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Drilling Dynamics MD

COMPANY	EXXONMOBIL
WELL	FRU197-33A4
FIELD	FREEDOM RANCH UNIT
REGION	ROCKY MOUNTAINS
COORDINATES	N39,54,56.038 W108,17,6.105
ELEVATION	6415' 6388'
COUNTY, STATE	RIO BLANCO COUNTY, COLO
API INDEX	05-103-11100-00
SPUD DATE	05/19/2009
CONTRACTOR	HELMRICH AND PAYNE
CO. REP.	K.GARDNER/G.PERKINS
RIG/TYPE	239/FLEX 3
LOGGING UNIT	MLU 033
GEOLOGISTS	LAYNE GOOD NICK BAUER
ADD. PERSONS	JASON REISENBICHLER JASON REYNOLDS
CO. GEOLOGIST	MELISSA SAURBORN

LOG INTERVAL

DEPTHS: 3900' **TO** 12512'

DATES: 05/19/2008 **TO** 06/06/09

SCALE: 1"=100'

CASING DATA

16" **AT** 130'

10.75" **AT** 3877'

7" **AT** 8717'

4.5" **AT** 12500'

MUD TYPES

SPUD **TO** 3900'

LSND **TO** 12512'

TO

TO

HOLE SIZE

9.875" **TO** 8723"

6.125" **TO** 12512'

TO

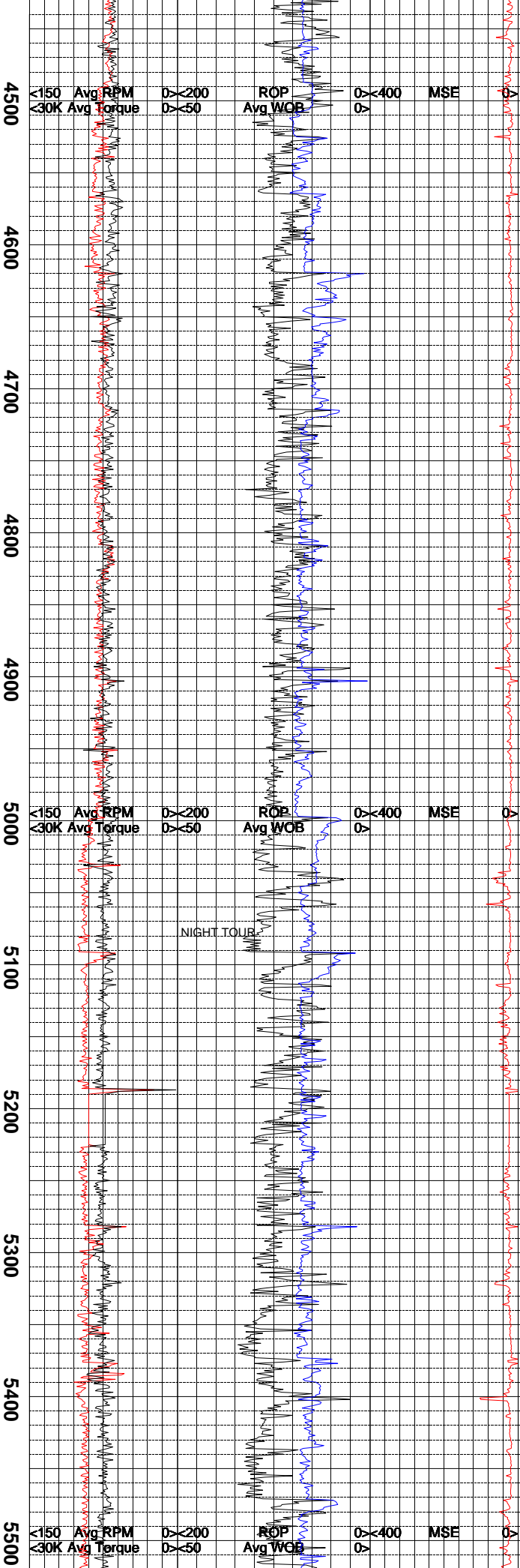
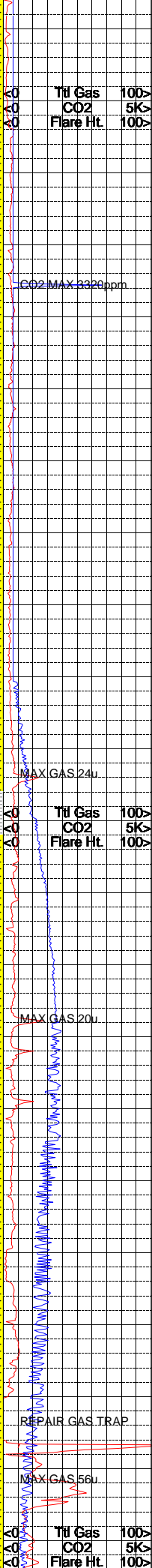
TO

