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# MUDLOG MD

**COMPANY** ExxonMobil Production  
**WELL** PCU296-6A8  
**FIELD** PICEANCE  
**REGION** ROCKIES  
**COORDINATES** 39.900102  
108.212136  
**ELEVATION** 7363.9  
**COUNTY, STATE** RIO BLANCO, CO  
**API INDEX** 05-103-11479-00  
**SPUD DATE** 04/05/2010  
**CONTRACTOR** HE  
**CO. REP.** KEVIN GARDNER  
**RIG/TYPE** 239 / FLEX 3  
**LOGGING UNIT** 33  
**GEOLOGISTS** NICK BAUER  
JASON REISENBICHLER  
**ADD. PERSONS** LAYNE GOOD  
JASON REYNOLDS  
**CO. GEOLOGIST** MELISSA SAURBORN

## LOG INTERVAL

## CASING DATA

**DEPTHS:** 148' TO 9717'  
**DATES:** 04/05/2010 TO 04/19/2010  
**SCALE:** 1"=100'

16" AT 147'  
10.75" AT 4438'  
AT  
AT

## MUD TYPES

## HOLE SIZE

SPUD MUD TO 4454'  
LSND TO 9717'  
TO  
TO

14.75" TO 4454'  
9.875" TO 9717'  
TO  
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	

<200 ROP ft/hr 0>  
 <50 Avg WOB klbs 0>  
 <0 Gamma API Units 100>

Depth  
 100  
 200  
 300  
 400  
 500  
 600  
 700  
 800  
 900

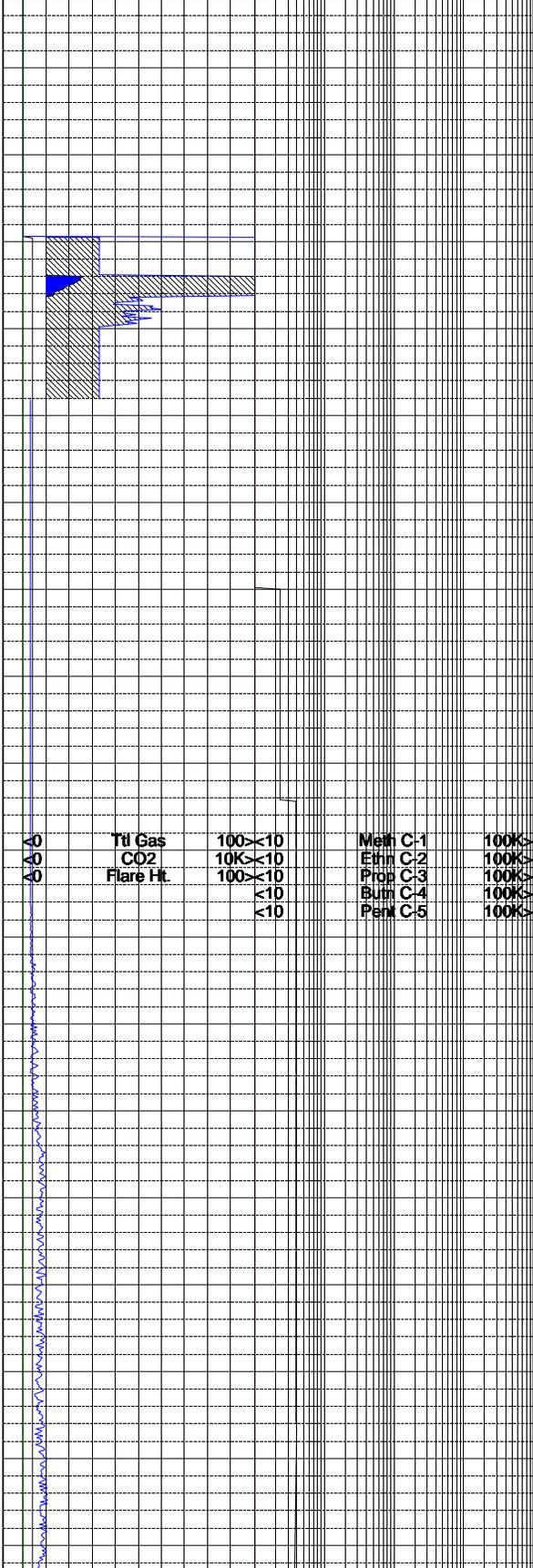
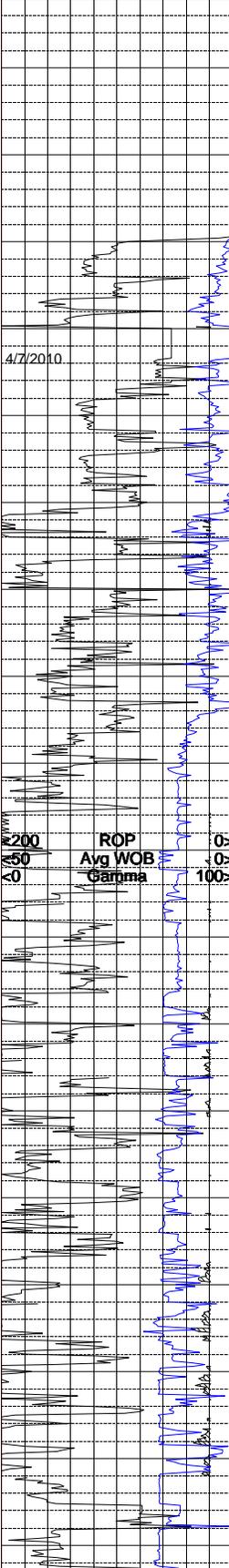
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 <0 Flare Ht. ft 100>

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Interp. Lith

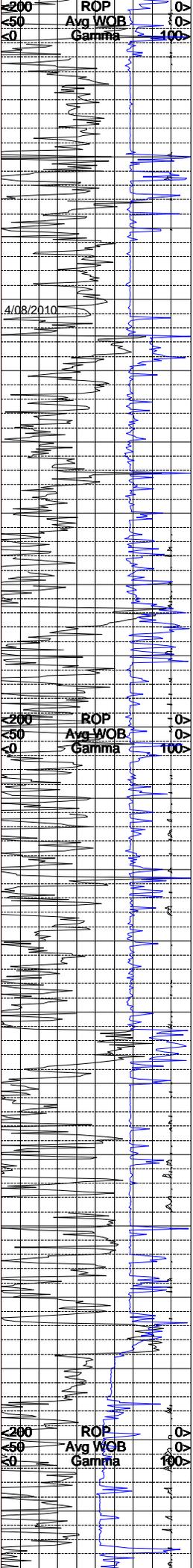
Remarks  
 Survey Data, Mud Reports, Other Info.



