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	PCU 197-34B7
FIELD	PICEANCE CREEK
REGION	ROCKY MOUNTAINS
COORDINATES	39.915669000
	108.261250000
ELEVATION	6647.9'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	05-103-11086-00
SPUD DATE	9/16/2009
CONTRACTOR	H _P
CO. REP.	S. GUYOTE, W. GARNER
RIG/TYPE	# 320/FLEX 4S+
LOGGING UNIT	MLU 032
GEOLOGISTS	J. KEEVAN, C. RECORD
	C. PIERCE
ADD. PERSONS	M. PIPER, B. HICKS
	T. WALKER
CO. GEOLOGIST	CHRIS ALBA

LOG INTERVAL

DEPTHS:	4022'	**TO**	12990'
DATES:	9/15/2009	**TO**	12/13/2009
SCALE:		1"=100'	

MUD TYPES

LSND	**TO**	4022'
LIGCO	**TO**	12990'
	TO	
	TO	

CASING DATA

16"	**AT**	130'
10.75"	**AT**	3990'
7"	**AT**	9220'
	AT	

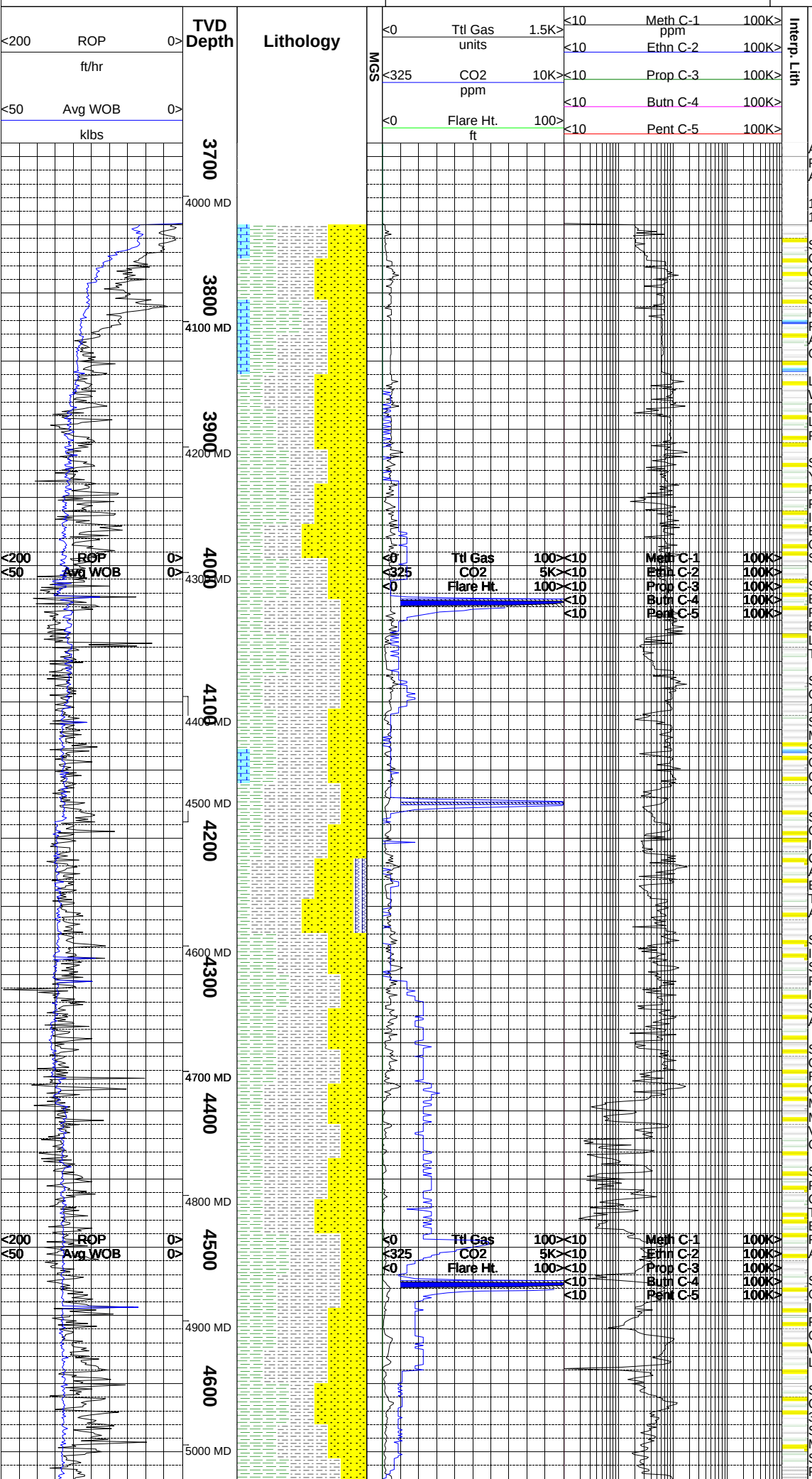
HOLE SIZE

14.75"	**TO**	4022'
9.875"	**TO**	9100'
6.125"	**TO**	12990'
	TO	

ABBREVIATIONS

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



Remarks

Survey Data, Mud Reports, Other Info.

ALL TRIP AND CONNECTION GASSES ARE REFERENCED ABOVE BACKGROUND; ALL OTHER ARE ABSOLUTE.

1% METH. EQUIV. = 50 UNITS = 10000 = PPM
10 3/4" CASING @ 3990' PIT 12.0 PPG [E]

SANDSTONE = GRAYISH PINK TO WHITE IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO FINE GRAIN SIZE; SAMPLE IS FAIR TO WELL SORTED; GRAINS ARE SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; HARDNESS RANGES FROM EASILY TO FIRMLY FRIBALE; CALCITE CEMENT; NO DISCERNIBLE ACCESSORIES; NO VISIBLE PORE SPACES; NO GAS SHOWS FROM THIS SAND.

LIMESTONE = VERY PALE BLUE TO BLUISH WHITE IN COLOR; SAMPLE IS PARTICLE DOMINATED WITH NON SKELETAL PARTICLES; LIME MUD MATRIX WITH POINT CONTACT FABRIC; INTRAPARTICAL POROSITY.

SILTSTONE = GRAYISH RED TO DARK YELLOWISH ORANGE IN COLOR; BRITTLE TO PULVERANT TENACITY; BLOCKY TO MOTTLED FRACTURE; CUTTINGS ARE NODULAR TO EQUANT IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY, ALMOST GRANULAR TEXTURE; THIN TO THICK STRUCTURE APPARENT.

SHALE = MEDIUM TO DARK GRAY IN COLORING; BRITTLE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND THIN TO LAMINAE STRUCTURE.

SANDSTONE = VERY LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH ABOUT 1% LITHIC SHOWS; FAIR TO MODERATE SORTING OR COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBROUNDED TO SUBANGULARITY; FRIABLE TO FIRMLY FRIABLE GRAIN SUPPORTED MATERIAL WITH CALCITIC CEMENTATION; NO OIL SHOWS AND VERY LOW GAS SHOWS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = OLIVE GRAY TO MEDIUM GRAY IN COLOR; DENSE TO CRUMBLY TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO NODULAR IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THICK TO NEARLY MASSIVE STRUCTURE APPARENT.