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	

Lithology	<0 Ttl Gas 1K> units			Depth	<150 Avg RPM 0><200 ROP 0><400 MSE 0>			MGS	Remarks	
	<0 CO2 5K> ppm				ft/hr					psi
	<0 Flare Ht. 100> ft				<30K Avg Torque 0><50 Avg WOB 0>					
					FTLBS					kilbs
									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 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 3876'.	
									CANRIG DRILLING TECHNOLOGY LTD. COMMENCED FULL LOGGING SERVICES ON 05/19/2009 at 3900'.	
									SHALE = DARK YELLOW TO LIGHT BROWN WITH SOME LIGHT BLUE FRAGMENTS; CRUNCHY TO CRUMBLY TO OCC BRITTLE TENACITY; PLANAR TO HACKLY TO EARTHLY FRACTURE; SCALY TO TABULAR CUTTINGS HABIT; EARTHLY TEXTURE WITH WAXY APPEARANCE WHEN WET; SMOOTH TO GRITTY WITH OCC SILTY GRAINS PRESENT; THIN TO THICK STRUCTURE WITH IRREGULAR SIZING OF CUTTINGS; CEMENT VERY COMMON AT BEGINNING OF HOLE; RARE PIECES OF LIGHT TO DARK PURPLE CLAYSTONE THAT APPEARS VERY SILTY AND GRITTY; NO APPARENT HYDROCARBON INDICATORS PRESENT; OVERALL NON CALCAREOUS.	
									SANDSTONE = LIGHT GRAY, CLEAR, SALT AND PEPPER GRAINS WITH DARK LITHICS PRESENT, OCC LIGHT BLUE AND LIGHT PINK QUARTZ; MODERATELY HARD TO HARD; FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; FAIR TO POORLY SORTED; SUBROUNDED TO ROUNDED WITH SOME IRREGULAR QUARTZ GRAINS PRESENT; MAINLY SILICA CEMENT WITH OCC CALCITE CRYSTALS COMMON; SLIGHTLY CALCAREOUS; KAOLINITE SAND VERY RARE BUT PRESENT IN SAMPLES; NO OIL INDICATORS PRESENT.	
									SHALE = DARK BROWN, TAN, LIGHT BLUE, WITH SOME DARK ORANGISH HUES; CRUMBLY TO CRUNCHY TO OCC BRITTLE TENACITY; EARTHLY TO OCC SPLINTERY AND HACKLY FRACTURE; SCALY TO TABULAR CUTTINGS HABIT; OVERALL DULL TO EARTHLY LUSTER; GRITTY TO SILTY TO OCC CLAYEY TEXTURE; MASSIVE TO LENTICULAR STRUCTURE; VERY WELL SORTED SHALE NODULES WITH OCC TRACES OF CALCITE AND QUARTZ FINE GRAINS THROUGHOUT SAMPLE; NON CALCAREOUS; NO APPARENT HYDROCARBON INDICATORS.	
									SANDSTONE = LIGHT GRAY TO DARK YELLOWISH ORANGE COLOR; VERY FINE GRAINED; WELL SORTED; SUBROUNDED GRAINS WITH MODERATE SPHERICITY; LIGHT GRAY CUTTINGS ARE GRAIN SUPPORTED, DARK YELLOWISH ORANGE CUTTINGS ARE MUD MATRIX SUPPORTED; FIRM TO FRIABLE CUTTINGS; FAIR REACTION WITH 10% HCL.	
									SHALE = PALE BLUE TO DARK YELLOWISH ORANGE COLOR; CRUMBLY TO BRITTLE TENACITY; SPLINTERY TO HACKLY TO EARTHLY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; EARTHLY TO WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; TRACE OF LAMINE ON SOME SURFACES OF CUTTINGS; FAIR REACTION WITH	



SILTSTONE = MODERATE YELLOWISH BROWN COLOR; DENSE TO BRITTLE TENACITY; BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; SLIGHT REACTION WITH 10% HCL; GRADING INTO SAND STONE;

SANDSTONE = MODERATE YELLOWISH BROWN TO MODERATE BROWN TO OLIVE GRAY TO GRAYISH RED PURPLE COLOR; VERY FINE TO FINE GRAINED; FAIR TO POOR SORTING; SUBANGULAR TO SUBROUND GRAINS; MODERATE TO LOW SPHERICITY; FRIABLE; MATRIX SUPPORTED WITH SALT AND PEPPER GRAINS; SLIGHT REACTION WITH HCL; UNDER UV LIGHT NO FLUORESCENCE.

SHALE = DARK YELLOWISH ORANGE TO MEDIUM BLuish COLOR; BRITTLE TO DENSE TO TOUGH TENACITY; EARTHY TO SPLINTERY TO CONCHOIDAL FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; EARTHY TO WAXY LUSTER; CLAYEY TO SMOOTH TEXTURE; TRACE OF SILT ON SURFACE OF THE CUTTINGS.

SANDSTONE = GRAYISH RED TO GRAYISH ORANGE COLOR; FINE TO VERY FINE GRAIN SIZE; FAIR SORTING; SUBANGULAR GRAINS; MODERATE SPHERICITY; FIRMLY FRIABLE; MATRIX SUPPORTED; LESS THEN 2% DARK LITHICS; PREDOMNIANTLY QUARTS GRAINS, CLEAR TO GRAYISH RED TO MILKY WHITE COLOR; FAIR REACTION WITH 10% HCL; NO HYDROCARBON FLUORESCENCE UNDER UV LIGHT.

SILTSTONE = MODERATE YELLOWISH BROWN COLOR; BRITTLE TO DENSE TENACITY; BLOCKY FRACTURE; NODULAR CUTTINGS HABIT; EARTHY LUSTER; SILTY TO GRITY TEXTURE, GRADING INTO SANDSTONE; PREDOMINANTLY MASSIVE WITH TRACE OF LAMINAE VISIBLE; SLIGHT REACTION IN HCL.

SHALE = GRAYISH ORANGE TO MEDIUM BLUE COLOR; DENSE TO TOUGH TO BRITTLE TENACITY; BLOCKY TO CONCHOIDAL TO HACKLY FRACTURE; NODUAL TO WEDGELIKE TO BLADED CUTTINGS HABIT; EARTHY TO DULL TO WAXY LUSTER; CLAYEY TO SILTY TEXTURE; MASSIVE STRUCTURE; SLIGHT REACTION WITH HCL.

