



Copyright © 2003 by Epoch Well Services, Inc.

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

MUDLOG MD

COMPANY ExxonMobil Production
WELL FRU 197-33A7
FIELD PICEANCE CREEK
REGION ROCKIES
COORDINATES 39.915575000
108.28575000
ELEVATION GL 6386
KB 6359
COUNTY, STATE RIO BLANCO, CO
API INDEX 05-103-1139-900
SPUD DATE 02/16/2010
CONTRACTOR HE
CO. REP. R.T. OWENS
RIG/TYPE 215/FLEX 3
LOGGING UNIT MLU051
GEOLOGISTS G.BAKER
B.MARSH
ADD. PERSONS D.CLAAR
B.JOHANNING
CO. GEOLOGIST MELANIE BIGGS

LOG INTERVAL

CASING DATA

DEPTHS: 3,790' TO 12,375'
DATES: 02/16/2010 TO 02/26/2010
SCALE: 1"=100'

10.75" AT 3,808'
7.00" AT 8,609'
AT
AT

MUD TYPES

HOLE SIZE

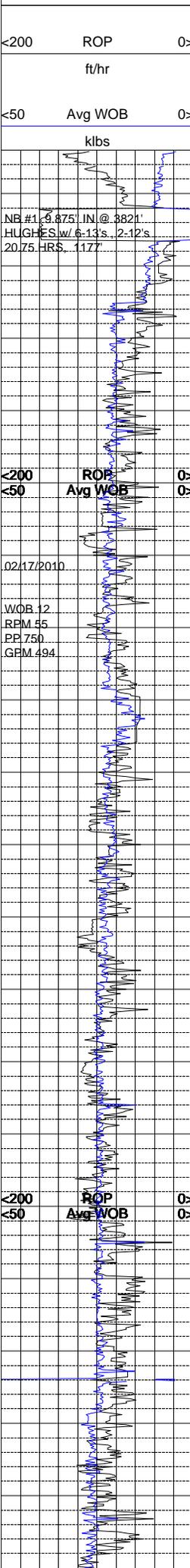
LSND TO 12,375"
TO
TO
TO

9.875" TO 8,619'
6.125" TO 12,375'
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	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	



Depth

3800

3900

4000

4100

4200

4300

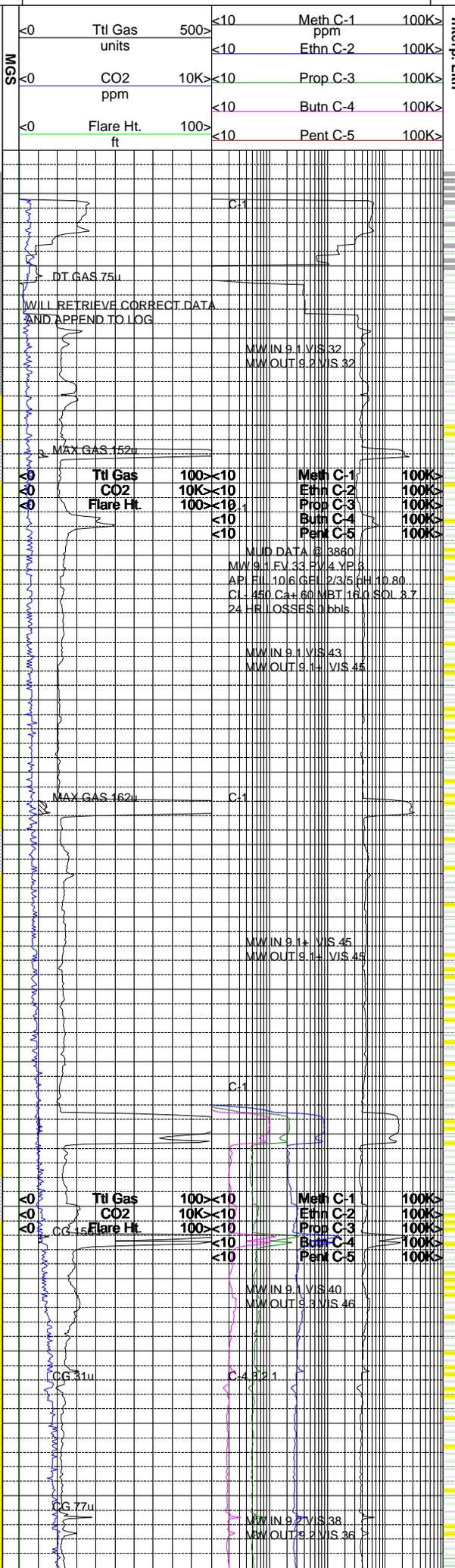
4400

4500

4600

4700

Lithology



Interp. Lith

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. ALL SAMPLE DEPTHS ARE REFERENCED TO RKB

CONNECTION GASES AS WELL AS TRIP AND DOWNTIME GASES ARE NOTED ON THE LOG. LARGE CONNECTION GASES WHICH APPEAR ON THE MUD LOG USUALLY REFLECT UPHOLE GAS INTERVALS BLEEDING GAS 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 GAS BUSTER THE INTERVAL IS MARKED ON THE MGS COLUMN AND SIZE OF FLARES NOTED.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE MUD LOG AS METAMORPHICS. KAOLIN PERCENTAGE IN SS INTERVALS IS ALSO NOTED

1 UNIT OF GAS = 200 PPM METHANE

EPOCH WELL SERVICES COMMENCED FULL LOGGING OPERATIONS ON 02/16/2010 @ 3890' MD

SHALE = PALE YELLOWISH BROWN, LIGHT BROWN, LIGHT GRAY; FIRM TO MODERATELY HARD; SUB BLOCKY, BLOCKY SLIGHT IRREGULAR FRACTURE; WEDGELIKE TABULAR SLIGHT PLATY CUTTINGS HABIT; EARTHY DULL SLIGHT WAXY LUSTER; SILTY TO CLAYEY TEXTURE; SOME GRADING TO SILTSTONE, TRACE CALCAREOUS.

