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

MUDLOG TVD

COMPANY	ExxonMobil Production
WELL	FRU197-33A6
FIELD	FREEDOM RANCH UNIT
REGION	ROCKY MOUNTAINS
COORDINATES	39.915536 108.285764
ELEVATION	GL = 6385' KB = 6412'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031153500
SPUD DATE	10/17/2009
CONTRACTOR	HELMRICH AND PAYNE
CO. REP.	RICKY OWENS
RIG/TYPE	215/FLEX 3
LOGGING UNIT	MLU 051
GEOLOGISTS	D.CLAAR B.MARSH
ADD. PERSONS	B. JOHANNING G.BAKER
CO. GEOLOGIST	M. BIGGS

LOG INTERVAL

DEPTHS: 3,852' **TO** 12,294'
DATES: 03/02/2010 **TO** 03/16/2010
SCALE: 1" = 100'

CASING DATA

10.75" **AT** 3,862'
7.00" **AT** 8,465'
AT
AT

MUD TYPES

LSND **TO** 12,294'
TO
TO
TO

HOLE SIZE

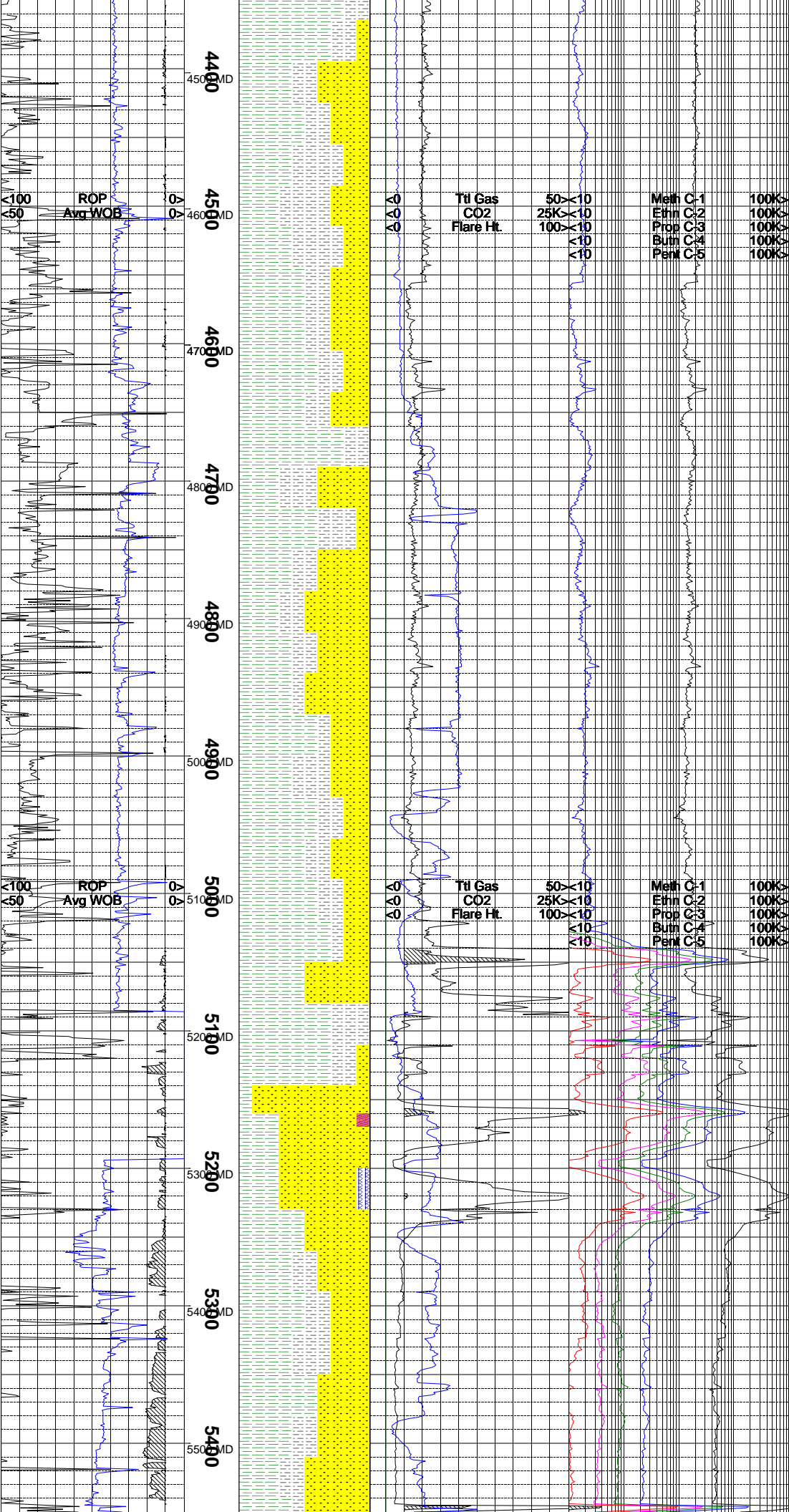
9.875" **TO** 8,465'
6.125" **TO** 12,294'
TO
TO

