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MUDLOG TVD

COMPANY ExxonMobil Production
WELL PCU 297-11C6
FIELD Piceance Creek Unit
REGION Rocky Mountains
COORDINATES 39.896082 N
108.254572 W
ELEVATION GL: 6965.3'
KB: 6995.5'
COUNTY, STATE Rio Blanco, CO
API INDEX 051031147200
SPUD DATE 02/12/2010
CONTRACTOR HP Drilling
CO. REP. M. Sadler / J. Wood
RIG/TYPE #326/ Flex-Rig 4
LOGGING UNIT #36
GEOLOGISTS J. Kokes / D. Thibodeaux
C. Record / J. Keevan
ADD. PERSONS H. Strickland / J. Yeagar
P. Strickland/ D. Lockhart
CO. GEOLOGIST Chris Alba

LOG INTERVAL

CASING DATA

DEPTHS: 3824' TO 12688'
DATES: 04/01/2010 TO 06/23/2010
SCALE: 1" = 100'

16" AT 150'
10 3/4" AT 3809'
7" AT 8665'
AT

MUD TYPES

HOLE SIZE

WATER BASED SPUD MUD TO 3824'
LSND TO 12688'
TO
TO

14 3/4" TO 3824'
9 7/8" TO 8680'
6 1/8" TO 12688'
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	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

TVD Depth

Lithology

<0	Ttl Gas	units	1K>	<10	Meth C-1	100K>
<10				<10	Ethn C-2	100K>
<330	CO2	ppm	5K>	<10	Prop C-3	100K>
<0	Flare Ht.	ft	100>	<10	Butn C-4	100K>
				<10	Pent C-5	100K>

Interp. Lith

Remarks
Survey Data, Mud Reports, Other Info.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3500 MD

MGS

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3500 MD

ALL SAMPLE DEPTHS ARE REFERENCED TO RKB. 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.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3600 MD

3600 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3600 MD

ALL CONNECTION GASES, TRIP GASES, AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUD LOG USUALLY REFLECT UP HOLE GAS INTERVALS BLEEDING GAS INTO THE BOREHOLE DURING CONNECTIONS.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3700 MD

3700 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3700 MD

GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF: METHANE = 10040 PPM, ETHANE = 990 PPM, PROPANE = 1000 PPM, ISOBUTANE = 1010 PPM, BUTANE = 1000 PPM, ISOPENTANE = 1000 PPM, PENTANE = 1000 PPM.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3800 MD

3800 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3800 MD

WHEN THE MUD IS CIRCULATED THROUGH THE GAS BUSTER, THE INTERVAL IS MARKED IN THE MGS COLUMN; THE SIZE OF THE FLARES ARE NOTED AS WELL.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3800 MD

3800 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3800 MD

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

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3900 MD

3900 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3900 MD

1 UNIT OF GAS = 200 PPM OF METHANE
SET 10.7" CASING @ 3808

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

3900 MD

3900 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

3900 MD

BEGAN LOGGING WELL PCU297-11C6 ON 04/01/2010 AT 22:30 HRS.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4000 MD

4000 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4000 MD

SANDSTONE=OFF WHITE ; FINE MEDIUM GRAIN; SUBROUNDED SUBANGULAR; MOD WELL SORTED; PREDOM QUARTZ GRAIN SUPPORTED; CLAY CALCITE CEMENT MATRIX; SLI REACTION TO HCL; MOD SPHERICITY; INTERBEDDED WITH BROWNISH RED SILTSTONES LIGHT MEDIUM GRAY SHALES LOW GAS READING; NO TRACE HYDROCARBONS

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4000 MD

4000 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4000 MD

SILTSTONE=REDDISH BROWN; MOD HARD OCC SOFT; CRUMBLY DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; MASSIVE CUTTINGS HABIT; DULL EARTHY OCC SPARKLING LUSTER; SMOOTH V GRITTY SANDY TEXTURE; MASSIVE STRUCTURE; INTERBEDDED WITH SHALES; LOW GAS; NO TRACE HYDROCARBONS

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4100 MD

4100 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4100 MD

SHALE=LIGHT MEDIUM GRAY BROWNISH YELLOW; MOD FIRM; CRUMBLY DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; MASSIVE PLATY CUTTINGS HABIT; DULL EARTHY OCC WAXY LUSTER; SMOOTH CLAYEY SLI SILTY TEXTURE; MOD CALCAREOUS; INTERBEDDED BROWNISH RED SILTSTONES; LOW GAS

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4200 MD

4200 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4200 MD

SILTSTONE=REDDISH BROWN; MOD HARD; DENSE TOUGH TENACITY; BLOCKY IRREGULAR FRACTURE; MASSIVE WEDGELIKE CUTTINGS DULL EARTHY OCC SPARKLING LUSTER; SMOOTH SANDY GRITTY TEXTURE; MASSIVE STRUCTURE INTERBEDDED MEDIUM LIGHT GRAY SHALES LOW GAS READINGS; NO TRACE HYDROCARBONS

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4300 MD

4300 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4300 MD

SHALE=LIGHT MEDIUM GRAY YELLOW BROWN; MOD HARD FIRM; DENSE CRUMBLY TENACITY; BLOCKY IRREGULAR FRACTURE; PLATY CUTTING HABIT; DULL EARTHY WAXY LUSTER; SMOOTH SILTY CLAYEY TEXTURE; MOD CALCAREOUS; TRACE CHALCOPYRITE EMBEDDED; INTERBEDDED REDDISH BROWN SILTSTONES OCC SANDSTONES STRINGERS; LOW GAS; NO TRACE HYDROCARBON

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4300 MD

4300 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4300 MD

SILTSTONE=REDDISH BROWN; MOD FIRM; DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; MASSIVE CUTTINGS HABIT; DULL EARTHY LUSTER; SMOOTH SANDY GRITTY TEXTURE; MASSIVE STRUCTURE; INTERBEDDED W/ SHALE OCC SANDSTONES; LOW GAS

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

4400 MD

4400 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4400 MD

SANDSTONE=WHITE OFF WHITE BROWNISH GRAY; FINE MEDIUM GRAIN; SUBROUNDED SUBANGULAR MOD WELL SORTED; PREDOM GRAIN SUPPORTED; CALCITE CLAY CEMENT; MOO REACTION TO HCL; TR BLACK LITHICS CLASTS EMBEDDED; MOD SPHERICITY.