SANDSTONE = LIGHT YELLOWISH BROWN, SOME OFF WHITE/TAN, TRACE LIGHT GRAYISH BROWN; UPPER TO LOWER VERY FINE GRAIN; SUB ANGULAR IN PART SOME SUB ROUND; CLAY TO SILICA MATRIX CEMENT; WEAK HCL REACTION; TRACE SPECKLED BLACK LITHIC/CARBONACEOUS SHALE IMBEDDED; POOR TO FAIR INTERGRANULAR POROSITY.

SILTSTONE = VARIED COLORS, LIGHT YELLOWISH BROWN, GRAYISH BROWN; CRUMBLY TO CRUNCHY TENACITY; PLATY TO SEMI MASSIVE CUTTINGS HABIT; SUB BLOCKY TO SLIGHT IRREGULAR FRACTURE; DULL RESINOUS LUSTER; GRITTY TO SILTY TEXTURE; TRACE CALCAREOUS; TRACE THINLY IMBEDDED GRAYISH SHALE.

SILTSTONE = YLWISH GRY, REDDISH BRWN, MED GRY; OCC MOTTLED; FIRM TO DENSE TENACITY WITH MASSIVE TO OCC SUB TABULAR CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SUB SPARKLY LUSTER WITH GRITTY TO EARTHY TEXTURE; SLIGHTLY CALC IN PLACES; COMMONLY GRADING TO AND INTERBEDDED WITH SHALES AND SANDSTONES.

SHALE = PALE YELLOWISH BROWN, LIGHT GRY-ISH BRWN, GRY MOTTLED APPEARANCE; FIRM TO DENSE TENACITY WITH SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SMOOTH TEXTURE WITH DULL EARTHY TO WAXY LUSTER; GRADES TO SILTSTONE IN PLACES; COMMONLY INTERBEDDED WITH SILTS AND SANDSTONE. SLIGHT REACTION TO DILUTE HCL IN PLACES.

SANDSTONE = LT GRY, GRYISH GRN, GRY WITH HUES OF YLW; INDIVIDUAL GRAINS ARE TRANSP TO OPAQUE; SUB ANGULAR TO SUB ROUND WITH LOW TO OCC MODERATE SPHERICTY MODERATELY SORTED; GRADES TO AND INTERBEDDED WITH SILTSTONES AND SHALES; DOMINANTLY CONSOLIDATED WITH CLAY OCC CALCAREOUS MATRIX; SLIGHT TO NO INCREASE IN DITCH GAS.

SHALE = PALE YLWISH GRY; LIGHT GRY-ISH PURP, GRY MOTTLED APPEARANCE; FIRM TO DENSE TENACITY WITH SUB TABULAR

NE #1 9.875 IN @ 3821'
HUGHES w/ 6-13's 2-12's
20.75 HR\$ 1177

DT GAS 75u

WILL RETRIEVE CORRECT DATA AND APPEND TO LOG

MW IN 9.1 VIS 32
MW OUT 9.2 VIS 32

MAX GAS 152u

Ttl Gas	100	<10	Meth C-1	100K
CO2	10K	<10	Ethn C-2	100K
Flare Ht.	100	<10	Prop C-3	100K
		<10	Butn C-4	100K
		<10	Pent C-5	100K

MUD DATA @ 3860'
MW 9.1 EV 33 PV 4 YP 8
API FIL 10.6 GEL 2/3.5 GH 10.80
CL 450 Ca+ 60 MBT 16.0 SOL 3.7
24 HR LOSSES 0 bbls

MW IN 9.1 VIS 43
MW OUT 9.1+ VIS 45

MAX GAS 162u

MW IN 9.1+ VIS 45
MW OUT 9.1+ VIS 45

CG 15u

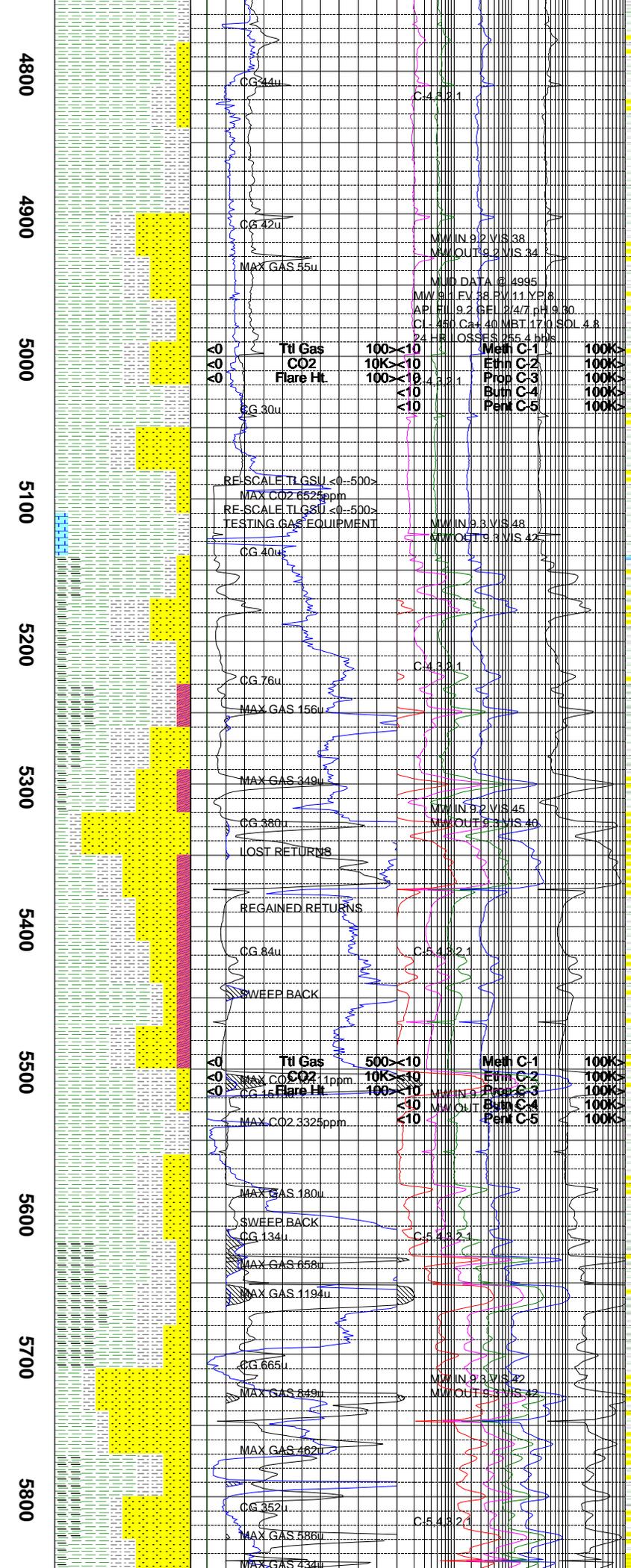
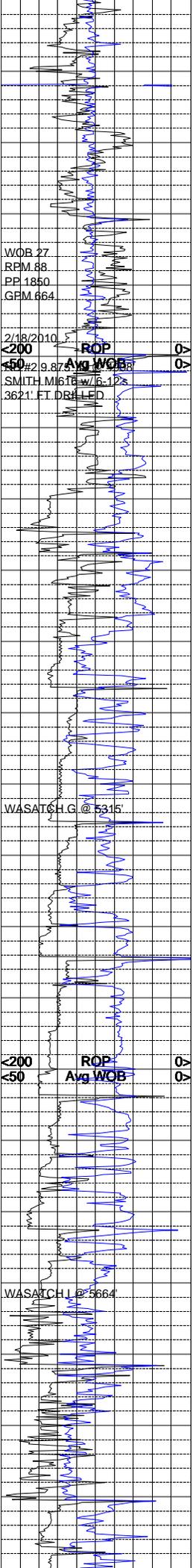
Ttl Gas	100	<10	Meth C-1	100K
CO2	10K	<10	Ethn C-2	100K
Flare Ht.	100	<10	Prop C-3	100K
		<10	Butn C-4	100K
		<10	Pent C-5	100K