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	

	TVD Depth	Lithology	MGS	Ttl Gas units	CO ₂ ppm	Flare Ht. ft	Meth C-1 ppm	Ethn C-2	Prop C-3	Buth C-4	Pent C-5	Interp. Lith	Remarks
<100 ROP ft/hr >			<0>	1K<	<0>	25K<	<10>	<10>	<10>	<10>	<10>		SURVEY DATA, MUD REPORTS, OTHER INFO.
Avg WOB klbs >													
	3400												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.
>100 ROP >	3500												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.
Avg WOB >	3600												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
	3700												WHEN THE MUD IS RUN THROUGH THE GAS BUSTER THE INTERVAL IS MARKED ON THE MGS COLUMN AND THE SIZE OF FLARES NOTED.
	3800												EVIDENCE OF FRACTURE FILL IS NOTED ON THE MUD LOG. KAOLIN PERCENTAGE IN SS INTERVALS IS ALSO NOTED ON THE MUD LOG.
	3900												1 UNIT OF GAS = 200PPM METHANE
	4000												10.75" CASING SET @ 3,837'
	4100												CANRIG STARTED FULL LOGGING SERVICES @ 3,852' ON 03/02/2010.
	4200												DRILL TO 3,862' AND PERFORM F.I.T.
	4300												SHALE = LIGHT GRAY TO BLuish GRAY WITH ORANGE-BROWN MUD ENCRUSTED; BRITTLE TO PULVERULENT; IRREGULAR TO PLANAR FRACTURE; MASSIVE TO PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHLY LUSTER; SMOOTH TO CLAYEY TEXTURE; THICK STRUCTURE; THICKLY BEDDED WITH SANDSTONE AND SOME SILTSTONE; ABUNDANT AMOUNT OF ORANGE-BROWN MUD IN SAMPLE.
	4400												SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT GRAY WITH A TRACE AMOUNT OF DARK LITHICS 0-3%; FINE TO UPPER VERY FINE GRAINED; FAIR TO POOR SORTING; VERY FINE LOOSE GRAINS TO FINE GRAINED SMALL CLUSTERS; SLIGHT TO MODERATE REACTION TO DILUTE HCL; SUB ANGULAR TO SUB ROUNDED; MODERATE TO LOW SPHERICITY; VERY THINLY INTERBEDDED WITH SHALE AND SILTSTONE.
	4500												SHALE = BROWNISH GRAY TO GRAY TO LIGHT BLuish GRAY; BRITTLE TO PULVERULENT TENACITY; IRREGULAR TO PLANAR FRACTURE; DULL TO EARTHLY LUSTER; SMOOTH TO CLAYEY TEXTURE; TRACE AMT OF CLAY IN SAMPLE TRAY; THIN STRUCTURE; THICKLY BEDDED WITH THIN LAYERS OF SANDSTONE OR SILTSTONE IN-BETWEEN.
	4600												SILTSTONE = YELLOWISH BROWN TO YELLOW GRAY TO LIGHT BLuish GRAY; VARICOLORED; MOTTLLED IN PART; MOD HARD TO CRUNCHY; SLI PLATY CUTTINGS; IRREGULAR FRACTURE; SPARKLING LUSTER WHEN DRIED; MOD CALC; RARE CARBONACEOUS MATERIAL; SILTY TO GRITTY TEXTURE; OCC CONTAINS VF QUARTZ GRAINS; SME F TO VF GRAINED SANDSTONE INTERBEDS; OCC LOOSE MEDIUM BROWN LS/CALCITE GRAINS; NO VISIBLE STRUCTURE.
	4700												NAHCOLITE = TRACE AMOUNTS IN SAMPLE; CLEAR; CRYSTALLINE; SOFT; WITH OUTER REDDISH CLAY COATING.
	4800												SHALE = VARICOLORED; MOTTLLED IN PART; LIGHT GRAY TO YELLOW BROWN; MOTTLLED GRAY/YELLOW; FIRM TO CRUNCHY TO MOD HARD; IRREGULAR TO BLOCKY FRACTURE; DOM PLATY CUTTINGS; SLI CALCAREOUS; VERY FINE MICA VARIABLE AMOUNTS OF SILT; GRADING TO ARGILLACEOUS SILTSTONE; ROUGH TO SILTY TEXTURE; RARE LIGHT GRAY SANDSTONE INTERBEDS; NO VISIBLE STRUCTURE; TRACE AMOUNTS OF NAHCOLITE IN SAMPLES.



SANDSTONE = LIGHT GRAY; SOME BROWN TO PURPLE TO DARK GRAY SPECIMENS; FINE TO VERY FINE GRAINED; ANGULAR TO SUBANGULAR; LOW TO MOD SPHERICITY; GRAIN SUPPORTED; DOM CALCAREOUS CMT; CLEAN W/ ONLY A TRACE OF CARBONACEOUS MATERIAL; SME REDDISH GRAINS; TIGHT POR; THINLY INTERBEDDED WITH SHALE AND SILTSTONE.

SHALE = VARICOLORED; MOTTLED IN PART; BROWN; LIGHT GRAY TO BLUISH GRAY; YELLOW FIRM TO MOD HARD; MASSIVE TO PLATY CTGS; IRREGULAR FRACTURE; DULL EARTHY LUSTER; NON CALCAREOUS IN PURE SHALE EXAMPLES; VARIABLE AMOUNTS OF SILT; GRADING TO ARGILLACEOUS SILTSTONE; INTERBEDDED W/VARICOLORED ARGILLACEOUS SANDSTONE; NO VISIBLE STRUCTURE.

SILTSTONE = VARICOLORED; MOTTLED; ORANGE BROWN; YELLOW BROWN; TRACE PURPLE; MOD HARD; MASSIVE TO SLI PLATY CUTTINGS; MOD CALCAREOUS; VF MICA; IRREGULAR FRACTURE; DULL EARTHY TO SLI SPARKLING LUSTER WHEN DRIED; SILTY TO GRITTY TEXTURE; SOME VERY ARGILLACEOUS EXAMPLES; NO VISIBLE STRUCTURE.

SANDSTONE = MINOR LOOSE GRAINS; LT GRAY; BRN; HARD PRESERVED SPECIMENS; FINE GRAINED; ANGULAR TO SUBANGULAR; LOW TO MOD SPHERICITY; CALCITE CEMENT; DOM GRAIN SUPPORTED W/SME MATRIX SUPPORTED ARGILLACEOUS EXAMPLES; NO GAS INCREASES.

SHALE = VARICOLORED; MOTTLED IN PART; LIGHT GRAY; YELLOW; YELLOW BROWN; TR PURPLE AND REDBROWN; FIRM TO MOD HARD; PLATY CUTTINGS; IRREGULAR FRACTURE; DULL EARTHY LUSTER; VERY FINE MICA; SMOOTH TO ROUGH TEXTURE TO SILTY IN SILTY EXAMPLES NON CALCAREOUS; MOD CALCAREOUS IN SILTY EXAMPLES; NO VISIBLE STRUCTURE; TRACE AMOUNTS OF WHITE, CRYSTALLINE NAHCOLITE IN SAMPLE TRAYS.

SANDSTONE = VARICOLORED; BROWN; PURPLE LT TO DARK GRAY; HARD; UPPER TO LOWER FINE GRAINED; LOW SPHERICITY; MOD SORTED CALCAREOUS CLAY CEMENT TO CALCITE CMT; DOM GRAIN SUPPORTED; SUBANGULAR GRS; MINOR AMT OF LOOSE GRAINS; TIGHT; NO GAS INCREASES.

SILTSTONE = DARK GRAY WITH HUES OF BROWN; VERY TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO TABULAR CUTTINGS HABIT; DULL TO SLIGHTLY SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SHALE.

