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Drilling Dynamics MD

COMPANY ExxonMobil Production

WELL PCU 197-34A5

FIELD PICEANCE CREEK

REGION ROCKY MOUNTAIN

COORDINATES LAT: 39.918116

LONG: -108.27697

ELEVATION G.L.:6492.9'

RKB: 30.2'

COUNTY, STATE RIO BLANCO, CO

API INDEX 051031154000

SPUD DATE 5/27/2010

CONTRACTOR HELMRICH_PAYNE

CO. REP. JOSEPH THOMAS

RIG/TYPE 325/FLEX 4S

LOGGING UNIT MLU 048

GEOLOGISTS MARK GROSS

DONNA NEW

ADD. PERSONS JENN SELL

CO. GEOLOGIST MELISSA J. SAURBORN

LOG INTERVAL

DEPTHS: 3644' TO 12633'
DATES: 05/27/2010 TO 08/24/2010
SCALE: 1" = 100'

CASING DATA

10.75" AT 3624'
7" AT 8600'
AT
AT

MUD TYPES

SPUD MUD TO 3644'
LSND TO 12633'
TO
TO

HOLE SIZE

14.75" TO 3644'
9.875" TO 8655'
6.125" TO 12633'
TO

ABBREVIATIONS

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

ALTERED ZONE	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

<0 Ttl Gas 2K>
units

<0 CO2 90K>
ppm

<0 Flare Ht. 100>
ft

Depth

<150 Avg RPM 0> <150 ROP 0> <400 MSE 0>

ft/hr

psi

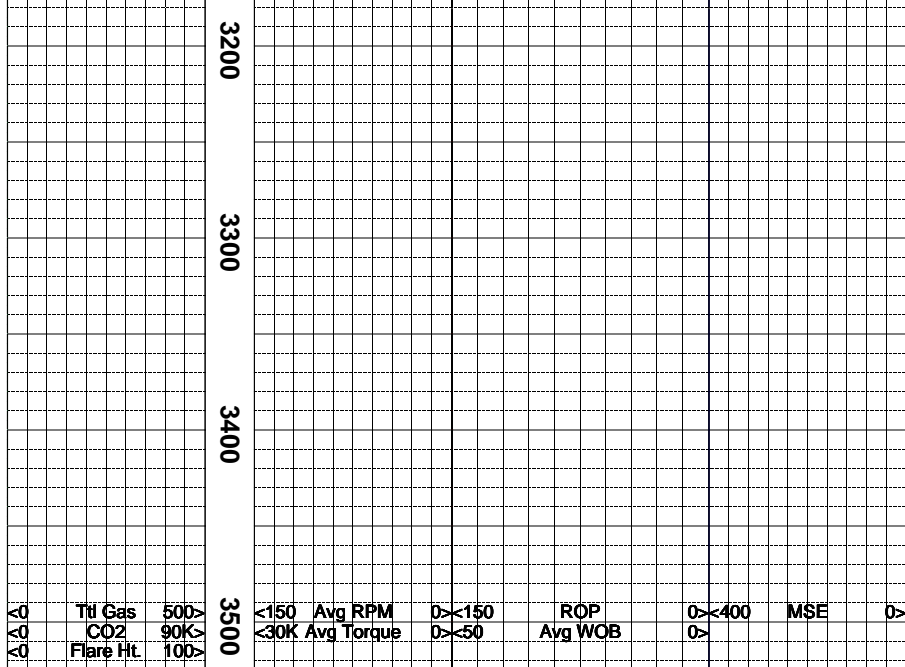
<30K Avg Torque 0> <50 Avg WOB 0>

FTLBS

klbs

MGS

Remarks
Survey Data, Mud Reports, Other Info.



ALL ROCK COLORS ARE REFERENCED TO THE 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 SEPERATOR) 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 MUDLOG.

10.75" SURFACE CASING WAS SET AT 3624'. DRILLED 10' OF NEW FORMATION AND PERFORM F.I.T. - GOOD. DRILL AHEAD.

SURVEY @ 3644' MD: INC 17.33 AZI 37.18 TVD 3507.83'

EPOCH WELL SERVICES COMMENCED FULL LOGGING ON 05/30/2010 AT 3645'

SHALE = PALE RED, LIGHT GRAY TO MEDIUM LIGHT GRAY, DARK YELLOWISH ORANGE TO PALE YELLOWISH ORANGE, ALL IN A MOTTLED PATTERN; CRUMBLY TO BRITTLE TENACITY; IRREGULAR TO SEMI PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY, PALE YELLOWISH ORANGE TO DARK YELLOWISH ORANGE; BRITTLE TO CRUMBLY TENACITY; BLOCKY TO IRREGULAR FRACUTRE; MASSIVE CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.

SHALE = LIGHT GRAY TO MOD YELLOWISH BROWN MOTTLED WITH BROWNISH GRAY; PLATY TO SCALY TO FLAKY CUTTINGS HABIT; CLAYEY TO SMOOTH TEXTURE; DULL EARTHY LUSTER; THINLY INTERBEDDED WITH PALE YELLOWISH GRAY SILTSTONE; PLANAR TO HACKLY FRACTURE.

SANDSTONE = VERY LIGHT GRAY TO PALE YELLOWISH BROWN OT OFF WHITE; FRAIBLE TO MODERATE HARD; VERY FINE TO FINE GRAIN; FAIRLY SORTED; SUBANGULAR TO SUBROUND; LOW TO MODERATE SPHERICITY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND SOME KAOLIN CEMENT; THINLY INTERBEDDED WITH SILTSTONE; TRACE ACC MINERALS OF NAHCOLITE AND CHLORITE; TR CARBONACEOUS MATERIAL IN SAMPLE FRAGS.

SHALE = LIGHT GRAY MOTTLED WITH MODERATE YELLOWISH BROWN AND TRACE GRAYISH RED; PLATY TO SCALY TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO SLIGHTLY SILTY TEXTURE; EARTHY LUSTER; THINLY INTERBEDDED WITH LIGHT GRAY SILTSTONE; ANGULAR TO PLANAR TO HACKLY FRACTURE.

SILTSTONE = LIGHT GRAY TO MODERATE YELLOWISH GRAY; IRREGULAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; SILTY TO CLAYEY TEXTURE; GRADES TO LIGHT GRAY SANDSTONE; TRACE LOOSE FINE GRAIN SAND; SPARKLING TO EARTHY LUSTER; THINLY INTERBEDDED WITH

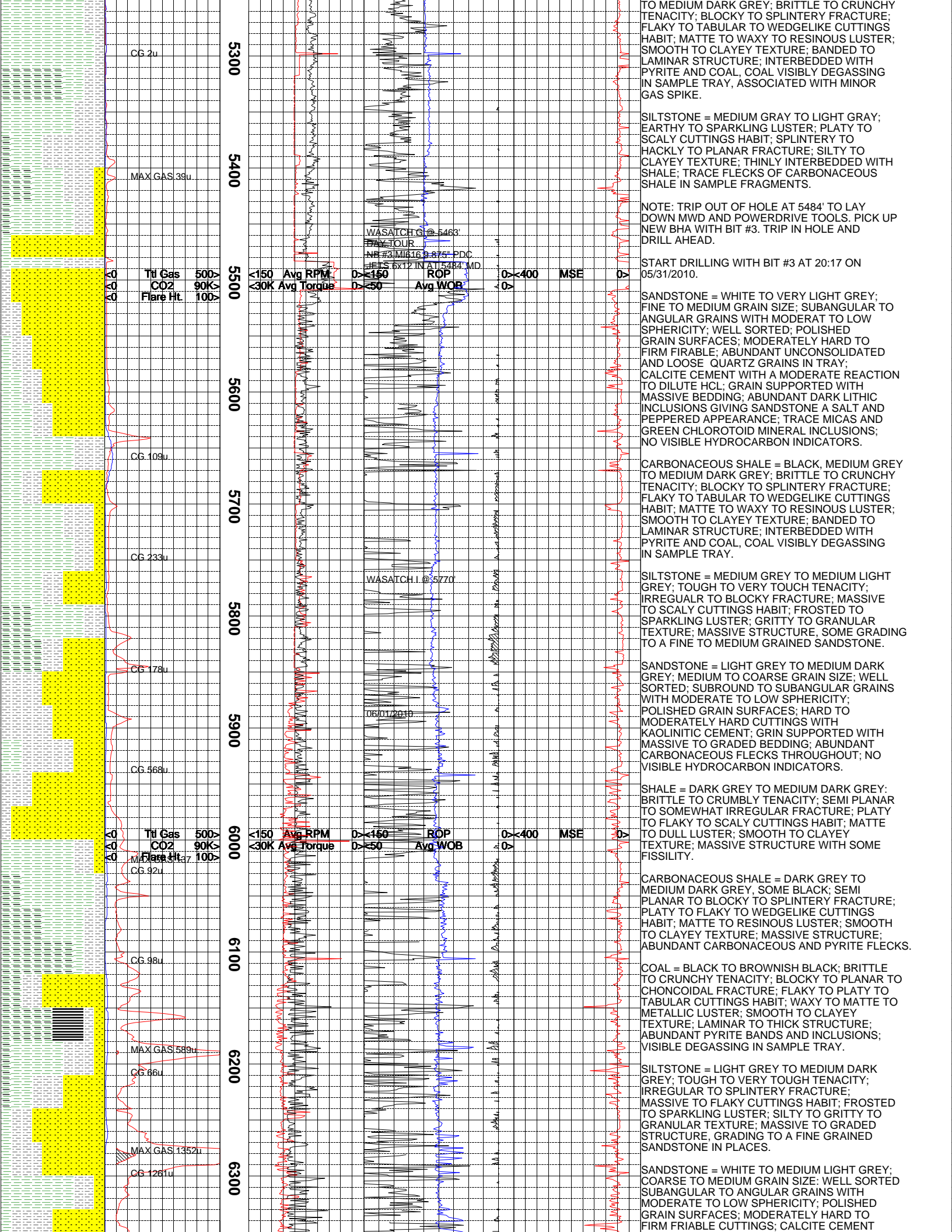
05/30/2010
NB #2 HCM 5042X 9.875" PDC
JETS 4x13, 2x12 IN BIT 3644'

