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	FRU197-33B2
FIELD	FREEDOM RANCH
REGION	ROCKIES
COORDINATES	39.921413000
	-108.282489000
ELEVATION	G.L: 6459.9'
	RKB: 30.2'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031142700
SPUD DATE	3/19/2010
CONTRACTOR	HP
CO. REP.	W.GARNER
RIG/TYPE	HP321
LOGGING UNIT	MLU#31
GEOLOGISTS	B.DELANEY
	C.RECORD
ADD. PERSONS	M.FRANCO
CO. GEOLOGIST	C.ALBA

LOG INTERVAL

DEPTHS:	4521'	**TO**	12754'
DATES:	06/06/2010	**TO**	06/17/2010
SCALE:	5"=100'		

MUD TYPES

WATER-BASED	**TO**	4521'
LSND	**TO**	12754'
	TO	
	TO	

CASING DATA

16"	**AT**	150'
10.75"	**AT**	4512'
4.5"	**AT**	12744'
	AT	

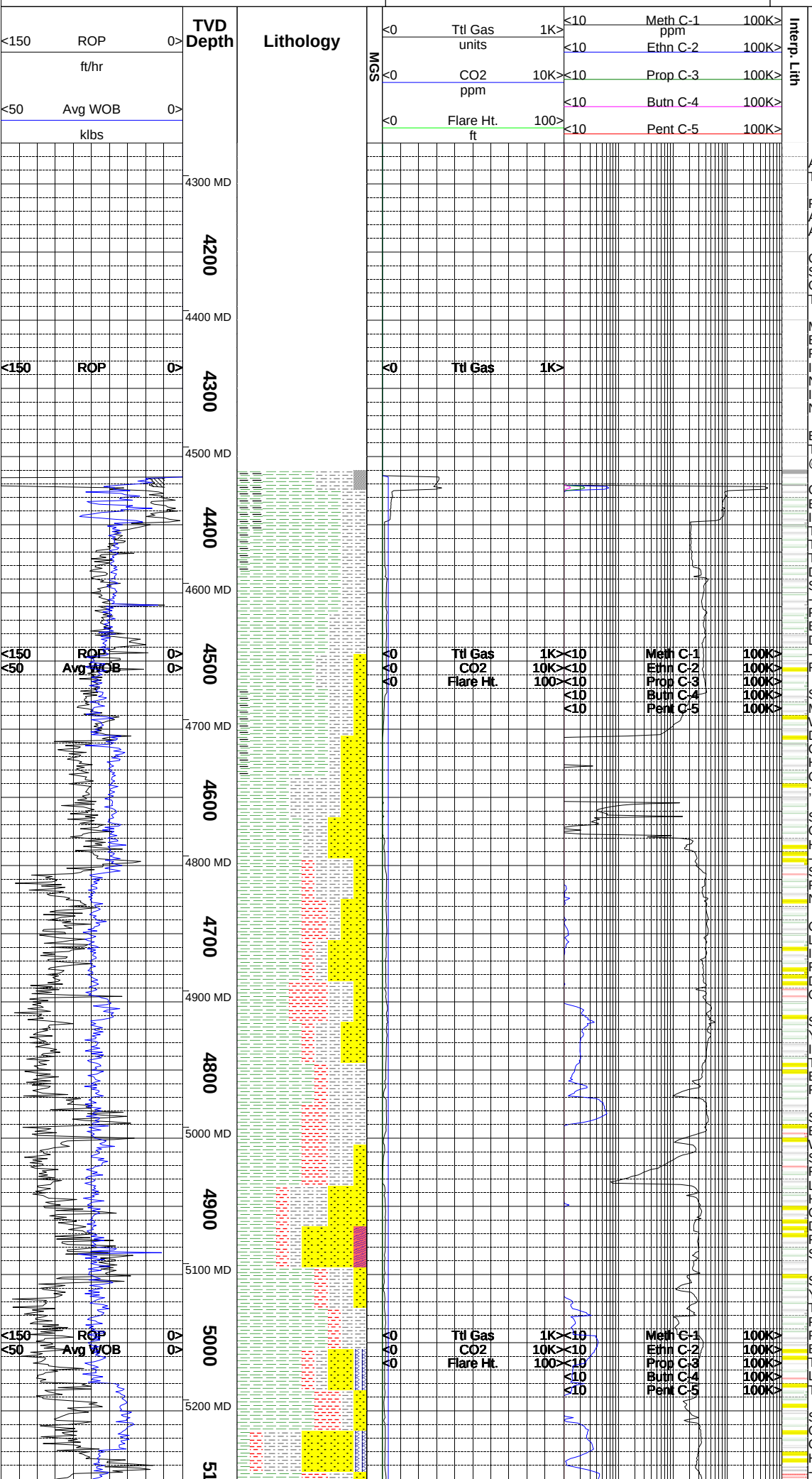
HOLE SIZE

14.75"	**TO**	4521'
8.9"	**TO**	11870'
7.875"	**TO**	12754'
	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 SAMPLE COLOR DESCRIPTIONS REFERENCED TO THE G.S.A. ROCK COLOR CHART.

ROCK CHARACTERISTICS AND CONSTITUENTS ARE LISTED FROM MOST ABUNDANT TO LEAST ABUNDANT PERCENTAGE OF SAMPLE.

GAS CALIBRATED TO S.P.L.W.A. STANDARDS (2% ME = 100 UNITS). GAS CHROMOTOGRAPHY EQUIPMENT CALIBRATED TO A TEST GAS COMPOSED OF THE FOLLOWING:

METHANE = 9,990 PPM
ETHANE = 1,010 PPM
PROPANE = 980 PPM
I-BUTANE = 1,000 PPM
N-BUTANE = 1,000 PPM
I-PENTANE = 1,000 PPM
N-PENTANE = 1,000 PPM

EPOCH WELL SERVICES COMMENCED LOGGING THE FRU 197-33B2 WELL ON 6/6/2010 @ 4522' MD.

CARBONACEOUS SHALE =BLACK TO BROWNISH BLACK TO OLIVE BLACK TO VERY DARK BROWN-ISH GRAY; SLIGHTLY DENSE TO MODERATELY TOUGH TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL VERY SLIGHTLY SPARKLING LUSTER; SLIGHTLY CLAY -EY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE CARBONACEOUS SHALE VISIBLE BEDDING WITH POOR GRADE SHALE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRES -ENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MOTTLING WITH GRAYISH RED PURPLE; VERY SLIGHTLY DENSE TO SLIGHTLY BRITTLE TO MODERATELY CRUMBLY TENACITY; IRREGULAR TO EARTHY-HACKLY FRACTURE; SUB-PLATY TO WEDGE LIKE CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE ; NO OTHER VISIBLE BEDDING FEATURES.

SILTSTONE = LIGHT GRAY TO LIGHT BLUISH GRAY; BRITTLE TO CRUMBLY TENACITY; SEMI HACKLY TO PREDOMINATELY BLOCKY FRACTURIN -G; CUTTINGS TEND TO BE WEDGE-LIKE TO SEMI TABULAR IN HABIT; GREASY TO SLIGHT FROSTED LUSTER; GRITTY TO SILTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

