SUB ANGULAR; FAIR SPHERICITY; OCC FROSTED SURFACE FEATURES; FIRM TO MODERATELY HARD, SOME EASILY FRIABLE; SLIGHT TO MODERATE CALCAREOUS CEMENT, TRACE SILICA MATRIX CEMENT; POOR TO FAIR INTERGRANULAR POROSITY; SOME BLACK DARK GRAY SPECKLED CARBONACEOUS SHALE / LITHIC IMBEDDED; NO HYDROCARBONS UNDER UV LIGHT.

CARBONACEOUS SHALE = DARK BROWNISH BLACK, CRUMBLY, CRUNCHY TENACITY; SUB BLKY TO BLKY; DULL LUSTER, GRITTY TEXT.

NOTE: TD INTERMEDIATE SECTION @ 8619' MD ON 02/20/2010 @ 00:30 HRS. MAX TRIP GAS 1778u. MAXIMUM DISPLACEMENT GAS FROM CEMENTING 1785u. RESUMED DRILLING AHEAD PRODUCTION SECTION 02/23/2010.

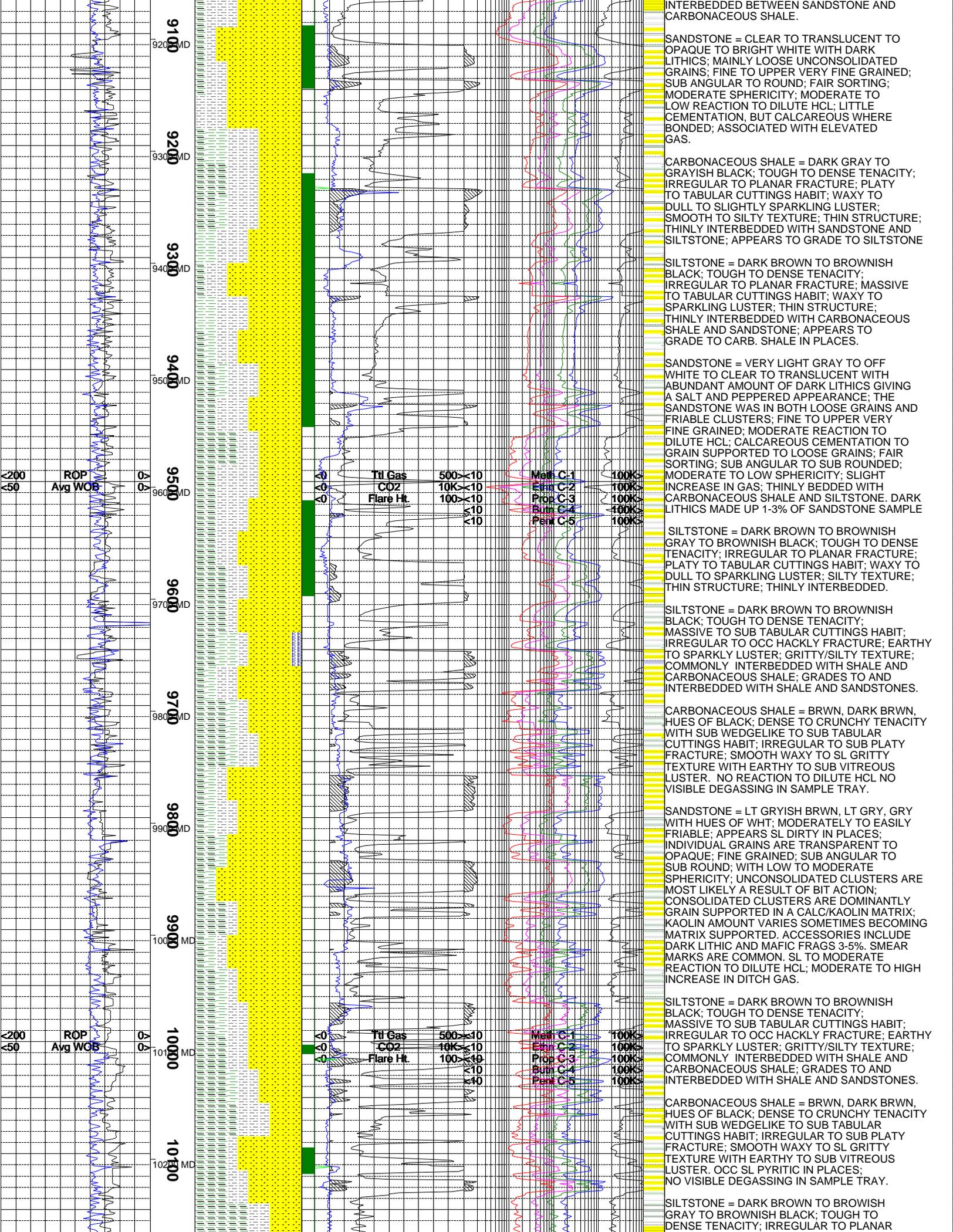
SANDSTONE = LT GRY, GRY, OFF WHT, GRY UPPER MEDIUM TO FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ROUND TO SUB ANGULAR OCC ROUND WITH MODERATE TO LOW SPHERICITY; MODERATELY TO MODERATELY WELL SORTED; DOMINANTLY CONSOLIDATED WITH CLAY/CALC CEMENT; CLUSTER ARE GRAIN SUPPORTED IN A CLAY/CALC MATRIX; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS VARYING FROM 3 TO 5%. MARKED INCREASE IN DITCH GAS; MODERATE TO STRONG REACTION TO DILUTE HCL.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR FRACTURE; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. NO REACTION TO DILUTE HCL NO VISIBLE DEGASSING IN SAMPLE TRAY.