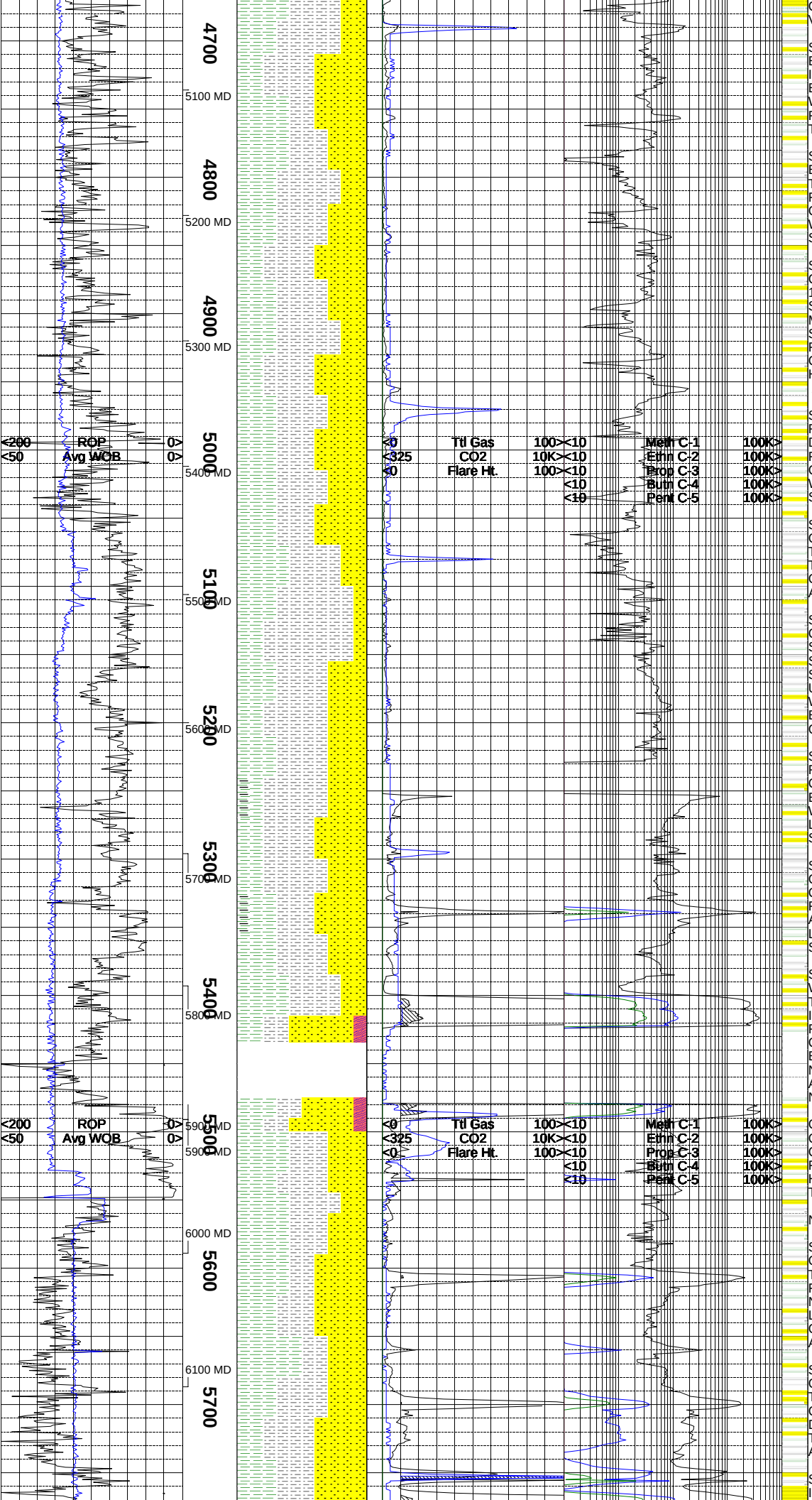
SHALE = LIGHT BLUISH GRAY TO LIGHT GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; SAMPLE SHOWS BLOCKY TO CONCHOIDAL FRACTURE; CUTTINGS ARE PLATY TO SCALY IN HABIT;GREASY TO DULL LUSTER EXHIBITED SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

SANDSTONE = LIGHT GRAY TO WHITE IN COLOR QUARTZ FRAMEWORK WITH SOME CALCITE AND FELSPAR GRAINS; VERY FINE TO MEDIUM GRAIN SIZE; ROUNDED TO SUBANGULAR WITH MODERATE SPHERICITY; FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO VISIBLE PORE SPACES; NO GAS SHOWS; CHLORITE GRAINS VISIBLE IN MATRIX.

SILTSTONE = LIGHT TO MEDIUM GRAY WITH REDDISH BROWN AND YELLOWISH GRAY IN COLORING; DENSE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND A THIN STRUCTURE.

SHALE = LIGHT TO MEDIUM GRAY WITH GRAYISH BLUE GREEN COLORATION; BRITTLE IN TENACITY WITH BLOCKY TO SPLINTERY FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN TO LAMINAE STRUCTURE.

SANDSTONE = VERY LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH ABOUT 3% LITHIC SHOWS; FAIR TO MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBANGULAR TO SUBROUNDED ANGULARITY; FRIABLE TO FIRMLY FRIABLE GRAIN SUPPORT WITH



CALCITIC CEMENTATION; NO OIL SHOWS AND VERY LOW GAS ASSOCIATED WITH THIS SAMPLE

SILTSTONE = MEDIUM GRAY WITH REDDISH BROWN AND MODERATE YELLOWISH BROWN IN COLORING; DENSE IN TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND THIN IN STRUCTURE.

SHALE = MEDIUM GRAY WITH SOME GRAYISH BLUE GREEN IN COLORING; DENSE TO BRITTLE TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN STRUCTURE.

SANDSTONE = VERY LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH ABOUT 1% LITHIC SHOWS; FAIR TO MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBANGULAR TO SUBROUNDED ANGULARITY; FRIABLE TO FIRMLY FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION AS TESTED BY DILUTE HCL; NO OIL SHOWS AND VERY LOW GAS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = LIGHT TO MEDIUM GRAY WITH REDDISH BROWN AND LIGHT BROWN COLORING; DENSE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND A THIN STRUCTURE.

SHALE = MEDIUM GRAY WITH GRAYISH BLUE GREEN COLORATION; DENSE TO BRITTLE IN TENACITY WITH PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; GREASY IN LUSTER WITH A SMOOTH TEXTURE AND THIN TO LAMINAE STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY IN COLOR; QUARTZ FRAMEWORK WITH NO LITHIC SHOWS; MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBANGULAR TO SUBROUNDED ANGULARITY; UNCONSOLIDATED TO FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION AS SUGGESTED BY DILUTE HCL; NO OIL SHOWS AND VERY LOW GAS ASSOCIATED.

SILTSTONE = MEDIUM TO DARK GRAY WITH REDDISH BROWN AND LIGHT BROWN COLORATION; DENSE IN TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY IN LUSTER WITH A SILTY TO COARSE GRAIN SILTY TEXTURE AND A THIN STRUCTURE.

SHALE = DARK YELLOWISH BROWN TO GREENISH GRAY IN COLOR; SAMPLE SHOWS DENSE TO CRUMBLY TENACITY; BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE PLATY TO SCALY IN APPEARANCE; WAXY TO SLIGHTLY FROSTED LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT; PYRITE VISIBLE.

SANDSTONE = VERY LIGHT GRAY TO CHALKY WHITE IN COLOR; QUARTZ FRAMEWORK; FINE TO VERY FINE GRAIN SIZE; WELL SORTED; INDISTINGUISHABLE ANGULARITY; HARDNESS RANGES FROM FRIABLE TO FIRMLY FRIABLE; CALCITE CEMENT INDICATED BY ACTIVE EFFERVESENCE IN HCL; GRAIN SUPPORTED; NO VISIBLE PORE SPACES; KAOLINITE ALTERATION VISIBLE IN SOME CUTTINGS; NO GAS SHOWS FROM THIS SAND.

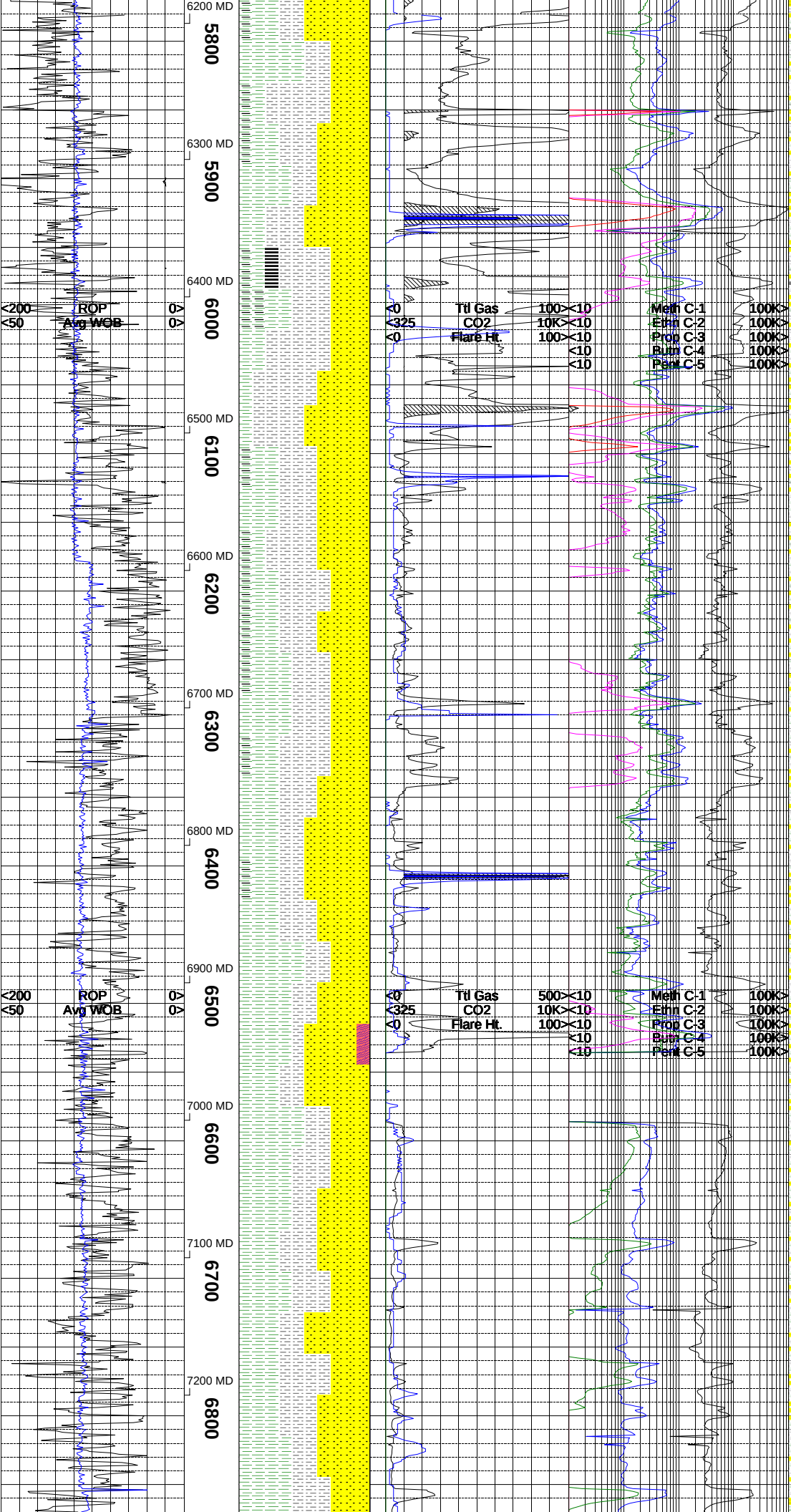
CARBONACEOUS SHALE = OLIVE BLACK TO GRAYISH BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLANAR TO SPLINTERY FRACTURE; TABULAR TO ELONGATED CUTTINGS HABIT; RESINOUS TO GREASY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE APPARENT.