DAY TOUR

CALIB GAS EQUIPMENT

Ttl Gas 500Y
CO2 90KY
Flare Ht. 100Y

CG-149u



TO MEDIUM DARK GREY; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SPLINTERY FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO LAMINAR STRUCTURE; INTERBEDDED WITH PYRITE AND COAL, COAL VISIBLY DEGASSING IN SAMPLE TRAY, ASSOCIATED WITH MINOR GAS SPIKE.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY; EARTHY TO SPARKLING LUSTER; PLATY TO SCALY CUTTINGS HABIT; SPLINTERY TO HACKLY TO PLANAR FRACTURE; SILTY TO CLAYEY TEXTURE; THINLY INTERBEDDED WITH SHALE; TRACE FLECKS OF CARBONACEOUS SHALE IN SAMPLE FRAGMENTS.

NOTE: TRIP OUT OF HOLE AT 5484' TO LAY DOWN MWD AND POWERDRIVE TOOLS. PICK UP NEW BHA WITH BIT #3. TRIP IN HOLE AND DRILL AHEAD.

START DRILLING WITH BIT #3 AT 20:17 ON 05/31/2010.

SANDSTONE = WHITE TO VERY LIGHT GRAY; FINE TO MEDIUM GRAIN SIZE; SUBANGULAR TO ANGULAR GRAINS WITH MODERAT TO LOW SPHERICITY; WELL SORTED; POLISHED GRAIN SURFACES; MODERATELY HARD TO FIRM FIRABLE; ABUNDANT UNCONSOLIDATED AND LOOSE QUARTZ GRAINS IN TRAY; CALCITE CEMENT WITH A MODERATE REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHIC INCLUSIONS GIVING SANDSTONE A SALT AND PEPPERED APPEARANCE; TRACE MICAS AND GREEN CHLOROTOID MINERAL INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.

CARBONACEOUS SHALE = BLACK, MEDIUM GREY TO MEDIUM DARK GREY; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SPLINTERY FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO LAMINAR STRUCTURE; INTERBEDDED WITH PYRITE AND COAL, COAL VISIBLY DEGASSING IN SAMPLE TRAY.

SILTSTONE = MEDIUM GREY TO MEDIUM LIGHT GREY; TOUGH TO VERY TOUCH TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO SCALY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; GRITTY TO GRANULAR TEXTURE; MASSIVE STRUCTURE, SOME GRADING TO A FINE TO MEDIUM GRAINED SANDSTONE.

SANDSTONE = LIGHT GREY TO MEDIUM DARK GREY; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; HARD TO MODERATELY HARD CUTTINGS WITH KAOLINITIC CEMENT; GRIN SUPPORTED WITH MASSIVE TO GRADED BEDDING; ABUNDANT CARBONACEOUS FLECKS THROUGHOUT; NO VISIBLE HYDROCARBON INDICATORS.

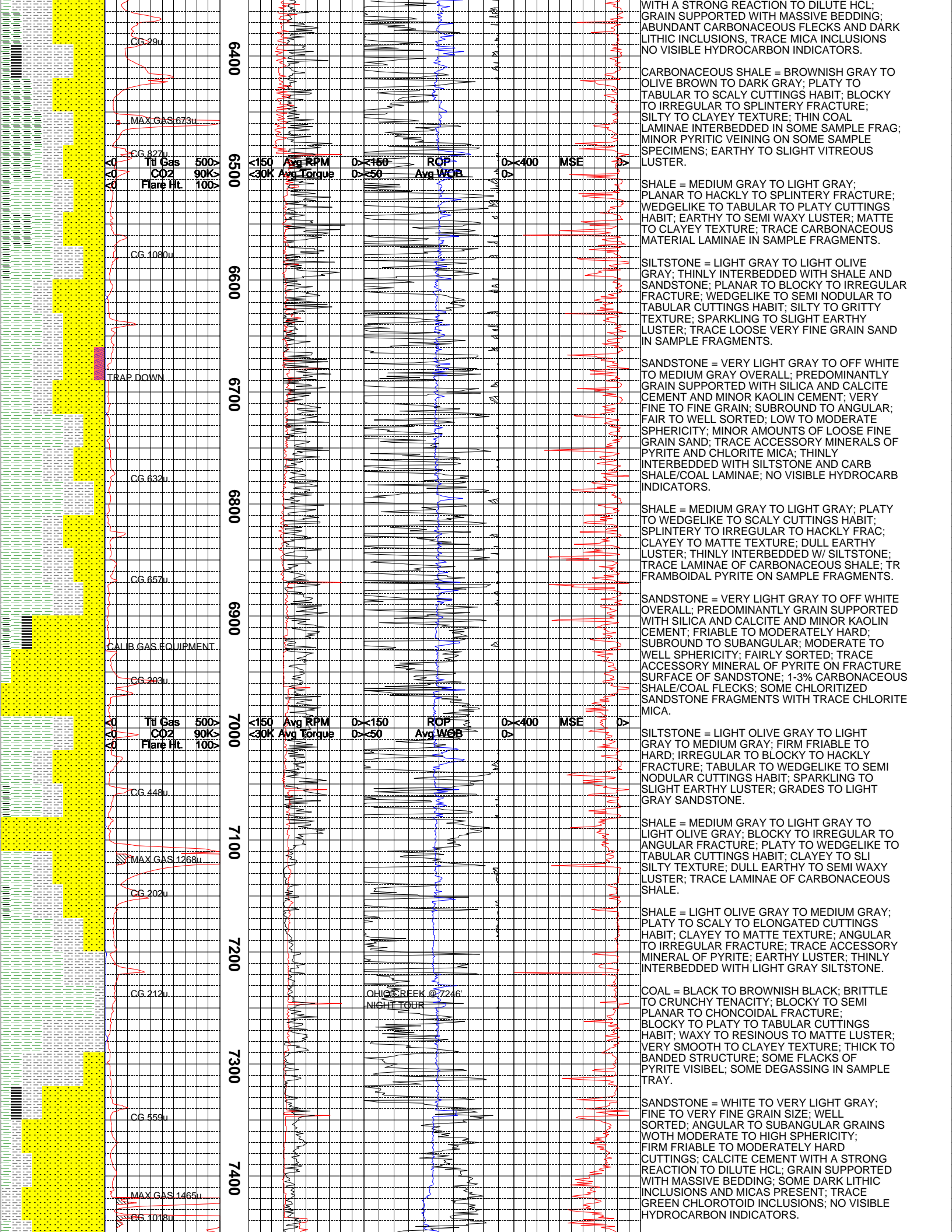
SHALE = DARK GREY TO MEDIUM DARK GREY; BRITTLE TO CRUMBLY TENACITY; SEMI PLANAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH SOME FISSILITY.