MW IN 9.1 VIS 40
MW OUT 9.3 VIS 46

CG 31u

MW IN 9.2 VIS 38
MW OUT 9.2 VIS 36

CG 77u



TO SUB WEDGE LIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; EARTHY TO SMOOTH TEXTURE WITH DULL EARTHY TO WAXY LUSTER; GRADES TO SILTSTONE IN PLACES; COMMONLY INTERBEDDED WITH SILTS AND SANDSTONE.

SILTSTONE = LIGHT YLWSH BRWN; GRAYISH BRWN, REDDISH PURP; CRUMBLY TO CRUNCHY TENACITY; SUB BLKY TO MASSIVE CUTTINGS HABIT; IRREGULAR TO SLIGHTLY HACKLY FRACTURE; DULL TO SUB SPARKLY LUSTER; GRITTY TO SILTY TEXTURE.

NOTE: TRIP OUT OF HOLE AT 4998' TO LAY DOWN DIRECTIONAL TOOLS. ACHIEVED VERTICAL AT 4996' MD 4901.16' TVD ON 02-17-2010 AT 12:17 HRS
MAXIMUM TRIP GAS 214u
FINAL SURVEY DATA FROM SCHLUMBERGER MD: 4996
TVD: 4901.16
AZIMUTH: 131.49
INCLINATION: 0.09

LIMESTONE = VERY LT BRWN TO BUFF; FIRM TO DENSE TENACITY WITH SUB WEDGE LIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR FRACTURE SL FLAKY SCALY IN PLACES; SMOOTH SCALY WITH DULL TO SUB WAXY LUSTER; STRONG VIOLENT REACTION TO DILUTE HCL; GRADES TO A LIMEY SHALE IN PLACES.

SHALE = GRY, GRY WITH DARK CARBONACEOUS MATERIAL AND OR LITHIC CLASTS; GRY WITH HUES OF YLW; FIRM TO SUB MALLEABLE TENACITY WITH IRREGULAR FRACTURE; SMOOTH TO SL EARTHY TEXTURE; WAXY TO SUB GREASY LUSTER; SL MOTTLED IN PLACES; SUB TABULAR/SUB MASSIVE TO WEDGE LIKE CUTTINGS HABIT; BECOMES LIMEY IN PLACES;

CARBONACEOUS SHALE = DARK BRWN, BRWN, HUES OF BLACK; BRWN WITH DARKER BRWN TO BLACK CARBONACEOUS LAMINATIONS; OCC PYRITIC IN PLACES; SMOOTH TO OCC SUB ABRASIVE TEXTURE WITH WAXY TO OCC SUB RESINOUS LUSTER; SUB TABULAR TO TABULAR CUTTINGS HABIT WITH IRREGULAR TO SUB PLATY FRACTURE; CRUNCHY TO DENSE TENACITY; GRADES TO SHALE IN PLACES INTERBEDDED WITH SHALES AND SANDSTONES.

SANDSTONE = GRY, LT GRY, GREEN; HARD NON FRIABLE; SUB ANGULAR TO ANGULAR OCC SUB ROUND; CONSOLIDATED; SILICEOUS/SL CALC CEMENT; GREEN HUES ARE MOST LIKELY A RESULT OF CHLORITIZATION.