<300	ROP	ft/hr	0>
<50	Avg WOB	klbs	0>
<1	Depth of Cut	in/rev	0>

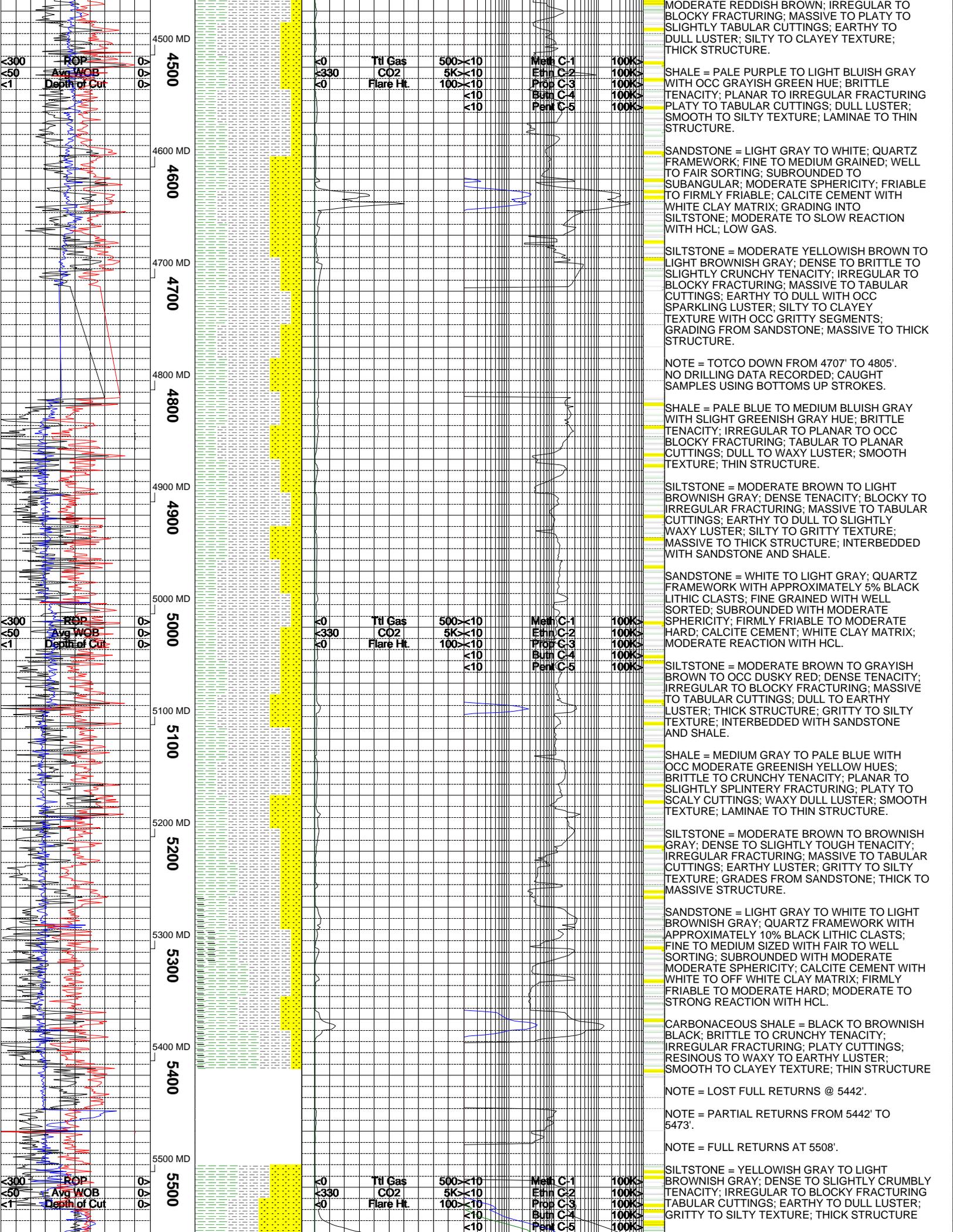
4400 MD

4400 MD

<0	Ttl Gas	units	500>	<10	Meth C-1	100K>
<330	CO2	ppm	5K>	<10	Ethn C-2	100K>
<0	Flare Ht.	ft	100>	<10	Prop C-3	100K>
				<10	Butn C-4	100K>
				<10	Pent C-5	100K>

4400 MD

SILTSTONE = DARK YELLOWISH ORANGE TO



4500 MD
4500
4600 MD
4600
4700 MD
4700
4800 MD
4800
4900 MD
4900
5000 MD
5000
5100 MD
5100
5200 MD
5200
5300 MD
5300
5400 MD
5400
5500 MD
5500

Depth (MD)	Ttl Gas	CO2	Flare Ht	Meth C:1	Ethn C:2	Prop C:3	Burn C:4	Perm C:5
4500	<10	<10	<10	100K	100K	100K	100K	100K
5000	<10	<10	<10	100K	100K	100K	100K	100K
5500	<10	<10	<10	100K	100K	100K	100K	100K

MODERATE REDDISH BROWN; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO PLATY TO SLIGHTLY TABULAR CUTTINGS; EARTHY TO DULL LUSTER; SILTY TO CLAYEY TEXTURE; THICK STRUCTURE.

SHALE = PALE PURPLE TO LIGHT BLUISH GRAY WITH OCC GRAYISH GREEN HUE; BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURING PLATY TO TABULAR CUTTINGS; DULL LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE.

SANDSTONE = LIGHT GRAY TO WHITE; QUARTZ FRAMEWORK; FINE TO MEDIUM GRAINED; WELL TO FAIR SORTING; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; FRIABLE TO FIRMLY FRIABLE; CALCITE CEMENT WITH WHITE CLAY MATRIX; GRADING INTO SILTSTONE; MODERATE TO SLOW REACTION WITH HCL; LOW GAS.

SILTSTONE = MODERATE YELLOWISH BROWN TO LIGHT BROWNISH GRAY; DENSE TO BRITTLE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY TO DULL WITH OCC SPARKLING LUSTER; SILTY TO CLAYEY TEXTURE WITH OCC GRITTY SEGMENTS; GRADING FROM SANDSTONE; MASSIVE TO THICK STRUCTURE.

NOTE = TOTCO DOWN FROM 4707' TO 4805'. NO DRILLING DATA RECORDED; CAUGHT SAMPLES USING BOTTOMS UP STROKES.

SHALE = PALE BLUE TO MEDIUM BLUISH GRAY WITH SLIGHT GREENISH GRAY HUE; BRITTLE TENACITY; IRREGULAR TO PLANAR TO OCC BLOCKY FRACTURING; TABULAR TO PLANAR CUTTINGS; DULL TO WAXY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE.

SILTSTONE = MODERATE BROWN TO LIGHT BROWNISH GRAY; DENSE TENACITY; BLOCKY TO IRREGULAR FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE TO THICK STRUCTURE; INTERBEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = WHITE TO LIGHT GRAY; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK LITHIC CLASTS; FINE GRAINED WITH WELL SORTED; SUBROUNDED WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO MODERATE HARD; CALCITE CEMENT; WHITE CLAY MATRIX; MODERATE REACTION WITH HCL.

SILTSTONE = MODERATE BROWN TO GRAYISH BROWN TO OCC DUSKY RED; DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; DULL TO EARTHY LUSTER; THICK STRUCTURE; GRITTY TO SILTY TEXTURE; INTERBEDDED WITH SANDSTONE AND SHALE.

SHALE = MEDIUM GRAY TO PALE BLUE WITH OCC MODERATE GREENISH YELLOW HUES; BRITTLE TO CRUNCHY TENACITY; PLANAR TO SLIGHTLY SPLINTERY FRACTURING; PLATY TO SCALY CUTTINGS; WAXY DULL LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN STRUCTURE.

SILTSTONE = MODERATE BROWN TO BROWNISH GRAY; DENSE TO SLIGHTLY TOUGH TENACITY; IRREGULAR FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY LUSTER; GRITTY TO SILTY TEXTURE; GRADES FROM SANDSTONE; THICK TO MASSIVE STRUCTURE.

SANDSTONE = LIGHT GRAY TO WHITE TO LIGHT BROWNISH GRAY; QUARTZ FRAMEWORK WITH APPROXIMATELY 10% BLACK LITHIC CLASTS; FINE TO MEDIUM SIZED WITH FAIR TO WELL SORTING; SUBROUNDED WITH MODERATE MODERATE SPHERICITY; CALCITE CEMENT WITH WHITE TO OFF WHITE CLAY MATRIX; FIRMLY FRIABLE TO MODERATE HARD; MODERATE TO STRONG REACTION WITH HCL.