CARBONACEOUS SHALE = DARK GREY TO MEDIUM DARK GREY, SOME BLACK; SEMI PLANAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; MATTE TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE; ABUNDANT CARBONACEOUS AND PYRITE FLECKS.

COAL = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO PLANAR TO CHONCOIDAL FRACTURE; FLAKY TO PLATY TO TABULAR CUTTINGS HABIT; WAXY TO MATTE TO METALLIC LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAR TO THICK STRUCTURE; ABUNDANT PYRITE BANDS AND INCLUSIONS; VISIBLE DEGASSING IN SAMPLE TRAY.

SILTSTONE = LIGHT GREY TO MEDIUM DARK GREY; TOUGH TO VERY TOUCH TENACITY; IRREGULAR TO SPLINTERY FRACTURE; MASSIVE TO FLAKY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; MASSIVE TO GRADED STRUCTURE, GRADING TO A FINE GRAINED SANDSTONE IN PLACES.

SANDSTONE = WHITE TO MEDIUM LIGHT GRAY; COARSE TO MEDIUM GRAIN SIZE; WELL SORTED SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; MODERATELY HARD TO FIRM FRIABLE CUTTINGS; CALCITE CEMENT



WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT CARBONACEOUS FLECKS AND DARK LITHIC INCLUSIONS, TRACE MICA INCLUSIONS NO VISIBLE HYDROCARBON INDICATORS.

CARBONACEOUS SHALE = BROWNISH GRAY TO OLIVE BROWN TO DARK GRAY; PLATY TO TABULAR TO SCALY CUTTINGS HABIT; BLOCKY TO IRREGULAR TO SPLINTERY FRACTURE; SILTY TO CLAYEY TEXTURE; THIN COAL LAMINAE INTERBEDDED IN SOME SAMPLE FRAG; MINOR PYRITIC VEINING ON SOME SAMPLE SPECIMENS; EARTHY TO SLIGHT VITREOUS LUSTER.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLANAR TO HACKLY TO SPLINTERY FRACTURE; WEDGELIKE TO TABULAR TO PLATY CUTTINGS HABIT; EARTHY TO SEMI WAXY LUSTER; MATTE TO CLAYEY TEXTURE; TRACE CARBONACEOUS MATERIAL LAMINAE IN SAMPLE FRAGMENTS.

SILTSTONE = LIGHT GRAY TO LIGHT OLIVE GRAY; THINLY INTERBEDDED WITH SHALE AND SANDSTONE; PLANAR TO BLOCKY TO IRREGULAR FRACTURE; WEDGELIKE TO SEMI NODULAR TO TABULAR CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; SPARKLING TO SLIGHT EARTHY LUSTER; TRACE VERY FINE GRAIN SAND IN SAMPLE FRAGMENTS.

SANDSTONE = VERY LIGHT GRAY TO OFF WHITE TO MEDIUM GRAY OVERALL; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE CEMENT AND MINOR KAOLIN CEMENT; VERY FINE TO FINE GRAIN; SUBROUND TO ANGULAR; FAIR TO WELL SORTED; LOW TO MODERATE SPHERICITY; MINOR AMOUNTS OF LOOSE FINE GRAIN SAND; TRACE ACCESSORY MINERALS OF PYRITE AND CHLORITE MICA; THINLY INTERBEDDED WITH SILTSTONE AND CARB SHALE/COAL LAMINAE; NO VISIBLE HYDROCARB INDICATORS.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLATY TO WEDGELIKE TO SCALY CUTTINGS HABIT; SPLINTERY TO IRREGULAR TO HACKLY FRAC; CLAYEY TO MATTE TEXTURE; DULL EARTHY LUSTER; THINLY INTERBEDDED W/ SILTSTONE; TRACE LAMINAE OF CARBONACEOUS SHALE; TR FRAMBOIDAL PYRITE ON SAMPLE FRAGMENTS.

SANDSTONE = VERY LIGHT GRAY TO OFF WHITE OVERALL; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE AND MINOR KAOLIN CEMENT; FRIABLE TO MODERATELY HARD; SUBROUND TO SUBANGULAR; MODERATE TO WELL SPHERICITY; FAIRLY SORTED; TRACE ACCESSORY MINERAL OF PYRITE ON FRACTURE SURFACE OF SANDSTONE; 1-3% CARBONACEOUS SHALE/COAL FLECKS; SOME CHLORITIZED SANDSTONE FRAGMENTS WITH TRACE CHLORITE MICA.

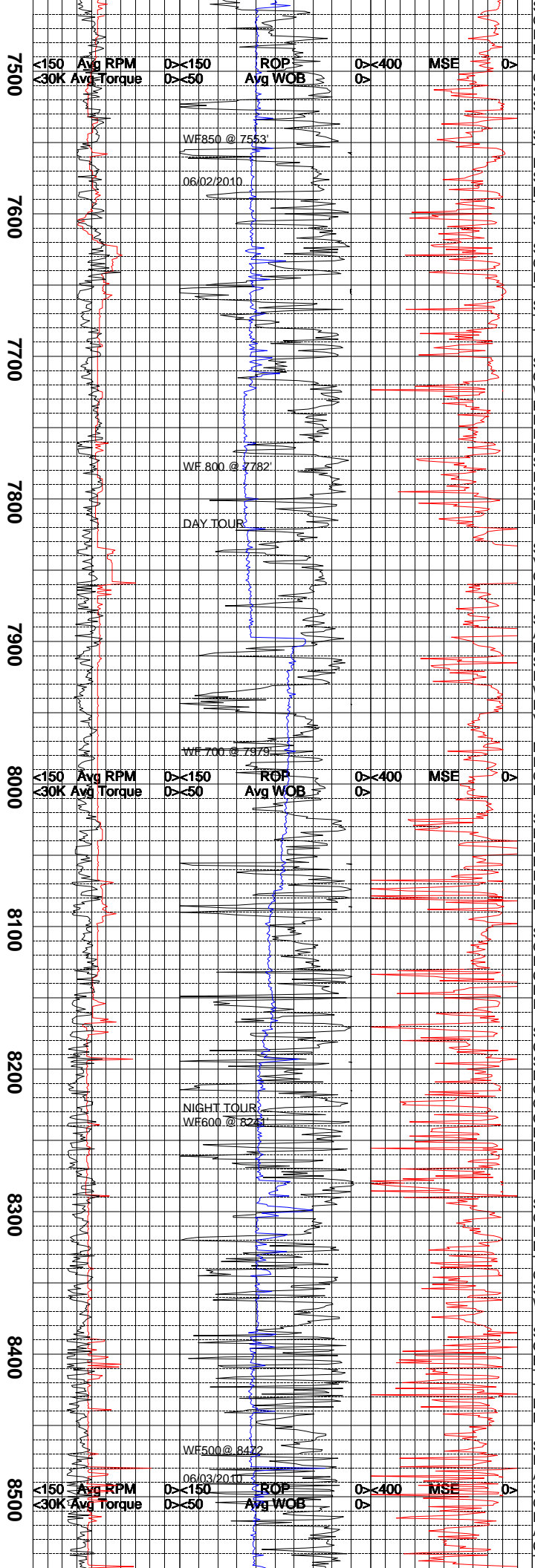
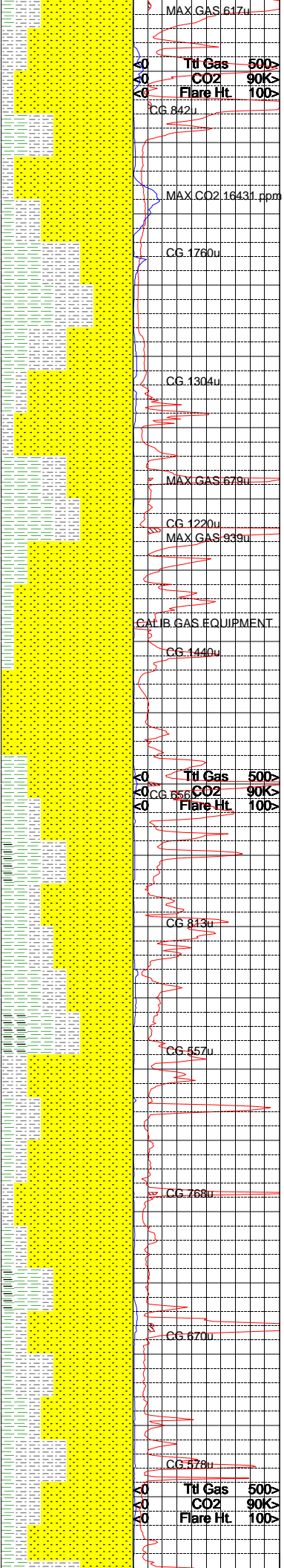
SILTSTONE = LIGHT OLIVE GRAY TO LIGHT GRAY TO MEDIUM GRAY; FIRM FRIABLE TO HARD; IRREGULAR TO BLOCKY TO HACKLY FRACTURE; TABULAR TO WEDGELIKE TO SEMI NODULAR CUTTINGS HABIT; SPARKLING TO SLIGHT EARTHY LUSTER; GRADES TO LIGHT GRAY SANDSTONE.