SHALE = LIGHT GRAY TO GRAY WITH ORANGE-BROWN HUES; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; BECOMING MORE THINLY BEDDED WITH SANDSTONE AND SILTSTONE.

NOTE = BIT TRIP BEGAN ON 03/03/2010 AT 21:00 HRS TO CHANGE OUT DIRECTIONAL TOOLS. RESUMED DRILLING ON 03/04/2010 AT 14:00 HRS.

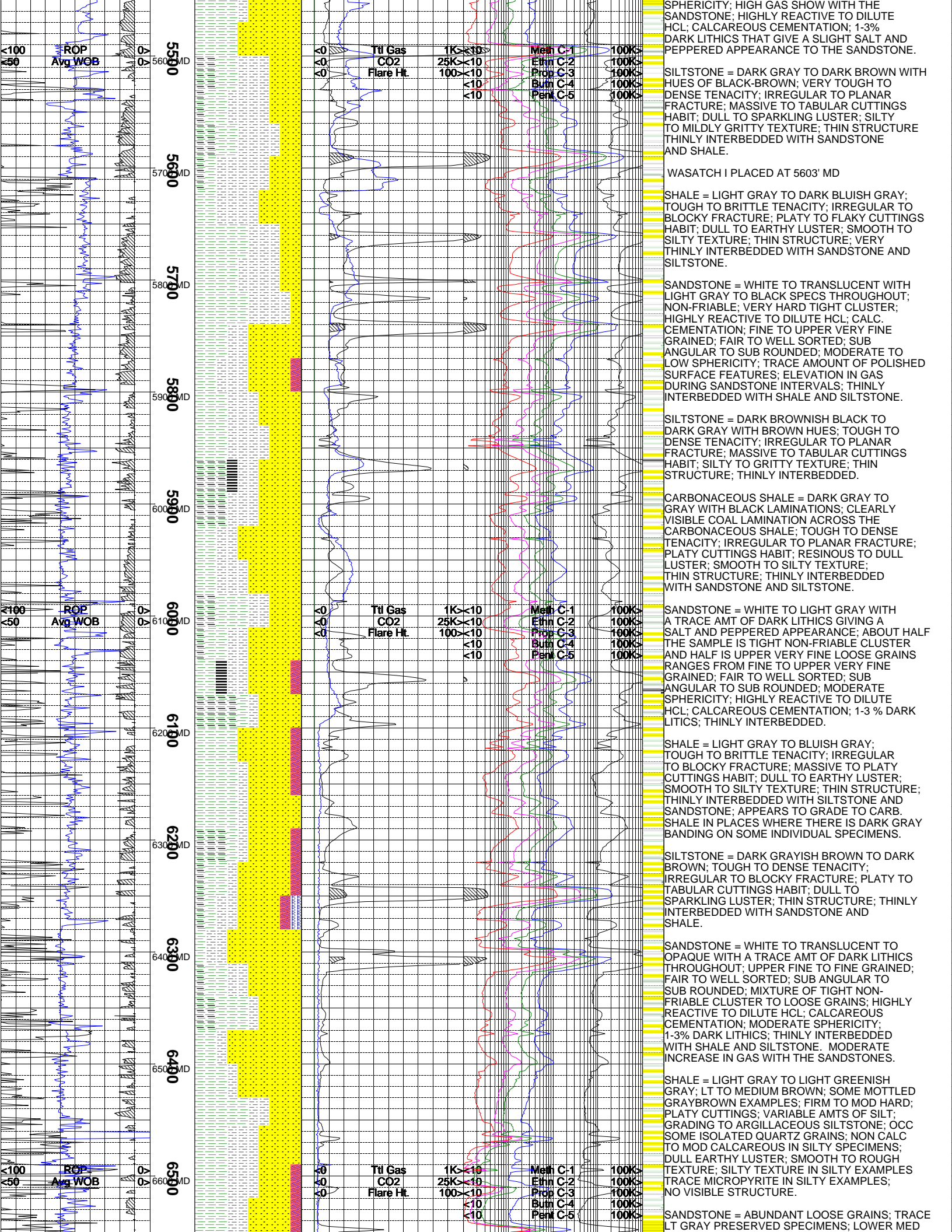
WASATCH G PLACED AT 5254' MD 5154' TVD

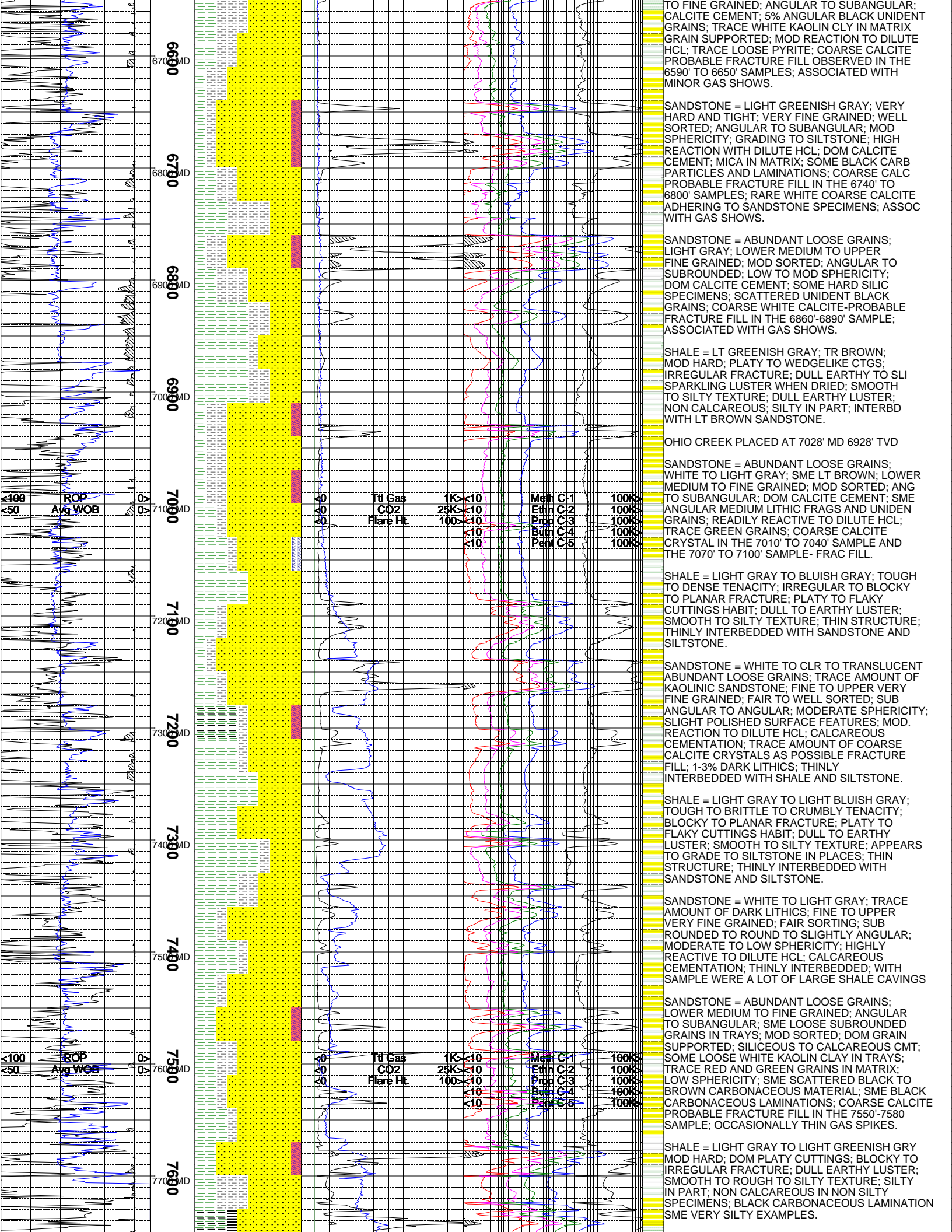
START TO LOSE MUD AT 5254'. LOST TOTAL RETURNS AT 5325'. REGAINED FULL RETURNS AT 5325'