NOTE = LOST COMPLETE RETURNS @ 5835' MD.

SILTSTONE = DARK YELLOWISH BROWN TO OLIVE GRAY IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO NODULAR IN APPEARANCE; DULL TO EARTHY LUSTER EXHIBITED; SILTY TO SLIGHTLY GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT; PYRITE VISIBLE IN MATRIX.

SHALE = LIGHT OLIVE BROWN TO LIGHT OLIVE GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; IRREGULAR TO BLOCKY FRACTURE; CUTTINGS ARE FLAKY TO WEDGELIKE IN HABIT DULL TO EARTHY LUSTER; TEXTURE IS CLAYEY TO SILTY; THIN TO LAMINAE STRUCTURE APPARENT; SLIGHTLY CALCAREOUS.

SANDSTONE = WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK WITH ABOUT



3-5% BLACK LITHIC CLASTS; COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTED; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO VISIBLE PORE SPACING; LOW TO MODERATE GAS SHOWS IN THIS SAND.

SILTSTONE = MODERATE REDDISH BROWN TO MODERATE BROWN IN COLOR; DENSE TO CRUNCHY TENACITY; SAMPLE HAS IRREGULAR TO CONCHOIDAL FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO GRANULAR TEXTURE WITH OCCASIONAL SPECIMEN SEEN GRADING INTO FINE SANDSTONE; THIN STRUCTURE APPARENT.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO NEARLY PULVERANT IN TENACITY; SPLINTERY TO BLOCKY FRACTURE; CUTTINGS ARE ELONGATED TO EQUANT IN APPEARANCE; RESINOUS TO GREASY LUSTER EXHIBITED; SMOOTH TO SILTY TEXTURE; THIN TO LAMINAE STRUCTURE APPARENT.

SHALE = MEDIUM LIGHT GRAY TO DARK GRAY IN COLOR; DENSE TO CRUMBLY IN TENACITY; FRACTURE RANGES FROM BLOCKY TO PLANAR; CUTTINGS ARE FLAKY TO TABULAR IN HABIT; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

COAL = DARK GRAY TO GRAYISH BLACK IN COLOR; DENSE TO BRITTLE IN TENACITY; BLOCKY TO PLANAR FRACTURE; CUTTINGS ARE TABULAR TO WEDGELIKE IN APPEARANCE; METALIC TO RESINOUS LUSTER; TEXTURE RANGES FROM SMOOTH TO SLIGHTLY SILTY; THIN STRUCTURE APPARENT; FAIR AMOUNT OF PYRITE BANDING VISIBLE IN SAMPLE.

SANDSTONE = WHITE TO YELOWISH GRAY IN COLOR; QUARTZ FRAMEWORK; MEDIUM TO VERY FINE GRAIN SIZE; FAIR TO WELL SORTED; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPHERICITY; SAMPLE IS EASILY TO FIRMLY FRIABLE; CALCITE CEMENT SAMPLE IS GRAIN SUPPORTED WITH POINT CONTACT FABRIC; SOME INTERBEDDING WITH SILTSTONES VISIBLE; MODERATE TO HIGH GAS SHOWS IN THIS SANDSTONE.

SILTSTONE = YELLOWISH GRAY TO LIGHT BROWNISH GRAY IN COLOR; BRITTLE TO TOUGH IN TENACITY; BLOCKY TO CONCHOIDAL FRACTURE; WEDGELIKE TO TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN STRUCTURE APPARENT.

CARBONACEOUS SHALE = BLACKISH IN COLOR; FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; RESINOUS IN LUSTER WITH A SMOOTH TEXTURE AND A THIN STRUCTURE.

SHALE = LIGHT BLUISH GRAY TO MEDIUM BLUISH GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLANAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE PLATY TO SCALY IN HABIT; WAXY TO EARTHY LUSTER EXHIBITED; SMOOTH TO SLIGHTLY SILTY TEXTURE;THIN STRUCTURE

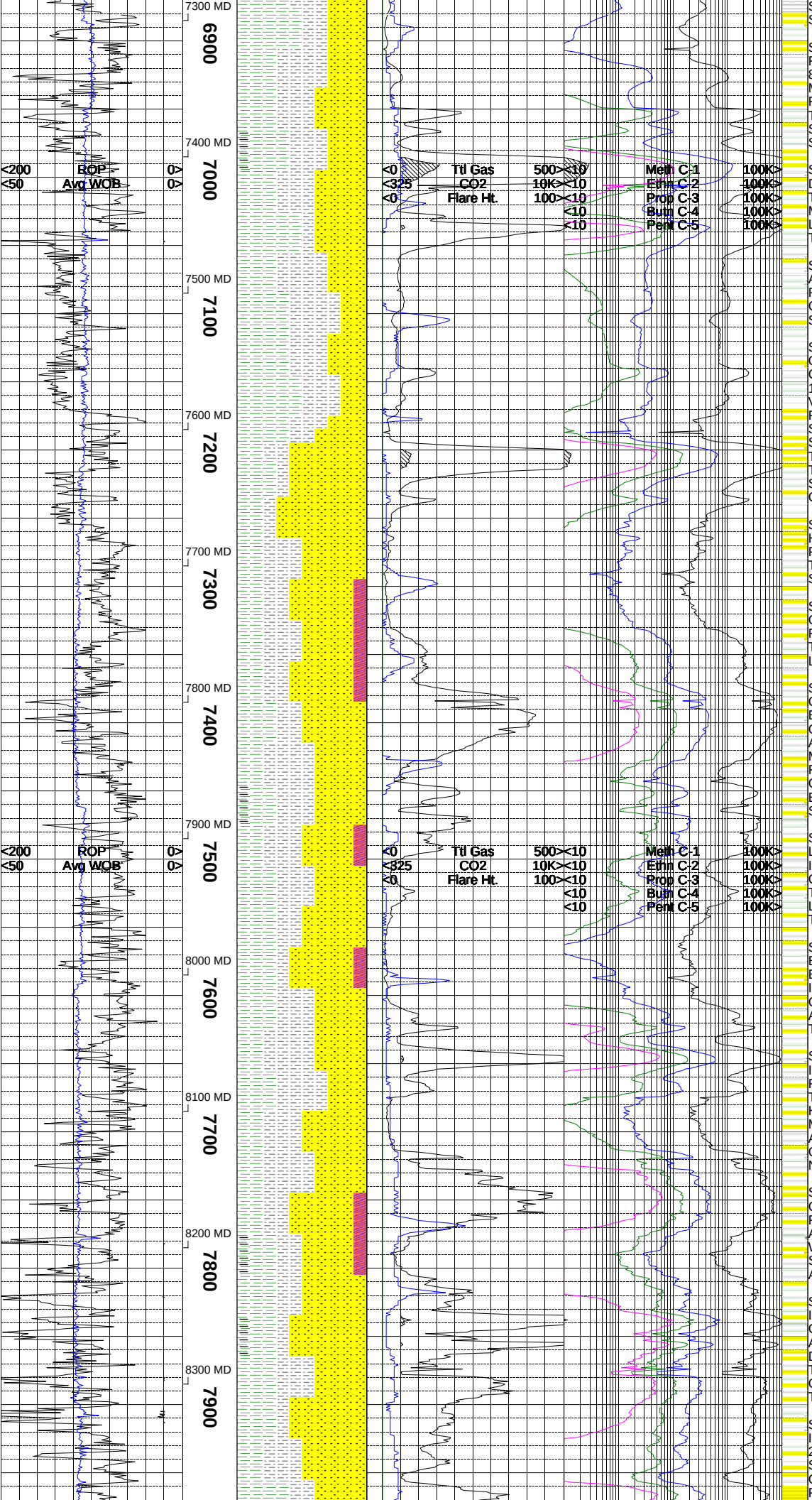
SANDSTONE = GRAYISH YELLOW GREEN TO YELLOWISH GRAY IN COLOR;QUARTZ FRAMEWORK MEDIUM TO FINE GRAIN SIZE; SAMPLE IS FAIR TO WELL SORTED; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPHERICITY; HARDNESS RANGES FROM FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO DISCERNIBLE BEDDING; NO VISIBLE POROSITY LOW GAS SHOWS FROM THIS SANDSTONE.