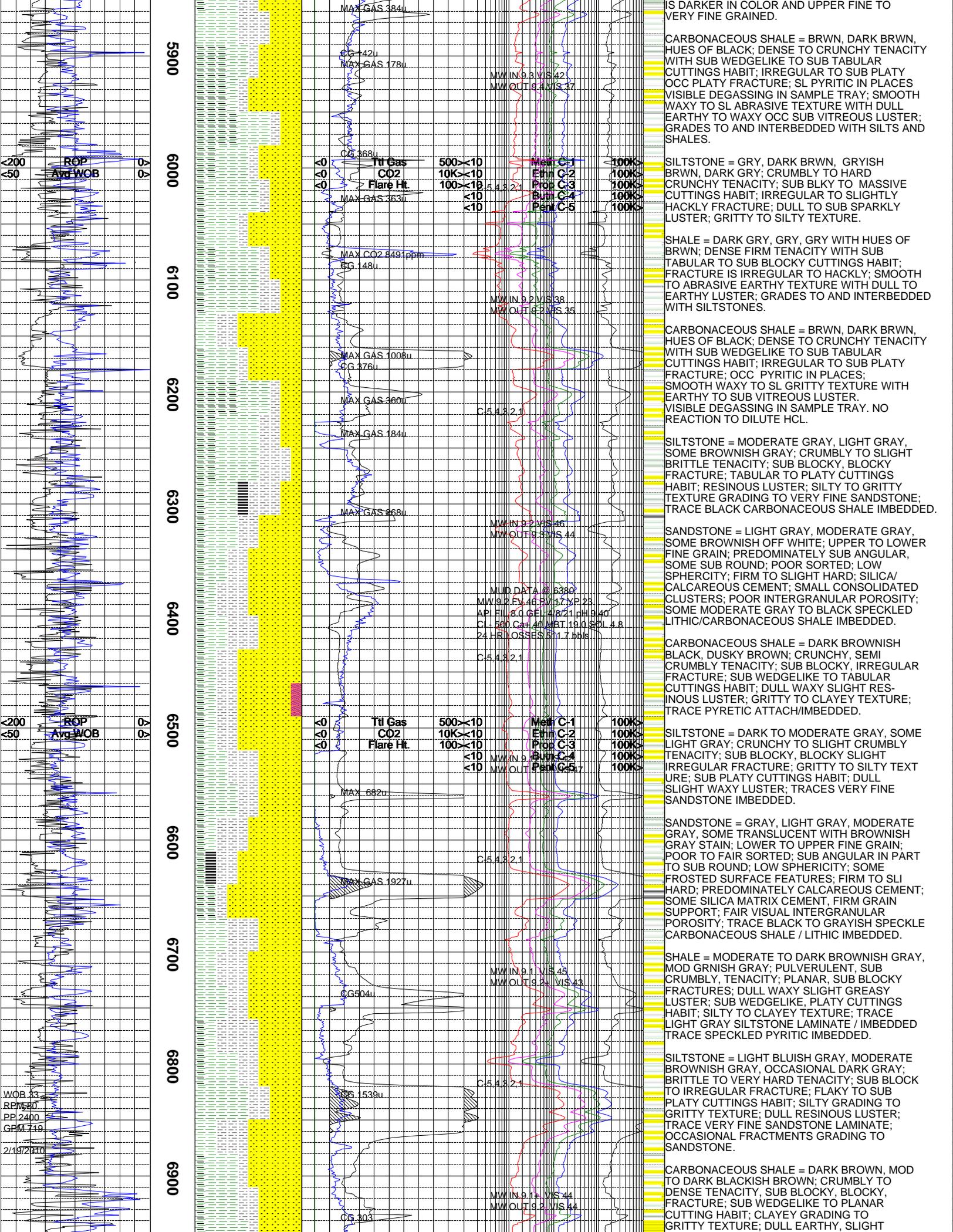
WASATCH G SANDSTONE = WHT, OFF WHT, VERY LT GRY; UPPER MEDIUM TO FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ANGULAR TO SUB ROUND TRANSPARENT TO TRANSLUCENT; MODERATELY TO WELL SORTED WITH LOW TO MODERATE SPHERICITY; FIRM BUT HIGHLY FRIABLE; DOMINANTLY UNCONSOLIDATED MOST LIKELY AS A RESULT OF BIT ACTION; CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; ACCESSORIES ARE LESS THAN 3%. MARKED INCREASE IN DITCH GAS; NO REACTION TO DILUTE HCL.

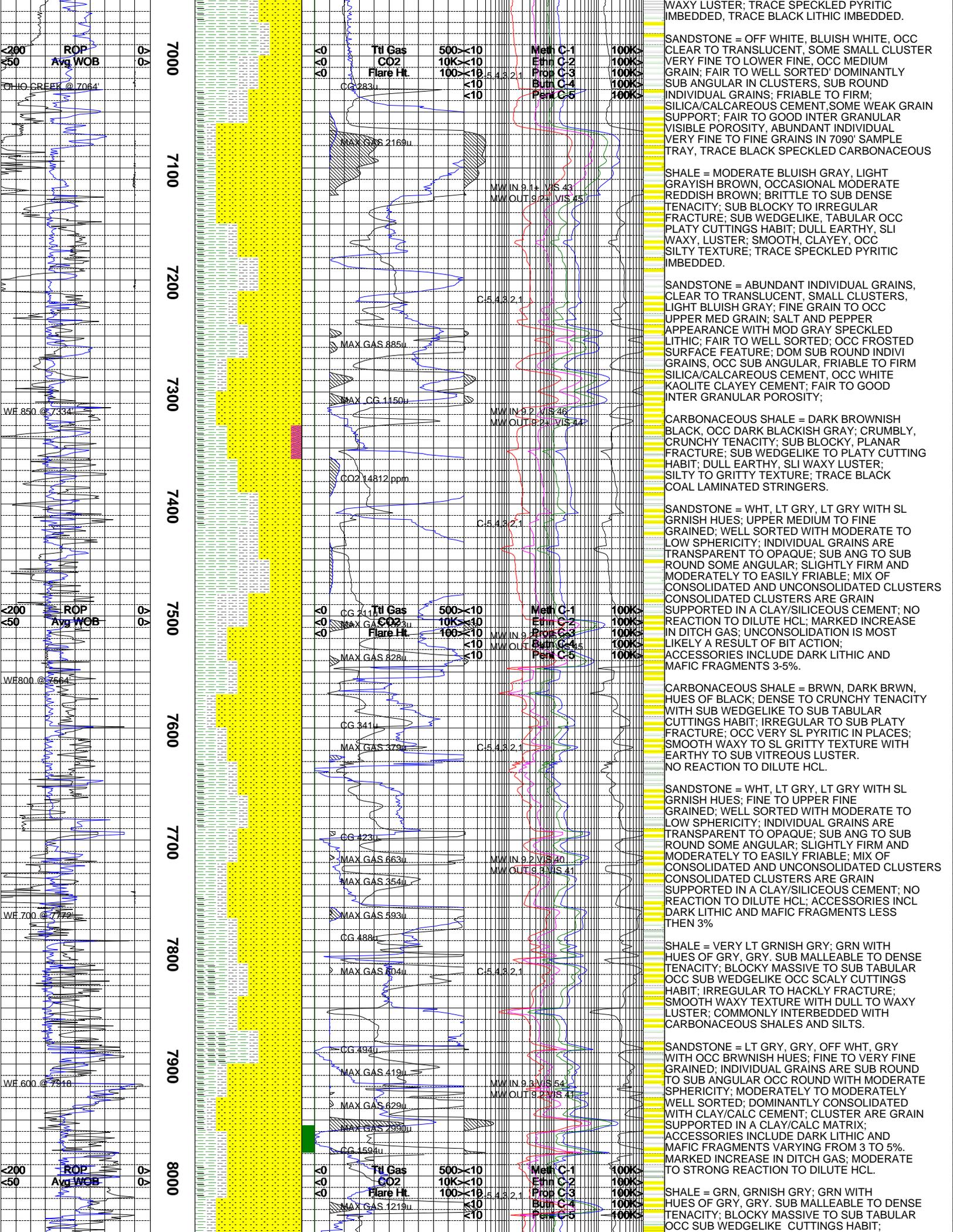
SHALE = DARK GRY, GRY, GRY WITH HUES OF BRWN; DENSE FIRM TENACITY WITH SUB TABULAR TO SUB BLOCKY CUTTINGS HABIT; FRACTURE IS IRREGULAR TO HACKLY; SMOOTH TO ABRASIVE EARTHY TEXTURE WITH DULL TO EARTHY LUSTER; GRADES TO AND INTERBEDDED WITH SILTSTONES.