WASATCH G SANDSTONE = ABUNDANT LOOSE GRAINS; FINE TO UPPER FINE GRAINED IN UPPER SECTION; FRIABLE IN UPPER SECTION; BECOMING MEDIUM GRAINED TOWARD BASE; DOM SILICEOUS CEMENT WITH MINOR CALCITE; ABUNDANT LOOSE GRAINS; GRAIN SUPPORTED; LOOSE KAOLIN CLAY OBSERVED IN LOWER SAND INTERVAL; COARSE CALCITE- PROBABLE FRACTURE FILL OBSERVED IN 5260- 5270' SAMPLE; 1300+ UNIT GAS SHOW ON TOP; LOWER GAS DATA IN WASATCH G NOT RELIABLE BECAUSE OF MUD LOSSES.

SHALE = GRAY TO BLUISH GRAY WITH HUES OF BROWN; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; MASSIVE TO PLATY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY WITH A TRACE AMOUNT OF DARK LITHICS; VERY NON-FRIABLE TIGHT CLUSTERS; UPPER VERY FINE GRAINED; WELL SORTED; SUB ROUNDED TO ANGULAR; MODERATE





TO FINE GRAINED; ANGULAR TO SUBANGULAR; CALCITE CEMENT; 5% ANGULAR BLACK UNIDENT GRAINS; TRACE WHITE KAOLIN CLY IN MATRIX GRAIN SUPPORTED; MOD REACTION TO DILUTE HCL; TRACE LOOSE PYRITE; COARSE CALCITE PROBABLE FRACTURE FILL OBSERVED IN THE 6590' TO 6650' SAMPLES; ASSOCIATED WITH MINOR GAS SHOWS.

SANDSTONE = LIGHT GREENISH GRAY; VERY HARD AND TIGHT; VERY FINE GRAINED; WELL SORTED; ANGULAR TO SUBANGULAR; MOD SPHERICITY; GRADING TO SILTSTONE; HIGH REACTION WITH DILUTE HCL; DOM CALCITE CEMENT; MICA IN MATRIX; SOME BLACK CARB PARTICLES AND LAMINATIONS; COARSE CALC PROBABLE FRACTURE FILL IN THE 6740' TO 6800' SAMPLES; RARE WHITE COARSE CALCITE ADHERING TO SANDSTONE SPECIMENS; ASSOC WITH GAS SHOWS.

SANDSTONE = ABUNDANT LOOSE GRAINS; LIGHT GRAY; LOWER MEDIUM TO UPPER FINE GRAINED; MOD SORTED; ANGULAR TO SUBROUNDED; LOW TO MOD SPHERICITY; DOM CALCITE CEMENT; SOME HARD SILIC SPECIMENS; SCATTERED UNIDENT BLACK GRAINS; COARSE WHITE CALCITE-PROBABLE FRACTURE FILL IN THE 6860'-6890' SAMPLE; ASSOCIATED WITH GAS SHOWS.

SHALE = LT GREENISH GRAY; TR BROWN; MOD HARD; PLATY TO WEDGELIKE CTGS; IRREGULAR FRACTURE; DULL EARTHY TO SLI SPARKLING LUSTER WHEN DRIED; SMOOTH TO SILTY TEXTURE; DULL EARTHY LUSTER; NON CALCAREOUS; SILTY IN PART; INTERBD WITH LT BROWN SANDSTONE.

OHIO CREEK PLACED AT 7028' MD 6928' TVD

SANDSTONE = ABUNDANT LOOSE GRAINS; WHITE TO LIGHT GRAY; SME LT BROWN; LOWER MEDIUM TO FINE GRAINED; MOD SORTED; ANG TO SUBANGULAR; DOM CALCITE CEMENT; SME ANGULAR MEDIUM LITHIC FRAGS AND UNIDENT GRAINS; READILY REACTIVE TO DILUTE HCL; TRACE GREEN GRAINS; COARSE CALCITE CRYSTAL IN THE 7010' TO 7040' SAMPLE AND THE 7070' TO 7100' SAMPLE- FRAC FILL.

