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## MUDLOG TVD

<b>COMPANY</b>	ExxonMobil Production
<b>WELL</b>	FRU 197-33B6
<b>FIELD</b>	Piceance Creek
<b>REGION</b>	Rockies
<b>COORDINATES</b>	39.921441 108.282516
<b>ELEVATION</b>	6459'
<b>COUNTY, STATE</b>	Rio Blanco, CO
<b>API INDEX</b>	051031142400
<b>SPUD DATE</b>	03/30/2010
<b>CONTRACTOR</b>	HE
<b>CO. REP.</b>	W.GARNER/ C.CURTIS
<b>RIG/TYPE</b>	HP321
<b>LOGGING UNIT</b>	MLU#31
<b>GEOLOGISTS</b>	M.FRANCO/C.RECORD B.DELANEY
<b>ADD. PERSONS</b>	M.PIPER/ R.MCCANE
<b>CO. GEOLOGIST</b>	CHRIS ALBA

### LOG INTERVAL

<b>DEPTHS:</b>	4045'	<b>TO</b>	12776'
<b>DATES:</b>	07/05/2010	<b>TO</b>	07/17/2010
<b>SCALE:</b>	1" = 100'		

### CASING DATA

16"	<b>AT</b>	149'
10.75"	<b>AT</b>	4045'
4"	<b>AT</b>	12776'

**AT**

### HOLE SIZE

14.00"	<b>TO</b>	4055'
10.00"	<b>TO</b>	10343'
8.15"	<b>TO</b>	12776'
	<b>TO</b>	

### MUD TYPES

WATER-BASED	<b>TO</b>	4055'
LSND	<b>TO</b>	12776'
	<b>TO</b>	
	<b>TO</b>	

### 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
	ANDESITE
	ANHYDRITE
	BASALT
	BENTONITE
	BIOTITIZATION
	BRECCIA
	CALCARENITE
	CALCAREOUS TUFF
	CALCILUTITE
	CARBONATES
	CARBONACEOUS MAT
	CARBONACEOUS SH
	CEMENT CONTAM.
	CHALK
	CRYSTALLINE TUFF
	CHERT - ARGILL

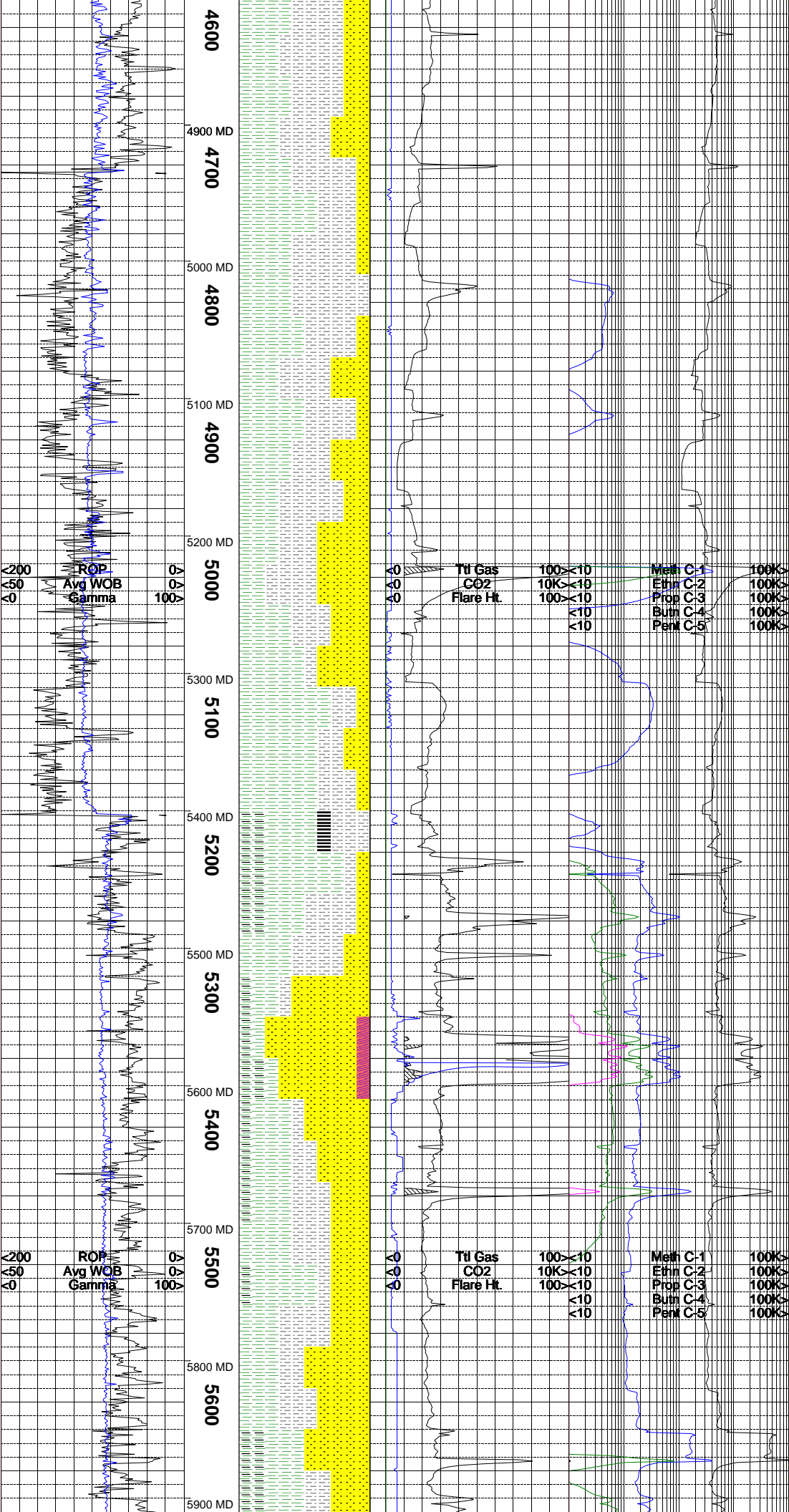
	CHERT - GLASSY
	CHERT - PORCEL
	CHERT - TIGER STRIPE
	CHERT - UNDIFF
	CLAY
	CLAY-MUDSTONE
	CLYST-TUFFACEOUS
	CHLORITIZATION
	COAL
	CONGLOMERATE
	CONGL. SAND
	CONGL. SANDSTONE
	COQUINA
	DACITE
	DIATOMITE
	DIORITE
	DOLOSTONE