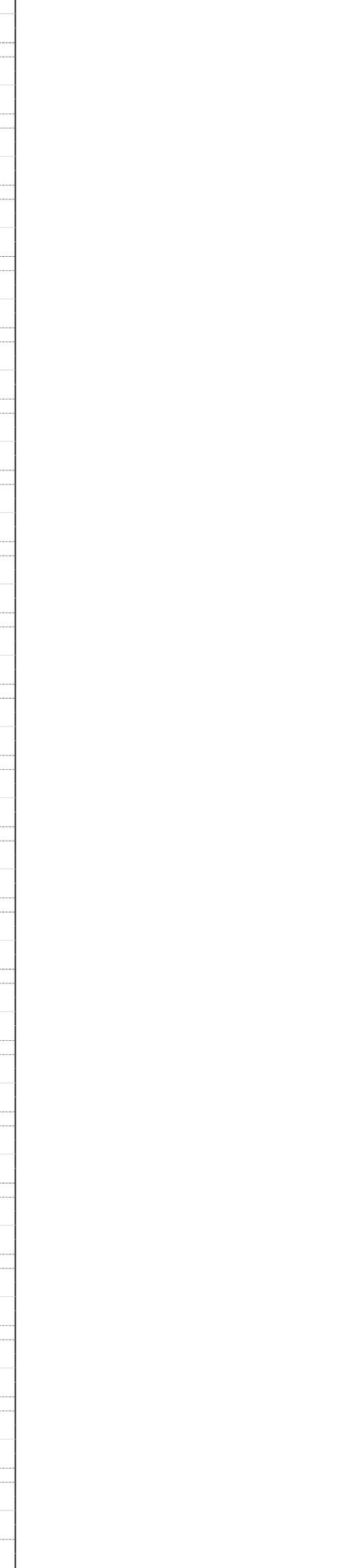
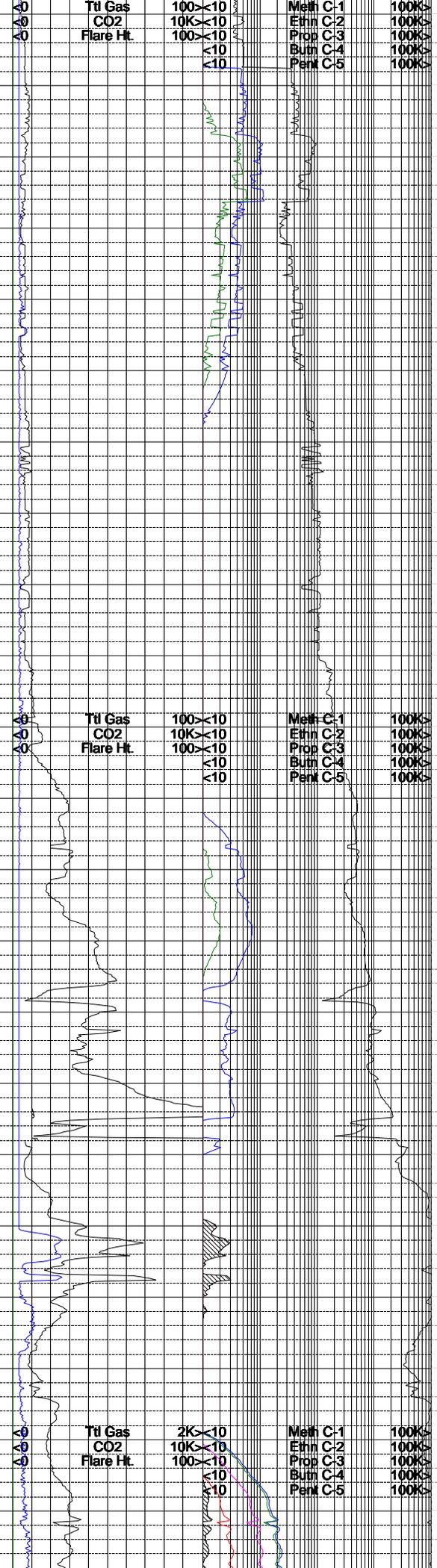
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1000  
1100  
1200  
1300  
1400  
1500  
1600  
1700  
1800  
1900  
2000



Ttl Gas 100x10  
 CO2 10Kx10  
 Flare Ht 100x10  
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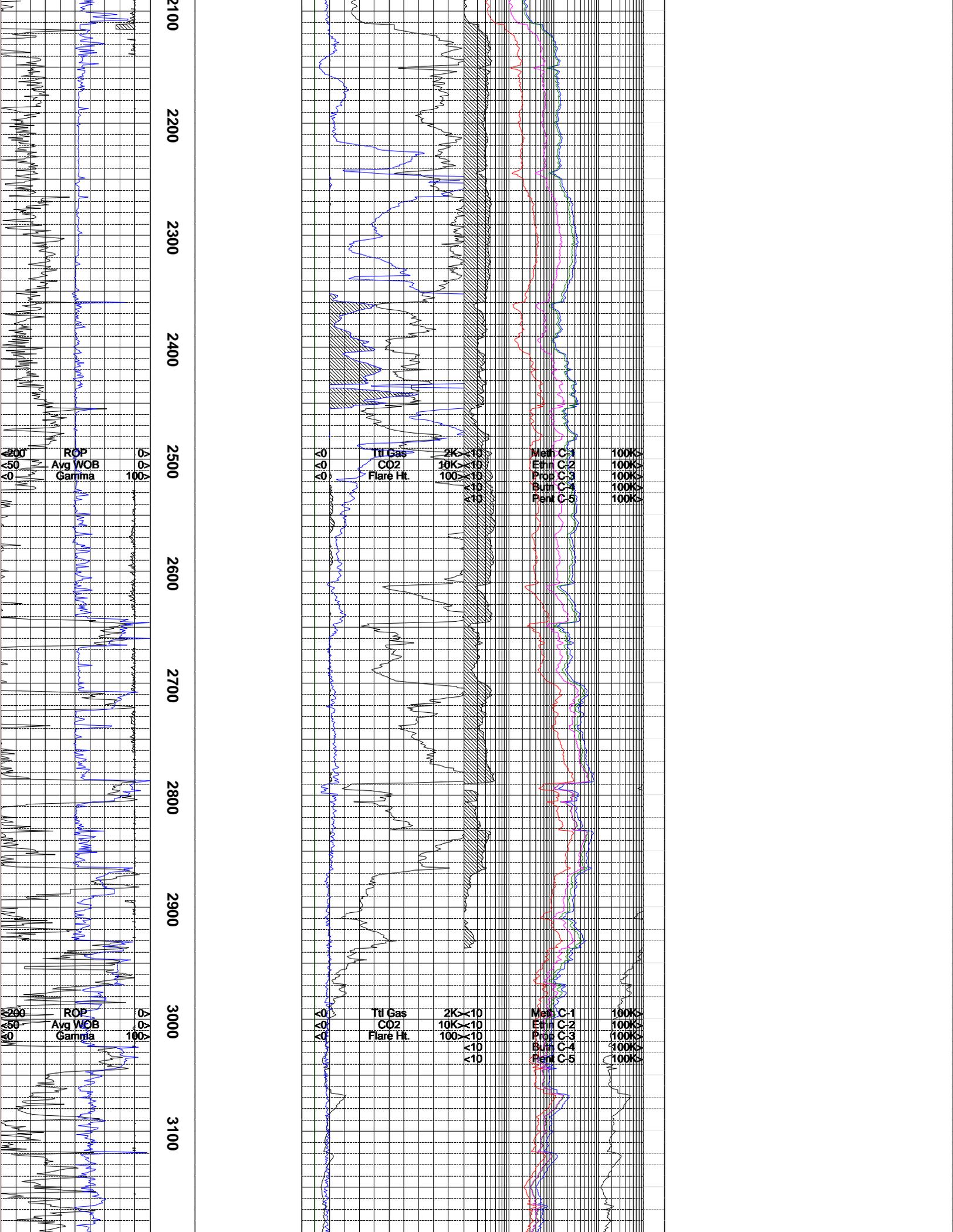
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 Flare Ht 100x10  
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 CO2 10Kx10  
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 <10  
 <10

Meth C-1 100Kx  
 Ethn C-2 100Kx  
 Prop C-3 100Kx  
 Butn C-4 100Kx  
 Pent C-5 100Kx

Meth C-1 100Kx  
 Ethn C-2 100Kx  
 Prop C-3 100Kx  
 Butn C-4 100Kx  
 Pent C-5 100Kx