SHALE = LIGHT GRAY TO BLUISH GRAY; TOUGH TO DENSE TENACITY; IRREGULAR TO BLOCKY TO PLANAR FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

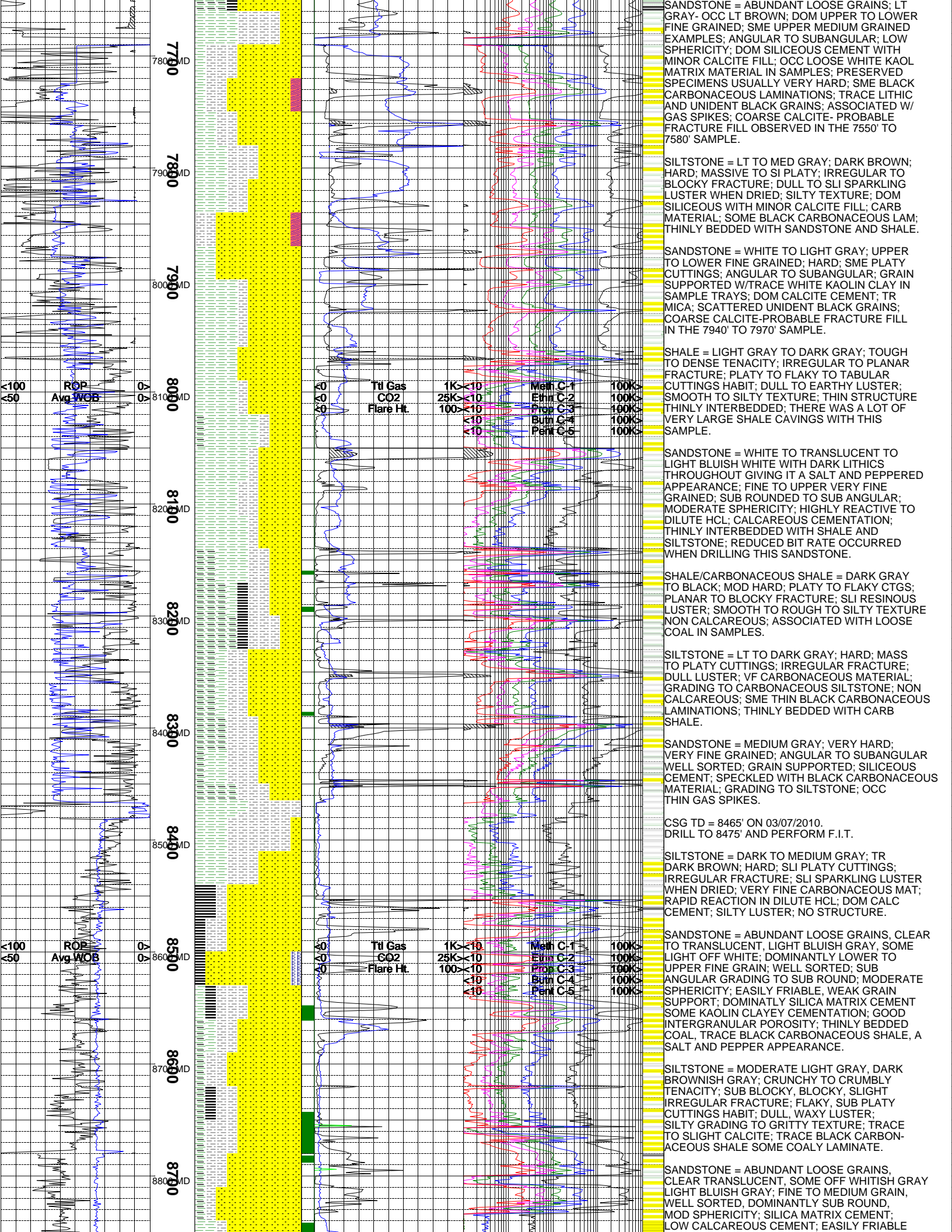
SANDSTONE = WHITE TO CLR TO TRANSLUCENT ABUNDANT LOOSE GRAINS; TRACE AMOUNT OF KAOLINIC SANDSTONE; FINE TO UPPER VERY FINE GRAINED; FAIR TO WELL SORTED; SUB ANGULAR TO ANGULAR; MODERATE SPHERICITY; SLIGHT POLISHED SURFACE FEATURES; MOD. REACTION TO DILUTE HCL; CALCAREOUS CEMENTATION; TRACE AMOUNT OF COARSE CALCITE CRYSTALS AS POSSIBLE FRACTURE FILL; 1-3% DARK LITHICS; THINLY INTERBEDDED WITH SHALE AND SILTSTONE.

SHALE = LIGHT GRAY TO LIGHT BLUISH GRAY; TOUGH TO BRITTLE TO CRUMBLY TENACITY; BLOCKY TO PLANAR FRACTURE; PLATY TO FLAKY CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; APPEARS TO GRADE TO SILTSTONE IN PLACES; THIN STRUCTURE; THINLY INTERBEDDED WITH SANDSTONE AND SILTSTONE.

SANDSTONE = WHITE TO LIGHT GRAY; TRACE AMOUNT OF DARK LITHICS; FINE TO UPPER VERY FINE GRAINED; FAIR SORTING; SUB ROUNDED TO ROUND TO SLIGHTLY ANGULAR; MODERATE TO LOW SPHERICITY; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; THINLY INTERBEDDED; WITH SAMPLE WERE A LOT OF LARGE SHALE CAVINGS

SANDSTONE = ABUNDANT LOOSE GRAINS; LOWER MEDIUM TO FINE GRAINED; ANGULAR TO SUBANGULAR; SME LOOSE SUBROUNDED GRAINS IN TRAYS; MOD SORTED; DOM GRAIN SUPPORTED; SILICEOUS TO CALCAREOUS CMT; SOME LOOSE WHITE KAOLIN CLAY IN TRAYS; TRACE RED AND GREEN GRAINS IN MATRIX; LOW SPHERICITY; SME SCATTERED BLACK TO BROWN CARBONACEOUS MATERIAL; SME BLACK CARBONACEOUS LAMINATIONS; COARSE CALCITE PROBABLE FRACTURE FILL IN THE 7550'-7580' SAMPLE; OCCASIONALLY THIN GAS SPIKES.

SHALE = LIGHT GRAY TO LIGHT GREENISH GRY MOD HARD; DOM PLATY CUTTINGS; BLOCKY TO IRREGULAR FRACTURE; DULL EARTHY LUSTER; SMOOTH TO ROUGH TO SILTY TEXTURE; SILTY IN PART; NON CALCAREOUS IN NON SILTY SPECIMENS; BLACK CARBONACEOUS LAMINATION SME VERY SILTY EXAMPLES.