	FELSIC SILIC DIKE
	FOSSIL
	GABBRO
	GLASSY TUFF
	GRANITE
	GRANITE WASH
	GRANODIORITE
	GYPSUM
	HALITE
	HORNBL-QTZ-DIO
	IGNEOUS (ACIDIC)
	IGNEOUS (BASIC)
	INTRUSIVES
	KAOLINITIC
	LIMESTONE
	LITHIC TUFF
	MARL - DOLO

	MARL - CALC
	METAMORPHICS
	MUDSTONE
	OBSIDIAN
	PALEOSOL
	PHOSPHATE
	PORCELANITE
	PORCELANEOUS CLYST
	PYRITE
	PYROCLASTICS
	QUARTZ DIORITE
	QUARTZ LATITE
	QUARTZ MONZONITE
	RECRYSTALLIZED CALCITE
	RHYOLITE
	SALT
	SAND

	SANDSTONE
	SANDSTONE-TUFFACEOUS
	SERICITIZATION
	SERPENTINE
	SHALE
	SHALE TUFFACEOUS
	SHELL FRAGMENTS
	SIDERITE
	SILICIFICATION
	SILTSTONE
	SILTST-TUFFACEOUS
	TUFF
	VOLCANICLASTICS SEDS
	VOLCANICS

[illegible]



FRAMEWORK WITH APPROXIMATELY 5-10% BLACK LITHIC CLASTS; FINE GRAINED AND WELL SORTED; SUBANGULAR; LOW TO MODERATE SPHERICITY; MODERATE HARD TO FIRMLY FRIABLE; MODERATE TO WEAK REACTION SUGGESTS CALCITE CEMENT; SMALL AMOUNTS OF WHITE KAOLINITIC MATRIX; NO VISIBLE BEDDING; OCCASIONAL DARK YELLOWISH ORANGE HUES.

SILTSTONE = MEDIUM GRAY TO LIGHT BROWNISH GRAY TO MODERATE OLIVE BROWN TO MODERATE BROWN; TENACITY IS MOSTLY BRITTLE TO OFTEN CRUMBLY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE SLIGHTLY MASSIVE TO TABULAR; EARTHY TO SLIGHTLY FROSTED LUSTER; GRITTY TO SILTY TEXTURE; GRADING FROM SANDSTONE; MASSIVE TO THICK STRUCTURE; LOW GAS ASSOCIATED WITH SAMPLE.

SANDSTONE = TRANSLUCENT TO GRAYISH ORANGE PINK TO LIGHT OLIVE GRAY; DOMINATE QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF VERY FINE BLACK CLASTS; MOSTLY FINE GRAINED WITH OCCASIONAL MEDIUM GRAINS; WELL TO FAIR SORTED; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; MODERATE HARD; SLIGHT TO MODERATE REACTION WITH HCL SUGGESTS SOME CALCITE CEMENT; GRAIN SUPPORTED WITH OCCASIONAL FRAGMENTS DISPLAYING A WHITE KAOLINITIC MATRIX; INCREASING AMOUNT OF LOOSE GRAINS IN SAMPLE.

SHALE = MEDIUM BLUSH GRAY TO GRAYISH GREEN TO MEDIUM GRAY WITH LIGHT OLIVE BROWN TO MEDIUM YELLOW STREAKS; BRITTLE TO SLIGHTLY CRUMBLY TENACITY; PLANAR TO SUB BLOCKY; TABULAR TO PLATY TO SLIGHTLY WEDGELIKE IN HABIT; DULL EARTHY TO SEMI WAXY LUSTER; PREDOMINATELY SMOOTH TO CLAYEY TO SLIGHT MATTE IN TEXTURE; 2-5% PALEOSOLS VISIBLE IN SAMPLE; NO OTHER VISIBLE BEDDING FEATURES.

SILTSTONE = VERY LIGHT GRAY TO LIGHT BLUISH GRAY TO MEDIUM BLUISH GRAY; CRUNCHY TO CRUMBLY TENACITY; PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO SLIGHT WEDGELIKE TO SEMI TABULAR IN HABIT; SLIGHT FROSTED TO SEMI TO SLIGHT GREASY LUSTER; GRITTY TO SILTY TEXTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK OLIVE GRAY; CRUNCHY TO CRUMBLY TO OCCASIONALLY STIFF TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY FRACTURING; VISIBLE BEDS OF CARBONACEOUS MATERIAL; VISIBLE VEINS OF PYRITE IN SAMPLE; CUTTINGS TEND TO BE WEDGELIKE TO SEMI TABULAR IN HABIT; FROSTED TO EARTHY LUSTER; TEXTURE RANGES FROM SMOOTH TO SILTY; THICK STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM LIGHT GRAY; DOMINANT QUARTZ FRAMEWORK WITH APPROXIMATELY 10% FINE BLACK LITHIC CLASTS EMBEDDED; COARSE TO FINE GRAINED WITH POOR SORTING; ANGULAR TO VERY ANGULAR WITH LOW SPHERICITY; EASILY FRIABLE TO MODERATELY FRIABLE; STRONG TO MODERATE REACTION WITH HCL SUGGESTS CALCITE CEMENT; MATRIX SUPPORTED WITH CALCITE MATRIX; ABUNDANT PYRITE IN SAMPLE AS AN ACCESSORY MINERAL; NO VISIBLE BEDDING.

