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Anchorage, AK
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MUDLOG TVD

COMPANY ExxonMobil Production
WELL FRU 197-33A9
FIELD FREEDOM RANCH UNIT
REGION ROCKY MOUNTAINS
COORDINATES N39.915656
W108.285725
ELEVATION KB 6415'
GL 6388'
COUNTY, STATE RIO BLANCO COUNTY, CO
API INDEX 05-103-11400-00
SPUD DATE 10/02/2009
CONTRACTOR HELMRICH AND PAYNE
CO. REP. RICKY T OWENS
RIG/TYPE 215/FLEX 3
LOGGING UNIT MLU 51
GEOLOGISTS GEORGE BAKER
BRENDA MARSH
ADD. PERSONS DEVIN CLAAR
BILL JOHANNING
CO. GEOLOGIST MELISSA SAURBORN

LOG INTERVAL

CASING DATA

DEPTHS: 3,800' TO 12,281'
DATES: 01/05/2010 TO 01/24/2010
SCALE: 5"=100'

16" AT 131'
10.75" AT 3,833'
7.00" AT 8,533'
AT

MUD TYPES

HOLE SIZE

SPUD TO 3,833'
LSND TO 12,281'
TO
TO

9.875' TO 8,533'
6.125' TO 12,281'
TO
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	KAOLINIC	RECRYSTALLIZED CALCITE	VOLCANICS
CHALK	DIATOMITE	LIMESTONE	RHYOLITE	
CRYSTALLINE TUFF	DIORITE	LITHIC TUFF	SALT	
CHERT - ARGILL	DOLOSTONE	MARL - DOLO	SAND	

3700 MD

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.

3700

EVIDENCE OF FRACTURE FILL IS NOTED ON

3800 MD

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 01/05/2010 AT 3848

3800

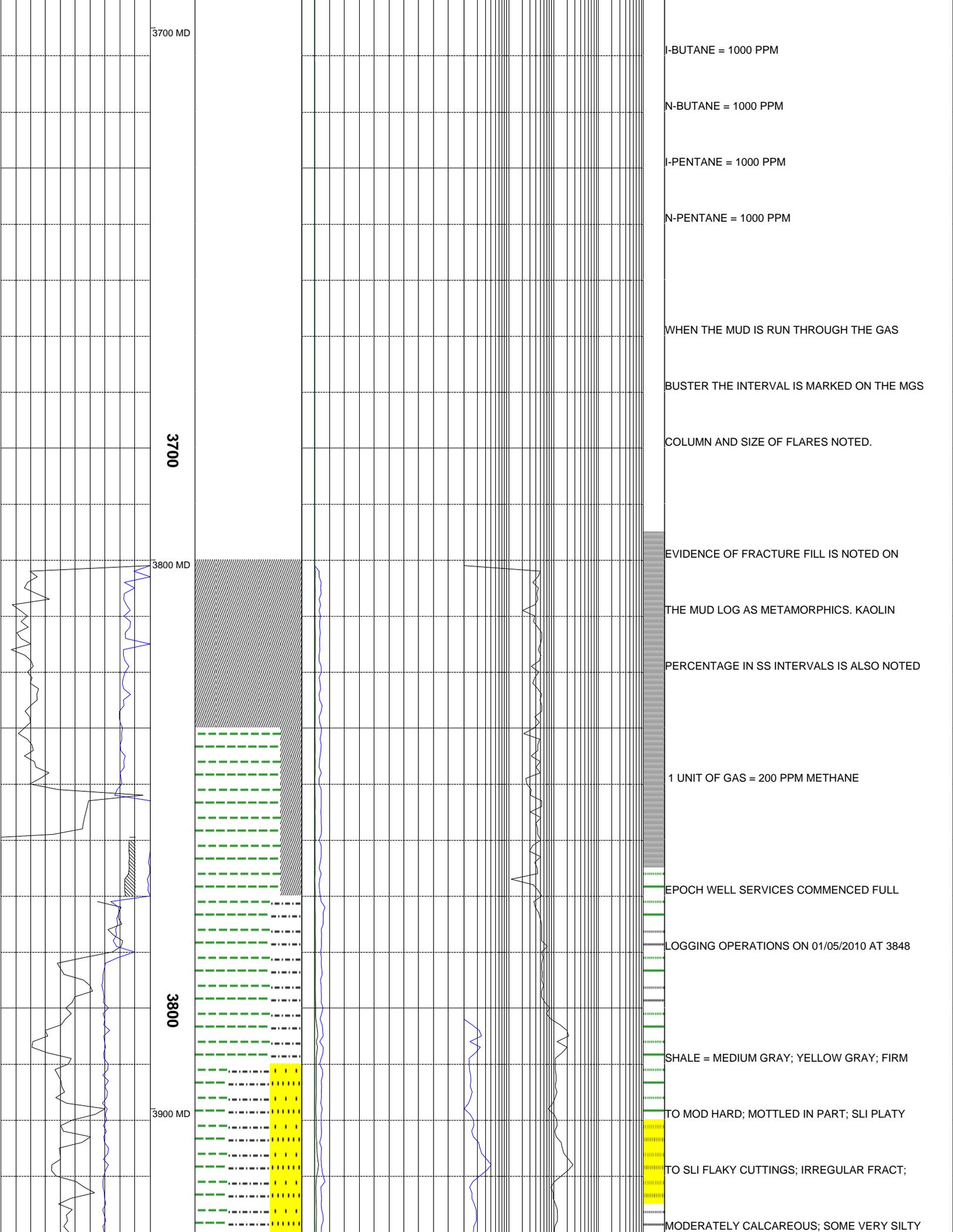
SHALE = MEDIUM GRAY; YELLOW GRAY; FIRM

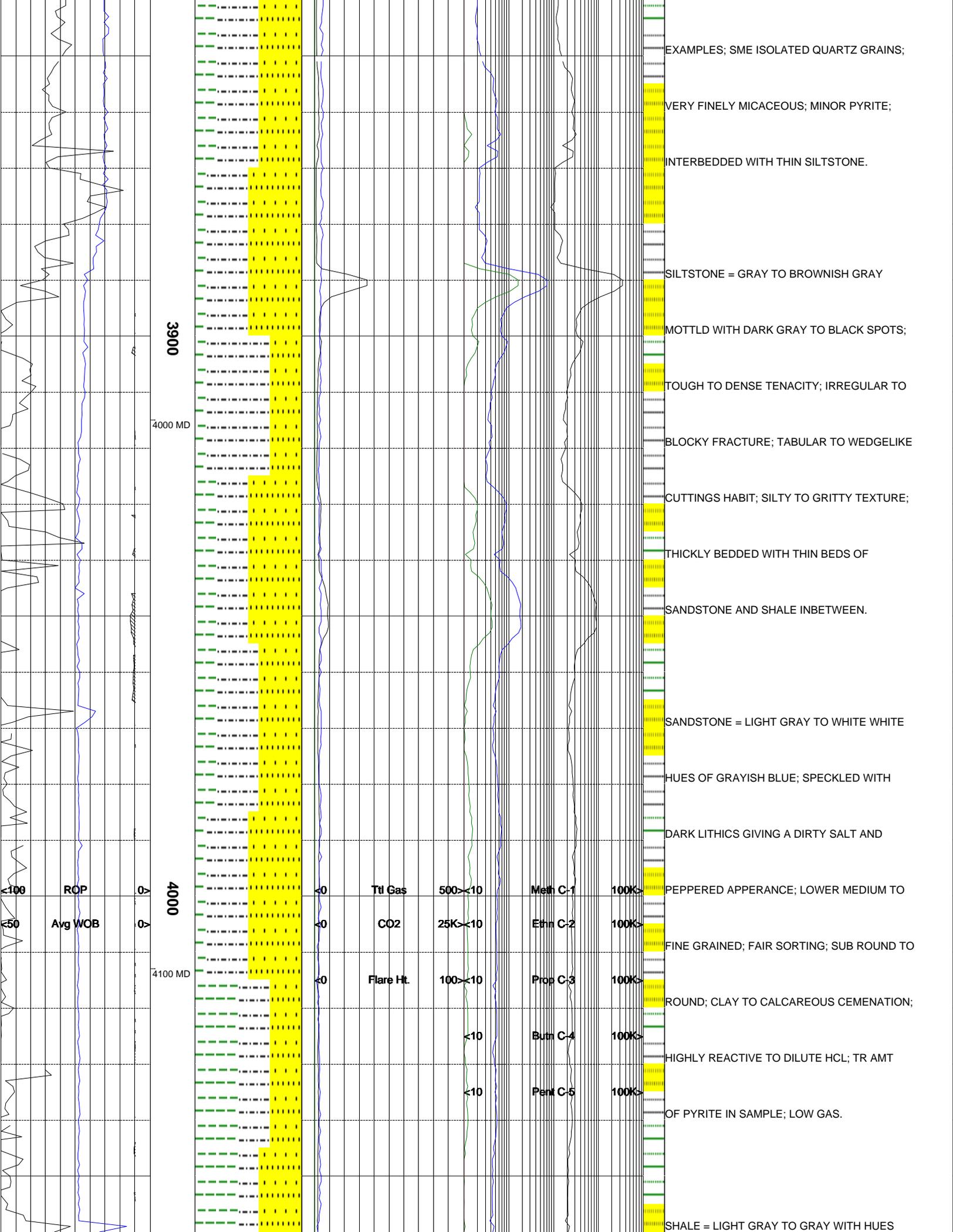
3900 MD

TO MOD HARD; MOTTLED IN PART; SLI PLATY

TO SLI FLAKY CUTTINGS; IRREGULAR FRACT;

MODERATELY CALCAREOUS; SOME VERY SILTY





3900

4000 MD

4000

4100 MD

ROP

Avg WOB

Ttl Gas

CO2

Flare Ht.

Meth C-1

Ethn C-2

Prop C-3

Butn C-4

Pent C-5

500 <10

25K <10

100 <10

<10

<10

100K >

100K >

100K >

100K >

100K >

EXAMPLES; SME ISOLATED QUARTZ GRAINS;

VERY FINELY MICACEOUS; MINOR PYRITE;

INTERBEDDED WITH THIN SILTSTONE.

SILTSTONE = GRAY TO BROWNISH GRAY

MOTTLED WITH DARK GRAY TO BLACK SPOTS;

TOUGH TO DENSE TENACITY; IRREGULAR TO

BLOCKY FRACTURE; TABULAR TO WEDGELIKE

CUTTINGS HABIT; SILTY TO GRITTY TEXTURE;

THICKLY BEDDED WITH THIN BEDS OF

SANDSTONE AND SHALE INBETWEEN.

