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

Drilling Dynamics MD

COMPANY ExxonMobil Production
WELL PCU 296-5A01
FIELD Piceance Creek Unit
REGION Rocky Mountain
COORDINATES 39.912053000
108.198567000
ELEVATION 7295.5'
COUNTY, STATE Rio Blanco, CO
API INDEX 051031124800
SPUD DATE 10/21/2009
CONTRACTOR Helmerich and Payne
CO. REP. C.Curtis/ M. Hudon
RIG/TYPE 321 / Flex 4
LOGGING UNIT 031
GEOLOGISTS M. Franco
C. Record/ B.Smelsor
ADD. PERSONS M.Piper
R.McCane
CO. GEOLOGIST Nova Roosmawati

LOG INTERVAL

CASING DATA

DEPTHS: 4665' TO 14288'
DATES: 09/06/2010 TO 10/05/2010
SCALE: 1" = 100'

16.0" AT 150'
10.75" AT 4633'
7.0" AT 10105'
4.5" AT 14265'

MUD TYPES

HOLE SIZE

WATERBASED TO 14288'
TO
TO
TO

14.75" TO 126'
9.875" TO 10119'
6.125" TO 14288'
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	SERICIZATION
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 2.5K>
units

<0 CO2 10K>
ppm

<0 Flare Ht. 100>
ft

Depth

<150 Avg RPM 0><200 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.

4200

4300

4400

4500

<0 Ttl Gas 100>
CO2 10K>
Flare Ht. 100>

<150 Avg RPM 0><200 ROP 0><400 MSE 0>

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

4600

4700

4800

4900

5000

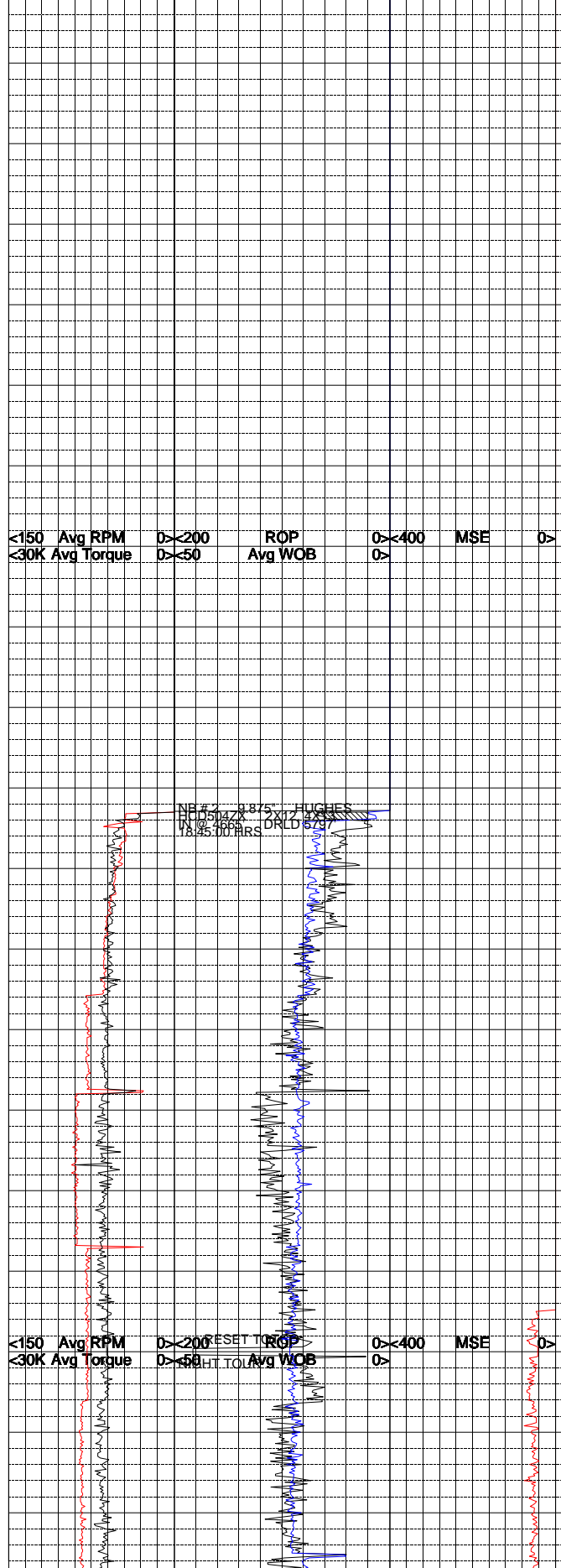
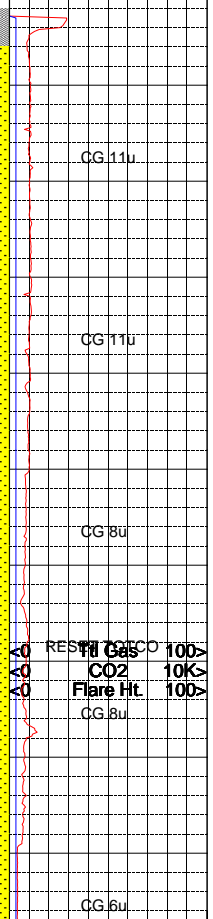
5100

RESIDUAL CO2 100>
CO2 10K>
Flare Ht. 100>

<150 Avg RPM 0><200 ROP 0><400 MSE 0>

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

NE # 2, 8.875" HUGHES
H005047R 2X12 6X35
18.2500 PIRS ORLD 6X35



ALL SAMPLE COLOR DESCRIPTIONS REFERENCED TO THE G.S.A. ROCK COLOR CHART.

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 CHROMATOGRAPHY 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

