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

MUDLOG TVD

COMPANY EXXONMOBIL
WELL PCU 296-5A9
FIELD PICEANCE CREEK
REGION ROCKIES
COORDINATES LAT: 39.911922
LONG:-108.198686
ELEVATION G.L.: 7294.1'
RKB: 30.2
COUNTY, STATE RIO BLANCO, CO
API INDEX 051031124100
SPUD DATE 12/05/2009
CONTRACTOR HELMERICH_PAYNE
CO. REP. C. CURTIS
RIG/TYPE FLEX 4S / HP 321
LOGGING UNIT ML031
GEOLOGISTS B. SMELSER, M. GROSS
C. RECORD
ADD. PERSONS
CO. GEOLOGIST C. ALBA

LOG INTERVAL

CASING DATA

DEPTHS: 4779' TO 13772'
DATES: 01/27/2011 TO 04/15/2011
SCALE: 1" = 100'

16" AT 150'
10.75" AT 4764'
7.00" AT 10032'
AT

MUD TYPES

HOLE SIZE

SPUD MUD TO 4779'
LSND TO 13772'
TO
TO

14.75" TO 4779'
9.875" TO 10051'
6.125" TO 13772'
TO

ABBREVIATIONS

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

ALTERED ZONE	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	

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ft/hr
<80 Avg WOB 0>
klbs

TVD Depth

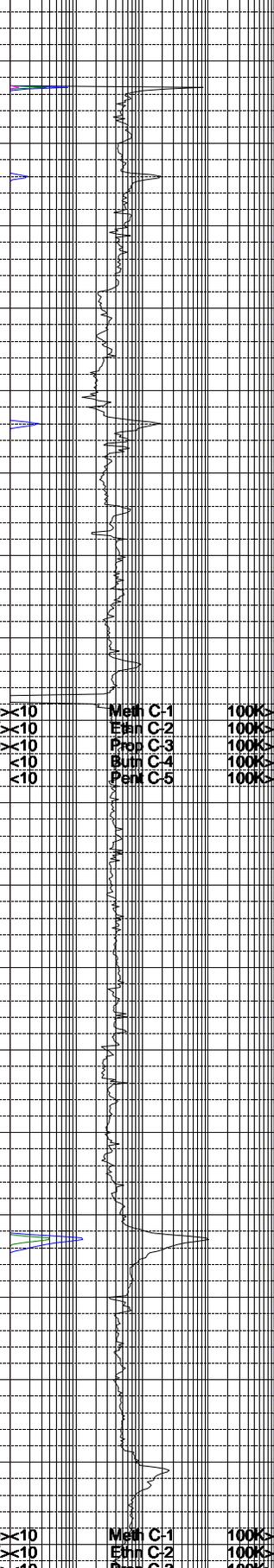
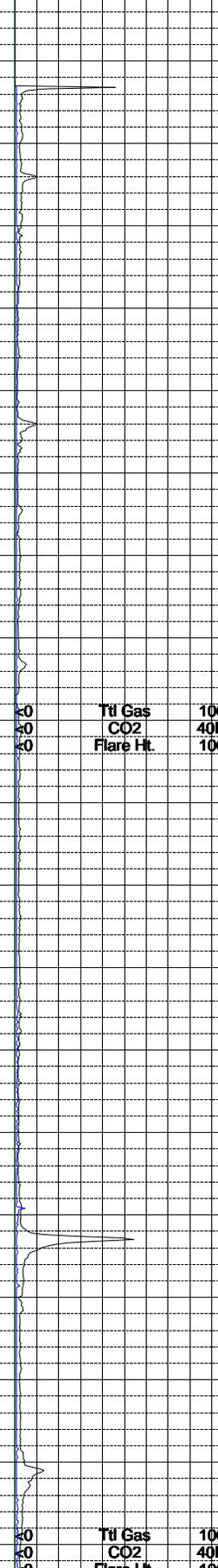
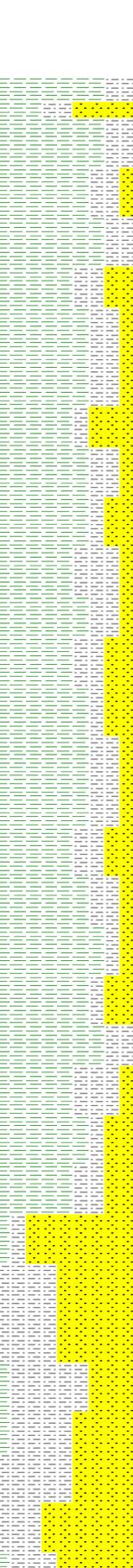
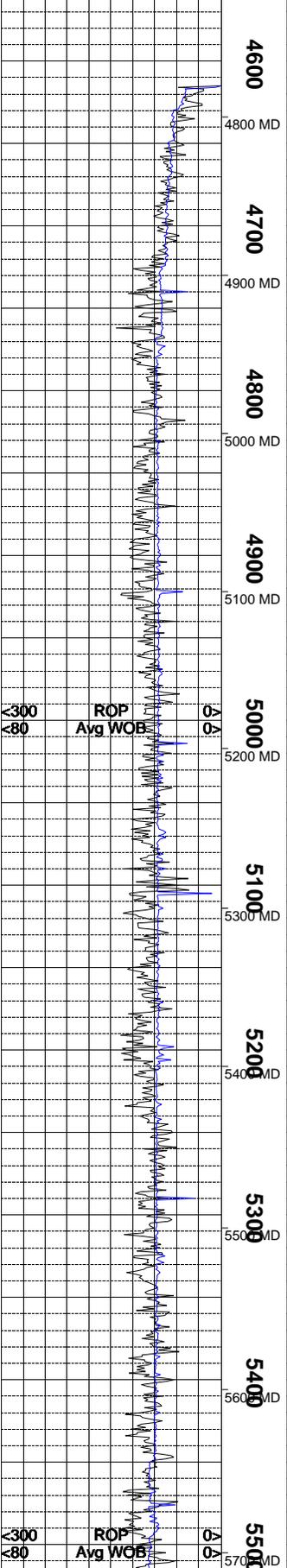
Lithology

MGS
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units
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ppm
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ft

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ppm
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<10 Prop C-3 100K>
<10 Butn C-4 100K>
<10 Pent C-5 100K>

Interp. Lith

Remarks
Survey Data, Mud Reports, Other Info.



EPOCH WELL SERVICES COMMENCED LOGGING THE PCU 296-5A 09 WELL ON 1/27/2011 @ 4779' MD.

SHALE = DARK YELLOWISH BROWN TO GRAYISH BROWN TO MODERATE YELLOWISH BROWN; PLATY TO FLAKY CUTTINGS HABIT; PLANAR TO SPLINTERY FRACTURE; EARTHY LUSTER; MINOR AMOUNTS OF CLAY WASHED OUT DURING CLEANING; THINLY INTERBEDDED WITH SILTSTONE.

SHALE = DARK YELLOWISH BROWN TO VERY DUSKY RED TO MEDIUM GRAY; PLATY TO SCALY TO TABULAR CUTTINGS HABIT; CLAYEY TO SLIGHTLY SILTY TEXTURE; DULL TO EARTHY LUSTER; THINLY INTERBEDDED W/ SILTSTONE AND PALE YELLOWISH BROWN SANDSTONE; CRUMBLY TO STIFF TENACITY.

SHALE = DARK YELLOWISH BROWN TO MOD YELLOWISH BROWN TO VERY DUSKY RED; PLANAR TO SPLINTERY TO HACKLY FRACTURE; DULL EARTHY TO TRACE SPARKLING LUSTER; GRADES TO PALE YELLOWISH BROWN SILTSTONE; TR FRAGMENTS OF PALE BROWN LIMESTONE.

SANDSTONE = VERY DUSKY RED TO PALE YELLOWISH BROWN TO LIGHT GRAY; HARD TO VERY HARD; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR CALCITE CEMENT; MODERATELY CALCAREOUS; VERY FINE TO UPPER FINE GRAIN; GRADATION TO SILTSTONE; 2-4% LITHIC FLECKS IN SAMPLE FRAGMENTS; INTERBEDDED WITH SILTSTONE AND SHALE; FAIRLY SORTED; LOW TO MOD SPHERICITY; ANGULAR TO SUBROUND; NO VISIBLE HYDROCARBON INDICATORS.

SHALE = DARK YELLOWISH BROWN TO VERY DUSKY RED TO MODERATE YELLOWISH BROWN; SCALY TO WEDGELIKE TO PLATY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; GRADES TO SILTSTONE; CRUMBLY TO STIFF TENACITY; EARTHY LUSTER; MASSIVE STRUCTURE WITH MOTTLED COLORS.

SHALE = MODERATE YELLOWISH BROWN TO DARK YELLOWISH BROWN TO VERY DUSKY RED; CLAYEY TO SILTY TEXTURE; PLANAR TO SPLINTERY TO ANGULAR FRACTURE; SCALY TO WEDGELIKE TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; GRADES TO PALE YELLOWISH BROWN SILTSTONE.