SILTSTONE = GRY, DARK BRWN, GRAYISH BRWN, REDDISH BRWN; CRUMBLY TO CRUNCHY TENACITY; SUB BLKY TO MASSIVE CUTTINGS HABIT; IRREGULAR TO SLIGHTLY HACKLY FRACTURE; DULL TO SUB SPARKLY LUSTER; GRITTY TO SILTY TEXTURE.

SHALE = DARK GRY, GRY, GRY WITH HUES OF BRWN; DENSE FIRM TENACITY WITH SUB TABULAR TO SUB BLOCKY CUTTINGS HABIT; FRACTURE IS IRREGULAR TO HACKLY; SMOOTH TO ABRASIVE EARTHY TEXTURE WITH DULL TO EARTHY LUSTER; GRADES TO AND INTERBEDDED WITH SILTSTONES.

SANDSTONE = LT GRY, GRAYISH BRWN OCC HUES OF WHT; FIRM AND MODERATELY FRIABLE; INDIVIDUAL GRAINS ARE TRNSP TO OPAQUE; SUB ANGULAR TO SUB ROUND; MODERATELY TO WELL SORTED WITH MODERATE TO LOW SPHERICITY; DOMINANTLY CONSOLIDATED; CLUSTERS ARE GRAIN SUPPORTED IN A CALC/KAOLIN CEMENT; MODERATE TO STRONG REACTION TO DILUTE HCL; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS AND SOME CARBONACEOUS MATERIAL; MARKED INCREASE IN DITCH GAS. DOMINANTLY FINE GRAINED. 2ND SANDSTONE





7000
7100
7200
7300
7400
7500
7600
7700
7800
7900
8000

ROP
Avg WOB
OHIO CREEK @ 7064
WE 850 @ 7334
WE 800 @ 7664
WE 700 @ 7774
WE 600 @ 7918

Ttl Gas 500x<10
CO2 10Kx<10
Flare Ht 100x<10
CG 283u
MAX GAS 2169u
MM IN 9.1+ VIS 43
MM OUT 9.2+ VIS 45
C-5 4.8 2.1
MAX GAS 885u
MAX CG 1150u
MM IN 9.2 VIS 46
MM OUT 9.2+ VIS 47
CO2 14812 ppm
C-5 4.8 2.1
CG 211u
MAX GAS 23u
Flare Ht 100x<10
MAX GAS 828u
CG 341u
MAX GAS 379u
C-5 4.8 2.1
CG 423u
MAX GAS 663u
MAX GAS 354u
MM IN 9.2 VIS 40
MM OUT 9.3 VIS 41
MAX GAS 593u
CG 488u
MAX GAS 604u
C-5 4.8 2.1
CG 494u
MAX GAS 419u
MM IN 9.5 VIS 54
MM OUT 9.2 VIS 47
MAX GAS 290u
CG 159u
Ttl Gas 500x<10
CO2 10Kx<10
Flare Ht 100x<10
MAX GAS 1219u
Meth C-1 100Kx<100
Ethn C-2 100Kx<100
Prop C-3 100Kx<100
Bum C-4 100Kx<100
Perm C-5 100Kx<100

WAXY LUSTER; TRACE SPECKLED PYRITIC IMBEDDED, TRACE BLACK LITHIC IMBEDDED.

SANDSTONE = OFF WHITE, BLUISH WHITE, OCC CLEAR TO TRANSLUCENT, SOME SMALL CLUSTER VERY FINE TO LOWER FINE, OCC MEDIUM GRAIN; FAIR TO WELL SORTED; DOMINANTLY SUB ANGULAR IN CLUSTERS, SUB ROUND INDIVIDUAL GRAINS; FRIABLE TO FIRM; SILICA/CALCAREOUS CEMENT, SOME WEAK GRAIN SUPPORT; FAIR TO GOOD INTER GRANULAR VISIBLE POROSITY, ABUNDANT INDIVIDUAL VERY FINE TO FINE GRAINS IN 7090' SAMPLE TRAY, TRACE BLACK SPECKLED CARBONACEOUS

SHALE = MODERATE BLUISH GRAY, LIGHT GRAYISH BROWN, OCCASIONAL MODERATE REDDISH BROWN; BRITTLE TO SUB DENSE TENACITY; SUB BLOCKY TO IRREGULAR FRACTURE; SUB WEDGE LIKE, TABULAR OCC PLATY CUTTINGS HABIT; DULL EARTHY, SLI WAXY, LUSTER; SMOOTH, CLAYEY, OCC SILTY TEXTURE; TRACE SPECKLED PYRITIC IMBEDDED.