SANDSTONE = LIGHT GRAY TO WHITE WHITE

HUES OF GRAYISH BLUE; SPECKLED WITH

DARK LITHICS GIVING A DIRTY SALT AND

PEPPERED APPEARANCE; LOWER MEDIUM TO

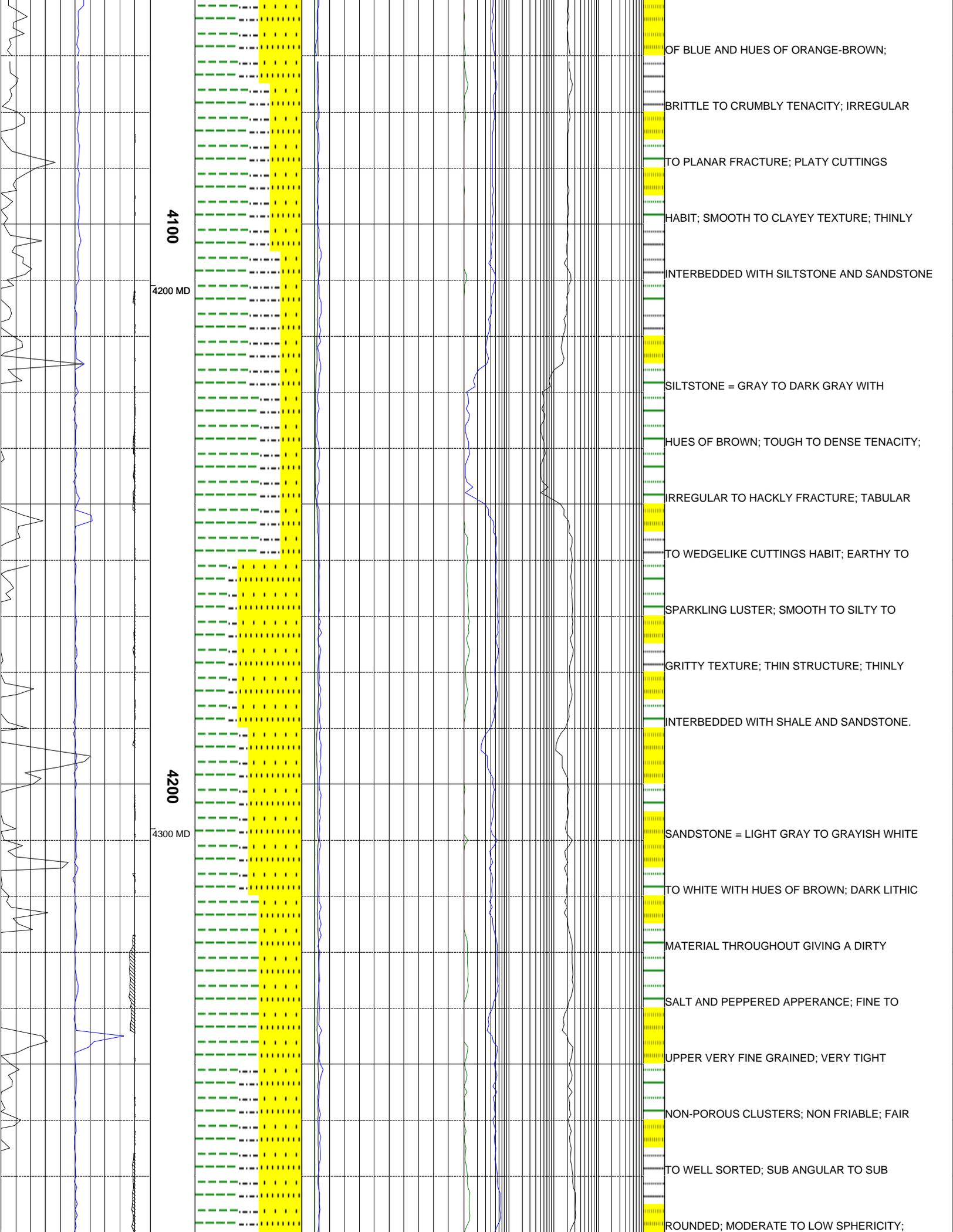
FINE GRAINED; FAIR SORTING; SUB ROUND TO

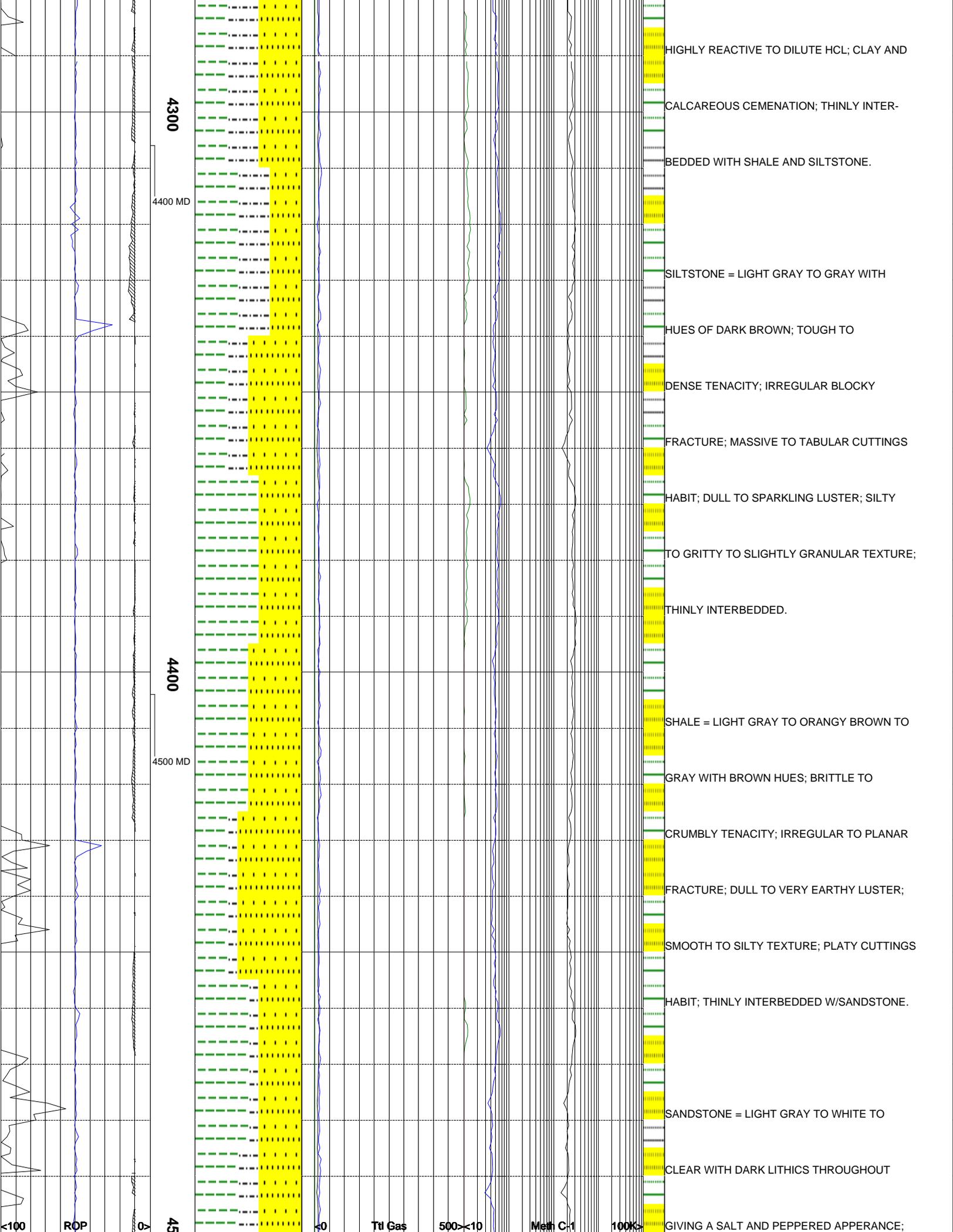
ROUND; CLAY TO CALCAREOUS CEMENTATION;

HIGHLY REACTIVE TO DILUTE HCL; TR AMT

OF PYRITE IN SAMPLE; LOW GAS.

SHALE = LIGHT GRAY TO GRAY WITH HUES





4300

4400 MD

4400

4500 MD

HIGHLY REACTIVE TO DILUTE HCL; CLAY AND

CALCAREOUS CEMENTATION; THINLY INTER-

BEDDED WITH SHALE AND SILTSTONE.

SILTSTONE = LIGHT GRAY TO GRAY WITH

HUES OF DARK BROWN; TOUGH TO

DENSE TENACITY; IRREGULAR BLOCKY

FRACTURE; MASSIVE TO TABULAR CUTTINGS

HABIT; DULL TO SPARKLING LUSTER; SILTY

TO GRITTY TO SLIGHTLY GRANULAR TEXTURE;

THINLY INTERBEDDED.

SHALE = LIGHT GRAY TO ORANGY BROWN TO

GRAY WITH BROWN HUES; BRITTLE TO

CRUMBLY TENACITY; IRREGULAR TO PLANAR

FRACTURE; DULL TO VERY EARTHY LUSTER;

SMOOTH TO SILTY TEXTURE; PLATY CUTTINGS

HABIT; THINLY INTERBEDDED W/SANDSTONE.

SANDSTONE = LIGHT GRAY TO WHITE TO

CLEAR WITH DARK LITHICS THROUGHOUT

GIVING A SALT AND PEPPERED APPEARANCE;