SHALE = MEDIUM GRAY TO LIGHT GRAY TO LIGHT OLIVE GRAY; BLOCKY TO IRREGULAR TO ANGULAR FRACTURE; PLATY TO WEDGELIKE TO TABULAR CUTTINGS HABIT; CLAYEY TO SLI SILTY TEXTURE; DULL EARTHY TO SEMI WAXY LUSTER; TRACE LAMINAE OF CARBONACEOUS SHALE.

SHALE = LIGHT OLIVE GRAY TO MEDIUM GRAY; PLATY TO SCALY TO ELONGATED CUTTINGS HABIT; CLAYEY TO MATTE TEXTURE; ANGULAR TO IRREGULAR FRACTURE; TRACE ACCESSORY MINERAL OF PYRITE; EARTHY LUSTER; THINLY INTERBEDDED WITH LIGHT GRAY SILTSTONE.

COAL = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SEMI PLANAR TO CHONCOIDAL FRACTURE; BLOCKY TO PLATY TO TABULAR CUTTINGS HABIT; WAXY TO RESINOUS TO MATTE LUSTER; VERY SMOOTH TO CLAYEY TEXTURE; THICK TO BANDED STRUCTURE; SOME FLACKS OF PYRITE VISIBEL; SOME DEGASSING IN SAMPLE TRAY.

SANDSTONE = WHITE TO VERY LIGHT GRAY; FINE TO VERY FINE GRAIN SIZE; WELL SORTED; ANGULAR TO SUBANGULAR GRAINS WOTH MODERATE TO HIGH SPHERICITY; FIRM FRIABLE TO MODERATELY HARD CUTTINGS; CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS AND MICAS PRESENT; TRACE GREEN CHLOROTOID INCLUSIONS; NO VISIBLE HYDROCARBON INDICATORS.



SILTSTONE = LIGHT GRAY TO MEDIUM DARK GRAY; TOUGH TO VERY TOUGH TENACITY; IRREGULAR TO SPLINTERY FRACTURE; MASSIVE TO FLAKY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; MASSIVE TO GRADED STRUCTURE, GRADING TO A FINE GRAINED SANDSTONE IN PLACES.

SHALE = MODERATE TO PALE YELLOWISH BROWN TO MEDIUM GRAY; PLATY TO FLAKY TO SEMI ELONGATED CUTTINGS HABIT; CLAYEY TO SMOOTH TEXTURE; PLANAR TO SPLINTERY TO BLOCKY FRACTURE; SOFT TO CRUMBLY TENACITY; DULL MATTE LUSTER; MASSIVE STRUCTURE.

SILTSTONE = MEDIUM GRAY TO MEDIUM LIGHT GRAY; TOUGH TO VERY TOUCH TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO SCALY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; GRITTY TO GRANULAR TEXTURE; MASSIVE STRUCTURE, SOME GRADING TO A FINE TO MEDIUM GRAINED SANDSTONE.

SANDSTONE = VERY LIGHT GRAY TO OFF WHITE OVERALL; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND CALCITE CEMENT AND TRACE KAOLIN; 1-3% CARBONACEOUS SHALE/COAL FLECKS INTERSPERSED IN SAMPLE FRAGMENTS; ROUND TO SUBANGULAR; VERY FINE TO UPPER FINE GRAIN; WELL SORTED; MODERATE TO WEL SPHERICITY; TRACE ACCESSORY MINERALS OF PYRITE AGGREGATE AND CHLORITE MICAS; SOME LOOSE GRAINS; TRANSLUCENT TO CLEAR; FRIABLE TO MODERATE HARD; TRACE LITHICS IN SAMPLE SPECIMENS.

SANDSTONE = OFF WHITE TO TRANSPARENT TO VERY LIGHT GRAY; PREDOMINANTLY LOOSE GRAIN; TRACE ACCESSORY MINERALS OF MICRO PYRITE AND CHLORITE MICA; SUBANGULAR TO ROUND; WELL SORTED; MODERATE TO HIGH SPHERICITY; CLEAR TO OPAQUE; MINOR ABRASIONS TO GRAINS POSSIBLE DUE TO PDC BIT ACTION; SOME PRESERVED SANDSTONE SPECIMENS; 1-2% CARBONACEOUS MATERIAL IN SAMPLE FRAGMENTS; THINLY INTERBEDDED WITH SILTSTONE LAMINAE; SOFT TO FIRM FRIABLE; SILICA AND CALCITE CEMENT; NO VISIBLE HYDROCARBON INDICATORS.

NOTE: UPHOLE FORMATION GASES BLEEDING INTO WELLBORE DURING CONNECTIONS. EARLY GASES SHOWING ON MUDLOG AT CONNECTION DEPTHS.

SHALE = MEDIUM GRAY TO LIGHT GRAY; HACKLY TO BLOCKY TO PLANAR FRACTURE; PLATY TO ELONGATED TO WEDGELIKE CUTTINGS HABIT; CLAYEY TO MATTE TEXTURE; DULL EARTHY TO SEMI WAXY LUSTER; GRADES TO LIGHT GRAY SILTSTONE; MINOR AMOUNTS OF LOOSE SAND IN SAMPLE FRAGMENTS.

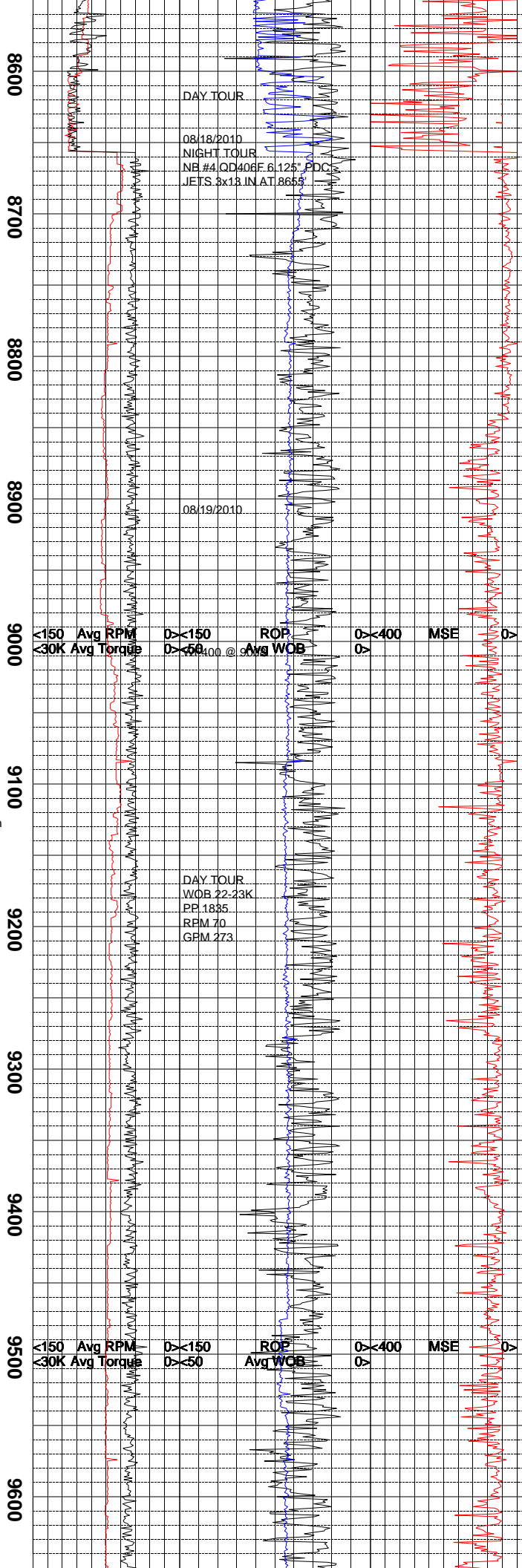
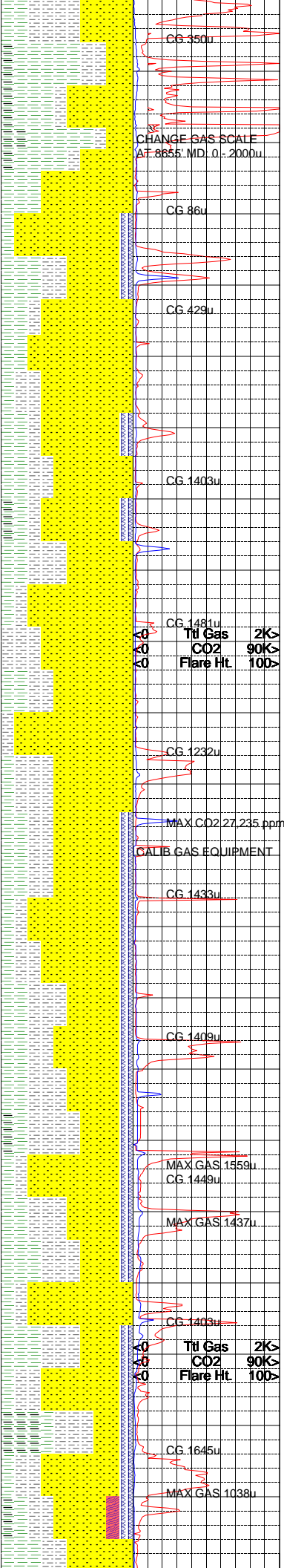
SILTSTONE = LIGHT GRAY TO LIGHT OLIVE GRAY; IRREGULAR TO HACKLY TO BLOCKY FRACTURE; FLAKY TO WEDGELIKE TO TABULAR CUTTINGS HABIT; SPARKLING TO SLI EARTHY LUSTER; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED WITH SHALE AND SANDSTONE.