SHALE = DARK YELLOWISH BROWN TO PALE YELLOWISH BROWN MOTTLED WITH VERY DUSKY RED; CLAYEY TO SILTY TEXTURE; SOFT TO CRUMBLY TENACITY; DULL EARTHY LUSTER; IRREGULAR TO ANGULAR TO PLANAR FRACTURE; WEDGELIKE TO TABULAR TO PLATY CUTTINGS HABIT; GRADATION TO SILTSTONE; MINOR TO MODERATE REACTION TO HCl; TRACE AMOUNTS OF LIMESTONE FRAGS IN SAMPLE.

SILTSTONE = MODERATE YELLOWISH BROWN TO GRAYISH RED MOTTLED WITH MEDIUM GRAY; SEMI NODULAR TO ELONGATED TO PLATY CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; SPARKLING LUSTER; MINOR LOOSE FINE GRAIN SAND IN SAMPLE FRAGMENTS; GRADATION TO SANDSTONE.

SANDSTONE = WHITE TO LIGHT GRAY TO MEDIUM GRAY TO BROWNISH GRAY TO A PALE YELLOWISH BROWN COLOR; QUARTZ FRAMEWORK WITH A MODERATE REACTION TO A 10% HCL SOLUTION INDICATING SILICA AND SLIGHT CALCITE CEMENTATION; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; FAIR TO WELL SORTING; SUBANGULAR TO SUBROUND ANGULARITY; MODERATE TO HIGH SPHERICITY; EASILY FRIABLE TO MODERATELY HARD HARDNESS; 10 - 30% LITHIC CLASTS IN THE SAMPLES; INTERBEDDED WITH SILTSTONE AND SHALE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SILTSTONE = MODERATE YELLOW TO YELLOWISH GRAY TO LIGHT OLIVE GRAY TO LIGHT GRAY TO PALE BROWN IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TO

<300 ROP 0>
<80 Avg WOB 0>

TVD Depth

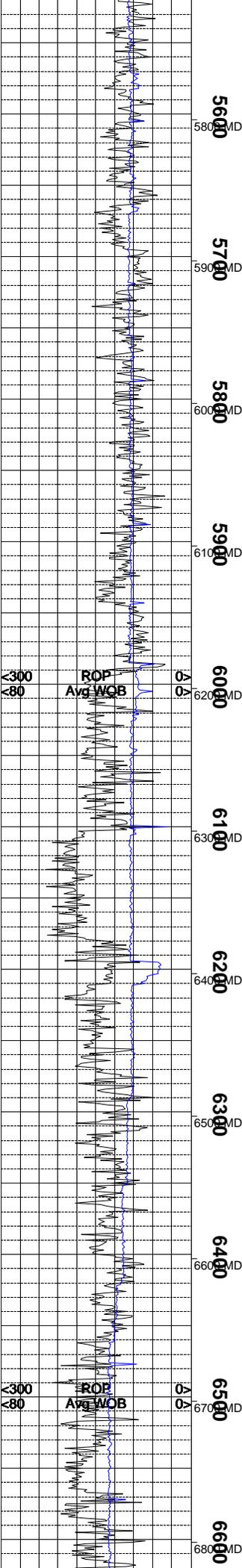
Lithology

MGS
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units
<0 CO2 40K>
ppm
<0 Flare Ht. 100>
ft

<10 Meth C-1 100K>
ppm
<10 Ethn C-2 100K>
<10 Prop C-3 100K>

Interp. Lith

Remarks



GRANULAR TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; KAOLINITE CLAY PRESENT IN THE SAMPLE AS AN ACCESSORY MINERAL.

SHALE = VERY LIGHT GRAY TO GRAY TO A GRAYISH BROWN TO GRAYISH ORANGE IN COLOR; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; LAMINAE TO NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; KAOLINITE CLAY PRESENT IN THE SAMPLE AS AN ACCESSORY MINERAL; INTERBEDDED WITH SILTSTONE AND SANDSTONE; SAMPLE CONTAINS TRACE AMOUNTS OF A GREEN MINERAL POSSIBLY CHLORITE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO A YELLOWISH BROWN TO A BROWNISH GRAY COLOR; QUARTZ FRAMEWORK WITH UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING WITH SOME SAMPLES BEING VERY WELL SORTED; ROUND TO SUBANGULAR ANGULARITY; HIGH TO MODERATE SPHERICITY; FROSTED GRAIN PRESENT ON SOME SAMPLES; EASILY FRIABLE TO FRIABLE TO MODERATELY HARD HARDNESS; MODERATE TO SLIGHT REACTION TO 10% HCL SOLUTION; SILICA CEMENTATION WITH SOME CALCITE CEMENTATION; KAOLINITE CLAY PRESENT AS AN ACCESSORY MINERAL; >10 -30% LITHIC CLASTS.

SILTSTONE = MODERATE YELLOW TO YELLOWISH GRAY TO VERY LIGHT GRAY TO MEDIUM GRAY TO PALE BROWN IN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TO GRANULAR TEXTURE; NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; ACCESSORY MINERALS IN THE SAMPLE INCLUDE KAOLINITE CLAY.

NOTE = TRIPPING OUT OF THE HOLE TO LAY DOWN DIRECTIONAL TOOLS @ 6181' MD.

SHALE = DUSKY YELLOWISH BROWN TO DARK YELLOWISH BROWN MOTTLED WITH VERY DUSKY RED; PLATY TO ELONGATED TO SEMI WEDGELIKE CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; EARTHY TO SLI SPARKLING LUSTER; GRADES TO GRAYISH RED SILTSTONE.

SANDSTONE = OFF WHITE TO GRAYISH RED MOTTLED WITH MODERATE YELLOWISH BROWN AND VERY DUSKY RED; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA CEMENT; WELL SORTED; VERY FINE TO UPPER FINE GRAIN; SUBROUND TO ANGULAR; MOD SPHERICITY; GRADATION TO MODERATE YELLOWISH BROWN SILTSTONE; SLIGHTLY TO MODERATELY CALCAREOUS; 5-7% NAHCOLITE IN SAMPLE; PALE REDDISH BROWN TO GRAYISH RED; THINLY INTERBEDDED WITH SILTSTONE; HARD TO VERY HARD; NO VISIBLE HYDROCARBON INDICATORS; TRACE ACCESSORY MINERAL OF MICRO PYRITE ON SAMPLE FRAGMENTS.

SILTSTONE = GRAYISH RED TO PALE BROWN TO GRAYISH BROWN TO MODERATE YELLOWISH BROWN IN COLOR; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHY TO LUSTER; SILTY TO GRITTY TO SLIGHTLY GRANULAR TEXTURE; THIN TO LAMINAE BEDDING STRUCTURES VISIBLE IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; INTERBEDDED WITH SANDSTONE AND SOME SHALE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO MEDIUM LIGHT GRAY TO LIGHT BLUISH GRAY TO GRAYISH BLUE GREEN TO A GRAYISH RED TO A DARK REDDISH BROWN COLOR; QUARTZ FRAMEWORK; VERY FINE TO LOWER MEDIUM GRAIN SIZE; VERY WELL TO FAIR SORTING; SUBANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; SOME FROSTED AND POLISHED GRAINS PRESENT IN THE SAMPLE; SLIGHT TO NO REACTION WITH A 10% HCL SOLUTION; PRIMARILY SILICA CEMENTATION; NO BEDDING STRUCTURES VISIBLE IN THE SAMPLE; NO IDENTIFIABLE ACCESSORY MINERALS PRESENT IN THE SAMPLE; SOME SAMPLES SHOW GRADING WITH YELLOWISH BROWN SILTSTONE; SAMPLE INTERBEDDED WITH SILTSTONE AND SOME SHALE; FEW LITHIC FRAGMENTS INCLUDED IN THE SANDSTONE SAMPLES.