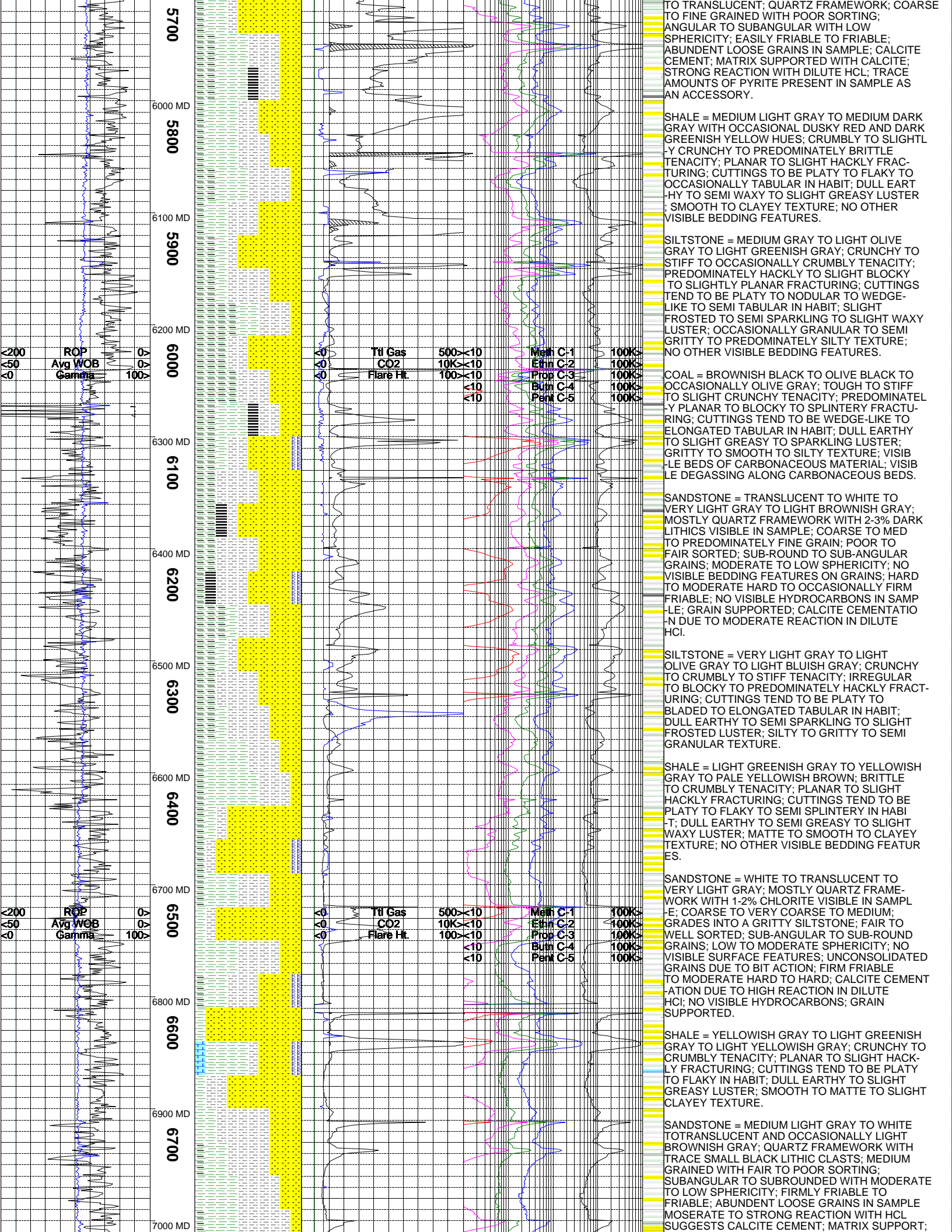
SHALE = PALE BLUE TO MEDIUM BLUISH GRAY TO MEDIUM GRAY; BRITTLE TO SLIGHTLY CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SLIGHTLY SPLINTERY; CUTTINGS ARE PLATY TO FLAKY TO SEMI TABULAR; WAXY TO DULL LUSTER; SILTY TO SMOOTH TEXTURE; GRADING FROM SILTSTONE; OCCASIONAL DUSKY RED AND DARK GREENISH YELLOW HUES OBSERVED ON SOME OF THE SAMPLE; THICK STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO MODERATE BROWN TO MODERATE OLIVE BROWN; CRUMBLY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE TABULAR TO SLIGHTLY MASSIVE HABIT; EARTHY TO WAXY LUSTER; TEXTURE MOSTLY RANGES FROM GRITTY TO SILTY AND OCCASIONALLY SLIGHTLY CLAYEY; THICK STRUCTURE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK; DENSE TO BRITTLE WITH OCCASIONALLY A SLIGHTLY CRUMBLY TENACITY IRREGULAR TO PLANAR TO SUB BLOCKY FRACTURING; WEDGELIKE CUTTINGS; POLISHED TO EARTHY LUSTER; TEXTURE IS SMOOTH TO SILTY; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE; SHALE AND SILTSTONE.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY





6680 7100 MD 6900 7200 MD 7000 7300 MD 7100 7400 MD 7200 7500 MD 7300 7600 MD 7400 7700 MD 7500 7800 MD 7600 7900 MD 7700 8000 MD 7800 8100 MD

ROP  
Avg WOB  
Gamma

Ttl Gas  
CO2  
Flare Ht.

