Houston, TX
(281) 784-5500
Bakersfield, CA
(661) 328-1595
New Iberia, LA
(337) 364-2322
Anchorage, AK
(907) 561-2465

Drilling Dynamics MD

COMPANY	ExxonMobil Production
WELL	PCU 197-34A9
FIELD	PICEANCE CREEK UNIT
REGION	ROCKY MOUNTAINS
COORDINATES	LAT: 39.918077
	LONG: - 108.277049
ELEVATION	G.L.: 6489.4'
	RKB: 30.2'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031153600
SPUD DATE	03/15/2010
CONTRACTOR	HELMERICH AND PAYNE
CO. REP.	JOSH LOVE
RIG/TYPE	HP 325 / FLEX 4S
LOGGING UNIT	MLU 48
GEOLOGISTS	MARK GROSS
	DONNA NEW
ADD. PERSONS	JENN SELL
CO. GEOLOGIST	MELISSA SAURBORN

LOG INTERVAL

DEPTHS:	3665'	**TO**	12534'
DATES:	05/21/2010	**TO**	09/05/2010
SCALE:	1" = 100'		

MUD TYPES

SPUD MUD	**TO**	3665'
LSND	**TO**	12534'
	TO	
	TO	

CASING DATA

10.75"	**AT**	3654'
7.00"	**AT**	8503'
	AT	
	AT	

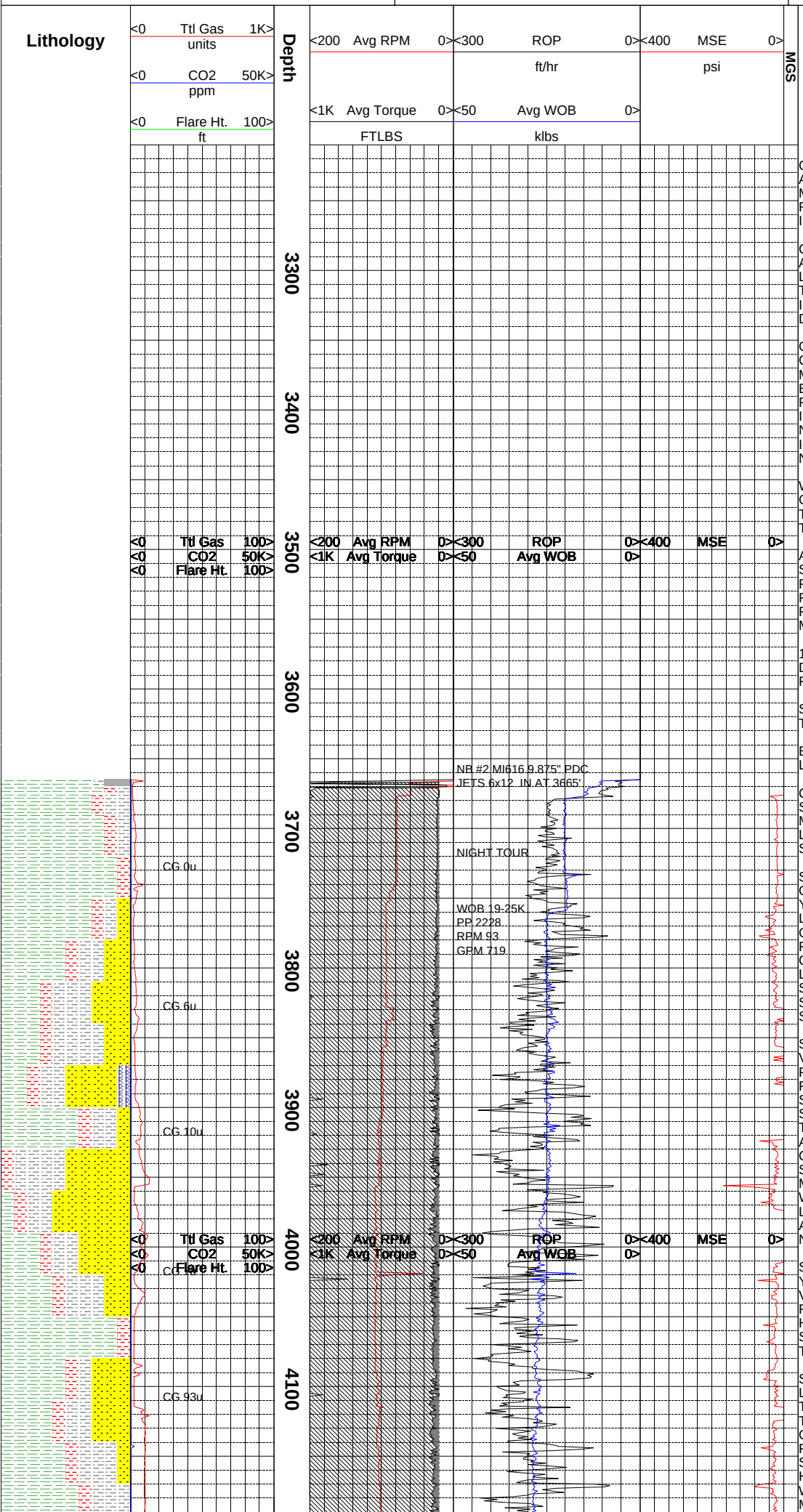
HOLE SIZE

14.75"	**TO**	3665'
9.875"	**TO**	8522'
6.125"	**TO**	12534'
	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.

GSA ROCK COLOR CHART. ROCK CONSTITUENTS ARE DESCRIBED WET AND LISTED IN ORDER OF MOST ABUNDANT TO LEAST ABUNDANT WITH RESPECT TO PERCENTAGE IN SAMPLE. DEPTH IS REFERENCED TO RKB.

CONNECTION GASES AS WELL AS TRIP GASES AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUDLOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING INTO THE BOREHOLE DURING CONNECTIONS.

GAS CHROMATOGRAPHY EQUIPMENT IS CALIBRATED TO A TEST GAS COMPOSED OF:
METHANE = 10000 PPM
ETHANE = 1000 PPM
PROPANE = 1000 PPM
I-BUTANE = 1000 PPM
N-BUTANE = 1000 PPM
I-PENTANE = 1000 PPM
N-PENTANE = 1000 PPM

WHEN THE MUD IS RUN THROUGH THE MGS (MUD GAS SEPARATOR) THE INTERVAL IS MARKED ON THE LOG IN THE SLIDE COLUMN AND NOTED ON THE LOG.

ALL SANDSTONE INTERVALS ARE EXAMINED FOR SAMPLE FLUORESCENCE IN THE UV SCOPE AND FOR HYDROCARBON FLUORESCENCE AND MINOR FLUORESCENCE FROM POSSIBLE FRACTURE FILL. ALL FLUORESCENCE IS NOTED ON THE MUD LOG.

10.75" SURFACE CASING WAS SET AT 3654'. DRILLED 10' OF NEW FORMATION AND PERFORM F.I.T. - GOOD. DRILL AHEAD.

SURVEY @ 3603' MD: INC 1.98 AZI 5.35
TVD 3539.20'

EPOCH WELL SERVICES COMMENCED FULL LOGGING ON 05/21/2010 AT 3665'

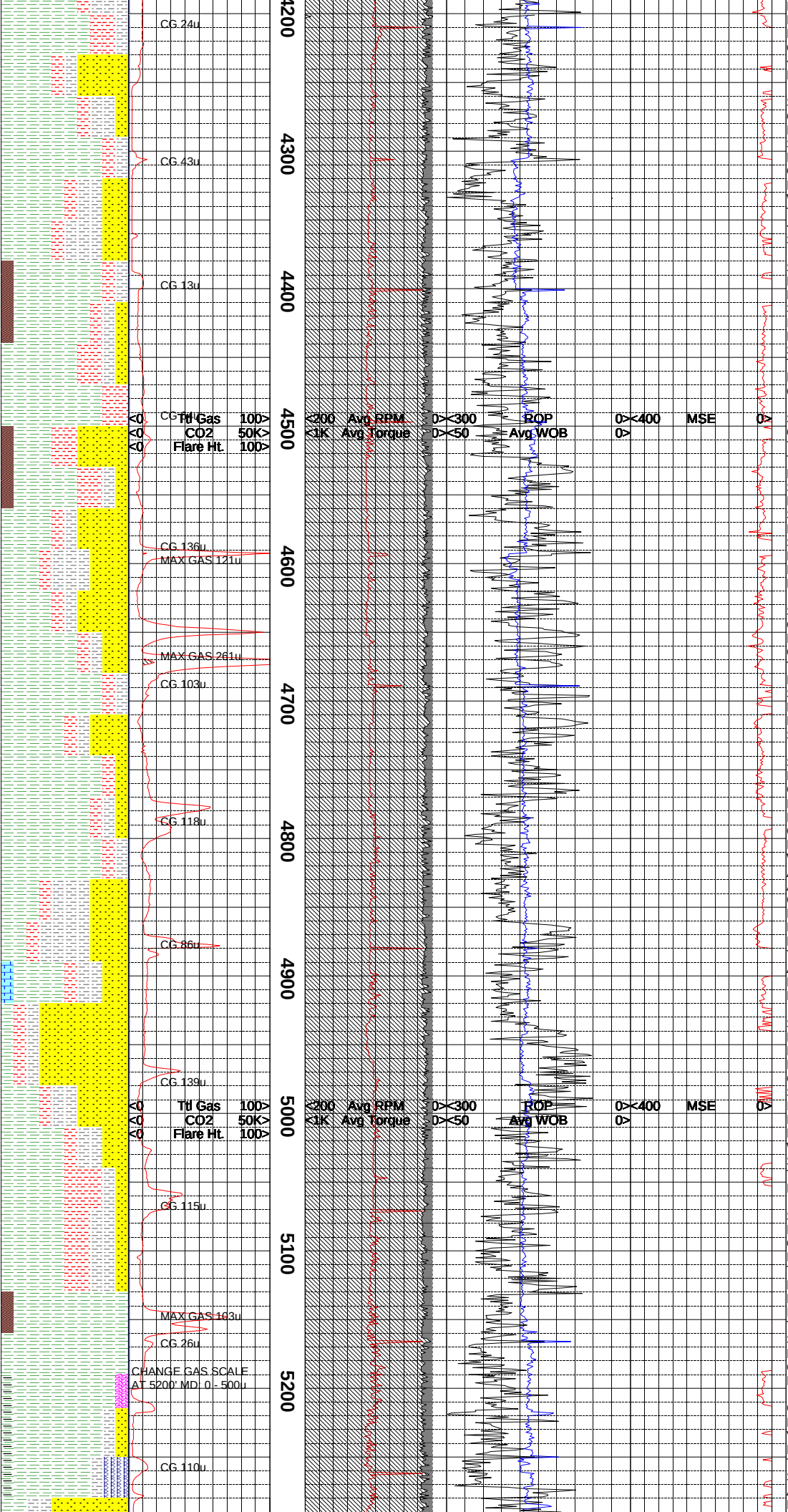
CLAYSTONE = PASTY TO SLIGHTLY STIFF, STICKY, MALLEABLE: FRACTURE EARTHY TO MUDDY; CUTTINGS HABIT MASSIVE GLOBULES; LUSTER EARTHY; TEXTURE PREDOMINANTLY SMOOTH; STRUCTURE MASSIVE.

