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Drilling Dynamics MD

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	HE
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

CASING DATA

DEPTHS: 4521' TO 12754'
DATES: 06/06/2010 TO 06/17/2010
SCALE: 1"=100'

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

MUD TYPES

HOLE SIZE

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

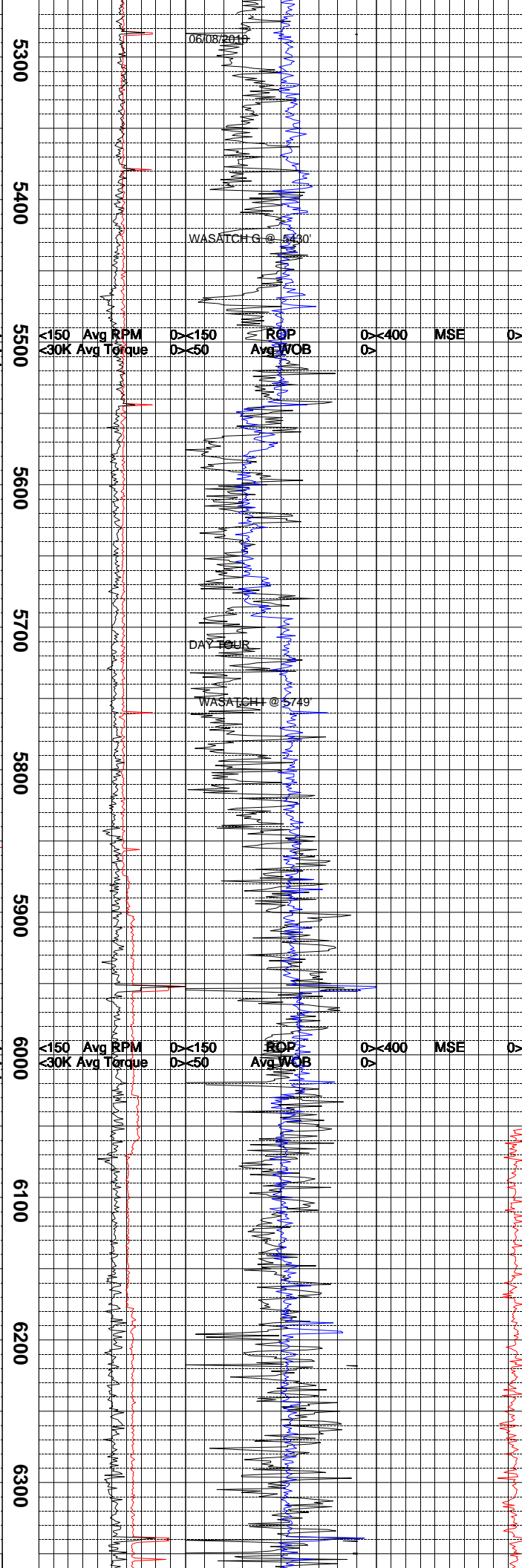
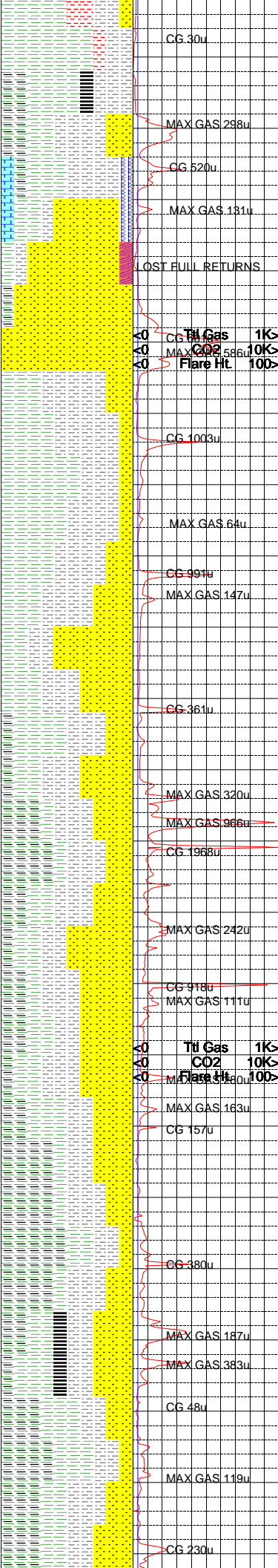
14.75" TO 4521'
8.9" TO 11870'
7.875" TO 12754'
TO