SHALE = GRY, LT GRY, DARK GRY WITH OCC HUES OF BRWN; DENSE TO BRITTLE TENACITY WITH SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; SMOOTH TO ABRASIVE TEXTURE WITH EARTHY TO DULL LUSTER; COMMONLY GRADING TO AND INTERBEDDED WITH SILTSTONES; OCC INTERBEDDED AND GRADING TO CARBONACEOUS SHALES.

SANDSTONE = WHITE TO LIGHT GRAY TO TRANSLUCENT TO OPAQUE; WITH DARK LITHICS THROUGHOUT GIVING A SALT AND PEPPERED APPEARANCE; FOUND IN TIGHT CLUSTERS; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; FINE TO VERY FINE GRAINED; WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; DARK LITHICS RANGE FROM 3-5% OF SAMPLE; NOTABLE INCREASE IN DITCH GAS.

SILTSTONE = DARK BROWNISH GRAY TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; TABULAR TO MASSIVE CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE; THINLY



9100 MD  
9200 MD  
9300 MD  
9400 MD  
9500 MD  
9600 MD  
9700 MD  
9800 MD  
9900 MD  
10000 MD  
10100 MD

<200  
<50  
ROP  
Avg WOB

Til Gas	500	>10	Core C-1	100%
CO2	10K	<10	Core C-2	100%
Flare Ht	100	<10	Core C-3	100%
			Core C-4	100%
			Core C-5	100%

SANDSTONE = CLEAR TO TRANSLUCENT TO OPAQUE TO BRIGHT WHITE WITH DARK LITHICS; MAINLY LOOSE UNCONSOLIDATED GRAINS; FINE TO UPPER VERY FINE GRAINED; SUB ANGULAR TO ROUND; FAIR SORTING; MODERATE SPHERICITY; MODERATE TO LOW REACTION TO DILUTE HCL; LITTLE CEMENTATION, BUT CALCAREOUS WHERE BONDED; ASSOCIATED WITH ELEVATED GAS.

CARBONACEOUS SHALE = DARK GRAY TO GRAYISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; WAXY TO DULL TO SLIGHTLY SPARKLING LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE; APPEARS TO GRADE TO SILTSTONE

SILTSTONE = DARK BROWN TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; WAXY TO SPARKLING LUSTER; THIN STRUCTURE; THINLY INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE; APPEARS TO GRADE TO CARB. SHALE IN PLACES.

SANDSTONE = VERY LIGHT GRAY TO OFF WHITE TO CLEAR TO TRANSLUCENT WITH ABUNDANT AMOUNT OF DARK LITHICS GIVING A SALT AND PEPPERED APPEARANCE; THE SANDSTONE WAS IN BOTH LOOSE GRAINS AND FRIABLE CLUSTERS; FINE TO UPPER VERY FINE GRAINED; MODERATE REACTION TO DILUTE HCL; CALCAREOUS CEMENTATION TO GRAIN SUPPORTED TO LOOSE GRAINS; FAIR SORTING; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; SLIGHT INCREASE IN GAS; THINLY BEDDED WITH CARBONACEOUS SHALE AND SILTSTONE. DARK LITHICS MADE UP 1-3% OF SANDSTONE SAMPLE

SILTSTONE = DARK BROWN TO BROWNISH GRAY TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; WAXY TO DULL TO SPARKLING LUSTER; SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED.

SILTSTONE = DARK BROWN TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; MASSIVE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO OCC HACKLY FRACTURE; EARTHY TO SPARKLY LUSTER; GRITTY/SILTY TEXTURE; COMMONLY INTERBEDDED WITH SHALE AND CARBONACEOUS SHALE; GRADES TO AND INTERBEDDED WITH SHALE AND SANDSTONES.