SHALE = MODERATE YELLOW TO DARK YELLOW ORANGE, LIGHT TO MEDIUM GRAY, MODERATE YELLOWISH BRAOWN TO MODERATE BROWN, LIGHT TO MODERATE RED, PALE PURPLE TO GRAYISH PURPLE; MODERATELY CRUNCHY TO FAIRLY SOFT; IRREGULAR TO MOTTLED FRACT, CUTTINGS HABIT MASSIVE TO SLIGHTLY WEDGE LIKE; LUSTER DULL TO SLIGHTLY WAXY; SMOOTH TO VERY SLIGHTLY SILTY TEXTURE; STRUCTURE MASSIVE; COMMON COLOR SWIRLING AND MOTTLING.

SANDSTONE = WHITE TO WHITEISH GRAY, V PALE ORANGE TO MODERATE ORANGE PINK, PALE TO MODERATE REDDISH BROWN; VERY FINW TO LOWER MEDIUM GRAINED; POORLY SORTED; SUB ROUNDED TO SUB ANGULAR; SPERICTY MODERATE TO HIGH; EASY FRIABLE TO MODERATE HARD; CEMENT PREDOMINANTLY ARGILLACEOUS W/ STRONG CALCAREOUS COMPONENT PRODUCING A MODERATE TO STRONG REACTION TO DILUTE HCL; MOSTLY MATRIX SUPPORTED WITH INTERSTICES VERY WELL FILLED; MASSIVE BEDDING; <1% DARK LITHIC CLASTS; RARE CHLORITE AND PYRITE AS ACCESSORY MINERALS; NO FLUORESCENCE; NO CUT; POOR VISIBLE POROSITY.

SILTSTONE = VERY LIGHT GRAY TO GRAYISH YELLOW, LIGHT TO MODERATE BROWN, WHITE; VERY SOFT TO MODERATELY FIRM TENACITY; FRACTURE HACKLY TO IRREGULAR; CUTTINGS HABIT MASSIVE WITH OCCASIONAL WEDGELIKE SPECIMENS; LUSTER EARTHY TO DULL; SILTY TO V SLIGHTLY ABRASIVE; MASSIVE STRUCT.

SANDSTONE = WHITE TO WHITISH GRAY, LIGHT TO MODERATE BROWN, MODERATE RED TO GRAYISH RED PURPLE, VERY PALE GHREEN TO LIGHT BRILLIANT GREEN, RARE MODERATE GRAYISH YELLOW; LOWER VERY FINE TO UPPER FINE; MODERATELY WELL TO WELL SORTED; SUB ROUNDED TO SUB ANGULAR; SPHERICITY HIGH; CEMENT PREDOMINANTLY ARGILLACEOUS WITH STRONG CALCAREOUS COMPONENT; MODERATLY SOFT TO MODERATELY HARD;



MOST SPECIMENS GRAIN SUPPORTED WITH FAIR AMOUNT OF MATRIX MATERIAL; WELL FILL INTERSTICES W/ RARE VOIDS EVIDENT; OCCASIONAL PYRITE; OCCASIONAL CHLORITE; <1% DARK ANGULAR, V FINE, LITHIC CLASTS; NO FLUORESCENCE; NO CUT; POOR VIS POROS.

SHALE = MODERATE TO DARK YELLOWISH ORANGE, LIGHT TO MEDIUM GRAY, LIGHT TO MODERATE BROWN; TENACITY MODERATELY SOFT TO CRUNCHY AND SOMEWHAT TOUGH; FRACTURE IRREGULAR TO HACKLY WITH OCCASIONAL SEMI CONCHOIDAL; DULL TO EARTHY; TEXTURE PREDOMINANTLY SMOOTH WITH SOME SLIGHT GRITTINESS; OCCASIONAL THIN DISCONTINUOUS V FINE SAND LENSES; < 1% NAHCOLITE IN SAMPLE INTERVAL; STRUCTURE MASSIVE.

SILTSTONE = MODERATE GRAYISH YELLOW TO DARK YELLOWISH ORANGE, LIGHT TO MEDIUM BROWN, MODERATE BROWNISH GRAY; MOD SOFT TO CRUNCHY; FRACTURE HACKLY TO IRREGULAR WITH SOME EARTHY; CUTTINGS HABIT MASSIVE TO WEDGE LIKE WITH SOME SEMI TABULAR; LUSTER DULL TO EARTHY; TEXTURE FAIRLY SILTY TO SLIGHTLY GRITTY DUE TO SPARSELY ENTARAINED FINE SAND GRAINS; STRUCTURE MASSIVE.

SHALE =MODERATE TO DARK YELLOWISH ORANGE, GRAYISH YELLOW TO GRAYISH YELLOW GREEN, LIGHT TO MODERATE BROWN; TENACITY CRUNCHY TO CRUMBLY SOME EARTHY; FRACTURE IRREGULAR TO HACKY SOME SUB CONCHOIDAL; LUSTER DULL TO EARTHY SOME SLIGHTLY WAXY; TEXTURE SMOOTH TO MODDERATELY SILTY; COLORS FREQUENT SWIRLED OR MOTTLED SUGGESTING SOME SOFT SEDIMENT DEFORMATION; RARE PYRITE; RARE THIN LENSES OF WIDELY DISSEMINATED VERY FINE SAND; DECREASED NAHCOLITE; NON FLUORESCENT.

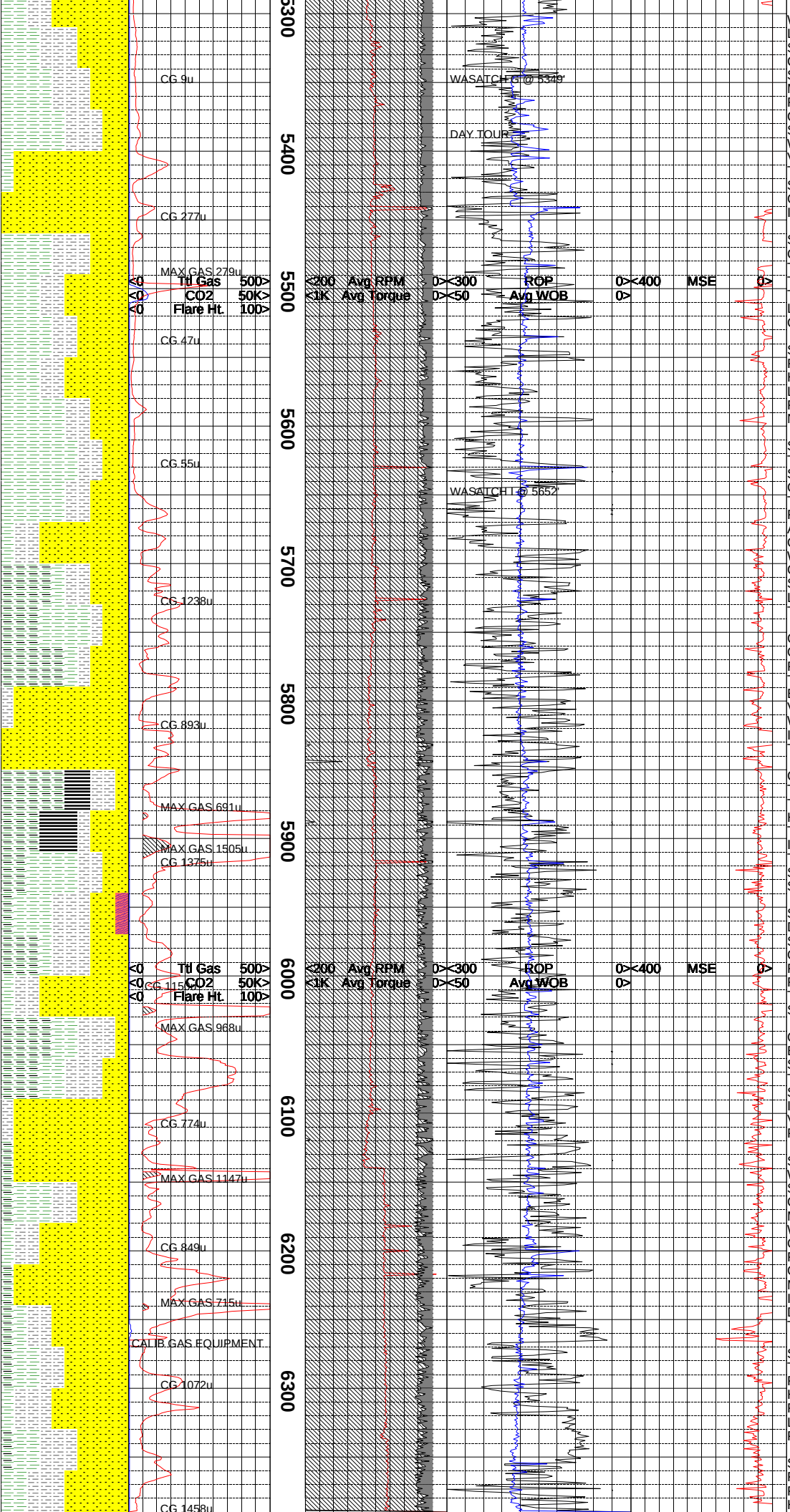
SILTSTONE = DARK YELLOWISH ORANGE TO GRAYISH YELLOW, LIGHT TO MODERATE RED BROW, LIGHT TO MEDIUM GRAY, WHITEISH GRAY, VERY PALE GRAYISH GREEN; CRUNCHY TO MODERATELY SOFT WITH RARE HARD; FRACTURE HACKLY TO IRREGULAR W/ OCCAS SUB CONCHOIDAL TO SEMI PLANAR; CUTTINGS HABIT MASSIVE WITH OCCASIONAL WEDGELIKE; LUSTER EARTHY TO DULL; TEXTURE SILTY TO SLIGHTLY SANDY; STRUCTURE MASSIVE.