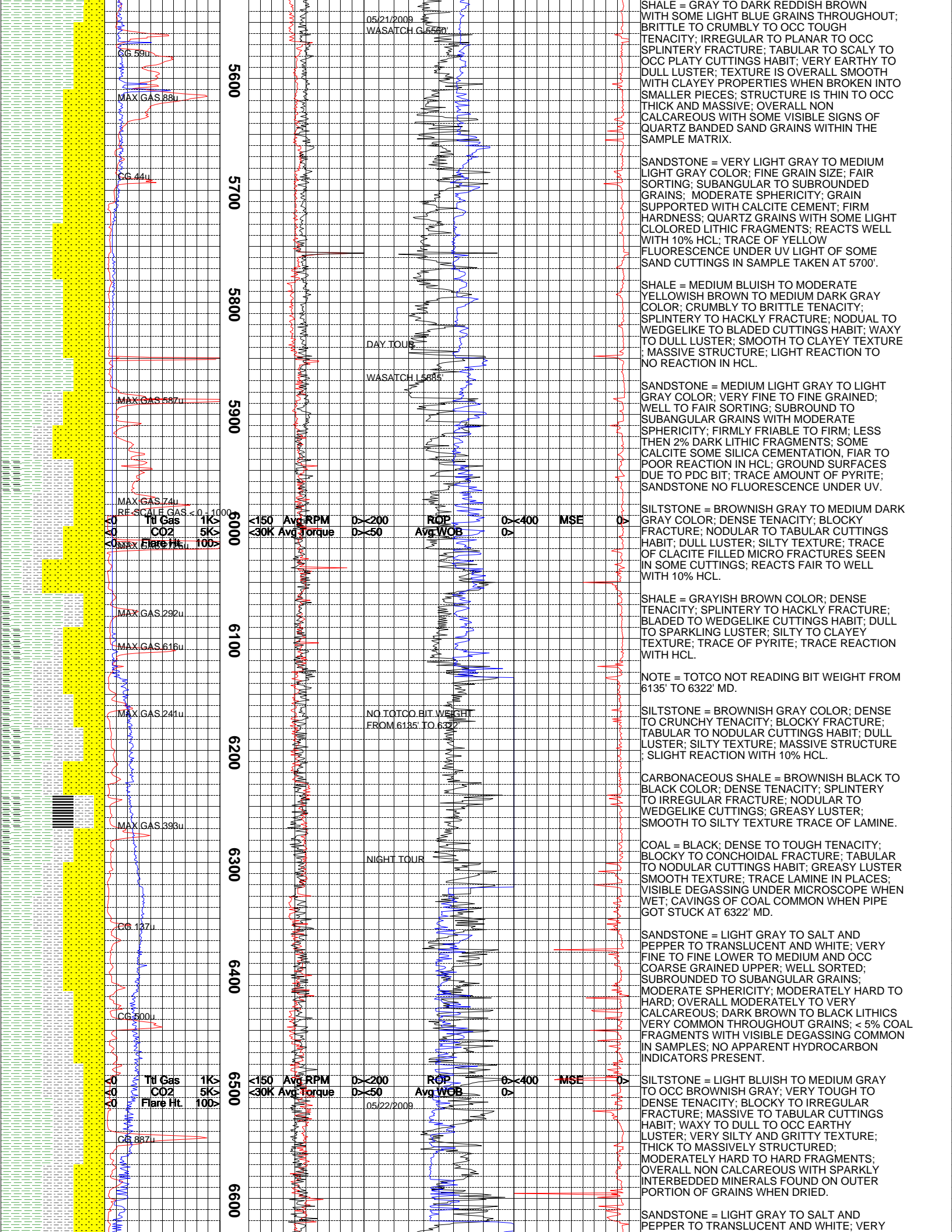
SHALE = MEDIUM BLUE TO MODERATE YELLOWISH BROWN COLOR; DENSE TO BRITTLE TENACITY; CHONCHOIDAL TO HACKLY TO EARTHY FRACTURE; WEDGELIKE TO BLADED TO NODUAL CUTTINGS HABIT; SMOOTH TO CLAYEY TEXTURE; WAXY TO EARTHY LUSTER; COATING OF SILT ON SOME OF THE SHALE CUTTINGS; NO REACTION WITH HCL.