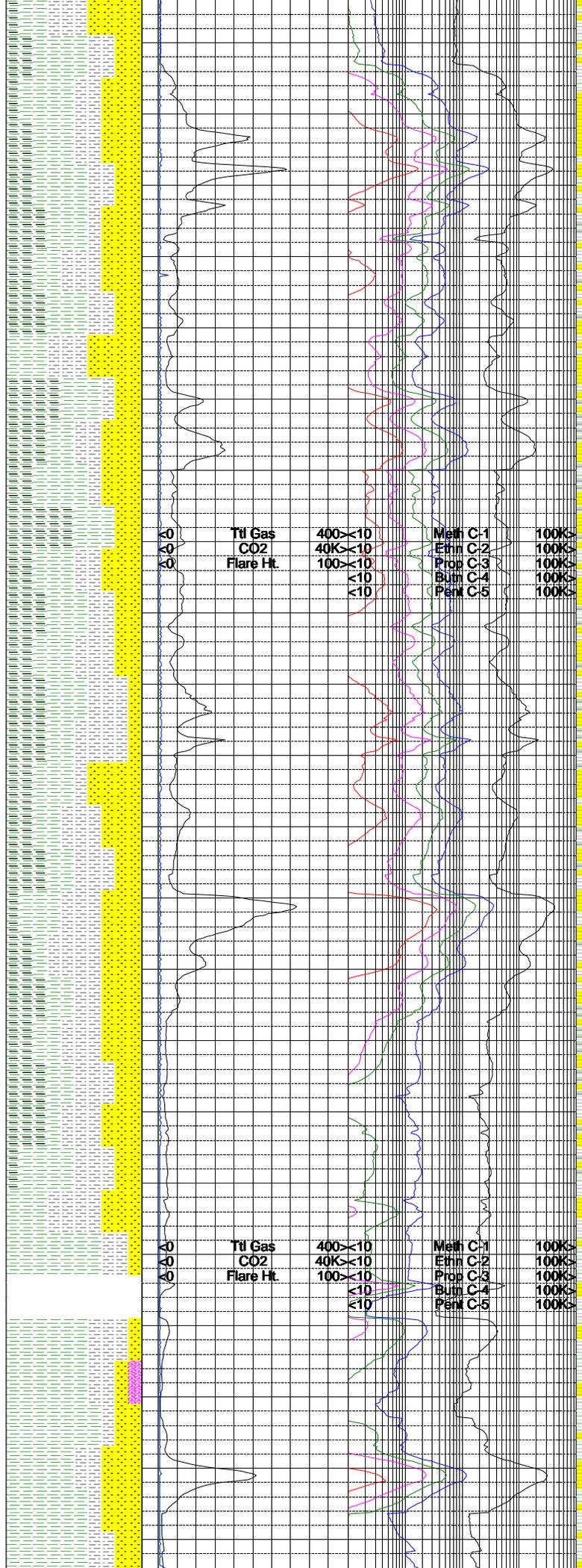
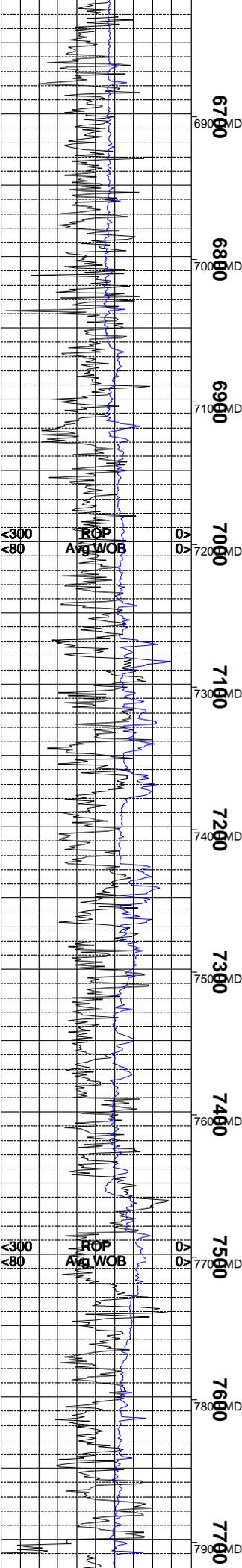
SILTSTONE = GRAYISH RED TO PALE BROWN TO GRAYISH BROWN TO MODERATE YELLOWISH BROWN IN COLOR; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO MOTTLED FRACTURE; MASSIVE TO PLATY TO TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; NO VISIBLE

<300
<80
ROP
Avg WOB

Til Gas 100x10
CO2 40Kx10
Flare Ht 100x10
Meth C-1 100Kx
Ethn C-2 100Kx
Prop C-3 100Kx
Burn C-4 100Kx
Perm C-5 100Kx

<300
<80
ROP
Avg WOB

Til Gas 400x10
CO2 40Kx10
Flare Ht 100x10
Meth C-1 100Kx
Ethn C-2 100Kx
Prop C-3 100Kx
Burn C-4 100Kx
Perm C-5 100Kx



BEDDING STRUCTURES PRESENT.

SHALE = VERY LIGHT GRAY TO GRAY TO MEDIUM GRAY TO GRAYISH BROWN IN COLOR; BRITTLE TO CRUMBLY TO CRUNCHY AND OCCASIONALLY PULVERULENT; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE WITH SOME SAMPLES BEING ALMOST SILTY; LAMINAE TO THIN STRUCTURES VISIBLE IN THE SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = BLACK TO VERY DARK GRAY IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO WAXY OR GREASY LUSTER; SMOOTH TO CLAYEY TEXTURE WITH SOME SAMPLES BEING SLIGHTLY SILTY; LAMINAE TO THIN STRUCTURE VISIBLE IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; INTERBEDDED WITH SHALE, SILTSTONE AND SANDSTONE.

SHALE = VERY LIGHT GRAY TO GRAY TO MEDIUM GRAY TO GRAYISH BROWN IN COLOR; BRITTLE TO CRUMBLY TO CRUNCHY AND OCCASIONALLY PULVERULENT; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE WITH SOME SAMPLES BEING ALMOST SILTY; LAMINAE TO THIN STRUCTURES VISIBLE IN THE SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = BLACK TO VERY DARK GRAY IN COLOR; DENSE TO BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO GREASY TO WAXY LUSTER; SMOOTH TO CLAYEY TO SLIGHTLY SILTY TEXTURE; VERY THIN TO LAMINAE BEDDING STRUCTURES VISIBLE ON THE SAMPLES; INTERBEDDED WITH SANDSTONE, SHALE AND SILTSTONE; TRACE AMOUNTS OF PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL.

NOTE: LOSE RETURNS @ 7312'. REGAIN PARTIAL RETURNS @ 7316'. FULL RETURNS @ 7330'.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO GRAY TO MEDIUM DARK GRAY TO BROWNISH GRAY TO A GRAYISH RED COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING WITH 10 - 30% LITHIC FRAGMENTS INCLUDED; SUBANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; FROSTED GRAINS DUE TO MECHANICAL ABRASION; MANY LOOSE GRAINS IN SAMPLE; FRIABLE TO FIRMLY FRIABLE TO MODERATELY HARD; GRAIN SUPPORTED; MODERATE REACTION WITH A 10% HCL SOLUTION; NO BEDDING STRUCTURES VISIBLE IN THE SAMPLE; TRACE AMOUNTS OF PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL; SOME TRACE CARBONACEOUS MATERIAL IN THE FORM OF COAL PRESENT IN THE SAMPLE.

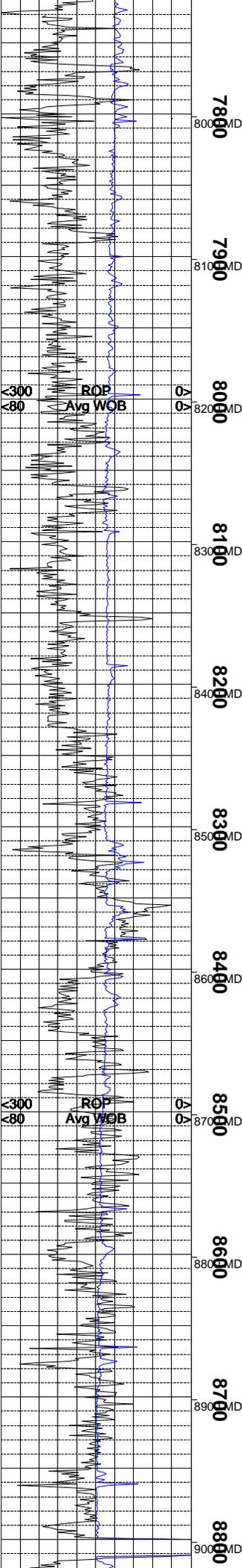
SILTSTONE = GRAY TO MEDIUM GRAY TO A REDDISH BROWN COLOR; DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; EARTHY TO DULL LUSTER; SLITY TO GRITTY TO GRANULAR TEXTURE; NO VISIBLE BEDDING STRUCTURES; PYRITE VISIBLE IN SMALL VEINS AND INCLUSIONS IN SOME OF THE SAMPLES; SOME COAL DEGASSING IN THE SAMPLE.

CARBONACEOUS SHALE = BROWNISH BLACK TO OLIVE GRAY TO DARK GRAY; SCALY TO PLATY TO ELONGATED CUTTINGS HABIT; CLAYEY TO SLIGHTLY SILTY TEXTURE; EARTHY TO SEMI VITREOUS LUSTER; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; GRADATION TO OLIVE GRAY SILTSTONE; THINLY INTERBEDDED WITH COAL LAMINAE; TRACE ACCESSORY MINERAL OF FRAMBOIDAL PYRITE AND PYRITIC VEINING.

NOTE: LOSE FULL RETURNS AT 7808'. GAIN PARTIAL RETURNS AT 7820'.