SANDSTONE = ABUNDANT LOOSE GRAINS; LT GRAY- OCC LT BROWN; DOM UPPER TO LOWER FINE GRAINED; SME UPPER MEDIUM GRAINED EXAMPLES; ANGULAR TO SUBANGULAR; LOW SPHERICITY; DOM SILICEOUS CEMENT WITH MINOR CALCITE FILL; OCC LOOSE WHITE KAOL MATRIX MATERIAL IN SAMPLES; PRESERVED SPECIMENS USUALLY VERY HARD; SME BLACK CARBONACEOUS LAMINATIONS; TRACE LITHIC AND UNIDENT BLACK GRAINS; ASSOCIATED W/ GAS SPIKES; COARSE CALCITE- PROBABLE FRACTURE FILL OBSERVED IN THE 7550' TO 7580' SAMPLE.

SILTSTONE = LT TO MED GRAY; DARK BROWN; HARD; MASSIVE TO SI PLATY; IRREGULAR TO BLOCKY FRACTURE; DULL TO SLI SPARKLING LUSTER WHEN DRIED; SILTY TEXTURE; DOM SILICEOUS WITH MINOR CALCITE FILL; CARB MATERIAL; SOME BLACK CARBONACEOUS LAM; THINLY BEDDED WITH SANDSTONE AND SHALE.

SANDSTONE = WHITE TO LIGHT GRAY; UPPER TO LOWER FINE GRAINED; HARD; SME PLATY CUTTINGS; ANGULAR TO SUBANGULAR; GRAIN SUPPORTED W/TRACE WHITE KAOLIN CLAY IN SAMPLE TRAYS; DOM CALCITE CEMENT; TR MICA; SCATTERED UNIDENT BLACK GRAINS; COARSE CALCITE-PROBABLE FRACTURE FILL IN THE 7940' TO 7970' SAMPLE.

SHALE = LIGHT GRAY TO DARK GRAY; TOUGH TO DENSE TENACITY; IRREGULAR TO PLANAR FRACTURE; PLATY TO FLAKY TO TABULAR CUTTINGS HABIT; DULL TO EARTHY LUSTER; SMOOTH TO SILTY TEXTURE; THIN STRUCTURE THINLY INTERBEDDED; THERE WAS A LOT OF VERY LARGE SHALE CAVINGS WITH THIS SAMPLE.

SANDSTONE = WHITE TO TRANSLUCENT TO LIGHT BLUISH WHITE WITH DARK LITHICS THROUGHOUT GIVING IT A SALT AND PEPPERED APPEARANCE; FINE TO UPPER VERY FINE GRAINED; SUB ROUNDED TO SUB ANGULAR; MODERATE SPHERICITY; HIGHLY REACTIVE TO DILUTE HCL; CALCAREOUS CEMENTATION; THINLY INTERBEDDED WITH SHALE AND SILTSTONE; REDUCED BIT RATE OCCURRED WHEN DRILLING THIS SANDSTONE.

SHALE/CARBONACEOUS SHALE = DARK GRAY TO BLACK; MOD HARD; PLATY TO FLAKY CTGS; PLANAR TO BLOCKY FRACTURE; SLI RESINOUS LUSTER; SMOOTH TO ROUGH TO SILTY TEXTURE NON CALCAREOUS; ASSOCIATED WITH LOOSE COAL IN SAMPLES.

SILTSTONE = LT TO DARK GRAY; HARD; MASS TO PLATY CUTTINGS; IRREGULAR FRACTURE; DULL LUSTER; VF CARBONACEOUS MATERIAL; GRADING TO CARBONACEOUS SILTSTONE; NON CALCAREOUS; SME THIN BLACK CARBONACEOUS LAMINATIONS; THINLY BEDDED WITH CARB SHALE.

SANDSTONE = MEDIUM GRAY; VERY HARD; VERY FINE GRAINED; ANGULAR TO SUBANGULAR WELL SORTED; GRAIN SUPPORTED; SILICEOUS CEMENT; SPECKLED WITH BLACK CARBONACEOUS MATERIAL; GRADING TO SILTSTONE; OCC THIN GAS SPIKES.

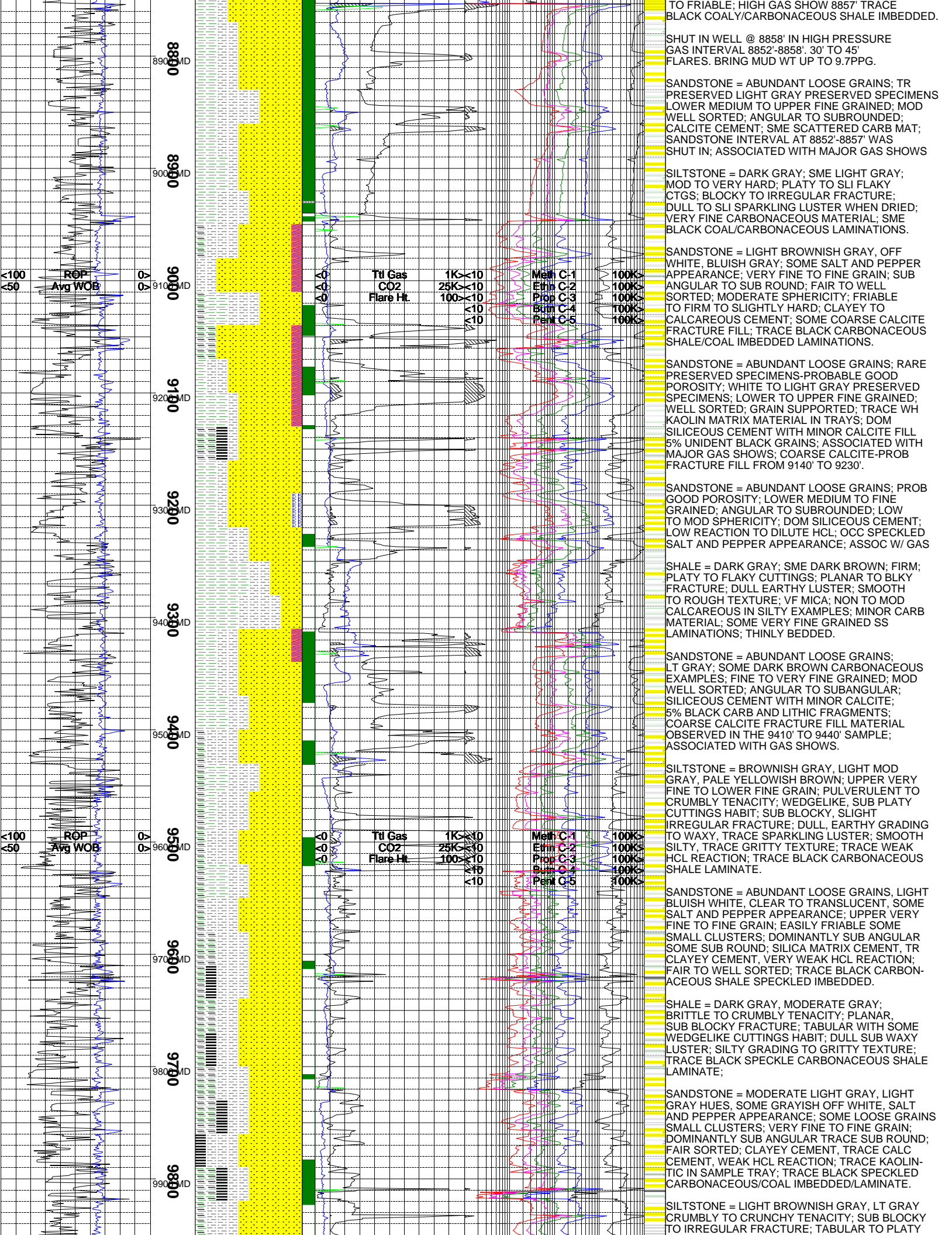
CSG TD = 8465' ON 03/07/2010.
DRILL TO 8475' AND PERFORM F.I.T.