CARBONACEOUS SHALE = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; IRREGULAR FRACTURING; PLATY CUTTINGS; RESINOUS TO WAXY TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE

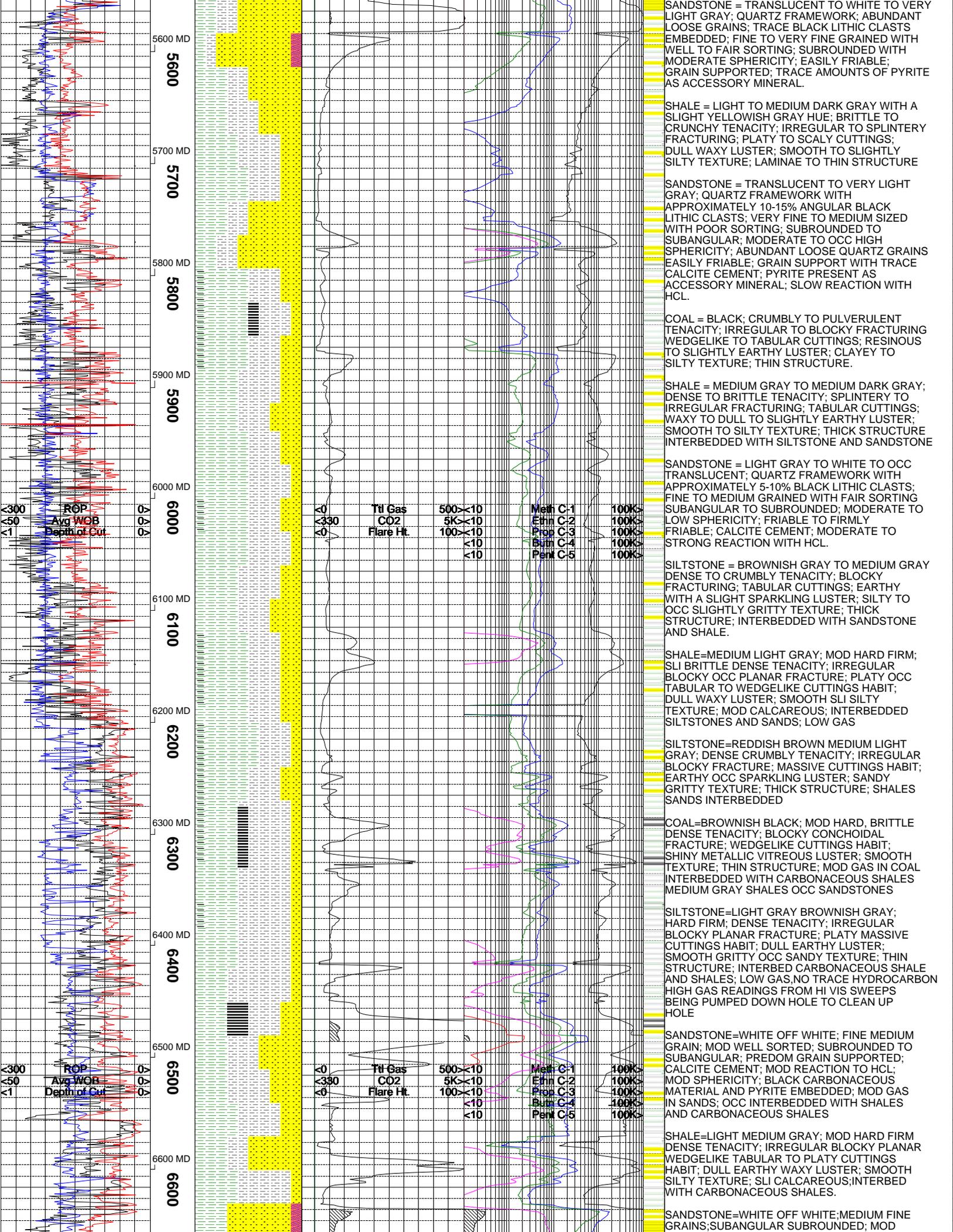
NOTE = LOST FULL RETURNS @ 5442'.

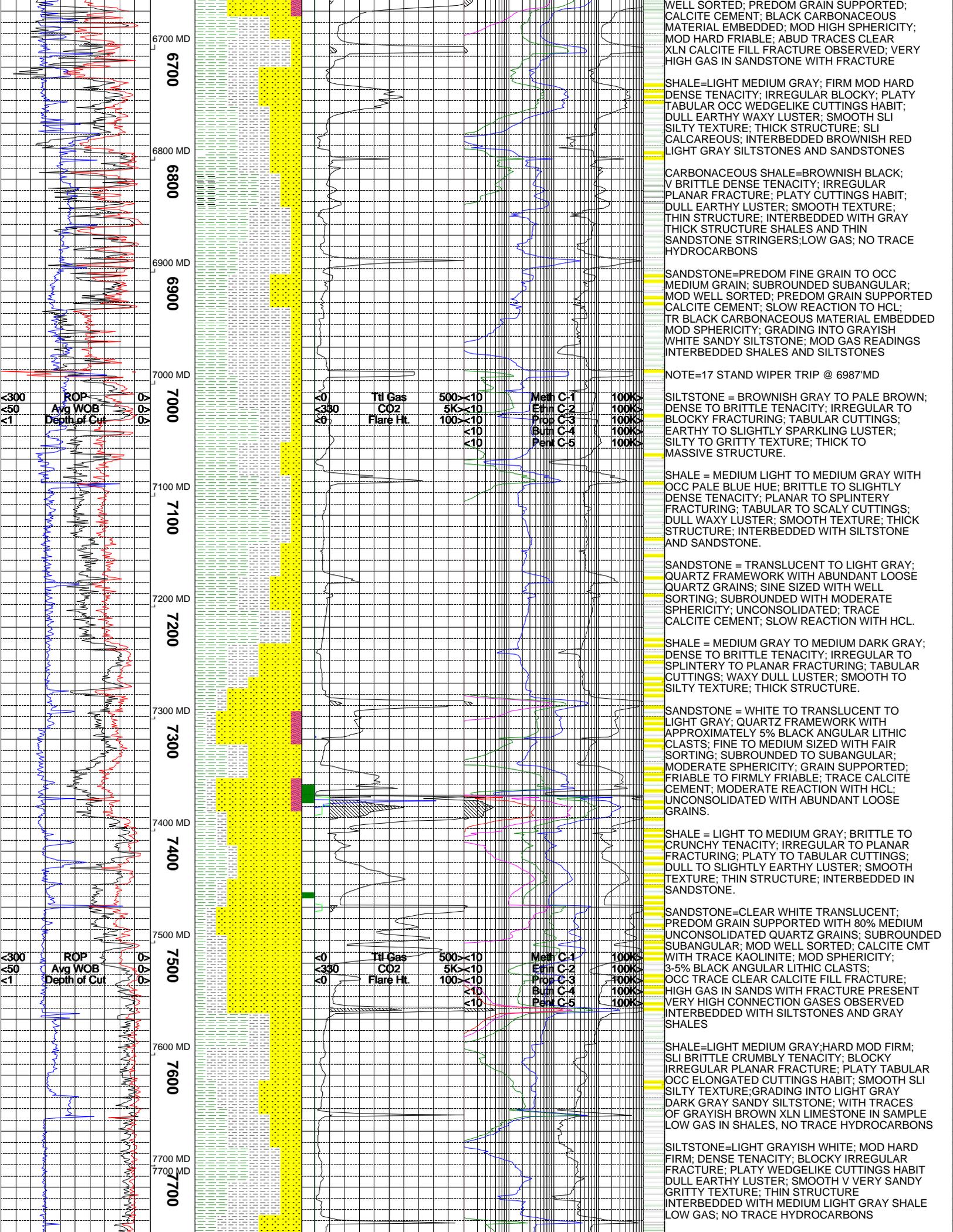
NOTE = PARTIAL RETURNS FROM 5442' TO 5473'.