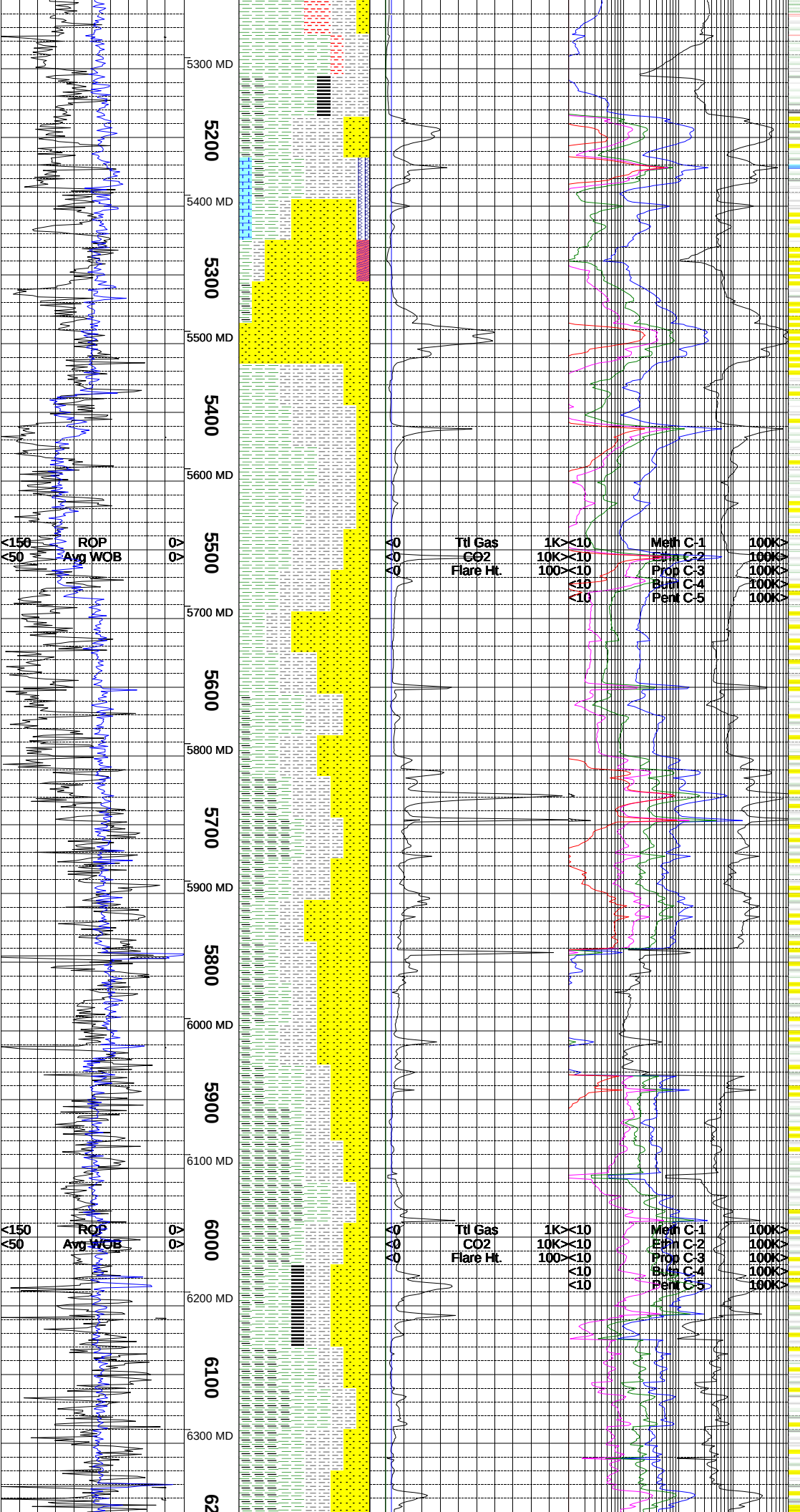
CLAYSTONE = LIGHT YELLOWISH GRAY TO LIGHT BROWNISH GRAY; NO VISIBLE FRACTURE IN SAMPLE; CUTTINGS TEND TO BE PLATY TO FLAKY TO OCCASIONALLY THINLY TABULAR; DULL EARTHY TO SEMI GREASY LUSTER; NO OTHER VISIBLE BEDDING FEATURES.

SHALE = VERY LIGHT GRAY TO A MOTTLED YELLOWISH GRAY DUE TO CHEMICAL WEATHER-ING IN SAMPLE; PREDOMINATELY PLANAR TO SLIGHT HACKLY FRACTURING; DULL TO EARTHY LUSTER; NO OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = GRAYISH ORANGE PINK TO LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAME-WORK WITH 1-2% DARK LITHICS VISIBLE IN SAMPLE; SUBANGULAR TO ANGULAR GRAINS; FINE TO MEDIUM GRAIN SIZE; MODERATE TO LOW SPHERICITY; FIRM FRIABLE TO MODERATE HARD TO OCCASIONALLY FRIABLE; CALCITIC CEMENTATION DUE TO HIGH REACTION IN DILUTE HCL; VISIBLE CALCITE FRACTURE FILL IN SAMPLE; GRADES INTO A FINE GRAIN SILTSTONE.

SILTSTONE = LIGHT GREENISH GRAY TO LIGHT YELLOWISH GRAY; BRITTLE TO CRUNCHY TENACITY; PREDOMINATELY HACKLY TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY TO WEDGE-LIKE TO OCCASIONALLY BLADED IN HABIT; SILTY TO SLIGHT GRITTY TEXTURE; SEMI GREASY TO SLIGHT FROSTED LUSTER; NAHCOLITE CRYSTALS VISIBLE THROUGH OUT THE SAMPLE.

SHALE = LIGHT GRAY TO LIGHT BROWNISH GRAY TO LIGHT OLIVE GRAY; BRITTLE TO CRUMBLY TO SLIGHT CRUNCHY TENACITY; SEMI HACKLY TO PREDOMINATELY PLANAR FRACTURIN -G; CUTTINGS TEND TO BE PLATY TO SLIGHT



FLAKY TO SEMI BLADED IN HABIT; SMOOTH TO CLAYEY TEXTURE; SLIGHT GREASY TO SEMI WAXY TO DULL EARTHY LUSTER; NO OTHER VISIBLE BEDDING FEATURE.

LIMESTONE = LIGHT BROWNISH GRAY TO LIGHT YELLOWISH GRAY; STIFF TO CRUNCHY TENA-CITY; IRREGULAR TO SPLINTERY FRACTURING; DISSOLVES READILY IN DILUTE HCl; CUTTING TEND TO BE NODULAR TO WEDGE-LIKE IN HABIT; SLIGHT WAXY TO SEMI VITREOUS LUSTER; SMOOTH TO SUCROSIC TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

WASATCH G SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; 2-3% DARK LITHICS VISIBLE IN SAMPLE; MOSTLY QUARTZ FRAMEWORK WITH VISIBLE CHLORITE CRYSTALS ; COARSE TO MEDIUM TO FINER GRAIN LATER IN FORMATION; WELL TO FAIR SORTED; SUB-ROUND TO ROUND GRAINS; MODERATE TO LOW SPHERICITY; FINE GRAIN HAVE A SLIGHT FROSTED APPEARANCE; UNCONSOLIDATED GRAIN DUE TO BIT ACTION; FIRM FRIABLE TO MOD-ERATE HARD TO VERY HARD; CALCITE CEMENT-ATION DUE TO HIGH REACTION IN DILUTE HCl , NO VISIBLE HYDROCARBONS; VISIBLE BEDS OF CARBONACEOUS MATERIAL VISIBLE THROUGH OUT THE SAMPLE; GRAIN SUPPORTED.

SILTSTONE = VERY LIGHT BLUISH GRAY TO LIGHT GRAY TO SLIGHT YELLOWISH GRAY; CRUNCHY TO STIFF TO OCCASIONALLY CRUMB-LY TENACITY; SEMI PLANAR TO PREDOMINATE HACKLY TO BLOCKY FRACTURING; CUTTINGS TEND TO BE SLIGHT WEDGE-LIKE TO SEMI TABULAR IN HABIT; SLIGHT GREASY TO SEMI FROSTED TO SLIGHT SPARKLING LUSTER; GRITTY TO SILTY TEXTURE; 20-30% VISIBLE PALESOLS IN SAMPLE.