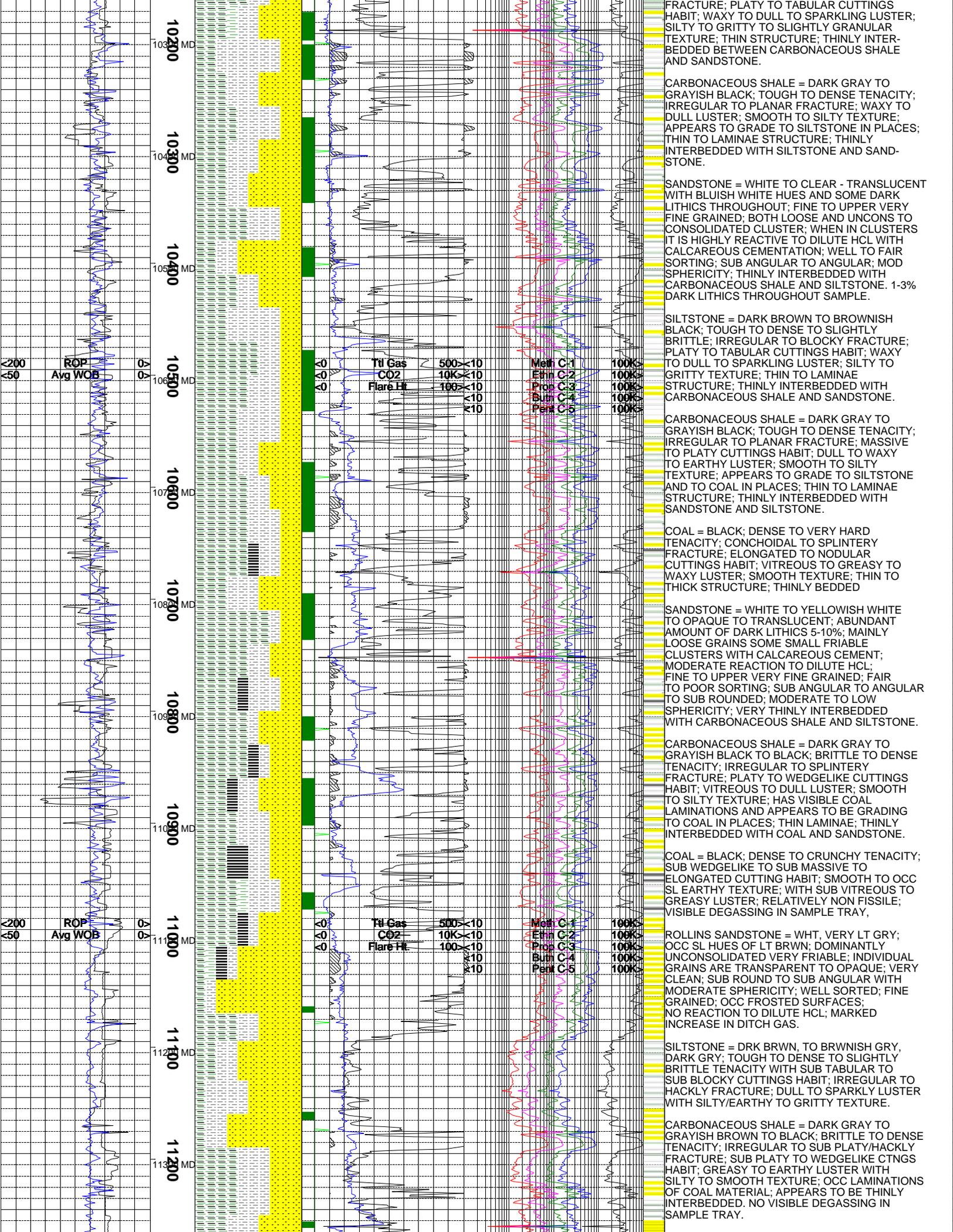
CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. NO REACTION TO DILUTE HCL NO VISIBLE DEGASSING IN SAMPLE TRAY.