Meth C-1 100Kx  
 Ethn C-2 100Kx  
 Prop C-3 100Kx  
 Butn C-4 100Kx  
 Pent C-5 100Kx



2100  
2200  
2300  
2400  
2500  
2600  
2700  
2800  
2900  
3000  
3100

ROP  
Avg WOB  
Gamma

Ttl Gas  
CO2  
Flare Ht

Meth C-1  
Ethn C-2  
Prop C-3  
Butn C-4  
Pent C-5

2K < 10  
10K < 10  
100 < 10  
< 10  
< 10

100K >  
100K >  
100K >  
100K >  
100K >

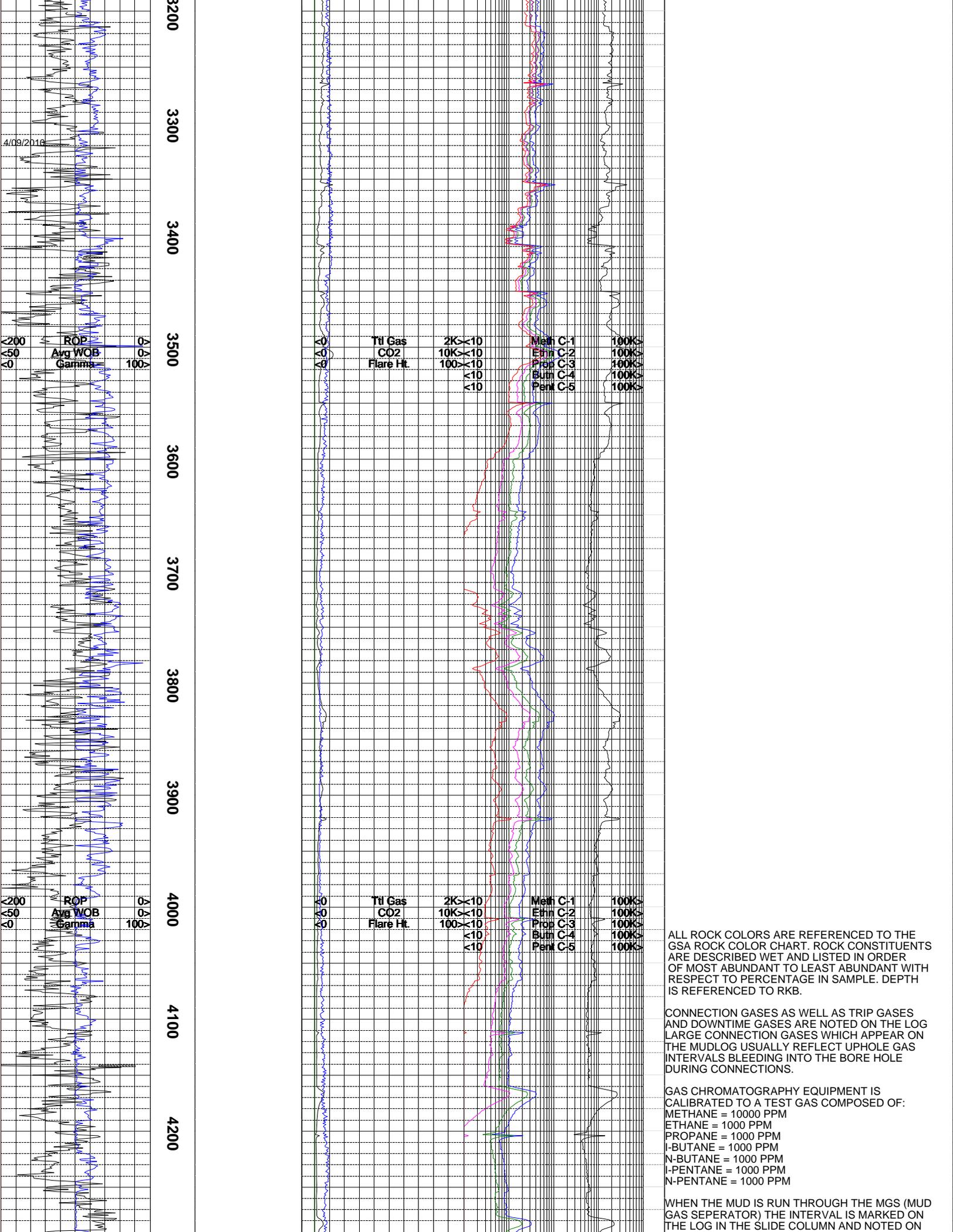
ROP  
Avg WOB  
Gamma

Ttl Gas  
CO2  
Flare Ht

Meth C-1  
Ethn C-2  
Prop C-3  
Butn C-4  
Pent C-5

2K < 10  
10K < 10  
100 < 10  
< 10  
< 10

100K >  
100K >  
100K >  
100K >  
100K >



3200  
3300  
3400  
3500  
3600  
3700  
3800  
3900  
4000  
4100  
4200

4/09/2016  
200  
150  
100

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CO2 10K  $\times$  10  
Flare Ht. 100  $\times$  10  
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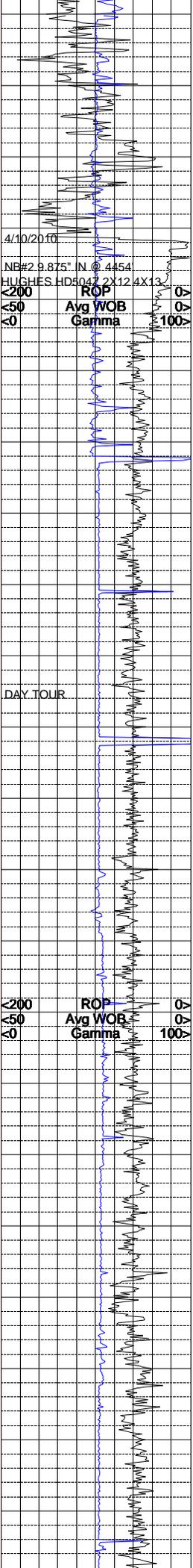
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Meth C-1 100K  
Ethn C-2 100K  
Prop C-3 100K  
Butn C-4 100K  
Pent C-5 100K

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.