SHALE = LIGHT GRAY TO YELLOWISH GREENISH GRAY WITH A SLIGHT BLUE HUE; BRITTLE TENACITY; FRACTURES FROM PLANAR TO SLIGHTLY SPLINTERY; SCALY TO PLATY CUTTINGS; DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY TO GRAY COLORING; FRAMEWORK CONSISTS OF APPROXIMATELY 75% QUARTZ AND 25% BLACK LITHIC CLASTS; COARSE TO MEDIUM SIZED GRAINS WITH POOR SORTING; SUBANGULAR WITH LOW SPHERICITY; EASILY FIRABLE TO MODERATE HARDNESS; STRONG REACTION WITH HCLSUGGESTS CALCITE CEMENT; MATRIX SUPPORTED.

SILTSTONE = MEDIUM DARK GRAY TO BROWNISH GRAY; BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; TABULAR CUTTINGS; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE.

SHALE = LIGHT TO MEDIUM DARK GRAY WITH SOME DARK GRAY TO BLACK AREAS; BRITTLE TO CRUNCHY TENACITY; FRACTURES FROM PLANAR TO SLIGHTLY CONCHOIDAL; PLATY TO



SCALY CUTTINGS; DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SANDSTONE = GRAY TO MEDIUM DARK GRAY; FRAMEWORK CONSISTS OF APPROXIMATELY 80% SANDSTONE AND 20% DARK LITHIC CLASTS MEDIUM TO FINE SIZED GRAINS WITH POOR TO FAIR SORTING; SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE; GRAIN SUPPORTED; MODERATE REACTION WITH HCL SUGGESTS CALCITE CEMENT.

SILTSTONE = BROWNISH GRAY TO MODERATE DARK GRAY COLORING; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING MASSIVE TO TABULAR CUTTINGS; EARTHY LUSTER; GRITTY TO SILTY TEXTURE; THICK TO MASSIVE STRUCTURE.

SHALE = LIGHT GRAY WITH YELLOWISH GREEN AND REDDISH BROWN HUES; BRITTLE TENACITY PLANAR FRACTURING; PLATY TO TABULAR CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TEXTURE; THIN STRUCTURE.

SANDSTONE = GRAY TO MEDIUM DARK GRAY TO OCCASIONALLY LIGHT GRAY; FRAMEWORK CONSISTS OF APPROXIMATELY 85% QUARTZ AND 15% BLACK LITHIC CLASTS; GRAIN SIZE VARIES FROM MEDIUM TO FINE WITH POOR TO FAIR SORTING WITH THE LIGHTER COLORED SAMPLE TENDING TO BE MORE FINELY SIZED; SUBANGULAR WITH LOW SPHERICITY; FRIABLE TO MODERATE HARDNESS WITH FINER GRAINS TENDING TO BE MORE FRIABLE; MODERATE TO STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT.

SHALE = LIGHT GRAY TO GRAY WITH PURPLE HUES; BRITTLE TENACITY; SPLINTERY TO PLANAR FRACTURING; PLATY CUTTINGS; DULL TO WAXY LUSTER; TEXTURE IS SMOOTH TO SILTY; THINK STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY; BRITTLE TO CRUMBLY TENACITY; FRACTURES FROMIRREGULAR TO BLOCKY; TABULAR TO WEDGELIKE CUTTINGS; EARTHY LUSTER; SILTY TO GRITTY TEXTURE.

SANDSTONE = YELLOWISH GRAY TO WHITE IN COLOR; QUARTZ FRAMEWORK WITH ABOUT 10% BLACK LITHIC CLASTS; VERY COARSE TO FINE GRAIN SIZE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR TO SUBROUNDED WITH LOW TO MODERATE SPHERICITY; HARDNESS RANGES FROM EASILY TO FIRMLY FRIABLE; CALCITE CEMENT; GRAIN SUPPORTED; NO DISCERNIBLE BEDDING; NO VISIBLE POROSITY; LOW GAS SHOWS FROM THIS SAND.

SHALE = LIGHT BLUISH GRAY TO MEDIUM LIGHT GRAY IN COLOR; BRITTLE TO CRUNCHY IN TENACITY; SAMPLE SHOWS BLOCKY TO CONCHOIDAL FRACTURE; CUTTINGS ARE PLATY TO SCALY IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE APPARENT.

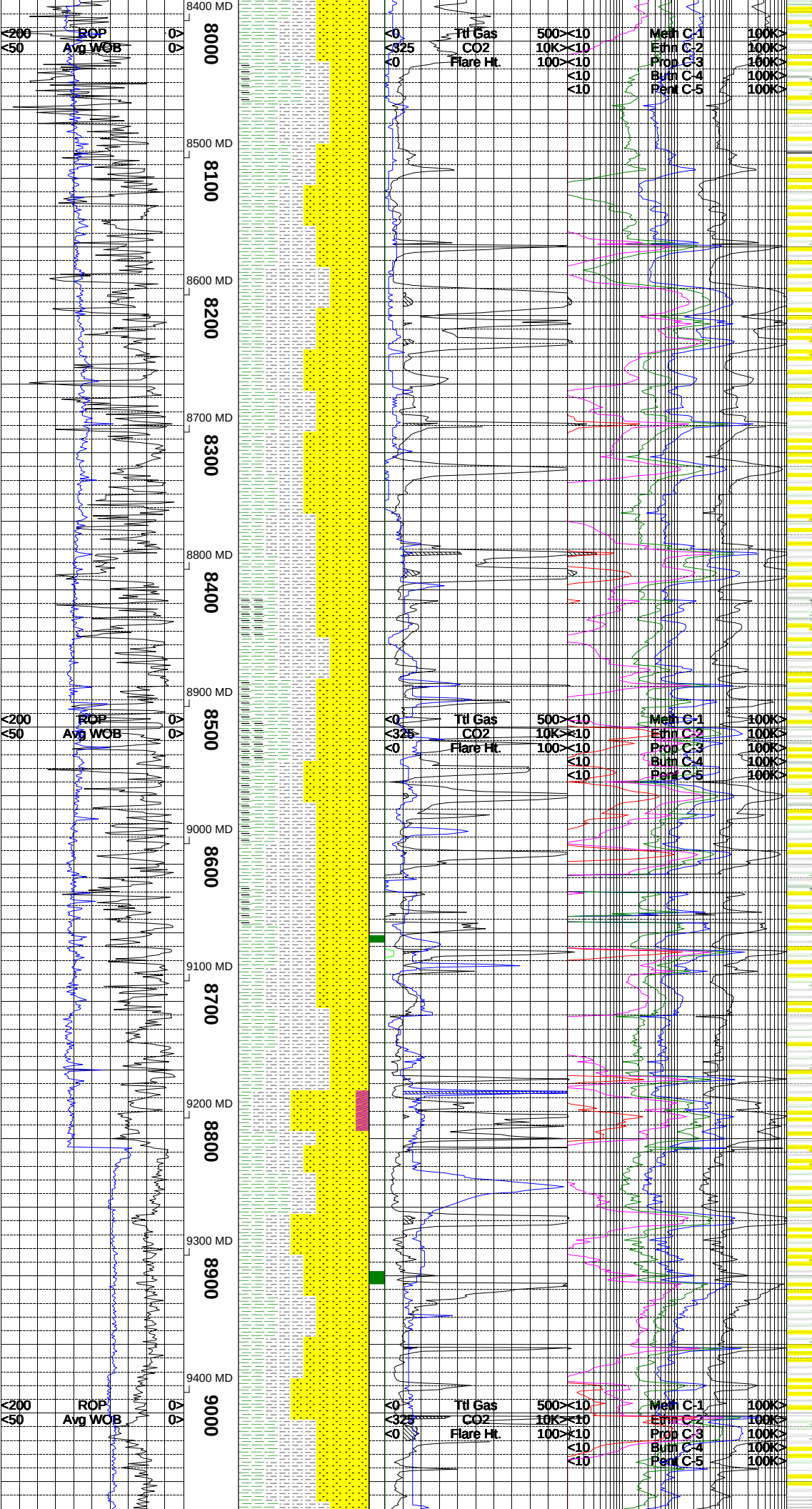
SILTSTONE = GRAYISH RED TO MEDIUM BLUISH GRAY IN COLOR; SAMPLE SHOWS BRITTLE TO NEARLY PULVERANT TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; CUTTINGS ARE WEDGELIKE TO NODULAR IN APPEARANCE; SILTY TO GRITTY TEXTURE; THIN TO THICK STRUCTURE APPARENT.