SANDSTONE = ABUNDANT INDIVIDUAL GRAINS, CLEAR TO TRANSLUCENT, SMALL CLUSTERS, LIGHT BLUISH GRAY; FINE GRAIN TO OCC UPPER MED GRAIN; SALT AND PEPPER APPEARANCE WITH MOD GRAY SPECKLED LITHIC; FAIR TO WELL SORTED; OCC FROSTED SURFACE FEATURE; DOM SUB ROUND INDIVI GRAINS, OCC SUB ANGULAR, FRIABLE TO FIRM SILICA/CALCAREOUS CEMENT, OCC WHITE KAOLITE CLAYEY CEMENT; FAIR TO GOOD INTER GRANULAR POROSITY;

CARBONACEOUS SHALE = DARK BROWNISH BLACK, OCC DARK BLACKISH GRAY; CRUMBLY, CRUNCHY TENACITY; SUB BLOCKY, PLANAR FRACTURE; SUB WEDGE LIKE TO PLATY CUTTING HABIT; DULL EARTHY, SLI WAXY LUSTER; SILTY TO GRITTY TEXTURE; TRACE BLACK COAL LAMINATED STRINGERS.

SANDSTONE = WHT, LT GRY, LT GRY WITH SL GRNISH HUES; UPPER MEDIUM TO FINE GRAINED; WELL SORTED WITH MODERATE TO LOW SPHERICITY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANG TO SUB ROUND SOME ANGULAR; SLIGHTLY FIRM AND MODERATELY TO EASILY FRIABLE; MIX OF CONSOLIDATED AND UNCONSOLIDATED CLUSTERS CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; NO REACTION TO DILUTE HCL; MARKED INCREASE IN DITCH GAS; UNCONSOLIDATION IS MOST LIKELY A RESULT OF BIT ACTION; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS 3-5%.

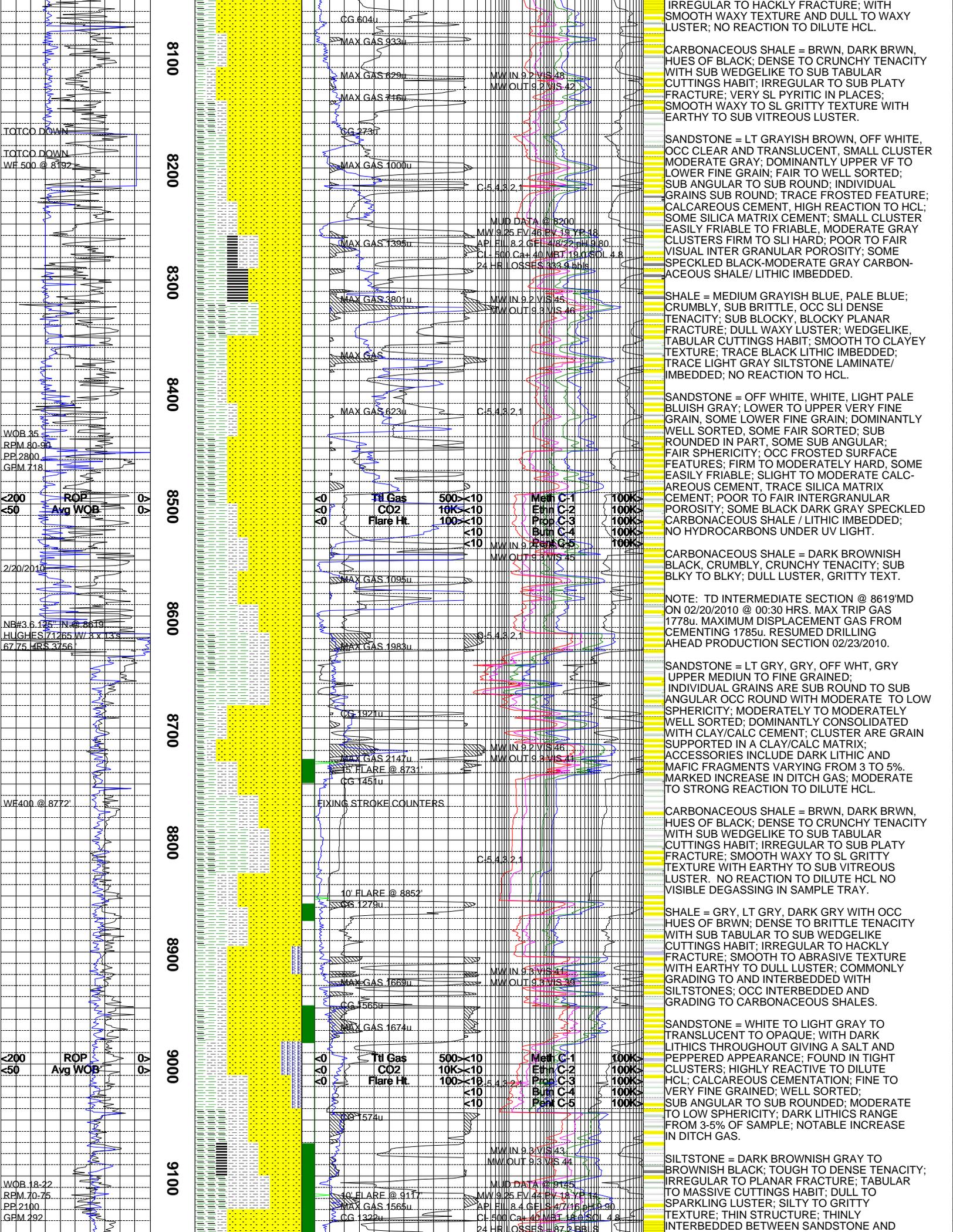
CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGE LIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; OCC VERY SL PYRITIC IN PLACES; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. NO REACTION TO DILUTE HCL.