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		CHERT - GLASSY		FELSIC SILIC DIKE		MARL - CALC		SANDSTONE
	ANDESITE		CHERT - PORCEL		FOSSIL		METAMORPHICS		SANDSTONE-TUFFACEOUS
	ANHYDRITE		CHERT - TIGER STRIPE		GABBRO		MUDSTONE		SERICITIZATION
	BASALT		CHERT - UNDIFF		GLASSY TUFF		OBSIDIAN		SERPENTINE
	BENTONITE		CLAY		GRANITE		PALEOSOL		SHALE
	BIOTITIZATION		CLAY-MUDSTONE		GRANITE WASH		PHOSPHATE		SHALE TUFFACEOUS
	BRECCIA		CLYST-TUFFACEOUS		GRANODIORITE		PORCELANITE		SHELL FRAGMENTS
	CALCARENITE		CHLORITIZATION		GYPSUM		PORCELANEOUS CLYST		SIDERITE
	CALCAREOUS TUFF		COAL		HALITE		PYRITE		SILICIFICATION
	CALCILUTITE		CONGLOMERATE		HORNBL-QTZ-DIO		PYROCLASTICS		SILTSTONE
	CARBONATES		CONGL. SAND		IGNEOUS (ACIDIC)		QUARTZ DIORITE		SILTST-TUFFACEOUS
	CARBONACEOUS MAT		CONGL. SANDSTONE		IGNEOUS (BASIC)		QUARTZ LATITE		TUFF
	CARBONACEOUS SH		COQUINA		INTRUSIVES		QUARTZ MONZONITE		VOLCANICLASTICS SEDS
	CEMENT CONTAM.		DACITE		KAOLINITIC		RECRYSTALLIZED CALCITE		VOLCANICS
	CHALK		DIATOMITE		LIMESTONE		RHYOLITE		
	CRYSTALLINE TUFF		DIORITE		LITHIC TUFF		SALT		
	CHERT - ARGILL		DOLOSTONE		MARL - DOLO		SAND		

Lithology	<div><0 Ttl Gas 1K></div>			Depth	<div><150 Avg RPM 0><150 ROP 0><400 MSE 0></div>			MGS	Remarks			
	<div><0 CO2 10K></div>				<div>ft/hr</div>					<div>psi</div>		
	<div><0 Flare Ht. 100></div>				<div>Avg WOB 0></div>							
	<div>ft</div>				<div>FTLBS</div>					<div>klbs</div>		
				4300						ALL SAMPLE COLOR DESCRIPTIONS REFERENCED TO THE G.S.A. ROCK COLOR CHART.		
				4400						ROCK CHARACTERISTICS AND CONSTITUENTS ARE LISTED FROM MOST ABUNDANT TO LEAST ABUNDANT PERCENTAGE OF SAMPLE.		
				4500						GAS CALIBRATED TO S.P.L.W.A. STANDARDS (2% ME = 100 UNITS). GAS CHROMATOGRAPHY EQUIPMENT CALIBRATED TO A TEST GAS COMPOSED OF THE FOLLOWING:		
				4600						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		
				4500	<div><150 Avg RPM 0><150 ROP 0><400 MSE 0></div>	<div><30K Avg Torque 0><50 Avg WOB 0></div>				EPOCH WELL SERVICES COMMENCED LOGGING THE FRU 197-33B2 WELL ON 6/6/2010 @ 4522' MD.		
	<div>MAX GAS 309u</div>									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.		
				4600								
				4700						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.		
				4800						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.		
				4900						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.		
				5000	<div><150 Avg RPM 0><150 ROP 0><400 MSE 0></div>	<div><30K Avg Torque 0><50 Avg WOB 0></div>				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.		
				5100						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.		
				5200						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 TENACITY; 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 MODERATE HARD TO VERY HARD; CALCITE CEMENTATION 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 CRUMBLY 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.