SHALE = MEDIUM GRAY TO LIGHT GRAY; PLATY TO ELONGATED TO TABULAR CUTTINGS HABIT; CLAYEY TEXTURE; EARTHY TO DULL LUSTER; MINOR FLECKS OF CARBONACEOUS SHALE IN SAMPLE FRAGMENTS; TRACE ACCESSORY MINERAL OF PYRITE ON FRACTURED SURFACE.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY MOTTLED WITH OLIVE GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA CEMENT; SUBANGULAR TO SUBROUND; MODERATE SPHERICITY; FAIR TO WELL SORTED; VERY



7890 MD
8000 MD
7990 MD
8100 MD
8090 MD
8200 MD
8190 MD
8300 MD
8290 MD
8400 MD
8390 MD
8500 MD
8490 MD
8600 MD
8590 MD
8700 MD
8690 MD
8800 MD
8790 MD
8900 MD
8890 MD
9000 MD

Til Gas	400 $\times 10$	Meth C-1	100K <math>< </math>
CO2	40K $\times 10$	Ethn C-2	100K <math>< </math>
Flare Ht	100 $\times 10$	Prop C-3	100K <math>< </math>
	<math>< 10</math>	Bum C-4	100K <math>< </math>
	<math>< 10</math>	Perlt C-5	100K <math>< </math>

FINE TO FINE GRAIN; TRACE ACCESSORY MINERALS OF CHLORITE AND MICRO PYRITE; GRADATION TO LIGHT MED GRAY SILTSTONE; MOD HARD TO HARD; THINLY INTERBEDDED WITH SILTSTONE AND SHALE; NO VISIBLE HYDROCARBON INDICATORS; 1-3% DARK LITHIC FRAGMENTS IN SAMPLE SPECIMENS.

SHALE = LIGHT GRAY TO MEDIUM GRAY; PLATY TO WEDGE LIKE TO SCALY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; EARTHY LUSTER; TRACE CARBONACEOUS SHALE FLECKS IN SAMPLE FRAGMENTS; TRACE ACCESSORY MINERAL OF PYRITE ON FRACTURE SURFACE; CRUNCHY TO HARD TENACITY.

SHALE = MEDIUM GRAY TO LIGHT GRAY; SCALY TO ELONGATED TO PLATY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; DULL TO EARTHY LUSTER; THINLY INTERBEDDED W/ SILTSTONE; MASSIVE STRUCTURE; TRACE ACCESSORY MINERAL OF PYRITE.

SILTSTONE = MEDIUM GRAY TO LIGHT GRAY MOTTLED WITH GRAYISH RED; TOUGH TO CRUNCHY TENACITY; SILTY TO SUCROSIC TEXTURE; SPARKLING TO EARTHY LUSTER; GRADATION TO LIGHT GRAY SANDSTONE; WEDGE LIKE TO SCALY CUTTINGS HABIT; IRREGULAR TO PLANAR TO ANGULAR FRACTURE.

SHALE = LIGHT GRAY TO MEDIUM GRAY; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; PLANAR TO SPLINTERY TO BLOCKY CUTTINGS HABIT; CLAYEY TO SILTY TEXTURE; DULL TO EARTHY LUSTER; MASSIVE STRUCTURE WITH THINLY INTERBEDDED WITH SILTSTONE.

SHALE = MEDIUM GRAY TO LIGHT GRAY MOTTLED WITH GRAYISH RED; PLATY TO SCALY TO WEDGE LIKE CUTTINGS HABIT; DULL TO EARTHY LUSTER; GRADATION TO LIGHT GRAY SILTSTONE; MASSIVE STRUCTURE WITH THIN INTERBEDDED LAMINAE OF SILTSTONE.

NOTE: LOSE FULL RETURNS AT 8507'. REGAIN PARTIAL RETURNS @ 8551'. FULL RETURNS @ 8575'.

SHALE = LIGHT GRAY TO MEDIUM GRAY; PLATY TO SCALY TO WEDGE LIKE CUTTINGS HABIT; SILTY TO MATTE TEXTURE; EARTHY LUSTER; TRACE ACCESSORY MINERALS OF MICAS AND PYRITE; HACKLY TO IRREGULAR TO PLANAR FRACTURE; THINLY INTERBEDDED WITH LIGHT GRAY SILTSTONE.

SANDSTONE = OFF WHITE TO LIGHT GRAY; PREDOMINANTLY LOOSE GRAINS; VERY FINE TO UPPER FINE GRAIN; LOW TO MOD SPHERICITY; ROUND TO SUBANGULAR; WELL SORTED; TRANSPARENT TO TRANSLUCENT; MINOR ABRASION DUE TO PDC BIT ACTION; TRACE ACCESSORY MINERALS OF CHLORITE MICA AND MICRO PYRITE; SLIGHTLY TO MODERATELY CALCAREOUS; 1-3% CARBONACEOUS FLECKS IN PRESERVED SAMPLE SPECIMENS; 10-20% OF SAMPLE AS PRESERVED SANDSTONE; GRADES TO LIGHT GRAY SILTSTONE.

SHALE = LIGHT GRAY TO MEDIUM GRAY WITH MINOR DARK GRAY; PLATY TO WEDGE LIKE TO ELONGATED CUTTINGS HABIT; MATTE TO SILTY TEXTURE; EARTHY LUSTER; GRADES TO LIGHT GRAY SILTSTONE; CRUNCHY TO MODERATE HARD TENACITY.

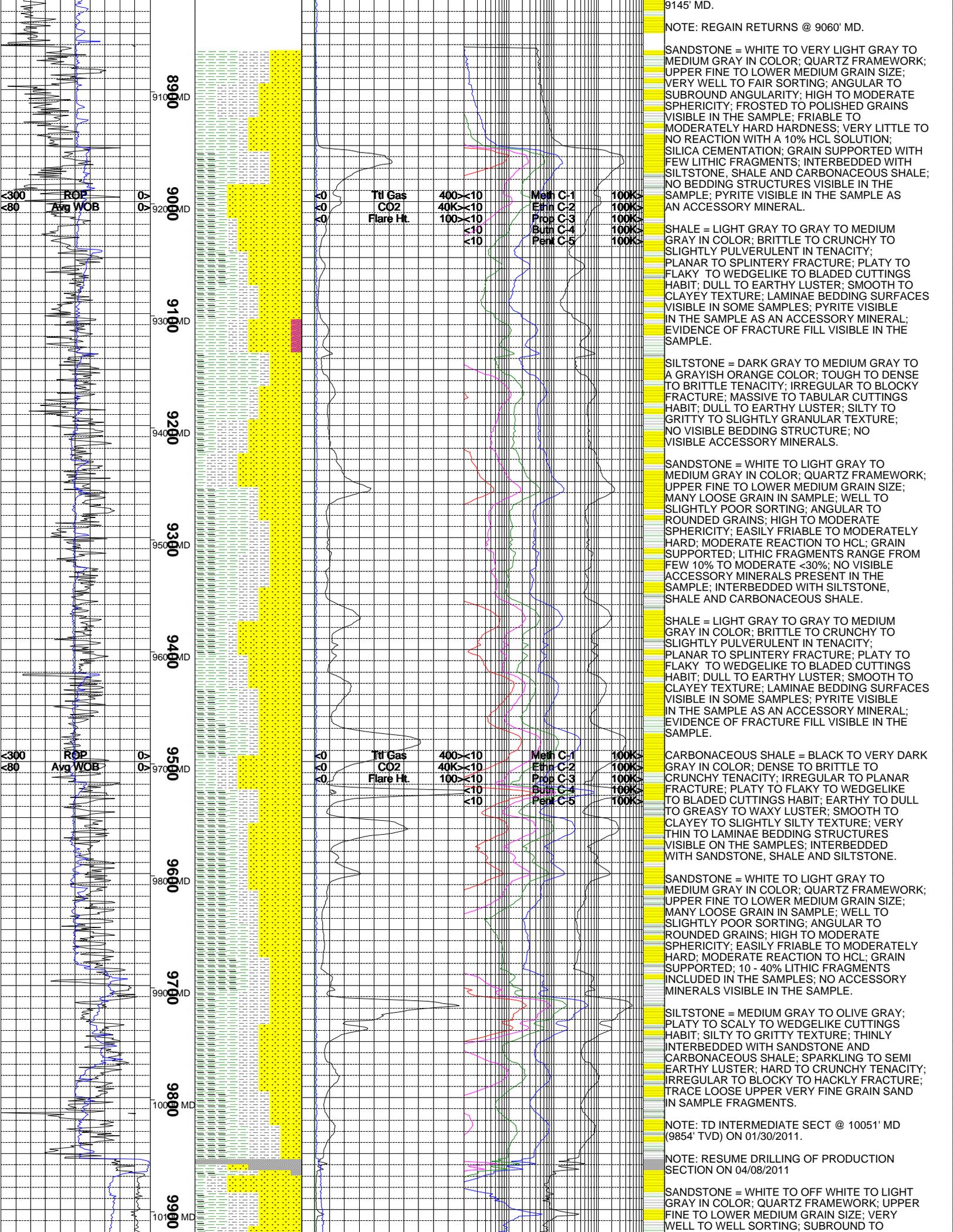
SILTSTONE = MEDIUM GRAY TO LIGHT GRAY MOTTLED WITH GRAYISH RED TO VERY DUSKY RED; HARD TO TOUGH TENACITY; IRREGULAR TO PLANAR FRACTURE; SILTY TO GRITTY TEXTURE; SPARKLING TO EARTHY LUSTER; GRADATION TO LIGHT GRAY SANDSTONE; ELONGATED TO SCALY TO TABULAR CUTTINGS HABIT.