SANDSTONE = WHT, LT GRY, LT GRY WITH SL GRNISH HUES; FINE TO UPPER FINE GRAINED; WELL SORTED WITH MODERATE TO LOW SPHERICITY; INDIVIDUAL GRAINS ARE TRANSPARENT TO OPAQUE; SUB ANG TO SUB ROUND SOME ANGULAR; SLIGHTLY FIRM AND MODERATELY TO EASILY FRIABLE; MIX OF CONSOLIDATED AND UNCONSOLIDATED CLUSTERS CONSOLIDATED CLUSTERS ARE GRAIN SUPPORTED IN A CLAY/SILICEOUS CEMENT; NO REACTION TO DILUTE HCL; ACCESSORIES INCL DARK LITHIC AND MAFIC FRAGMENTS LESS THEN 3%

SHALE = VERY LT GRNISH GRY; GRN WITH HUES OF GRY, GRY. SUB MALLEABLE TO DENSE TENACITY; BLOCKY MASSIVE TO SUB TABULAR OCC SUB WEDGE LIKE OCC SCALY CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; SMOOTH WAXY TEXTURE WITH DULL TO WAXY LUSTER; COMMONLY INTERBEDDED WITH CARBONACEOUS SHALES AND SILTS.

SANDSTONE = LT GRY, GRY, OFF WHT, GRY WITH OCC BRWNISH HUES; FINE TO VERY FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ROUND TO SUB ANGULAR OCC ROUND WITH MODERATE SPHERICITY; MODERATELY TO MODERATELY WELL SORTED; DOMINANTLY CONSOLIDATED WITH CLAY/CALC CEMENT; CLUSTER ARE GRAIN SUPPORTED IN A CLAY/CALC MATRIX; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS VARYING FROM 3 TO 5%. MARKED INCREASE IN DITCH GAS; MODERATE TO STRONG REACTION TO DILUTE HCL.

SHALE = GRN, GRNISH GRY; GRN WITH HUES OF GRY, GRY. SUB MALLEABLE TO DENSE TENACITY; BLOCKY MASSIVE TO SUB TABULAR OCC SUB WEDGE LIKE CUTTINGS HABIT;



CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; VERY SL PYRITIC IN PLACES; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER.

SANDSTONE = LT GRAYISH BROWN, OFF WHITE, OCC CLEAR AND TRANSLUCENT, SMALL CLUSTER MODERATE GRAY; DOMINANTLY UPPER VF TO LOWER FINE GRAIN; FAIR TO WELL SORTED; SUB ANGULAR TO SUB ROUND; INDIVIDUAL GRAINS SUB ROUND; TRACE FROSTED FEATURE; CALCAREOUS CEMENT, HIGH REACTION TO HCL; SOME SILICA MATRIX CEMENT; SMALL CLUSTER EASILY FRIABLE TO FRIABLE, MODERATE GRAY CLUSTERS FIRM TO SLI HARD; POOR TO FAIR VISUAL INTER GRANULAR POROSITY; SOME SPECKLED BLACK-MODERATE GRAY CARBONACEOUS SHALE/ LITHIC IMBEDDED.

SHALE = MEDIUM GRAYISH BLUE, PALE BLUE; CRUMBLY, SUB BRITTLE, OCC SLI DENSE TENACITY; SUB BLOCKY, BLOCKY PLANAR FRACTURE; DULL WAXY LUSTER; WEDGELIKE, TABULAR CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; TRACE BLACK LITHIC IMBEDDED; TRACE LIGHT GRAY SILTSTONE LAMINATE/ IMBEDDED; NO REACTION TO HCL.

SANDSTONE = OFF WHITE, WHITE, LIGHT PALE BLUISH GRAY; LOWER TO UPPER VERY FINE GRAIN, SOME LOWER FINE GRAIN; DOMINANTLY WELL SORTED, SOME FAIR SORTED; SUB ROUNDED IN PART, SOME SUB ANGULAR; FAIR SPHERICITY; OCC FROSTED SURFACE FEATURES; FIRM TO MODERATELY HARD, SOME EASILY FRIABLE; SLIGHT TO MODERATE CALCAREOUS CEMENT, TRACE SILICA MATRIX CEMENT; POOR TO FAIR INTERGRANULAR POROSITY; SOME BLACK DARK GRAY SPECKLED CARBONACEOUS SHALE / LITHIC IMBEDDED; NO HYDROCARBONS UNDER UV LIGHT.

CARBONACEOUS SHALE = DARK BROWNISH BLACK, CRUMBLY, CRUNCHY TENACITY; SUB BLKY TO BLKY; DULL LUSTER, GRITTY TEXT.

NOTE: TD INTERMEDIATE SECTION @ 8619MD ON 02/20/2010 @ 00:30 HRS. MAX TRIP GAS 1778u. MAXIMUM DISPLACEMENT GAS FROM CEMENTING 1785u. RESUMED DRILLING AHEAD PRODUCTION SECTION 02/23/2010.