SANDSTONE = WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK; COARSE TO FINE GRAIN SIZE; GRAINS ARE SUBROUNDED TO ANGULAR WITH MODERATE SPHERICITY; HARDNESS RANGES FROM FRIABLE TO MODERATELY HARD; CALCITE CEMENT; NO ALTERATION VISINLE IN MATRIX; POINT CONTACT FABRIC WITH NO VISIBLE POROSITY; NO GAS SHOWS FROM THIS SANDSTONE.

SHALE = VERY PALE GREEN TO LIGHT GRAY IN COLOR; BRITTLE TO CRUMBLY TENACITY; PLANAR TO CONCHOIDAL FRACTURE;CUTTINGS ARE FLAKY TO ELONGATED IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SLIGHTLY SILTY TEXTURE; THIN STRUCTURE APPARENT.

SILTSTONE = GRAYISH BROWN TO MEDIUM GRAY IN COLOR; TOUGH TO BRITTLE TENACITY; CONCHOIDAL TO PLANAR FRACTURE; CUTTINGS ARE TABULAR TO WEDGELIKE IN APPEARANCE; DULL TO EARTHY LUSTER; SILTY TO GRANULAR TEXTURE WITH SEVERAL SPECIMEN SEEN GRADING INTO FINE SANDSTONES; THIN TO THICK STRUCTURE APPARENT.

SANDSTONE = WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK WITH ABOUT 20% BLACK LITHIC FRAGMENTS GIVING THE SAMPLE A SALT AND PEPPER APPEARANCE; GRAIN SIZE RANGES FROM COARSE TO FINE; POOR TO FAIR SORTING; GRAINS ARE ANGULAR



TO SUBANGULAR WITH LOW TO MODERATE SPHERICITY; HARDNESS RANGES FROM FIRMLY FRIABLE TO HARD; SILICA CEMENT; NO VISIBLE POROSITY; CALCITE GRAINS SEEN AS ACCESSORY GRAINS; LOW TO MODERATE GAS SHOWS FROM THIS SANDSTONE.

SHALE = GRAYISH RED TO BROWNISH GRAY IN COLOR; TOUGH TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURE; CUTTINGS ARE TABULAR TO WEDGELIKE IN APPEARANCE; EARTHY TO FROSTED LUSTER EXHIBITED; SILTY TO GRITTY TEXTURE; THIN STRUCTURE APPARENT.

SILTSTONE = DARK REDDISH BROWN TO DARK YELLOWISH BROWN IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO PLANAR FRACTURE; SCALY TO TABULAR CUTTINGS HABIT; DULL TO FROSTED LUSTER; THIN STRUCTURE APPARENT; PYRITE VISIBLE IN SAMPLE.

SANDSTONE = TRANSLUCENT TO WHITE TO LIGHT GRAY; QUARTZ FRAMEWORK WITH ABOUT 10%-15% BLACK LITHIC CLASTS; GRAINS VARY FROM MEDIUM TO FINE SIZED WITH POOR TO FAIR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; MODERATE HARD TO HARD; GRAIN SUPPORTED; VERY LOW REACTION WITH HCL SUGGESTS SILICA CEMENT.

SHALE = LIGHT GRAY TO GRAY WITH DARK BROWN TO PURPLE HUES; BRITTLE TO DENSE TENACITY; PLANAR FRACTURING; PLATY TO TABULAR CUTTINGS; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE.

SILTSTONE = DARK BROWN TO BROWNISH GRAY; DENSE TO TOUGH TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; MASSIVE TO TABULAR CUTTINGS; EARTHY WITH A SLIGHT FROSTED LUSTER; TEXTURE RANGES FROM MOSTLY GRITTY TO SILTY POSSIBLY GRADING FROM SANDSTONE; THICK STRUCTURE.

SANDSTONE = TRANSLUCENT TO WHITE TO MEDIUM DARK GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ WITH APPROXIMATELY 15% BLACK LITHIC CLASTS GIVING THE SAMPLE A SALT AND PEPPER LOOK; GRAIN SIZE VARIES FROM COARSE TO MEDIUM WITH OCCASIONAL FINE GRAINS; POOR SORTING; SUBROUNDED TO SUBANGULAR WITH MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE TO HARD; SILICA CEMENT AS SUGGESTED BY THE LOW REACTION WITH HCL; GRAIN SUPPORTED; PYRITE PRESENT AS AN ACCESSORY MINERAL.

SILTSTONE = MEDIUM DARK GRAY WITH REDDISH BROWN TO DARK BROWN HUES; DENSE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY; TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; GRITTY TO LIGHTLY SILTY TEXTURE; THICK STRUCTURE.

CARBONACEOUS SHALE = BLACK TO DARK GRAY COLOR; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO IRREGULAR FRACTURING; WEDGELIKE CUTTINGS; RESINOUS TO GREASY LUSTER; SMOOTH TEXTURE; THIN TO THICK STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM GRAY IN COLOR; SENSE TO CRUMBLY TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS RANGE FROM FLAKY TO BLADED IN APPEARANCE; WAXY TO DULL LUSTER EXHIBITED; CLAYEY TO SILTY TEXTURE; LAMINAE STRUCTURE THINLY BEDDED BETWEEN SILTSTONES APPARENT.

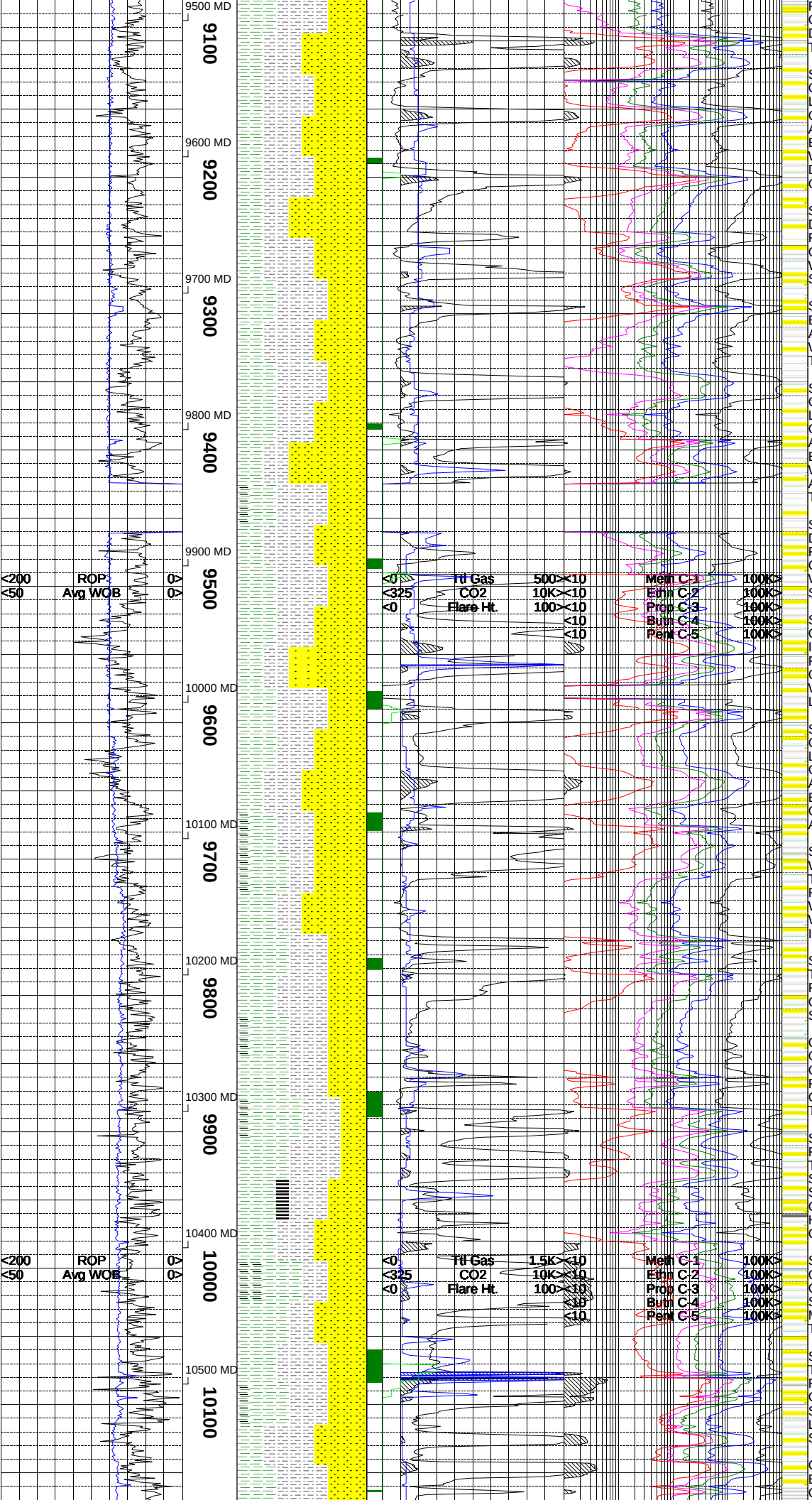
SANDSTONE = PINKISH GRAY TO WHITE TO NEARLY TRANSLUCENT IN COLOR; QUARTZ FRAMEWORK WITH SOME FELDSPAR GRAINS; COARSE TO FINE GRAIN SIZE; FAIR SORTING; GRAINS ARE ROUNDED TO SUBANGULAR WITH MODERATE TO HIGH SPHERICITY; SAMPLE IS FIRMLY FRIABLE TO MODERATELY HARD; CALCITE CEMENT SUGGESTED BY HIGH REACTION WITH HCL; NO VISIBLE POROSITY; MODERATE GAS SHOWS FROM THIS SANDSTONE.