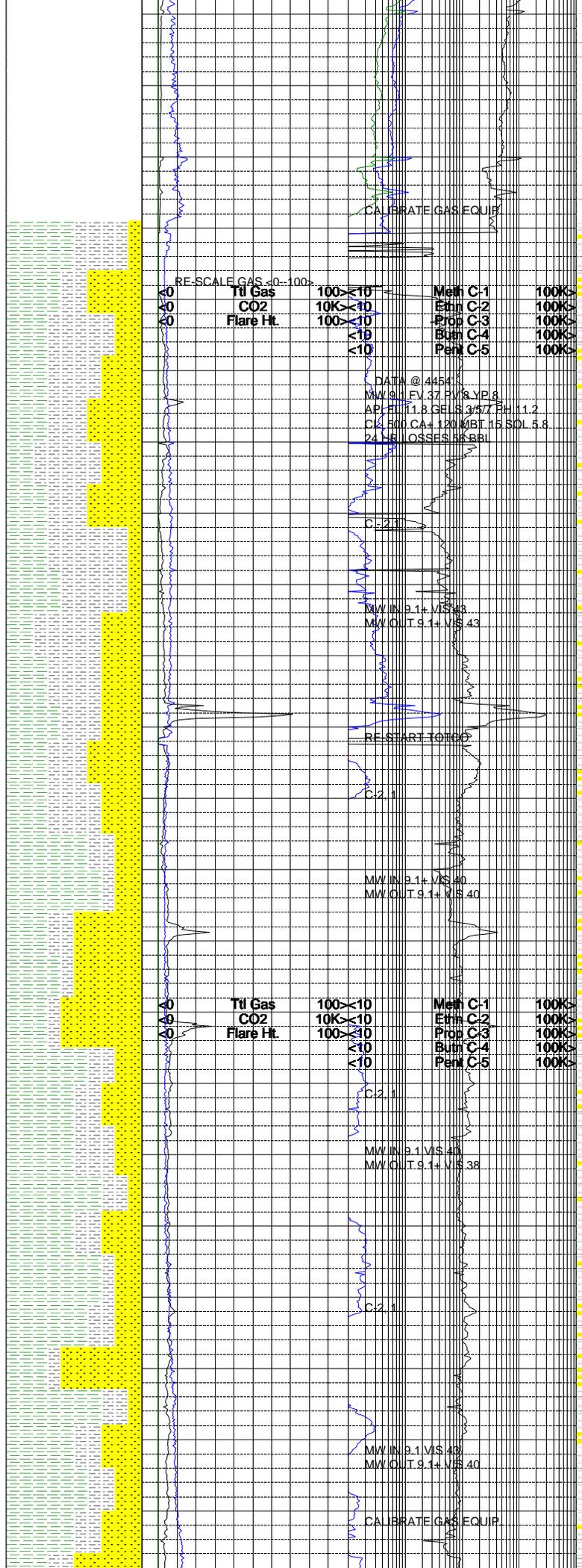
CONNECTION GASES AS WELL AS TRIP GASES AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUDLOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING INTO THE BORE HOLE DURING CONNECTIONS.

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



1300  
 4400  
 4500  
 4600  
 4700  
 4800  
 4900  
 5000  
 5100  
 5200  
 5300



THE LOG.

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

10.5" SURFACE CASING WAS SET AT 4438'.

CANRIG DRILLING TECHNOLOGY LTD. COMMENCED FULL LOGGING SERVICES ON 04/13/2010.

SILTSTONE = TAN TO BROWN IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUNCHY TO PULVERANT TENACITY WITH IRREGULAR TO HACKLY FRACTURES; ELONGATED TO TABULAR CTGS HABIT WITH A DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

SHALE = GRAY TO TAN IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUMBLY TO CRUNCHY TENACITY WITH IRREGULAR TO PLANAR FRACTURES; WEDGELIKE TO ELONGATED CTGS HABIT WITH A DULL TO SLIGHTLY FROSTED LUSTER; SMOOTH TO SILTY TEXTURE.

SANDSTONE = MEDIUM TO FINE GRAIN SIZE WITH A TAN TO LIGHT GRAY IN COLOR; FAIR TO POOR SORTING WITH SUBROUND TO SUBANGULAR ANGULARITY; MODERATE TO LOW SPHERICITY WITH BRITTLE TO CRUNCHY TENACITY; WEDGELIKE TO ELONGATED CTGS HABIT WITH A DULL TO FROSTED LUSTER; GRITTY TO GRANULAR TEXTURE WITH A CALCITIC FRAMEWORK.

SILTSTONE = TAN IN COLOR WITH LOW TO MODERATE SPHERICITY; CRUNCHY TO CRUMBLY TENACITY WITH ELONGATED TO WEDGELIKE CTGS HABIT WITH A DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

SHALE = MEDIUM YELLOWISH BROWN TO MEDIUM GRAY COLOR; CRUMBLY TO CRUNCHY TEXTURE; IRREGULAR TO HACKLY TO BLOCKY FRACTURE; EARTHY TO DULL LUSTER; CLAYEY TO SILTY TEXTURE; SLIGHT TO FAIR REACTION WITH 10% HCL.

SANDSTONE = MEDIUM LIGHT GRAY TO LIGHT GRAY COLOR; QUARTZ GRAINS WITH LESS THAN 2% DARK LITHIC FRAGMENT; VERY FINE TO FINE GRAIN SIZE; SUBROUNDED GRAINS WITH MODERATE TO HIGH SPHERICITY; FIRM HARDNESS; GRAIN SUPPORTED WITH CALCITE CEMENTATION; FAIR REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = MODERATE YELLOWISH BROWN TO MEDIUM GRAY TO BROWNISH GRAY COLOR; DENSE TO CRUNCHY TO CRUMBLY TENACITY; IRREGULAR TO HACKLY FRACTURE; WEDGELIKE TO BLADED TO NODULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; CLAYEY TO SILTY TO SMOOTH TEXTURE; TRACE OF LAMINAE ON SURFACE OF CUTTINGS; SLIGHT TO FAIR REACTION WITH HCL.

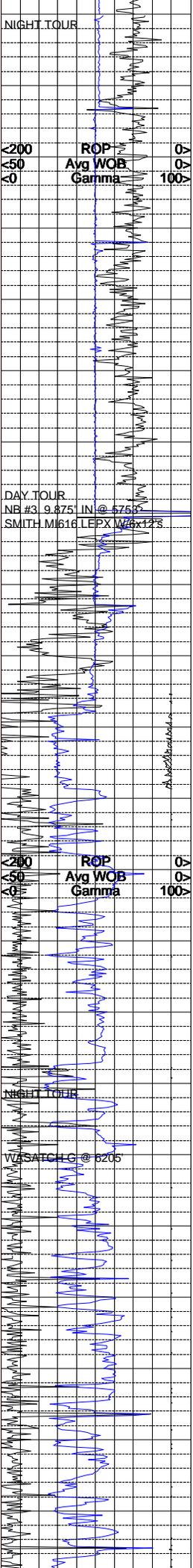
SILTSTONE = PALE YELLOWISH BROWN TO DARK YELLOWISH ORANGE COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; MASSIVE STRUCTURE; SLIGHT REACTION TO 10% HCL.

SHALE = MODERATE YELLOWISH BROWN TO MEDIUM BLUISH GRAY TO MEDIUM GRAY COLOR; CRUNCHY TO DENSE TENACITY; HACKLY TO IRREGULAR FRACTURE; WEDGELIKE TO HACKLY CUTTINGS HABIT; DULL TO WAXY LUSTER; SMOOTH TO SILTY TO GRITTY TEXTURE; TRACE OF LAMINAE ON SURFACE OF CUTTINGS; SLIGHT REACTION WITH HCL.