SANDSTONE = LIGHT REDDISH BROWN TO MODERATE RED, VERY PALE ORANGE TO GRAYISH PINK, PALE YELLOWISH BROWN TO DARK YELLOWISH BROWN; FRAMEWORK PREDOMINANTLY TRANSPARENT COLORLESS QUARTZ TO TRANSLUCENT WHITEISH QUARTZ; LOWER VERY FINE TO LOWER FINE; VERY WELL SORTED; SUB ROUNDED TO SUB ANGULAR; SPHERICITY HIGH; CEMENTATION ARGILLACEOUS WITH MINOR CALCAREOUS COMPONENT WITH MODERATE REACTION TO HCL; MOSTLY GRAIN SUPPORTED WITH SPARSE BUT VISIBLE MATRIX MATERIAL; INTERSTICES MODERATELY FILLED WITH VOIDS OCCASIONAL TO COMMON; RARE LITHIC CLASTS, CHLORITE, AND PYRITE; RARE BRIGHT YELLOW MINERAL FLUORESCENCE; NO CUT; MODERATE TO POOR VISIBLE POROSITY.

SHALE = MODERATE GRAYISH YELLOW TO DARK GRAYISH ORANGE, LIGHT TO MODERATE BROWN, MODERATE RED TO MODERATE REDDISH BROWN, SOME GRAYISH RED PURPLE; CRUNCHY TO MODERATELY TOUGH; OCCAS SOFT SPECIMENS; FRACTURE HACKLY TO IRREGULAR WITH SOME SUB CONCHOIDAL; CUT HABIT MASSIVE W/ COMMON WEDGELIKE; LUSTER DULL TO EARTHY WITH OCCASIONAL WAXY; TEXTURE SMOOTH TO VERY SLIGHTLY SILTY; STRUCTURE MASSIVE; VERY RARE THIN SMALL FLECKS CARBONACEOUS MATERIAL; NON FLUORESCENT.

SHALE = LIGHT TO MODERATE YELLOWISH BROWN, DARK YELLOWISH ORANGE TO PALE ORANGE, LIGHT TO MEDIUM GRAY, LIGHT TO MODERATE BROWN, RARE DARK GRAY; CRUNCHY TO MODERATELY TOUGH TENACITY; FRACTURE HACKLY TO IRREGULAR; CUTTINGS HABIT MASSIVE TO WEDGELIKE WITH COMMON IRREGULAR; LUSTER DULL TO SEMI WAXY; TEXTURE SMOOTH TO VERY SLIGHTLY SILTY; STRUCTURE MASSIVE WITH OCCASIONAL THIN DISCONTINUOUS AND IRREGULAR STINGER OF CARBONACEOUS MATERIAL; OCCASIONAL PYRITE AS ACCESSORY; NON FLUORESCENT.

CARBONACEOUS SHALE = BLACK, BROWNISH BLACK, REDDISH BLACK; ABUNDANT PYRITE; VERY TOUGH, HARD; FRACTURE PLANAR; CUT HABIT TABULAR TO MASSIVE; VERY RESINOUS TO NEAR GEMLIKE, SEMI VITREOUS SPECIMENS STRUCTURE THINNLY LAMINATED W/ PYRITE AND VERY THIN SHALES; NO OUTGASSING EVIDENT.



WASATCH G SANDSTONE = OFF WHITE TO VERY LIGHT GRAY OVERALL; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR KAOLIN CEMENT; 1-3% CARBONACEOUS MATERIAL IN SAMPLE FRAGMENTS; TRACE ACCESSORY MINERALS OF CHLORITE MICA AND PYRITE; FIRM FRIABLE TO HARD; SOME LOOSE GRAIN CLEAR TO OPAQUE SAND; PRESERVED SPECIMEN SHOWS MODERATE SPHERICITY; FAIRLY WELL SORTED; SUBROUND TO SUBANGULAR; VERY FINE TO UPPER FINE GRAIN; MODERATE TO HIGHLY CALCAREOUS; TRACE CHLORITZED SANDSTONE IN SAMPLE; GRADES TO LIGHT GRAY SILTSTONE; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = VERY LIGHT GRAY TO MEDIUM GRAY; HARD TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; PLATY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO SLIGHT EARTHY LUSTER; GRADES TO VERY LIGHT GRAY SANDSTONE; TRACE UPPER FINE GRAIN SAND IN SAMPLE SPECIMENS.

SHALE = MEDIUM GRAY TO LIGHT GRAY SOME REDDISH BROWN; PLATY TO SCALY CUTTINGS HABIT; MATTE TO SILTY TEXTURE; EARTHY LUSTER; SPLINTERY TO PLANAR TO ANGULAR FRAC; GRADES TO LIGHT GRAY SILTSTONE; NO VISIBLE STRUCTURE.

SANDSTONE = LIGHT GRAY TO OFF WHITE TO TRACE MEDIUM GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND TRACE KAOLIN CEMENT; FAIRLY TO WELL SORTED; MODERATE TO WELL SPHERICITY; VERY FINE TO UPPER FINE GRAIN; MODERATE HARD TO HARD; TRACE ACCESSORY MINERAL OF CRYSTALLINE PYRITE ON SAMPLE FRAGMENTS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; TRACE FLECKS OF COAL/CARBONACEOUS SHALE IN SAMPLE SPECIMENS; SUB ROUND TO SUB ANGULAR; TR LOOSE GRAINS WITH MINOR ABRASIONS DUE TO POSSIBLE BIT ACTION.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; WEDGELIKE TO FLAKY TO ELONGATED CUTTINGS HABIT; EARTHY TO SEMI VITREOUS LUSTER; TRACE VISIBLE DEGASSING; THINLY INTERBEDDED WITH COAL LAMINAE; MINOR PYRITIC VEINING IN SAMPLE SPECIMENS; MATTE TO ABRASIVE TEXTURE.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO SPLINTERY TO SEMI CONCHOIDAL FRAC; TABULAR TO WEDGELIKE TO FLAKY CUTTINGS HABIT; SMOOTH TO MATTE TEXTURE; VITREOUS TO SLIGHTLY EARTHY LUSTER; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; TRACE PYRITIC VEINING ALONG FRACTURE SURFACES; HIGH DEGASSING OBSERVED FROM SAMPLE FRAGMENTS.

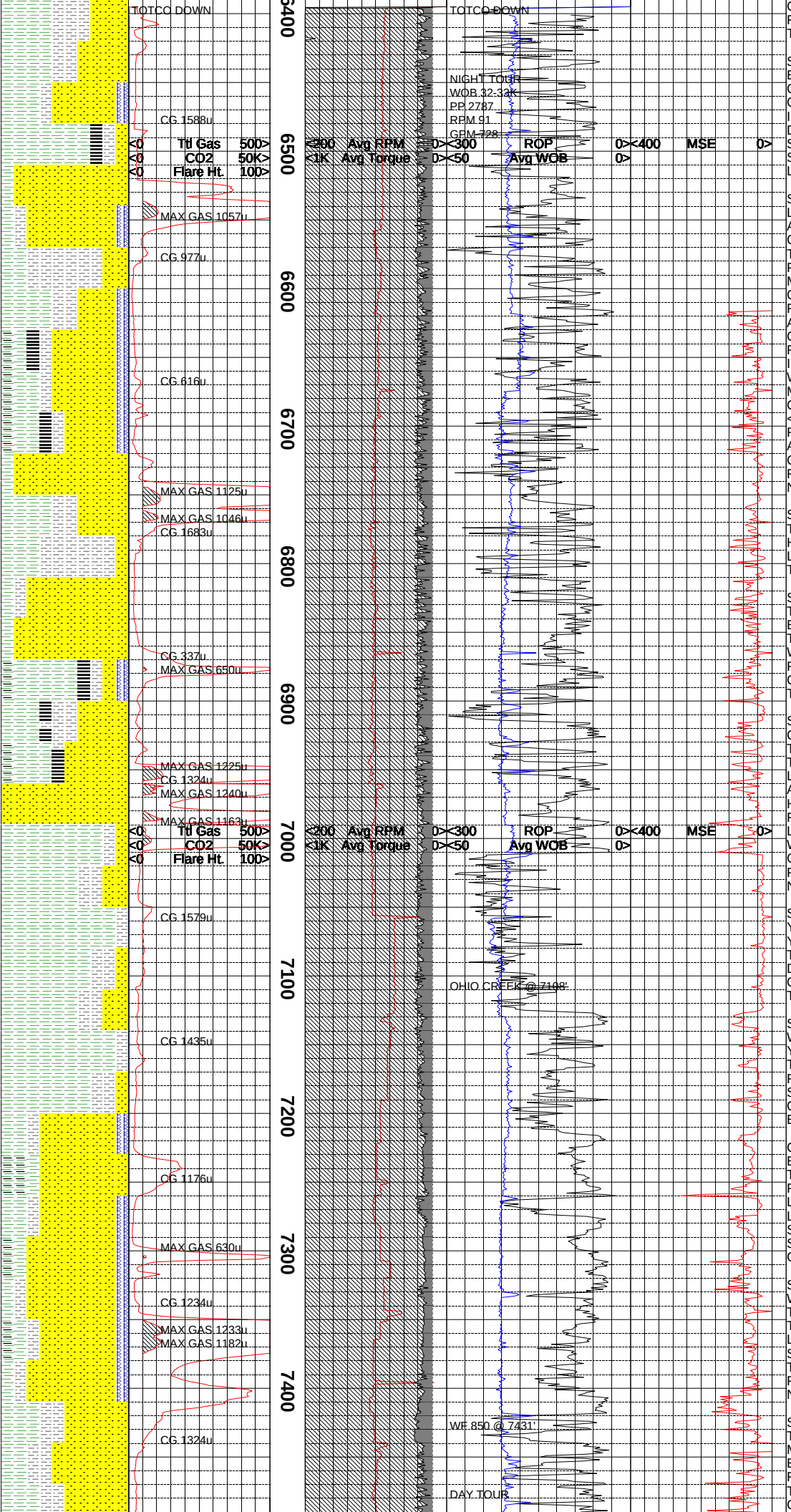
SILTSTONE = MEDIUM GRAY TO OLIVE GRAY TO DARK GRAY; HARD TO CRUNCHY TENACITY; SPARKLING TO EARTHY LUSTER; SUCROSIC TO GRITTY TEXTURE; TABULAR TO WEDGELIKE TO FLAKY CUTTINGS HABIT; IRREGULAR TO PLATY FRAC; GRADES TO LIGHT GRAY SANDSTONE; TRACE THIN CARBONACEOUS LAMINAE IN SOME SAMPLE SPECIMENS.