500>  
10K>  
100>  
<10

Meth C-1  
Ethn C-2  
Prop C-3  
Butn C-4  
Pent C-5

100K  
100K  
100K  
100K  
100K

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONALLY MEDIUM GRAY; PREDOMINATELY BRITTLE TO CRUMBLY TO SLIGHTLY CRUNCHY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI SPLINTERY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO OCCASIONALLY TABULAR TO WEDGE-LIKE IN HABIT; DULL EARTHY TO GREASY TO SEMI-RESINOUS LUSTER; MATTE TO PREDOMINATELY SMOOTH TO CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SILSTONE - LIGHT OLIVE GRAY TO BROWNISH TO MEDIUM GRAY; CRUNCHY TO STIFF TO TOUGH TENACITY; IRREGULAR TO PLANAR TO PRE-DOMINATELY HACKLY FRACTURING; CUTTINGS TEND TO BE TABULAR TO ELONGATED WEDGE-LIKE IN HABIT; SPARKLING TO SLIGHT GREAS-Y TO SEMI FROSTED LUSTER; OCCASIONALLY GRANULAR TO GRITTY TO SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

OHIO CREEK SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY; 3-5% DARK LITHICS VISIBLE IN THE SAMPLE; VERY COARSE TO MEDIUM TO PREDOMINATELY COARSE GRAIN SIZE; FAIR TO WELL SORTED; SUB-ANGULAR TO SUB-ROUND GRAINS; MODERATE TO HIGH SPHERICITY; GRAINS HAVE A SLIGHT POLISH APPEARANCE; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; FIRM FRIABLE TO MODERATELY HARD; GRAIN SUPPORTED; CALCITIC CEMENTATION DUE TO HIGH REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE; GRAIN SUPPORTED; MOSTLY QUARTZ FRAMEWORK.

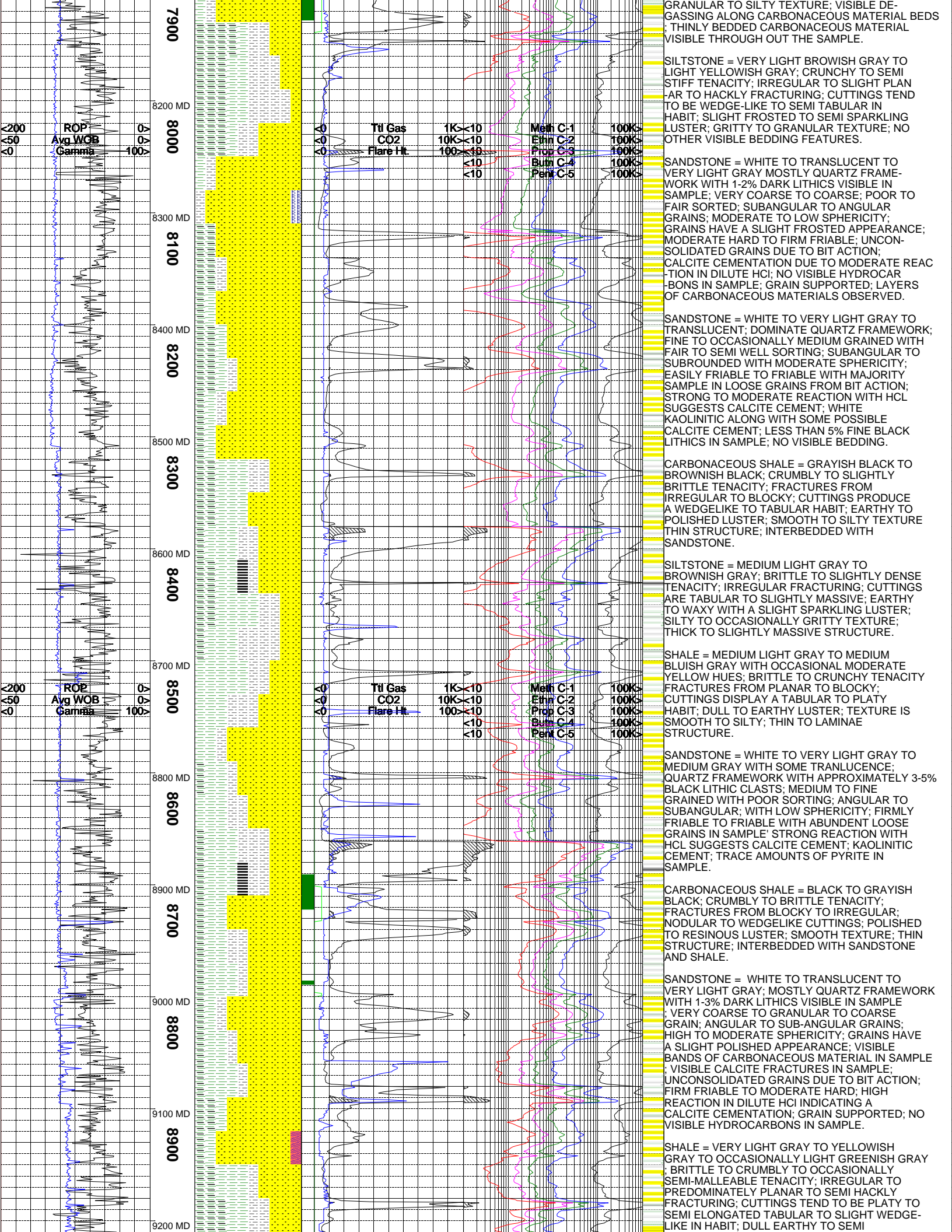
SHALE = LIGHT GREENISH GRAY TO LIGHT BL  
-UISH GRAY TO VERY LIGHT GRAY; BRITTLE  
TO CRUMBLY TENACITY; PREDOMINATELY  
PLANAR TO SLIGHT BLOCKY FRACTURING; CUT-  
TINGS TEND TO BE PLATY TO FLAKY TO SLIGH-  
-T BLADED IN HABIT; DULL EARTHY TO SEMI-  
WAXY TO SLIGHT GREASY LUSTER; CLAYEY TO  
SMOOTH TO MATTE TEXTURE; THIN BEDS OF  
CARBONACEOUS MATERIAL VISIBLE THROUGH-  
OUT THE SAMPLE; NO OTHER VISIBLE BEDDING  
FEATURES.