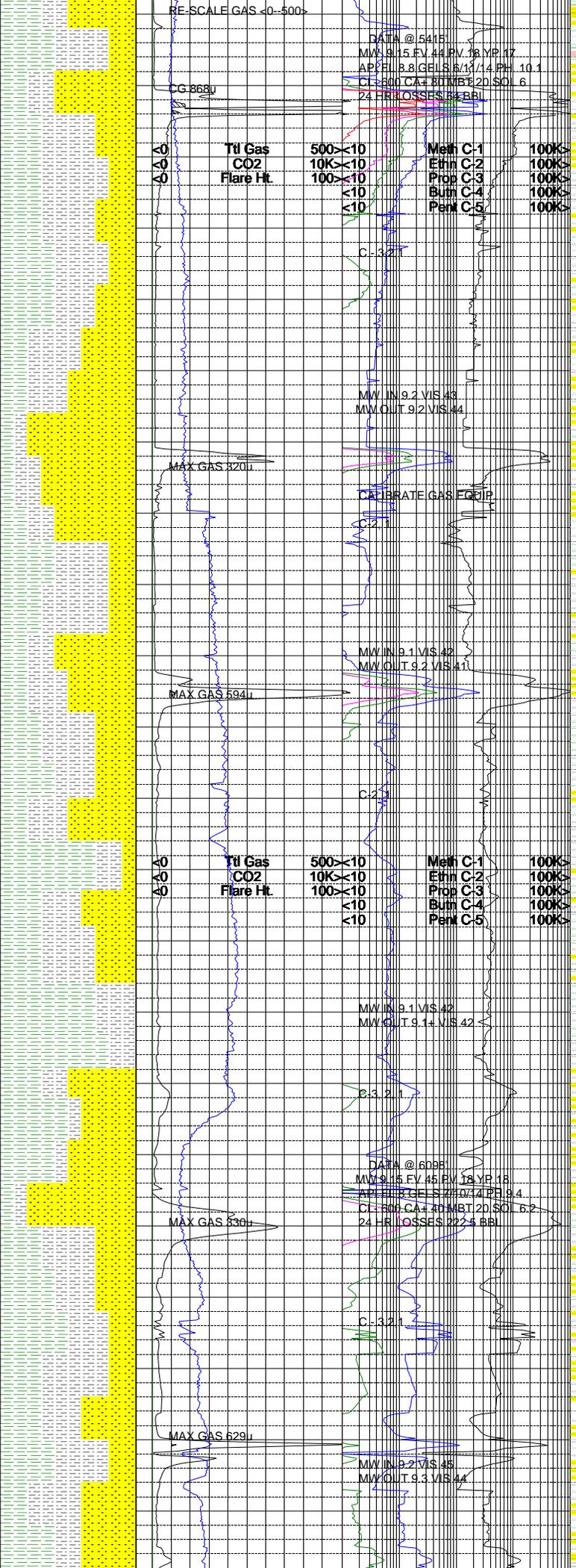
SANDSTONE = MEDIUM LIGHT GRAY TO GRAYISH RED TO BROWNISH GRAY COLOR; CLEAR TO LIGHT BROWNISH TO PALE REDDISH BROWN COLORED QUARTZ GRAINS WITH ABOUT 2% DARK LITHIC FRAGMENTS; FINE TO MEDIUM GRAIN SIZE; SUBANGULAR TO ANGULAR GRAINS WITH MODERATE TO LOW SPHERICITY; FIRM HARDNESS; GRAIN SUPPORTED; SILICA CEMENTATION; SURFACE ENCRUSTATION ON GRAINS; TRACE OF MECHANICAL ABRASION ON

SILTSTONE = DARK YELLOWISH BROWN COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; NO REACTION WITH HCL.

SHALE = TAN TO GRAY IN COLOR WITH LOW TO MODERATE SPHERICITY; CRUMBLY TO CRUNCHY TENACITY WITH IRREGULAR TO PLANAR FRACTURES; ELONGATED TO TABULAR CTGS HABIT WITH A DULL TO EARTHY LUSTER



5400  
5500  
5600  
5700  
5800  
5900  
6000  
6100  
6200  
6300  
6400



SANDSTONE = GRAY TO TAN IN COLOR WITH A CALCITIC FRAMEWORK; MEDIUM TO FINE GRAIN SIZE WITH FAIR TO WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY WITH HIGH TO MODERATE SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH 20% UNCONSOLIDATED; NODULAR TO ELONGATED CTGS HABIT WITH A DULL TO SLIGHTLY FROSTED LUSTER; GRITTY TO GRANULAR TEXTURE.

SILTSTONE = TAN TO YELLOWISH BROWN IN COLOR WITH LOW TO MODERATE SPHERICITY; PULVERANT TO CRUMBLY TENACITY WITH IRREGULAR TO MOTTLED FRACTURES; ELONGATED TO WEDGELIKE CTGS HABIT WITH A DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

SHALE = GRAY TO TAN IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUNCHY TO CRUMBLY TO BRITTLE TENACITY WITH IRREGULAR TO PLANNER FRACTURES; TABULAR TO WEDGELIKE TO ELONGATED CTGS HABIT WITH A DULL TO FROSTED LUSTER; SMOOTH TO SILTY TEXTURE.

SILTSTONE = MODERATE YELLOWISH BROWN COLOR; CRUNCHY TENACITY; IRREGULAR FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITTY TEXTURE. GRADING INTO SANDSTONE; MASSIVE STRUCTURE; FAIR REACTION WITH 10% HCL.

SANDSTONE = MEDIUM LIGHT GRAY TO MEDIUM BROWNISH GRAY COLOR; PREDOMINANTLY QUARTZ GRAINS, CLEAR TO A LIGHT BROWNISH COLOR; LESS THAN 2% DARK LITHIC FRAGMENTS; FAIR SORTING; ANGULAR TO SUB-ANGULAR GRAINS; WITH LOW TO MODERATE SPHERICITY; FIRM HARDNESS; SILICA CEMENTATION; SLIGHT REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = BROWNISH GRAY TO BLuish GRAY COLOR; BRITTLE TO DENSE TO CRUMBLY TENACITY; IRREGULAR TO CONCHOIDAL FRACTURE; WEDGELIKE TO ELONGATED TO NODULAR CUTTINGS HABIT; DULL TO WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; NO REACTION WITH HCL.

SILTSTONE = GRAYISH BROWN TO DARK YELLOWISH BROWN COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO TABULAR CUTTINGS HABIT; EARTHY TO SPARKLING LUSTER; SILTY TEXTURE; MASSIVE STRUCTURE; TRACE REACTION WITH HCL.

SANDSTONE = MEDIUM GRAY TO BROWISH GRAY TO DUSKY RED COLOR; QUARTZ AND FELDSPAR GRAINS WITH ABOUT 2% DARK LITHIC FRAGMENTS; FINE TO VERY FINE TO MEDIUM GRAIN SIZE WITH POOR TO FAIR SORTING; SUBANGULAR TO ANGULAR GRAINS; MODERATE TO LOW SPHERICITY; FIRM TO FIRMLY FRIABLE; GRAIN AND MATRIX SUPPORTED; DUSKY RED MATRIX; SLIGHT TO TRACE REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

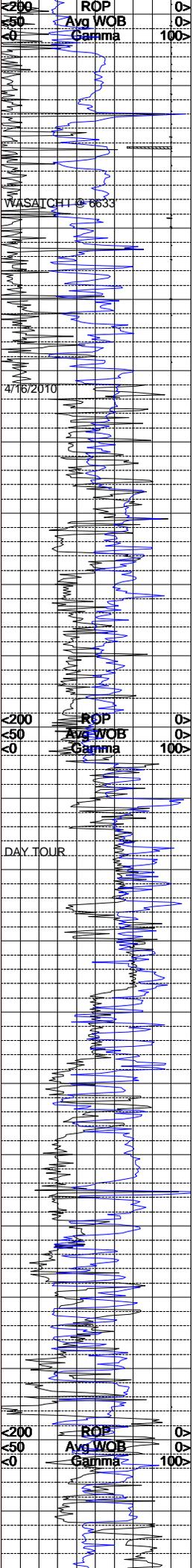
SHALE = GRAY TO BROWN IN COLOR WITH MODERATE TO LOW SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH IRREGULAR TO MOTTLED FRACTURES; TABULAR TO WEDGELIKE CTGS HABIT WITH A DULL TO FROSTED LUSTER ; SMOOTH TO SILTY TEXTURE.

SILTSTONE = TAN TO LIGHT GRAY IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUMBLY TO CRUNCHY CTGS HABIT WITH DULL TO EARTHY LUSTER; HACKLY TO MOTTLED FRACTURES WITH ELONGATED TO WEDGELIKE CTGS HABIT; SMOOTH TO SILTY TEXTURE.