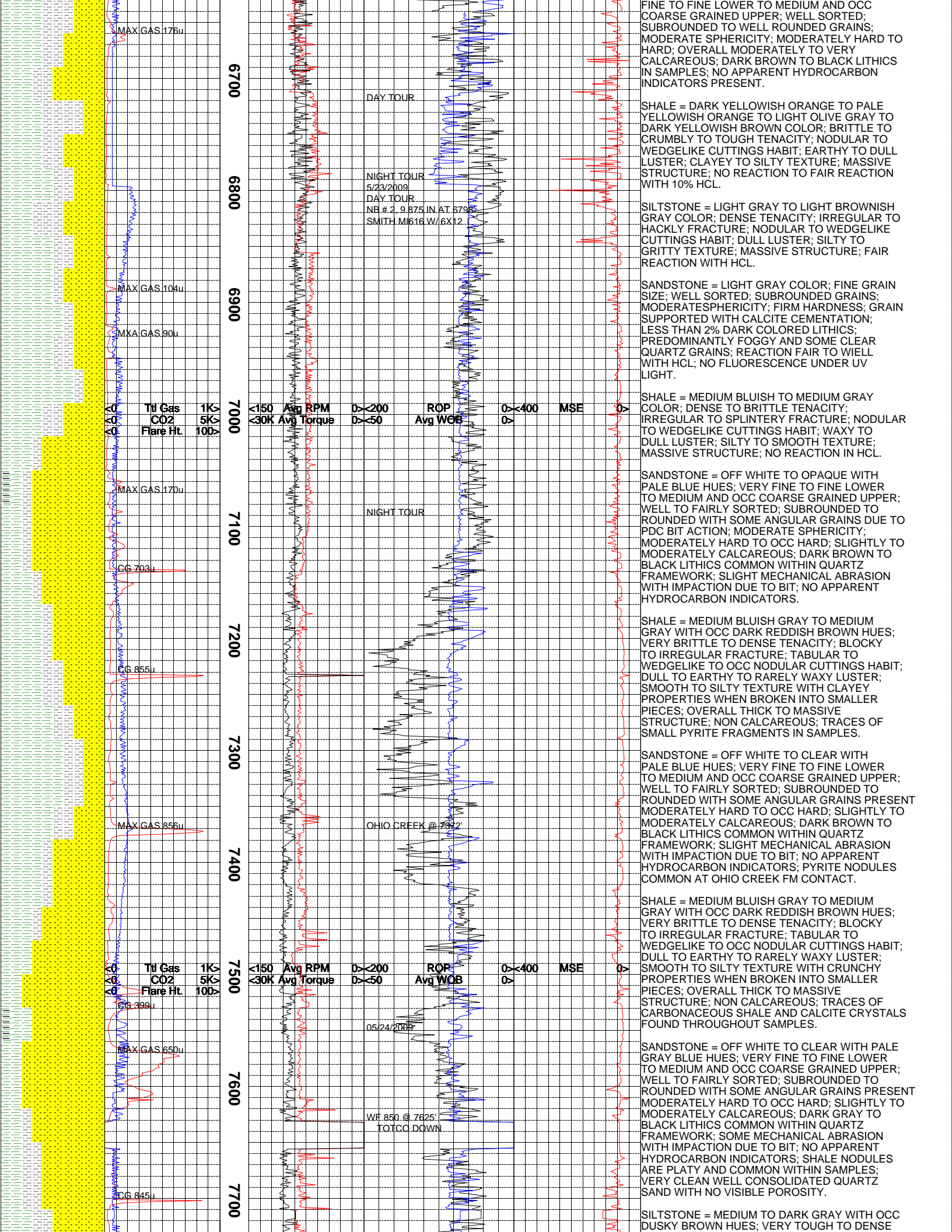
SHALE = GRAYISH ORANGE TO LIGHT BLUEISH COLOR; TOUGH TO BRITTLE TO CRUNCHY TENACITY; HACKLY TO IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO OCC BLADED CUTTINGS HABIT; SMOOTH TO SILTY TO OCC CLAYEY TEXTURE; EARTHY TO DULL TO OCC GREASY LUSTER; SANDY CEMENT CLUSTERS FOUND SCATTERED THROUGHOUT SAMPLES; NON TO SLIGHTLY CALCAREOUS; NO APPARENT HYDROCARBON INDICATORS PRESENT.

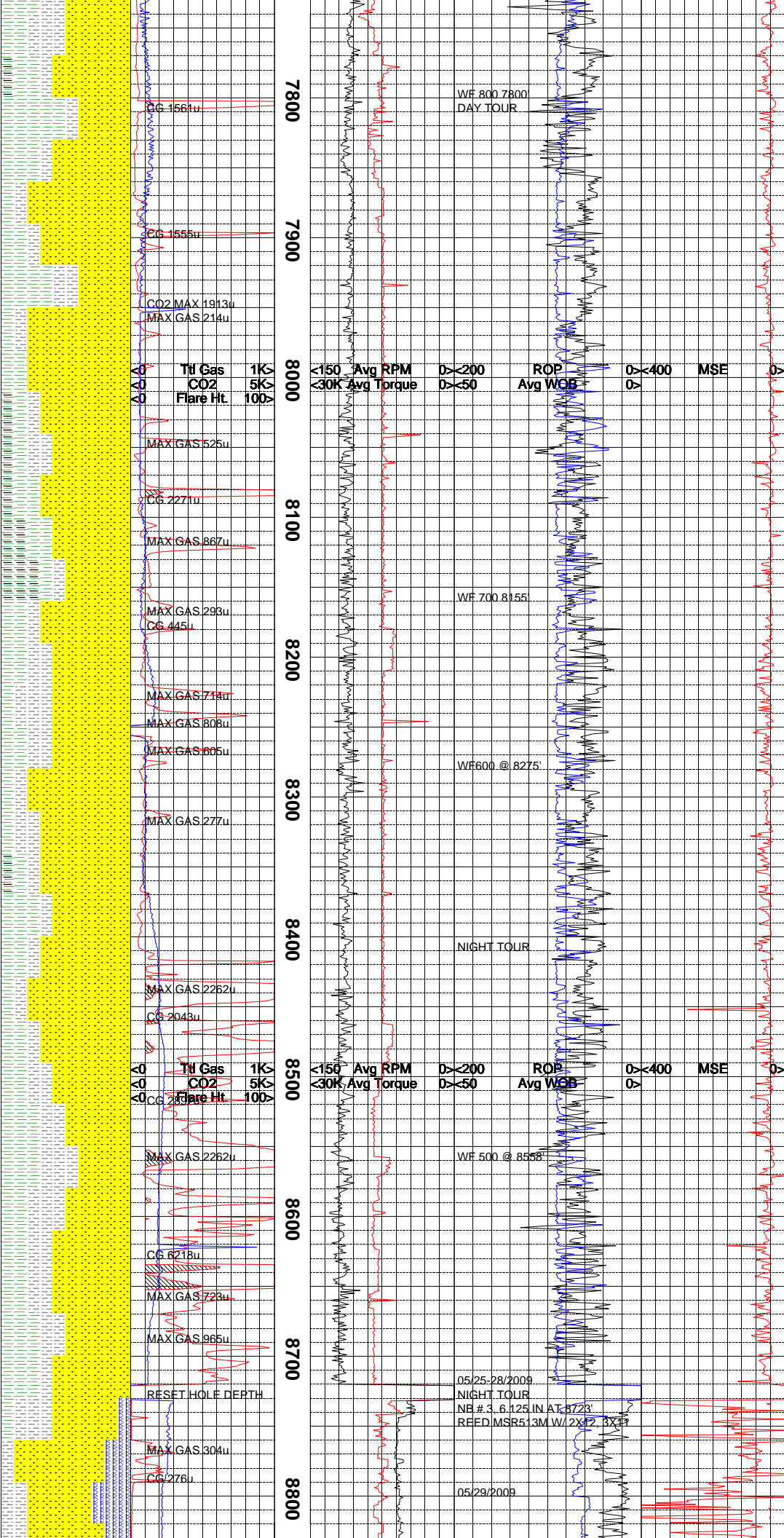
SANDSTONE = LIGHT GRAY TO DARK GRAY WITH DARK GREENISH HUES AND DARK LITHICS; VERY FINE TO FINE TO OCC MEDIUM GRAINED; VERY WELL TO WELL SORTED; SUBROUNDED TO ROUNDED WITH SUBANGULAR QUARTZ GRAINS THROUGHOUT SAMPLE; MODERATE SPHERICITY; MAINLY SILICA CEMENTATION WITH CLEAR TO PINKISH CRYSTALS COMMON; OVERALL NON TO SLIGHTLY CALCAREOUS; NO APPARENT OIL INDICATORS PRESENT.