LIMESTONE = LIGHT BROWNISH GRAY TO LIGHT OLIVE GRAY TO SEMI GREENISH GRAY; TOUGH TO STIFF TENACITY; DISSOLVES READILY IN DILUTE HCl; IRREGULAR TO HACKLY TO SEMI SPLINTERY FRACTURING; CUTTINGS TEND TO BE ELONGATE TABULAR TO WEDGE-LIKE TO PREDOMINATELY NODULAR IN HABIT; SPARKLING TO SLIGHT FROSTED TO SEMI WAXY TO SLIGHT RESINOUS LUSTER; MATTE TO CRYSTALLINE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

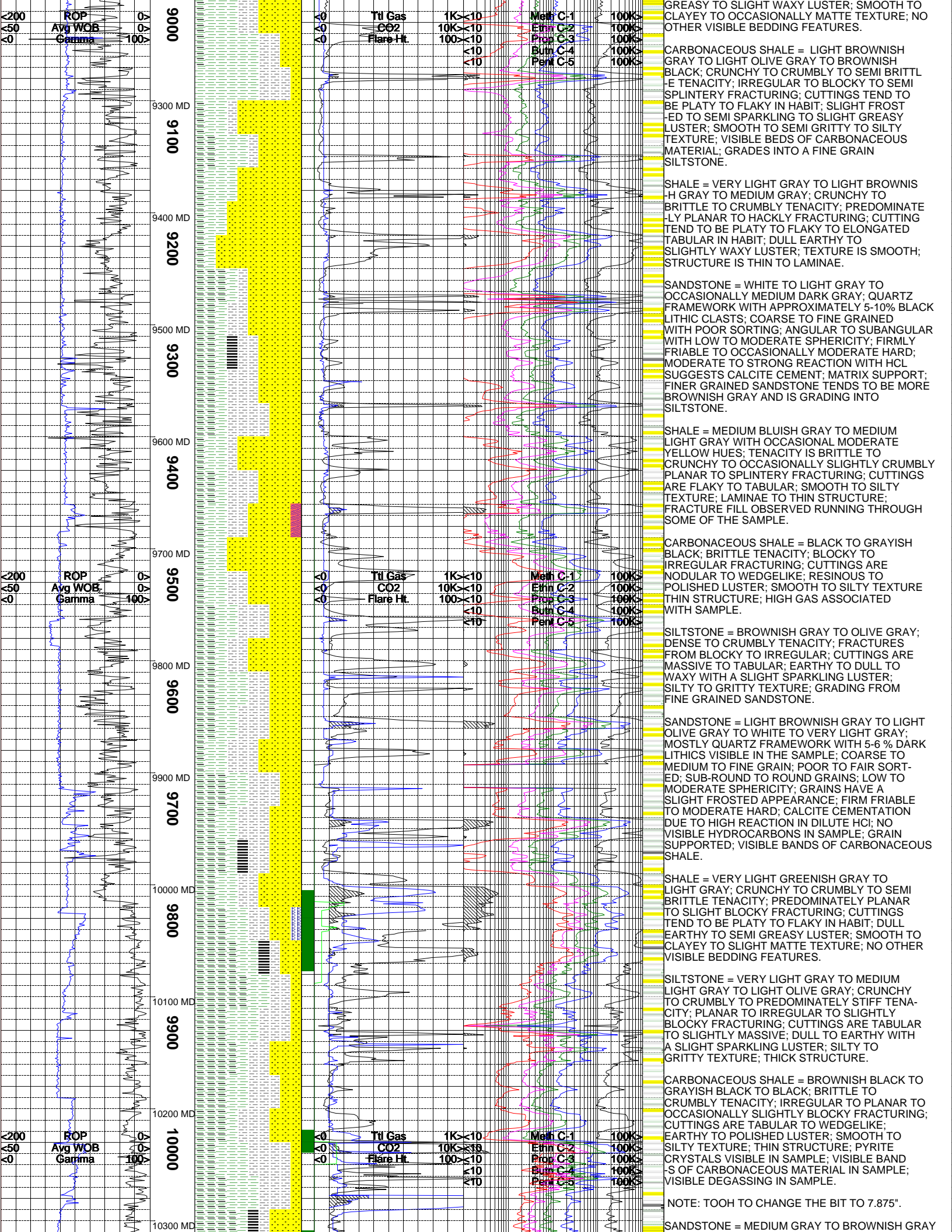
SHALE = LIGHT GREENISH GRAY TO VERY LIGHT GRAY; BRITTLE TO CRUMBLY TO OCCASIONALLY CRUNCHY TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO OCCASIONALLY TABULAR IN HABIT; DULL EARTHY TO SEMI GREASY LUSTER; CLAYEY TO SMOOTH TO PREDOMINATELY MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