SHALE = MEDIUM GRAY MOTTLED WITH VERY DUSKY RED TO GRAYISH RED; MATTE TO SILTY TEXTURE; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; SPLINTERY TO PLANAR FRACTURE; GRADATION TO LIGHT GRAY SILTSTONE; EARTHY TO DULL LUSTER.

NOTE: LOSE FULL RETURNS @ 9013' MD.

NOTE: PULLED UP 2 STANDS AND WORK PIPE TO BUILD UP MUD VOLUME.

NOTE: DUE TO LOSS OF RETURNS, SAMPLE LITHOLOGY WILL BE AN APPROXIMATION UNTIL A BOTTOMS UP IS ESTABLISHED @



NOTE: REGAIN RETURNS @ 9060' MD.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO MEDIUM GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; VERY WELL TO FAIR SORTING; ANGULAR TO SUBROUND ANGULARITY; HIGH TO MODERATE SPHERICITY; FROSTED TO POLISHED GRAINS VISIBLE IN THE SAMPLE; FRIABLE TO MODERATELY HARD HARDNESS; VERY LITTLE TO NO REACTION WITH A 10% HCL SOLUTION; SILICA CEMENTATION; GRAIN SUPPORTED WITH FEW LITHIC FRAGMENTS; INTERBEDDED WITH SILTSTONE, SHALE AND CARBONACEOUS SHALE; NO BEDDING STRUCTURES VISIBLE IN THE SAMPLE; PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL.

SHALE = LIGHT GRAY TO GRAY TO MEDIUM GRAY IN COLOR; BRITTLE TO CRUNCHY TO SLIGHTLY PULVERULENT IN TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE BEDDING SURFACES VISIBLE IN SOME SAMPLES; PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL; EVIDENCE OF FRACTURE FILL VISIBLE IN THE SAMPLE.

SILTSTONE = DARK GRAY TO MEDIUM GRAY TO A GRAYISH ORANGE COLOR; TOUGH TO DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO GRITTY TO SLIGHTLY GRANULAR TEXTURE; NO VISIBLE BEDDING STRUCTURE; NO VISIBLE ACCESSORY MINERALS.

SANDSTONE = WHITE TO LIGHT GRAY TO MEDIUM GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; MANY LOOSE GRAIN IN SAMPLE; WELL TO SLIGHTLY POOR SORTING; ANGULAR TO ROUNDED GRAINS; HIGH TO MODERATE SPHERICITY; EASILY FRIABLE TO MODERATELY HARD; MODERATE REACTION TO HCL; GRAIN SUPPORTED; LITHIC FRAGMENTS RANGE FROM FEW 10% TO MODERATE <30%; NO VISIBLE ACCESSORY MINERALS PRESENT IN THE SAMPLE; INTERBEDDED WITH SILTSTONE, SHALE AND CARBONACEOUS SHALE.

SHALE = LIGHT GRAY TO GRAY TO MEDIUM GRAY IN COLOR; BRITTLE TO CRUNCHY TO SLIGHTLY PULVERULENT IN TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE BEDDING SURFACES VISIBLE IN SOME SAMPLES; PYRITE VISIBLE IN THE SAMPLE AS AN ACCESSORY MINERAL; EVIDENCE OF FRACTURE FILL VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = BLACK TO VERY DARK GRAY IN COLOR; DENSE TO BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO GREASY TO WAXY LUSTER; SMOOTH TO CLAYEY TO SLIGHTLY SILTY TEXTURE; VERY THIN TO LAMINAE BEDDING STRUCTURES VISIBLE ON THE SAMPLES; INTERBEDDED WITH SANDSTONE, SHALE AND SILTSTONE.

SANDSTONE = WHITE TO LIGHT GRAY TO MEDIUM GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; MANY LOOSE GRAIN IN SAMPLE; WELL TO SLIGHTLY POOR SORTING; ANGULAR TO ROUNDED GRAINS; HIGH TO MODERATE SPHERICITY; EASILY FRIABLE TO MODERATELY HARD; MODERATE REACTION TO HCL; GRAIN SUPPORTED; 10 - 40% LITHIC FRAGMENTS INCLUDED IN THE SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SILTSTONE = MEDIUM GRAY TO OLIVE GRAY; PLATY TO SCALY TO WEDGELIKE CUTTINGS HABIT; SILTY TO GRITTY TEXTURE; THINLY INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE; SPARKLING TO SEMI EARTHY LUSTER; HARD TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY TO HACKLY FRACTURE; TRACE LOOSE UPPER VERY FINE GRAIN SAND IN SAMPLE FRAGMENTS.

NOTE: TD INTERMEDIATE SECT @ 10051' MD (9854' TVD) ON 01/30/2011.

NOTE: RESUME DRILLING OF PRODUCTION SECTION ON 04/08/2011

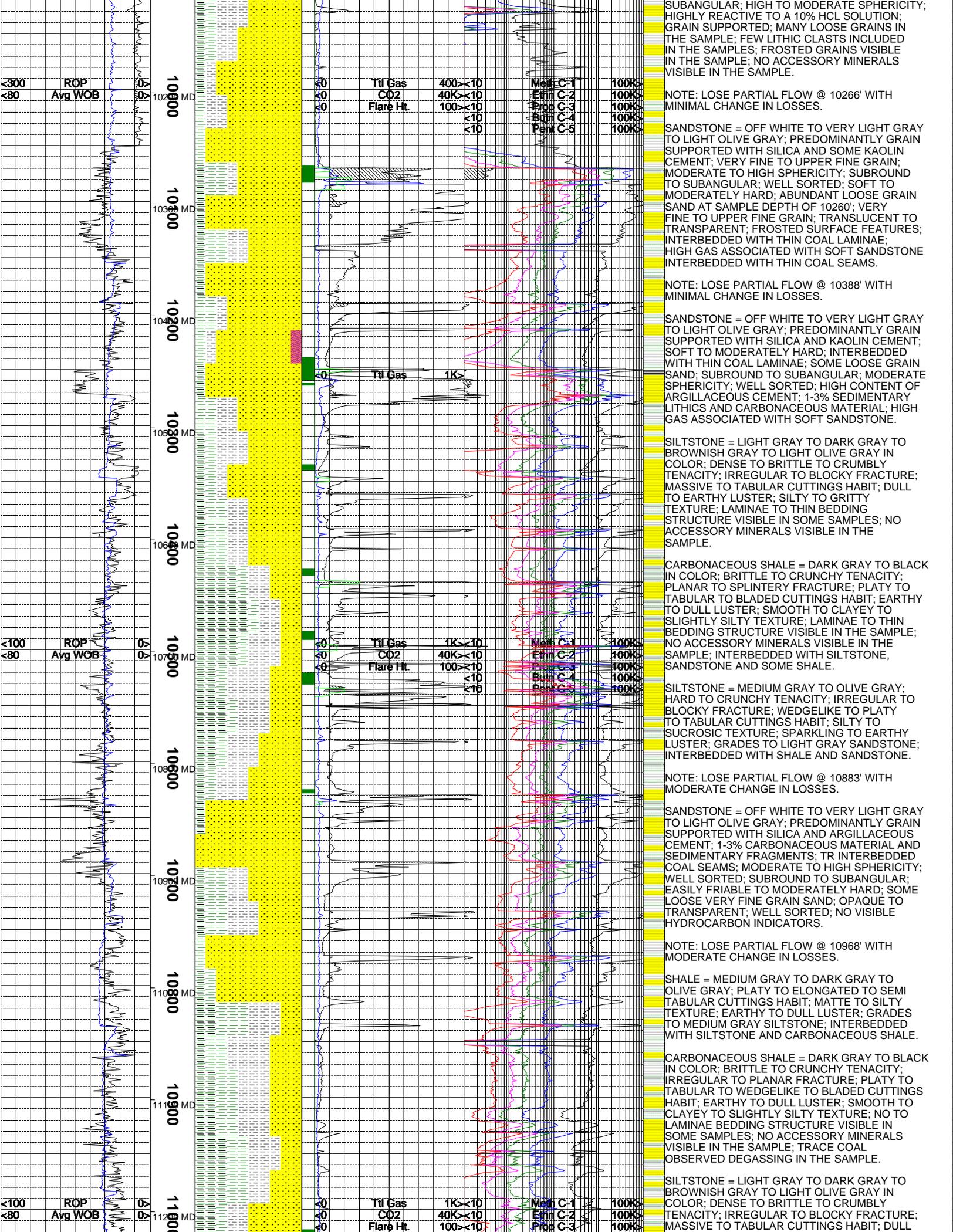
SANDSTONE = WHITE TO OFF WHITE TO LIGHT GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; VERY WELL TO WELL SORTING; SUBROUND TO

<300
<80

<300
<80

Til Gas 400 > 10
CO2 40K > 10
Flare Ht 100 > 10
Meth C-1 100K >
Ethn C-2 100K >
Prop C-3 100K >
Bum C-4 100K >
Pernt C-5 100K >

Til Gas 400 > 10
CO2 40K > 10
Flare Ht 100 > 10
Meth C-1 100K >
Ethn C-2 100K >
Prop C-3 100K >
Bum C-4 100K >
Pernt C-5 100K >