CARBONACEOUS SHALE = OLIVE GRAY TO BROWNISH GRAY TO DARK GRAY; BLOCKY TO SPLINTERY TO IRREGULAR FRACTURE; MATTE TO SLIGHTLY SILTY TEXTURE; EARTHY TO SEMI VITREOUS LUSTER; THIN COAL LAMINAE IN SAMPLE FRAGMENTS; MINOR PYRITIC VEINING; TRACE CALCITE SUBSTITUTION IN POSSIBLE FOSSIL REMAINS.

SANDSTONE = OLIVE GRAY TO LIGHT GRAY WITH SOME OFF WHITE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA, KAOLIN AND SOME CALCITE CEMENT; SUB ROUND TO ANGULAR; MODERATE TO HIGH SPHERICITY; FAIR TO WEL WELL SORTED; VERY FINE TO UPPER FINE GRAIN; 2-5% CARBONACEOUS SHALE/COAL FLECKS IN SAMPLE FRAGMENTS; SOME LOOSE GRAINS IN SAMPLE; MINOR ACCESSORY MINERAL OF CRYSTALLINE PYRITE; THINLY INTERBEDDED W/ COAL LAMINAE; NO VISIBLE DEGASSING ALONG COAL CONTACTS; CLEAR TO TRANSLUCENT.

SHALE = LIGHT GRAY TO LIGHT OLIVE GRAY TO MEDIUM GRAY; MATTE TO ABRASIVE TEXT; FLAKY TO TABULAR TO ELONGATED CUTTINGS HABIT; PLANAR TO SPLINTERY TO HACKLY FRACTURE; DULL EARTHY LUSTER; GRADES TO LIGHT GRAY SILTSTONE; TRACE FRAMBOIDAL PYRITE ON SHALE FRAGMENTS.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; FIRM TO HARD TENACITY; BLOCKY TO IRREG; FRACTURE; WEDGELIKE TO TABULAR CUTTINGS HABIT; SPARKLING TO SLI EARTHY LUSTER;



GRITTY TO SUCROSIC TEXTURE; TRACE VERY FINE GRAIN IN SAMPLE SPECIMENS; GRADES TO VERY FINE GRAIN SANDSTONE.

SHALE = VERY LIGHT TO MEDIUM GRAY, LIGHT BROWN TO MEDIUM BROWN; CRUMBLY TO CRUNCHY TENACITY; HACKLY TO PLANAR W/ OCCASIONAL PLANAR PARTING; CUTTINGS HAB IRREGULAR TO RARE WEDGELIKE ; LUSTER DULL TO SUCROSIC WITH SOME WAXY; TEXTURE SMOOTH TO V SLIGHTLY SILTY IN OCCASIONAL SPECIMENS; STRUCTURE MASSIVE TO THINLY LAMINATED; NON FLUORESCENT.

SANDSTONE = WHITE, WHITISH GRAY TO LIGHT GRAY; SALT AND LIGHTLY PEPPERED APPEARANCE; TRANSLUCENT TO TRANSPARENT COLORLESS QUARTZ FRAMEWORK; UPPER FINE TO UPPER MEDIUM; MODERATE SORTING; PREDOMINANTLY SUBANGULAR TO ANGULAR; MODERATELY HIGH SPHERICITY; SURFICIAL GRAIN ABRASION MINIMAL; SOFT TO MODERATE FRIABLE WITH OCCASIONAL FIRMLY FRIABLE ABUNDANT LOOSE GRAINS; CEMENTATION CALCAREOUS WITH MODERATE TO STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED; INTERSTICES MODERATELY TO MODERATELY WELL FILLED WITH COMMON VOIDS; BEDDING MASSIVE; COMMON CHLORITE AND OCCASIONAL CHLORITOID ACCESSORIES; LITHIC CLASTS: <2% LIGHT TO DARK BROWN TO BLACK WITH RARE RED; FINE TO MEDIUM; SUB ANGULAR TO ANGULAR; PRISMOIDAL; FAIRLY FRIM TO CRUNCHY; DULL TO SLIGHTLY WAXY; POSSIBLE REWORKED SEDIMENTS; NO FLUORESCENCE; NO CUT; MODERATE VISIBLE POROSITY.

SILTSTONE = LIGHT TO MEDIUM GRAY, LIGHT TO MODERATE BROWN; CRUNCHY; FRACTURE HACKLY TO PLANAR;CUTTINGS HABIT MASSIVE; LUSTER EARTHY TO DULL; TEXTURE SILTY TO SLIGHTLY GRITTY; STRUCTURE MASSIVE.

SHALE = LIGHT TO MEDIUM GRAY; LIGHT TO MODERATE BROWN, DUSKY YELLOWISH BROWN TO OCCASIONAL BLACKISH BROWN; TENACITY MODERATELY SOFT TO CRUNCHY WITH OCCASIONAL BRITTLE SPECIMENS; FRACTURE HACKLY TO SLIGHTLY IRREGULAR; CUTTINGS HABIT MASSIVE; LUSTER DULL; TEXTURE SMOOTH TO SLIGHTLY SILTY.

SANDSTONE = WHITISH GRAY TO MEDIUM GRAY; FRAMEWORK PREDOMINANTLY TRANSPARENT TO TRANSLUCENT COLORLESS TO WHITE QUARTZ; LOWER VERY FINE TO LOWER MEDIUM; POORLY SORTED; SUB ANGULAR TO SUN ROUNDED; MODERTE TO HIGH SPHERICITY; SOFT TO MODERATELY FRIABLE PRESENTS AS PREDOMINANTLY LOOSE GRAINS; CEMENTATION CALCAREOUS WITH MINOR ARGILLACEOUS COMPONENT; GRAIN SUPPORTED; CHLORITE, CHLORITOID, PYRITE ACCESSORIES; NO FLUORESCENCE; NO CUT.

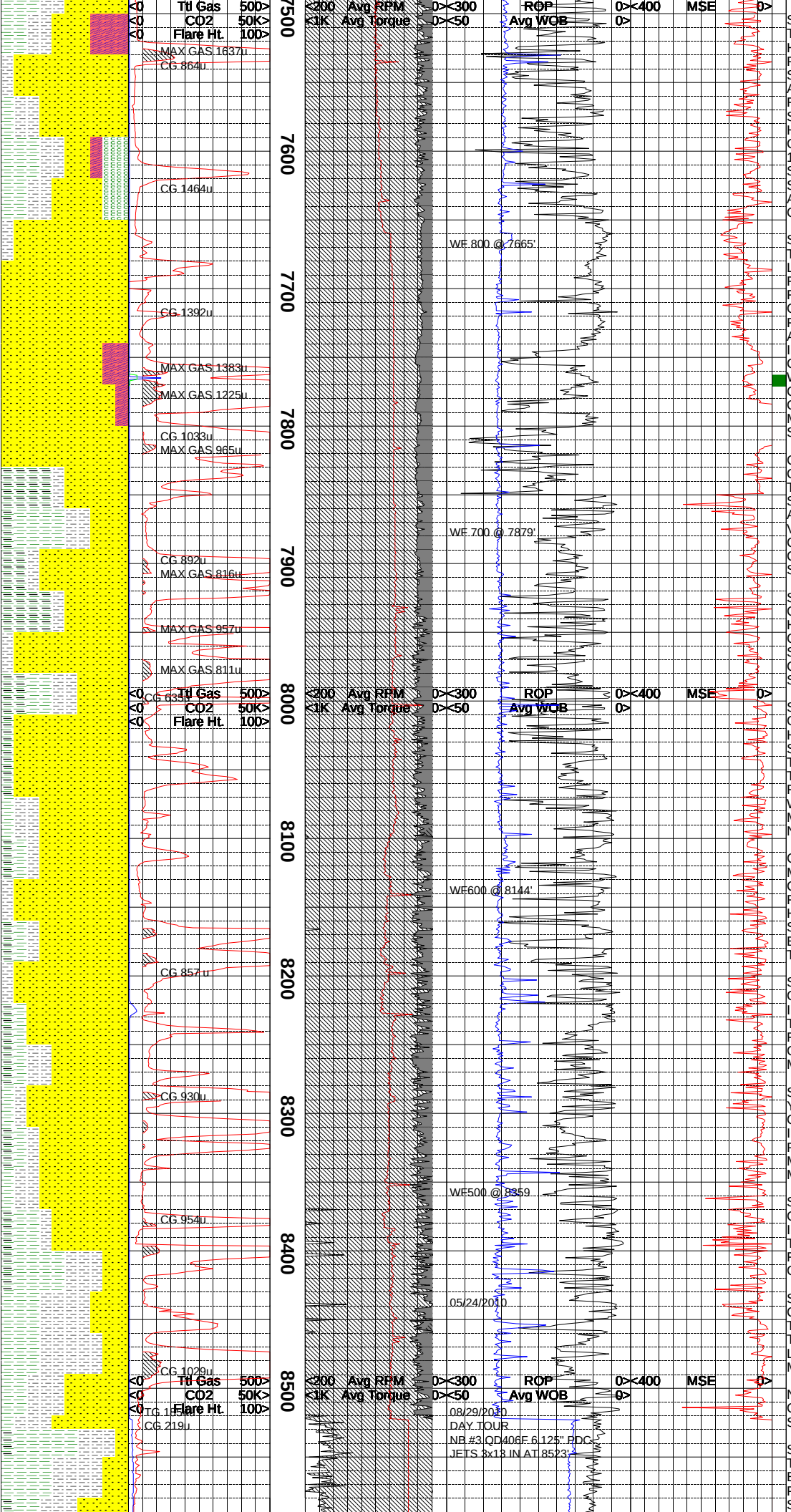
SHALE = LIGHT TO MEDIUM GRAY; DARK YELLOWISH ORANGE, MODERATE TO LIGHT YELLOWISH BROWN; CRUNCHY TO MODERATELY TOUGH TENACITY; FRACTURE HACKLY; LUSTER DULL TO WAXY; CUTTINGS HABIT MASSIVE W/ OCCASIONAL WEDGELIKE; TEXTURE SMOOTH TO SLIGHTLY SILTY.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY, WHITISH GRAY, V PALE ORANGE TO MODERATE YELLOWISH BROWN; CRUMBLY TO CRUNCHY TENACITY W/ SOME FAIRLY HARD SPECIMENS; FRACTURE HACKLY TO IRREGULAR W/ RARE SEMI CONCHOIDAL; CUTTINGS HABIT MASSIVE OCCASIONAL WEDGELIKE; LUSTER DULL TO EARTHY; STRUCTURE MASSIVE.