NOTE = FULL RETURNS AT 5508'.

SILTSTONE = YELLOWISH GRAY TO LIGHT BROWNISH GRAY; DENSE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURING TABULAR CUTTINGS; EARTHY TO DULL LUSTER; GRITTY TO SILTY TEXTURE; THICK STRUCTURE

ROP
Avg WOB
Depth of Cut





6700 MD
6700
6800 MD
6800
6900 MD
6900
7000 MD
7000
7100 MD
7100
7200 MD
7200
7300 MD
7300
7400 MD
7400
7500 MD
7500
7600 MD
7600
7700 MD
7700

300
50
1
ROP
Avg WOB
Depth of Cut

300
50
1
ROP
Avg WOB
Depth of Cut

Ttl Gas	500 > 10	Meth C-1	100K >
CO2	5K > 10	Ethn C-2	100K >
Flare Ht	100 > 10	Prop C-3	100K >
	< 10	Burn C-4	100K >
	< 10	Perm C-5	100K >

WELL SORTED; PREDOM GRAIN SUPPORTED; CALCITE CEMENT; BLACK CARBONACEOUS MATERIAL EMBEDDED; MOD HIGH SPHERICITY; MOD HARD FRIABLE; ABUD TRACES CLEAR XLN CALCITE FILL FRACTURE OBSERVED; VERY HIGH GAS IN SANDSTONE WITH FRACTURE

SHALE=LIGHT MEDIUM GRAY; FIRM MOD HARD DENSE TENACITY; IRREGULAR BLOCKY; PLATY TABULAR OCC WEDGELIKE CUTTINGS HABIT; DULL EARTHY WAXY LUSTER; SMOOTH SLI SILTY TEXTURE; THICK STRUCTURE; SLI CALCAREOUS; INTERBEDDED BROWNISH RED LIGHT GRAY SILTSTONES AND SANDSTONES

CARBONACEOUS SHALE=BROWNISH BLACK; V BRITTLE DENSE TENACITY; IRREGULAR PLANAR FRACTURE; PLATY CUTTINGS HABIT; DULL EARTHY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED WITH GRAY THICK STRUCTURE SHALES AND THIN SANDSTONE STRINGERS; LOW GAS; NO TRACE HYDROCARBONS

SANDSTONE=PREDOM FINE GRAIN TO OCC MEDIUM GRAIN; SUBROUNDED SUBANGULAR; MOD WELL SORTED; PREDOM GRAIN SUPPORTED CALCITE CEMENT; SLOW REACTION TO HCL; TR BLACK CARBONACEOUS MATERIAL EMBEDDED MOD SPHERICITY; GRADING INTO GRAYISH WHITE SANDY SILTSTONE; MOD GAS READINGS INTERBEDDED SHALES AND SILTSTONES

NOTE=17 STAND WIPER TRIP @ 6987' MD

SILTSTONE = BROWNISH GRAY TO PALE BROWN; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING; TABULAR CUTTINGS; EARTHY TO SLIGHTLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THICK TO MASSIVE STRUCTURE.

SHALE = MEDIUM LIGHT TO MEDIUM GRAY WITH OCC PALE BLUE HUE; BRITTLE TO SLIGHTLY DENSE TENACITY; PLANAR TO SPLINTERY FRACTURING; TABULAR TO SCALY CUTTINGS; DULL WAXY LUSTER; SMOOTH TEXTURE; THICK STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY; QUARTZ FRAMEWORK WITH ABUNDANT LOOSE QUARTZ GRAINS; SINE SIZED WITH WELL SORTING; SUBROUNDED WITH MODERATE SPHERICITY; UNCONSOLIDATED; TRACE CALCITE CEMENT; SLOW REACTION WITH HCL.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY; DENSE TO BRITTLE TENACITY; IRREGULAR TO SPLINTERY TO PLANAR FRACTURING; TABULAR CUTTINGS; WAXY DULL LUSTER; SMOOTH TO SILTY TEXTURE; THICK STRUCTURE.

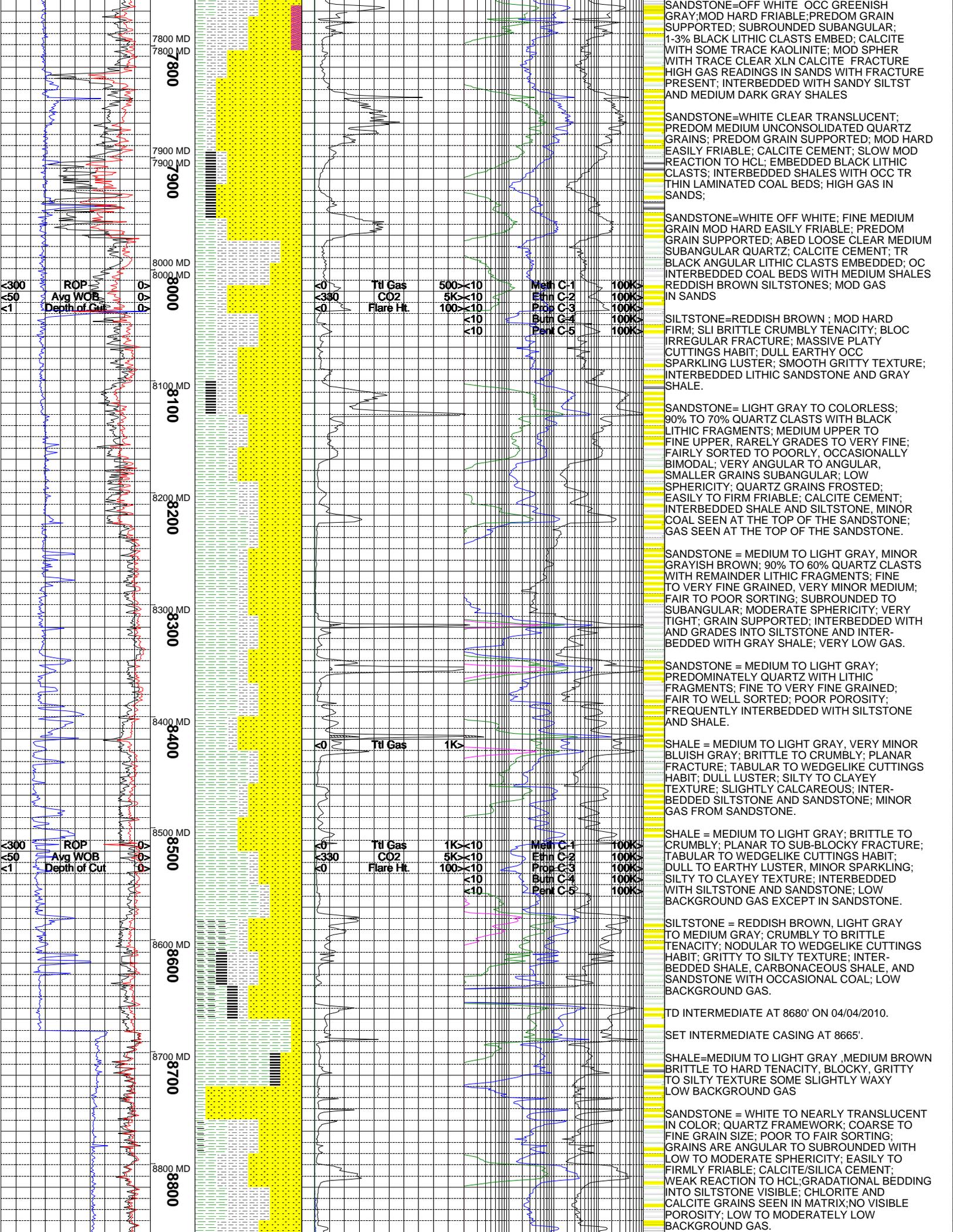
SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT GRAY; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK ANGULAR LITHIC CLASTS; FINE TO MEDIUM SIZED WITH FAIR SORTING; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; GRAIN SUPPORTED; FRIABLE TO FIRMLY FRIABLE; TRACE CALCITE CEMENT; MODERATE REACTION WITH HCL; UNCONSOLIDATED WITH ABUNDANT LOOSE GRAINS.