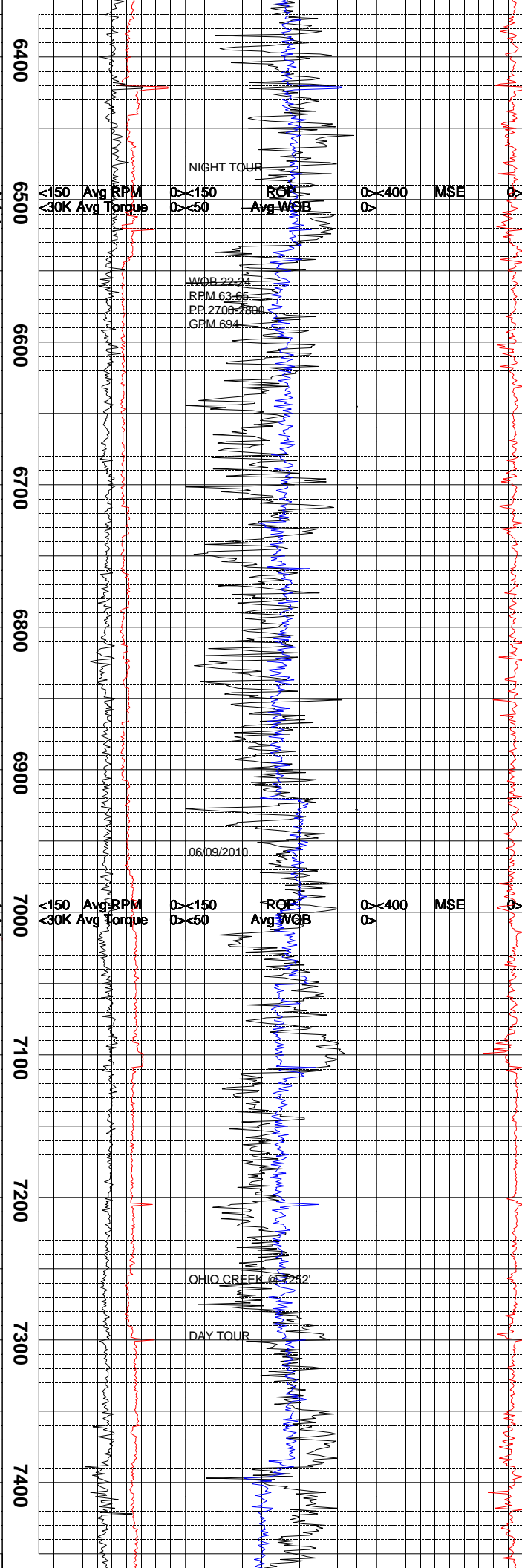
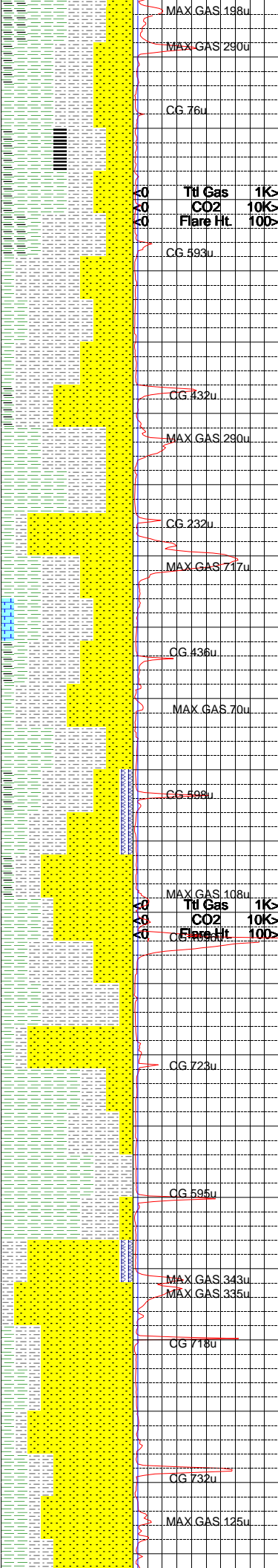
SHALE = LIGHT GRAY TO LIGHT OLIVE GRAY; BRITTLE TO CRUMBLY TENACITY; HACKLY TO PREDOMINATELY PLANAR FRACTURING; CUTTING TEND TO BE PLATY TO FLAKY IN HABIT; DULL TO EARTHY TO SEMI WAXY LUSTER; SMOOTH TO SEMI-SILTY TO SEMI-CLAYEY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES 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; QUARTZ DOMINANT; PREDOMINATELY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; COMPOSED OF CALCITIC CEMENTATION WITH LIGHT TO MODERATE REACTION TO DILUTE HCl; MATRIX CONTAINS 3 TO 7% DARK LITHIC FRAGMENTS; VERY FINE TO MEDIUM-FINE GRAINED; FAIR TO WELL SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; LOW MODERATELY HIGH SPHERICITY; POOR GRADE SILTSTONE VISIBLE BEDDING 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 GRAY TO VERY LIGHT BROWNISH GRAY; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TENACITY; 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 CLAYEY 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; OCCASIONAL MASSIVE TO SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; CARBONACEOUS SHALE AND POOR GRADE SANDSTONE VISIBLE BEDDING WITH VERY SMALL AMOUNT OF COAL; NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY; SLIGHTLY DENSE TO MODERATELY TOUGH TENACITY; IRREGULAR TO OCCASIONAL 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 DEGRADING; NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.



SANDSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MEDIUM LIGHT GRAY WITH BLACK HUES; QUARTZ DOMINATE; PREDOMINATELY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONTAINS CALCITIC CEMENT WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 5 TO 8% DARK LITHIC FRAGMENTS; 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 CARBONACEOUS SHALE BEDS; NO OTHER VISIBLE BEDDING 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 HYDROCARBONS IN SAMPLE; VISIBLE CARBONACEOUS MATERIAL IN SAMPLE.

SHALE= LIGHT BLUISH GRAY TO LIGHT GRAY TO VERY LIGHT GRAY; PREDOMINATELY BRITTLE 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.

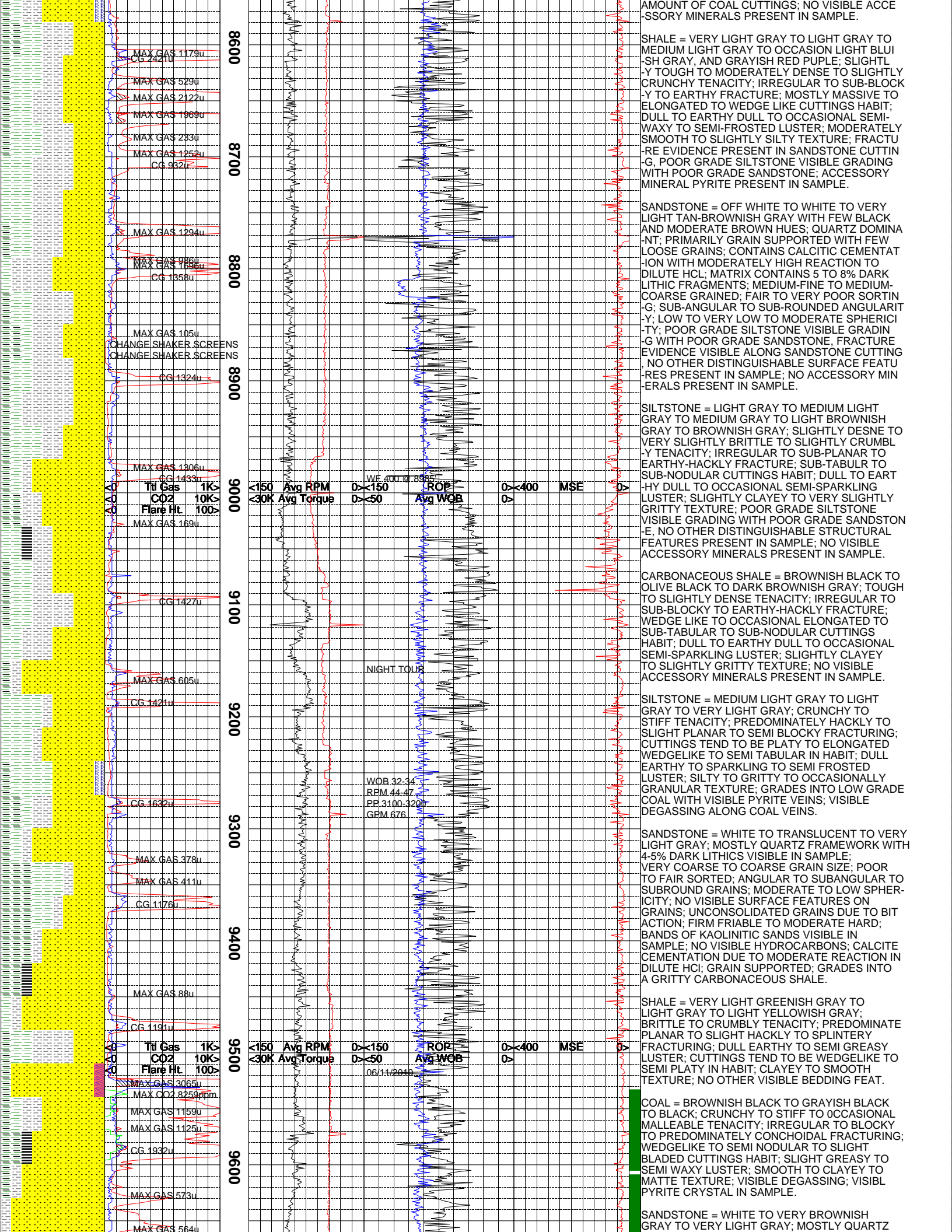
CARBONACEOUS SHALE = LIGHT OLIVE GRAY TO LIGHT BROWNISH GRAY TO BROWNISH GRAY; VISIBLE BEDS OF CARBONACEOUS MATERIAL VISIBLE THROUGH OUT THE SAMPLE; CRUMBLY TO CRUNCHY TO SLIGHTLY BRITTLE TENACITY; PLANAR TO SEMI BLOCKY TO OCCASIONALLY HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO SEMI WEDGELIKE TO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