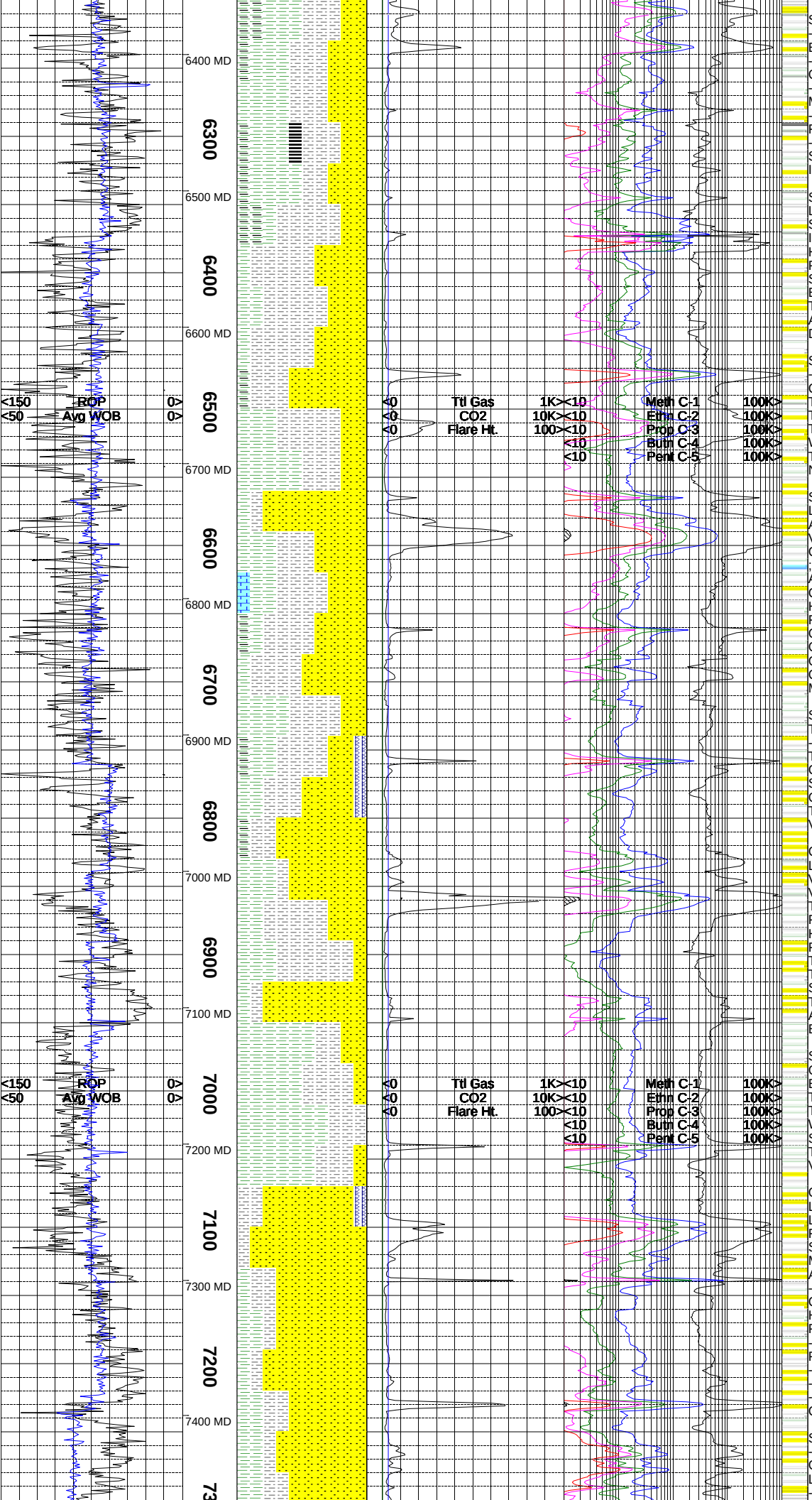
SHALE = LIGHT GRAY TO LIGHT OLIVE GRAY; BRITTLE TO CRUMBLY TENACITY; HACKLY TO PREDOMINATELY PLANAR FRACTURING; CUTTING TEND TO BE PLATY TO FLAKY IN HABIT; DULL TO EARTHY TO SEMI WAXY LUSTER; SMOOTH TO SEMI-SILTY TO SEMI-CLAYEY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT TANISH-BROWNISH GRAY WITH BLACK AND OCCASIONAL MODERATE GREEN HUES; QUAR -TZ DOMINANT; PREDOMINATELY GRAIN SUPPOR -TED WITH FEW LOOSE GRAINS; COMPOSED OF CALCITIC CEMENTATION WITH LIGHT TO MODER -ATE REACTION TO DILUTE HCL; MATRIX CONT -AINS 3 TO 7% DARK LITHIC FRAGMENTS; VER -Y FINE TO MEDIUM-FINE GRAINED; FAIR TO WELL SORTING; SUB-ANBULAR TO SUB-ROUNDED ANGULARITY; LOW MODERATELY HIGH SPHERIC-ITY; POOR GRADE SILTSTONE VISIBLE BEDDIN -G WITH POOR GRADE SANDSTONE, NO OTHER VISIBLE BEDDING OR OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO VERY LIGHT BROWNISH GRAY; MODERATE -LY DENSE TO VERY SLIGHTLY TOUGH TENACIT -Y; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; VERY SLIGHTLY CLA -YEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH GRAY TO DARK BROWNISH GRAY TO OCCASIONAL OLIVE BLACK; MODERATELY DENSE TO SLIGHTLY TOUGH TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASI -ONAL MASSIVE TO SUB-TABULAR TO SUB-NODU -LAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLI -GHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; CARBONACEOUS SHALE AND POOR GRADE SANDSTONE VISIBLE BEDDING WITH VERY SMALL AMOUNT OF COAL, NO OTHER DIST -INGUISHABLE STRUCTURAL FEATURES PRESENT ; ACCESSORY MINERAL PYRITE PRESENT IN SA -MPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY; SLIGHTLY DENSE TO MODERA -TELY TOUGH TENACITY; IRREGULAR TO OCCAS -IONAL BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO VERY SLIGHTLY SILTY TEXTURE; VERY SMALL AMOUNT OF COAL VISIBLE DEGASS -ING, NO OTHER DISTINGUISHABLE STRUCTURA -L FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.



SANDSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO OCCASIONAL MEDIUM LIGHT GRAY WITH BLACK HUES; QUARTZ DOMINATE; PREDOMINATE -LY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONTAINS CALCITIC CEMENT WITH MO -DERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 8% DARK LITHIC FRAG -MENTS; MEDIUM TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB -ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE IN SANDSTONE.

SILTSTONE = LIGHT OLIVE GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY; CRUNCHY TO STIFF TO OCCASIONALLY CRUMBLY TENACITY; IRREGULAR TO PLANAR TO PREDOMINATELY HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI TABULAR IN HABIT; SLIGHT FROSTED TO SEMI GREASY TO DULL EARTHY LUSTER; SILTY TO SEMI GRITTY TEXTURE; VISIBLE PYRITE VEINS IN CARBON- ACEOUS SHALE BEDS; NO OTHER VISIBLE BED- DING FEATURES.

SHALE = LIGHT MEDIUM GRAY TO LIGHT BLUIS -S GRAY; BRITTLE TO CRUMBLY TO SLIGHT CRUNCHY TENACITY; PREDOMINATELY PLANAR TO SLIGHT BLOCKY FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO SEMI ELONGATED TABULAR IN HABIT; DULL EARTHY TO SEMI WAXY TO SLIGHT GREASY LUSTER; SMOOTH TO SLIGHT SILTY TO SEMI CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK WITH A 1-3% OF LIGHT GREEN CHLORITE CRYSTALS VISIBLE IN SAMPLE; MOSTLY COARSE TO VERY COARSE TO OCCASIONALLY MEDIUM GRAIN SIZE ; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; FIRM FRIABLE TO MODERATE HARD; CALCITE CEMENTATION DUE TO MODERATE TO HIGH REACTION IN DILUTE HCl; POOR TO FAIR TO WELL SORTED; SUBROUND TO ROUND GRAINS; LOW TO MODERATE SPHERICITY; GRAINS HAVE A SLIGHT POLISH APPEARANCE; GRAIN SUPPORTED; NO VISIBLE HYDRO- CARBONS IN SAMPLE; VISIBLE CARBONACEOUS MATERIAL IN SAMPLE.

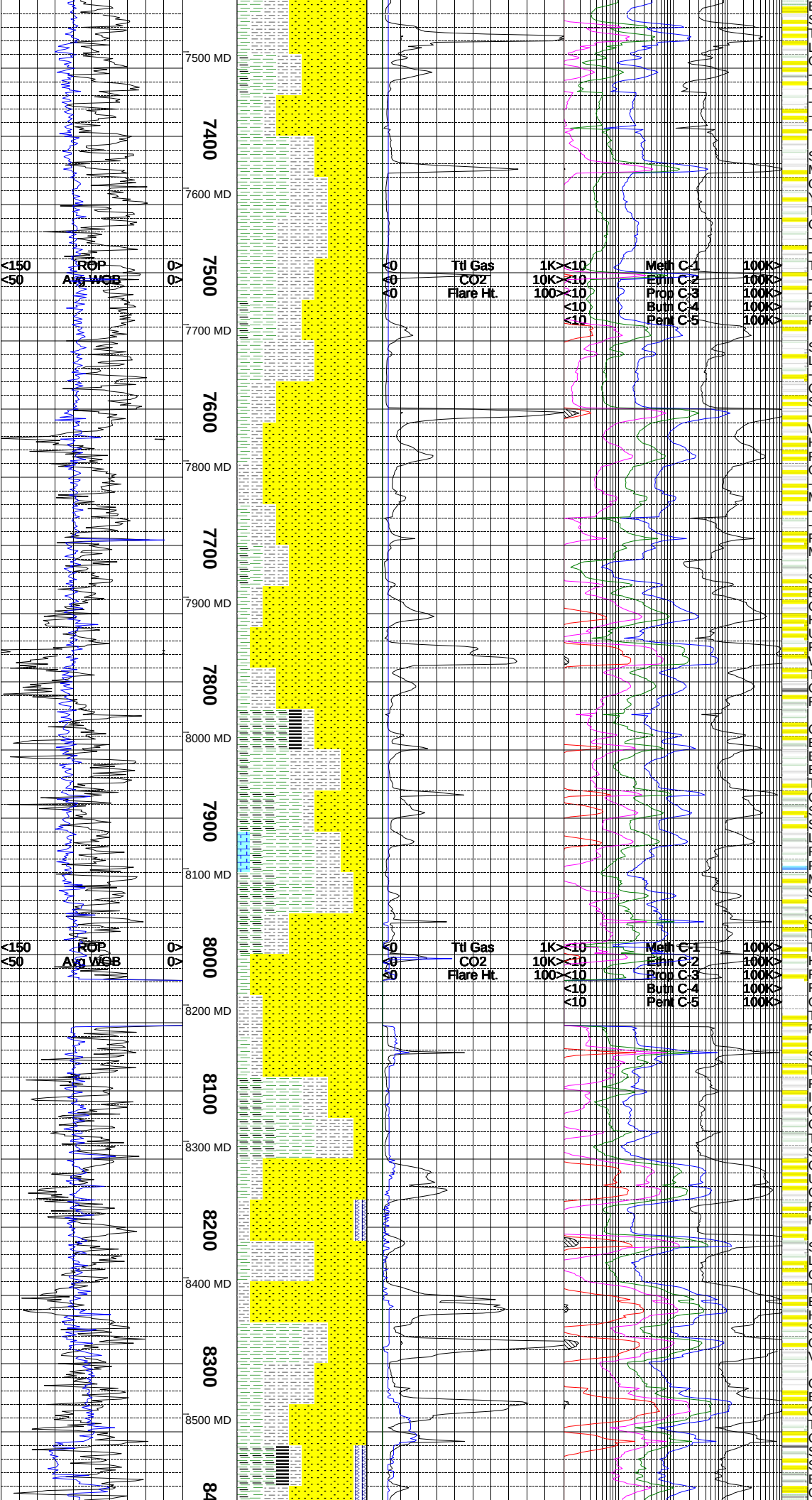
SHALE= LIGHT BLUISH GRAY TO LIGHT GRAY TO VERY LIGHT GRAY; PREDOMINATELY BRITTL -E TO CRUMBLY TO OCCASIONALLY CRUNCHY TENACITY; PLANAR TO HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SLIGHTLY NODULAR; DULL EARTHY TO SEMI GREASY TO SLIGHT SPARKLING LUSTER; SILTY TO CLAYEY TO MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