SHALE = LIGHT TO MEDIUM GRAY; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURING; PLATY TO TABULAR CUTTINGS; DULL TO SLIGHTLY EARTHY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE; INTERBEDDED IN SANDSTONE.

SANDSTONE=CLEAR WHITE TRANSLUCENT; PREDOM GRAIN SUPPORTED WITH 80% MEDIUM UNCONSOLIDATED QUARTZ GRAINS; SUBROUNDED SUBANGULAR; MOD WELL SORTED; CALCITE CMT WITH TRACE KAOLINITE; MOD SPHERICITY; 3-5% BLACK ANGULAR LITHIC CLASTS; OCC TRACE CLEAR CALCITE FILL FRACTURE; HIGH GAS IN SANDS WITH FRACTURE PRESENT VERY HIGH CONNECTION GASES OBSERVED INTERBEDDED WITH SILTSTONES AND GRAY SHALES

SHALE=LIGHT MEDIUM GRAY; HARD MOD FIRM; SLI BRITTLE CRUMBLY TENACITY; BLOCKY IRREGULAR PLANAR FRACTURE; PLATY TABULAR OCC ELONGATED CUTTINGS HABIT; SMOOTH SLI SILTY TEXTURE; GRADING INTO LIGHT GRAY DARK GRAY SANDY SILTSTONE; WITH TRACES OF GRAYISH BROWN XLN LIMESTONE IN SAMPLE LOW GAS IN SHALES, NO TRACE HYDROCARBONS

SILTSTONE=LIGHT GRAYISH WHITE; MOD HARD FIRM; DENSE TENACITY; BLOCKY IRREGULAR FRACTURE; PLATY WEDGELIKE CUTTINGS HABIT DULL EARTHY LUSTER; SMOOTH V VERY SANDY GRITTY TEXTURE; THIN STRUCTURE INTERBEDDED WITH MEDIUM LIGHT GRAY SHALE LOW GAS; NO TRACE HYDROCARBONS



7800 MD
7800 MD
800
7900 MD
7900 MD
900
8000 MD
8000 MD
8100 MD
8100 MD
8200 MD
8200 MD
8300 MD
8300 MD
8400 MD
8400 MD
8500 MD
8500 MD
8600 MD
8600 MD
8700 MD
8700 MD
8800 MD
8800 MD

ROP
Avg WOB
Depth of Cut

ROP
Avg WOB
Depth of Cut

Ttl Gas 500K<10
CO2 5K<10
Flare Ht 100K<10
Meth C-1 100K<
Ethn C-2 100K<
Prop C-3 100K<
Burn C-4 100K<
Perm C-5 100K<

Ttl Gas 1K<

Ttl Gas 1K<10
CO2 5K<10
Flare Ht 100K<10
Meth C-1 100K<
Ethn C-2 100K<
Prop C-3 100K<
Burn C-4 100K<
Perm C-5 100K<

SANDSTONE=OFF WHITE OCC GREENISH GRAY;MOD HARD FRIABLE;PREDOM GRAIN SUPPORTED; SUBROUNDED SUBANGULAR; 1-3% BLACK LITHIC CLASTS EMBED; CALCITE WITH SOME TRACE KAOLINITE; MOD SPHER WITH TRACE CLEAR XLN CALCITE FRACTURE HIGH GAS READINGS IN SANDS WITH FRACTURE PRESENT; INTERBEDDED WITH SANDY SILTST AND MEDIUM DARK GRAY SHALES

SANDSTONE=WHITE CLEAR TRANSLUCENT; PREDOM MEDIUM UNCONSOLIDATED QUARTZ GRAINS; PREDOM GRAIN SUPPORTED; MOD HARD EASILY FRIABLE; CALCITE CEMENT; SLOW MOD REACTION TO HCL; EMBEDDED BLACK LITHIC CLASTS; INTERBEDDED SHALES WITH OCC TR THIN LAMINATED COAL BEDS; HIGH GAS IN SANDS;

SANDSTONE=WHITE OFF WHITE; FINE MEDIUM GRAIN MOD HARD EASILY FRIABLE; PREDOM GRAIN SUPPORTED; ABED LOOSE CLEAR MEDIUM SUBANGULAR QUARTZ; CALCITE CEMENT; TR BLACK ANGULAR LITHIC CLASTS EMBEDDED; OC INTERBEDDED COAL BEDS WITH MEDIUM SHALES REDDISH BROWN SILTSTONES; MOD GAS IN SANDS

SILTSTONE=REDDISH BROWN ; MOD HARD FIRM; SLI BRITTLE CRUMBLY TENACITY; BLOC IRREGULAR FRACTURE; MASSIVE PLATY CUTTINGS HABIT; DULL EARTHY OCC SPARKLING LUSTER; SMOOTH GRITTY TEXTURE; INTERBEDDED LITHIC SANDSTONE AND GRAY SHALE.

SANDSTONE= LIGHT GRAY TO COLORLESS; 90% TO 70% QUARTZ CLASTS WITH BLACK LITHIC FRAGMENTS; MEDIUM UPPER TO FINE UPPER, RARELY GRADES TO VERY FINE; FAIRLY SORTED TO POORLY, OCCASIONALLY BIMODAL; VERY ANGULAR TO ANGULAR, SMALLER GRAINS SUBANGULAR; LOW SPHERICITY; QUARTZ GRAINS FROSTED; EASILY TO FIRM FRIABLE; CALCITE CEMENT; INTERBEDDED SHALE AND SILTSTONE, MINOR COAL SEEN AT THE TOP OF THE SANDSTONE; GAS SEEN AT THE TOP OF THE SANDSTONE.

SANDSTONE = MEDIUM TO LIGHT GRAY, MINOR GRAYISH BROWN; 90% TO 60% QUARTZ CLASTS WITH REMAINDER LITHIC FRAGMENTS; FINE TO VERY FINE GRAINED, VERY MINOR MEDIUM; FAIR TO POOR SORTING; SUBROUNDED TO SUBANGULAR; MODERATE SPHERICITY; VERY TIGHT; GRAIN SUPPORTED; INTERBEDDED WITH AND GRADES INTO SILTSTONE AND INTERBEDDED WITH GRAY SHALE; VERY LOW GAS.

SANDSTONE = MEDIUM TO LIGHT GRAY; PREDOMINATELY QUARTZ WITH LITHIC FRAGMENTS; FINE TO VERY FINE GRAINED; FAIR TO WELL SORTED; POOR POROSITY; FREQUENTLY INTERBEDDED WITH SILTSTONE AND SHALE.