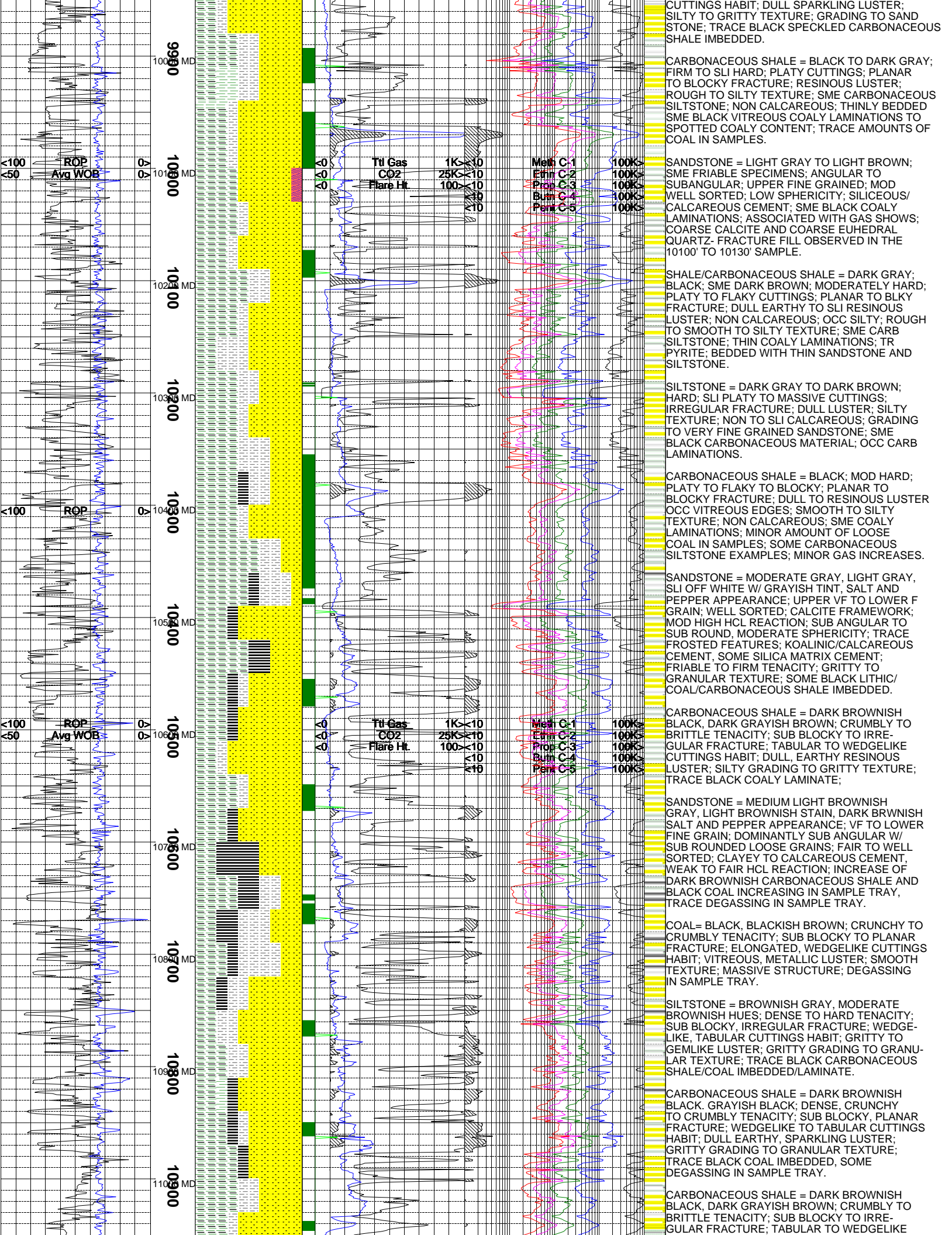
SILTSTONE = DARK TO MEDIUM GRAY; TR DARK BROWN; HARD; SLI PLATY CUTTINGS; IRREGULAR FRACTURE; SLI SPARKLING LUSTER WHEN DRIED; VERY FINE CARBONACEOUS MAT; RAPID REACTION IN DILUTE HCL; DOM CALC CEMENT; SILTY LUSTER; NO STRUCTURE.