100

ROP

Δ

45

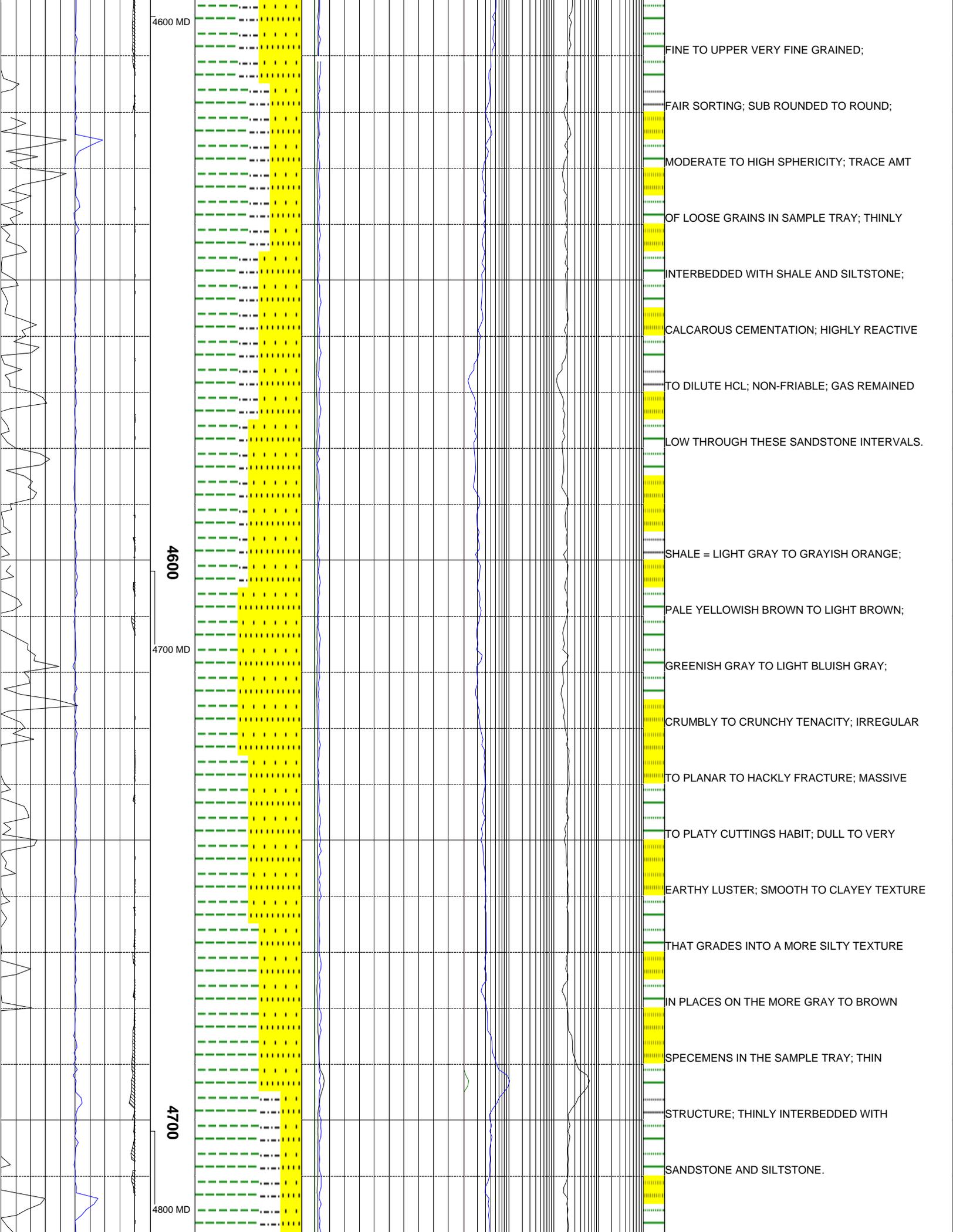
0

Ttl Gas

500x10

Meth C-1

100K>



4600 MD

FINE TO UPPER VERY FINE GRAINED;
FAIR SORTING; SUB ROUNDED TO ROUND;
MODERATE TO HIGH SPHERICITY; TRACE AMT
OF LOOSE GRAINS IN SAMPLE TRAY; THINLY
INTERBEDDED WITH SHALE AND SILTSTONE;
CALCAROUS CEMENTATION; HIGHLY REACTIVE
TO DILUTE HCL; NON-FRIABLE; GAS REMAINED
LOW THROUGH THESE SANDSTONE INTERVALS.

4600

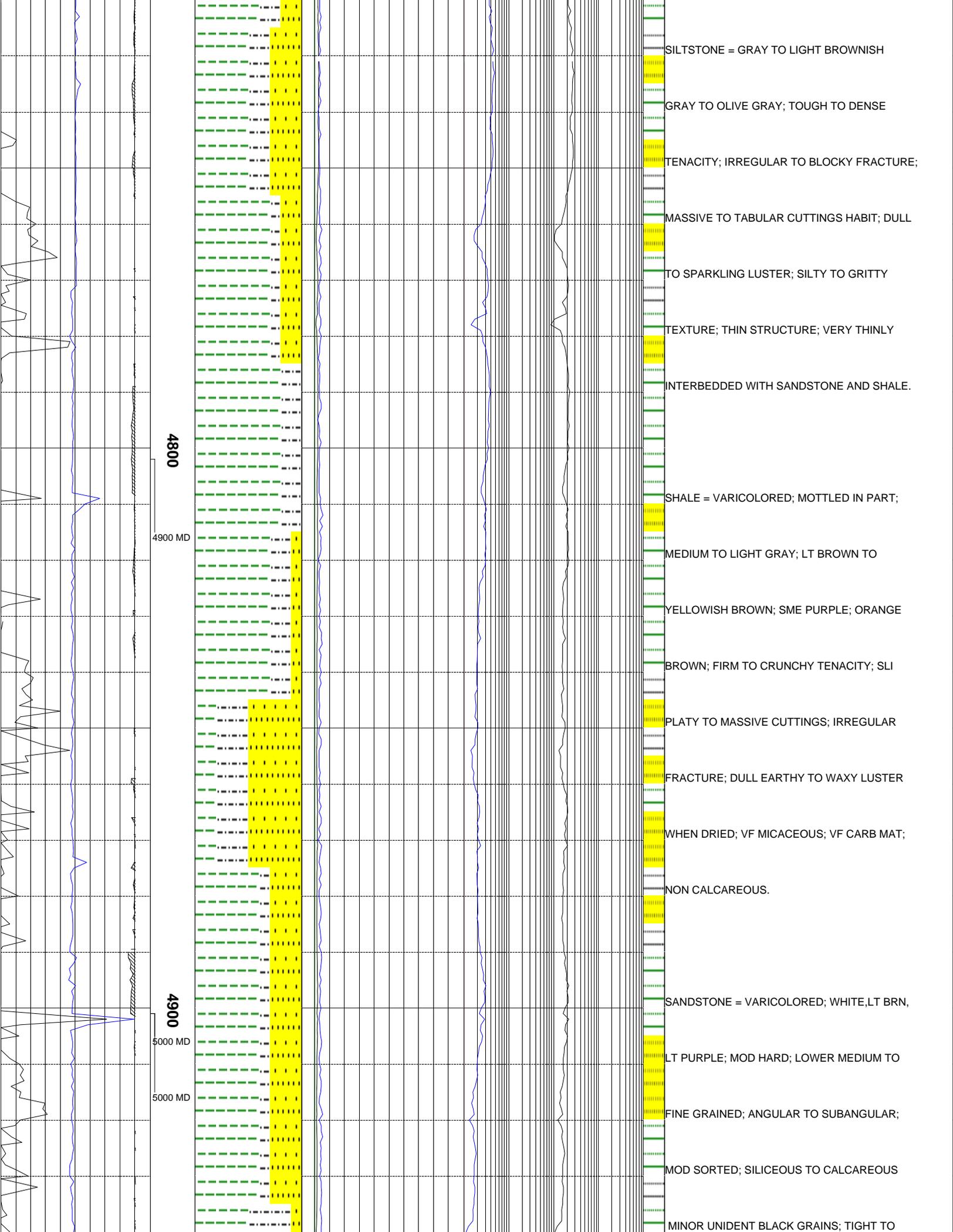
4700 MD

SHALE = LIGHT GRAY TO GRAYISH ORANGE;
PALE YELLOWISH BROWN TO LIGHT BROWN;
GREENISH GRAY TO LIGHT BLUISH GRAY;
CRUMBLY TO CRUNCHY TENACITY; IRREGULAR
TO PLANAR TO HACKLY FRACTURE; MASSIVE
TO PLATY CUTTINGS HABIT; DULL TO VERY
EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE

4700

4800 MD

THAT GRADES INTO A MORE SILTY TEXTURE
IN PLACES ON THE MORE GRAY TO BROWN
SPECIMENS IN THE SAMPLE TRAY; THIN
STRUCTURE; THINLY INTERBEDDED WITH
SANDSTONE AND SILTSTONE.



4800

4900 MD

4900

5000 MD

5000 MD

SILTSTONE = GRAY TO LIGHT BROWNISH

GRAY TO OLIVE GRAY; TOUGH TO DENSE

TENACITY; IRREGULAR TO BLOCKY FRACTURE;

MASSIVE TO TABULAR CUTTINGS HABIT; DULL

TO SPARKLING LUSTER; SILTY TO GRITTY

TEXTURE; THIN STRUCTURE; VERY THINLY

INTERBEDDED WITH SANDSTONE AND SHALE.

SHALE = VARICOLORED; MOTTLED IN PART;

MEDIUM TO LIGHT GRAY; LT BROWN TO

YELLOWISH BROWN; SME PURPLE; ORANGE

BROWN; FIRM TO CRUNCHY TENACITY; SLI

PLATY TO MASSIVE CUTTINGS; IRREGULAR

FRACTURE; DULL EARTHY TO WAXY LUSTER

WHEN DRIED; VF MICACEOUS; VF CARB MAT;

NON CALCAREOUS.

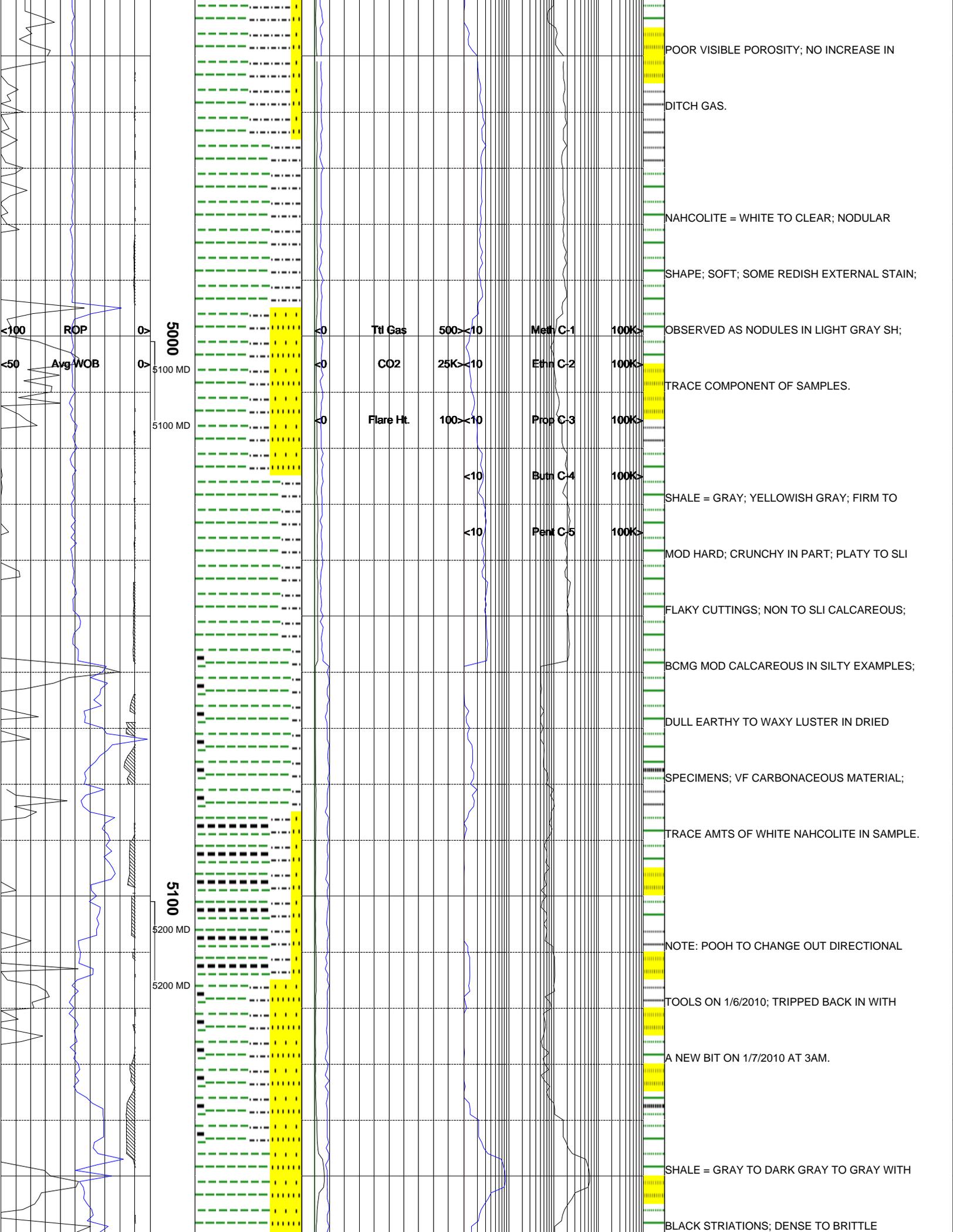
SANDSTONE = VARICOLORED; WHITE, LT BRN,

LT PURPLE; MOD HARD; LOWER MEDIUM TO

FINE GRAINED; ANGULAR TO SUBANGULAR;