SANDSTONE = WHITE TO MEDIUM LIGHT GREY; COARSE TO MEDIUM GRAIN SIZE; WELL SORTED SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; MAINLY UNCONSOLIDATED QUARTZ GRAINS WITH FEW EASILY FRIABLE CUTTINGS; GRAIN SUPPORTED AND MASSIVELY BEDDED WHERE CONSOLIDATED; ABUNDANT DARK LITHIC INCLUSIONS IN SANDSTONE; INTERBEDDED WITH A LIGHT GREY SILTSTONE; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = LIGHT GREY TO MEDIUM LIGHT GREY; TOUGH TO VERY TOUGH TENACITY; IRREGULAR TO SPLINTERY FRACTURE; MASSIVE TO FLAKY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; MASSIVE TO GRADED STRUCTURE, GRADING TO A FINE GRAINED WHITE TO LIGHT GREY SANDSTONE.

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

SANDSTONE = WHITE TO VERY LIGHT GREY; FINE TO MEDIUM GRAIN SIZE; SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; WELL SORTED; POLISHED GRAIN SURFACES; MODERATELY HARD TO FIRM FIRABLE; ABUNDANT UNCONSOLIDATED AND LOOSE QUARTZ GRAINS IN TRAY; CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH



MASSIVE BEDDING; SOME DARK LITHICS; NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = LIGHT TO MEDIUM GRAY; BLOCKY TO IRREGULAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; SILTY TEXTURE; SPARKLING LUSTER; GRADES TO SANDSTONE.

NOTE: TD INTERMEDIATE SECTION AT 8655' MD (8471' TVD) ON 06/03/2010.

NOTE: RETURN TO DRILLING 8/19/2010

SANDSTONE = WHITE TO LIGHT GREY; FINE TO MEDIUM GRAIN SIZE; WELL SORTED; SUBROUND TO SUBANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; FIRM FRIABLE TO MODERATELY HARD CUTTINGS CALCITE CEMENT WITH A MODERATE TO STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS ABOUT 10% TO 15%. SOME KAOLINITE; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = DARK GREY TO MEDIUM DARK GREY; BRITTLE TO CRUMBLY TENACITY; SEMI PLANAR TO SOMEWHAT IRREGULAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE WITH SOME FISSILITY.

SILTSTONE = LIGHT GRAY TO GRAY; BRITTLE TO CRUNCHY TENACITY; PLANAR TO BLOCKY FRACTURE; CUTTINGS HABIT MASSIVE TO FLAKY AND SOMEWHAT SCALY; LUSTER SLIGHTLY FROSTED TO EARTHY; SILTY TO GRITTY TEXTURE; THIN TO MASSIVE STRUCTURE.

SANDSTONE = WHITE TO LIGHT GRAY; REDDISH BROWN TO BROWN; BLACK; MOSTLY QUARTZ FRAMEWORK; RARE KAOLINITE; MEDIUM TO COARSE GRAIN SIZE; WELL TO VERY WELL SORTED; ROUND TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; FIRM FRIABLE TO MODERATELY HARD; CALCITE CEMENT; PREDOMINATELY GRAIN SUPPORTED MATRIX; MASSIVE BEDDING; NO VISIBLE HYDROCARBONS.

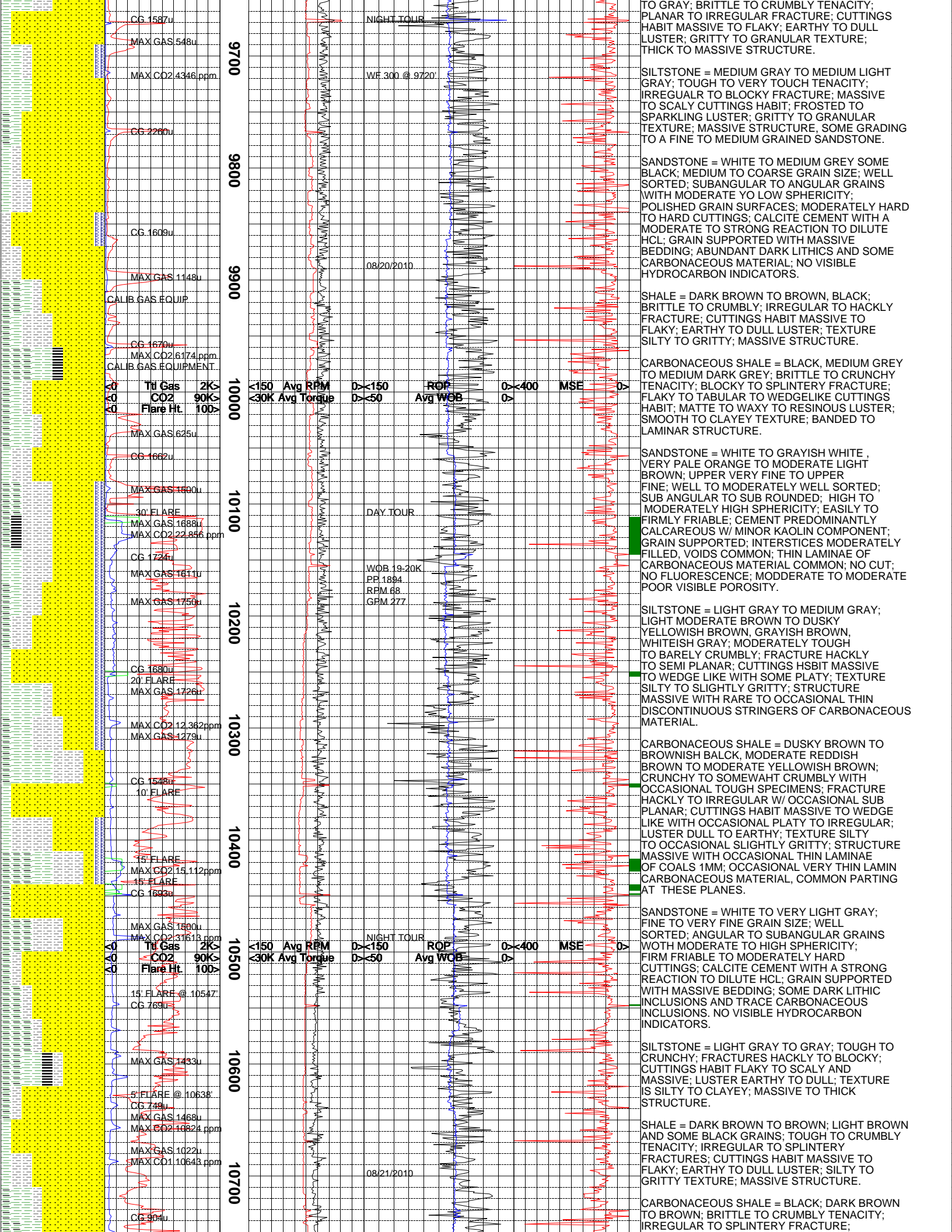
SHALE = LIGHT GREY TO MEDIUM DARK GREY; BRITTLE TO CRUMBLY TENACITY; SPLINTERY TO PLANAR FRACTURE; PLATY TO FLAKY TO SCALY CUTTINGS HABIT; MATTE TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; MASSIVE STRUCTURE.