SHALE = MEDIUM TO LIGHT GRAY, VERY MINOR BLUISH GRAY; BRITTLE TO CRUMBLY; PLANAR FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; DULL LUSTER; SILTY TO CLAYEY TEXTURE; SLIGHTLY CALCAREOUS; INTERBEDDED SILTSTONE AND SANDSTONE; MINOR GAS FROM SANDSTONE.

SHALE = MEDIUM TO LIGHT GRAY; BRITTLE TO CRUMBLY; PLANAR TO SUB-BLOCKY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; DULL TO EARTHY LUSTER, MINOR SPARKLING; SILTY TO CLAYEY TEXTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE; LOW BACKGROUND GAS EXCEPT IN SANDSTONE.

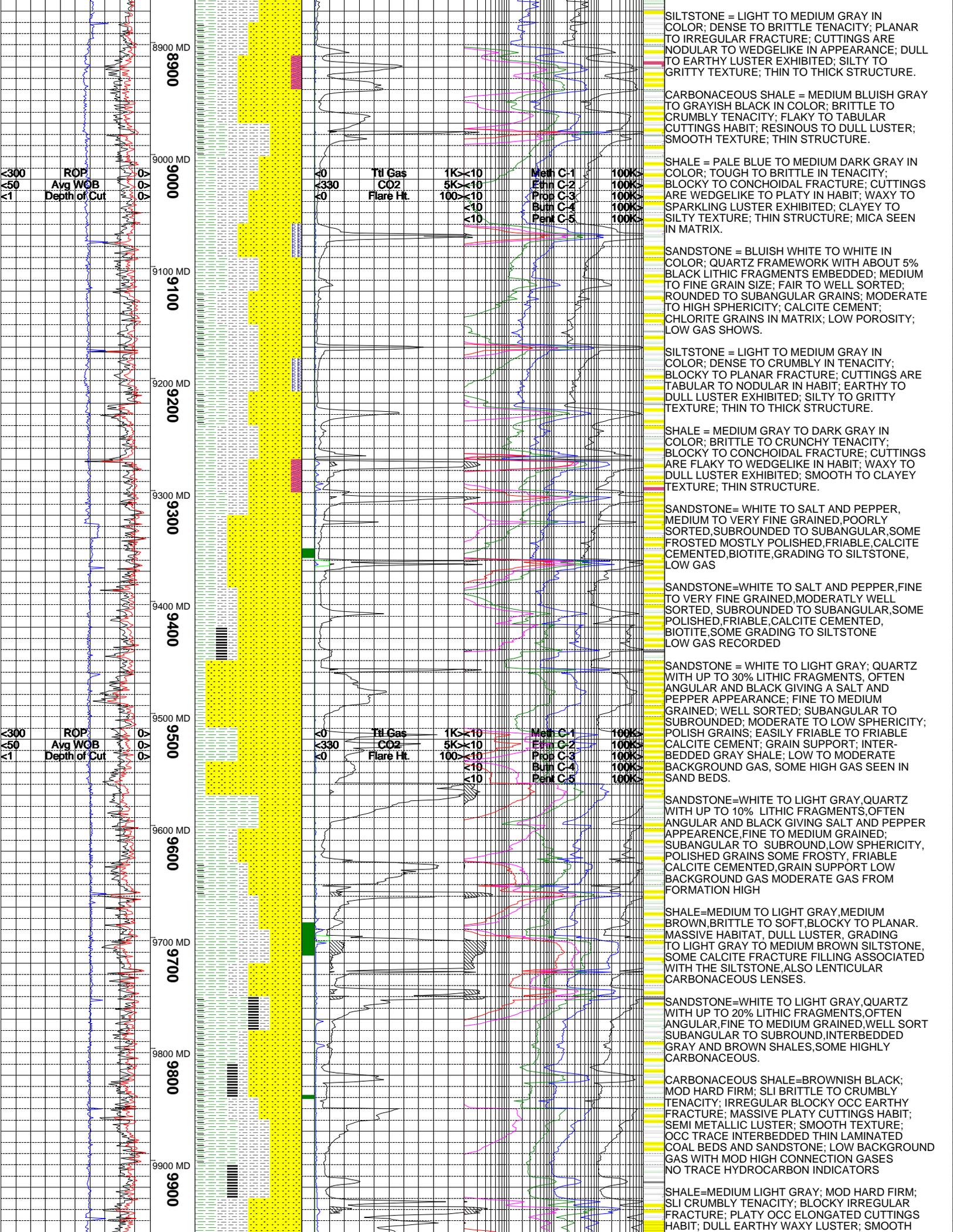
SILTSTONE = REDDISH BROWN, LIGHT GRAY TO MEDIUM GRAY; CRUMBLY TO BRITTLE TENACITY; NODULAR TO WEDGELIKE CUTTINGS HABIT; GRITTY TO SILTY TEXTURE; INTERBEDDED SHALE, CARBONACEOUS SHALE, AND SANDSTONE WITH OCCASIONAL COAL; LOW BACKGROUND GAS.

TD INTERMEDIATE AT 8680' ON 04/04/2010.

SET INTERMEDIATE CASING AT 8665'.

SHALE=MEDIUM TO LIGHT GRAY ,MEDIUM BROWN BRITTLE TO HARD TENACITY, BLOCKY, GRITTY TO SILTY TEXTURE SOME SLIGHTLY WAXY LOW BACKGROUND GAS

SANDSTONE = WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK; COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; EASILY TO FIRMLY FRIABLE; CALCITE/SILICA CEMENT; WEAK REACTION TO HCL;GRADATIONAL BEDDING INTO SILTSTONE VISIBLE; CHLORITE AND CALCITE GRAINS SEEN IN MATRIX;NO VISIBLE POROSITY; LOW TO MODERATELY LOW BACKGROUND GAS.



SILTSTONE = LIGHT TO MEDIUM GRAY IN COLOR; DENSE TO BRITTLE TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS ARE NODULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

CARBONACEOUS SHALE = MEDIUM BLuish GRAY TO GRAYISH BLACK IN COLOR; BRITTLE TO CRUMBLY TENACITY; FLAKY TO TABULAR CUTTINGS HABIT; RESINOUS TO DULL LUSTER; SMOOTH TEXTURE; THIN STRUCTURE.

SHALE = PALE BLUE TO MEDIUM DARK GRAY IN COLOR; TOUGH TO BRITTLE IN TENACITY; BLOCKY TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO PLATY IN HABIT; WAXY TO SPARKLING LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; THIN STRUCTURE; MICA SEEN IN MATRIX.

SANDSTONE = BLuish WHITE TO WHITE IN COLOR; QUARTZ FRAMEWORK WITH ABOUT 5% BLACK LITHIC FRAGMENTS EMBEDDED; MEDIUM TO FINE GRAIN SIZE; FAIR TO WELL SORTED; ROUNDED TO SUBANGULAR GRAINS; MODERATE TO HIGH SPHERICITY; CALCITE CEMENT; CHLORITE GRAINS IN MATRIX; LOW POROSITY; LOW GAS SHOWS.

SILTSTONE = LIGHT TO MEDIUM GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; TABULAR TO PLANAR FRACTURE; CUTTINGS ARE TABULAR TO NODULAR IN HABIT; EARTHY TO DULL LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE.