CARBONACEOUS SHALE = BROWNISH BLACK, BLACK, REDDISH BLACK; MODERATELY HARD TO FIRM WITH SOME BRITTLE; FRACTURE PLANAR;CUTTINGS HABIT BLOCKY TO TABULAR; LUSTER RESINOUS TO SLIGHTY WAXY; FINELY LAMINATED WITH ABUNDANT PYRITE; SOME SPECIMENS MORE PYRITE THAN CARBONACEOUS SHALE; EXTREMELY RARE LOW VOLUME OUT GASSING.

SANDSTONE = WHITEISH GRAY TO LIGHT GRAY WITH RARE MEDIUM GRAY; FRAMEWORK TRANSLUCENT WHITEISH QUARTZ TO COLORLESS TRANSPARENT QUARTZ; LOWER FINE TO LOWER MEDIUM GRAIN; POORLY SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE TO HIGH SPHERICITY, CALCAREOUS CEMENT; PRESENTS AS PREDOMINANTLY LOOSE GRAINS; NO FLUORESCENCE; NO CUT.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLATY TO SCALY TO TABULAR CUTTINGS HABIT; MATTE TO SLIGHTLY SILTY TEXTURE; DULL EARTHY LUSTER; IRREGULAR TO SPLINTERY FRAC; GRADES TO LIGHT GRAY SILTSTONE; THINLY INTERBEDDED WITH SILTSTONE AND CARBONACEOUS SHALE.



SANDSTONE = GRAYISH GREEN TO OFF WHITE TO LIGHT OLIVE GRAY; FIRM FRIABLE TO MOD HARD; SLIGHTLY TO MODERATELY CALCAREOUS; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND TR KAOLIN AND CALCITE CEMENT; APPROXIMATELY 15-20% CALCITE FRACTURE FILL YIELD HIGH GAS INTERVAL; ROUND TO SUB ANGULAR; WELL SORTED; MODERATE TO HIGH SPHERICITY; VERY FINE TO UPPER FINE GRAIN WITH TRACE LOWER MEDIUM GRAIN; 1-3% CARBONACEOUS SHALE/COAL FLECKS IN SAMPLE FRAGMENTS; ABUNDANT CHLORITIZED SANDSTONE SAMPLE SPECIMENS; MINOR AMOUNTS OF CHLORITE MICA AND TRACE AMTS OF MICRO PYRITE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO TRANSPARENT OVERALL; PREDOMINANTLY LOOSE GRAINS W/ FEW PRESERVED SPECIMENS; ROUND TO SUB ANGULAR; VERY FINE TO UPPER FINE GRAIN; SOME MEDIUM GRAIN; CLEAR TO OPAQUE; LOOSE CARBONACEOUS SHALE/COAL FLECKS AMONG SAMPLE; HIGH GAS AND ROP ASSOCIATED WITH EASILY FRIABLE SANDSTONE INTERBEDDED WITH CALCITE FRACTURE FILL; CUBIC TO IRREGULAR FRACTURE; BLOCKY TO WEDGELIKE CUTTINGS HABIT; PREDOMINANTLY CLEAR TO SEMI OPAQUE; TRACE STRIATIONS ON SAMPLE SPECIMENS; TRACE ACCESSORY MINERAL OF MICRO PYRITE; PRESERVED SPECIMENS INTERBEDDED WITH SILTSTONE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLATY TO SCALY TO ELONGATED CUTTINGS HABIT; MATTE TO SILTY TEXTURE; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; EARTHY TO SEMI VITREOUS LUSTER; THINLY INTERBEDDED WITH COAL LAMINAE; MINOR DEGASSING ALONG CONTACTS; SOME PYRITIC VEINING ON FRAC SURFACES; GRADE TO OLIVE GRAY SILTSTONE.

SILTSTONE = OLIVE GRAY TO LIGHT BROWNISH GRAY; FIRM FRIABLE TO HARD; IRREGULAR TO HACKLY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; SPARKLING LUSTER; SOME INTERBEDDED WITH CARBONACEOUS SHALE LAMINAE; TRACE COAL SPECKS; GRADES TO OLIVE GRAY SANDSTONE.

SANDSTONE = LIGHT OLIVE GRAY TO LIGHT GRAY TO OFF WHITE; EASILY FRIABLE TO MOD HARD; PREDOMINANTLY LOOSE GRAINS WITH SOME PRESERVED FRAGMENTS; TRANSLUCENT TO CLEAR; ROUND TO SUB ANGULAR; MODERATE TO HIGH SPHERICITY; WELL SORTED; VERY FINE TO UPPER FINE GRAIN; TRACE FRAGMENT WITH KAOLIN CEMENT; 1-3% CARBONACEOUS MATERIAL FLECKS IN PRESERVED SPECIMENS; NO VISIBLE HYDROCARBON INDICATORS.

CARBONACEOUS SHALE = MEDIUM DARK GRAY TO MEDIUM GRAY, SOME BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; FLAKY TO TABULAR CUTTINGS HABIT; MATTE TO DULL TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO BANDED STRUCTURE, INTERBEDDED WITH THIN COAL SEAMS, SOME PYRITE INCLUSIONS.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY; TOUGH TO BRITTLE TENACITY; IRREGULAR TO SPLINTERY FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; GRADING TO A FINE TO MEDIUM GRAINED SANDSTONE.

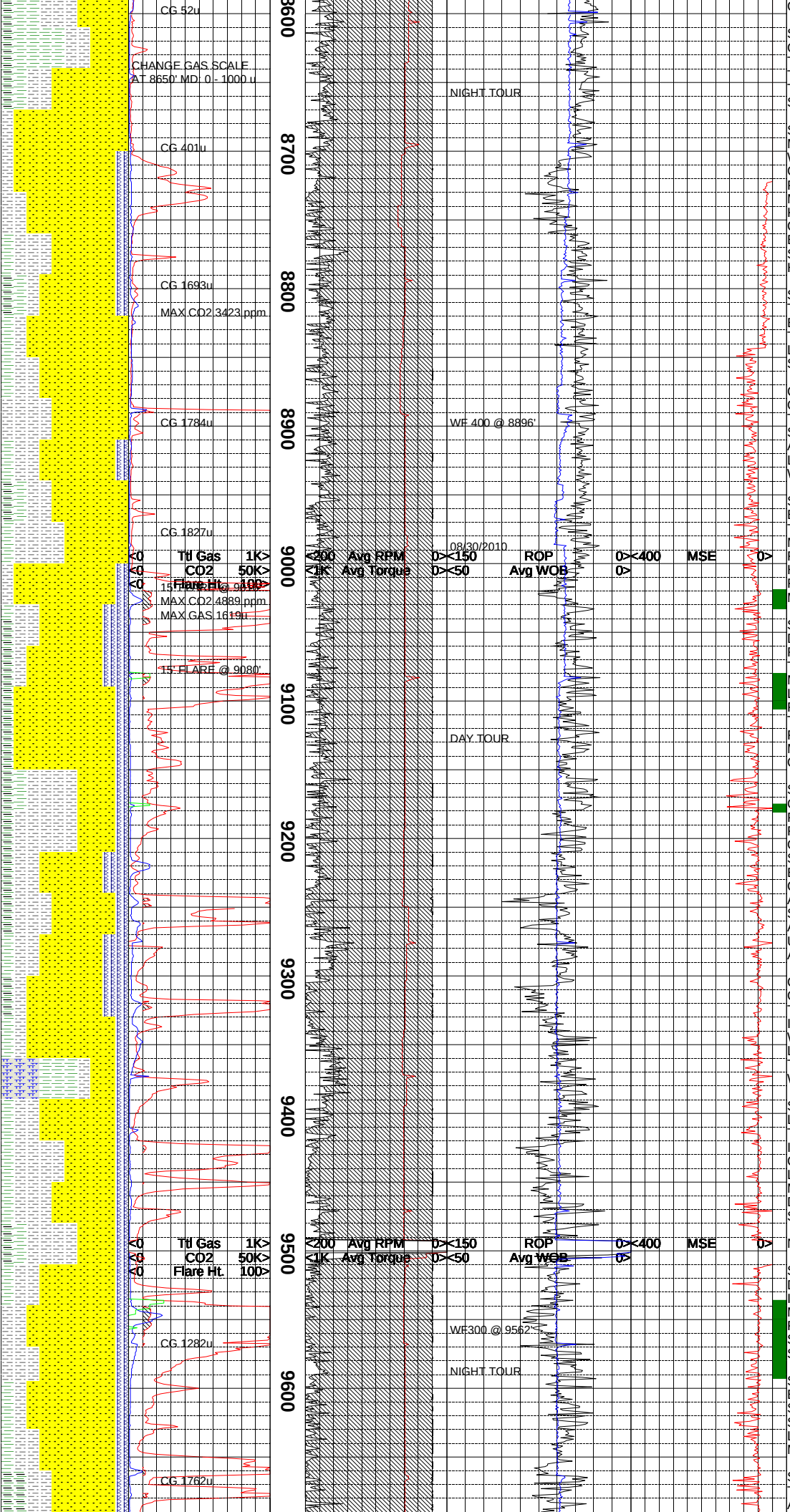
SHALE = WHITE TO LIGHT GRAY, PALE YELLOWISH ORANGE TO DARK YELLOWISH ORANGE; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SEMI PLANAR FRACTURE; PLATY TO SCALY CUTTINGS HABIT; DULL TO MATTE LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH FISSILITY.