SILTSTONE = LIGHT TO MEDIUM GRAY, VERY PALE ORANGE TO LIGHT MEDIUM BROWN, WHITEISH GRAY; CRUNCHY TO BRITTLE; FRACTURE HACKLY TO IRREGULAR WITH RARE SUB CONCHOIDAL; CUTTINGS HABIT MASSIVE TO IRREGULAR WITH OCCASIONAL PLATY TO WEDGE LIKE; LUSTER DULL TO EARTHY W/ SLIGHT PEPPERED APPEARANCE; TEXTURE SILTY TO VERY SLIGHTLY GRITTY; STRUCTURE MASSIVE WITH RARE THIN DISCONTINUOUS STRINGERS AND LAMINAE OF SLIGHTLY CARBONACEOUS MATERIAL WITH OCCASIONAL PARTING AT THESE SURFACES; RARE SPECIMENS SHOW THIN APPROX 1MM, ALTERNATING, INTERBEDDING WITH UPPER VERY FINE TO LOWER FINE GRAINED SANDSTONE.

SANDSTONE = WHITE TO WHITEISH GRAY, VERY PALE ORANGE TO LIGHT MODERATE BROWN, VERY LIGHT GRAY TO MEDIUM GRAY, GRAYISH BROWN; FRAME WORK PREDOMINANTLY QUARTZ TRANSLUCENT TO TRANSPARENT WITH RARE OPAQUE; UPPER VERY FINE TO UPPER FINE; WELL TO MODERATELY WELL SORTED; ANGULAR TO SUB ANGULAR; MODERATEHIGH SPHERICITY; COMMON WELL FROSTED GRAIN SURFACES; MODERATELY HARD TO FIRMLY FRIABLE; CEMENTATION HIGHLY CALCAREOUS WITH MINOR KAOLINITIC COMPONENT SHOWING VIGOROUS REACTION TO DILUTE HCL; GRAIN SUPPORTED; INTERSTICES COMMONLY MODERATELY WELL TO WELL FILLED; OCCAS VOIDS EVIDENT; OCCASIONAL THIN LAMINAE CARBONACEOUS MATERIAL; RARE LOOSE CHLORITE BOOKS IN SAMPLE INTERVAL; 1% TO 3% DARK ANGULAR LITHIC CLASTS IN OCCASIONAL SPECIMENS; NO FLUORESCENCE; NO CUT; POOR TO MODERATELY POOR VISIBLE POROSITY.

CARBONACEOUS SHALE = DUSKY YELLOWISH BROWN TO MODERATE REDDISH BROWN, BLACKISH BROWN; SLIGHTLY CRUNCHY TO TO SLIGHTLY TOUGH; FRUCTURE HACKLY TO IRREGULAR; CUTTINGS HABIT MASSIVE TO WEDGELIKE TO PLATY; DULL TO EARTHY; TEXTURE SILTY TO SLIGHTLY GRITTY WITH SOME SPECIMENS SLIGHTLY ABRASIVE DUE TO THIN DISCONTINUOUS SAND LENSES.

SHALE = DARK BROWN TO BROWN; LIGHT GRAY



CG 1587u
MAX GAS 548u
MAX CO2 4346 ppm
CG 2260u
CG 1609u
MAX GAS 1148u
CALIB GAS EQUIP
CG 1670u
MAX CO2 6174 ppm
CALIB GAS EQUIP
MAX GAS 625u
CG 1662u
MAX GAS 1690u
30' FLARE
MAX GAS 1688u
MAX CO2 22856 ppm
CG 1724u
MAX GAS 1611u
MAX GAS 1750u
CG 1680u
20' FLARE
MAX GAS 1726u
MAX CO2 12362 ppm
MAX GAS 1279u
CG 1548u
10' FLARE
15' FLARE
MAX CO2 15112 ppm
15' FLARE
CG 1693u
MAX GAS 1690u
MAX CO2 31613 ppm
15' FLARE @ 10547'
CG 769u
MAX GAS 1433u
5' FLARE @ 10638'
CG 748u
MAX GAS 1468u
MAX CO2 16824 ppm
MAX GAS 1022u
MAX CO2 10643 ppm
CG 904u

9700
9800
9900
10000
10100
10200
10300
10400
10500
10600
10700

NIGHT TOUR
WF 300 @ 9720
08/20/2010
DAY TOUR
WOB 19-20K
PP 1894
RPM 88
GPM 277
NIGHT TOUR

TO GRAY; BRITTLE TO CRUMBLY TENACITY; PLANAR TO IRREGULAR FRACTURE; CUTTINGS HABIT MASSIVE TO FLAKY; EARTHY TO DULL LUSTER; GRITTY TO GRANULAR TEXTURE; THICK TO MASSIVE STRUCTURE.

SILTSTONE = MEDIUM GRAY TO MEDIUM LIGHT GRAY; TOUGH TO VERY TOUCH TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO SCALY CUTTINGS HABIT; FROSTED TO SPARKLING LUSTER; GRITTY TO GRANULAR TEXTURE; MASSIVE STRUCTURE, SOME GRADING TO A FINE TO MEDIUM GRAINED SANDSTONE.

SANDSTONE = WHITE TO MEDIUM GREY SOME BLACK; MEDIUM TO COARSE GRAIN SIZE; WELL SORTED; SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; POLISHED GRAIN SURFACES; MODERATELY HARD TO HARD CUTTINGS; CALCITE CEMENT WITH A MODERATE TO STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; ABUNDANT DARK LITHICS AND SOME CARBONACEOUS MATERIAL; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = DARK BROWN TO BROWN, BLACK; BRITTLE TO CRUMBLY; IRREGULAR TO HACKLY FRACTURE; CUTTINGS HABIT MASSIVE TO FLAKY; EARTHY TO DULL LUSTER; TEXTURE SILTY TO GRITTY; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = BLACK, MEDIUM GREY TO MEDIUM DARK GREY; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SPLINTERY FRACTURE; FLAKY TO TABULAR TO WEDGELIKE CUTTINGS HABIT; MATTE TO WAXY TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO LAMINAR STRUCTURE.

SANDSTONE = WHITE TO GRAYISH WHITE, VERY PALE ORANGE TO MODERATE LIGHT BROWN; UPPER VERY FINE TO UPPER FINE; WELL TO MODERATELY WELL SORTED; SUB ANGULAR TO SUB ROUNDED; HIGH TO MODERATELY HIGH SPHERICITY; EASILY TO FIRMLY FRIABLE; CEMENT PREDOMINANTLY CALCAREOUS W/ MINOR KAOLIN COMPONENT; GRAIN SUPPORTED; INTERSTICES MODERATELY FILLED, VOIDS COMMON; THIN LAMINAE OF CARBONACEOUS MATERIAL COMMON; NO CUT; NO FLUORESCENCE; MODERATE TO MODERATE POOR VISIBLE POROSITY.

SILTSTONE = LIGHT GRAY TO MEDIUM GRAY; LIGHT MODERATE BROWN TO DUSKY YELLOWISH BROWN, GRAYISH BROWN, WHITEISH GRAY; MODERATELY TOUGH TO BARELY CRUMBLY; FRACTURE HACKLY TO SEMI PLANAR; CUTTINGS HSBIT MASSIVE TO WEDGE LIKE WITH SOME PLATY; TEXTURE SILTY TO SLIGHTLY GRITTY; STRUCTURE MASSIVE WITH RARE TO OCCASIONAL THIN DISCONTINUOUS STRINGERS OF CARBONACEOUS MATERIAL.