ROP
Avg WOB

ROP
Avg WOB

ROP
Avg WOB

10200 MD

10300 MD

10400 MD

10500 MD

10600 MD

10700 MD

10800 MD

10900 MD

11000 MD

11100 MD

11200 MD

Ti Gas	400	10	Meth C-1	100K
CO2	40K	10	Ethin C-2	100K
Flare Ht	100	10	Prop C-3	100K
	<10		Burn C-4	100K
	<10		Perm C-5	100K

Ti Gas	1K	10	Meth C-1	100K
CO2	40K	10	Ethin C-2	100K
Flare Ht	100	10	Prop C-3	100K
	<10		Burn C-4	100K
	<10		Perm C-5	100K

Ti Gas	1K	10	Meth C-1	100K
CO2	40K	10	Ethin C-2	100K
Flare Ht	100	10	Prop C-3	100K
	<10		Burn C-4	100K
	<10		Perm C-5	100K

NOTE: LOSE PARTIAL FLOW @ 10266' WITH MINIMAL CHANGE IN LOSSES.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO LIGHT OLIVE GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND SOME KAOLIN CEMENT; VERY FINE TO UPPER FINE GRAIN; MODERATE TO HIGH SPHERICITY; SUBROUND TO SUBANGULAR; WELL SORTED; SOFT TO MODERATELY HARD; ABUNDANT LOOSE GRAIN SAND AT SAMPLE DEPTH OF 10260'; VERY FINE TO UPPER FINE GRAIN; TRANSLUCENT TO TRANSPARENT; FROSTED SURFACE FEATURES; INTERBEDDED WITH THIN COAL LAMINAE; HIGH GAS ASSOCIATED WITH SOFT SANDSTONE INTERBEDDED WITH THIN COAL SEAMS.

NOTE: LOSE PARTIAL FLOW @ 10388' WITH MINIMAL CHANGE IN LOSSES.

SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO LIGHT OLIVE GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND KAOLIN CEMENT; SOFT TO MODERATELY HARD; INTERBEDDED WITH THIN COAL LAMINAE; SOME LOOSE GRAIN SAND; SUBROUND TO SUBANGULAR; MODERATE SPHERICITY; WELL SORTED; HIGH CONTENT OF ARGILLACEOUS CEMENT; 1-3% SEDIMENTARY LITHICS AND CARBONACEOUS MATERIAL; HIGH GAS ASSOCIATED WITH SOFT SANDSTONE.

SILTSTONE = LIGHT GRAY TO DARK GRAY TO BROWNISH GRAY TO LIGHT OLIVE GRAY IN COLOR; DENSE TO BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SILTY TO GRITTY TEXTURE; LAMINAE TO THIN BEDDING STRUCTURE VISIBLE IN SOME SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = DARK GRAY TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY; PLANAR TO SPLINTERY FRACTURE; PLATY TO TABULAR TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TO SLIGHTLY SILTY TEXTURE; LAMINAE TO THIN BEDDING STRUCTURE VISIBLE IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; INTERBEDDED WITH SILTSTONE, SANDSTONE AND SOME SHALE.

SILTSTONE = MEDIUM GRAY TO OLIVE GRAY; HARD TO CRUNCHY TENACITY; IRREGULAR TO BLOCKY FRACTURE; WEDGELIKE TO PLATY TO TABULAR CUTTINGS HABIT; SILTY TO SUCROSIC TEXTURE; SPARKLING TO EARTHY LUSTER; GRADES TO LIGHT GRAY SANDSTONE; INTERBEDDED WITH SHALE AND SANDSTONE.

NOTE: LOSE PARTIAL FLOW @ 10883' WITH MODERATE CHANGE IN LOSSES.

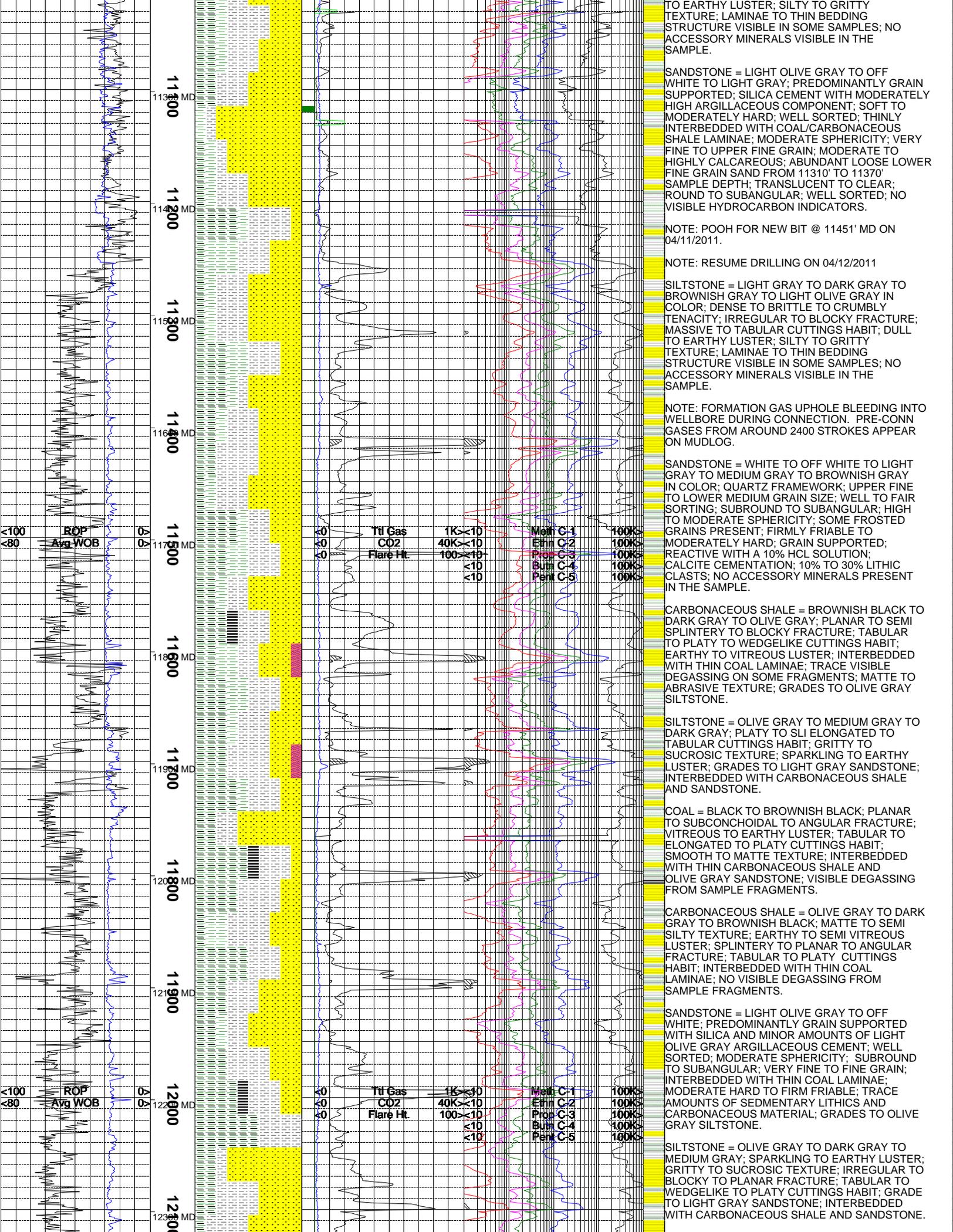
SANDSTONE = OFF WHITE TO VERY LIGHT GRAY TO LIGHT OLIVE GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND ARGILLACEOUS CEMENT; 1-3% CARBONACEOUS MATERIAL AND SEDIMENTARY FRAGMENTS; TR INTERBEDDED COAL SEAMS; MODERATE TO HIGH SPHERICITY; WELL SORTED; SUBROUND TO SUBANGULAR; EASILY FRIABLE TO MODERATELY HARD; SOME LOOSE VERY FINE GRAIN SAND; OPAQUE TO TRANSPARENT; WELL SORTED; NO VISIBLE HYDROCARBON INDICATORS.

NOTE: LOSE PARTIAL FLOW @ 10968' WITH MODERATE CHANGE IN LOSSES.

SHALE = MEDIUM GRAY TO DARK GRAY TO OLIVE GRAY; PLATY TO ELONGATED TO SEMI TABULAR CUTTINGS HABIT; MATTE TO SILTY TEXTURE; EARTHY TO DULL LUSTER; GRADES TO MEDIUM GRAY SILTSTONE; INTERBEDDED WITH SILTSTONE AND CARBONACEOUS SHALE.

CARBONACEOUS SHALE = DARK GRAY TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO TABULAR TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TO CLAYEY TO SLIGHTLY SILTY TEXTURE; NO TO LAMINAE BEDDING STRUCTURE VISIBLE IN SOME SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE; TRACE COAL OBSERVED DEGASSING IN THE SAMPLE.