CARBONACEOUS SHALE = LIGHT OLIVE GRAY TO LIGHT BROWNISH GRAY TO BROWNISH GRAY; VISIBLE BEDS OF CARBONACEOUS MATERIAL VISIBLE THROUGH OUT THE SAMPLE; CRUMBLY TO CRUNCHY TO SLIGHTLY BRITTLE TENACITY; PLANAR TO SEMI BLOCKY TO OCCASIONALLY HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO SEMI WEDGELIKE TO ELONGATED TABULAR IN HABIT; DULL TO SLIGHT GREASY TO SPARKLING TO SEMI FROSTED LUSTER; SILTY TO GRITTY TO OCCASIONALLY SMOOTH TEXTURE; VISIBLE DEGASSING ALONG CARBON- ACEOUS MATERIAL BEDS; VISIBLE PYRITE BANDS IN MOST OF SAMPLE.

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

OHIO CREEK SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; 2-3% DARK LITHICS VISIBLE IN SAMPLE; MOSTLY QUARTZ FRAMEWORK; VERY COARSE TO COARSE GRAIN SIZE; SUB ANGULAR TO SUBROUND GRAINS; MODERATE TO LOW SPHERICITY; GRAINS HAVE A SLIGHT PITTED APPEARANCE; GRAIN SUPPOR -TED WITH MOSTLY LOOSE GRAINS; CONTAINS CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; FAIR TO POOR SORTING; POOR GRADE SILTSTONE VISIB -LE GRADING WITH POOR GRADE SANDSTONE, POOR GRADE SILTSTONE VISIBLE BEDDING WIT -H SHALE, NO OTHER DISTINGUISHABLE STRUC -TURAL FEATURES PRESENT; ACCESSORY MINER -AL PYRITE VISIBLY IN CONTACT WITH SHALE CUTTING IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO OCCASIONAL LIGHT BLUISH TO LIGHT GREENISH GRAY; SLIGHTLY DENSE TO SLIGHT- LY BRITTLE TO SLIGHLTY CRUMBLY TO CRUNCH -Y TENACITY; IRREGULAR TO SUB-PLANAR TO



EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH FINE GRAINED SANDSTONE, SHALE VISIBLE INTERBEDDED IN SILTSTONE CUTTING, NO OTHER DISTINGUISHABLE STRUCTUAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY WITH OCCASIONAL MEDIUM LIGHT GRAY AND DARK YELLOWISH ORANGE MOTTLING; MODERATELY TOUGH TO SLIGHLTY DENSE TO OCCASIONAL CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY FRACTURE; MASSIVE TO ELONGATED TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT TAN-BROWNISH GRAY WITH BLACK, MODERATE BROWN, AND OCCASIONAL MODERATE GREEN HUES; QUARTZ DOMINANTE; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; COMPOSED ENTIRELY OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 8% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SILTSTONE = LIGHT OLIVE GRAY TO LIGHT BROWNISH GRAY TO SLIGHT YELLOWISH GRAY; CRUNCHY TO SEMI STIFF TENACITY; SEMI HACKLY TO PLANAR TO OCCASIONALLY IRREGULAR FRACTURING; CUTTINGS TEND TO BE PLATY TO SLIGHT BLADED TO ELONGATED WEDGE-LIKE IN HABIT; FROSTED TO SPARKLING TO SLIGHT GREASY LUSTER; SILTY TO SEMI GRITTY TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

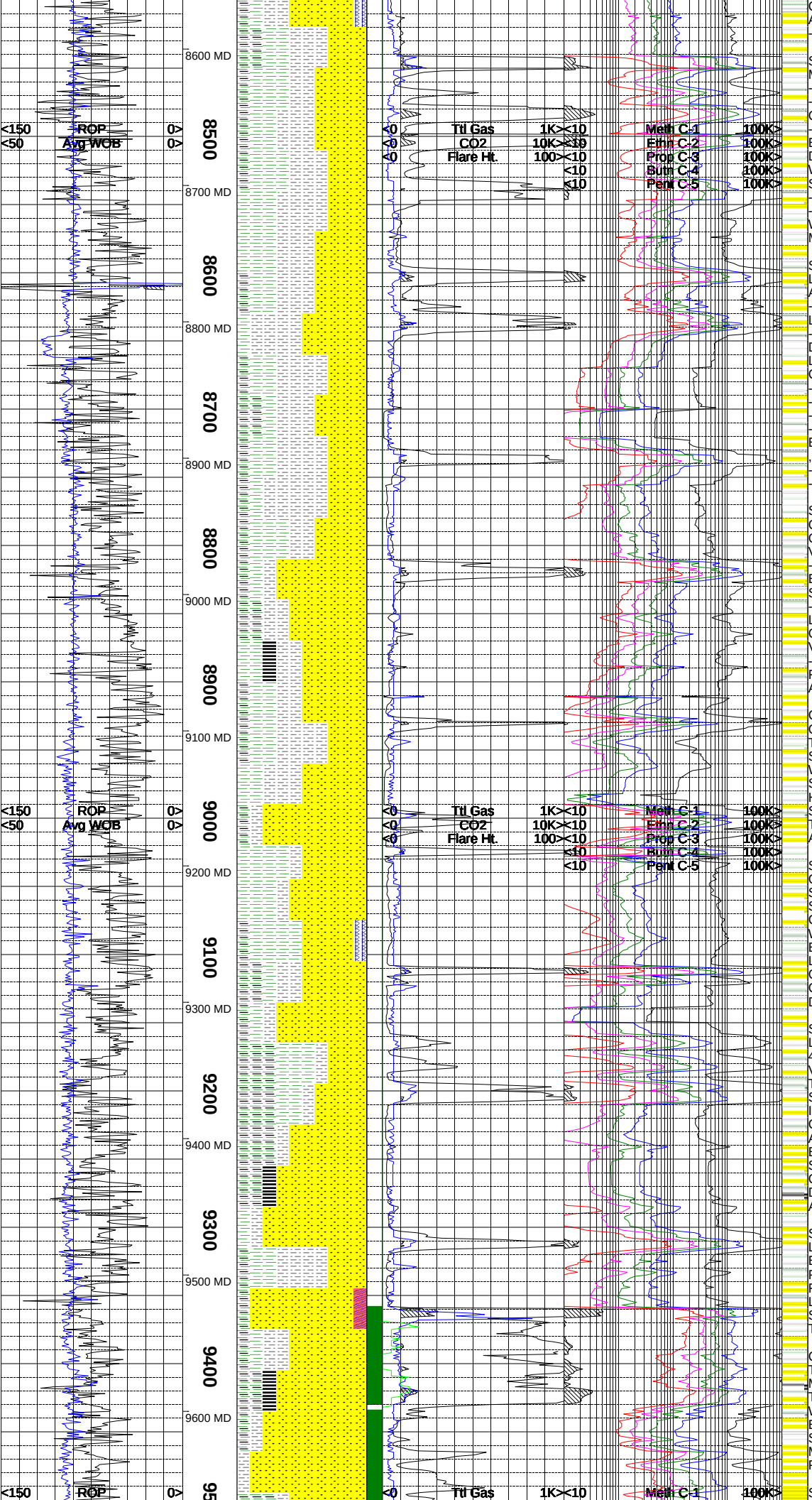
CARBONACEOUS SHALE = OLIVE GRAY TO BROWNISH GRAY TO OCCASIONALLY BROWNISH BLACK; CRUMBLY TO CRUNCHY TO BRITTLE TENACITY; PREDOMINATELY HACKLY TO SPLINTERY TO SEMI BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SLIGHT TABULAR IN HABIT; DULL EARTHY TO SLIGHT METALLIC SPARKLE TO SEMI FROSTED LUSTER; GRITTY TO SEMI GRANULAR TO PREDOMINATELY CLAYEY TEXTURE; VISIBLE PYRITE; VISIBLE BEDS OF CARBONACEOUS MATERIAL; VISIBLE DEGASSING IN MOST OF SAMPLE.