SHALE = DARK GRAY TO YELLOWISH BROWN WITH LIGHT BLUE GRAINS THROUGHOUT; BRITTLE TO CRUMBLY TO OCC TOUGH TENACITY; IRREGULAR TO PLANAR TO OCC SPLINTERY FRACTURE; TABULAR TO SCALY TO OCC PLATY CUTTINGS HABIT; VERY EARTHY TO DULL LUSTER; TEXTURE IS OVERALL SMOOTH WITH CLAYEY PROPERTIES WHEN BROKEN INTO SMALLER PIECES; STRUCTURE IS THIN TO OCC THICK AND MASSIVE; OVERALL NON CALCAREOUS WITH SOME VISIBLE SIGNS OF KAOLINITE BANDED SAND PARTICLES WITHIN THE SAMPLE MATRIX.

SANDSTONE = LIGHT GRAY TO OFF WHITE WITH DARK GREENISH HUES AND DARK LITHICS; VERY FINE TO FINE TO OCC COARSE GRAINED; VERY WELL TO WELL SORTED; SUBROUNDED TO ROUNDED WITH SUBANGULAR QUARTZ GRAINS THROUGHOUT SAMPLE; MODERATE SPHERICITY; MAINLY SILICA CEMENTATION WITH CLEAR TO WHITE CRYSTALS COMMON; OVERALL NON TO SLIGHTLY CALCAREOUS; NO APPARENT OIL INDICATORS PRESENT.







TENACITY; BLOCKY TO IRREGULAR FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT WITH SOME ELONGATED FRAGMENTS; VERY DULL TO EARTHY LUSTER; VERY SILTY TO CLAYEY TEXTURE; THICK TO OCC THIN STRUCTURE; HARD TO BREAK INTO PIECES BUT FLAKES OFF IN A CLAY-LIKE FASHION WHEN POKED WITH METAL TOOL; OVERALL NON CALCAREOUS.

SHALE = MEDIUM BLUISH TO PALE BLUE COLOR; BRITTLE TO DENSE TENACITY; SPLINTERY TO HACKLY FRACTURE; WEDGELIKE TO NODULAR CUTTINGS HABIT; WAXY LUSTER; SMOOTH TEXTURE; MASSIVE STRUCTURE; NO REACTION WITH 10% HCL.

SANDSTONE = LIGHT GRAY TO VERY LIGHT GRAY COLOR; MEDIUM TO FINE GRAINED; POOR TO FAIR SORTING; SUBROUNDED GRAINS WITH MODERATE SPHERICITY; FRIABLE, LOOSE GRAINS IN TRAY DUE TO PDC BIT, PREDOMINATLY SMALL CUTTINGS OF LESS THAN 1MM IN SIZE; FOGGY QUARTZ GRAINS WITH SOME CLEAR; LESS THAN 2% DARK LITHICS; SOME CALCITE CEMENTATION, REACTS WELL WITH HCL; NO FLUORESCENCE UNDER UV LIGHT

SHALE = LIGHT BLUISH TO LIGHT BROWNISH TO PINKISH GRAY COLOR; DENSE TO TOUGH TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO PLATY CUTTINGS HABIT; WAXY TO DULL LUSTER; SILTY TEXTURE; MASSIVE STRUCTURE; NO REACTION WITH HCL; SMALL CUTTINGS SIZE OF LESS THAN 1 MM.

SANDSTONE = LIGHT GRAY COLOR; FINE TO MEDIUM GRAIN SIZE; POOR TO FAIR SORTING; SUBROUND GRAINS WITH MODERATE SPHERICITY; FRIABLE TO FIRMLY FRIABLE; GRAIN SUPPORTED; QUARTZ GRAINS ARE CLEAR TO FOGGY; LESS THAN 2% DARK LITHICS IN MOST CUTTINGS 5% LITHIC IN SOME CUTTINGS; SLIGHT TO NO REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT.

SILTSTONE = PALE BROWN TO BROWNISH GRAY COLOR; DENSE TENACITY; IRREGULAR TO BLOCKY FRACTURE; NODULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; MASSIVE STRUCTURE; TRACE REACTION WITH HCL.

SHALE = LIGHT BLUISH TO PALE YELLOW BROWN COLOR; DENSE TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; WAXY TO DULL LUSTER; SMOOTH TEXTURE; MASSIVE STRUCTURE; NO REACTION IN HCL.

SANDSTONE = LIGHT GRAY TO VERY LIGHT GRAY COLOR; FINE TO VERY FINE GRAIN SIZE; FAIR SORTING; SUBROUND TO SUB-ANGULAR GRAINES; QUARTZ GRAINS WITH LESS THAN 2% DARK LITHICS; FIRM FRIABLE; GRAIN SUPPORTED; SLIGHT REACTION WITH HCL; NO FLUORESCENCE UNDER UV LIGHT; GROUND SURFACES DUE TO PDC BIT.