MOD SORTED; SILICEOUS TO CALCAREOUS

MINOR UNIDENT BLACK GRAINS; TIGHT TO

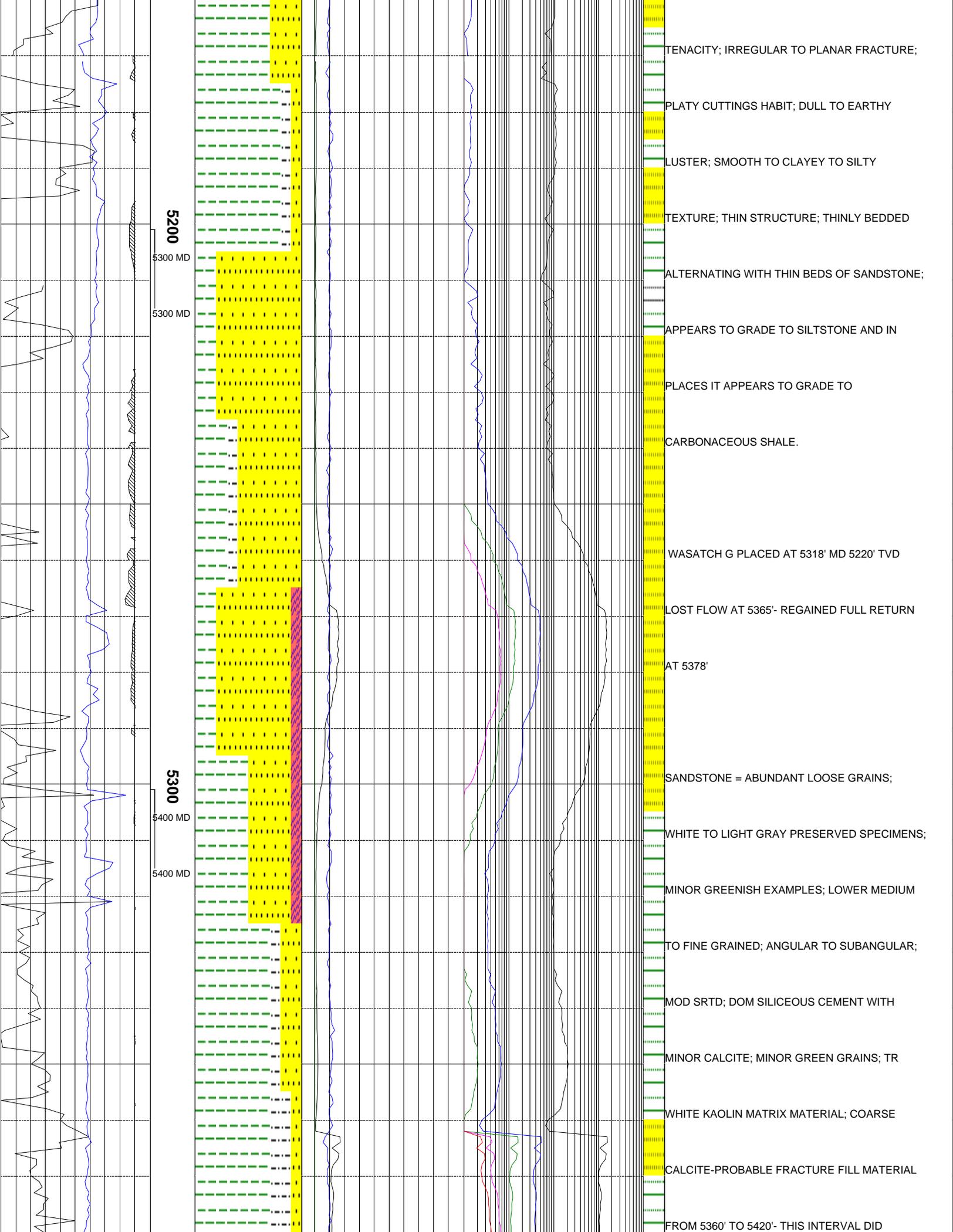


5000
5100 MD
5100 MD

5100
5200 MD
5200 MD

POOR VISIBLE POROSITY; NO INCREASE IN
DITCH GAS.
NAHCOLITE = WHITE TO CLEAR; NODULAR
SHAPE; SOFT; SOME REDISH EXTERNAL STAIN;
OBSERVED AS NODULES IN LIGHT GRAY SH;
TRACE COMPONENT OF SAMPLES.
SHALE = GRAY; YELLOWISH GRAY; FIRM TO
MOD HARD; CRUNCHY IN PART; PLATY TO SLI
FLAKY CUTTINGS; NON TO SLI CALCAREOUS;
BCMG MOD CALCAREOUS IN SILTY EXAMPLES;
DULL EARTHY TO WAXY LUSTER IN DRIED
SPECIMENS; VF CARBONACEOUS MATERIAL;
TRACE AMTS OF WHITE NAHCOLITE IN SAMPLE.
NOTE: POOH TO CHANGE OUT DIRECTIONAL
TOOLS ON 1/6/2010; TRIPPED BACK IN WITH
A NEW BIT ON 1/7/2010 AT 3AM.
SHALE = GRAY TO DARK GRAY TO GRAY WITH
BLACK STRIATIONS; DENSE TO BRITTLE

Ttl Gas 500 <math><10</math> Meth C-1 100K <math><10</math>
CO2 25K <math><10</math> Ethn C-2 100K <math><10</math>
Flare Ht. 100 <math><10</math> Prop C-3 100K <math><10</math>
<math><10</math> Butn C-4 100K <math><10</math>
<math><10</math> Pent C-5 100K <math><10</math>



5200

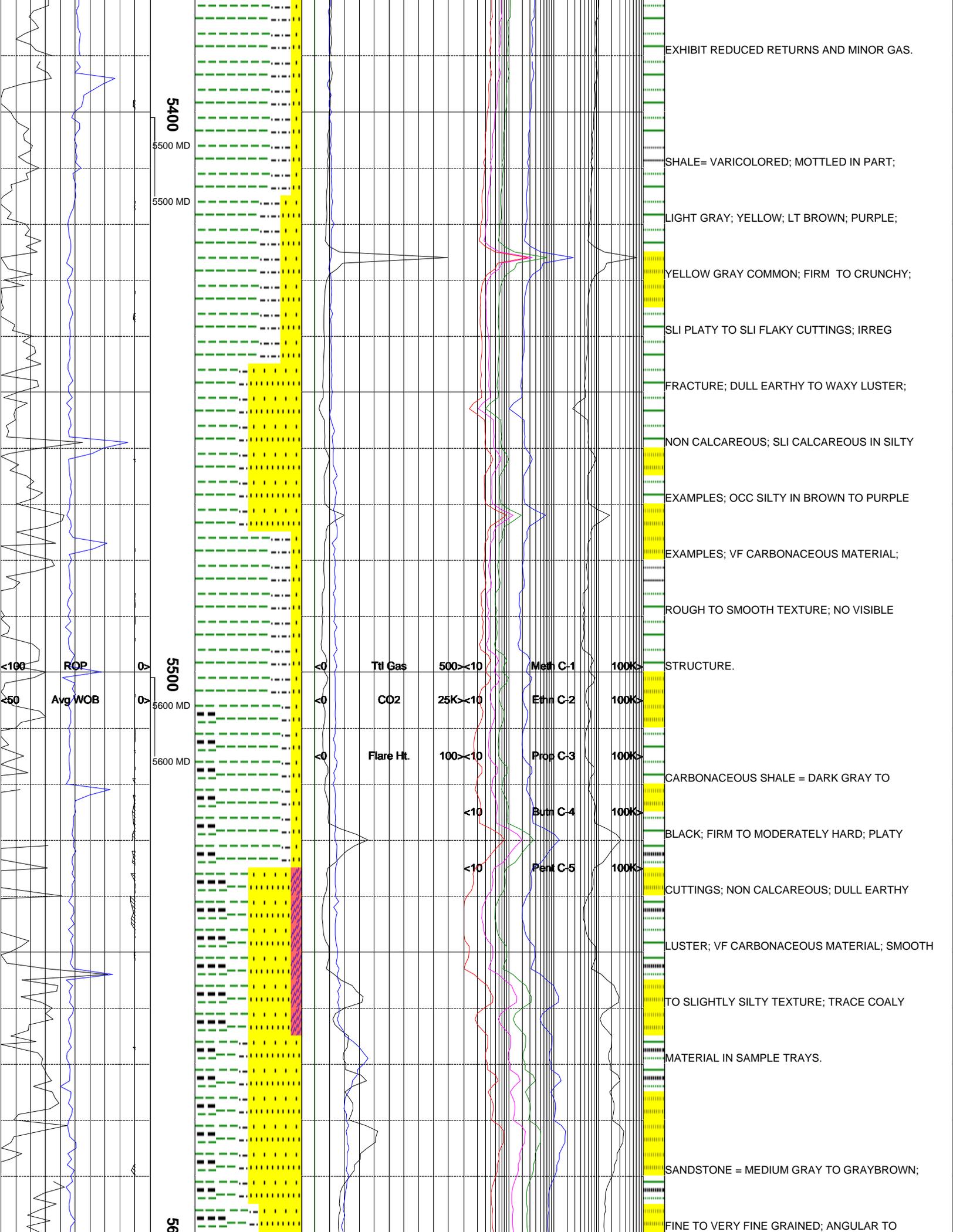
5300 MD

5300 MD

5300

5400 MD

5400 MD



5400

5500 MD

5500 MD

5500

5600 MD

5600 MD

56

EXHIBIT REDUCED RETURNS AND MINOR GAS.

SHALE= VARICOLORED; MOTTLED IN PART;

LIGHT GRAY; YELLOW; LT BROWN; PURPLE;

YELLOW GRAY COMMON; FIRM TO CRUNCHY;

SLI PLATY TO SLI FLAKY CUTTINGS; IREG

FRACTURE; DULL EARTHY TO WAXY LUSTER;

NON CALCAREOUS; SLI CALCAREOUS IN SILTY

EXAMPLES; OCC SILTY IN BROWN TO PURPLE

EXAMPLES; VF CARBONACEOUS MATERIAL;

ROUGH TO SMOOTH TEXTURE; NO VISIBLE

STRUCTURE.