NOTE = INTERMEDIATE TD REACHED AT 9220' MD ON 9/22/2009 @ 12:55 P.M.

NOTE = STARTED DRILLING PRODUCTION ON 12/09/2009 AT APPROXIMATELY 1:00 PM.

SANDSTONE = WHITE TO LIGHT GRAY WITH A QUARTZ FRAMEWORK; COARSE TO FINE SIZED FRAINS WITH FAIR TO POOR SORTING; SUBANGULAR TO SUBROUNDED; MODERATE HARD TO HARD; GRAIN SUPPORTED; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; MODERATE TO LOW GAS ASSOCIATED WITH SAMPLE DEPTH.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY; TENACITY IS BRITTLE TO CRUNCHY;



FRACTURES FROM PLANAR TO IRREGULAR; CUTTINGS ARE PLATY TO SLIGHTLY TABULAR; DULL TO EARTHY LUSTER, SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH ABOUT 5% LITHIC SHOWS; MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBANGULAR TO SUBROUNDED ANGULARITY; EASILY FRIABLE TO FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION AS TESTED WITH DILUTE HCL; NO OIL SHOWS AND LOW GAS SHOWS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = LIGHT TO DARK GRAY IN COLOR; DENSE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND THIN IN STRUCTURE.

SHALE = MEDIUM GRAY IN COLORING WITH BRITTLE TENACITY AND BLOCKY FRACTURE IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN STRUCTURE.

SANDSTONE = VERY LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH 7% LITHICS; MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBROUNDED TO SUBANGULAR ANGULARITY; EASILY FRIABLE TO FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION; NO OIL SHOWS AND MODERATE GAS SHOWS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = MEDIUM TO DARK GRAY IN COLOR DENSE TO BRITTLE TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND THIN IN STRUCTURE.

SHALE = LIGHT TO MEDIUM GRAY WITH SOME GRAYISH BLUE GREEN COLORATION; BRITTLE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN TO LAMINAE STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY IN COLORING; QUARTZ FRAMEWORK WITH ABOUT 4% LITHICS; MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBROUNDED ANGULARITY; SOFT TO EASILY FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION; NO OIL SHOWS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = GRAY TO MEDIUM DARK GRAY WITH SLIGHTLY BROWNISH GRAY HUES; TENACITY IS DENSE TO CRUNCHY; FRACTURES FROM IRREGULAR TO BLOCKY; CUTTINGS ARE WEDGELIKE TO TABULAR; EARTHY TO DULL WITH A SLIGHT SPARKLING LUSTER; TEXTURE IS GRITTY TO SILTY; THIN STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY; TEXTURE IS BRITTLE; SPLINTERY TO PLANAR FRACTURING; TABULAR TO ELONGATED CUTTINGS; WAXY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE

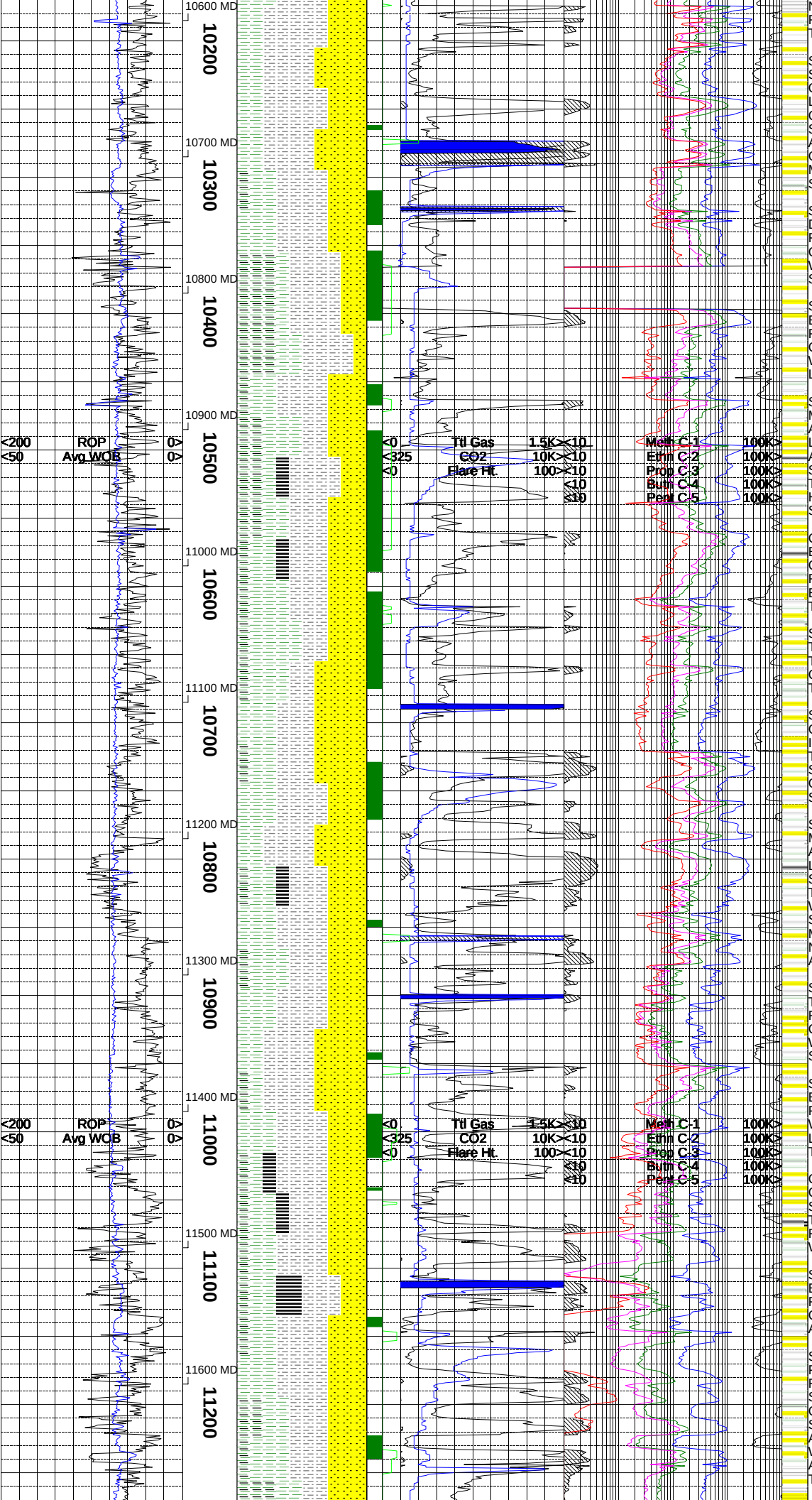
CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK TO DARK GRAY; TENACITY IS CRUNCHY TO BRITTLE; IRREGULAR TO BLOCKY FRACTURING; WEDGELIKE TO NODULAR CUTTINGS; RESINOUS TO EARTHY LUSTER; THIN STRUCTURE.