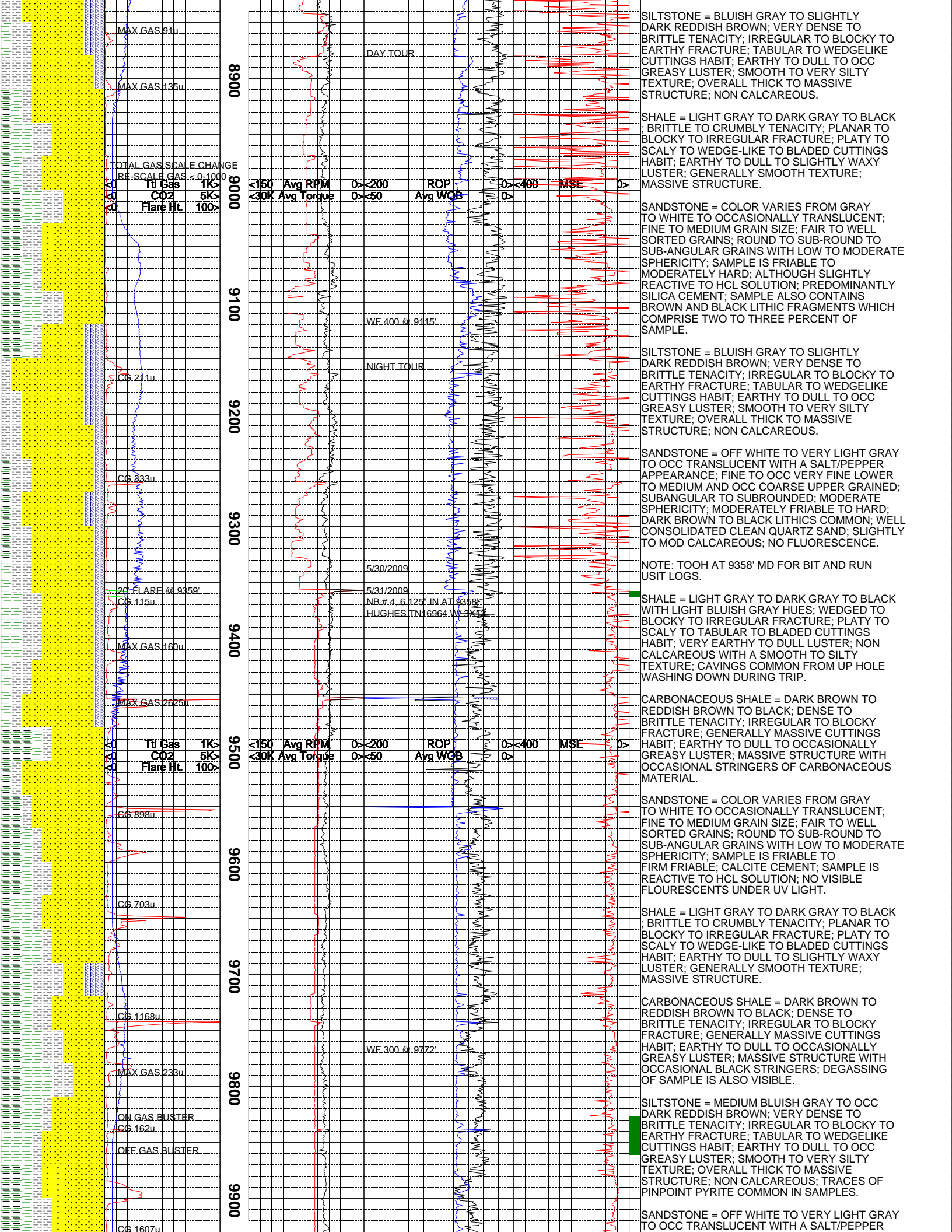
SILTSTONE = MEDIUM BLUISH GRAY TO OCC DARK REDDISH BROWN; VERY DENSE TO BRITTLE TENACITY; IRREGULAR TO BLOCKY TO EARTHY FRACTURE; TABULAR TO WEDGELIKE CUTTINGS HABIT; EARTHY TO DULL TO OCC GREASY LUSTER; SMOOTH TO VERY SILTY TEXTURE; OVERALL THICK TO MASSIVE STRUCTURE; NON CALCAREOUS; TRACES OF PINPOINT PYRITE COMMON IN SAMPLES.