SHALE = MEDIUM GRAY TO DARK GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO CONCHOIDAL FRACTURE; CUTTINGS ARE FLAKY TO WEDGELIKE IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO SALT AND PEPPER, MEDIUM TO VERY FINE GRAINED, POORLY SORTED, SUBROUNDED TO SUBANGULAR, SOME FROSTED MOSTLY POLISHED, FRIABLE, CALCITE CEMENTED, BIOTITE, GRADING TO SILTSTONE, LOW GAS

SANDSTONE = WHITE TO SALT AND PEPPER, FINE TO VERY FINE GRAINED, MODERATLY WELL SORTED, SUBROUNDED TO SUBANGULAR, SOME POLISHED, FRIABLE, CALCITE CEMENTED, BIOTITE, SOME GRADING TO SILTSTONE, LOW GAS RECORDED

SANDSTONE = WHITE TO LIGHT GRAY; QUARTZ WITH UP TO 30% LITHIC FRAGMENTS, OFTEN ANGULAR AND BLACK GIVING A SALT AND PEPPER APPEARANCE; FINE TO MEDIUM GRAINED; WELL SORTED; SUBANGULAR TO SUBROUNDED; MODERATE TO LOW SPHERICITY; POLISH GRAINS; EASILY FRIABLE TO FRIABLE CALCITE CEMENT; GRAIN SUPPORT; INTERBEDDED GRAY SHALE; LOW TO MODERATE BACKGROUND GAS, SOME HIGH GAS SEEN IN SAND BEDS.

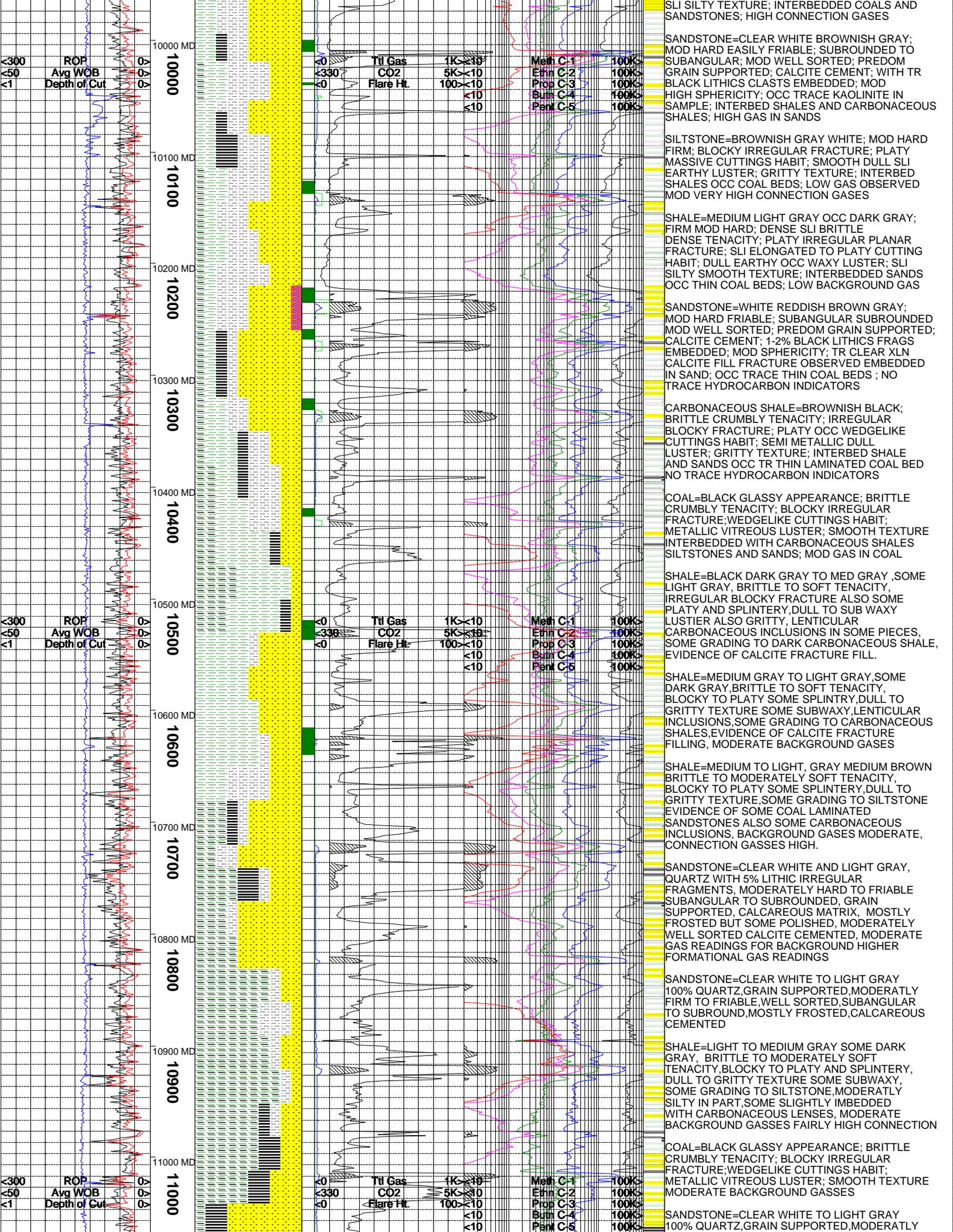
SANDSTONE = WHITE TO LIGHT GRAY, QUARTZ WITH UP TO 10% LITHIC FRAGMENTS, OFTEN ANGULAR AND BLACK GIVING SALT AND PEPPER APPEARANCE, FINE TO MEDIUM GRAINED; SUBANGULAR TO SUBROUND, LOW SPHERICITY, POLISHED GRAINS SOME FROSTY, FRIABLE CALCITE CEMENTED, GRAIN SUPPORT LOW BACKGROUND GAS MODERATE GAS FROM FORMATION HIGH