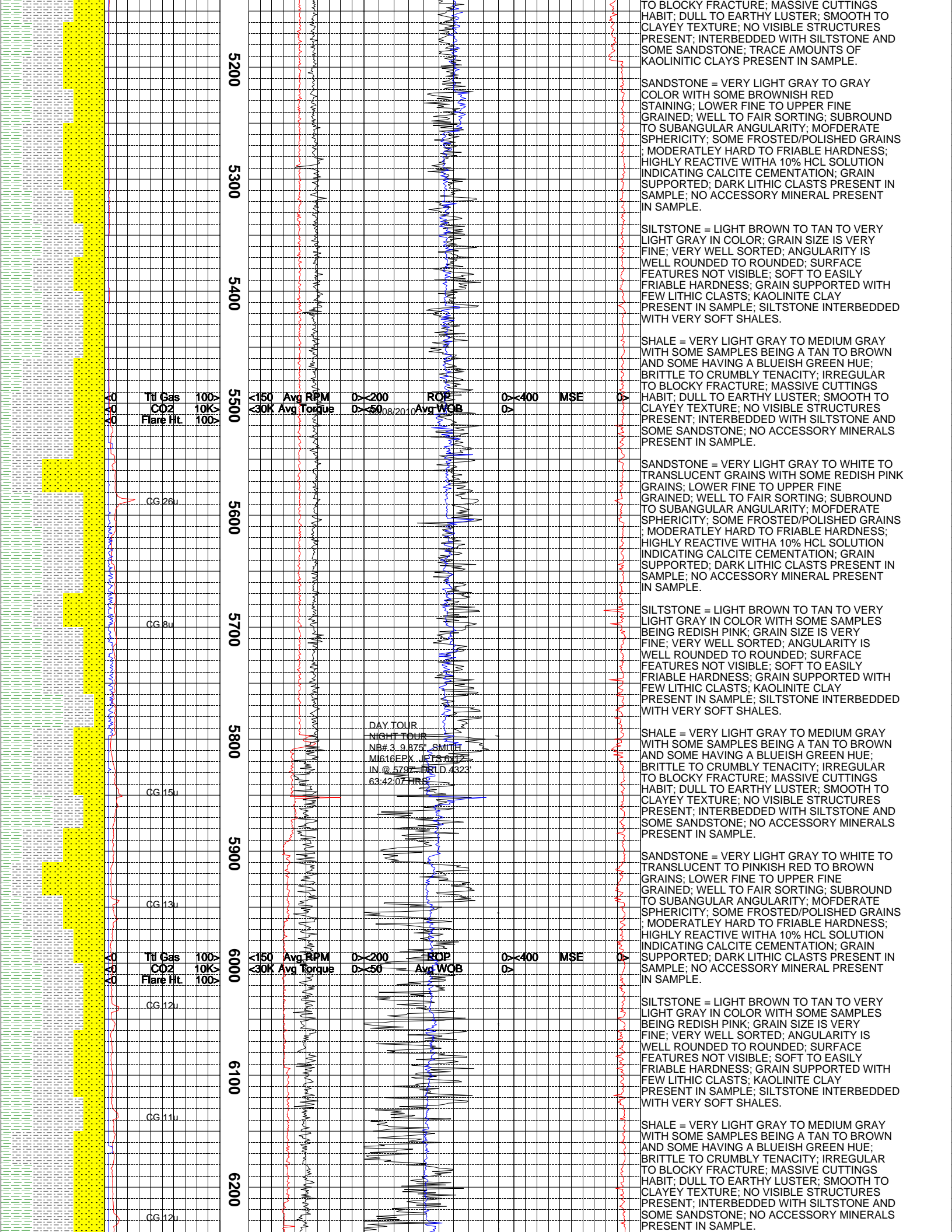
EPOCH WELL SERVICES COMMENCED LOGGING THE FRU 296-5A01 WELL ON 9/7/2010 @ 4665' MD.

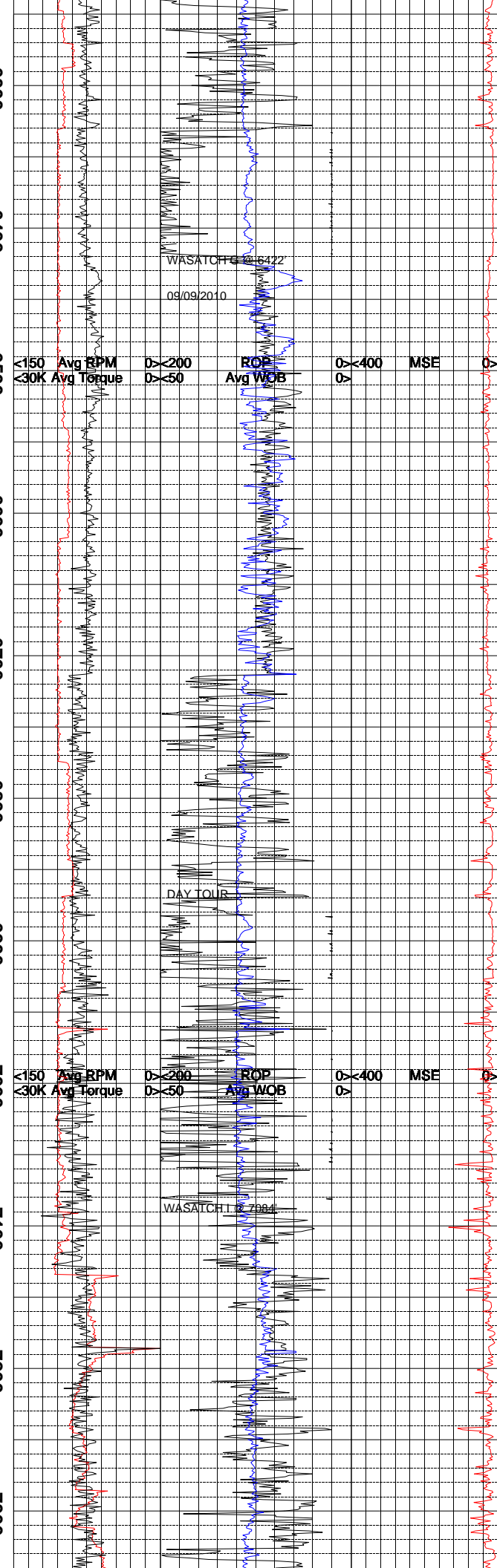
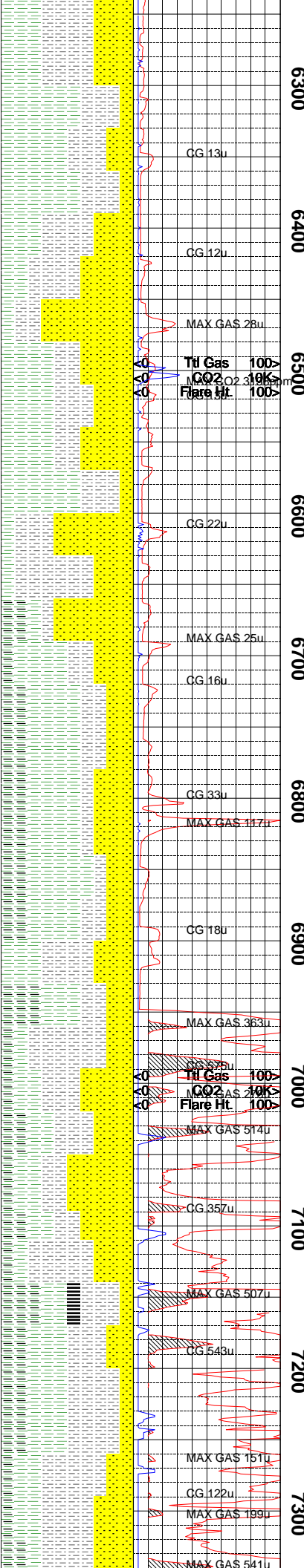
SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL PALE RED PURPLE AND LIGHT YELLOWISH TAN GRAY; SLIGHTLY DENSE TO SLIGHTLY CRUMBLY TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONALLY MASSIVE TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO MODERATELY CLAYEY TO SLIGHTLY SILTY TEXTURE; VERY SMALL AMOUNT OF CARBONACEOUS SHALE VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNT OF ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT GRAY TO VERY LIGHT TANISH BROWN GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINANT; MODERATELY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO ANGULAR TO SUB-ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; VERY POOR GRADE SANDSTONE VISIBLE GRADING WITH POOR GRADE SILTSTONE, NO LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = LIGHT BROWN TO TAN TO VERY LIGHT GRAY IN COLOR; GRAIN SIZE IS VERY FINE; VERY WELL SORTED; ANGULARITY IS WELL ROUNDED TO ROUNDED; SURFACE FEATURES NOT VISIBLE; SOFT TO EASILY FRIABLE HARDNESS; GRAIN SUPPORTED WITH FEW LITHIC CLASTS; KAOLINITE CLAY PRESENT IN SAMPLE; SILTSTONE INTERBEDDED WITH VERY SOFT SHALES.