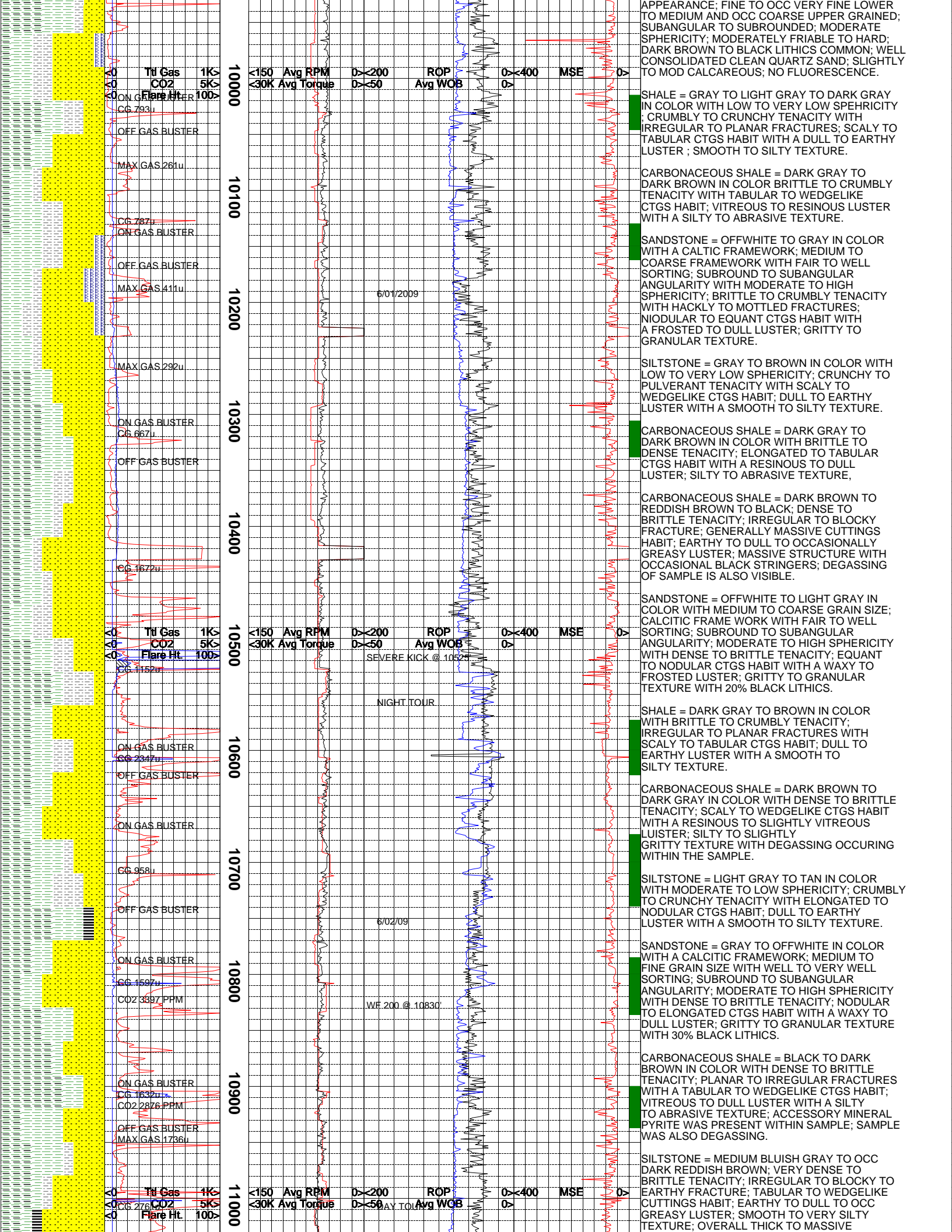
SHALE = LIGHT BLUISH TO PALE YELLOW BROWN COLOR; DENSE TENACITY; IRREGULAR FRACTURE; WEDGELIKE TO NODULAR TO BLADED CUTTINGS HABIT; EARTHY TO DULL LUSTER; SMOOTH TEXTURE; MASSIVE TO THICK STRUCTURE; NO REACTION WITH HCL.

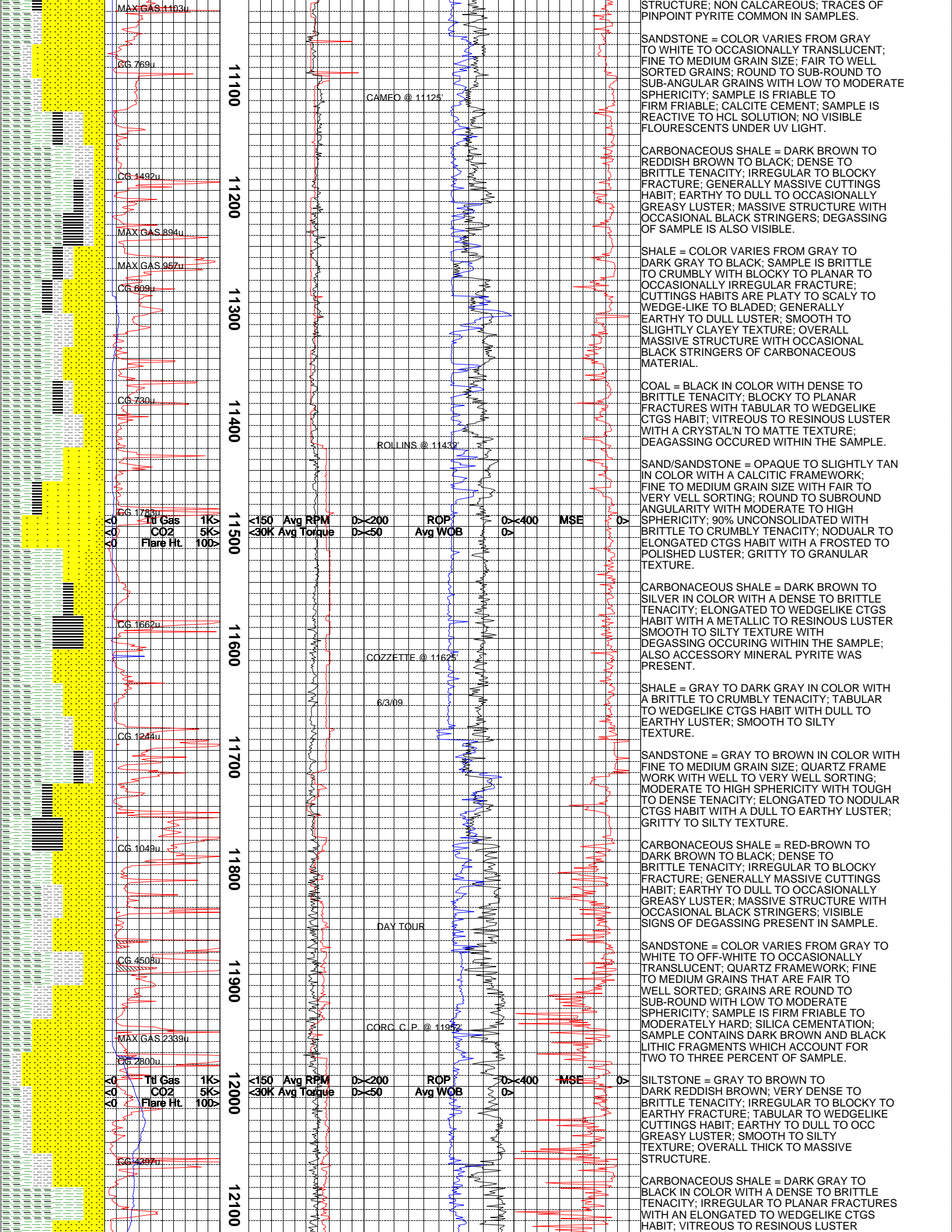
SANDSTONE = OFF WHITE TO CLEAR WITH PALE GRAY BLUE HUES; VERY FINE TO FINE LOWER TO MEDIUM AND OCC COARSE GRAINED UPPER; WELL TO FAIRLY SORTED; SUBROUNDED TO ROUNDED WITH SOME ANGULAR GRAINS PRESENT MODERATELY HARD TO FRIABLE; SLIGHTLY TO MODERATELY CALCAREOUS; DARK GRAY TO BLACK LITHICS COMMON WITHIN QUARTZ; NO HYDROCARBON INDICATORS; SHALE NODULES ARE PLATY AND COMMON WITHIN SAMPLES.