Ttl Gas 500<10 Meth C-1 100K>

CO2 25K<10 Ethn C-2 100K>

Flare Ht. 100<10 Prop C-3 100K>

<10 Butn C-4 100K>

<10 Pent C-5 100K>

CARBONACEOUS SHALE = DARK GRAY TO

BLACK; FIRM TO MODERATELY HARD; PLATY

CUTTINGS; NON CALCAREOUS; DULL EARTHY

LUSTER; VF CARBONACEOUS MATERIAL; SMOOTH

TO SLIGHTLY SILTY TEXTURE; TRACE COALY

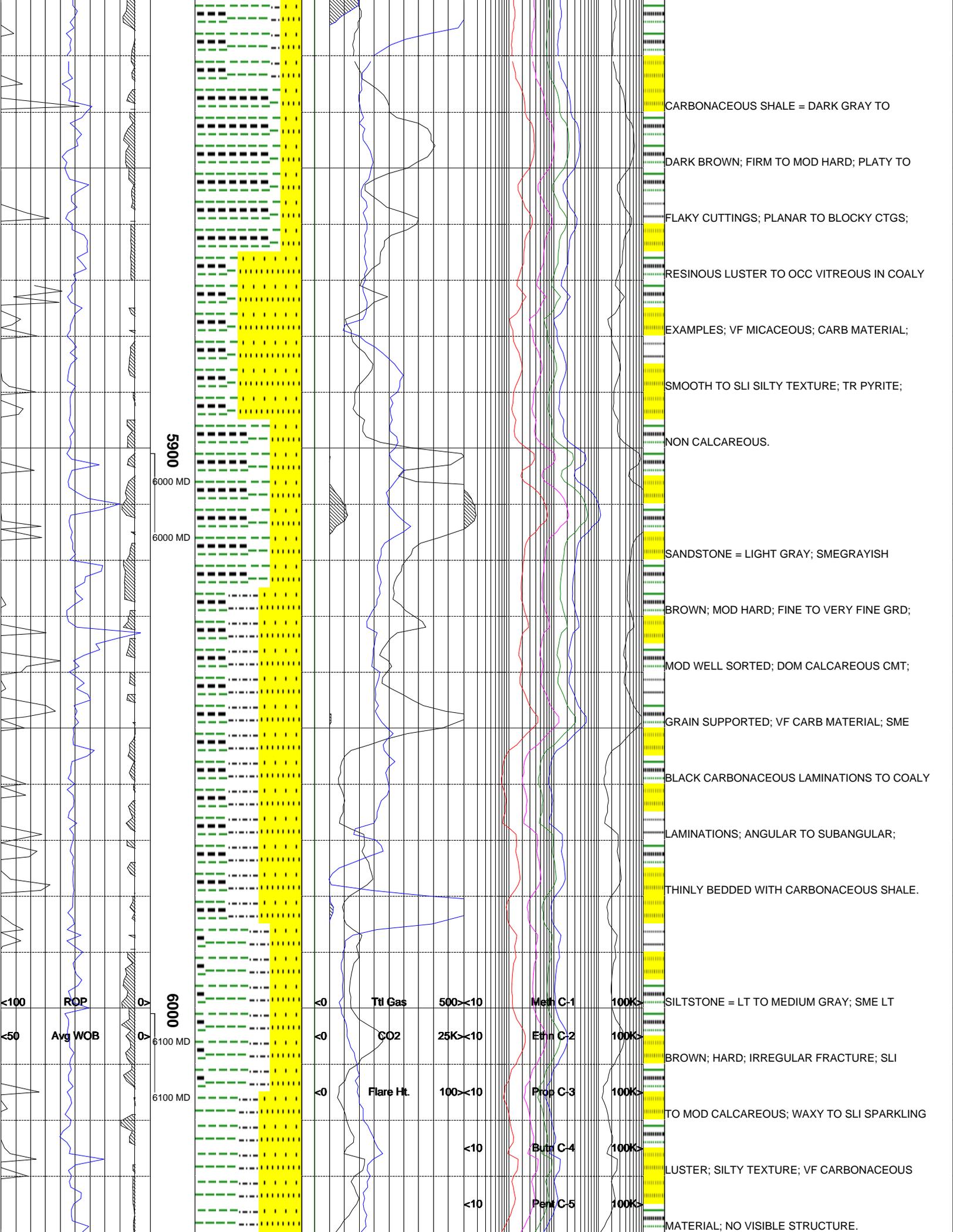
MATERIAL IN SAMPLE TRAYS.

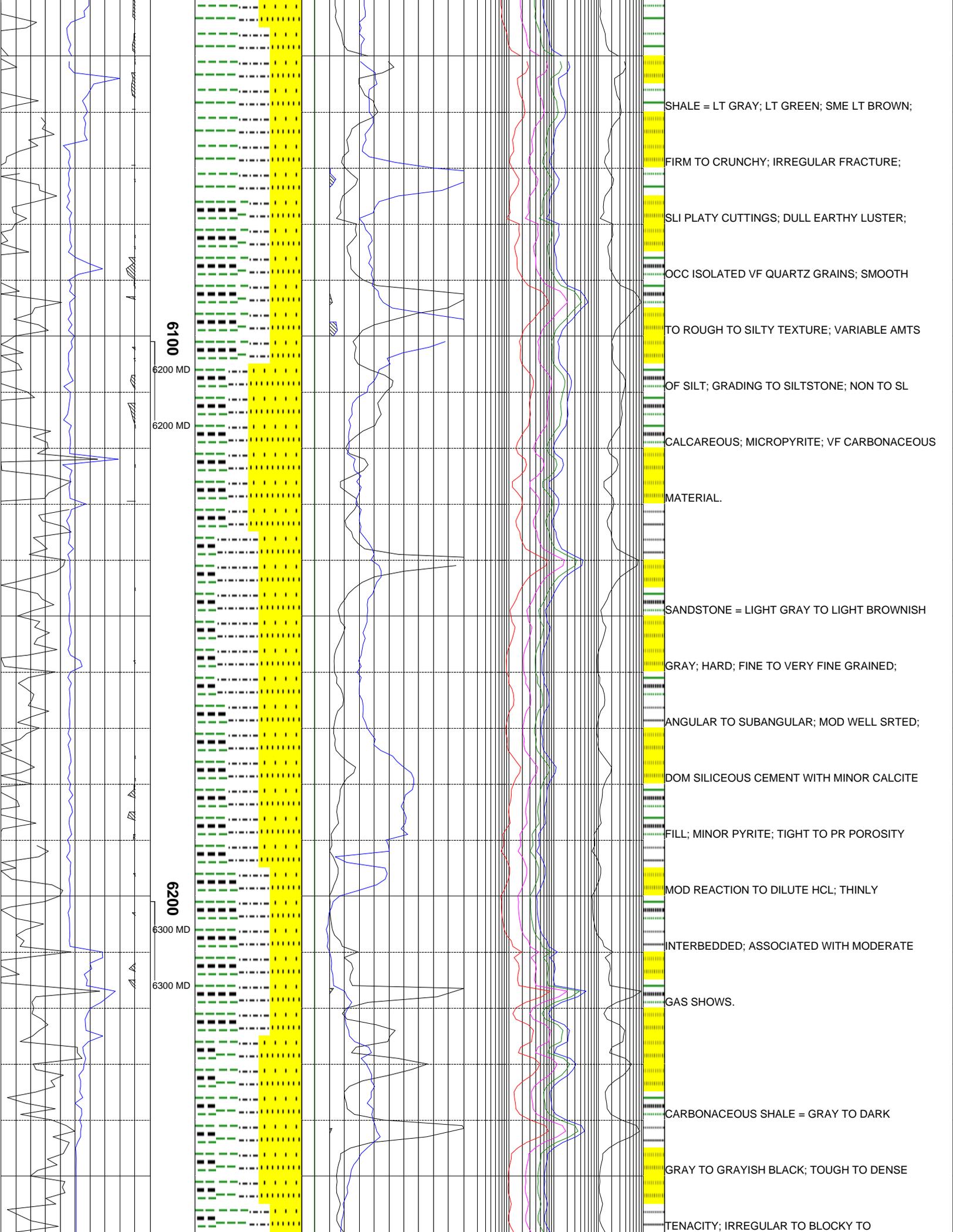
SANDSTONE = MEDIUM GRAY TO GRAYBROWN;