SILTSTONE = LIGHT GRAY TO DARK GRAY TO BROWNISH GRAY TO LIGHT OLIVE GRAY IN COLOR; DENSE TO BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL



TO EARTHLY LUSTER; SILTY TO GRITTY TEXTURE; LAMINAE TO THIN BEDDING STRUCTURE VISIBLE IN SOME SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

SANDSTONE = LIGHT OLIVE GRAY TO OFF WHITE TO LIGHT GRAY; PREDOMINANTLY GRAIN SUPPORTED; SILICA CEMENT WITH MODERATELY HIGH ARGILLACEOUS COMPONENT; SOFT TO MODERATELY HARD; WELL SORTED; THINLY INTERBEDDED WITH COAL/CARBONACEOUS SHALE LAMINAE; MODERATE SPHERICITY; VERY FINE TO UPPER FINE GRAIN; MODERATE TO HIGHLY CALCAREOUS; ABUNDANT LOWER FINE GRAIN SAND FROM 11310' TO 11370' SAMPLE DEPTH; TRANSLUCENT TO CLEAR; ROUND TO SUBANGULAR; WELL SORTED; NO VISIBLE HYDROCARBON INDICATORS.

NOTE: POOH FOR NEW BIT @ 11451' MD ON 04/11/2011.

NOTE: RESUME DRILLING ON 04/12/2011

SILTSTONE = LIGHT GRAY TO DARK GRAY TO BROWNISH GRAY TO LIGHT OLIVE GRAY IN COLOR; DENSE TO BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURE; MASSIVE TO TABULAR CUTTINGS HABIT; DULL TO EARTHLY LUSTER; SILTY TO GRITTY TEXTURE; LAMINAE TO THIN BEDDING STRUCTURE VISIBLE IN SOME SAMPLES; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

NOTE: FORMATION GAS UPHOLE BLEEDING INTO WELLBORE DURING CONNECTION. PRE-CONN GASES FROM AROUND 2400 STROKES APPEAR ON MUDLOG.

SANDSTONE = WHITE TO OFF WHITE TO LIGHT GRAY TO MEDIUM GRAY TO BROWNISH GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING; SUBROUND TO SUBANGULAR; HIGH TO MODERATE SPHERICITY; SOME FROSTED GRAINS PRESENT; FIRMLY FRIABLE TO MODERATELY HARD; GRAIN SUPPORTED; REACTIVE WITH A 10% HCL SOLUTION; CALCITE CEMENTATION; 10% TO 30% LITHIC CLASTS; NO ACCESSORY MINERALS PRESENT IN THE SAMPLE.

CARBONACEOUS SHALE = BROWNISH BLACK TO DARK GRAY TO OLIVE GRAY; PLANAR TO SEMI SPLINTERY TO BLOCKY FRACTURE; TABULAR TO PLATY TO WEDGELIKE CUTTINGS HABIT; EARTHLY TO VITREOUS LUSTER; INTERBEDDED WITH THIN COAL LAMINAE; TRACE VISIBLE DEGASSING ON SOME FRAGMENTS; MATTE TO ABRASIVE TEXTURE; GRADES TO OLIVE GRAY SILTSTONE.

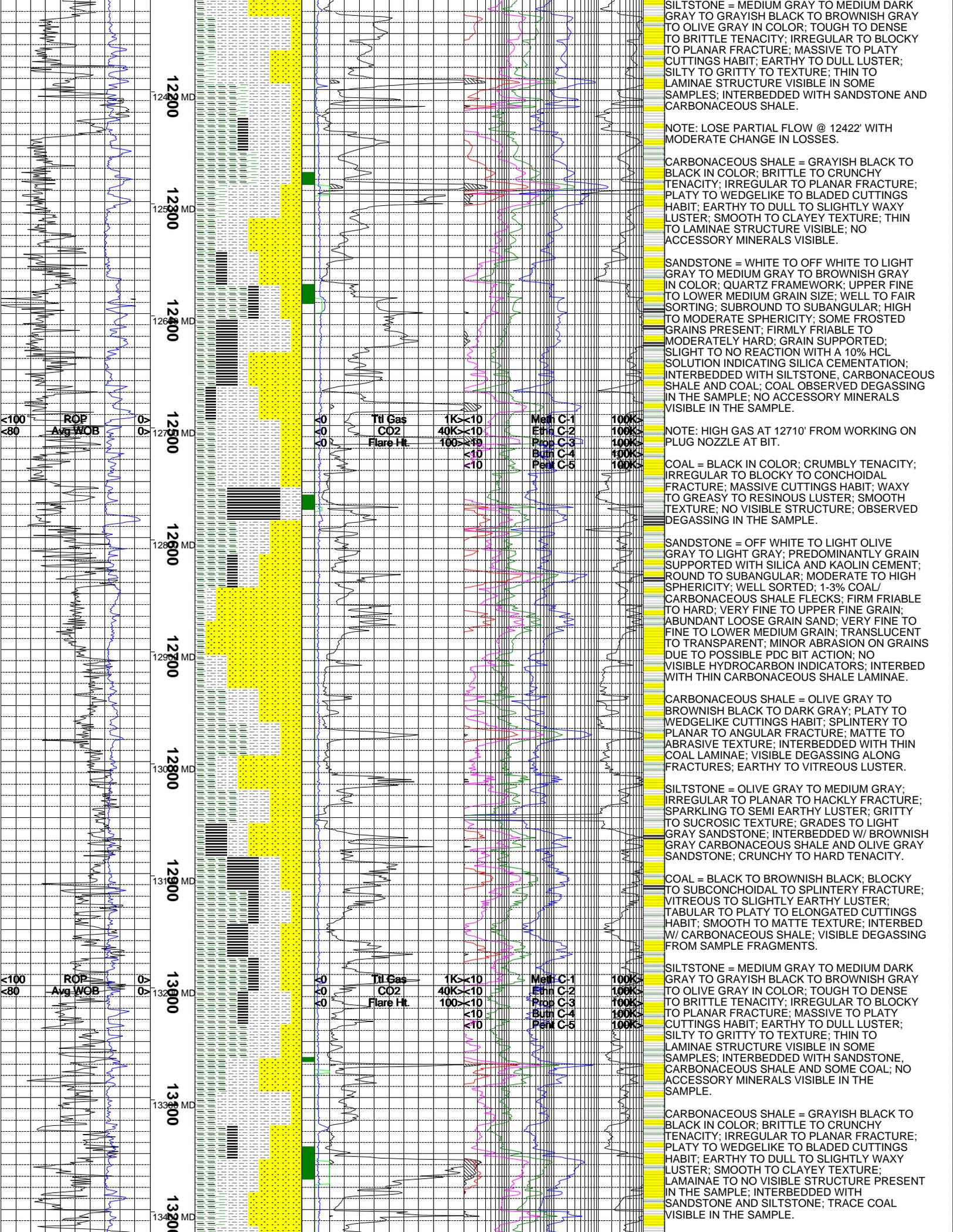
SILTSTONE = OLIVE GRAY TO MEDIUM GRAY TO DARK GRAY; PLATY TO SLI ELONGATED TO TABULAR CUTTINGS HABIT; GRITTY TO SUCROSIC TEXTURE; SPARKLING TO EARTHLY LUSTER; GRADES TO LIGHT GRAY SANDSTONE; INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.

COAL = BLACK TO BROWNISH BLACK; PLANAR TO SUBCONCHOIDAL TO ANGULAR FRACTURE; VITREOUS TO EARTHLY LUSTER; TABULAR TO ELONGATED TO PLATY CUTTINGS HABIT; SMOOTH TO MATTE TEXTURE; INTERBEDDED WITH THIN CARBONACEOUS SHALE AND OLIVE GRAY SANDSTONE; VISIBLE DEGASSING FROM SAMPLE FRAGMENTS.

CARBONACEOUS SHALE = OLIVE GRAY TO DARK GRAY TO BROWNISH BLACK; MATTE TO SEMI SILTY TEXTURE; EARTHLY TO SEMI VITREOUS LUSTER; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; TABULAR TO PLATY CUTTINGS HABIT; INTERBEDDED WITH THIN COAL LAMINAE; NO VISIBLE DEGASSING FROM SAMPLE FRAGMENTS.

SANDSTONE = LIGHT OLIVE GRAY TO OFF WHITE; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND MINOR AMOUNTS OF LIGHT OLIVE GRAY ARGILLACEOUS CEMENT; WELL SORTED; MODERATE SPHERICITY; SUBROUND TO SUBANGULAR; VERY FINE TO FINE GRAIN; INTERBEDDED WITH THIN COAL LAMINAE; MODERATE HARD TO FIRM FRIABLE; TRACE AMOUNTS OF SEDIMENTARY LITHICS AND CARBONACEOUS MATERIAL; GRADES TO OLIVE GRAY SILTSTONE.

SILTSTONE = OLIVE GRAY TO DARK GRAY TO MEDIUM GRAY; SPARKLING TO EARTHLY LUSTER; GRITTY TO SUCROSIC TEXTURE; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; TABULAR TO WEDGELIKE TO PLATY CUTTINGS HABIT; GRADE TO LIGHT GRAY SANDSTONE; INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.