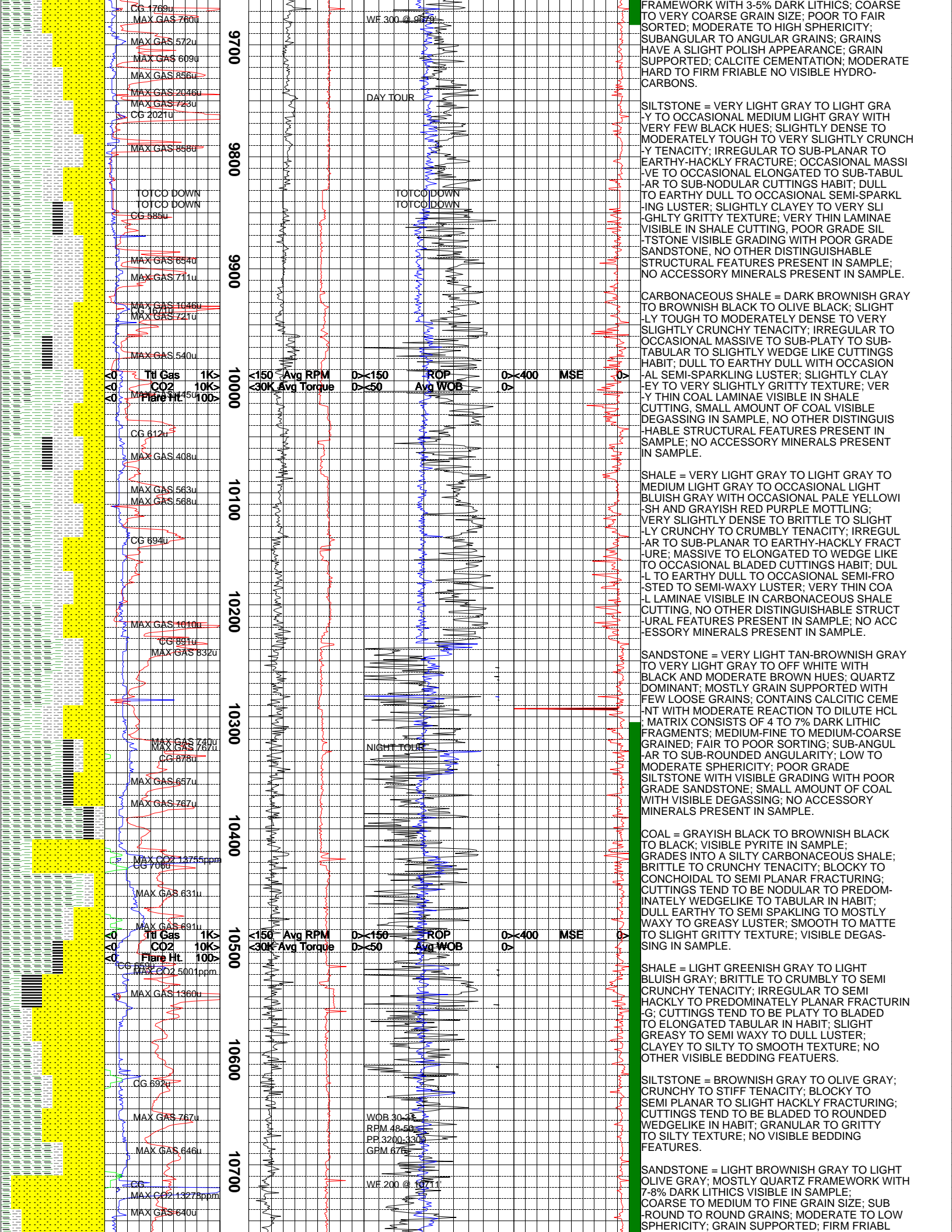
SHALE = VERY LIGHT GRAY TO MEDIUM LIGHT GRAY TO LIGHT BLUISH GRAY; CRUMBLY TO BRITTLE TENACITY; PREDOMINATELY PLANAR TO SLIGHT HACKLY FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SLIGHT WEDGE-LIKE IN HABIT; SLIGHT FROSTED TO SEMI GREASY TO DULL EARTHY LUSTER; SILTY TO CLAYEY TO MATTE TEXTURE; NO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