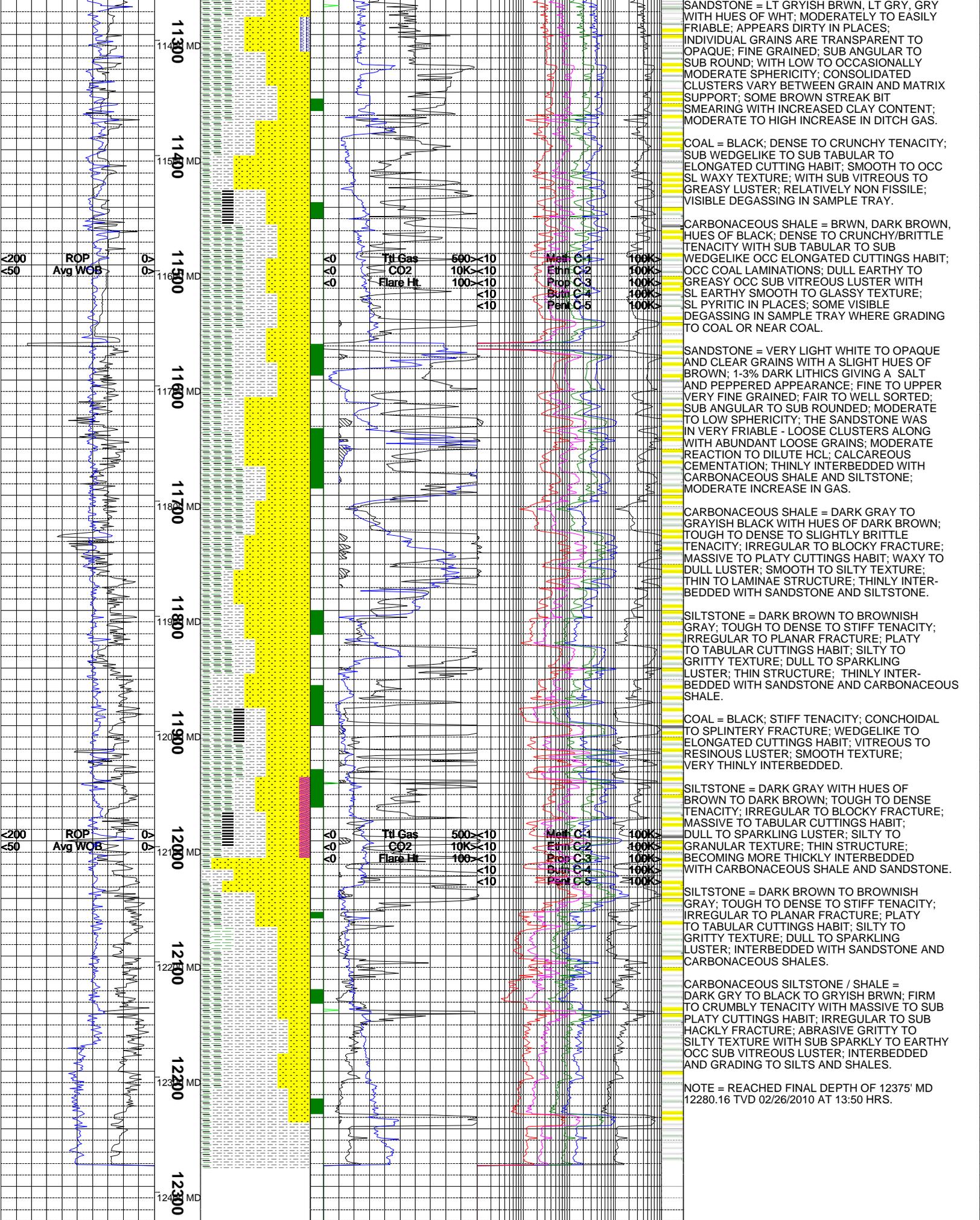
SANDSTONE = LT GRAYISH BRWN, LT GRY, GRY WITH HUES OF WHT; MODERATELY TO EASILY FRIABLE; APPEARS SL DIRTY IN PLACES; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; FINE GRAINED; SUB ANGULAR TO SUB ROUND; WITH LOW TO MODERATE SPHERICITY; UNCONSOLIDATED CLUSTERS ARE MOST LIKELY A RESULT OF BIT ACTION; CONSOLIDATED CLUSTERS ARE DOMINANTLY GRAIN SUPPORTED IN A CALC/KAOLIN MATRIX; KAOLIN AMOUNT VARIES SOMETIMES BECOMING MATRIX SUPPORTED. ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGS 3-5%. SMEAR MARKS ARE COMMON. SL TO MODERATE REACTION TO DILUTE HCL; MODERATE TO HIGH INCREASE IN DITCH GAS.

SILTSTONE = DARK BROWN TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; MASSIVE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO OCC HACKLY FRACTURE; EARTHY TO SPARKLY LUSTER; GRITTY/SILTY TEXTURE; COMMONLY INTERBEDDED WITH SHALE AND CARBONACEOUS SHALE; GRADES TO AND INTERBEDDED WITH SHALE AND SANDSTONES.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. OCC SL PYRITIC IN PLACES; NO VISIBLE DEGASSING IN SAMPLE TRAY.

SILTSTONE = DARK BROWN TO BROWISH GRAY TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR





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