CARBONACEOUS SHALE = DUSKY BROWN TO BROWNISH BALCK, MODERATE REDDISH BROWN TO MODERATE YELLOWISH BROWN; CRUNCHY TO SOMEWAHT CRUMBLY WITH OCCASIONAL TOUGH SPECIMENS; FRACTURE HACKLY TO IRREGULAR W/ OCCASIONAL SUB PLANAR; CUTTINGS HABIT MASSIVE TO WEDGE LIKE WITH OCCASIONAL PLATY TO IRREGULAR; LUSTER DULL TO EARTHY; TEXTURE SILTY TO OCCASIONAL SLIGHTLY GRITTY; STRUCTURE MASSIVE WITH OCCASIONAL THIN LAMINAE OF COALS 1MM; OCCASIONAL VERY THIN LAMIN CARBONACEOUS MATERIAL, COMMON PARTING AT THESE PLANES.

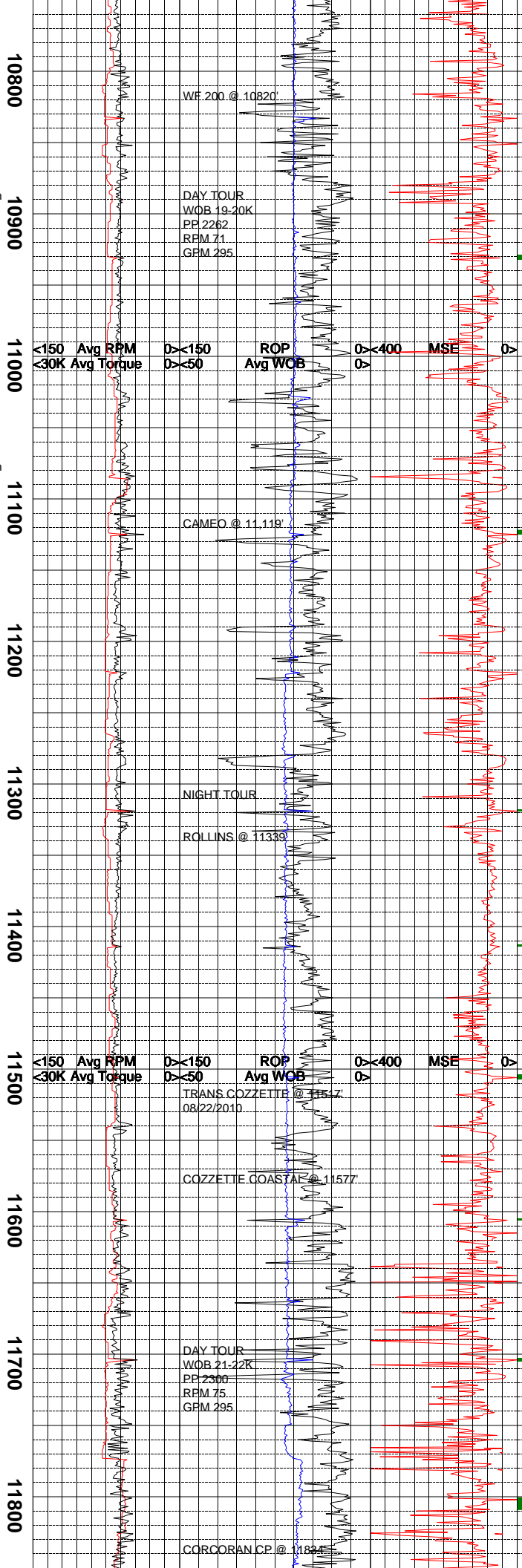
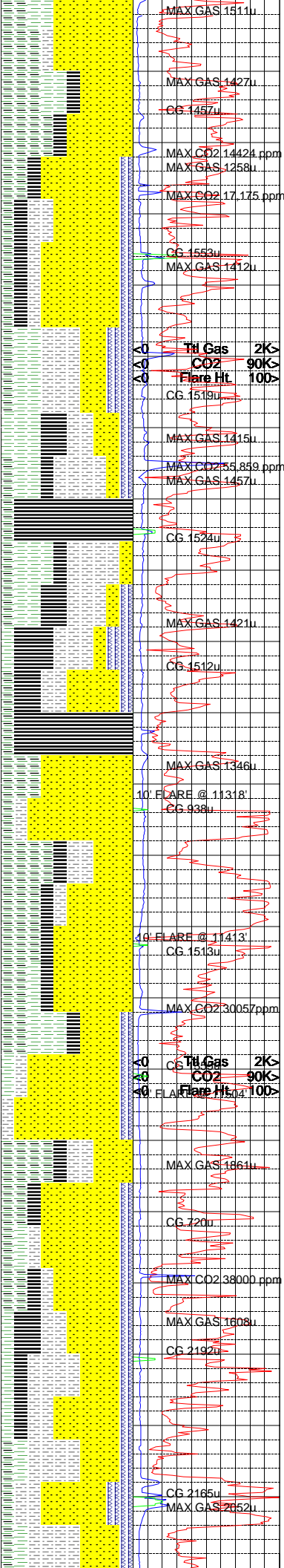
SANDSTONE = WHITE TO VERY LIGHT GRAY; FINE TO VERY FINE GRAIN SIZE; WELL SORTED; ANGULAR TO SUBANGULAR GRAINS WOTH MODERATE TO HIGH SPHERICITY; FIRM FRIABLE TO MODERATELY HARD CUTTINGS; CALCITE CEMENT WITH A STRONG REACTION TO DILUTE HCL; GRAIN SUPPORTED WITH MASSIVE BEDDING; SOME DARK LITHIC INCLUSIONS AND TRACE CARBONACEOUS INCLUSIONS. NO VISIBLE HYDROCARBON INDICATORS.

SILTSTONE = LIGHT GRAY TO GRAY; TOUGH TO CRUNCHY; FRACTURES HACKLY TO BLOCKY; CUTTINGS HABIT FLAKY TO SCALY AND MASSIVE; LUSTER EARTHY TO DULL; TEXTURE IS SILTY TO CLAYEY; MASSIVE TO THICK STRUCTURE.

SHALE = DARK BROWN TO BROWN; LIGHT BROWN AND SOME BLACK GRAINS; TOUGH TO CRUMBLY TENACITY; IRREGULAR TO SPLINTERY FRACTURES; CUTTINGS HABIT MASSIVE TO FLAKY; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE.

CARBONACEOUS SHALE = BLACK; DARK BROWN TO BROWN; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO SPLINTERY FRACTURE;

<150 Avg RPM
<30K Avg Torque
0 <150
0 <50
ROP
Avg WOB
0 <400
MSE
0 >



CUTTINGS HABIT MASSIVE TO FLAKY; LUSTER EARTHY TO GREASY; GRITTY TO SMOOTH TEXTURE; BANDED TO LAMINAR STRUCTURE; INTERBEDDED WITH THIN BANDS OF COAL.

COAL = BLACK, BLACKISH BROWN, OLIVE BLACK; BRITTLE TO CRUNCHY TENACITY; FRACTURE CONCHOIDAL, PLANAR, ANGULAR; CUT HABIT BLOCKY, TABULAR, SPLINTERY AND ELONGATED, MASSIVE; LUSTER VITREOUS TO SUB METALLIC LUSTER; TEXTURE SMOOTH HOMOGENOUS; STRUCTURE VERY THINLY LAMINATED TO 1MM LAMINAE; VIGOROUS TO MODERATE OUT GASSING IN MOST SAMPLES.

SANDSTONE = WHITE TO WHITEISH GRAY, VERY PALE ORANGE TO LIGHT BROWN, LIGHT GRAY TO GRAYISH BROWN; FRAMEWORK MOSTLY TRANSPARENT TO TRANSLUCENT COLORLESS QUARTZ; UPPER TO LOWER VERY FINE GRAINED; VERY WELL TO WELL SORTED; SUB ROUNDED TO WELL ROUNDED; HIGH TO VERY HIGH SPHERICITY; SOFT TO EASILY FRIABLE; CEMENTATION SPARSE KAOLIN WITH MINOR CALCAREOUS COMPONENT SHOWING POOR TO MODERATE REACTION TO DILUTE HCL; INTERSTICES WELL TO MOD WELL FILLED WITH OCCASIONAL VOIDS, MASSIVE BEDDING; NO LITHIC CLASTS; NO CUT; NO FLUORESCENCE.