SHALE = VERY LIGHT GRAY TO MEDIUM GRAY WITH SOME SAMPLES BEING A TAN TO BROWN AND SOME HAVING A BLUEISH GREEN HUE; BRITTLE TO CRUMBLY TENACITY; IRREGULAR





SANDSTONE = VERY LIGHT GRAY TO WHITE TO TRANSLUCENT TO PINKISH RED TO BROWN GRAINS; LOWER FINE TO UPPER FINE GRAINED; WELL TO FAIR SORTING; SUBROUND TO SUBANGULAR ANGULARITY; MODERATE SPHERICITY; SOME FROSTED/POLISHED GRAINS; MODERATELY HARD TO FRIABLE HARDNESS; HIGHLY REACTIVE WITH A 10% HCL SOLUTION INDICATING CALCITE CEMENTATION; GRAIN SUPPORTED; DARK LITHIC CLASTS PRESENT IN SAMPLE; KAOLINITE CLAY PRESENT IN SAMPLE.

SILTSTONE = LIGHT BROWN TO TAN TO VERY LIGHT GRAY IN COLOR WITH SOME SAMPLES BEING REDDISH PINK TO A DARK BROWN COLOR; GRAIN SIZE IS VERY FINE TO FINE TO UPPER FINE; VERY WELL SORTED; ANGULARITY IS WELL ROUNDED TO SUB-ANGULAR; SURFACE FEATURES NOT VISIBLE; SOFT TO EASILY FRIABLE HARDNESS; GRAIN SUPPORTED WITH FEW LITHIC CLASTS; KAOLINITE CLAY PRESENT IN SAMPLE; SILTSTONE INTERBEDDED WITH SHALE AND SANDSTONE.

SHALE = VERY LIGHT GRAY TO MEDIUM GRAY WITH SOME SAMPLES HAVING A BLUISH HUE; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; NO VISIBLE STRUCTURES PRESENT; INTERBEDDED WITH SILTSTONE AND SOME SANDSTONE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT GRAY TO WHITE TO TRANSLUCENT GRAINS; UPPER FINE TO MEDIUM GRAINED; WELL SORTED; SUBROUNDED TO SUBANGULAR ANGULARITY; MODERATE SPHERICITY; SOME SAMPLES SHOW SURFACE FEATURES OF MECHANICAL ABRASION; MODERATELY HARD TO FRIABLE HARDNESS; HIGHLY REACTIVE WITH A 10% HCL SOLUTION INDICATING CALCITE CEMENTATION; GRAIN SUPPORTED; DARK LITHIC CLASTS PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

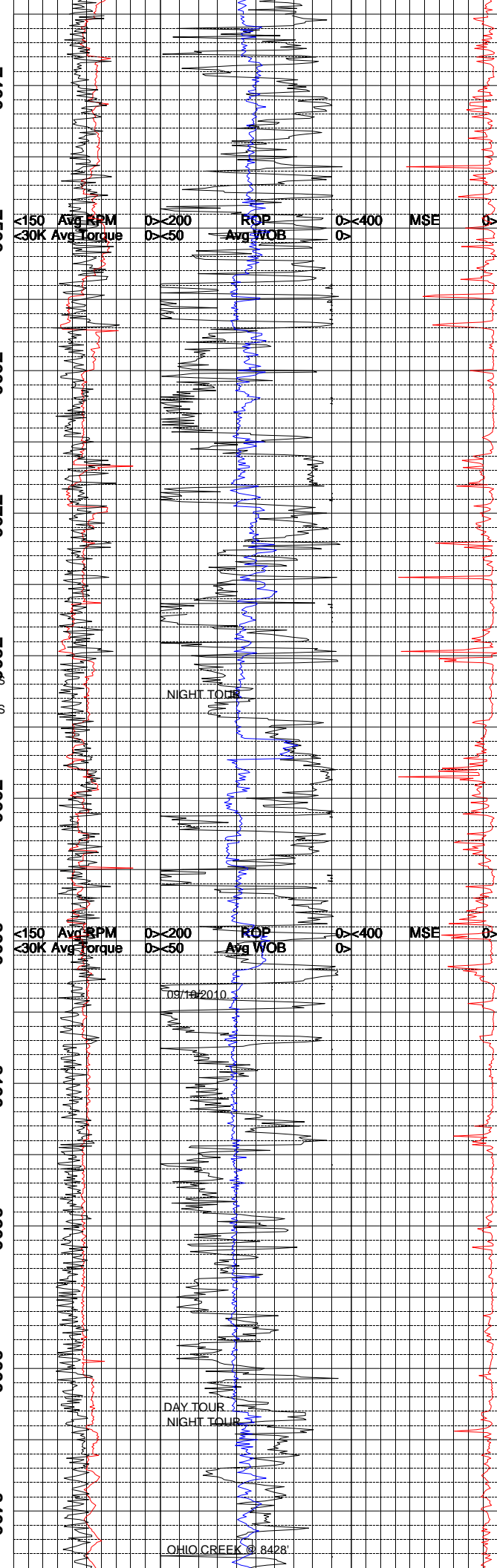
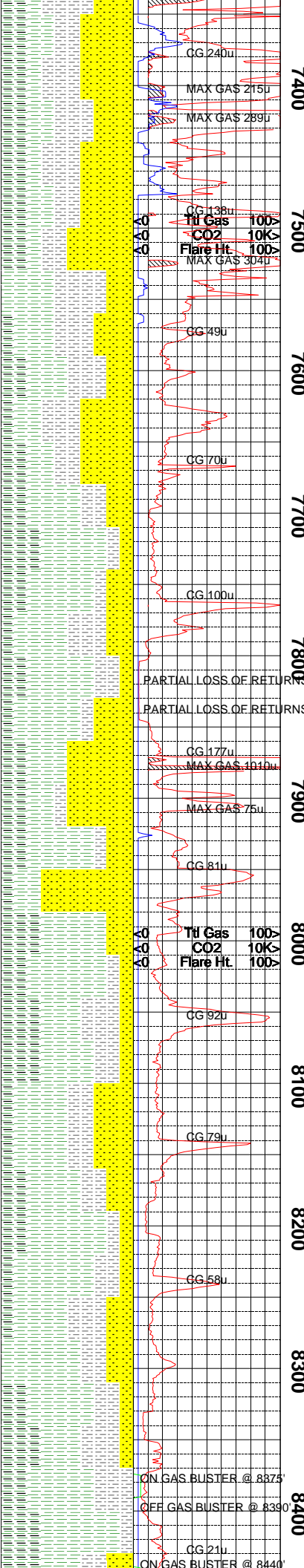
CARBONACEOUS SHALE = VERY DARK GRAY TO ALMOST BLACK IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; LUSTER IS DULL TO EARTHY; SMOOTH TO CLAYEY TEXTURE; NO VISIBLE STRUCTURE IN THE SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY TO OCCASIONAL MODERATE REDDISH BROWN IN COLOR; SLIGHTLY DENSE TO SLIGHTLY CRUMBLY TO VERY SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE SILTSTONE VISIBLE BEDDING WITH POOR GRADE SANDSTONE AND POOR GRADE SHALE IN SAMPLE, NO LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERAL PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL LIGHT GRAY AND GRAYISH RED PURPLE MOTTLED IN COLOR; VERY SLIGHTLY TOUGH TO MODERATELY DENSE TO OCCASIONAL CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SLIGHTLY SILTY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO VERY LIGHT TANISH BROWN-GRAY TO OCCASIONAL LIGHT BRILLIANT GREEN WITH FEW BLACK AND MODERATE BROWN HUES IN COLOR; QUARTZ DOMINATE; PREDOMINATELY GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONSISTENT OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 2 TO 4% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED TO ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH GRAY TO DARK BROWNISH GRAY TO OCCASIONAL BROWNISH BLACK IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY



TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO SUB-TABULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY TO OCCASIONAL SEMI-SMOOTH TEXTURE; VERY SMALL AMOUNT OF CARBONACEOUS SHALE LIGHTLY EFFERVESCING IN SAMPLE. SMALL AMOUNT OF KAOLINITIC SANDSTONE IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLY PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL MEDIUM BROWNISH GRAY IN COLOR; MODERATELY TOUGH TO MODERATELY DENSE TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED TO SUB-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO VERY SLIGHTLY SILTY TEXTURE; VERY SMALL AMOUNTS OF CARBONACEOUS SHALE AND COAL VISIBLY EFFERVESCING IN SAMPLE, THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNTS OF ACCESSORY MINERAL PYRITE VISIBLE IN SAMPLE.

CARBONACEOUS SHALE = BROWNISH GRAY TO DARK BROWNISH GRAY TO OCCASIONAL BROWNISH COLOR; MODERATELY DENSE TO SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO SUB-TABULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY TO SLIGHTLY GRITTY TO OCCASIONALLY SEMI-SMOOTH TEXTURE; VERY SMALL AMOUNTS OF CARBONACEOUS SHALE WHICH SLIGHTLY EFFERVESCE WHEN IN CONTACT WITH A 10% SOLUTION OF HCL; IN SAMPLE. SMALL AMOUNT OF KAOLINITIC SANDSTONE IN SAMPLE; NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT.

NOTE : CHANGE OF THA ATTENUATION FROM x10 TO x100 AT 7879' MD.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY IN COLOR WITH SOME SAMPLES BEING A VERY LIGHT BROWNISH GRAY OR A BLUEISH GREEN GRAY; TOUGH TO DENSE TO BRITTLE TENACITY; FRACTURE IS PLANAR TO BLOCKY; THE CUTTINGS HABIT IS MASSIVE TO PLATY WITH SOME SAMPLES SHOWING A FLAKY OR SCALY HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TO SILTY TEXTURE; SOME SAMPLES SHOW LAMINAE TO VERY THIN STRUCTURE WITH THE MAJORITY OF THE SAMPLE HAVING NO STRUCTURE; ACCESSORY MINERALS IN SAMPLE INCLUDE KAOLINITE AND A TRACE AMOUNT OF PYRITE.

SILTSTONE = GRAY TO VERY LIGHT GRAY IN COLOR WITH SOME SAMPLES BEING VERY LIGHT BROWN TO A REDISH BROWN COLOR; TENACITY IS DENSE TO BRITTLE TO CRUNCHY; BLOCKY TO IRREGULAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT WITH SOME SAMPLES BEING WEDGE LIKE; LUSTER IS DULL TO EARTHY; SILTY TO GRITTY TEXTURE; NO VISIBLE STRUCTURE PRESENT; SAMPLES INTERBEDDED WITH SHALE AND CARBONACEOUS SHALE; SOME SAMPLES ARE NOT VERY WELL CONSOLIDATED; NO ACCESSORY MINERALS PRESENT IN THE SAMPLE.

SANDSTONE = TRANSLUCENT TO WHITE TO GRAY IN COLOR WITH SOME SAMPLES HAVING BEING A RUSTY BROWN AND SOME HAVING A BLUEISH GREEN HUE; FRAMEWORK IS DOMINATED BY QUARTZ GRAIN WITH K-SPAR AND LITHIC FRAGMENTS; GRAIN SIZE IS LOWER MEDIUM TO UPPER FINE GRAINED; VERY WELL TO WELL SORTING; ROUNDED TO SUBROUNDED TO SUBANGULAR GRAINS; HIGH TO MODERATE SPHERICITY; SOME INDIVIDUAL GRAINS ARE FROSTED DUE TO MECHANICAL ABRASION; HARDNESS IS HARD TO FRIABLE WITH SOME SAMPLES BEING SOFT AND NOT WELL CONSOLIDATED; VERY LITTLE REACTION WITH 10% HCL SOLUTION; GRAIN SUPPORTED WITH POSSIBLE SILICA CEMENTATION.

NOTE : CHANGE OF THA ATTENUATION FROM x100 TO x10 AT 8339' MD.

SHALE = LIGHT GRAY TO MEDIUM DARK GRAY IN COLOR WITH SOME SAMPLES BEING A VERY LIGHT BROWNISH GRAY OR A BLUEISH GREEN GRAY; TOUGH TO DENSE TO BRITTLE TENACITY; FRACTURE IS PLANAR TO BLOCKY; THE CUTTINGS HABIT IS MASSIVE TO PLATY WITH SOME SAMPLES SHOWING A FLAKY OR SCALY HABIT; DULL TO EARTHY LUSTER;

OFF GAS BUSTER @ 8460'