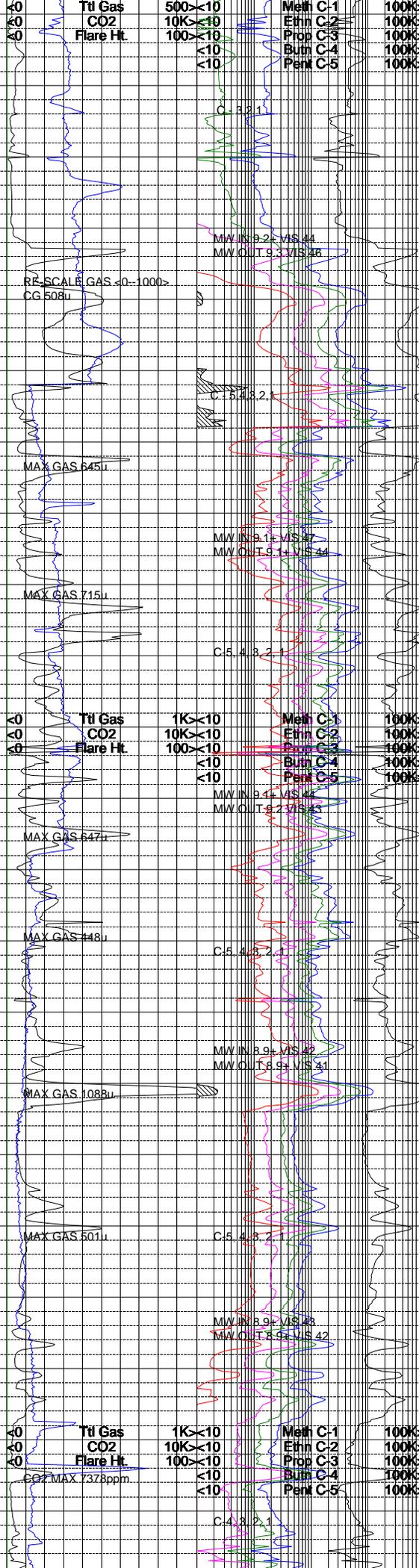
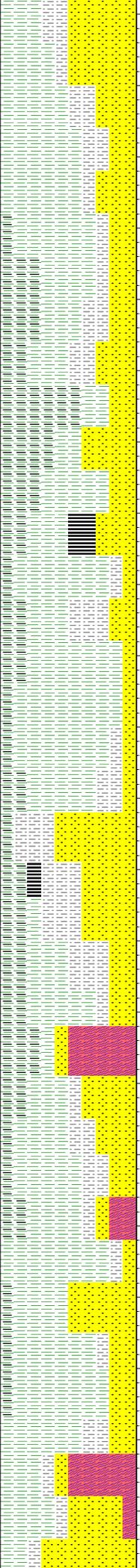
SANDSTONE = GRAY TO BROWN TO LIGHT GRAY IN COLOR; FINE TO MEDIUM GRAIN SIZE WITH FAIR TO WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY WITH MODERATE TO HIGH SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH NODULAR TO ELONGATED CTGS HABIT; FROSTED TO WAXY LUSTER WITH A GRITTY TO GRANULAR TEXTURE .

SHALE = BROWN TO GRAY IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUNCHY TO BRITTLE TENACITY WITH IRREGULAR TO HACKLY FRACTURES; TABULAR TO WEDGELIKE CTGS HABIT WITH A DULL TO FROSTED LUSTER WITH A SMOOTH TO SILTY TEXTURE.

SILTSTONE = LIGHT GRAY TO TAN IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUNCHY TO CRUMBLY TENACITY WITH WEDGELIKE TO ELONGATED CTGS HABIT; IRREGULAR TO



6500  
6600  
6700  
6800  
6900  
7000  
7100  
7200  
7300  
7400  
7500



Meth C-1 100%  
Ethn C-2 100%  
Prop C-3 100%  
Butn C-4 100%  
Pen C-5 100%

MOTTLED FRACTURES WITH DULL TO EARTHY LUSTER WITH A SMOOTH TO SILTY TEXTURE.

SANDSTONE = GRAY TO BROWN IN COLOR WITH A CALCITIC FRAMEWORK; FINE TO MEDIUM GRAIN SIZE WITH SUBROUND TO SUBANGULAR ANGULARITY; MODERATE TO HIGH SPHERICITY WITH BRITTLE TO CRUNCHY TENACITY; NODULAR TO WEDGELIKE CTGS HABIT WITH WAXY TO DULL LUSTER WITH GRITTY TO GRANULAR TEXTURE.

CARBONACEOUS SHALE = DARK BROWN TO BLACK IN COLOR WITH LOW TO VERY LOW SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH PLANAR TO IRREGULAR FRACTURES; WEDGELIKE TO SCALY CTGS HABIT WITH RESINOUS TO DULL LUSTER; SILTY TO ABRASIVE TEXTURE WITH ACCESSORY MINERAL PYRITE PRESENT.

SHALE = GRAY TO DARK GRAY IN COLOR WITH LOW TO MODERATE SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH ELONGATED TO TABULAR CTGS HABIT; DULL TO RESINOUS LUSTER WITH A SMOOTH TO SILTY TEXTURE.

SANDSTONE = GRAY TO LIGHT GRAY IN COLOR WITH FINE TO MEDIUM GRAIN SIZE; CALCITIC FRAMEWORK WITH FAIR TO WELL SORTING; SUBROUND TO SUBANGULAR ANGULARITY WITH MODERATE TO HIGH SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH ELONGATED TO NODULAR CTGS HABIT; DULL TO FROSTED LUSTER WITH A GRITTY TO GRANULAR TEXTURE

COAL = BLACK IN COLOR WITH LOW TO VERY LOW SPHERICITY; BRITTLE TO CRUMBLY TENACITY WITH IRREGULAR TO PLANAR FRACTURES; TABULAR TO SCALY CTGS HABIT WITH A RESINOUS TO VITREOUS LUSTER; SLIGHT DEGASSING OCCURRING WITH A SMOOTH TO MATTE TEXTURE.

CARBONACEOUS CHALE = DARK GRAY TO DARK BROWN IN COLOR WITH LOW TO VERY LOW SPHERICITY; BRITTLE TO DENSE TENACITY WITH BLOCKY TO IRREGULAR FRACTURES; TABULAR TO WEDGELIKE CTGS HABIT WITH A RESINOUS TO DULL LUSTER; SMOOTH TO SILTY TEXTURE.

SHALE = MEDIUM GRAY TO MEDIUM DARK GRAY COLOR; CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; WEDGELIKE CUTTINGS HABIT; DULL TO WAXY LUSTER; CLAYEY TO SILTY TEXTURE; SLIGHT REACTION WITH HCL.

SANDSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY COLOR; QUARTZ AND FELDSPAR GRAINS, TRACE AMOUNT OF DARK LITHIC FRAGMENTS; VERY FINE TO FINE GRAIN SIZE; WELL TO FAIR SORTING; SUBROUNDED GRAINS WITH MODERATE SPHERICITY; ETCHED SURFACES ON GAINS DUE TO CHEMICAL DISSOLUTION; CALCITE CEMENTATION; FAIR REACTION WITH 10% HCL; TRACE ON MINERAL FLUORESCENCE UNDER UV LIGHT.

CARBONACEOUS SHALE = BROWNISH BLACK TO GRAYISH BROWN COLOR; CRUNCHY TENACITY; BLOCKY TO IRREGULAR FRACTURE; ELONGATED TO TABULAR TO WEDGELIKE CUTTINGS HABIT; GREASY TO EARTHY LUSTER; SILTY TO CLAYEY TEXTURE; CARBONACEOUS LAMINAE; TRACE REACTION WITH HCL; TRACE OF PYRITE.