SILTSTONE = DUSKY YELLOWISH BROWN TO MODERATE YELLOWISH BROWN, LIGHT MOD BROWN TO BROWNISH GRAY; CRUNCHY TO SOMEWHAT TOUGH THENACITY; FRACTURE HACKLY TO SUB PLANAR ; CUTTINGS HABIT MASSIVE TO COMMON WEDGE LIKE; LUSTER DULL TO EARTHY; TEXTURE SILTY TO SLIGHT GRITTINESS; STRUCTURE MASSIVE.

COAL = BLACK, BLACKISH BROWN, GRAYISH BROWN; CRUNCHY TO BRITTLE TENACITY; FRACTURE CONCHOIDAL, SEMI BLOCKY, ANGLR; CUT HABIT BLOCKY, TABULAR, PLATY W/ RARE MASSIVE; LUSTER VITREOUS TO METALLIC; TEXTURE SMOOTH AND HOMOGENOUS; THINLY LAMINATED STRUCTURE W/ SOME THICKER LAMINAE APROX 1MM; VIGOROUS OUTGASSING IN MOST SPECIMENS.

CARBONACEOUS SHALE = DARK GREY TO MEDIUM DARK GREY, SOME BLACK; SEMI PLANAR TO BLOCKY TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE CUTTINGS HABIT; MATTE TO RESINOUS LUSTER; SMOOTH TO CLAYEY TEXTURE; BANDED TO LAMINAR STRUCTURE, INTERBEDDED WITH THIN TO MEDIUM BANDS OF COAL WITH SOME VISIBLE DEGASSING.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLATY TO WEDGELIKE TO SCALY CUTTINGS HABIT; SPLINTERY TO IRREGULAR TO HACKLY FRAC; CLAYEY TO MATTE TEXTURE; DULL EARTHY LUSTER; THINLY INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.

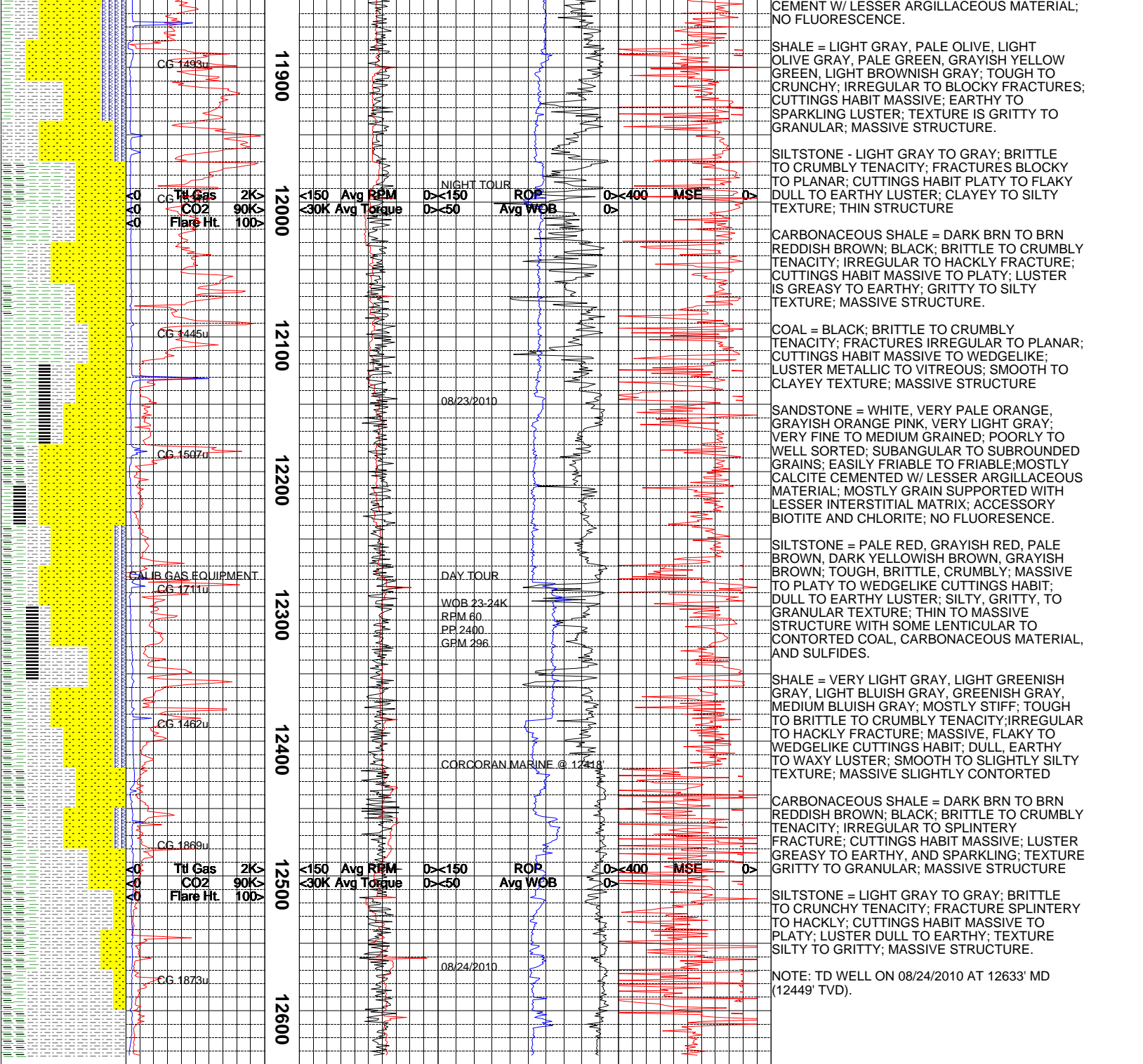
COAL = BLACK TO BROWNISH BLACK; BRITTLE TO CRUNCHY TENACITY; BLOCKY TO SEMI PLANAR TO CHONCOIDAL FRACTURE; BLOCKY TO PLATY TO TABULAR CUTTINGS HABIT; WAXY TO RESINOUS TO MATTE LUSTER; VERY SMOOTH TO CLAYEY TEXTURE; THICK TO BANDED STRUCTURE; VISIBLE DEGASSING IN SAMPLE TRAY.

SANDSTONE = WHITE TO TRANSPARENT TO TRANSLUCENT; GRAYISH BROWN TO LIGHT BROWN; FRAMEWORK IS MOSTLY QUARTZ; WITH FINE TO MEDIUM GRAIN SIZE; WELL TO VERY WELL SORTED; ROUND TO SUBROUNDED ANGULARITY; MODERATE TO HIGH SPHERICITY; SOFT TO EASILY FRIABLE; SOME KAOLINITIC CEMENT; GRAIN SUPPORTED MATRIX; MASSIVE BEDDING; NO VISIBLE HYDROCARBONS.

CARBONACEOUS SHALE = DUSKY YELLOWISH BROWN TO MODERATE BROWN, DARK GRAYISH BROWN TO BLACKISH BROWN; BARELY CRUNCHY TO CRUMBLY; FRACTURE HACKLY TO IRREGULAR; CUTTINGS HABIT MASSIVE TO WEDGELIKE; TEXTURE SMOOTH TO SLIGHTLY SILTY; STRUCTURE MASSIVE; THIN LAMINAE OF CARBONACEOUS MATERIAL; VISIBLE OUTGASSING FROM LAMINAE.

COAL = BLACK , BLACKISH GRAY, OLIVE BLACK, GRAYISH BLACK; CRUNCHY TO BRITTLE TENACITY; FRACTURE CONCHOIDAL, BLOCKY, ANGULAR; CUTTINGS HABIT BLOCKY TO TABULAR TO FLAKY; METALLIC TO VITREOUS TO RESINOUS LUSTER; SMOOTH HOMOGENOUS TEXTURE; MASSIVE, SOMEWHAT CONTORTED STRUCTURE; NO VISIBLE OUTGASSING.

SANDSTONE = WHITE, PALE RED, PALEREDDISH BROWN; VERY FINE TO MEDIUM GRAINED; QUARTZ FRAMEWORK; FAIRLY WELL SORTED TO WELL SORTED; SUBANGULAR TO ROUNDED GRAINS; SOFT TO FIRMLY FRIABLE; CALCITE



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