Flare Ht. 100%
CO2 10K%
Flare Ht. 100%

PARTIAL LOSS OF RETURNS
PARTIAL LOSS OF RETURNS

RE-SCALE TTL GAS <0.500

CG 62u
MAX CO2 880ppm
MAX GAS 389u

CG 101u
MAX GAS 260u
MAX CO2 3688ppm

CG 76u
MAX GAS 1010u
MAX CO2 3688ppm

CG 65u
MAX GAS 1250u
MAX GAS 62u

Flare Ht. 100%
CO2 10K%
Flare Ht. 100%

MAX GAS 76u
MAX CO2 2137ppm

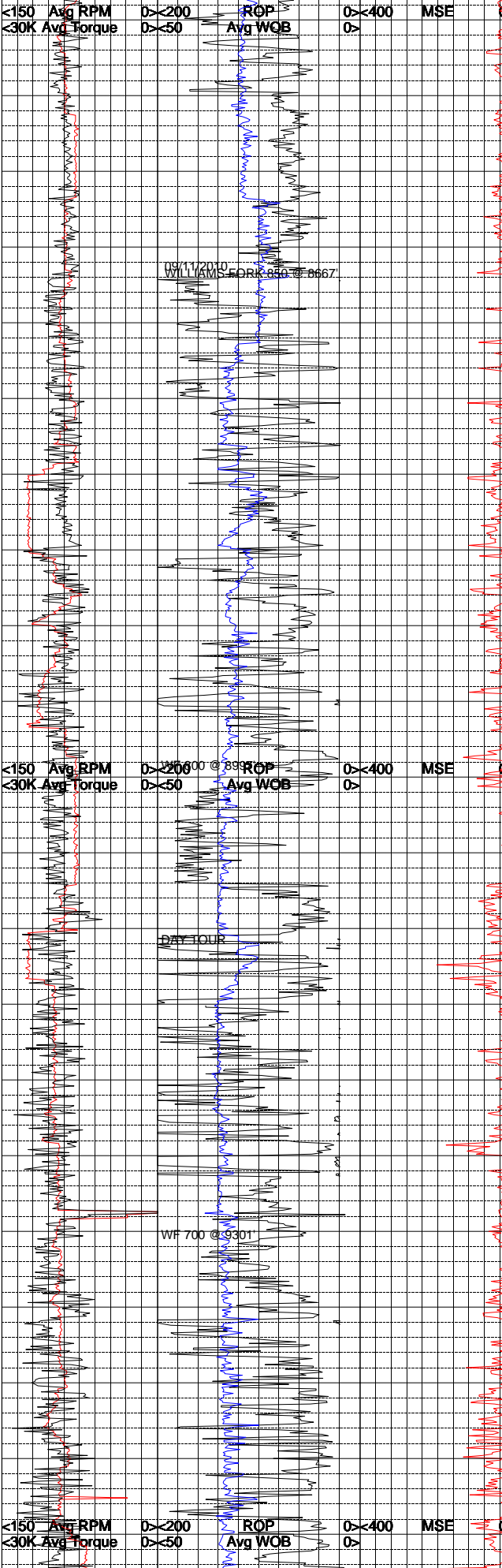
CG 1216u
MAX GAS 238u
MAX GAS 496u

CG 1281u
MAX GAS 392u
MAX GAS 511u

CG 1332u
MAX GAS 285u
MAX GAS 402u
CG 567u

MAX GAS 121u
MAX GAS 100u
MAX GAS 297u

Flare Ht. 100%
CO2 10K%
Flare Ht. 100%



SMOOTH TO CLAYEY TO SILTY TEXTURE;
SOME SAMPLES SHOW LAMINAE TO VERY THIN
STRUCTURE WITH THE MAJORITY OF THE
SAMPLE HAVING NO STRUCTURE.

CARBONACEOUS SHALE = BLACK TO A VERY
DARK BROWN COLOR; DENSE TO BRITTLE
TENACITY; IRREGULAR TO PLANAR FRACTURE;
CUTTINGS HABIT IS PLATY TO WEDGELIKE TO
BLADED; DULL TO EARTHY LUSTER; SMOOTH
TO CLAYEY TO SILTY TEXTURE; NO VISIBLE
STRUCTURE IN THE SAMPLE.

SILTSTONE = LIGHT BROWN TO TAN TO A
REDISH BROWN COLOR; CRUMBLY TO CRUNCHY
TENACITY; SOME SAMPLE IS NOT VERY WELL
CONSOLIDATED; IRREGULAR TO BLOCKY
FRACTURE; MASSIVE CUTTINGS HABIT; DULL
EARTHY LUSTER WITH SOME HAVING A GREASY
LUSTER; SILTY TO GRITTY TEXTURE; NO
VISIBLE STRUCTURE OR ACCESSORY MINERALS.

SANDSTONE = TRANSLUCENT TO WHITE GRAINS;
QUARTZ FRAMEWORK; UPPER FINE TO LOWER
MEDIUM GRAIN SIZE; VERY WELL TO WELL
SORTING; ROUND TO SUBROUND TO SUB
ANGULAR GRAINS; SPERICITY IS HIGH TO
MODERATE; SOME FROSTED GRAINS; FIRMLY
FRIABLE TO HARD; CALCITE CEMENTATION;
GRAIN SUPPORTED; FEW LITHIC CLASTS;
HIGHLY REACTIVE WITH A 10% HCL SOLUTION;
NO VISIBLE FLOURECENSE.

SHALE = VERY LIGHT GRAY TO DARK GRAY TO
A VERY LIGHT BLUEISH GRAY; BRITTLE TO
CRUNCHY TENACITY; PLANAR TO IRREGULAR
FRACTURE; PLATY TO WEDGELIKE TO BLADED
CUTTINGS HABIT; DULL TO EARTHY LUSTER;
SMOOTH TO CLAYEY TEXTURE; LAMINAE TO
THIN STRUCTURE; INTERBEDDED WITH
SILTSTONE AND SANDSTONE.

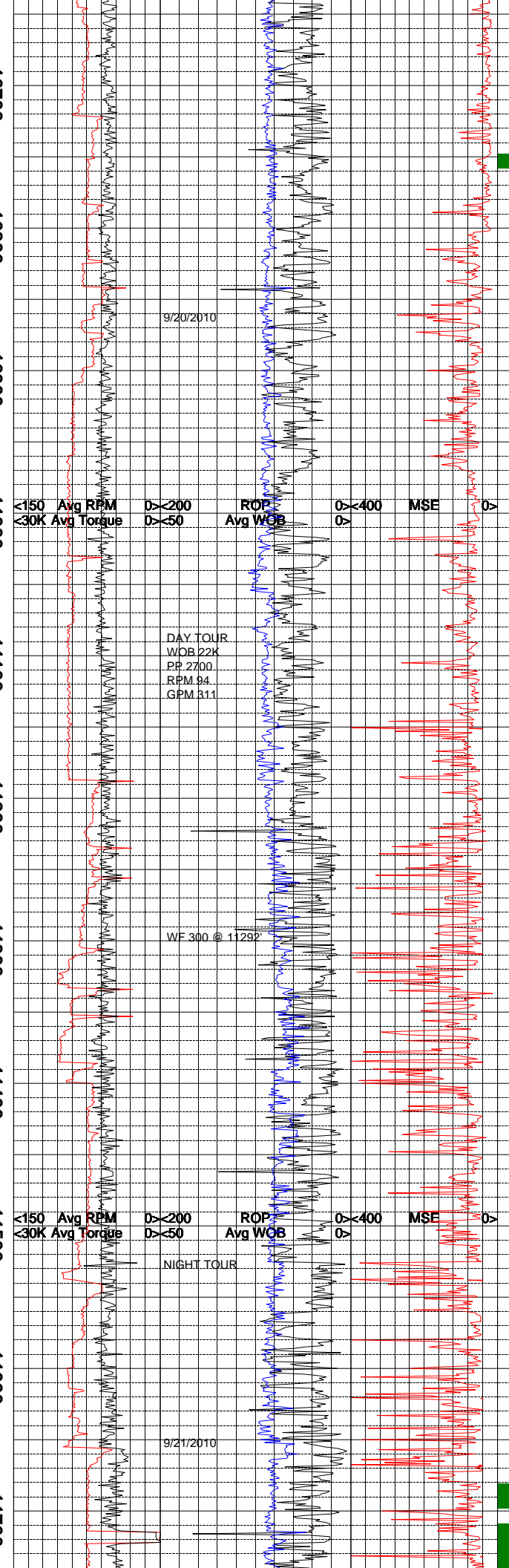
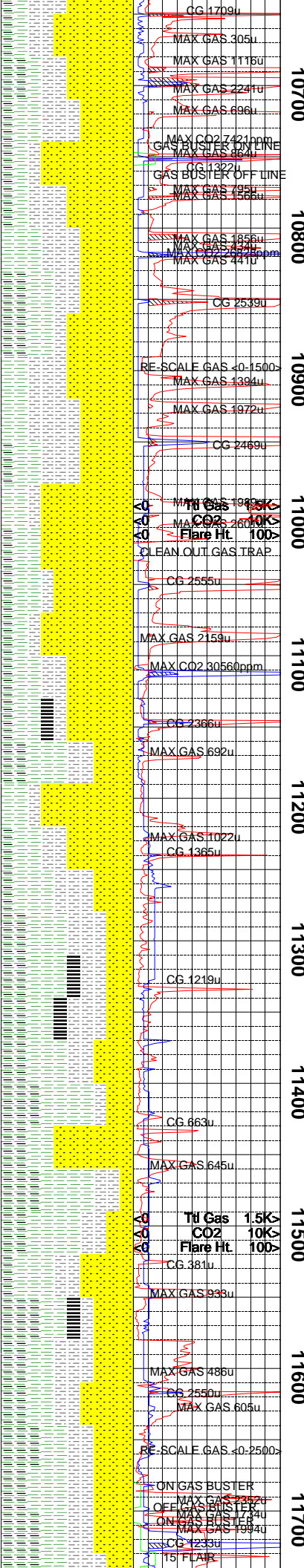
SILTSTONE = LIGHT BROWN TO TAN TO A
REDISH BROWN COLOR; CRUMBLY TO CRUNCHY
TENACITY; SOME SAMPLE IS NOT VERY WELL
CONSOLIDATED; IRREGULAR TO BLOCKY
FRACTURE; MASSIVE CUTTINGS HABIT; DULL
EARTHY LUSTER WITH SOME HAVING A GREASY
LUSTER; SILTY TO GRITTY TEXTURE; NO
VISIBLE STRUCTURE OR ACCESSORY MINERALS.