SHALE = VERY LIGHT GRAY TO GREENISH GRAY TO YELLOWISH GRAY; CRUMBLY TO BRITTLE TENACITY; PREDOMINATELY PLANAR TO SEMI HACKLY TO OCCASIONALLY SPLINTERY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY IN HABIT; DULL EARTHY TO SLIGHTLY GREASY LUSTER; SILTY TO CLAYEY TO MATTE TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; PREDOMINATELY QUARTZ FRAMEWORK WITH 1-2% DARK LITHICS VISIBLE IN SAMPLE; GRANULAR TO VERY COARSE TO COARSE GRAIN SIZE; POOR TO FAIR SORTED; GRAIN SUPPORTED; SUBANGULAR TO ANGULAR TO SUB ROUND GRAINS; MODERATE TO LOW SPHERICITY; NO VISIBLE SURFACE FEATURES ON GRAINS; FIRM FRIABLE TO FRIABLE; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; CALCITE CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl; NO VISIBLE HYDROCARBONS IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO MEDIUM LIGHT GRAY; CRUNCHY TO STIFF TO SLIGHT CRUMBLY TENACITY; PREDOMINATELY HACKLY TO PLANAR FRACTURING; CUTTINGS TEND TO BE WEDGELIKE TO ELONGATED TABULAR IN HABIT; SLIGHT FROSTED TO DULL EARTHY TO SEMI GREASY LUSTER; GRITTY TO SILTY TO OCCASIONALLY SMOOTH TEXTURE; NO OTHER VISIBLE BEDDING FEATURES.

CARBONACEOUS SHALE = OLIVE GRAY TO OLIVE BLACK TO BROWNISH BLACK; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; IRREGULAR TO PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI TABULAR IN HABIT; DULL EARTHY TO SEMI FROSTED TO SPARKLING LUSTER; VISIBL BEDS OF CARBONACEOUS MATERIAL; SILTY TO GRITTY TEXTURE; VISIBLE DEGASSING ALONG



CARBONACEOUS SHALE CUTTINGS AND SMALL AMOUNT OF COAL CUTTINGS; NO VISIBLE ACCE -SSORY MINERALS PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASION LIGHT BLUI -SH GRAY, AND GRAYISH RED PUPLE; SLIGHTL -Y TOUGH TO MODERATELY DENSE TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCK -Y TO EARTHY FRACTURE; MOSTLY MASSIVE TO ELONGATED TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI- WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; FRACTU -RE EVIDENCE PRESENT IN SANDSTONE CUTTIN -G, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO WHITE TO VERY LIGHT TAN-BROWNISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINA -NT; PRIMARILY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONTAINS CALCITIC CEMENTAT -ION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 8% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM- COARSE GRAINED; FAIR TO VERY POOR SORTIN -G; SUB-ANGULAR TO SUB-ROUNDED ANGULARIT -Y; LOW TO VERY LOW TO MODERATE SPHERICI -TY; POOR GRADE SILTSTONE VISIBLE GRADIN -G WITH POOR GRADE SANDSTONE, FRACTURE EVIDENCE VISIBLE ALONG SANDSTONE CUTTING , NO OTHER DISTINGUISHABLE SURFACE FEATU -RES PRESENT IN SAMPLE; NO ACCESSORY MIN -ERALS PRESENT IN SAMPLE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO LIGHT BROWNISH GRAY TO BROWNISH GRAY; SLIGHTLY DESNE TO VERY SLIGHTLY BRITTLE TO SLIGHTLY CRUMBL -Y TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EART -HY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTON -E, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO VISIBLE ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH BLACK TO OLIVE BLACK TO DARK BROWNISH GRAY; TOUGH TO SLIGHTLY DENSE TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY-HACKLY FRACTURE; WEDGE LIKE TO OCCASIONAL ELONGATED TO SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO SLIGHTLY GRITTY TEXTURE; NO VISIBLE ACCESSORY MINERALS PRESENT IN SAMPLE.

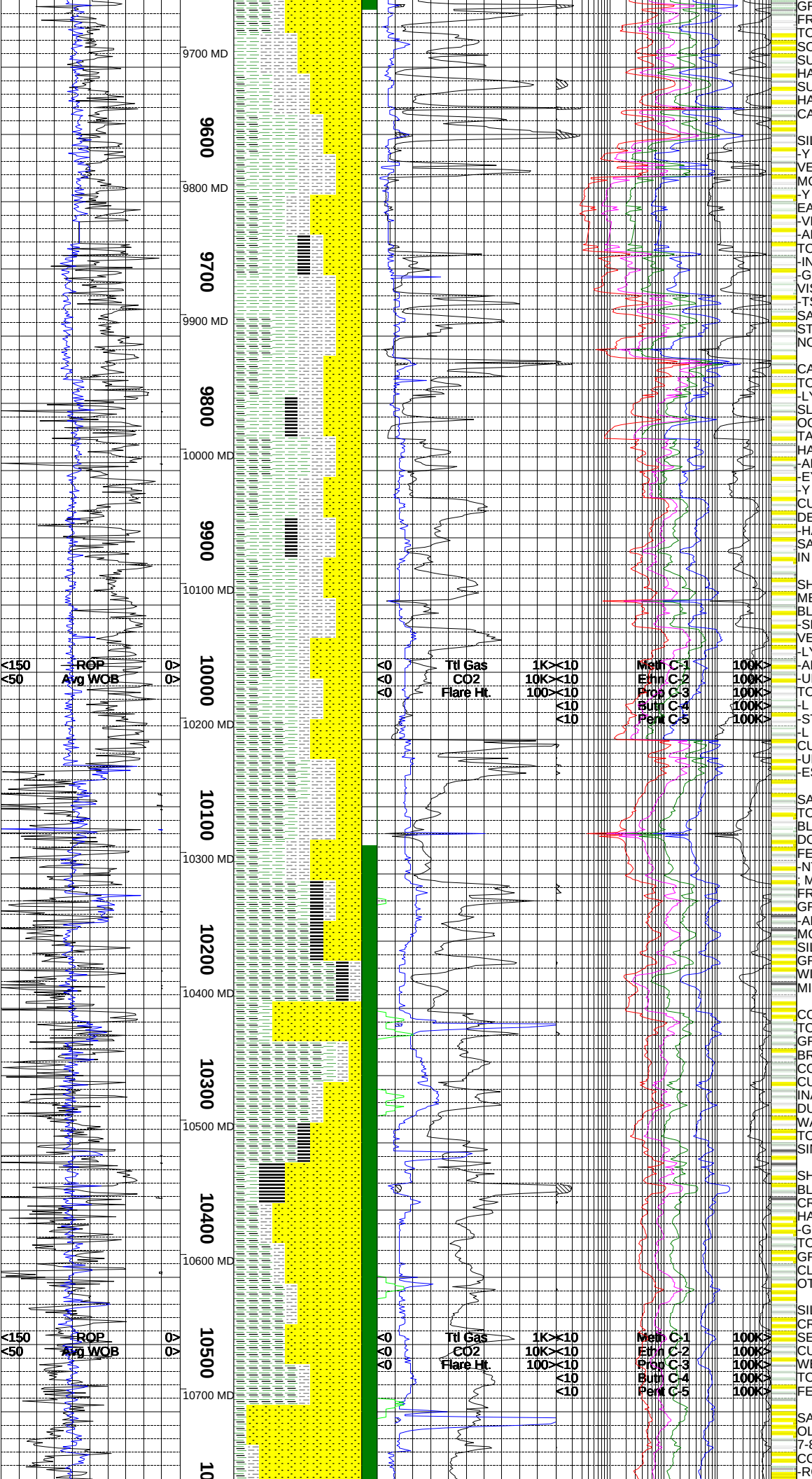
SILTSTONE = MEDIUM LIGHT GRAY TO LIGHT GRAY TO VERY LIGHT GRAY; CRUNCHY TO STIFF TENACITY; PREDOMINATELY HACKLY TO SLIGHT PLANAR TO SEMI BLOCKY FRACTURING; CUTTINGS TEND TO BE PLATY TO ELONGATED WEDGELIKE TO SEMI TABULAR IN HABIT; DULL EARTHY TO SPARKLING TO SEMI FROSTED LUSTER; SILTY TO GRITTY TO OCCASIONALLY GRANULAR TEXTURE; GRADES INTO LOW GRADE COAL WITH VISIBLE PYRITE VEINS; VISIBLE DEGASSING ALONG COAL VEINS.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK WITH 4-5% DARK LITHICS VISIBLE IN SAMPLE; VERY COARSE TO COARSE GRAIN SIZE; POOR TO FAIR SORTED; ANGULAR TO SUBANGULAR TO SUBROUND GRAINS; MODERATE TO LOW SPHER- ICITY; NO VISIBLE SURFACE FEATURES ON GRAINS; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; FIRM FRIABLE TO MODERATE HARD; BANDS OF KAOLINITIC SANDS VISIBLE IN SAMPLE; NO VISIBLE HYDROCARBONS; CALCITE CEMENTATION DUE TO MODERATE REACTION IN DILUTE HCl; GRAIN SUPPORTED; GRADES INTO A GRITTY CARBONACEOUS SHALE.