NOTE = ABUNDANT FINE GRAIN CALCITE IN SAMPLE AT 7240'; UNCONSOLIDATED WITH SUBROUNDED GRAINS; LOGGED AT METAMORPHICS; POSSIBLE FRACTURE FILL.

SHALE = LIGHT BROWNISH GRAY TO MEDIUM BLUISH GRAY COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO SPLINTRY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TO CLAYEY TEXTURE; TRACE OF CARBONACEOUS LAMINAE; NO REACTION WITH HCL.

SANDSTONE = MEDIUM LIGHT GRAY COLOR; QUARTZ AND FELDSPAR GRAINS; VERY FINE TO FINE GRAIN SIZE; WELL SORTED; SUBROUNDED GRAINS; MODERATE SPHERICITY; GOUND SURFACES ON CUTTINGS DUE TO PDC BIT; FIRM HARDNESS; GRAIN AND MATRIX SUPPORTED WITH CALCITE CEMENTATION; REACTS WELL WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = MEDIUM DARK GRAY TO GRAYISH RED COLOR; DENSE TO BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO WEDGELIKE TO TABULAR CUTTINGS HABIT; WAXY TO DULL LUSTER SMOOTH TO CLAYEY LUSTER; TRACE OF LAMINAE ON SURFACE OF CUTTINGS; NO REACTION IN HCL.

SILTSTONE = MODERATE BROWN COLOR; BRITTLE TO DENSE TENACITY; IRREGULAR

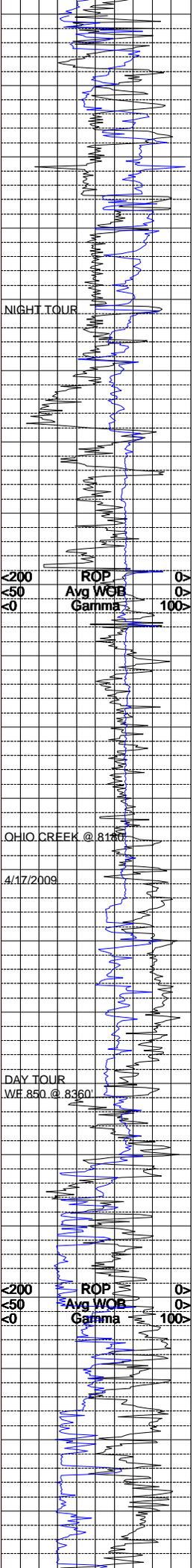
Ttl Gas 500x<10  
CO2 10Kx<10  
Flare Ht 100x<10

Meth C-1 100%  
Ethn C-2 100%  
Prop C-3 100%  
Butn C-4 100%  
Pen C-5 100%

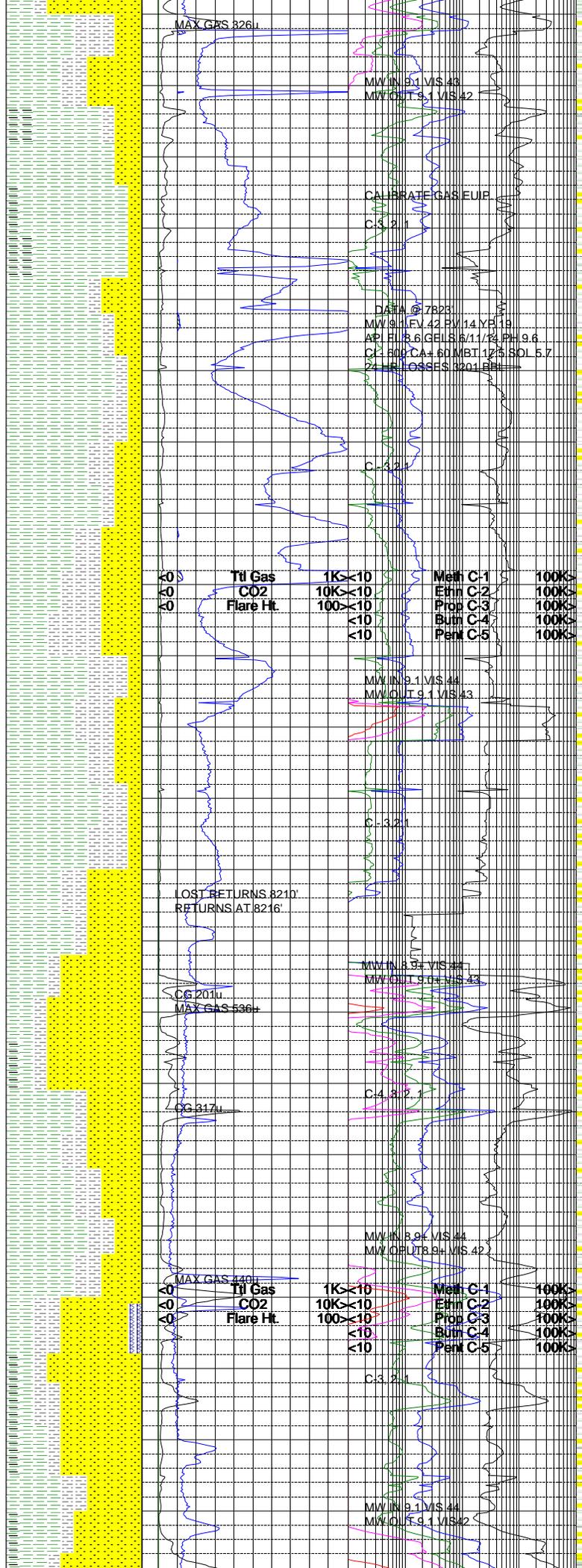
Ttl Gas 1Kx<10  
CO2 10Kx<10  
Flare Ht 100x<10

Meth C-1 100%  
Ethn C-2 100%  
Prop C-3 100%  
Butn C-4 100%  
Pen C-5 100%

CO2 MAX 7378ppm



7600  
7700  
7800  
7900  
8000  
8100  
8200  
8300  
8400  
8500  
8600



FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY LUSTER; SILTY TEXTURE; MASSIVE STRUCTURE; FAIR REACTION WITH 10% HCL.

SHALE = MEDIUM GRAY TO MEDIUM BLuish GRAY TO LIGHT BLuish GRAY COLOR; BRITTLE TO CRUNCHY TO CRUMBLY; IRREGULAR TO SPLINTERY TO HACKLY FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; WAXY TO DULL LUSTER; TRACE OF PYRITE; NO REACTION IN HCL.

CARBONACEOUS SHALE = BROWNISH BLACK TO DUSKY BROWN COLOR; DENSE TO CRUNCHY TENACITY; BLOKY TO IRREGULAR FRACTURE; WEDGELIKE TO TABULAR TO NODULAR CUTTINGS HABIT; GREASY TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; CARBONACEOUS LAMINAE; TRACE OF PYRITE; NO REACTION WITH HCL.

SANDSTONE = LIGHT GRAY TO GRAY IN COLOR WITH FINE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTING WITH MODERATE TO HIGH SPHERICITY; DENSE TO BRITTLE TENACITY WITH NODULAR TO ELONGATED CTGS HABIT; FROSTED TO DULL LUSTER WITH GRITTY TO GRANULAR TEXTURE; 10% BLACK LITHICS PRESENT.