SANDSTONE = TRANSLUCENT TO WHITE GRAINS;
QUARTZ FRAMEWORK; UPPER FINE TO LOWER
MEDIUM GRAIN SIZE; VERY WELL TO WELL
SORTING; ROUND TO SUBROUND TO SUB
ANGULAR GRAINS; SPERICITY IS HIGH TO
MODERATE; SOME FROSTED GRAINS; FIRMLY
FRIABLE TO HARD; CALCITE CEMENTATION;
GRAIN SUPPORTED; FEW LITHIC CLASTS;
HIGHLY REACTIVE WITH A 10% HCL SOLUTION;
NO VISIBLE FLOURECENSE.

CARBONACEOUS SHALE = BROWNISH GRAY TO
DARK BROWNISH GRAY TO BROWNISH BLACK TO
OCCASIONAL OLIVE BLACK IN COLOR; MODERAT
ELY DENSE TO SLIGHTLY TOUGH TENACITY;
IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR
TO EARTHY FRACTURE; MOSTLY SMALLER CUTTI
NGS TO WEDGE LIKE TO SUB-TABULAR CUTTIN
GS HABIT; DULL TO EARTHY DULL TO OCCAS
IONAL SEMI-SPARKLING LUSTER; SEMI-SMOOTH
TO VERY SLIGHTLY GRITTY TEXTURE; POOR
GRADE SILTSTONE VISIBLE GRADING WITH POO
R GRADE SANDSTONE, VERY THIN COAL LAMIN
AE VISIBLE IN SHALE CUTTING, VERY SMALL
AMOUNT OF CARBONACEOUS SHALE VISIBLE
EFFERVESCING IN SAMPLE, NO OTHER DISTINGU
ISHABLE STRUCTURAL FEATURES PRESENT IN
SAMPLE; NO VISIBLE ACCESSORY MINERALS
PRESENT IN SAMPLE.

SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO
OCCASIONAL MEDIUM LIGHT GRAY IN COLOR;
MODERATELY DENSE TO VERY SLIGHTLY TOUGH
TO OCCASIONAL CRUNCHY TENACITY; IRREGULA
R TO SEMI-BLOCKY TO SEMI-PLANAR TO EART
HY FRACTURE; OCCASIONAL MASSIVE TO SUB
PLATY TO WEDGE LIKE TO OCCASIONAL ELONGA
TED CUTTINGS HABIT; DULL TO EARTHY DULL
TO OCCASINAL SEMI-FROSTED TO SEMI-WAXY
LUSTER; MODERATELY SMOOTH TO SEMI-
SILTY TEXTURE; POOR GRADE SANDSTONE VISI
BLY IN CONTACT WITH COAL, SMALL AMOUNT
CARBONACEOUS SHALE AND COAL VISIBLY
EFFERVESCING IN SAMPLE, NO OTHER DISTING
UISHABLE STRUCTURAL FEATURES PRESENT IN
SAMPLE; TRACE AMOUNTS OF ACCESSORY MINER
AL PYRITE PRESENT IN SAMPLE.

SILTSTONE = LIGHT GRAY TO MEDIUM LIGHT
GRAY WITH FEW BLACK HUES IN COLOR; MODER
ATELY DENSE TO OCCASIONAL BRITTLE TENAC
ITY; IRREGULAR TO SUB-PLANAR TO EARTH-
HACKLY FRACTURE; SUB-TABULAR TO SUB-
NODULAR CUTTINGS HABIT; DULL TO EARTHY
DULL TO OCCASIONAL SEMI-SPARKLING LUSTER
; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANU
LAR TEXTURE; POOR GRADE SANDSTONE VISI
BLE GRADING WITH POOR GRADE SILTSTONE,
NO LAMINAE OR OTHER DISTINGUISHABLE STRU



SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MEDIUM LIGHT GRAY TO OCCASIONAL MEDIUM GRAY IN COLOR; SLIGHTLY DENSE TO SLIGHTLY CRUMBLY TO VERY SLIGHTLY BRITTLE TENACITY; IRREGULAR TO SUB-PLANAR TO SEMI-BLOCKY TO EARTHY FRACTURE; WEDGE LIKE TO OCCASIONAL ELONGATED TO MOSTLY SMALLER CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SEMI-SILTY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRAY IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TENACITY; IRREGULAR TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR TO OCCASIONAL SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING AND BEDDING WITH POOR GRADE SANDSTONE, VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = WHITE TO LIGHT GRAY; DOMINATE QUARTZ FRAMEWORK WITH APPROX. 10% BLACK LITHIC CLASTS INTERBEDDED; FINE TO MEDIUM GRAINED WITH FAIR TO SEMI WELL SORTING; SUBANGULAR TO SUBROUNDED WITH MODERATE SPHERICITY; FIRMLY FRIABLE TO MODERATE HARDNESS; CALCITE CEMENT AS SUGGESTED BY A MEDIUM TO STRONG REACTION WITH HCL; KAOLINITE IN MATRIX; NO VISIBLE BEDDING STRUCTURE.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY WITH A SLIGHT MEDIUM BLUISH GRAY HUE; SLIGHTLY DENSE TO BRITTLE TENACITY; FRACTURES FROM PLANAR TO IRREGULAR; CUTTINGS ARE PLATY TO SLIGHTLY TABULAR; LUSTER RANGES FROM EARTHY TO WAXY TO DULL; SMOOTH TO SILTY TEXTURE; LAMINAE TO THIN STRUCTURE; INTERBEDDED WITH SILTSTONE; NO OTHER VISIBLE STRUCTURES.