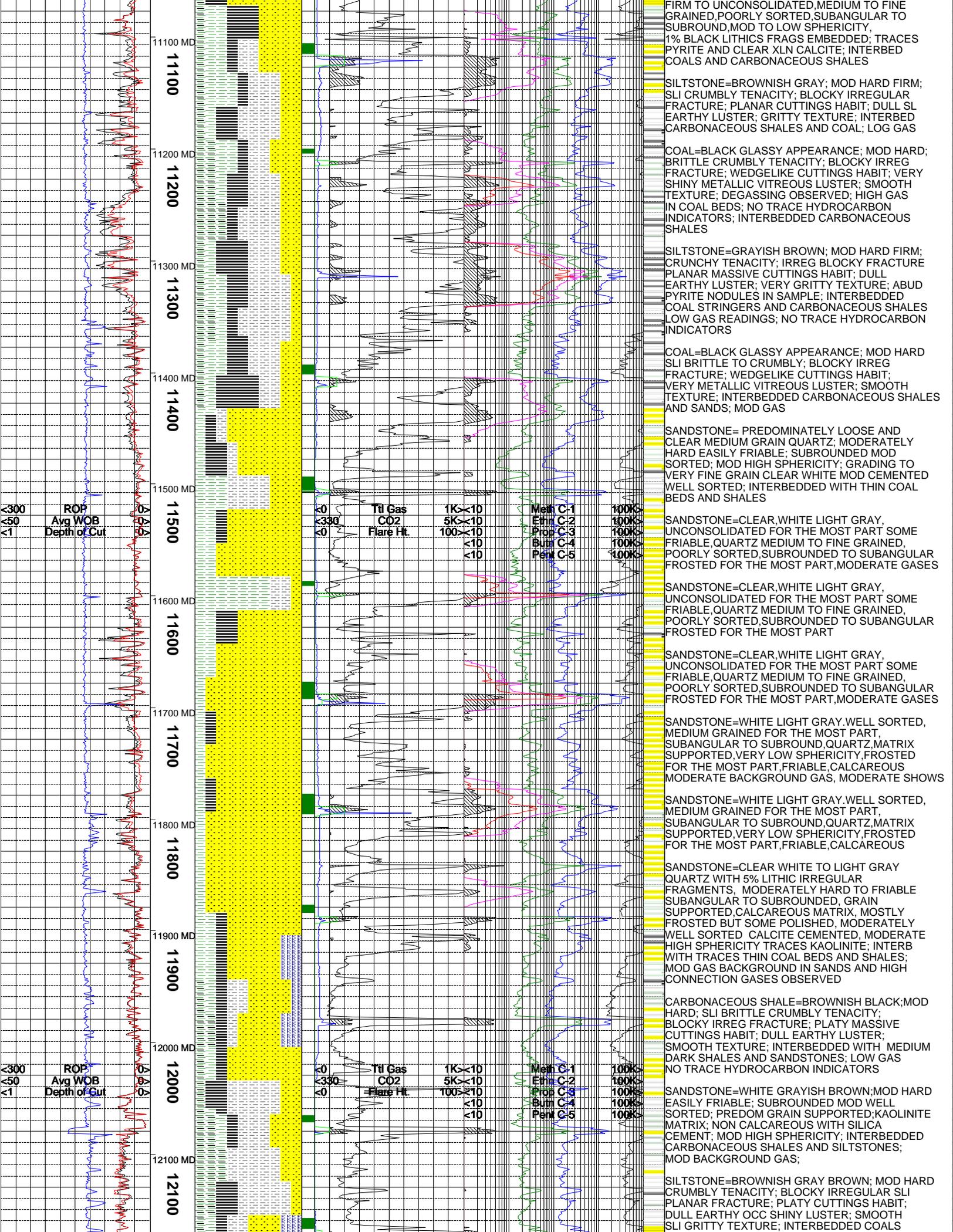
SHALE = MEDIUM TO LIGHT GRAY, MEDIUM BROWN, BRITTLE TO SOFT, BLOCKY TO PLANAR. MASSIVE HABITAT, DULL LUSTER, GRADING TO LIGHT GRAY TO MEDIUM BROWN SILTSTONE, SOME CALCITE FRACTURE FILLING ASSOCIATED WITH THE SILTSTONE, ALSO LENTICULAR CARBONACEOUS LENSES.

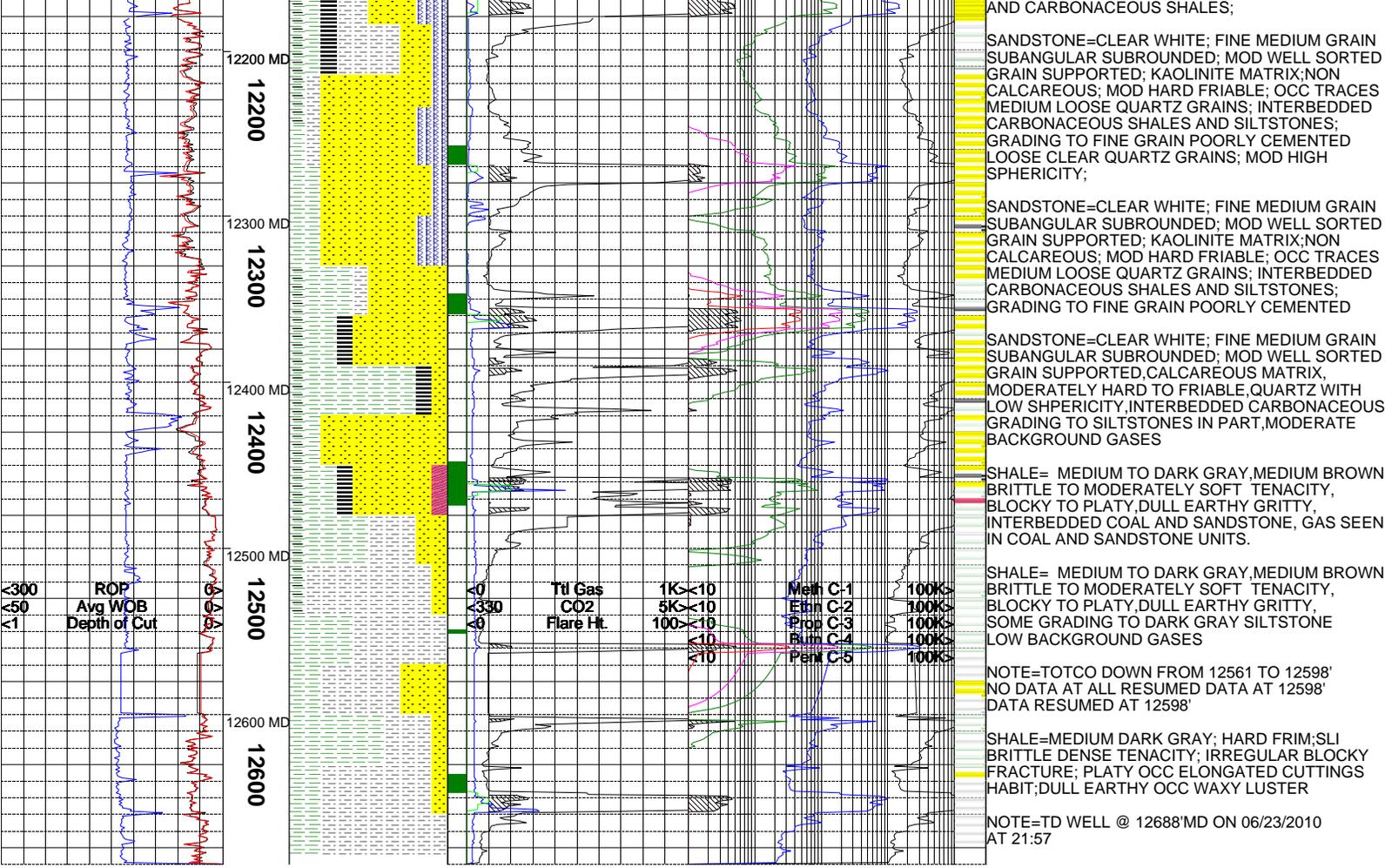
SANDSTONE = WHITE TO LIGHT GRAY, QUARTZ WITH UP TO 20% LITHIC FRAGMENTS, OFTEN ANGULAR, FINE TO MEDIUM GRAINED, WELL SORT SUBANGULAR TO SUBROUND, INTERBEDDED GRAY AND BROWN SHALES, SOME HIGHLY CARBONACEOUS.

CARBONACEOUS SHALE = BROWNISH BLACK; MOD HARD FIRM; SLI BRITTLE TO CRUMBLY TENACITY; IRREGULAR BLOCKY OCC EARTHY FRACTURE; MASSIVE PLATY CUTTINGS HABIT; SEMI METALLIC LUSTER; SMOOTH TEXTURE; OCC TRACE INTERBEDDED THIN LAMINATED COAL BEDS AND SANDSTONE; LOW BACKGROUND GAS WITH MOD HIGH CONNECTION GASES NO TRACE HYDROCARBON INDICATORS

SHALE = MEDIUM LIGHT GRAY; MOD HARD FIRM; SLI CRUMBLY TENACITY; BLOCKY IRREGULAR FRACTURE; PLATY OCC ELONGATED CUTTINGS HABIT; DULL EARTHY WAXY LUSTER; SMOOTH







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