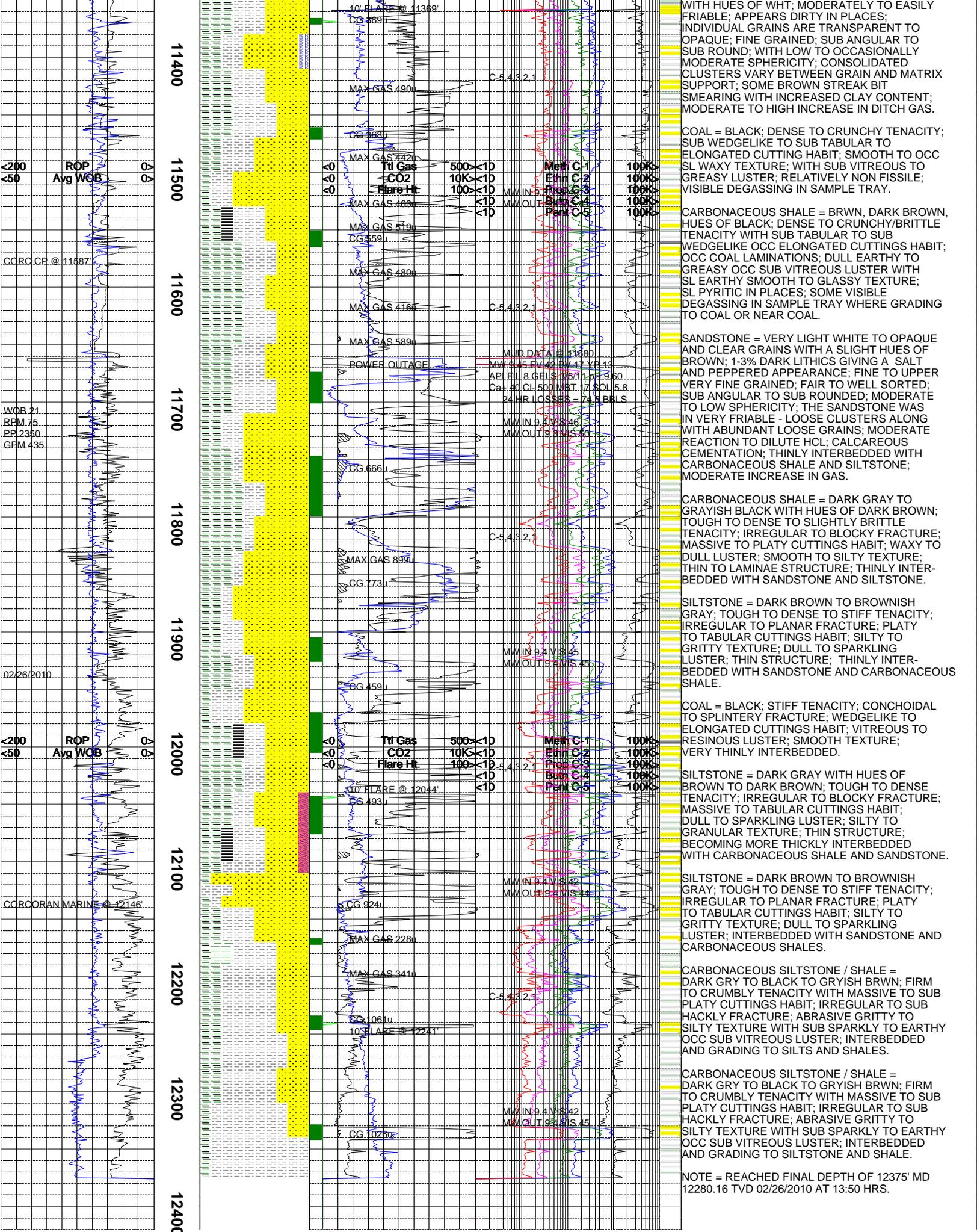
SANDSTONE = LT GRY, GRY, OFF WHT, GRY UPPER MEDIUM TO FINE GRAINED; INDIVIDUAL GRAINS ARE SUB ROUND TO SUB ANGULAR OCC ROUND WITH MODERATE TO LOW SPHERICITY; MODERATELY TO MODERATELY WELL SORTED; DOMINANTLY CONSOLIDATED WITH CLAY/CALC CEMENT; CLUSTER ARE GRAIN SUPPORTED IN A CLAY/CALC MATRIX; ACCESSORIES INCLUDE DARK LITHIC AND MAFIC FRAGMENTS VARYING FROM 3 TO 5%. MARKED INCREASE IN DITCH GAS; MODERATE TO STRONG REACTION TO DILUTE HCL.

CARBONACEOUS SHALE = BRWN, DARK BRWN, HUES OF BLACK; DENSE TO CRUNCHY TENACITY WITH SUB WEDGELIKE TO SUB TABULAR CUTTINGS HABIT; IRREGULAR TO SUB PLATY FRACTURE; SMOOTH WAXY TO SL GRITTY TEXTURE WITH EARTHY TO SUB VITREOUS LUSTER. NO REACTION TO DILUTE HCL NO VISIBLE DEGASSING IN SAMPLE TRAY.

SHALE = GRY, LT GRY, DARK GRY WITH OCC HUES OF BRWN; DENSE TO BRITTLE TENACITY WITH SUB TABULAR TO SUB WEDGELIKE CUTTINGS HABIT; IRREGULAR TO HACKLY FRACTURE; SMOOTH TO ABRASIVE TEXTURE WITH EARTHY TO DULL LUSTER; COMMONLY GRADING TO AND INTERBEDDED WITH SILTSTONES; OCC INTERBEDDED AND GRADING TO CARBONACEOUS SHALES.

SANDSTONE = WHITE TO LIGHT GRAY TO TRANSLUCENT TO OPAQUE; WITH DARK LITHICS THROUGHOUT GIVING A SALT AND PEPPERED APPEARANCE; FOUND IN TIGHT CLUSTERS; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; FINE TO VERY FINE GRAINED; WELL SORTED; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; DARK LITHICS RANGE FROM 3-5% OF SAMPLE; NOTABLE INCREASE IN DITCH GAS.

SILTSTONE = DARK BROWNISH GRAY TO BROWNISH BLACK; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; TABULAR TO MASSIVE CUTTINGS HABIT; DULL TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED BETWEEN SANDSTONE AND



The log data, interpretations and recommendation provided by Epoch are inferences and assumptions based on measurements of drilling fluids. Such inferences and assumptions are not infallible and reasonable professionals may differ. Epoch does not represent or warrant the accuracy, correctness or completeness of any log data, interpretations, recommendations or information provided by Epoch, its officers, agents or employees. Epoch does