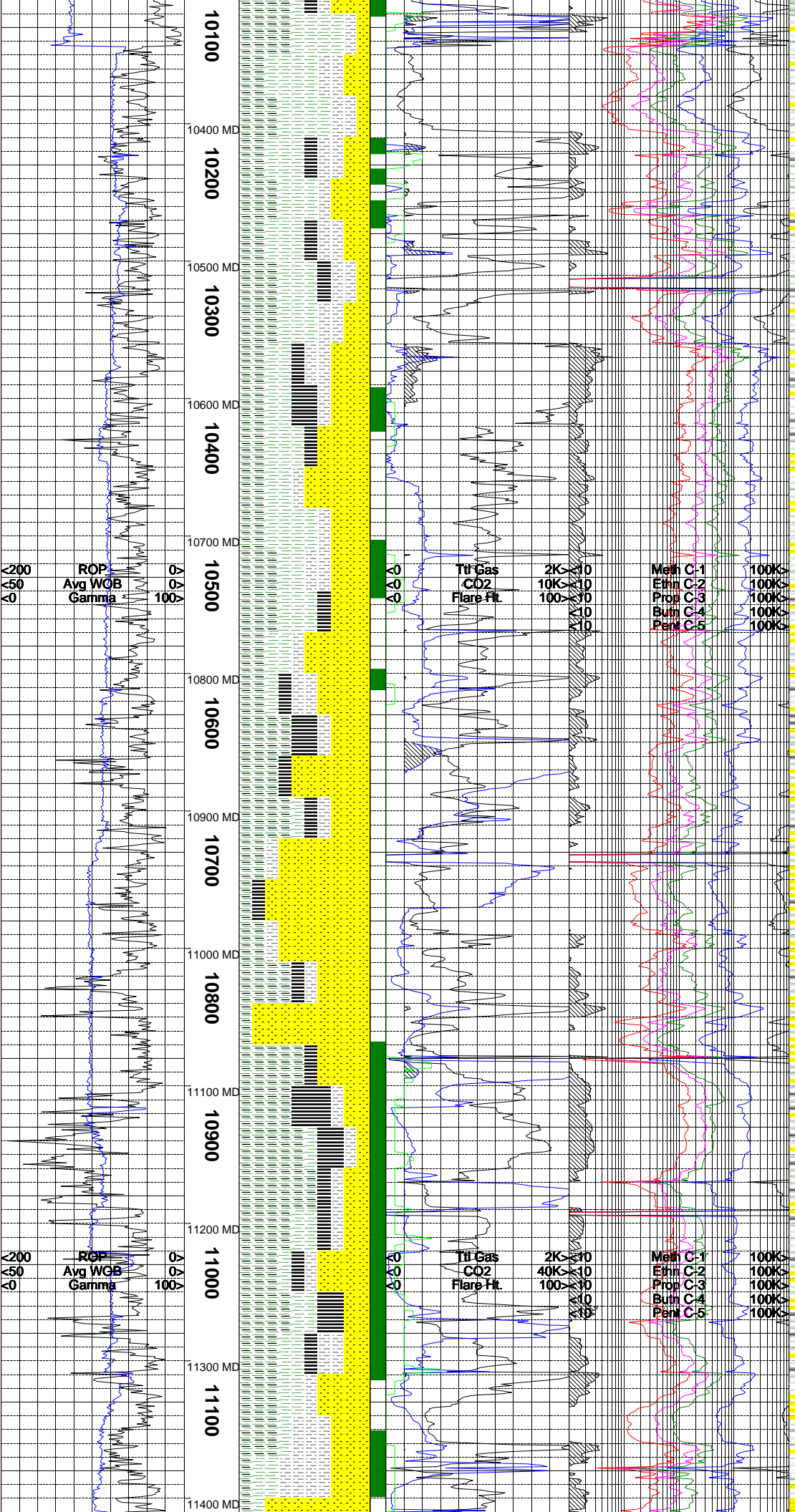
SANDSTONE = WHITE TO VERY LIGHT GRAY TO LIGHT GRAY WITH A FEW LIGHT GREENISH GRAY; MOSTLY QUARTZ FRAME-WORK; VISIBLE CHLORITE CRYSTALS AND 5-6% CARBONACEOUS MATERIAL VISIBLE IN SAMPLE; VERY COARSE TO COARSE; POOR TO FAIR SORTED; SUB-ANGULAR TO ANGULAR GRAINS; MODERATE TO HIGH SPHERICITY; NO VISIBLE SURFACE FEATURES; FIRM FRIABLE TO FRIABLE TO OCCASIONAL MODERATE HARD; GRAIN SUPPORTED; NO VISIBLE HYDROCARBONS; CALCITE CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl.

CARBONEOUS SHALE = OLIVE GRAY TO MEDIUM GRAY TO OCCASIONALLY MEDIUM DARK GRAY; CRUNCHY TO CRUMBLY TO SEMI BRITTLE TENACITY; VISIBLE BEDS OF CARBONEOUS MATERIAL; IRREGULAR TO SLIGHT PLANAR TO BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY IN HABIT; DULL TO SPARKLING TO SEMI METALLIC TO SLIGHT FROSTED LUSTER; GRITTY TO OCCASIONALLY









QUARTZ FRAMEWORK WITH FINE TO VERY FINE GRAINS; WELL SORTED; SUBROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; MODERATE HARD TO SLIGHTLY FIRMLY FRIABLE GRAIN SUPPORTED; SLIGHT REACTION WITH HCL SUGGESTS COME CALCITE CEMENT; NO VISIBLE BEDDING; THIN LAYERS OF CARBONACEOUS SHALE CAN OCCASIONALLY BE SEEN IN SOME OF THE SAMPLE; CONTAINS TRACE AMOUNTS OF PYRITE AS ACCESSORY.