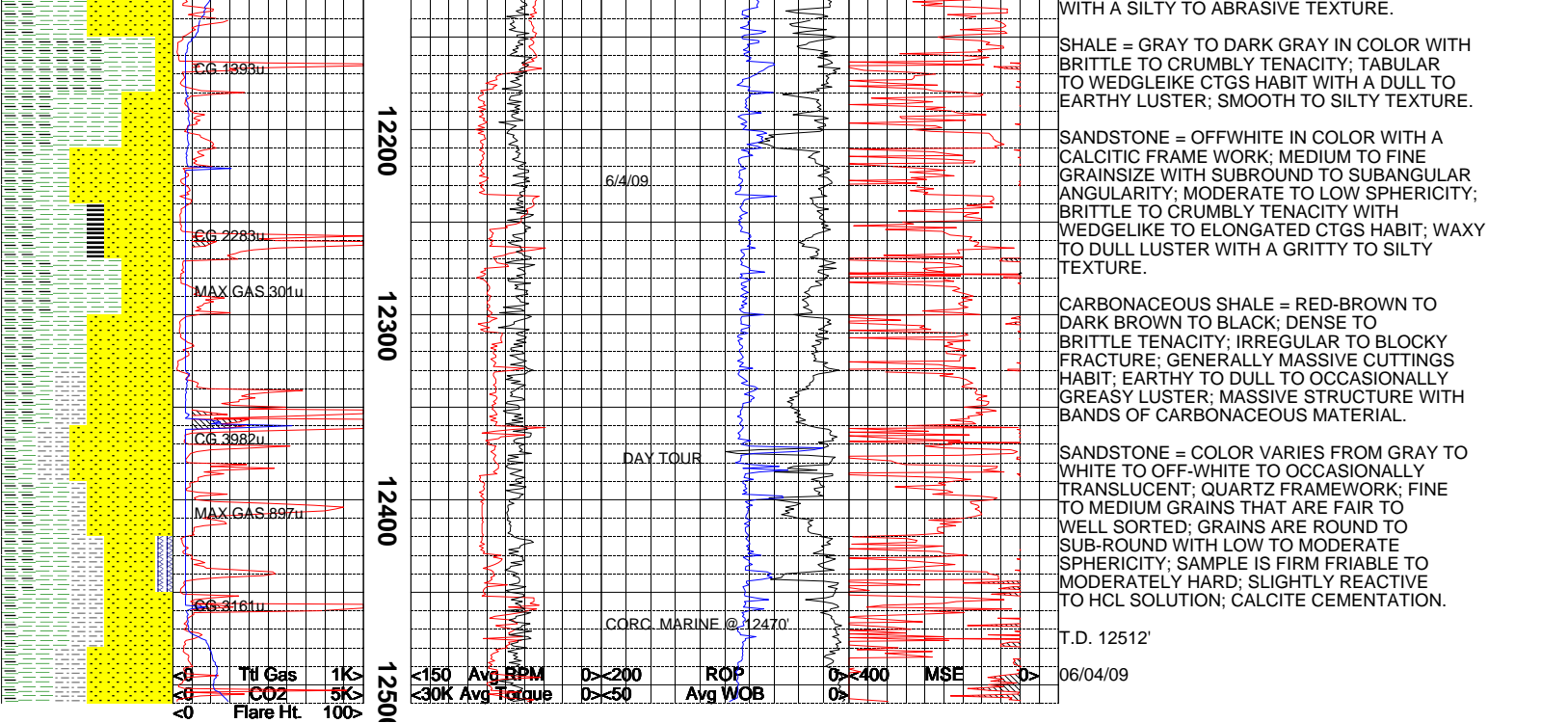
NOTE: TD INTERMEDIATE SECTION @ 8723' MD ON 05/24/2009 AT 23:00 HRS.

SANDSTONE = OPAQUE, OFF WHITE, CLEAR, LIGHT GREENISH GRAY HUES; VERY FINE TO FINE GRAINED; SUBANGULAR TO SUBROUNDED; OVERALL HARD QUARTZ SAND; KAOLINITIC SAND GRAINS VERY COMMON; OVERALL FINE SILICA CEMENTATION; VERY WELL SORTED WITH NO VISIBLE POROSITY; VERY CLEAN AND COMPACTED SAND GRAINS WHEN WET; NON TO SLIGHTLY CALCAREOUS WITH DARK BROWN SILTSTONE FRAGMENTS COMMON; NO APPARENT OIL INDICATORS PRESENT.









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