SANDSTONE = WHITE TO MEDIUM GRAY; QUARTZ FRAMEWORK WITH SOME LOOSE GRAINS; COARSE TO FINE SIZED GRAINS WITH POOR TO FAIR SORTING; SUBANGULAR; LOW TO MODERATE SPHERICITY; HARD TO FIRMLY FRIABLE; GRAIN SUPPORTED; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; SOME CARBONACEOUS MATERIAL PRESENT.

SILTSTONE = GRAYISH BROWN TO MEDIUM DARK GRAY; TENACITY RANGES FROM DENSE TO CRUMBLY; FRACTURES FROM BLOCKY TO SLIGHTLY IRREGULAR; TABULAR TO SLIGHTLY MASSIVE CUTTINGS; EARTHY LUSTER; GRITTY TO SILTY TEXTURE; MASSIVE STRUCTURE.

SHALE = MEDIUL GRAY TO MEDIUM DARK GRAY; TENACITY IS CRUNCHY TO BRITTLE; FRACTURES FROM PLANAR TO SLIGHTLY BLOCKY CUTTINGS ARE PLATY TO TABULAR TO SLIGHTLY ELONGATED; DULL EARTHY TO DULL LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK; TENACITY IS PULVERULENT TO CRUNCHY; BLOCKY TO IRREGULAR FRACTURING;



NODULAR TO WEDGELIKE CUTTINGS; LUSTER IS RESINOUS TO POLISHED; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY WITH SOME PALE REDDISH BROWN COLORATION; QUARTZ FRAMEWORK WITH ABOUT 5% - 10% LITHICS; FAIR TO MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBANGULAR TO SUBROUNDED ANGULARITY; FRIABLE TO FIRMLY FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION; MODERATE TO HIGH GAS SHOWS AND NO OIL SHOWS ASSOCIATED WITH THIS SAMPLE.

SILTSTONE = MEDIUM TO DARK GRAY IN COLOR DENSE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; EARTHY TO FROSTED LUSTER WITH A SILTY TEXTURE AND THIN IN STRUCTURE.

SHALE = LIGHT TO DARK GRAY IN COLORING; BRITTLE INTENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN TO LAMINAE STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM LIGHT GRAY; FRAMEWORK CONSISTS OF APPROXIMATELY 80% QUARTZ AND 20% DARK LITHIC CLASTS GIVING THE SPECIMEN A SALT AND PEPPER LOOK; COARSE TO MEDIUM GRAIN SIZE WITH FAIR TO POOR SORTING; ANGULAR TO SUBANGULAR; LOW SPHERICITY; MODERATE HARDNESS; STRONG REACTION WITH HCL SUGGESTS CALCITE CEMENT; GRAIN SUPPORTED

CARBONACEOUS SHALE = BROWNISH GRAY TO BLACK; TENACITY RANGES FROM DENSE TO CRUNCHY; IRREGULAR TO SPLINTERY FRACTURING; SCALY TO TABULAR CUTINGS; EARTHY TO DULL LUSTER; SMOOTH TO SILTY TEXTURE; THIN TO THICK STRUCTURE.

SHALE = MEDIUM DARK GRAY TO MEDIUM GRAY; TENACITY IS BRITTLE TO CRUNCHY; PLANAR TO SPLINTERY FRACTURING; PLATY TO SCALY CUTTINGS; WAXY TO DULL LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY; TENACITY IS DENSE TO CRUMBLY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO WEDGELIKE CUTTINGS; EARTHY WITH A SLIGHT FROSTED LUSTER; TEXTURE IS MOSTLY GRITTY TO SLIGHTLY SILTY; THICK STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM DARK GRAY; FRAMEWORK CONSISTS OF APPROXIMATELY 85% QUARTZ AND 15% BLACK LITHIC CLASTS GIVING THE SPECIMEN A STRONG SALT AND PEPPER LOOK TO SOME OF THE SAMPLE; COARSE TO FINE GRAINED WITH WELL TO FAIR SORTING; ANUGULAR TO SUBROUNDED; MODERATE TO LOW SPHERICITY; MODERATE HARD TO HARD; SILICA CEMENT; NO REACTION WITH HCL; HIGH GAS ASSOCCIATED WITH SAMPLE DEPTH.

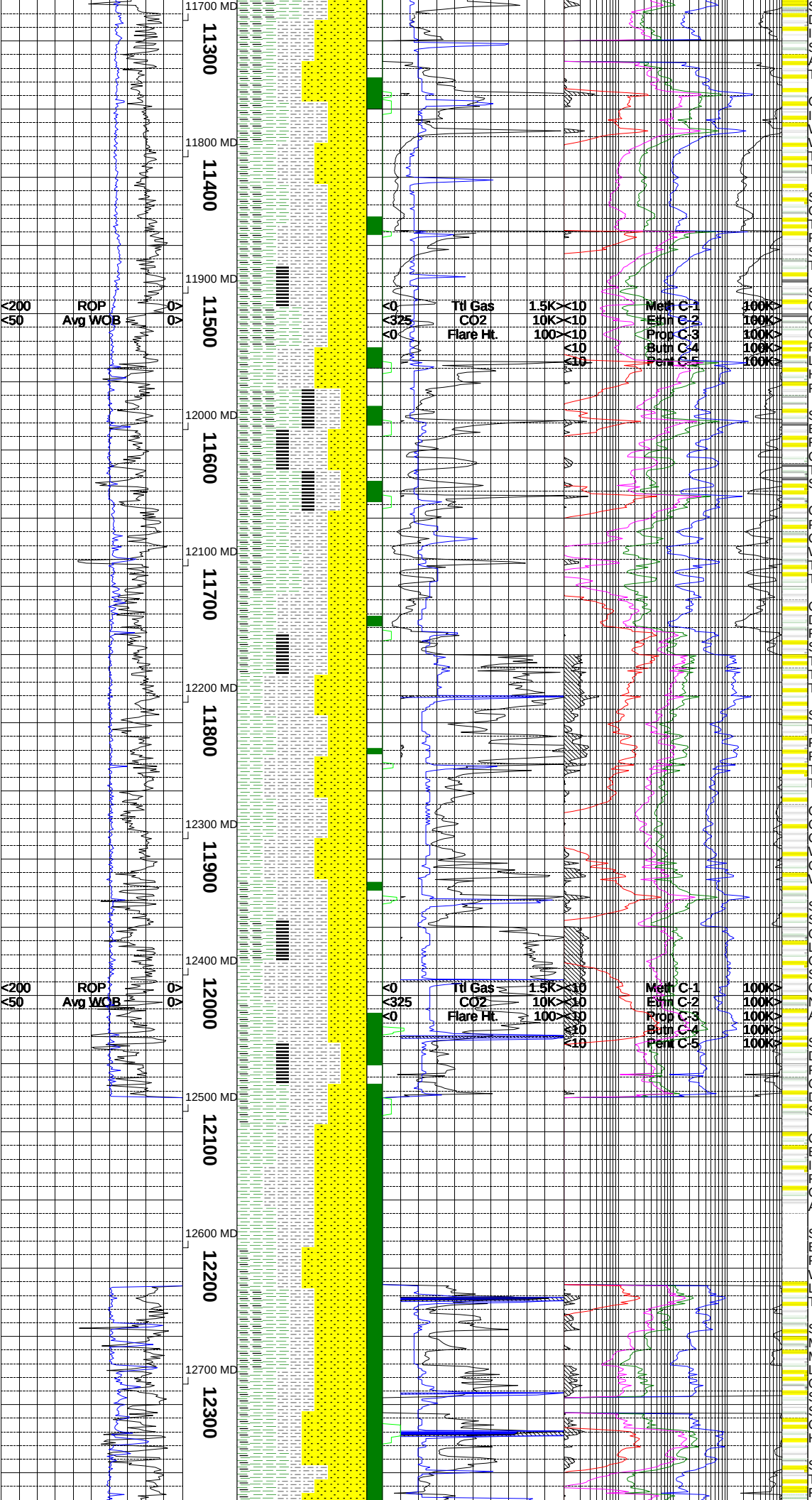
SILTSTONE = MEDIUM TO DARK GRAY WITH TENACITY WITH BLOCKY TO SPLINTERY FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; DULL TO EARTHY LUSTER WITH A SILTY TEXTURE AND THIN IN STRUCTURE.