COAL = BLACK; TENACITY IS SLIGHTLY BRITTLE TO MOSTLY CRUMBLY TO PULVERULENT FRACTURES FROM PLANAR TO BLOCKY; CUTTINGS ARE WEDGE LIKE TO NODULAR; POLISHED TO RESINOUS TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK; TENACITY IS BRITTLE TO SLIGHTLY DENSE; FRACTURES FROM PLANAR TO SEMI BLOCKY; CUTTINGS DISPLAY A PLATY TO TABULAR HABIT; WAXY TO EARTHY LUSTER; TEXTURE IS SMOOTH TO SILTY TO OCCASIONALLY CLAYEY; THICK STRUCTURE; HIGH GAS ASSOCIATED WITH SAMPLE.

SHALE = GREENISH GRAY TO PALE BLUE TO MEDIUM DARK GRAY WITH OCCASIONAL DARK GREENISH YELLOW HUES; TENACITY IS BRITTLE TO CRUMBLY; FRACTURES FROM SPLINTERY TO PLANAR; CUTTINGS ARE PLATY TO FLAKY; DULL WAXY LUSTER; SMOOTH TO SILTY TEXTURE; THICK STRUCTURE.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH GRAY TO MODERATE OLIVE BROWN; DENSE TO BRITTLE TENACITY; BLOCKY TO PLANAR FRACTURING; CUTTINGS ARE TABULAR TO SLIGHTLY PLATY; EARTHY TO DULL TO SLIGHTLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; STHIN STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAME WORK WITH 1-3% DARK LITHICS VISIBLE IN THE SAMPLE; VERY COARSE TO COARSE TO MEDIUM GRAIN SIZE; FAIR TO POORLY SORTED ; SUB-ANGULAR TO SUB-ROUND GRAINS; HIGH TO MODERATE SPHERICITY; NO VISIBLE SURFACE FEATURES; FIRM FRIABLE TO MODERATE HARD; GRAIN SUPPORTED; NO VISIBLE HYDRO-CARBONS IN SAMPLE; CALCITE CEMENTATION DUE TO MODERATE TO HIGH REACTION DILUTE HCl.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO MEDIUM DARK GRAY; CRUNCHY TO CRUMBLY TO SLIGHT BRITTLE TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY TO SEMI SPLINTERY CUTTINGS HABIT; CUTTINGS TEND TO BE WEDGE-LIKE TO SEMI ELONGATED TABULAR TO PLATY CUTTINGS HABIT; GREASY TO OCCASIONALLY SPARKLING TO DULL EARTHY TO SEMI WAXY LUSTER; PREDOMINATELY GRITTY TO SILTY TO SLIGHT MATTE TEXTURE; VISIBLE DEGASSING ALONG CARBONACEOUS MATERIAL BEDS; MASSIVE STRUCTURES.

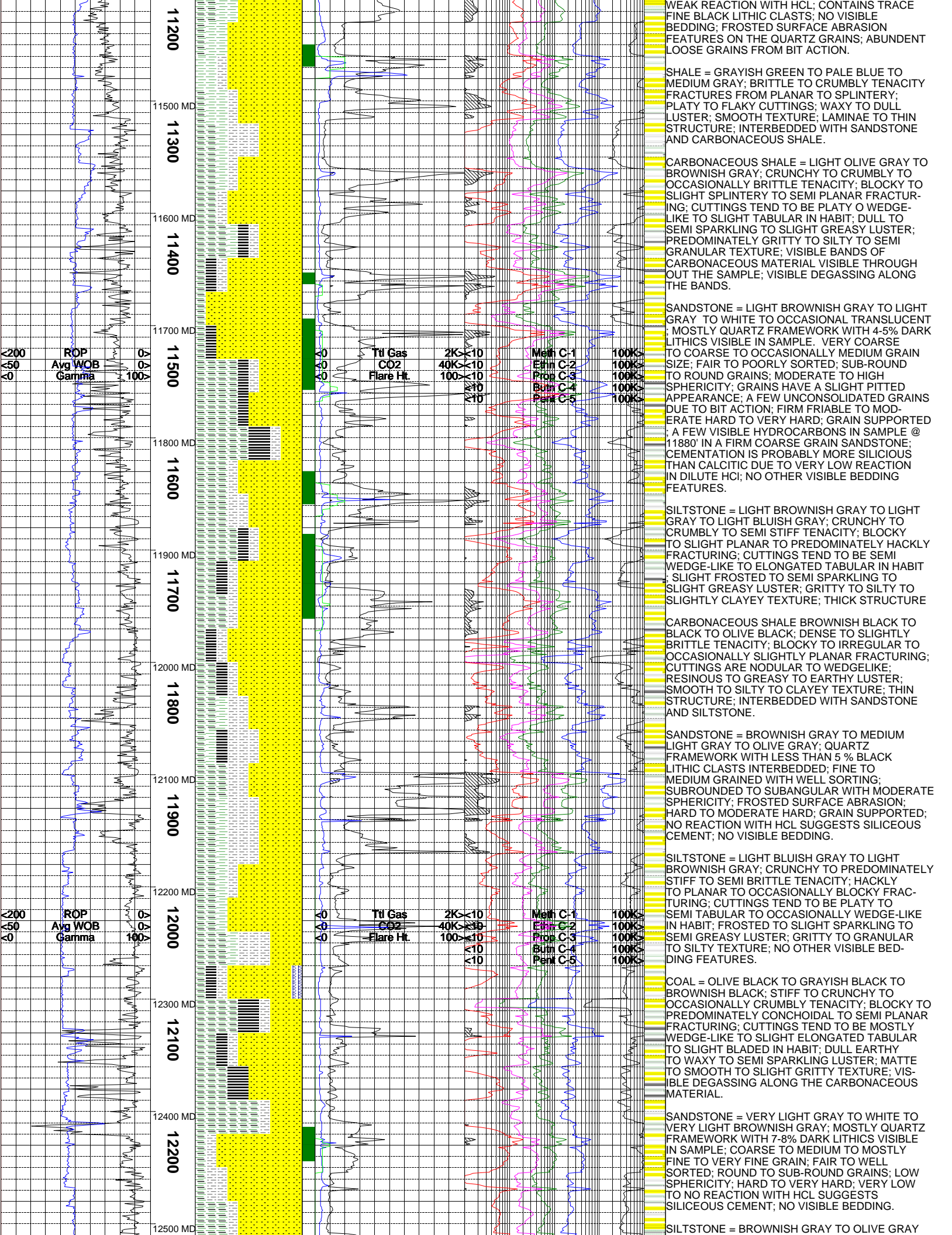
COAL = BLACK TO BROWNISH BLACK TO OLIVE BLACK; CRUNCHY TO STIFF TENACITY; IRREGULAR TO BLOCKY TO PREDOMINATELY CONCHODIAL FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO OCCASIONALLY BLADED TO ELONGATED TABULAR IN HABIT; PREDOMINATELY GREASY TO WAXY TO SEMI SPARKLING TO SLIGHT VITREOUS LUSTER; PREDOMINATELY MATTE TO SMOOTH TO OCCASIONALLY SILTY TO GRITTY TEXTURE; VISIBLE DEGASSING THROUGH OUT THE SAMPLE.