12400 MD
12500 MD
12600 MD
12700 MD
12800 MD
12900 MD
13000 MD
13100 MD
13200 MD
13300 MD
13400 MD

<100
>80

ROP
Avg WOB

Tilt Gas 1K <10
CO2 40K <10
Flare Ht 100 <10

Meth C-1 100K
Ethn C-2 100K
Prop C-3 100K
Bum C-4 100K
Perm C-5 100K

<100
>80

ROP
Avg WOB

Tilt Gas 1K <10
CO2 40K <10
Flare Ht 100 <10

Meth C-1 100K
Ethn C-2 100K
Prop C-3 100K
Bum C-4 100K
Perm C-5 100K

SILTSTONE = MEDIUM GRAY TO MEDIUM DARK GRAY TO GRAYISH BLACK TO BROWNISH GRAY TO OLIVE GRAY IN COLOR; TOUGH TO DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TO TEXTURE; THIN TO LAMINAE STRUCTURE VISIBLE IN SOME SAMPLES; INTERBEDDED WITH SANDSTONE AND CARBONACEOUS SHALE.

NOTE: LOSE PARTIAL FLOW @ 12422' WITH MODERATE CHANGE IN LOSSES.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE VISIBLE; NO ACCESSORY MINERALS VISIBLE.

SANDSTONE = WHITE TO OFF WHITE TO LIGHT GRAY TO MEDIUM GRAY TO BROWNISH GRAY IN COLOR; QUARTZ FRAMEWORK; UPPER FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO FAIR SORTING; SUBROUND TO SUBANGULAR; HIGH TO MODERATE SPHERICITY; SOME FROSTED GRAINS PRESENT; FIRMLY FRIABLE TO MODERATELY HARD; GRAIN SUPPORTED; SLIGHT TO NO REACTION WITH A 10% HCL SOLUTION INDICATING SILICA CEMENTATION; INTERBEDDED WITH SILTSTONE, CARBONACEOUS SHALE AND COAL; COAL OBSERVED DEGASSING IN THE SAMPLE; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

NOTE: HIGH GAS AT 12710' FROM WORKING ON PLUG NOZZLE AT BIT.

COAL = BLACK IN COLOR; CRUMBLY TENACITY; IRREGULAR TO BLOCKY TO CONCHOIDAL FRACTURE; MASSIVE CUTTINGS HABIT; WAXY TO GREASY TO RESINOUS LUSTER; SMOOTH TEXTURE; NO VISIBLE STRUCTURE; OBSERVED DEGASSING IN THE SAMPLE.

SANDSTONE = OFF WHITE TO LIGHT OLIVE GRAY TO LIGHT GRAY; PREDOMINANTLY GRAIN SUPPORTED WITH SILICA AND KAOLIN CEMENT; ROUND TO SUBANGULAR; MODERATE TO HIGH SPHERICITY; WELL SORTED; 1-3% COAL/ CARBONACEOUS SHALE FLECKS; FIRM FRIABLE TO HARD; VERY FINE TO UPPER FINE GRAIN; ABUNDANT LOOSE GRAIN SAND; VERY FINE TO FINE TO LOWER MEDIUM GRAIN; TRANSLUCENT TO TRANSPARENT; MINOR ABRASION ON GRAINS DUE TO POSSIBLE PDC BIT ACTION; NO VISIBLE HYDROCARBON INDICATORS; INTERBED WITH THIN CARBONACEOUS SHALE LAMINAE.

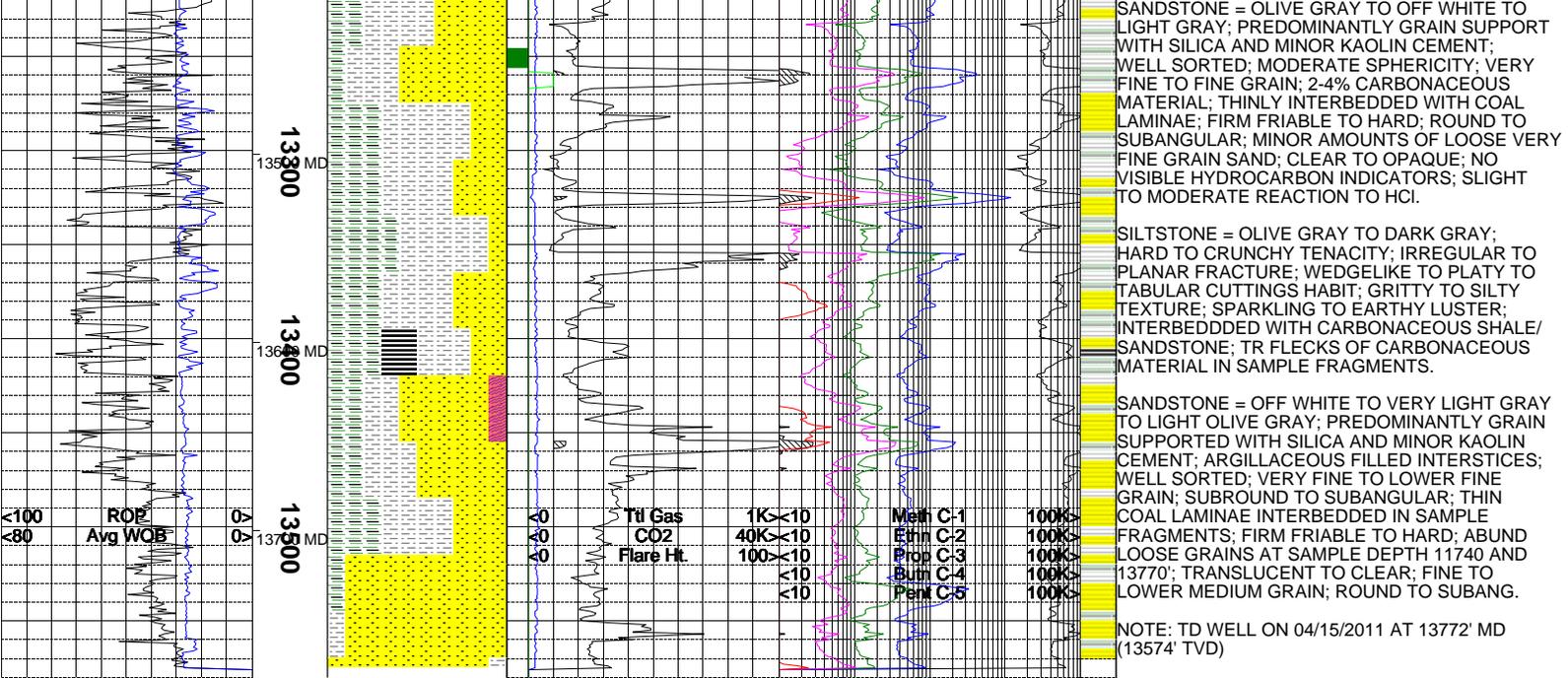
CARBONACEOUS SHALE = OLIVE GRAY TO BROWNISH BLACK TO DARK GRAY; PLATY TO WEDGELIKE CUTTINGS HABIT; SPLINTERY TO PLANAR TO ANGULAR FRACTURE; MATTE TO ABRASIVE TEXTURE; INTERBEDDED WITH THIN COAL LAMINAE; VISIBLE DEGASSING ALONG FRACTURES; EARTHY TO VITREOUS LUSTER.

SILTSTONE = OLIVE GRAY TO MEDIUM GRAY; IRREGULAR TO PLANAR TO HACKLY FRACTURE; SPARKLING TO SEMI EARTHY LUSTER; GRITTY TO SUCROSIC TEXTURE; GRADES TO LIGHT GRAY SANDSTONE; INTERBEDDED W/ BROWNISH GRAY CARBONACEOUS SHALE AND OLIVE GRAY SANDSTONE; CRUNCHY TO HARD TENACITY.

COAL = BLACK TO BROWNISH BLACK; BLOCKY TO SUBCONCHOIDAL TO SPLINTERY FRACTURE; VITREOUS TO SLIGHTLY EARTHY LUSTER; TABULAR TO PLATY TO ELONGATED CUTTINGS HABIT; SMOOTH TO MATTE TEXTURE; INTERBED W/ CARBONACEOUS SHALE; VISIBLE DEGASSING FROM SAMPLE FRAGMENTS.

SILTSTONE = MEDIUM GRAY TO MEDIUM DARK GRAY TO GRAYISH BLACK TO BROWNISH GRAY TO OLIVE GRAY IN COLOR; TOUGH TO DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; EARTHY TO DULL LUSTER; SILTY TO GRITTY TO TEXTURE; THIN TO LAMINAE STRUCTURE VISIBLE IN SOME SAMPLES; INTERBEDDED WITH SANDSTONE, CARBONACEOUS SHALE AND SOME COAL; NO ACCESSORY MINERALS VISIBLE IN THE SAMPLE.

CARBONACEOUS SHALE = GRAYISH BLACK TO BLACK IN COLOR; BRITTLE TO CRUNCHY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO SLIGHTLY WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; LAMINAE TO NO VISIBLE STRUCTURE PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE AND SILTSTONE; TRACE COAL VISIBLE IN THE SAMPLE.



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