SILTSTONE = DARK GRAY TO MEDIUM DARK GRAY; TOUGH TO VERY TOUGH TENACITY; IRREGULAR TO MOTTLED FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY; CRUMBLY TO VERY BRITTLE TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; DULL TO MATTE LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH SOME FISSILITY

NOTE: TD INTERMEDIATE SECTION @ 8522' MD ON 05/24/2010. BEGIN DRILLING PRODUCTION SECTION ON 08/29/2010.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLATY TO TABULAR TO FLAKY CUTTINGS HABIT; SEMI EARTHY TO WAXY LUSTER; IRREGULAR TO PLANAR TO SPLINTERY FRACTURE; CLAYEY TO SLIGHTLY SILTY TEXTURE; GRADES TO LIGHT



GRAY SILTSTONE.

SILTSTONE = VERY LIGHT GRAY TO MEDIUM GRAY; HARD TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; PLATY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO SLIGHT EARTHY LUSTER; MASSIVE STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY, SOME MEDIUM GRAY; FINE TO MEDIUM GRAIN SIZE; WELL SORTED; SUBANGULAR TO SUBROUNDED GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES WHERE VISIBLE; MADERATELY HARD TO FIRM FRIABLE CUTTINGS KAOLINITIC CEMENT WITH TRACE CALCITE CEMENT; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHIC INCLUSIONS SOME SMEARING DUE TO BIT; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY; TOUGH TO CRUNCHY TENACITY; FRACTURE IS BLOCKY TO PLANAR; CUTTINGS HABIT MASSIVE TO FLAKY; LIGHT SPARKLING TO EARTHY LUSTER; TEXTURE SILTY TO GRITTY; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLATY TO SCALY TO ELONGATED CUTTINGS HABIT; MATTE TO SILTY TEXTURE; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; EARTHY TO WAXY LUSTER; BANDED STRUCTURE, INTERBEDDED WITH THIN COAL SEAMS.

SANDSTONE = WHITE TO LIGHT GRAY; LIGHT BROWN TO BROWNISH GRAY; TRANSPARENT TO TRANSLUCENT; QUARTZ FRAMEWORK; FINE TO MEDIUM GRAIN SIZE; WELL TO FAIR SORTING; ROUND TO SUBROUNDED ANGULARITY; HIGH TO MODERATE SPHERICITY; EASY FRIABLE TO FRIABLE; GRAIN SUPPORTED MATRIX; NO VISIBLE HYDROCARBONS.

SILTSTONE = GRAY, LIGHT GRAY, MEDIUM DARK GRAY, GRAYISH RED TO VERY DUSKY RED; TOUGH TO CRUNCHY TENACITY; BLOCKY TO IRREGULAR FRACTURE; CUTTINGS ARE MASSIVE TO WEDGELIKE; DULL TO EARTHY LUSTER; SILTY TO GRITTY TEXTURE; GRADES FROM VERY FINE SAND TO CLAY; MASSIVE TO THIN LENTICULAR STRUCTURE; CONTAINS FINELY DISSEMINATED CARBONACEOUS MATERIAL TO THIN, DISCONTINUOUS LENSES OF COAL AND CARBONACEOUS MATERIAL.

SANDSTONE = VERY LIGHT GRAY, LIGHT GREENISH GRAY, MEDIUM LIGHT GRAY, PINKISH GRAY; QUARTZ AND LESSER FELDSPAR FRAMEWORK; VERY FINE GRAINED TO MEDIUM GRAINED; FAIR TO VERY WELL SORTED; SUBANGULAR TO WELL ROUNDED GRAINS; EASILY FRIABLE TO MODERATELY HARD; CALCITE CEMENTED WITH LESSER ARGILLACEOUS MATERIAL; PRIMARILY GRAIN SUPPORTED; INTERSTICIES FILLED WITH ARGILLACEOUS MATERIAL, KAOLINITE; UP TO 5 PERCENT OPAQUE MINERALS, BIOTITE AND LESSER DARK MAFIC ACCESSORY

CALCAREOUS MARLSTONE = VERY PALE ORANGE, GRAYISH ORANGE, PALE YELLOWISH BROWN; TOUGH TO CRUMBLY TENACITY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE, FLAKY TO WEDGELIKE CUTTINGS HABIT; WAXY TO DULL LUSTER; CLAYEY TO MATTE TEXTURE; MASSIVE TO FISSLE STRUCTURE; VIGOROUSLY REACTS WITH DILUTE HCL.

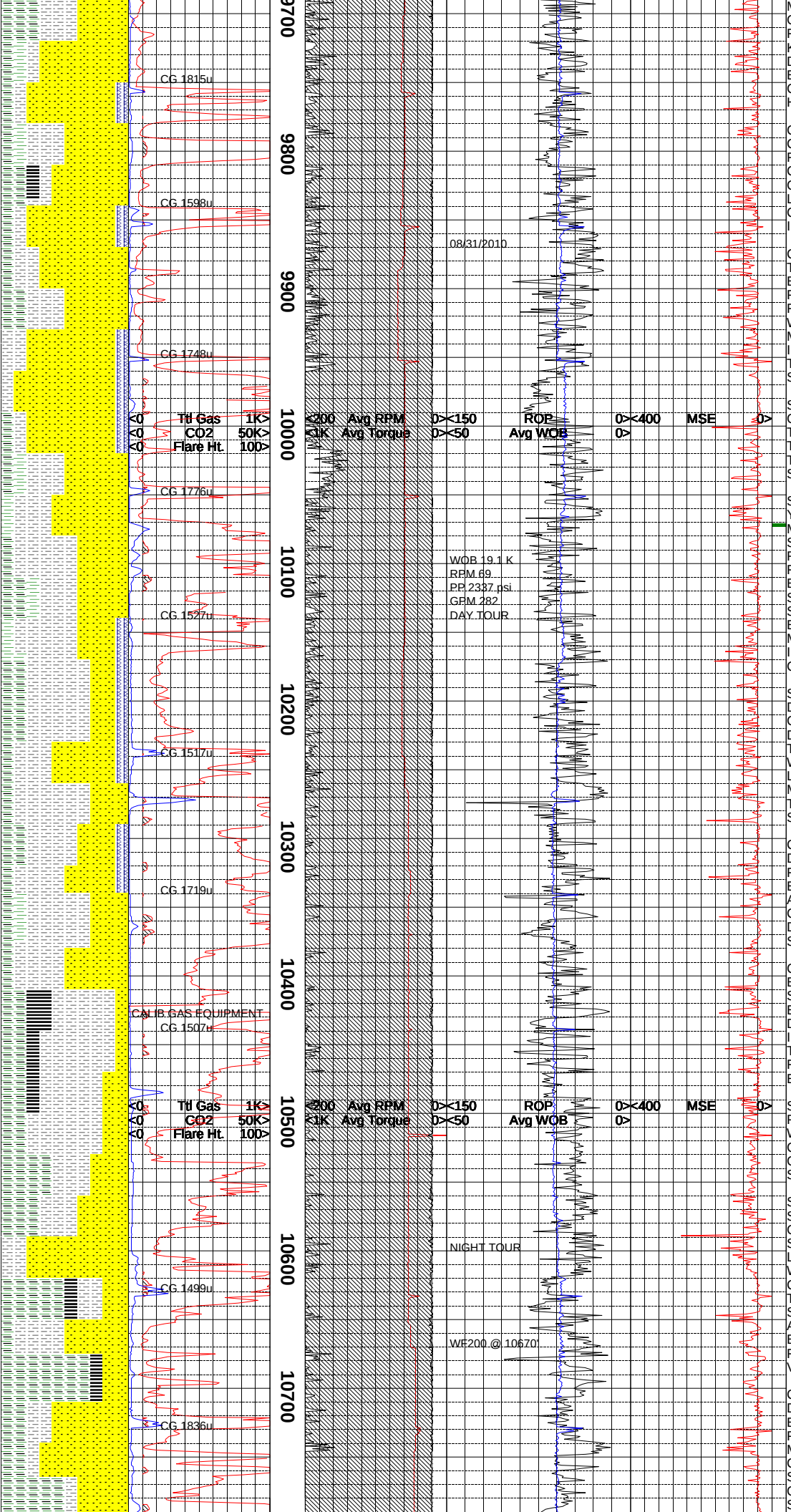
SHALE = VERY LIGHT GRAY, LIGHT GRAY, LIGHT BLUISH GRAY, TO GREENISH GRAY; TOUGH TO BRITTLE TENACITY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE TO WEDGELIKE CUTTINGS HABIT; WAXY, DULL TO EARTHLIKE LUSTER; CLAYEY TO SILTY TEXTURE; THIN TO MASSIVE STRUCTURE; CONTAINS MINUTE DISSEMINATED CARBONACEOUS PARTICLES AND SULFIDES.

NOTE: TOTCO DOWN

SILTSTONE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY; TOUGH TO BRITTLE TENACITY; IRREGULAR TO SOMEWHAT BLOCKY FRACTURE; MASSIVE TO FLAKY CUTTINGS HABIT; DULL TO FROSTED TO SPARKLING LUSTER; SILTY TO SOMEWHAT GRITTY TEXTURE; MASSIVE STRUCTURE.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY; BRITTLE TO CRUMBLY TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE TO FISSLE STRUCTURE.

SANDSTONE = WHITE TO MEDIUM GRAY; FINE TO MEDIUM GRAIN SIZE; WELL SORTED; AUBANGULAR TO ANGULAR GRAINS WITH



MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; MODERATELY HARD TO FIRM FRIABLE CUTTINGS; CALCITE AND KAILINITIC CEMENT, SOME REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHICS AND CARBONACEOUS FLECKS; NO VISBLE HYDROCARBON INDICATORS.