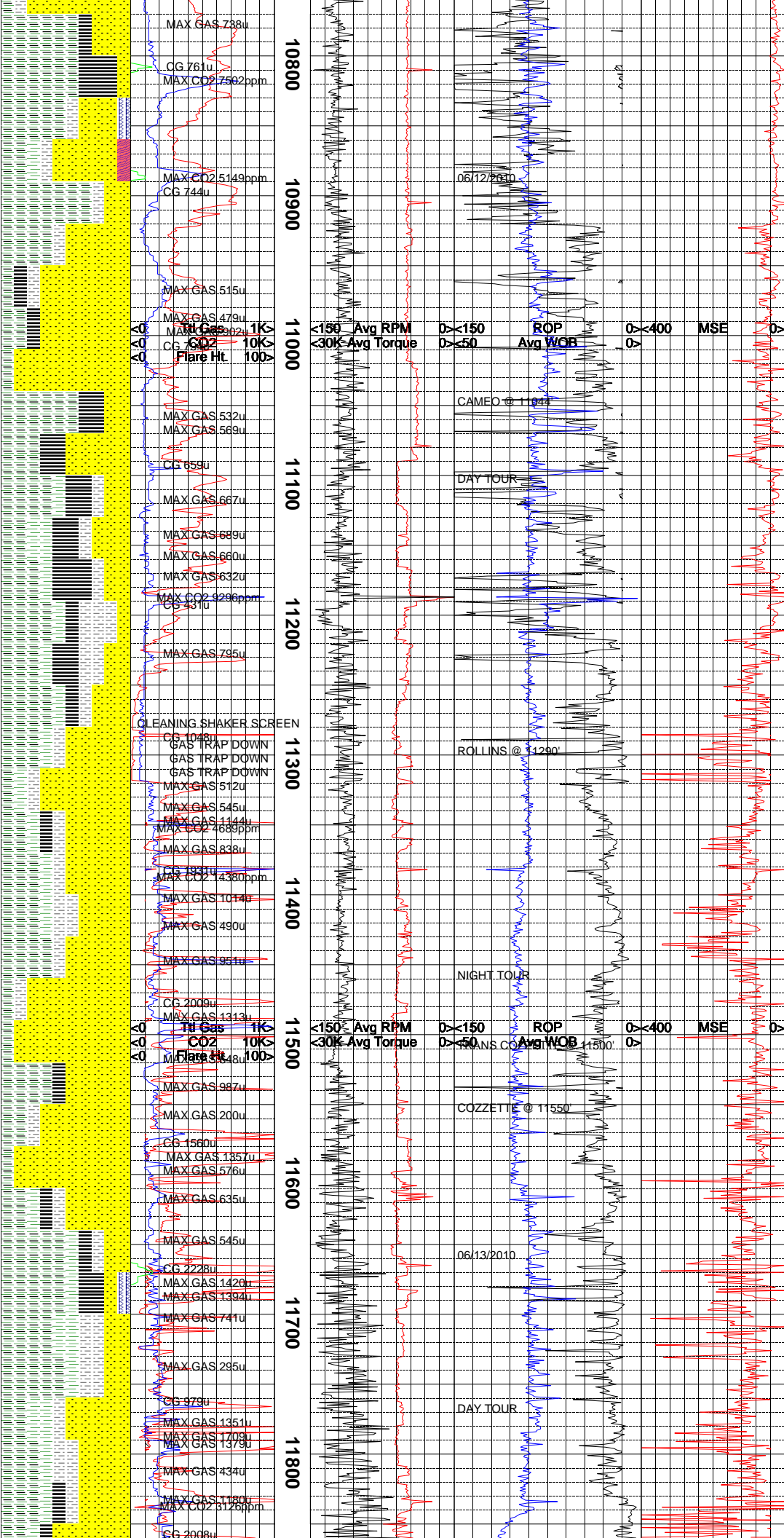
OHIO CREEK SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; 2-3% DARK LITHICS VISIBLE IN SAMPLE; MOSTLY QUARTZ FRAMEWORK; VERY COARSE TO COARSE GRAIN SIZE; SUB ANGULAR TO SUBROUND GRAINS; MODERATE TO LOW SPHERICITY; GRAINS HAVE A SLIGHT PITTED APPEARANCE; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS;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