SHALE = VERY LIGHT GREENISH GRAY TO LIGHT GRAY TO LIGHT YELLOWISH GRAY; BRITTLE TO CRUMBLY TENACITY; PREDOMINATE PLANAR TO SLIGHT HACKLY TO SPLINTERY FRACTURING; DULL EARTHY TO SEMI GREASY LUSTER; CUTTINGS TEND TO BE WEDGELIKE TO SEMI PLATY IN HABIT; CLAYEY TO SMOOTH TEXTURE; NO OTHER VISIBLE BEDDING FEAT.

COAL = BROWNISH BLACK TO GRAYISH BLACK TO BLACK; CRUNCHY TO STIFF TO 0CCASIONAL MALLEABLE TENACITY; IRREGULAR TO BLOCKY TO PREDOMINATELY CONCHOIDAL FRACTURING; WEDGELIKE TO SEMI NODULAR TO SLIGHT BLADED CUTTINGS HABIT; SLIGHT GREASY TO SEMI WAXY LUSTER; SMOOTH TO CLAYEY TO MATTE TEXTURE; VISIBLE DEGASSING; VISIBL PYRITE CRYSTAL IN SAMPLE.

SANDSTONE = WHITE TO VERY BROWNISH



GRAY TO VERY LIGHT GRAY; MOSTLY QUARTZ FRAMEWORK WITH 3-5% DARK LITHICS; COARSE TO VERY COARSE GRAIN SIZE; POOR TO FAIR SORTED; MODERATE TO HIGH SPHERICITY; SUBANGULAR TO ANGULAR GRAINS; GRAINS HAVE A SLIGHT POLISH APPEARANCE; GRAIN SUPPORTED; CALCITE CEMENTATION; MODERATE HARD TO FIRM FRIABLE NO VISIBLE HYDRO-CARBONS.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA -Y TO OCCASIONAL MEDIUM LIGHT GRAY WITH VERY FEW BLACK HUES; SLIGHTLY DENSE TO MODERATELY TOUGH TO VERY SLIGHTLY CRUNCH -Y TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; OCCASIONAL MASSI -VE TO OCCASIONAL ELONGATED TO SUB-TABUL -AR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKL -ING LUSTER; SLIGHTLY CLAYEY TO VERY SLI -GHLTY GRITTY TEXTURE; VERY THIN LAMINAE VISIBLE IN SHALE CUTTING, POOR GRADE SIL -TSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OLIVE BLACK; SLIGHT -LY TOUGH TO MODERATELY DENSE TO VERY SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO OCCASIONAL MASSIVE TO SUB-PLATY TO SUB-TABULAR TO SLIGHTLY WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL WITH OCCASION -AL SEMI-SPARKLING LUSTER; SLIGHTLY CLAY -EY TO VERY SLIGHTLY GRITTY TEXTURE; VER -Y THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, SMALL AMOUNT OF COAL VISIBLE DEGASSING IN SAMPLE, NO OTHER DISTINGUIS -HABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL LIGHT BLUISH GRAY WITH OCCASIONAL PALE YELLOWI -SH AND GRAYISH RED PURPLE MOTTLING; VERY SLIGHTLY DENSE TO BRITTLE TO SLIGHT -LY CRUNCHY TO CRUMBLY TENACITY; IRREGUL -AR TO SUB-PLANAR TO EARTHY-HACKLY FRACT -URE; MASSIVE TO ELONGATED TO WEDGE LIKE TO OCCASIONAL BLADED CUTTINGS HABIT; DUL -L TO EARTHY DULL TO OCCASIONAL SEMI-FRO -STED TO SEMI-WAXY LUSTER; VERY THIN COA -L LAMINAE VISIBLE IN CARBONACEOUS SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCT -URAL FEATURES PRESENT IN SAMPLE; NO ACC -ESSORY MINERALS PRESENT IN SAMPLE.

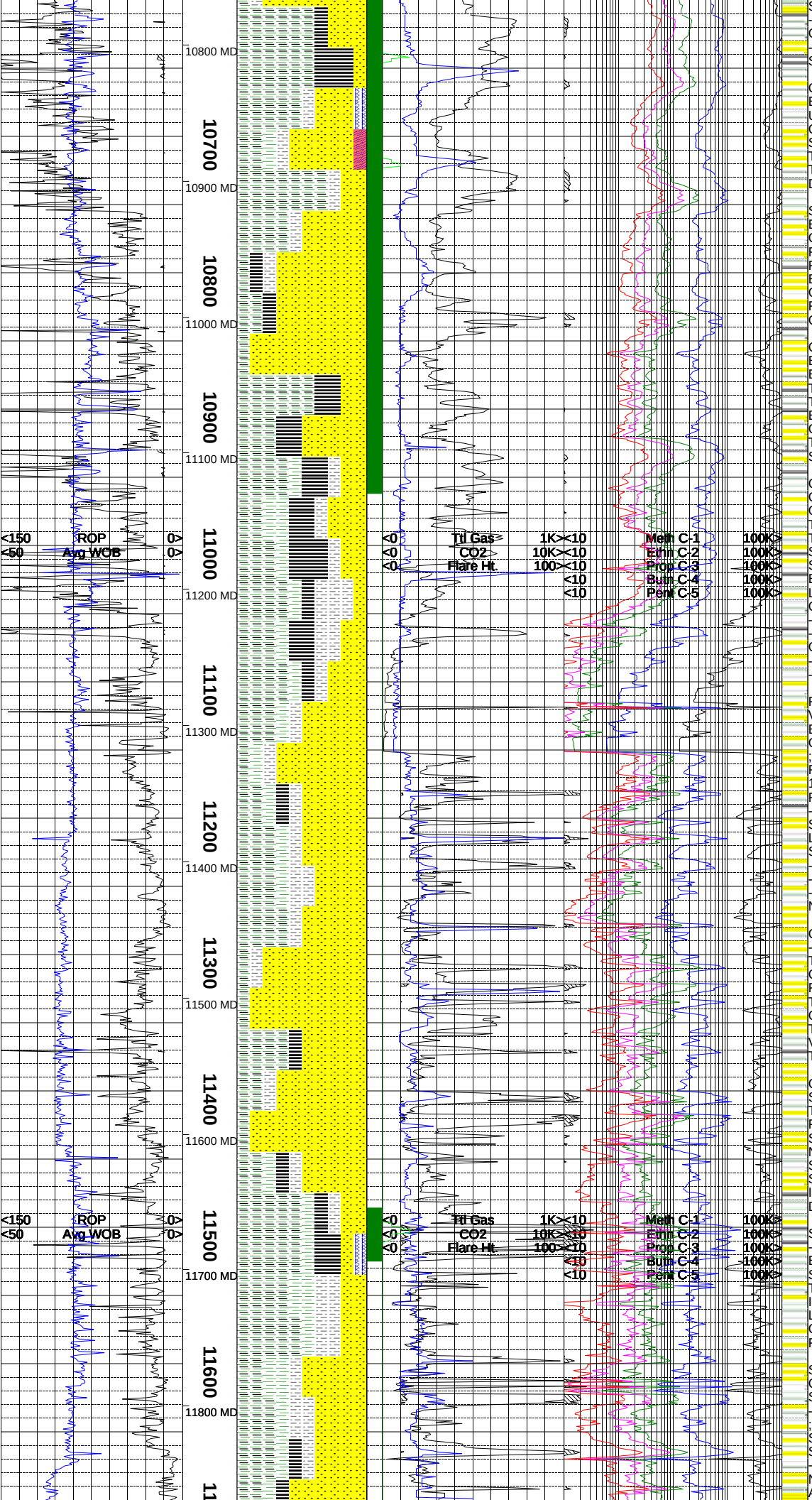
SANDSTONE = VERY LIGHT TAN-BROWNISH GRAY TO VERY LIGHT GRAY TO OFF WHITE WITH BLACK AND MODERATE BROWN HUES; QUARTZ DOMINANT; MOSTLY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONTAINS CALCITIC CEME -NT WITH MODERATE REACTION TO DILUTE HCL ; MATRIX CONSISTS OF 4 TO 7% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGUL -AR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE WITH VISIBLE GRADING WITH POOR GRADE SANDSTONE; SMALL AMOUNT OF COAL WITH VISIBLE DEGASSING; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