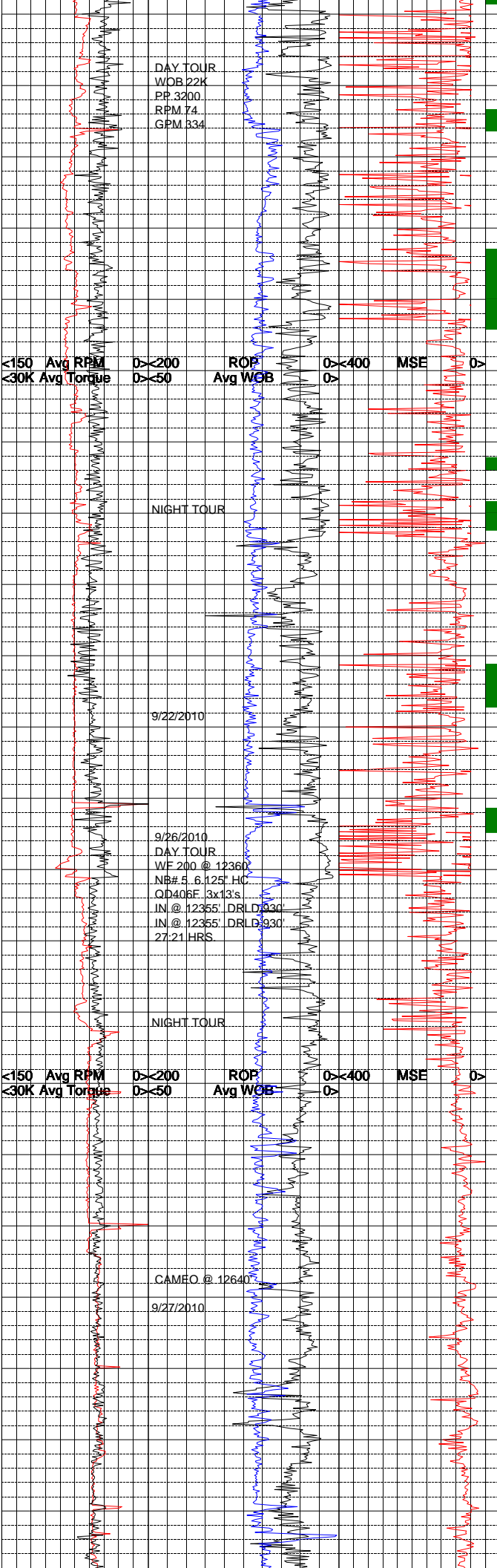
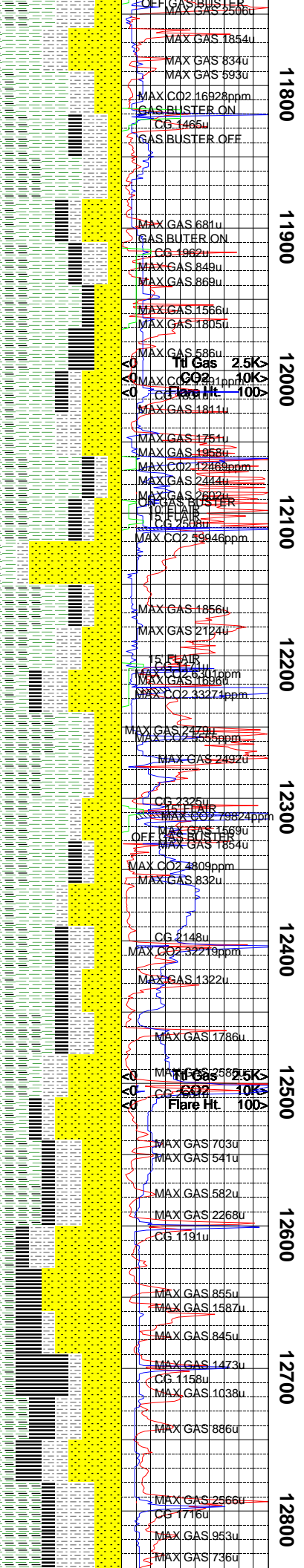
SILTSTONE = MEDIUM DARK GRAY TO DARK GRAY; DENSE TO SLIGHTLY BRITTLE TENACITY FRACTURES FROM MOSTLY IRREGULAR TO BLOCKY; CUTTINGS ARE TABULAR TO SEMI WEDGELIKE; EARTHY TO SLIGHTLY SPARKLING LUSTER; SILTY TEXTURE; GRADING INTO SHALE; THIN TO SEMI THICK STRUCTURE; OCCASIONAL VERY THIN SEAMS OF COAL RUNNING THROUGH; NO OTHER VISIBLE STRUCTURE.

COAL = BLACK; CRUMBLY TO BRITTLE TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR TO OCCASIONALLY PLANAR; CUTTINGS ARE FLAKY TO NODULAR; RESINOUS TO POLISHED LUSTER; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE AND SHALE; THIN VEINS OBSERVED RUNNING THROUGH SILTSTONE AND SANDSTONE SPECIMENS.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BLACK; TENACITY IS BRITTLE TO SLIGHTLY CRUNCHY; PLANAR FRACTURING; CUTTINGS ARE ELONGATED TO OCCASIONALLY WEDGELIKE; DULL EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SANDSTONE; TRACE AMOUNTS OF PYRITE PRESENT OCCASIONALLY OBSERVED ON THE CARBONACEOUS SHALE.

SANDSTONE = LIGHT BROWNISH GRAY TO YELLOWISH GRAY TO VERY LIGHT GRAY WITH FEW MODERATE BROWN AND BLACK HUES; QUARTZ DOMINATE; PREDOMINATELY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATELY HIGH REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; FINE TO MEDIUM COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED TO ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE IN VISIBLE BEDDING CONTACT WITH POOR GRADE SANDSTONE, POOR GRADE CARBONACEOUS SHALE VISIBLE BEDDING WITH SHALE, NO OTHER LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL MEDIUM BROWNISH GRAY IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO EARTHY FRACTURE; OCCASIONAL MASSIVE TO



WEDGE LIKE TO ELONGATED TO SEMI-PLATY CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-WAXY TO SEMI-FROSTED LUSTER; MODERATELY SMOOTH TO SEMI-SILTY TEXTURE; NO VISIBLE LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO GRAY TO BLACK; TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY; FRACTURES FROM IRREGULAR TO SEMI BLOCKY TO PLANAR; TABULAR CUTTINGS; WAXY TO EARTHY TO SLIGHTLY RESINOUS LUSTER; SILTY TO SMOOTH TEXTURE; TRACE AMOUNTS OF PYRITE ASSOCIATED WITH SAMPLE.

COAL = BLACK TO GRAYISH BLACK; VERY BRITTLE TO CRUMBLY TENACITY; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE NODULAR TO OCCASIONALLY FLAKY; RESINOUS TO POLISHED LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE; INTERBEDDED WITH SHALE AND CARBONACEOUS SHALE AND SANDSTONE.