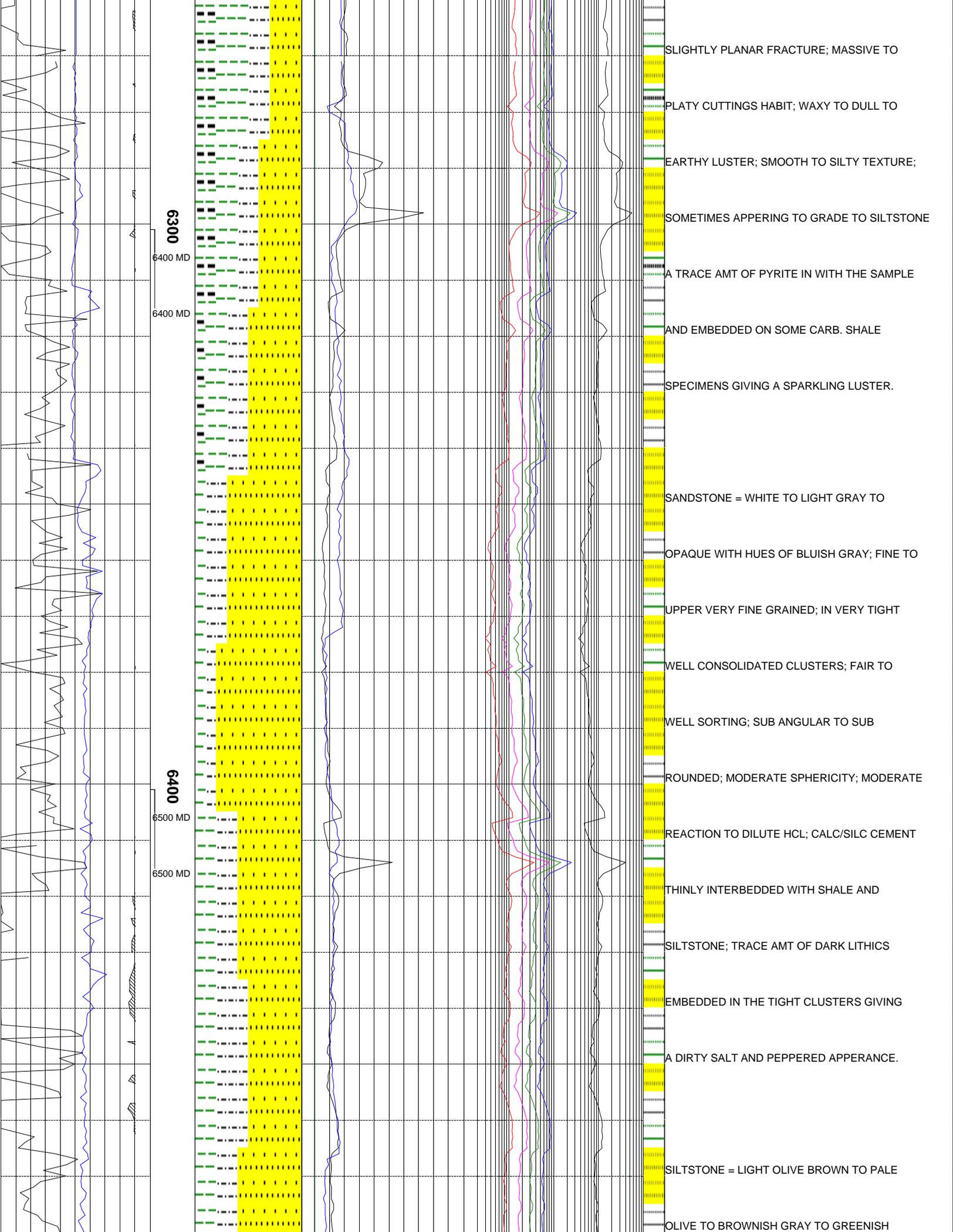
FINE TO VERY FINE GRAINED; ANGULAR TO

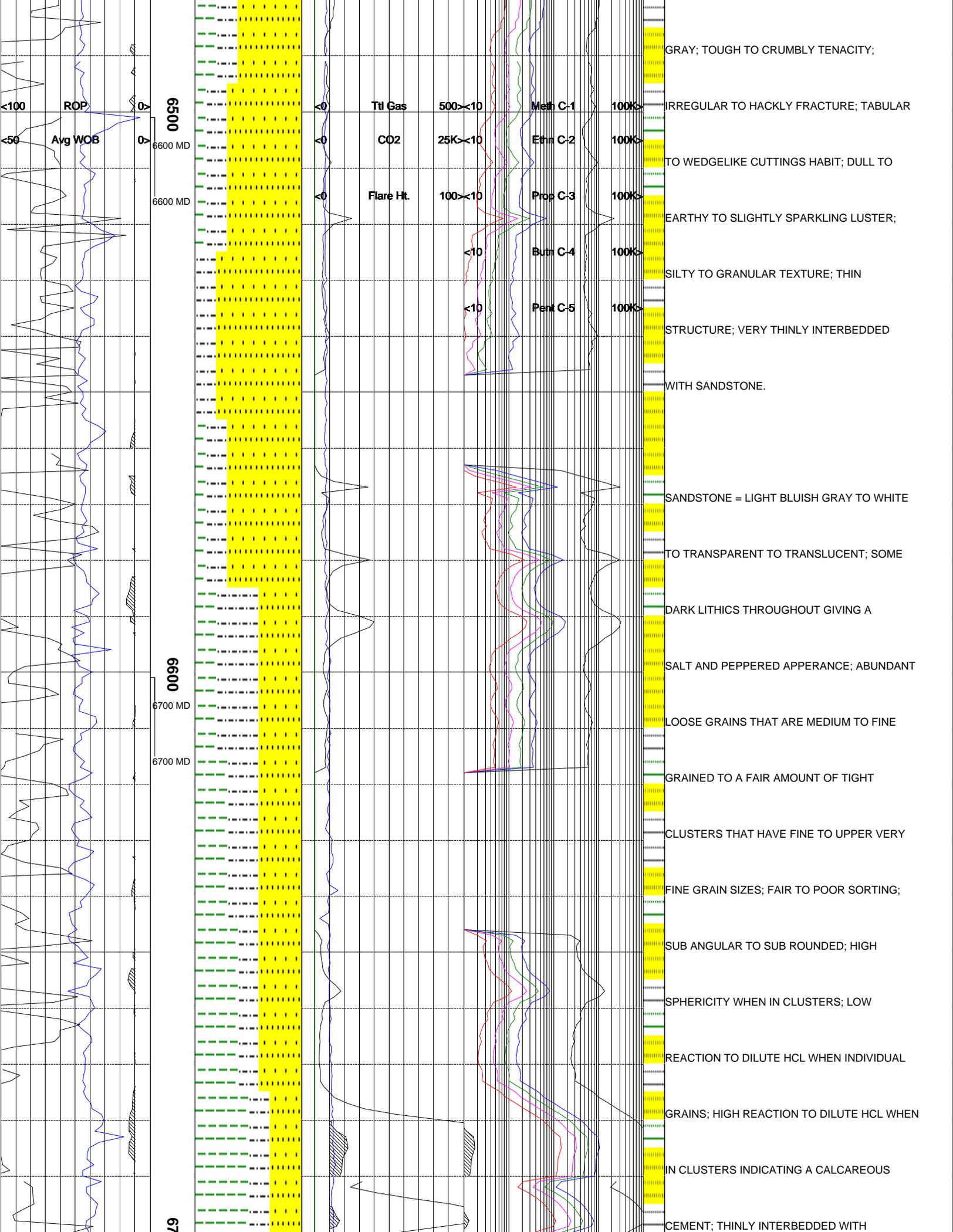
ROP

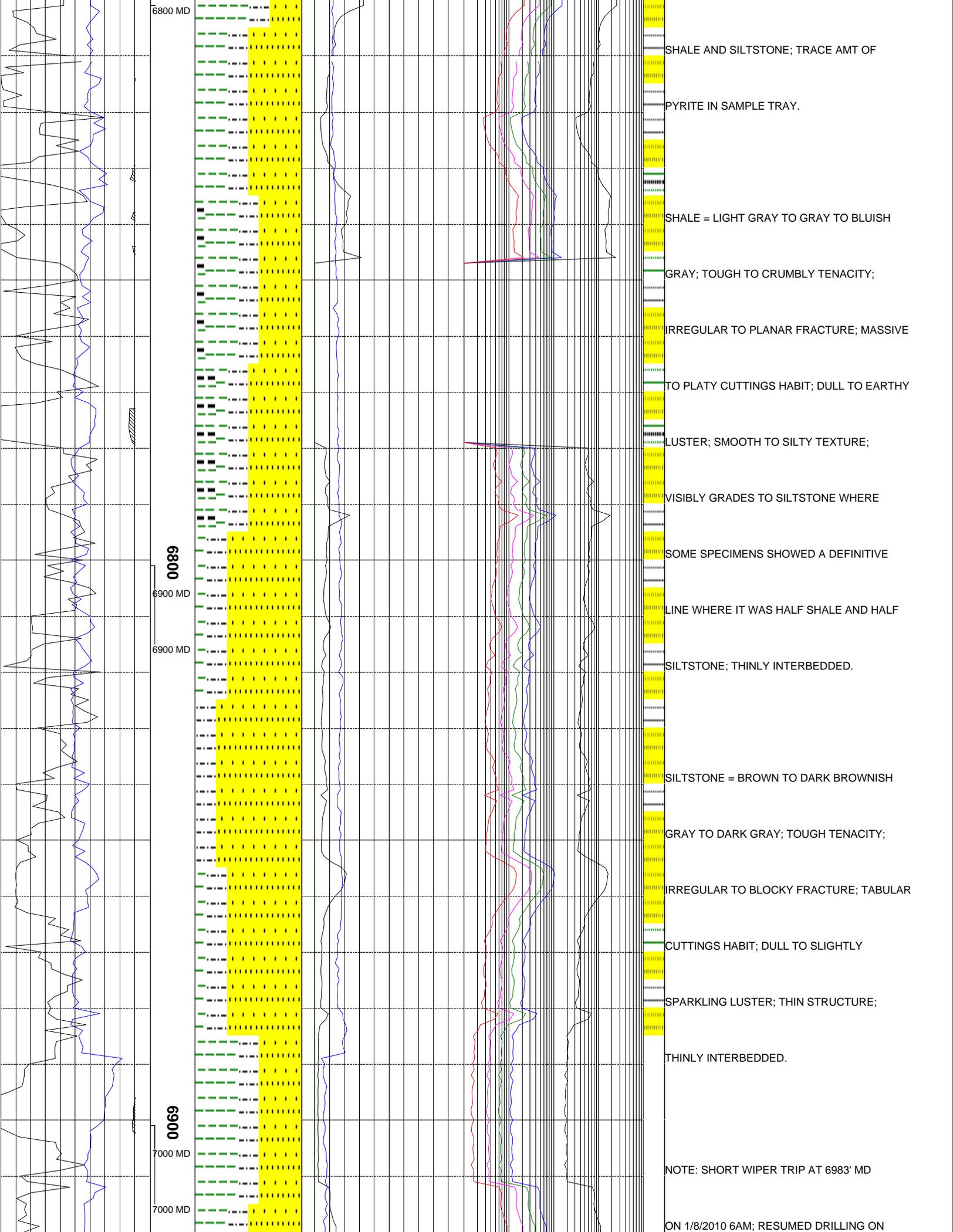
Avg WOB

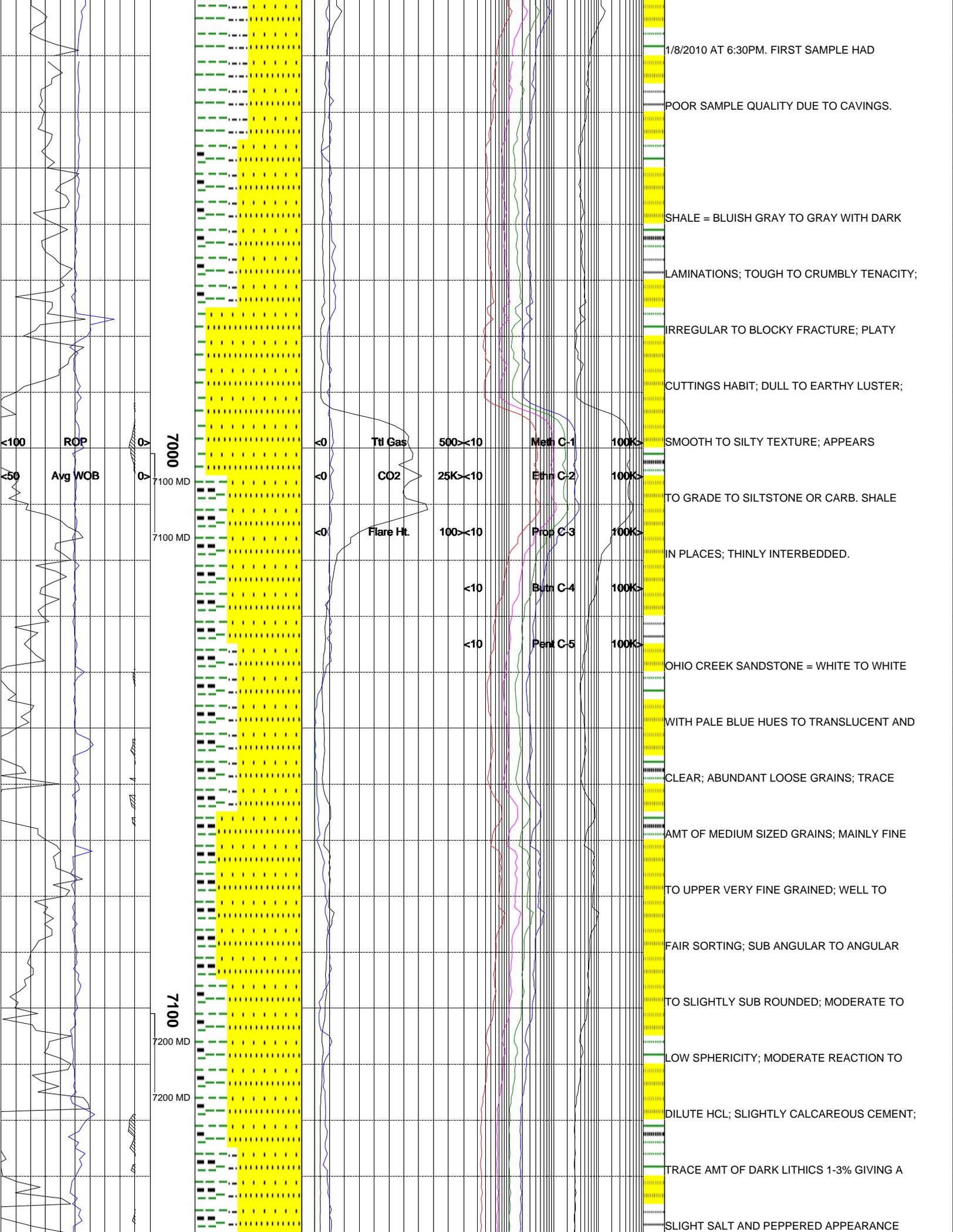


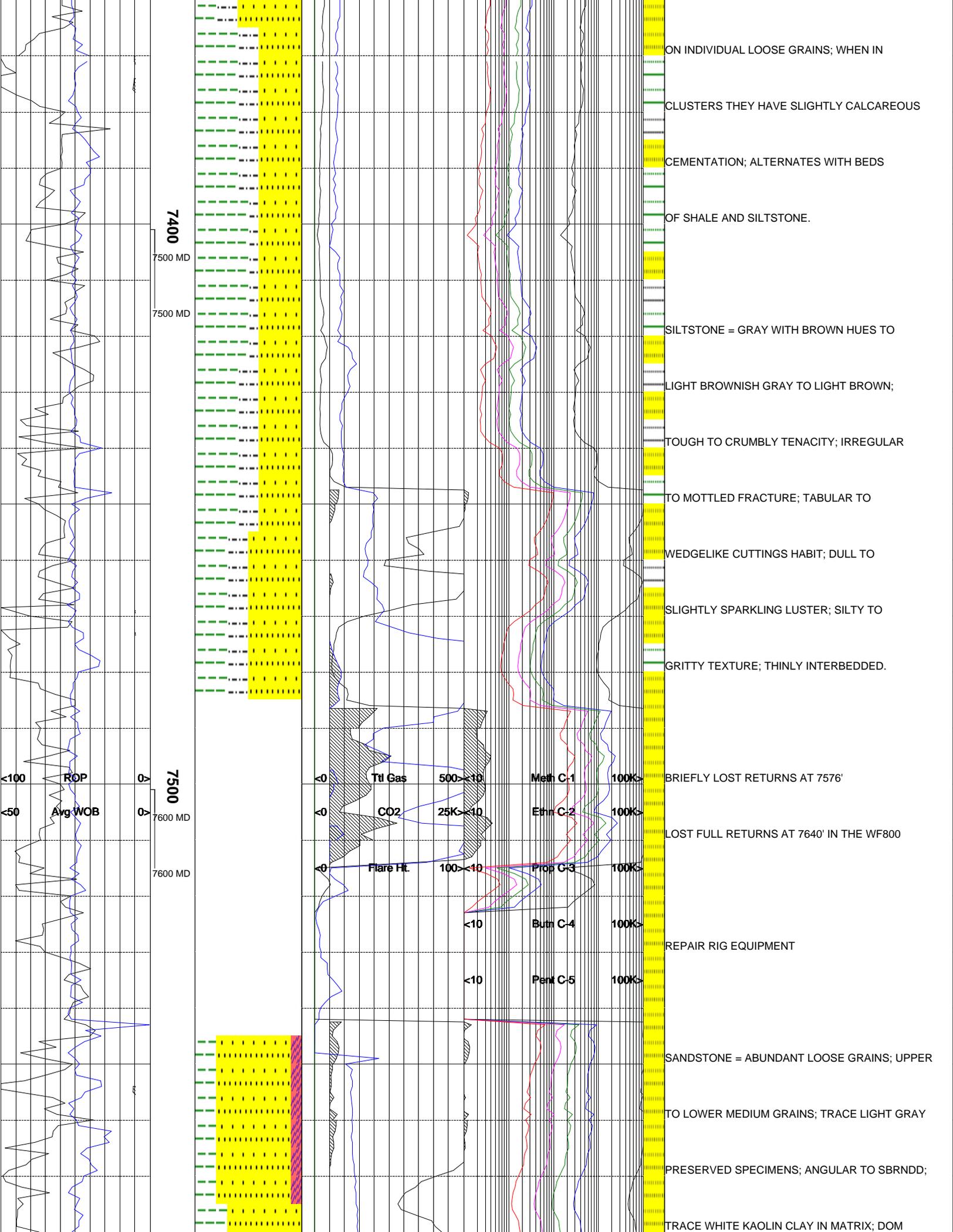


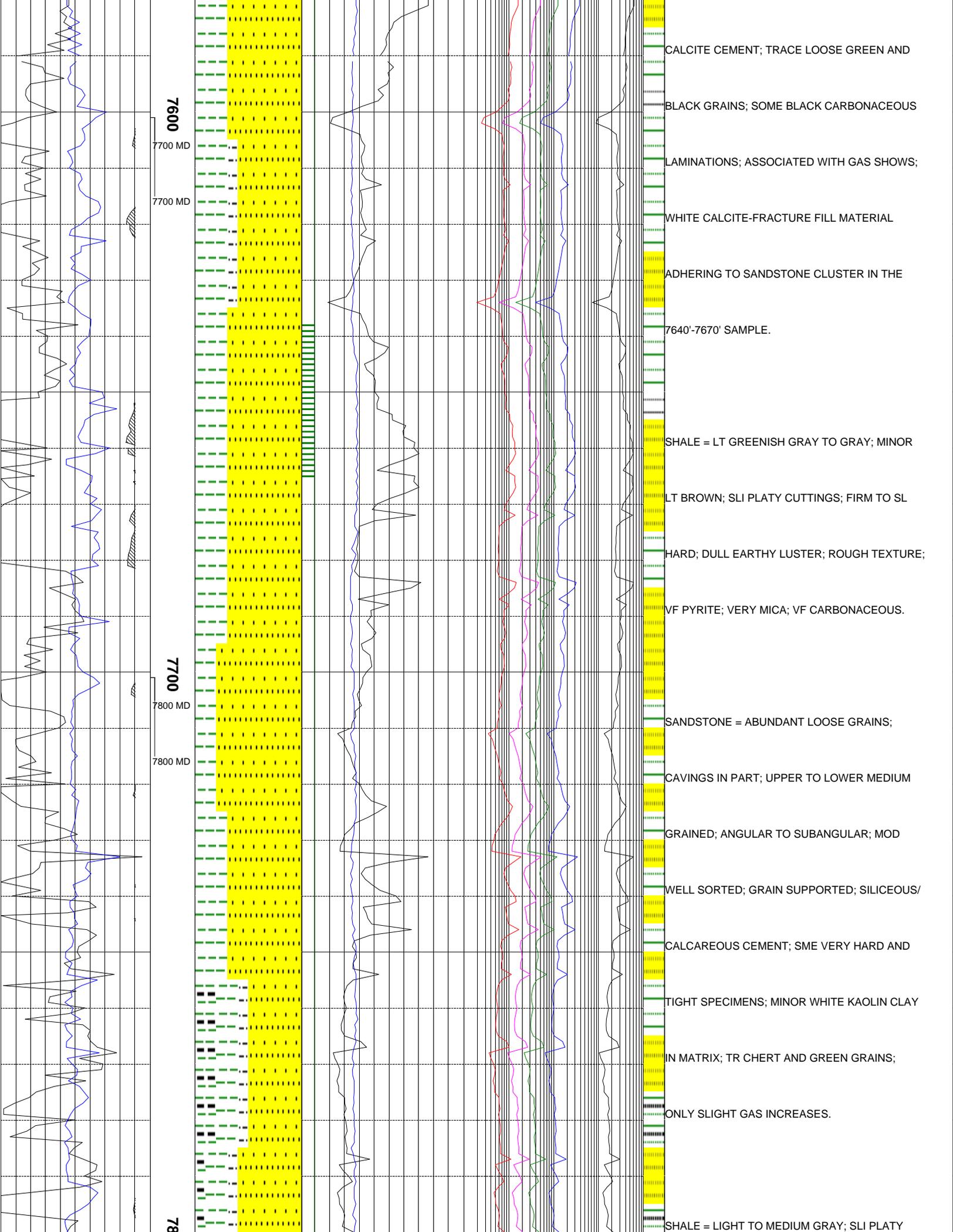












7600

7700 MD

7700 MD

7700

7800 MD

7800 MD

78

CALCITE CEMENT; TRACE LOOSE GREEN AND

BLACK GRAINS; SOME BLACK CARBONACEOUS

LAMINATIONS; ASSOCIATED WITH GAS SHOWS;

WHITE CALCITE-FRACTURE FILL MATERIAL

ADHERING TO SANDSTONE CLUSTER IN THE

7640'-7670' SAMPLE.

SHALE = LT GREENISH GRAY TO GRAY; MINOR

LT BROWN; SLI PLATY CUTTINGS; FIRM TO SL

HARD; DULL EARTHY LUSTER; ROUGH TEXTURE;

VF PYRITE; VERY MICA; VF CARBONACEOUS.

SANDSTONE = ABUNDANT LOOSE GRAINS;