SHALE = GRAY TO LIGHT GRAY IN COLOR WITH LOW TO VERY LOW SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH IRREGULAR TO PLANAR TO CRUNCHY FRACTURES; WEDGELIKE TO SCALY CTGS HABIT WITH A SLIGHTLY FROSTED TO DULL LUSTER; SMOOTH TO SILTY TEXTURE.

SILTSTONE = TAN TO BROWN TO LIGHT GRAY IN COLOR WITH MODERATE TO LOW SPHERICITY; BRITTLE TO CRUMBLY TENACITY WITH IRREGULAR TO MOTTLED FRACTURES; SCALY TO ELONGATED CTGS HABIT WITH A DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE.

SHALE = GRAY TO DARK GRAY IN COLOR WITH MODERATE TO LOW SPHERICITY; CRUNCHY TO BRITTLE TENACITY WITH PLANAR TO IRREGULAR FRACTURES; WEDGELIKE TO TABULAR TO SCALY CTGS HABIT WITH A DULL TO FROSTED LUSTER; SMOOTH TO SILTY TEXTURE.

SANDSTONE = OFFWHITE TO TRANSLUCENT IN COLOR WITH FINE TO MEDIUM GRAIN SIZE; FAIR TO WELL SORTING WITH ROUND TO SUBROUND ANGULARITY; 90% UNCONSOLIDATED WITH A POLISHED TO WAXY LUSTER; GRITTY TO GRANULAR TEXTURE.

SHALE = GRAY TO BROWN IN COLOR WITH LOW TO VERY LOW SPHERICITY; CRUNCHY TO CRUMBLY TENACITY WITH IRREGULAR TO HACKLY FRACTURES; TABULAR TO WEDGELIKE CTGS HABIT WITH A DULL TO FROSTED LUSTER; SMOOTH TO SILTY TEXTURE.

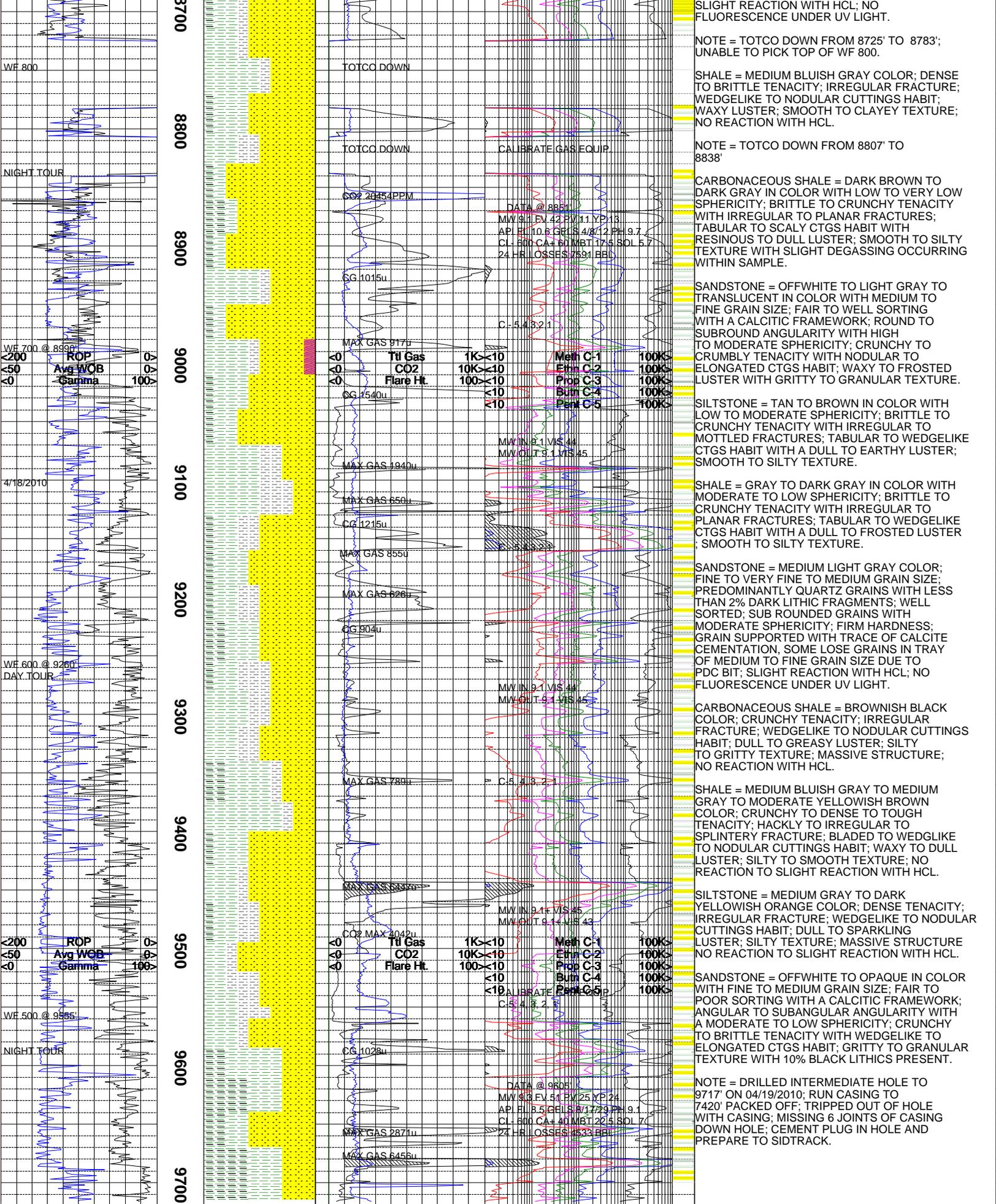
CARBONACEOUS SHALE = BLACK TO DARK BROWN IN COLOR WITH LOW TO VERY LOW SPHERICITY; BRITTLE TO CRUNCHY TENACITY WITH WEDGELIKE TO SCALY CTGS HABIT; RESINOUS TO DULL LUSTER WITH SMOOTH TO SILTY TEXTURE.

SANDSTONE = LIGHT GRAY TO MEDIUM LIGHT GRAY COLOR; PREDOMINANTLY QUARTZ GRAINS WITH LESS THAN 2% DARK LITHIC FRAGMENTS; FINE TO MEDIUM TO VERY FINE GRAIN SIZE; POOR SORTING; SUBANGULAR TO ANGULAR TO SUBROUNDED GRAINS; MODERATE TO LOW SPHERICITY; FIRMLY FRIABLE TO FRIABLE WITH ABUNDANT LOSE GRAINS IN TRAY; GRAIN SUPPORTED WITH TRACE OF SILICA CEMENTATION; TRACE REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SHALE = MEDIUM GRAY TO DARK REDDISH BROWN COLOR; DENSE TO CRUNCHY TENACITY; IRREGULAR TO CONCHOIDAL TO BLOCKY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; WAXY TO DULL LUSTER; TRACE OF LAMINAE ON SURFACE OF GRAINS; NO REACTION WITH HCL.

SILTSTONE = DARK YELLOWISH ORANGE TO BROWNISH GRAY TO MODERATE REDDISH BROWN COLOR; CRUMBLY TO DENSE TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; SLIGHT REACTION WITH HCL.

SANDSTONE = VERY LIGHT GRAY COLOR; PREDOMINANTLY QUARTZ GRAINS; FINE TO VERY FINE TO MEDIUM GRAIN SIZE; FAIR TO POOR SORTING; SUBROUNDED TO SUBANGULAR GRAINS; WITH MODERATE SPHERICITY; FRIABLE WITH ABUNDANT LOSE GRAINS IN TRAY; ABOUT 20% KAOLINITIC SANDSTONE;



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