COAL = BLACK TO OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; MATTTE TO WAXY TO GREASY LUSTER; SMOOTH TEXTURE; BANDED TO LAMINAR STRUCTURE, INTERBEDDED WITH CARBONACEOUS SHALE; VISIBLE DEGASSING IN SAMPLE TRAY.

CARBONACEOUS SHALE = MEDIUM DARK GRAY TO DARK GRAY WITH SOME BLACK TO OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; SEMI PLANAR TO PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE TO BANDED TO LAMINAR STRUCTURE; INTERBEDDED WITH THIN BANDS AND LAMINAE TO COAL, SO VISIBLE DEGASSING FROM COAL SEAMS.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY; HARD TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; PLATY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO SLIGHT MATTE LUSTER; MASSIVE STRUCTURE

SANDSTONE = VERY LIGHT GRAY, LIGHT GRAY YELLOWISH GRAY, LIGHT BROWNISH GRAY; MEDIUM TO VERY FINE GRAINED; FAIRLY WELL SORTED TO WELL SORTED; SUBANGULAR TO ROUNDED GRAINS; EASILY FRIABLE TO FIRM FRIABLE; MODERATELY TO WEAKLY CEMENTED BY CALCITE; PREDOMINANTLY GRAIN SUPPORTED; MASSIVELY BEDDED WITH LESSER SILTY TO CLAYEY LENSES; OPAQUE FE-OXIDES BIOTITE, FE-SILICATES ARE ACCESSORY MINERALS; KAOLINITE OCCURS AS SECONDARY INTERSTITIAL MATRIX AND AS FLAKY COATINGS.

SILTSTONE = PALE RED, GRAYISH RED, VERY DUSKY RED, MEDIUM GRAY TO DARK GRAY, GRAYISH BROWN TO DUSKY BROWN; TOUGH, DENSE TO CRUMBLY; IRREGULARLY BLOCKY TO HACKLY FRACTURE; MASSIVE, TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY, GRITTY TO MATTE TEXTURE; MASSIVE TO LENTICULAR STRUCTURE; GRADES TO VERY FINE SANDSTONE, CARBONACEOUS SHALE AND LOW GRADE, UNDEVELOPED COAL.

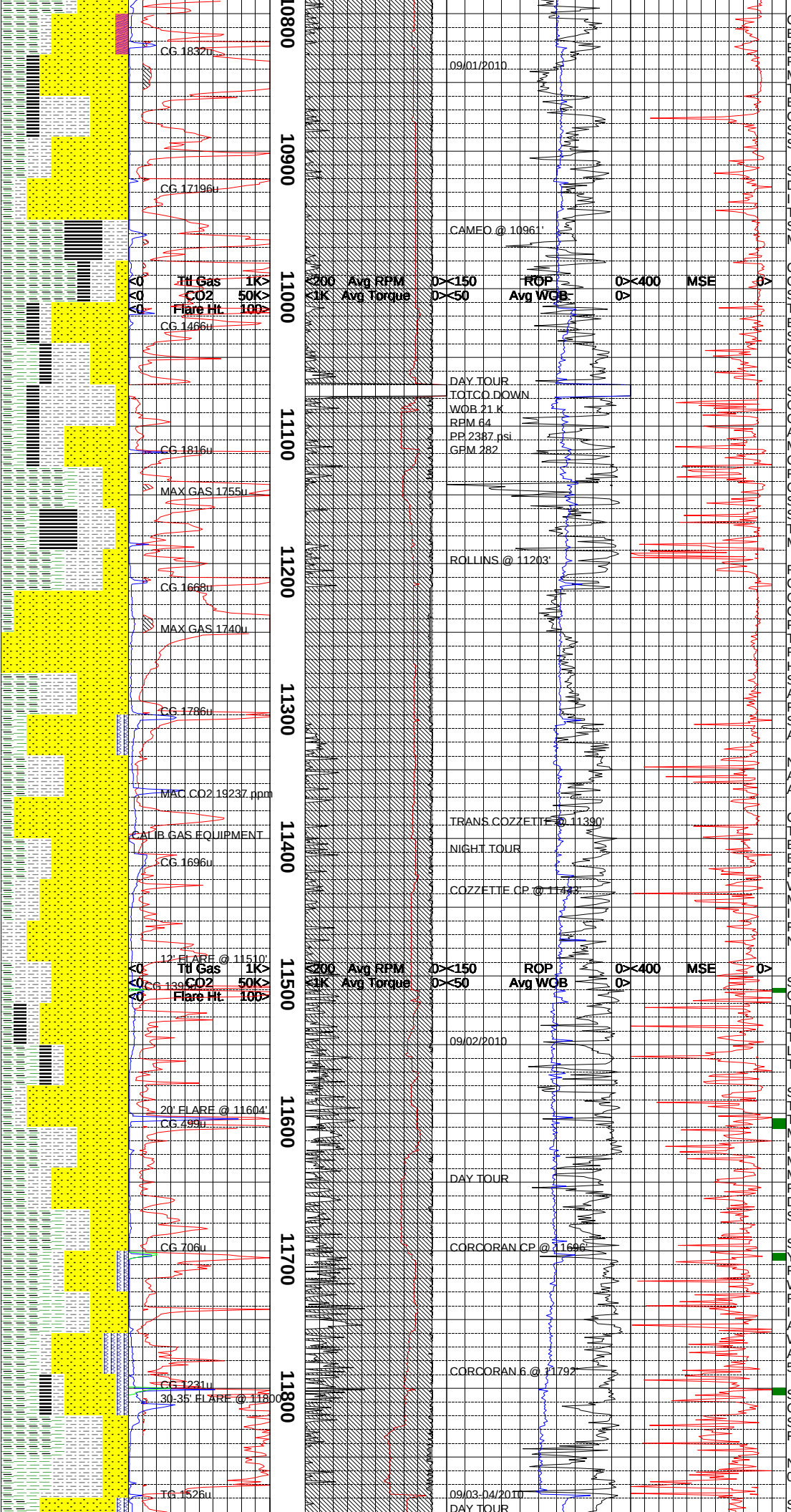
CARBONACEOUS SHALE = OLIVE BROWN TO DARK GRAY TO BROWNISH GRAY; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; DULL EARTHY TO SLIGHTLY VITREOUS LUSTER; ANGULAR TO PLANAR TO SPLINTERY FRACTURE; CLAYEY TO SILTY TEXTURE; MINOR VISIBLE DEGASSING OF THINLY INTERBEDDED COAL IN SAMPLE FRAGMENTS.

COAL = BLACK TO OLIVE BLACK TO BROWNISH BLACK; BLOCKY TO SUB CONCHOIDAL TO SEMI SPLINTERY FRACTURE; TABULAR TO PLATY TO ELONGATED CUTTINGS HABIT; VISIBLE DEGASSING FROM SAMPLE SPECIMENS; THINLY INTERBEDDED WITH CARBONACEOUS SHALE; TRACE PYRITE VEINING ON SOME SAMPLE FRAGMENTS; SMOOTH TO CLAYEY TEXTURE; EARTHY TO VITREOUS LUSTER.

SILTSTONE = OLIVE GRAY TO MEDIUM GRAY; PLANAR TO ANGULAR TO IRREGULAR FRACTURE; WEDGELIKE TO SCALY TO SEMI NODULAR CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; GRADES TO LIGHT OLIVE GRAY SANDSTONE; SPARKLING TO EARTHY LUSTER.

SANDSTONE = WHITE TO VERY LIGHT GRAY, SOME MEDIUM DARK GRAY; FINE TO MEDIUM GRAIN SIZE; WELL SORTED; SUNABGULAR TO SUBROUNDED GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES WHERE VISIBLE;MODERATELY HARD TO HARD CUTTINGS; CALCITE CEMENT WITH A MODERATE TO STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHIC INCLUSIONS; SOME BLACK TO BROWNISH BLACK CARBONACEOUS FLECKS; TRACE MICAS AND PYRITE; NO VISIBLE HYDROCARBON INCLUSIONS.

CARBONACEOUS SHALE = BLACK TO MEDIUM DARK GRAY; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO SEMI PLANAR FRACTURE PLATY TO FLAKY TO TABULAR CUTTINGS HABIT MATTE TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO FISSLE STRUCTURE, INTERBEDDED WITH THIN BANDS OF COAL, SOME VISIBLE DEGASSING OF COAL SEAMS IN SAMPLE TRAY.



COAL = BLACK TO GRAYISH BLACK TO OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SEMI PLANAR TO PLANAR FRACTURE PLATY TO FLAKY TO TABULAR CUTTINGS HABIT MATTE TO RESINOUS TO WAXY LUSTER; SMOOTH TO CLAYEY TO MATTE TEXTURE; LAMINAR TO BANDED STRUCTURE, INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE, SOME VISIBLE DEGASSING OF COALS IN SAMPLE TRAY.

SILTSTONE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY; TOUGH TO VERY TOUGH TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO WEDGELIKE CUTTINGS HABIT; MATTE TO SPARKLING LUSTER; SILTY TO GRITTY TEXT; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE GRAY TO DARK GRAY; PLANAR TO SPLINTERY TO ANGULAR FRACTURE; TABULAR TO PLATY TO ELONGATED CUTTINGS HABIT; EARTHY TO SEMI VITREOUS LUSTER; MATTE TO SILTY TEXTURE; THINLY INTERBEDDED WITH COAL LAMINAE WITH VISIBLE DEGASSING IN SAMPLE FRAGMENTS.

SANDSTONE = LIGHT OLIVE GRAY TO MEDIUM GRAY TO BROWNISH GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR AMOUNTS OF CALCITE CEMENT; WEAK TO MODERATE REACTION TO HCl; 2-4% COAL/ CARBONACEOUS SHALE FLECKS IN SAMPLE FRAGMENTS; THINLY INTERBEDDED WITH COAL LAMINAE AND LIGHT OLIVE GRAY SILTSTONE; VERY FINE TO FINE GRAIN WITH SOME MEDIUM GRAIN; WELL SORTED; MOD TO WELL SORTED; SUB ROUND TO SUB ANG; MODERATE TO HIGH SPHERICITY.