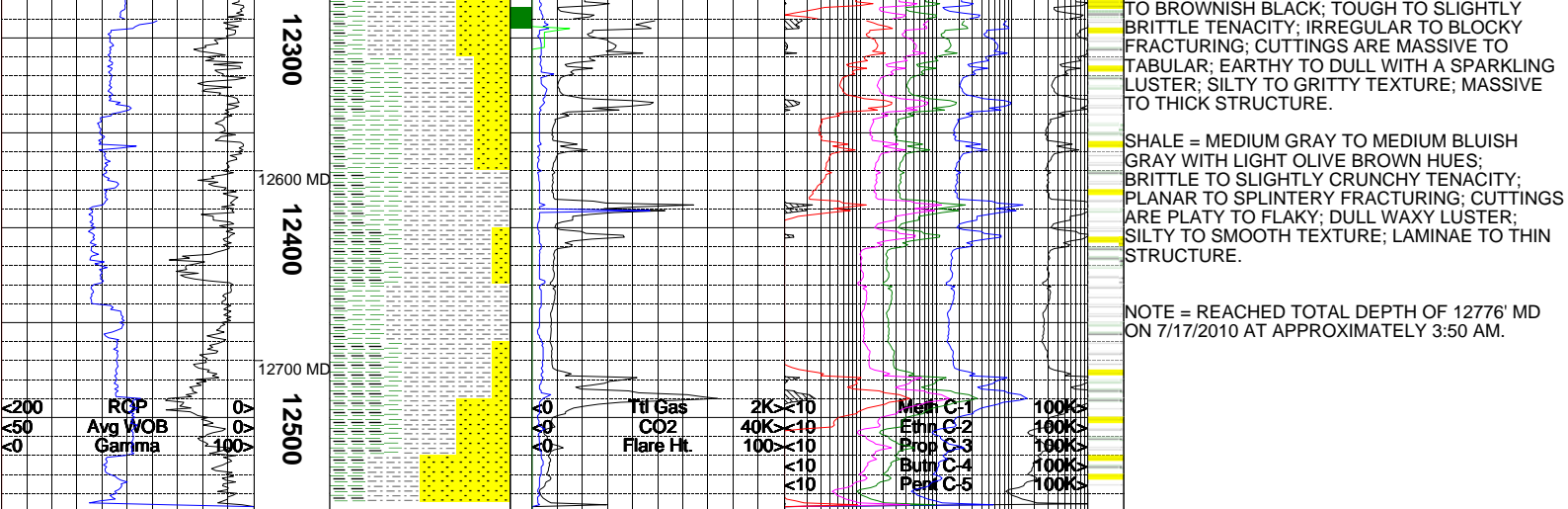
SANDSTONE = TRANSLUCENT TO LIGHT BROWN TO LIGHT GRAY TO WHITE; DOMINATE QUARTZ FRAMEWORK WITH APPROXIMATELY 5% BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM FINE GRAINED WITH WELL SORTING; SUBROUND TO SUBANGULAR WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS; GRAIN SUPPORTED; LIGHT TO MODERATE REACTION WITH HCL SUGGESTS CALCAREOUS CEMENT; THIN LAMINAR COAL AND CARBONACEOUS BANDING OBSERVED; HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BROWNISH BLACK TO BLACK; CRUNCHY TO SLIGHTLY BRITTLE TENACITY; MOSTLY PLANAR TO SLIGHTLY BLOCKY FRACTURING; CUTTINGS ARE SPLINTERY TO TABULAR TO PLATY; EARTHY TO OCCASIONALLY DULL TO RESINOUS LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; THICK STRUCTURE.

SANDSTONE = WHITE TO VERY LIGHT GRAY; BEACH SAND; QUARTZ FRAMEWORK; MEDIUM GRAINED WITH WELL SORTING; SUBROUNDED WITH MODERATE SPHERICITY; MODERATE HARD TO HARD; CALCAREOUS CEMENT; MODERATE TO







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