SILTSTONE = BROWNISH GRAY TO MEDIUM GRAY TENACITY IS DENSE TO BRITTLE; FRACTURES FROM BLOCKY TO IRREGULAR; CUTTINGS ARE TABULAR TO WEDGELIKE; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; SILTY TEXTURE; LIKELY GRADING FROM SHALE; THIN COAL LAMINAE VISIBLE IN SHALE CUTTING; SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT BROWNISH GRAY TO LIGHT YELLOWISH GRAY WITH FEW BLACK AND MODERATE BROWN HUES; QUARTZ DOMINANT FRAMEWORK; PREDOMINATELY GRAIN SUPPORTED WITH VERY FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH LIGHT TO MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 3 TO 5% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM-COARSE GRAINED; FAIR TO POOR SORTING; SUB-ANGULAR TO SUB-ROUNDED TO OCCASIONAL ROUNDED ANGULARITY; LOW TO MODERATE SPHERICITY; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE SURFACE FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

NOTE = TRIPPED OUT @ 12355' TO CHANGE OUT BIT.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY TO MEDIUM GRAY TO OCCASIONAL MEDIUM DARK GRAY IN COLOR; MODERATELY DENSE TO VERY SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO HACKLY FRACTURE; OCCASIONAL MASSIVE TO ELONGATED TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERATELY SMOOTH TO SEMI-SILTY TEXTURE; VERY THIN COAL LAMINAE VISIBLE IN SHALE CUTTING; SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT IN SAMPLE; NO ACCESSORY MINERALS VISIBLY PRESENT IN SAMPLE.

CARBONACEOUS SHALE = DARK BROWNISH GRAY TO BROWNISH BLACK TO OCCASIONAL OLIVE BLACK IN COLOR; MODERATELY TO SLIGHTLY DENSE TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB-PLANAR TO EARTHY-HACKLY FRACTURE; SUB-TABULAR TO SUB-NODULAR CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-SPARKLING TO OCCASIONAL SEMI-GREASY LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TEXTURE; POOR GRADE CARBONACEOUS SHALE VISIBLY BEDDED WITH COAL, POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE, SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; TRACE AMOUNTS OF PYRITE VISIBLY PRESENT IN SAMPLE.

COAL = GRAYISH BLACK TO BLACK IN COLOR; VERY SLIGHTLY DENSE TO MODERATELY CRUNCHY TO VERY SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO SUB-BLOCKY TO HACKLY FRACTURE; OCCASIONAL MASSIVE TO WEDGE LIKE TO OCCASIONAL ELONGATED CUTTINGS HABIT; DULL TO EARTHY DULL TO OCCASIONAL SEMI-METALLIC TO SEMI-VITREOUS LUSTER; SEMI-SMOOTH TEXTURE; FAIR AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE, NO OTHER DISTINGUISHABLE STRUCTURAL FEATURES VISIBLY PRESENT IN SAMPLE; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SILTSTONE = BROWNISH GRAY TO DARK GRAY

DAY TOUR
WOB 22K
RP 3200
PP 74
GPM 334

<150 Avg RPM >200 ROP >400 MSE >
<30K Avg Torque >50 Avg WCB >

NIGHT TOUR

9/22/2010

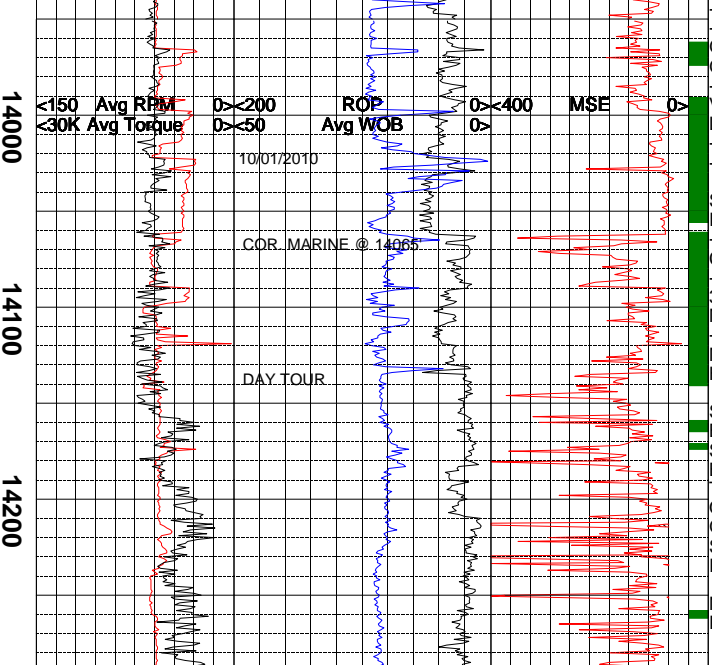
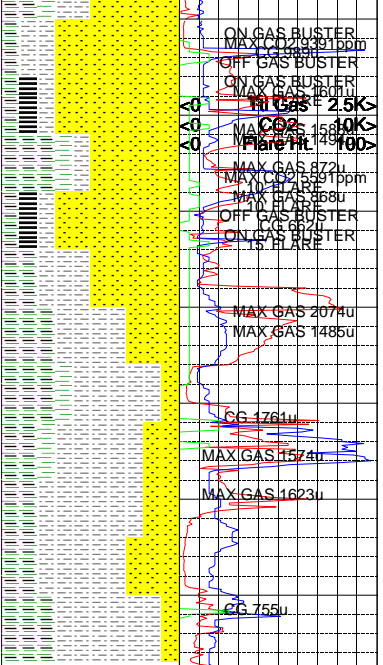
9/26/2010
DAY TOUR
WF 200 @ 12360
NB# 5.6.125' HC
OD406F 3x13's
IN @ 12355' DRLD 930
IN @ 12355' DRLD 930
27-21 HRS

NIGHT TOUR

<150 Avg RPM >200 ROP >400 MSE >
<30K Avg Torque >50 Avg WCB >

CAMEO @ 12640

9/27/2010



-Y DULL TO OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHTLY GRITTY TO VERY SLIGHTLY GRANULAR TO SEMI-CLAYEY TEXTURE; POOR GRADE SILTSTONE VISIBLE GRADING WITH POOR GRADE SANDSTONE. SMALL AMOUNT OF COAL VISIBLY EFFERVESCING IN SAMPLE. NO OTHER LAMINAE OR OTHER DISTINGUISHABLE STRUCTURAL FEATURES PRESENT; NO ACCESSORY MINERALS PRESENT IN SAMPLE.

SANDSTONE = OFF WHITE TO YELLOWISH GRAY-ISH WHITE; QUARTZ DOMINATE; GRAIN SUPPORTED WITH FEW LOOSE GRAINS; CONSISTS OF CALCITIC CEMENTATION WITH MODERATE REACTION TO DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK LITHIC FRAGMENTS; MEDIUM-FINE TO MEDIUM GRAINED; FAIR TO WELL SORTING; SUB-ANGULAR TO SUB-ROUNDED ANGULARITY; MODERATE SPHERICITY; HARD TO MODERATE HARDNESS; NO VISIBLE BEDDING STRUCTURE.

SILTSTONE - MEDIUM DARK GRAY TO GRAYISH BLACK TO BROWNISH BLACK; DENSE TO SLIGHTLY BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURING; CUTTINGS ARE MASSIVE TO TABULAR; DULL EARTHY TO WAXY WITH AN OCCASIONAL SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THICK TO MASSIVE STRUCTURE; CONTAINS CARBONACEOUS SHALE INTERBEDDED.

NOTE = REACHED TOTAL DEPTH OF 14288' FOR PCU 296-5A01 ON 10/1/2010 AT 3:00 PM.

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