COAL = GRAYISH BLACK TO BROWNISH BLACK TO BLACK; VISIBLE PYRITE IN SAMPLE; GRADES INTO A SILTY CARBONACEOUS SHALE; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO CONCHOIDAL TO SEMI PLANAR FRACTURING; CUTTINGS TEND TO BE NODULAR TO PREDOM-INATELY WEDGELIKE TO TABULAR IN HABIT; DULL EARTHY TO SEMI SPAKLING TO MOSTLY WAXY TO GREASY LUSTER; SMOOTH TO MATTE TO SLIGHT GRITTY TEXTURE; VISIBLE DEGAS-SING IN SAMPLE.

SHALE = LIGHT GREENISH GRAY TO LIGHT BLUISH GRAY; BRITTLE TO CRUMBLY TO SEMI CRUNCHY TENACITY; IRREGULAR TO SEMI HACKLY TO PREDOMINATELY PLANAR FRACTURIN -G; CUTTINGS TEND TO BE PLATY TO BLADED TO ELONGATED TABULAR IN HABIT; SLIGHT GREASY TO SEMI WAXY TO DULL LUSTER; CLAYEY TO SILTY TO SMOOTH TEXTURE; NO OTHER VISIBLE BEDDING FEATUERS.

SILTSTONE = BROWNISH GRAY TO OLIVE GRAY; CRUNCHY TO STIFF TENACITY; BLOCKY TO SEMI PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE BLADED TO ROUNDED WEDGELIKE IN HABIT; GRANULAR TO GRITTY TO SILTY TEXTURE; NO VISIBLE BEDDING FEATURES.

SANDSTONE = LIGHT BROWNISH GRAY TO LIGHT OLIVE GRAY; MOSTLY QUARTZ FRAMEWORK WITH 7-8% DARK LITHICS VISIBLE IN SAMPLE; COARSE TO MEDIUM TO FINE GRAIN SIZE; SUB -ROUND TO ROUND GRAINS; MODERATE TO LOW



SPHERICITY; GRAIN SUPPORTED; FIRM FRIABL
-E TO MODERATE HARD; UNCONSOLIDATED
GRAINS DUE TO BIT ACTION; CALCITE CEMENT
-ATION; NO VISIBLE HYDROCARBONS IN
SAMPLE; NO VISIBLE SURFACE FEATURES.

COAL = BLACK TO BROWNISH BLACK TO OLIVE
BLACK; CRUNCHY TO STIFF TENACITY; IRREG-
ULAR TO BLOCKY TO PLANAR FRACTURING;
CUTTINGS TEND TO BE PLATY TO FLAKY TO
SEMI WEDGELIKE IN HABIT; GREASY TO WAXY
TO OCCASIONALLY SPARKLING LUSTER; SILTY
TO SMOOTH TO MATTE TEXTURE; VISIBLE
DEGASSING IN MOST OF SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT
BLUISH GRAY; CRUNCHY TO CRUMBLY TENA-
CITY; PREDOMINATELY PLANAR TO HACKLY
FRACTURING; CUTTINGS TEND TO BE PLATY TO
FLAKY TO SEMI TABULAR IN HABIT; DULL
EARTHY TO SEMI GREASY LUSTER; SILTY TO
GRITTY TEXTURE; NO OTHER VISIBLE BEDDING
FEATURES; FOUND CALCITE FRACTURE FILL IN
COARSE GRAIN SANDSTONES.

COAL = BLACK TO OLIVE BLACK TO GRAYISH
BLACK; STIFF TO CRUNCHY TO OCCASIONALLY
BRITTLE TENACITY; BLOCKY TO CONCHOIDAL
TO SEMI PLANAR FRACTURING; CUTTINGS TEND
TO BE WEDGELIKE TO SEMI TABULAR TO
BLADED IN HABIT; DULL EARTHY TO SEMI
GREASY TO WAXY LUSTER; MATTE TO SMOOTH
TO SLIGHT GRITTY TEXTURE; VISIBLE DEGAS-
SING IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH
GRAY TO BROWNISH BLACK TO OCCASINAL
OLIVE BLACK; SLIGHTLY DENSE TO SLIGHTLY
TOUGH TENACITY; IRREGULAR TO SUB-BLOCKY
TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE;
SUB-TABULAR TO OCCASINAL WEDGE LIKE TO
SUB-NODULAR CUTTINGS HABIT; DULL TO
EARTHY DULL TO OCCASIONAL SEMI-SPARKLING
LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHLTY
GRITTY TEXTURE; COAL MODERATELY DEGASSIN
-G, AND VERY SMALL AMOUNT OF CARBONACEOU
-S SHALE CUTTING VISIBLE DEGASSING; NO
OTHER DISTINGUISHABLE STRUCTURAL FEATURE
-S PRESENT IN SAMPLE; NO ACCESSORY MINER
-ALS PRESENT IN SAMPLE.

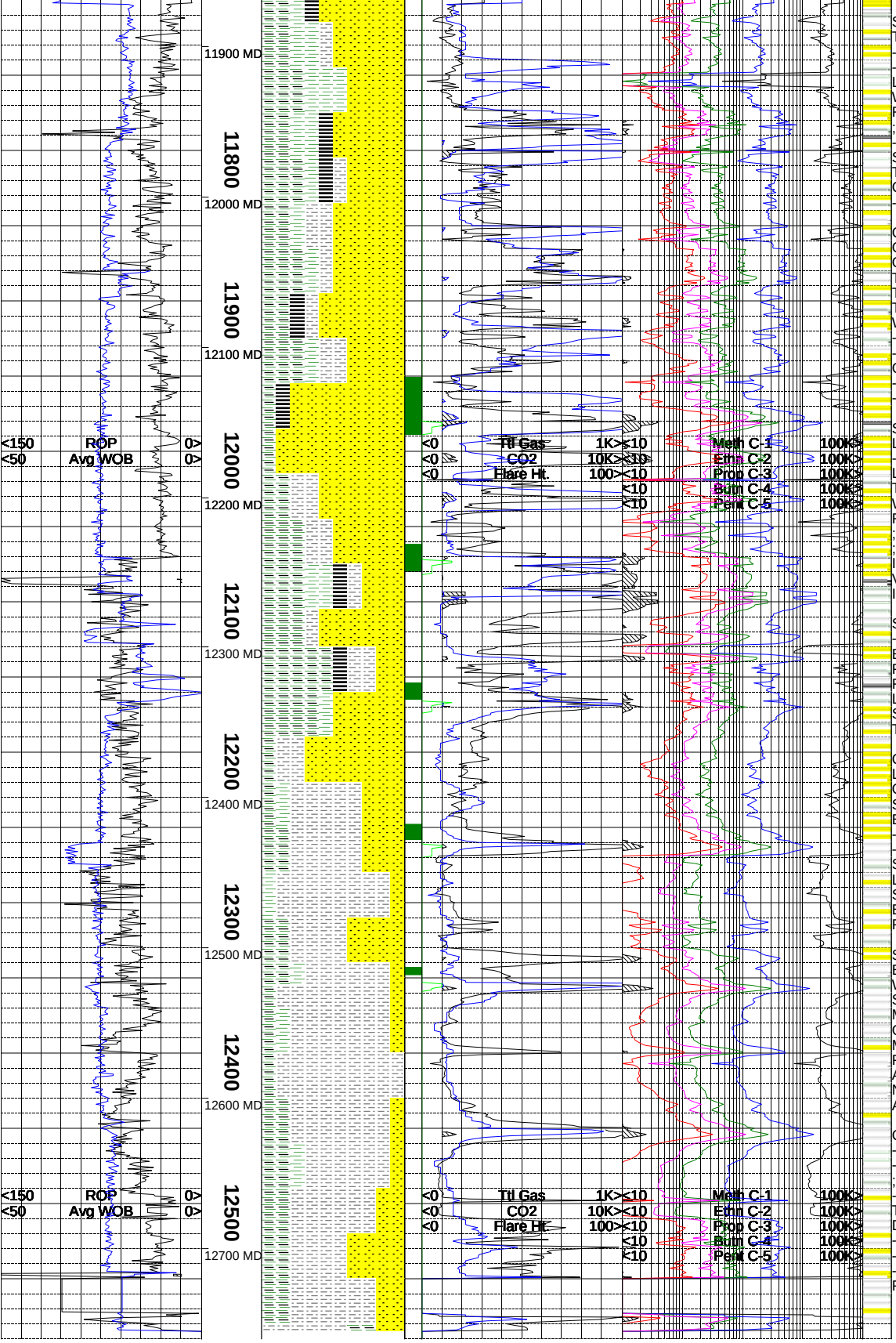
ROLLINS SANDSTONE = WHITE TO OFF WHITE
VERY LIGHT YELLOWISH GRAY WITH FEW
BLACK HUES; QUARTZ DOMINANT FRAMEWORK;
GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS
; CONTAINS SILICIC CEMENTATION WITH NO
REACTION TO DILUTE HCL; MATRIX CONTAINS
1 TO 3% DARK LITHIC FRAGMENTS; MEDIUM-
FINE TO MEDIUM-COARSE GRAINED; MODERATEL
-Y FAIR TO POOR SORTING; SUB-ANGULAR TO
SUB-ROUNDED TO ROUNDED ANGULARITY;
LOW TO MODERATE SPHERICITY; POOR GRADE
SILTSTONE VISIBLE GRADING WITH POOR GRAD
-E SANDSTONE, SMALL AMOUNT OF SHALE VISI
-BLE DEGASSING IN SAMPLE, NO OTHER DISTI
-NGUISHABLE STRUCTURAL FEATURES PRESENT;
NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = OLIVE GRAY TO BROWN
-ISH GRAY; CRUNCHY TO CRUMBLY TO BRITTLE
TENACITY; HACKLY TO PLANAR FRACTURING;
CUTTINGS TEND TO BE PLATY TO SLIGHT
FLAKY TO PREDOMINATELY WEDGELIKE TO SEMI
TABULAR IN HABIT; FROSTED TO SLIGHT
GREASY TO SEMI SPARKLING LUSTER; GRITTY
TO SILTY TO OCCASIONALLY SMOOTH TEXTURE;
VISIBLE BEDS OF CARBONACEOUS MATERIAL IN
THE SAMPLE.