ROLLINS SANDSTONE = WHITE, VERY LIGHT GRAY, YELLOWISH GRAY, LIGHT BROWNISH GRAY, VERY PALE ORANGE; VERY FINE GRAINED TO MEDIUM GRAINED; GRAINBOUND PREDOMINANTLY WITH QUARTZ; FAIRLY WELL TO WELL SORTED; SUBANGULAR TO SUB-ROUNDED GRAIN ANGULARITY; MODERATELY HARD TO EASILY FRIABLE; CEMENTED BY SILICA, CALCITE AND SECONDARY ARGILLACEOUS MATERIAL; INTERSTICIES FILLED BY VERY FINE GRAINED CLASTICS AND SILT, ALSO BY SECONDARY KAOLINITE; ACCESSORY MINERALS: BIOTITE, KAOLINITE,

NOTE: UPHOLE GASSES BLEEDING INTO HOLE AROUND 2000 STKS WHICH IS ASSOCIATED W/ A HIGH GAS SANDSTONE INTERVAL @ 9500' MD

CARBONACEOUS SHALE = MEDIUM LIGHT GREY TO DARK GREY WITH SOME BLACK TO OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE TO BANDED TO LAMINAR STRUCTURE; INTERBEDDED WITH THIN BANDS OF COAL AND FLECKS OF COAL, TRACE PYRITE FLACKS AND NODULES; SOME SLIGHT VISIBLE DEGASSING FROM COAL SEAMS.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY; HARD TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO SPLINTERY FRACTURE; PLATY TO WEDGELIKE CUTTINGS HABIT; SPARKLING TO SLIGHT MATTE LUSTER; MASSIVE TO LENTICULAR STRUCTURE; GRADATIONAL IN TEXTURE TO CARBONACEOUS SHALE.

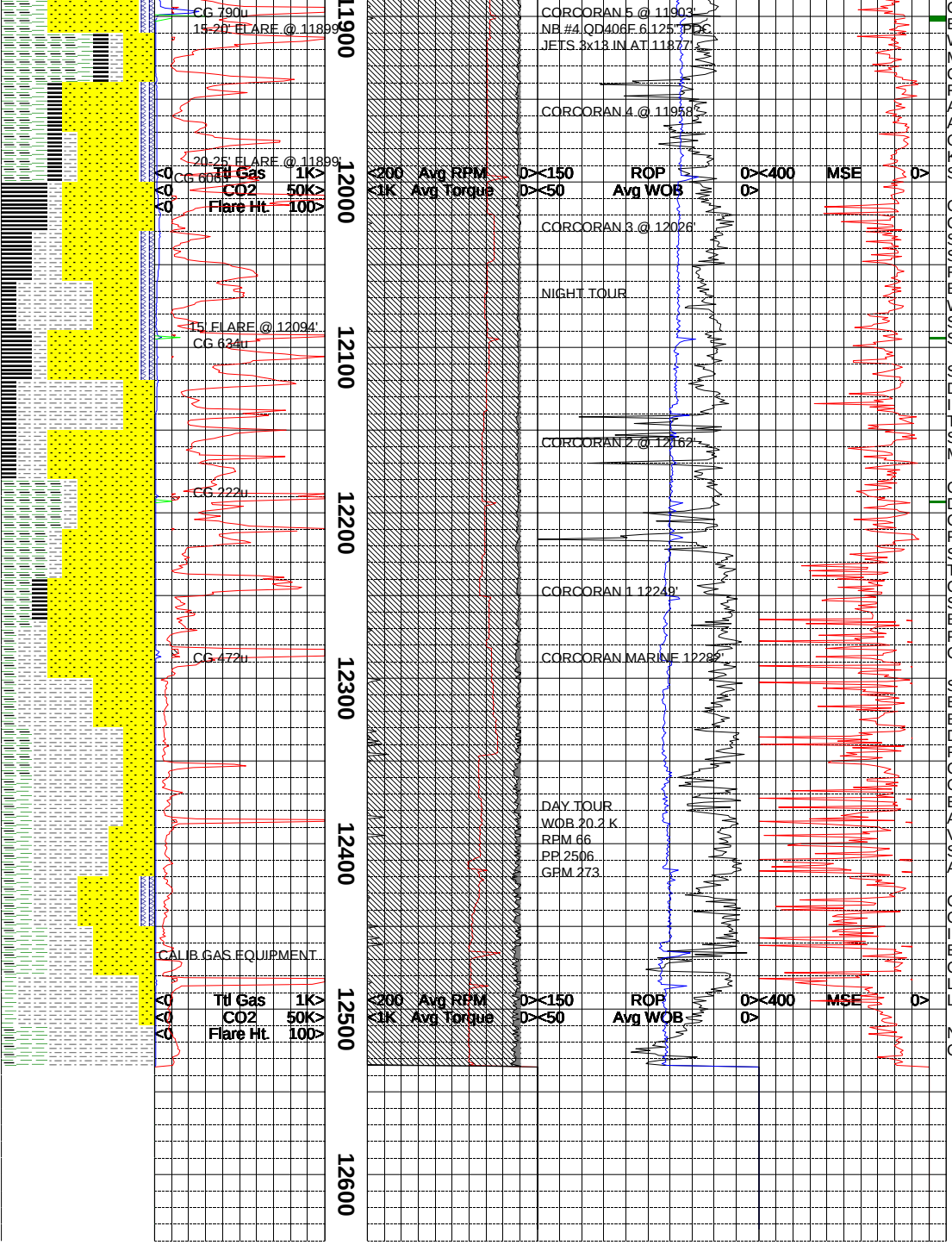
SHALE = LIGHT BLUISH GRAY, LIGHT GRAY, TO MEDIUM LIGHT GRAY; TOUGH TO BRITTLE TENACITY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE, TABULAR TO WEDGELIKE CUTTINGS HABIT; DULL TO WAXY LUSTER; CLAYEY, MATTE TO SLIGHTLY GRITTY TEXTURE; MASSIVE STRUCTURE WITHOUT PLANAR FEATURES; FRACTURE SURFACES SHOW DISSEMINATED CARBON FRAGMENTS AND SULFIDES.

SANDSTONE = WHITE, VERY PALE ORANGE, TO YELLOWISH GRAY; VERY FINE GRAINED TO FINE GRAINED; QUARTZ FRAMEWORK; FAIRLY WELL TO WELL SORTED; EASILY FRIABLE TO FIRMLY FRIABLE; TRACE CALCITE CEMENT; INTERSTICIES FILLED WITH SILTY CLASTICS AND SECONDARY WHITE KAOLINITE; MASSIVE WITH NO VISIBLE BEDDING FEATURES; ACCESSORY BIOTITE, OPAQUE FE-OXIDES; 50 PERCENT ALTERED WITH WHITE KAOLINITE.

SILTSTONE = MEDIUM GRAY TO LIGHT OLIVE GRAY; IRREGULAR TO BLOCKY FRACTURE; SEMI SPARKLING TO EARTHY LUSTER; PLATY TO FLAKY CUTTINGS HABIT; GRITTY TEXTURE.

NOTE: TRIP OUT FOR NEW BIT @ 11877' ON 09/02/2010.

SANDSTONE = VERY LIGHT GRAY, PINKISH



GRAY, YELLOWISH GRAY, PALE YELLOWISH BROWN; VERY FINE TO FINE GRAINED; FAIRLY WELL TO WELL SORTED; EASILY FRIABLE TO MODERATELY HARD; MODERATE CALCITE CEMENT; GRAIN SUPPORTED; INTERSTICIES FILLED WITH SILT AND SECONDARY ALTERATION CLAYS; MASSIVELY BEDDED; ACCESSORY MINERALS INCLUDE BIOTITE, OPAQUE OXIDES; ABUNDANT SECONDARY KAOLINITE AS INTERSTITIAL FILLING AND SCALY TO WEDGELIKE CUTTINGS.

COAL = BLACK TO OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; PLOCKY TO PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TEXTURE; BANDED TO THICK STRUCTURE; INTERBEDDED WITH WHITE SANDSTONE AND LIGHT GREY SILTSTONE; STRONG VISIBLE DEGASSING IN SAMPLE TRAY.

SILTSTONE = MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY; TOUGH TO VERY TOUGH TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO WEDGELIKE CUTTINGS HABIT; MATTE TO SPARKLING LUSTER; SILTY TO GRITTY TEXT; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = BLACK TO MEDIUM DARK GREY; BRITTLE TO CRUNCHY TO CRUMBLY TENACITY; IRREGULAR TO SEMI PLANAR TO SPLINTERY FRACTURE; PLATY TO SCALY TO WEDGELIKE CUTTINGS HABIT; DULL TO MATTE TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO BANDED STRUCTURE WITH SOME FISSILITY AND BREAKAGE ALONG THIN SEAMS OF COAL AND PYRITE; TRACE VIVIBLE DEGASSING FROM COAL SEAMS IN SAMPLE TRAY.

SILTSTONE = PALE YELLOWISH BROWN, PALE BROWN, DARK YELLOWISH BROWN, GRAYISH BROWN TO OLIVE GRAY; MODERATELY HARD, DENSE, TO CRUNCHY; IRREGULAR TO SLIGHTLY PLANAR FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRANULAR TEXTURE; MASSIVE TO FAINTLY BANDED STRUCTURE; FAINT BEDDING OBSERVED AS EXHIBITED BY COLOR, GRAIN SIZE VARIATION; CONTAINS NARROW LENSES OF SULFIDES (PYRITE), CARBONACEOUS MATERIAL AND UNDEVELOPED COAL.

CARBONACEOUS SHALE = BROWNISH GRAY, OLIVE GRAY, OLIVE BLACK; BLOCKY TO IRREGULAR FRACTURE; MASSIVE TO WEDGELIKE EARTHY TO DULL LUSTER; GRITTY, SILTY TO CLAYEY TEXTURE; MASSIVE TO IRREGULARLY LENTICULAR STRUCTUE; CONTAINS DISCRETE LENSES OF CARBONACEOUS MATERIAL.

NOTE: TD WELL AT 12534' MD (12465' TVD) ON 09/05/2010.