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL LIGHT BLUISH TO LIGHT GREENISH GRAY; SLIGHTLY DENSE TO SLIGHTLY BRITTLE TO SLIGHTLY CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO









-E TO MODERATE HARD; UNCONSOLIDATED GRAINS DUE TO BIT ACTION; CALCITE CEMENTATION; NO VISIBLE HYDROCARBONS IN SAMPLE; NO VISIBLE SURFACE FEATURES.

COAL = BLACK TO BROWNISH BLACK TO OLIVE BLACK; CRUNCHY TO STIFF TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY TO FLAKY TO SEMI WEDGE LIKE 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 BLUI SH GRAY; CRUNCHY TO CRUMBLY TENACITY; 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 WEDGE LIKE TO SEMI TABULAR TO BLADED IN HABIT; DULL EARTHY TO SEMI GREASY TO WAXY LUSTER; MATTE TO SMOOTH TO SLIGHT GRITTY TEXTURE; VISIBLE DEGASSING 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 SLIGHTLY GRITTY TEXTURE; COAL MODERATELY DEGASSING, AND VERY SMALL AMOUNT OF CARBONACEOUS SHALE CUTTING VISIBLE DEGASSING; NO OTHER DISTINGUISHABLE STRUCTURAL FEATURE PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

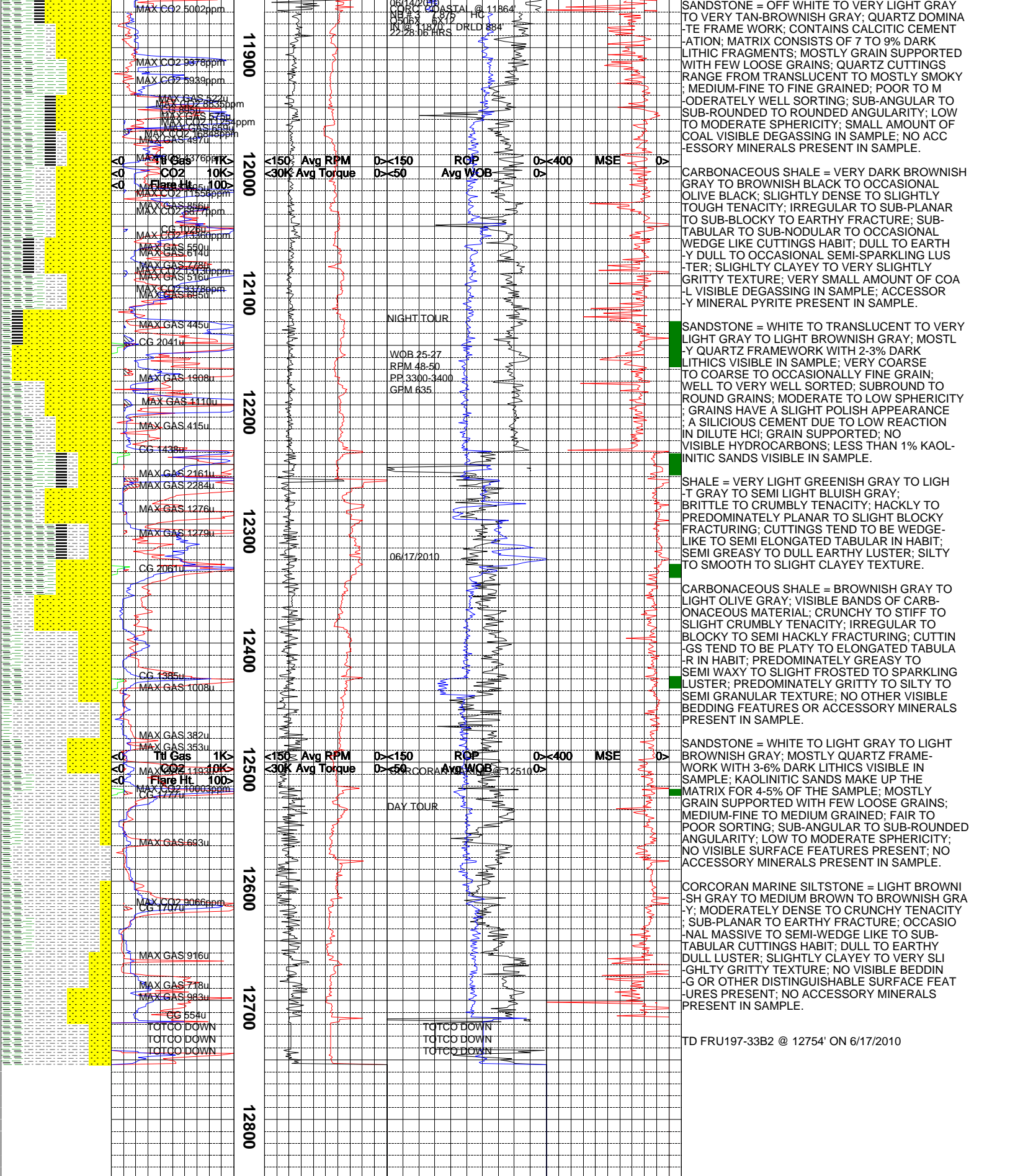
ROLLINS SANDSTONE = WHITE TO OFF WHITE VERY LIGHT YELLOWISH GRAY WITH FEW BLACK HUES; QUARTZ DOMINANT FRAMEWORK; GRAIN SUPPORTED WITH MOSTLY LOOSE GRAINS; CONTAINS SILICIC CEMENTATION WITH NO REACTION TO DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED;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

CARBONACEOUS SHALE = OLIVE GRAY TO BROWNISH GRAY; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY; HACKLY TO PLANAR FRACTURING; CUTTINGS TEND TO BE PLATY TO SLIGHT FLAKY TO PREDOMINATELY WEDGE LIKE 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 PREDOMINATELY SMOOTH TEXTURE; VISIBLE DEGASSING IN MOST OF SAMPLE.

SHALE = VERY LIGHT GREENISH GRAY TO LIGHT BLUI SH 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; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; VERY SMALL AMOUNT OF COAL VISIBLE DEGASSING IN SAMPLE, NO OTHER STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.



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