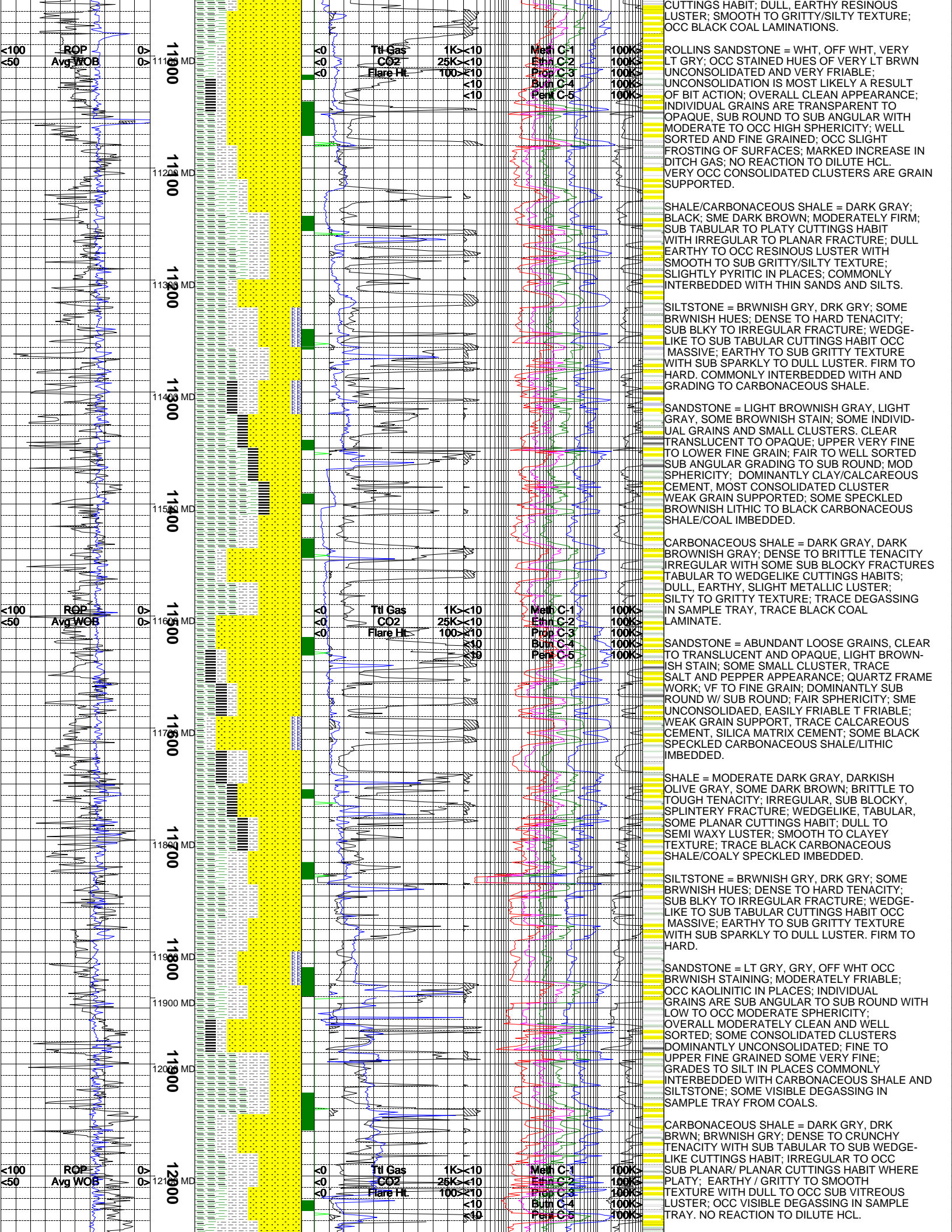
SANDSTONE = ABUNDANT LOOSE GRAINS, CLEAR TO TRANSLUCENT, LIGHT BLUISH GRAY, SOME LIGHT OFF WHITE; DOMINANTLY LOWER TO UPPER FINE GRAIN; WELL SORTED; SUB ANGULAR GRADING TO SUB ROUND; MODERATE SPHERICITY; EASILY FRIABLE, WEAK GRAIN SUPPORT; DOMINANTLY SILICA MATRIX CEMENT SOME KAOLIN CLAYEY CEMENTATION; GOOD INTERGRANULAR POROSITY; THINLY BEDDED COAL, TRACE BLACK CARBONACEOUS SHALE, A SALT AND PEPPER APPEARANCE.

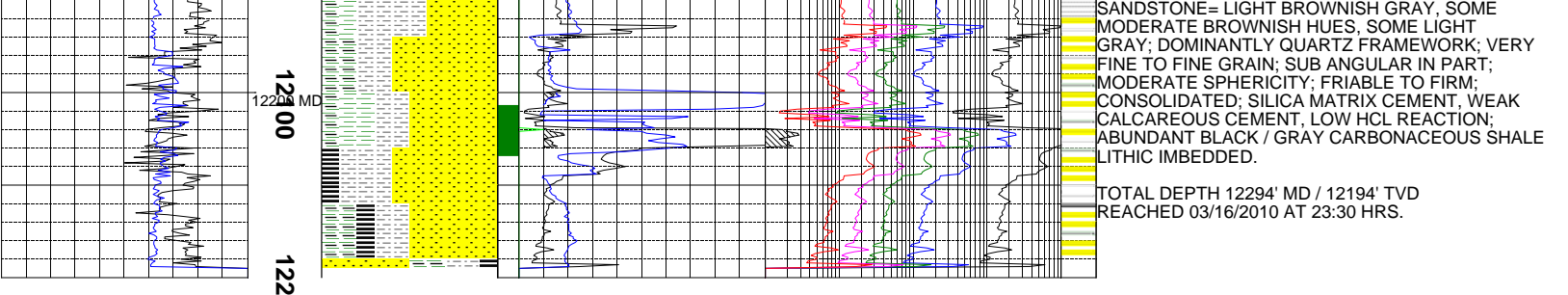
SILTSTONE = MODERATE LIGHT GRAY, DARK BROWNISH GRAY; CRUNCHY TO CRUMBLY TENACITY; SUB BLOCKY, BLOCKY, SLIGHT IRREGULAR FRACTURE; FLAKY, SUB PLATY CUTTINGS HABIT; DULL, WAXY LUSTER; SILTY GRADING TO GRITTY TEXTURE; TRACE TO SLIGHT CALCITE; TRACE BLACK CARBON-ACEOUS SHALE SOME COALY LAMINATE.

SANDSTONE = ABUNDANT LOOSE GRAINS, CLEAR TRANSLUCENT, SOME OFF WHITISH GRAY LIGHT BLUISH GRAY; FINE TO MEDIUM GRAIN, WELL SORTED, DOMINANTLY SUB ROUND, MOD SPHERICITY; SILICA MATRIX CEMENT; LOW CALCAREOUS CEMENT; EASILY FRIABLE









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 not and cannot guarantee the accuracy of any such interpretation of the log data, interpretations or recommendations and Company is fully responsible for all decisions and actions it takes based on such log data, interpretations and recommendations.