COAL = GRAYISH BLACK TO BROWNISH BLACK;
STIFF TO CRUNCHY TO SEMI MALLEABLE
TENACITY; IRREGULAR TO HACKLY TO SEMI
PLANAR FRACTURING; CUTTINGS TEND TO BE
SEMI WEDGE-LIKE TO ELONGATED TO SLIGHT
NODULAR IN HABIT; PREDOMINATELY WAXY TO
SLIGHT GREASY TO SEMI SPARKLING LUSTER;
SILTY TO OCCASIONALLY GRITTY TO PREDOM-
INATELY MATTE TO SMOOTH TEXTURE; VISIBL
DEGASSING IN MOST OF SAMPLE.

SHALE = VERY LIGHT GREENISH GRAY TO LIGH
-T BLUISH GRAY TO LIGHT GRAY; CRUMBLY TO
BRITTLE TENACITY; IRREGULAR TO PLANAR TO
SLIGHT SPLINTERY FRACTURING; CUTTINGS
TEND TO BE FLAKY TO PLATY TO SEMI BLADED
IN HABIT; DULL EARTHY TO SEMI GREASY
LUSTER; SMOOTH TO MATTE TO PREDOMINATELY
CLAYEY TEXTURE; NO OTHER VISIBLE BEDDING
FEATURES.

SILTSTONE = LIGHT GRAY TO LIGHT BROWNISH
GRAY; DENSE TO SLIGHTLY TOUGH TENACITY;
SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SU
-B-TABULAR TO SUB-NODULAR CUTTINGS HABIT
; DULL TO EARTHY DULL TO OCCASIONAL SEMI
SPAKLING LUSTER; SLIGHTLY CLAYEY TO VERY
SLIGHTLY GRITTY TEXTURE; VERY SMALL AMOU
-NT OF COAL VISIBLY DEGASSING IN SAMPLE,
NO OTHER STRUCTURAL FEATURES PRESENT; NO
ACCESSORY MINERALS PRESENT IN SAMPLE.



SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO VERY TAN-BROWNISH GRAY; QUARTZ DOMINA -TE FRAME WORK; CONTAINS CALCITIC CEMENT -ATION; MATRIX CONSISTS OF 7 TO 9% DARK LITHIC FRAGMENTS; MOSTLY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; QUARTZ CUTTINGS RANGE FROM TRANSLUCENT TO MOSTLY SMOKY ; MEDIUM-FINE TO FINE GRAINED; POOR TO M -ODERATELY WELL SORTING; SUB-ANGULAR TO SUB-ROUNDED TO ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; SMALL AMOUNT OF COAL VISIBLE DEGASSING IN SAMPLE; NO ACC -ESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = VERY DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BLACK; SLIGHTLY DENSE TO SLIGHTLY TOUGH TENACITY; IRREGULAR TO SUB-PLANAR TO SUB-BLOCKY TO EARTHY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL WEDGE LIKE CUTTINGS HABIT; DULL TO EARTH -Y DULL TO OCCASIONAL SEMI-SPARKLING LUS -TER; SLIGHLTY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY SMALL AMOUNT OF COA -L VISIBLE DEGASSING IN SAMPLE; ACCESSOR -Y MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = WHITE TO TRANSLUCENT TO VERY LIGHT GRAY TO LIGHT BROWNISH GRAY; MOSTL -Y QUARTZ FRAMEWORK WITH 2-3% DARK LITHICS VISIBLE IN SAMPLE; VERY COARSE TO COARSE TO OCCASIONALLY FINE GRAIN; WELL TO VERY WELL SORTED; SUBROUND TO ROUND GRAINS; MODERATE TO LOW SPHERICITY ; GRAINS HAVE A SLIGHT POLISH APPEARANCE ; A SILICIOUS CEMENT DUE TO LOW REACTION IN DILUTE HCl; GRAIN SUPPORTED; NO VISIBLE HYDROCARBONS; LESS THAN 1% KAOL-INITIC SANDS VISIBLE IN SAMPLE.

SHALE = VERY LIGHT GREENISH GRAY TO LIGH -T GRAY TO SEMI LIGHT BLUISH GRAY; BRITTLE TO CRUMBLY TENACITY; HACKLY TO PREDOMINATELY PLANAR TO SLIGHT BLOCKY FRACTURING; CUTTINGS TEND TO BE WEDGE-LIKE TO SEMI ELONGATED TABULAR IN HABIT; SEMI GREASY TO DULL EARTHY LUSTER; SILTY TO SMOOTH TO SLIGHT CLAYEY TEXTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO LIGHT OLIVE GRAY; VISIBLE BANDS OF CARB-ONACEOUS MATERIAL; CRUNCHY TO STIFF TO SLIGHT CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO SEMI HACKLY FRACTURING; CUTTIN -GS TEND TO BE PLATY TO ELONGATED TABULA -R IN HABIT; PREDOMINATELY GREASY TO SEMI WAXY TO SLIGHT FROSTED TO SPARKLING LUSTER; PREDOMINATELY GRITTY TO SILTY TO SEMI GRANULAR TEXTURE; NO OTHER VISIBLE BEDDING FEATURES OR ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = WHITE TO LIGHT GRAY TO LIGHT BROWNISH GRAY; MOSTLY QUARTZ FRAME-WORK WITH 3-6% DARK LITHICS VISIBLE IN SAMPLE; KAOLINITIC SANDS MAKE UP THE MATRIX FOR 4-5% OF THE SAMPLE; MOSTLY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; MEDIUM-FINE TO MEDIUM GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; NO VISIBLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CORCORAN MARINE SILTSTONE = LIGHT BROWNI -SH GRAY TO MEDIUM BROWN TO BROWNISH GRA -Y; MODERATELY DENSE TO CRUNCHY TENACITY ; SUB-PLANAR TO EARTHY FRACTURE; OCCASIO -NAL MASSIVE TO SEMI-WEDGE LIKE TO SUB-TABULAR CUTTINGS HABIT; DULL TO EARTHY DULL LUSTER; SLIGHTLY CLAYEY TO VERY SLI -GHLTY GRITTY TEXTURE; NO VISIBLE BEDDIN -G OR OTHER DISTINGUISHABLE SURFACE FEAT -URES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.