SHALE = MEDIUM TO DARK GRAY IN COLOR; BRITTLE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND A THIN TO LAMINAE STRUCTURE.

COAL = DARK GRAY TO BLACKISH IN COLORING CRUNCHY TO PULVERULENT IN TENACITY WITH SPLINTERY TO BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; RESINOUS LUSTER ON A SMOOTH TEXTURE WITH A THIN STRUCTURE.

SHALE = MEDIUM TO DARK GRAY IN COLORING; BRITTLE TO CRUNCHY TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER ON A SMOOTH TEXTURE AND A THIN STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY WITH PALE REDDISH BROWN COLORATION; QUARTZ FRAMEWORK WITH ABOUT 5% - 10% LITHIC SHOWS; FAIR TO MODERATE SORTING OF COARSE GRAIN SIZING WITH MODERATE SPHERICITY AND SUBROUNDED TO SUB ANGULAR ANGULARITY; EASILY FRIABLE GRAIN SUPPORT WITH CALCITIC CEMENTATION; NO OIL SHOWS AND MODERATE GAS SHOWS ASSOCIATED WITH THIS SAMPLE.



SILTSTONE = MEDIUM TO DARK GRAY IN COLOR DENSE IN TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT SILTY TO COARSE GRAIN SILTY TEXTURE WITH AN EARTHY TO FROSTED LUSTER AND THIN TO THICK STRUCTURE.

CARBONACEOUS SHALE = DARK GRAY TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY WITH BLOCKY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; SMOOTH IN TEXTURE WITH A RESINOUS LUSTER AND A THIN TO THICK STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY COLORING; TENACITY IS DENSE TO BRITTLE TO SLIGHTLY CRUNCHY; PLANAR FRACTURING; PLATY TO SCALY CUTTINGS; DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TEXTURE; THIN TO LAMINAE STRUCTURE.

SANDSTONE = BROWNISH GRAY TO MEDIUM DARK GRAY TO TRANSLUCENT; FRAMEWORK CONSISTS OF QUARTZ WITH ABOUT 10% BLACK LITHIC CLASTS; FINE TO MEDIUM SIZED GRAINS WITH FAIR SORTING; SUBROUNDED TO SUBABGULAR; LOW TO MODERATE SPHERICITY; MODERATE HARDNESS; GRAIN SUPPORTED; VERY SLIGHT REACTION WITH HCLSUGGESTS SILICA CEMENT.

SILTSTONE = BROWNISH GRAY TO BROWNISH BLACK; TENACITY IS TOUGH TO DENSE; FRACTURES FROM IRREGULAR TO BLOCKY; CUTTINGS ARE TABULAR; EARTHY LUSTER; TEXTURE IS MOSTLY GRITTY TO SLIGHTLY SILTY; THICK STRUCTURE.

COAL = BLACK; TENACITY IS CRUMBLY TO PULVERULENT; IRREGULAR TO BLOCKY TO CONCHOIDAL FRACTURING; NODULAR TO WEDGELIKE; LUSTER RANGES FROM RESINOUS TO POLISHED TO EARTHY; TEXTURE IS SMOOTH TO CLAYEY; THIN STRUCTURE.

CARBONACEOUS SHALE = GRAYISH BLACK TO DARK GRAY; TOUGH TO DENSE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY TO SLIGHTLY PLANAR; CUTTINGS ARE PLATY TO TABULAR; LUSTER IS POLISHED TO EARTHY; TEXTURE IS SMOOTH TO SILTY; STRUCTURE IS THIN TO THICK.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY; TENACITY IS CRUNCHY TO DENSE; FRACTURES FROM PLANAR TO SPLINTERY; CUTTINGS ARE PLATY TO SCALY; LUSTER IS WAXY TO DULL; TEXTURE IS SMOOTH TO SILTY; THIN TO THICK STRUCTURE.

COAL = BLACKIS IN COLORING; BRITTLE TO CRUNCHY TENACITY WITH BLOCKY TO CONCHOIDAL FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; RESINOUS TO GEMLIKE LUSTER AND A SMMOTH TEXTURE WITH A THIN TO THICK STRUCTURE.

SANDSTONE = LIGHT TO MEDIUM GRAY WITH SOME PALE REDDISH BROWN COLORATION; QUARTZ FRAMEWORK SHOWING ABOUT 7% - 10% LITHICS; FAIR TO MODERATE SORTING OF COARSE GRAIN SIZING WITH SUBANGULAR TO SUBROUNDED ANGULARITY AND MODERATE GRAIN SUPPORT WITH CALCITIC CEMENTATION; NO OIL SHOWS AND MODERATE GASES ASSOCIATED WITH THIS SAMPLE.

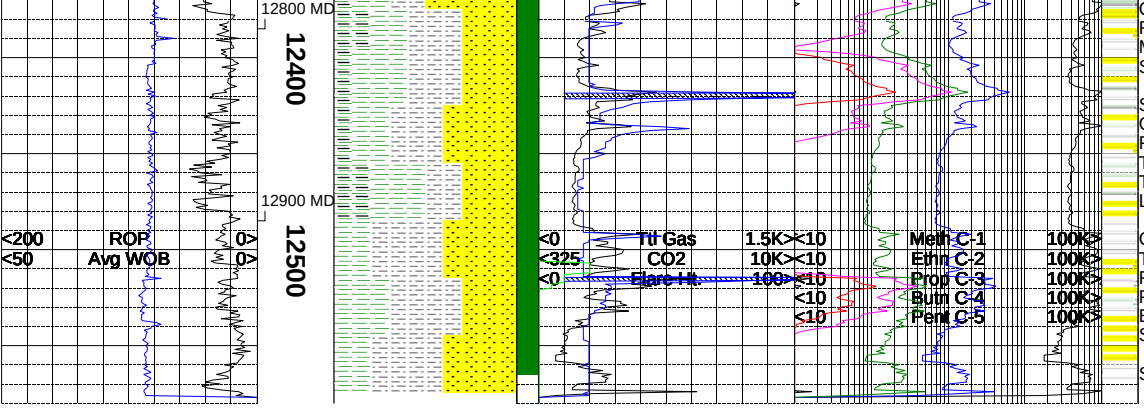
SILTSTONE = MEDIUM TO DARK GRAY IN COLOR DENSE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO ELONGATED CUTTINGS HABIT; SILTY TEXTURE WITH A DULL TO EARTHY LUSTER AND A THIN STRUCUTRE.

CARBONACEOUS SHALE = DARK GRAY TO BLACKISH IN COLORING; BRITTLE TO CRUNCHY IN TENACITY WITH BLOCKY TO SPLINTERY FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; RESINOUS IN LUSTER WITH A SMOOTH TEXTURE AND THIN IN STRUCTURE.

SHALE = LIGHT TO MEDIUM GRAY IN COLORING BRITTLE IN TENACITY WITH BLOCKY TO PLANAR FRACTURING IN A TABULAR TO WEDGELIKE CUTTINGS HABIT; WAXY TO GREASY LUSTER WITH A SMOOTH TEXTURE AND THIN TO LAMINAE STRUCTURE.

SANDSTONE = WHITE TO TRANSLUCENT TO MEDIUM LIGHT GRAY; FRAMEWORK CONSISTS OF MOSTLY QUARTZ WITH ABOUT 10% BLACK LITHIC CLASTS; FINE TO MEDIUM SIZED GRAINS WITH FAIR TO POOR SORTING; SUBROUNDED TO SUBANGULAR; FIRMLY FRIABLE SILICA GRAIN SUPPORTED WITH SILICA CEMENT AS SUGGESTED BY NO REACTION WITH HCL.

SILTSTONE = BROWNISH GRAY TO DARK GRAY; TENACITY IS TOUGH TO DENSE; FRACTURES FROM BLOCKY TO OCCASSIONALY IRREGULAR;



CUTTINGS ARE MASSIVE TO TABULAR; LUSTER RANGES FROM EARTHY TO WAXY; TEXTURE IS MOSTLY GRITTY TO SLIGHTLY SILTY; THICK STRUCTURE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY; TENACITY IS DENSE TO BRITTLE; PLANAR FRACTURING; CUTTINGS ARE PLATY TO TABULAR; LUSTER IS DULL TO EARTHY; TEXTURE IS SMOOTH TO SILTY; THIN TO LAMINAE STRUCTURE.

CARBONACEOUS SHALE = DARK GRAY TO BLACK; TENACITY IS TOUGH TO DENSE; FRACTURES FROM IRREGULAR TO BLOCKY TO SLIGHTLY PLANAR; CUTTINGS ARE TABULAR; LUSTER IS EARTHY TO DULL; SMOOTH TEXTURE; THIN STRUCTURE.

SANDSTONE = TRANSLUCENT TO WHITE TO