CAVINGS IN PART; UPPER TO LOWER MEDIUM

GRAINED; ANGULAR TO SUBANGULAR; MOD

WELL SORTED; GRAIN SUPPORTED; SILICEOUS/

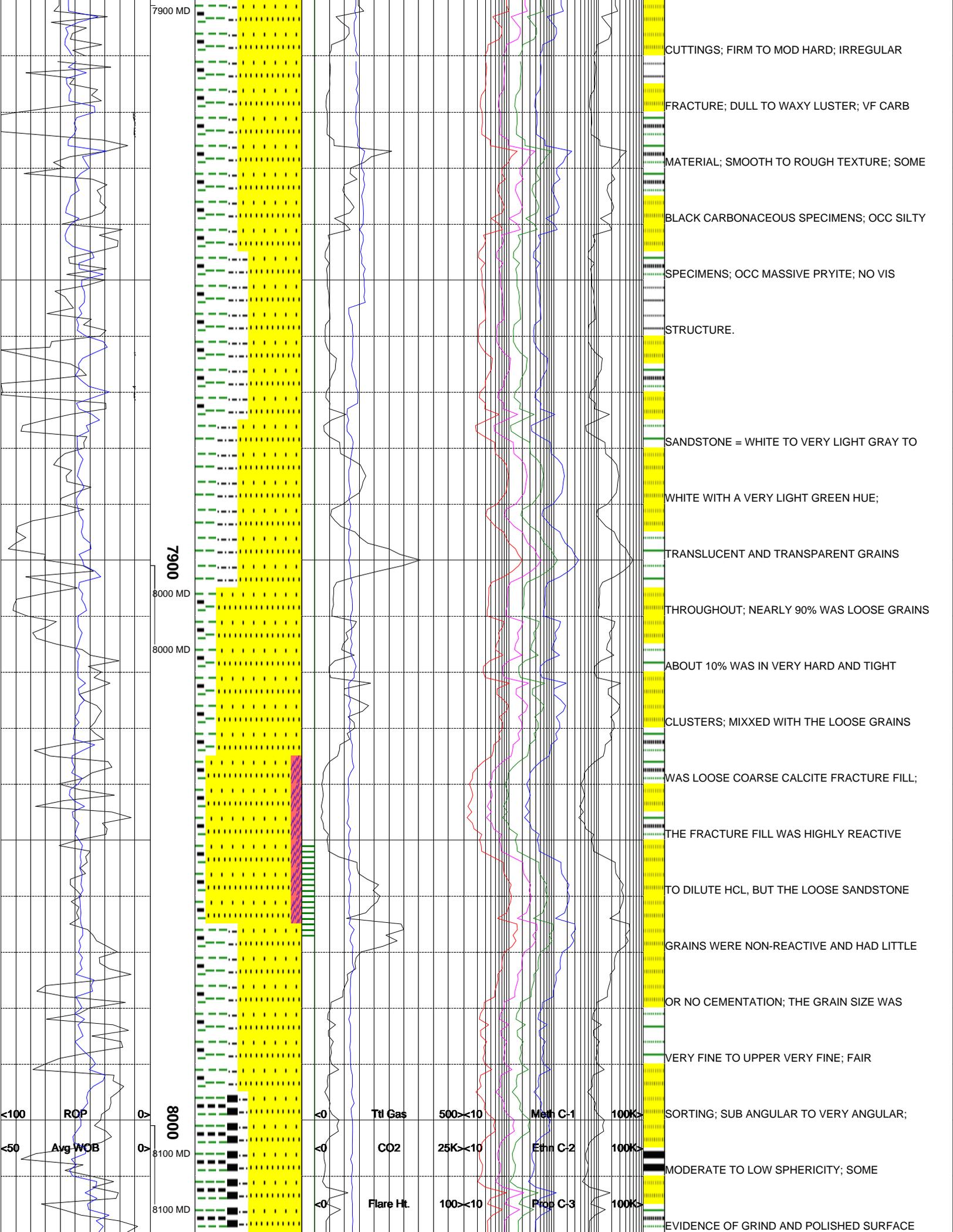
CALCAREOUS CEMENT; SME VERY HARD AND

TIGHT SPECIMENS; MINOR WHITE KAOLIN CLAY

IN MATRIX; TR CHERT AND GREEN GRAINS;

ONLY SLIGHT GAS INCREASES.

SHALE = LIGHT TO MEDIUM GRAY; SLI PLATY



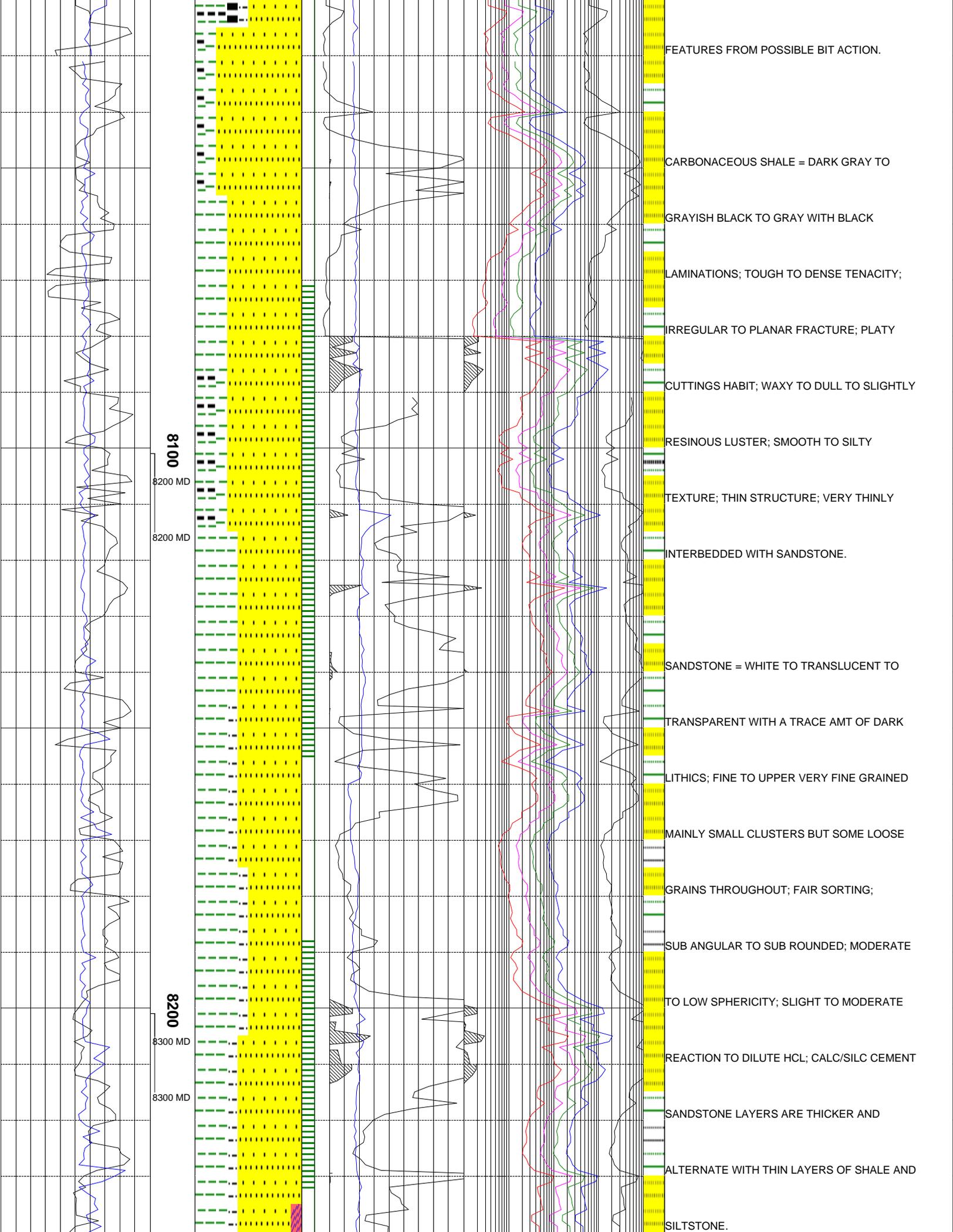
7900 MD
7900
8000 MD
8000 MD
8000
8100 MD
8100 MD

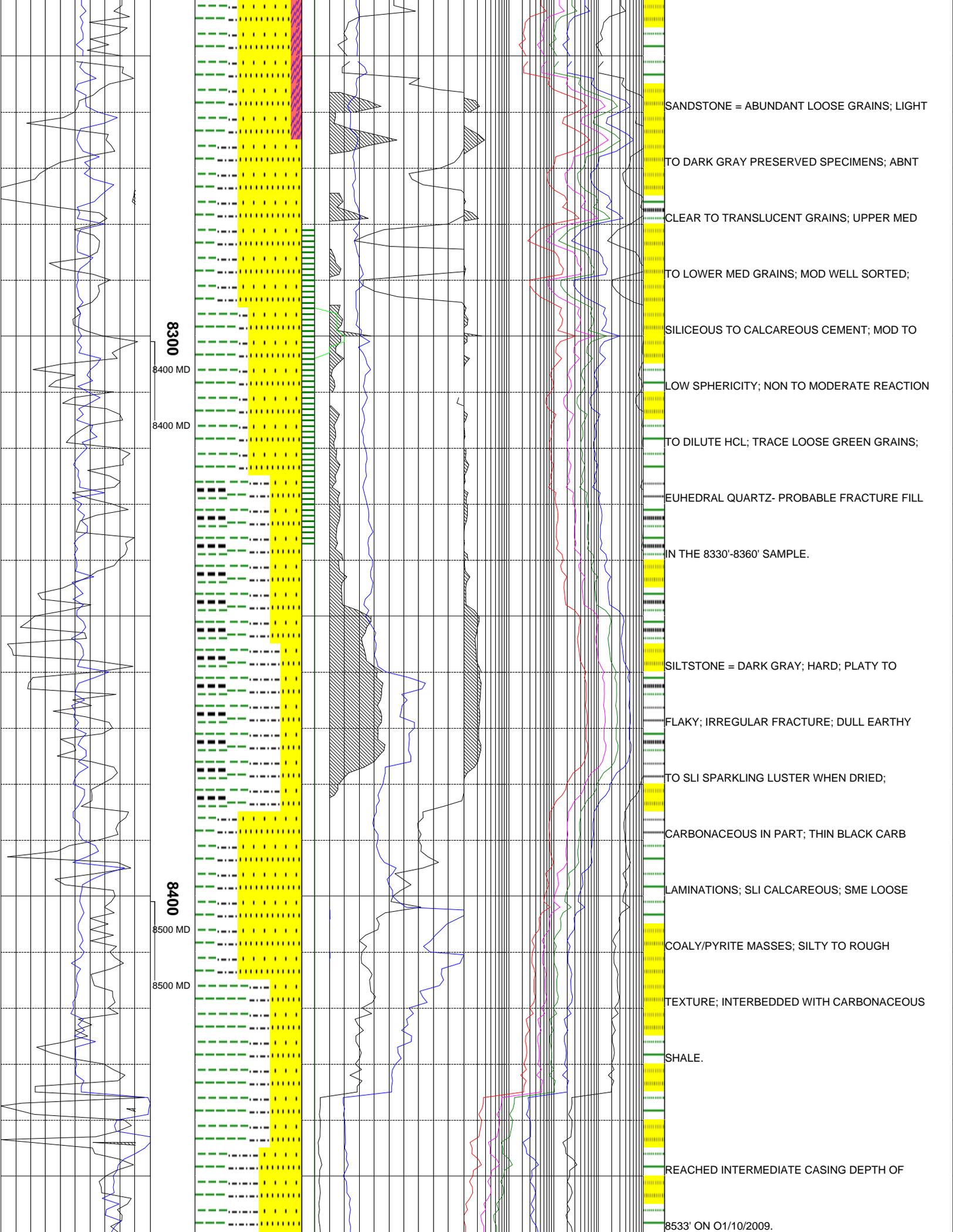
<100 ROP
<50 Avg WOB

Ttl Gas 500 <10
CO2 25K <10
Flare Ht. 100 <10

Meth C-1 100K >
Ethn C-2 100K >
Prop C-3 100K >

CUTTINGS; FIRM TO MOD HARD; IRREGULAR
FRACTURE; DULL TO WAXY LUSTER; VF CARB
MATERIAL; SMOOTH TO ROUGH TEXTURE; SOME
BLACK CARBONACEOUS SPECIMENS; OCC SILTY
SPECIMENS; OCC MASSIVE PRYITE; NO VIS
STRUCTURE.
SANDSTONE = WHITE TO VERY LIGHT GRAY TO
WHITE WITH A VERY LIGHT GREEN HUE;
TRANSLUCENT AND TRANSPARENT GRAINS
THROUGHOUT; NEARLY 90% WAS LOOSE GRAINS
ABOUT 10% WAS IN VERY HARD AND TIGHT
CLUSTERS; MIXED WITH THE LOOSE GRAINS
WAS LOOSE COARSE CALCITE FRACTURE FILL;
THE FRACTURE FILL WAS HIGHLY REACTIVE
TO DILUTE HCL, BUT THE LOOSE SANDSTONE
GRAINS WERE NON-REACTIVE AND HAD LITTLE
OR NO CEMENTATION; THE GRAIN SIZE WAS
VERY FINE TO UPPER VERY FINE; FAIR
SORTING; SUB ANGULAR TO VERY ANGULAR;
MODERATE TO LOW SPHERICITY; SOME
EVIDENCE OF GRIND AND POLISHED SURFACE



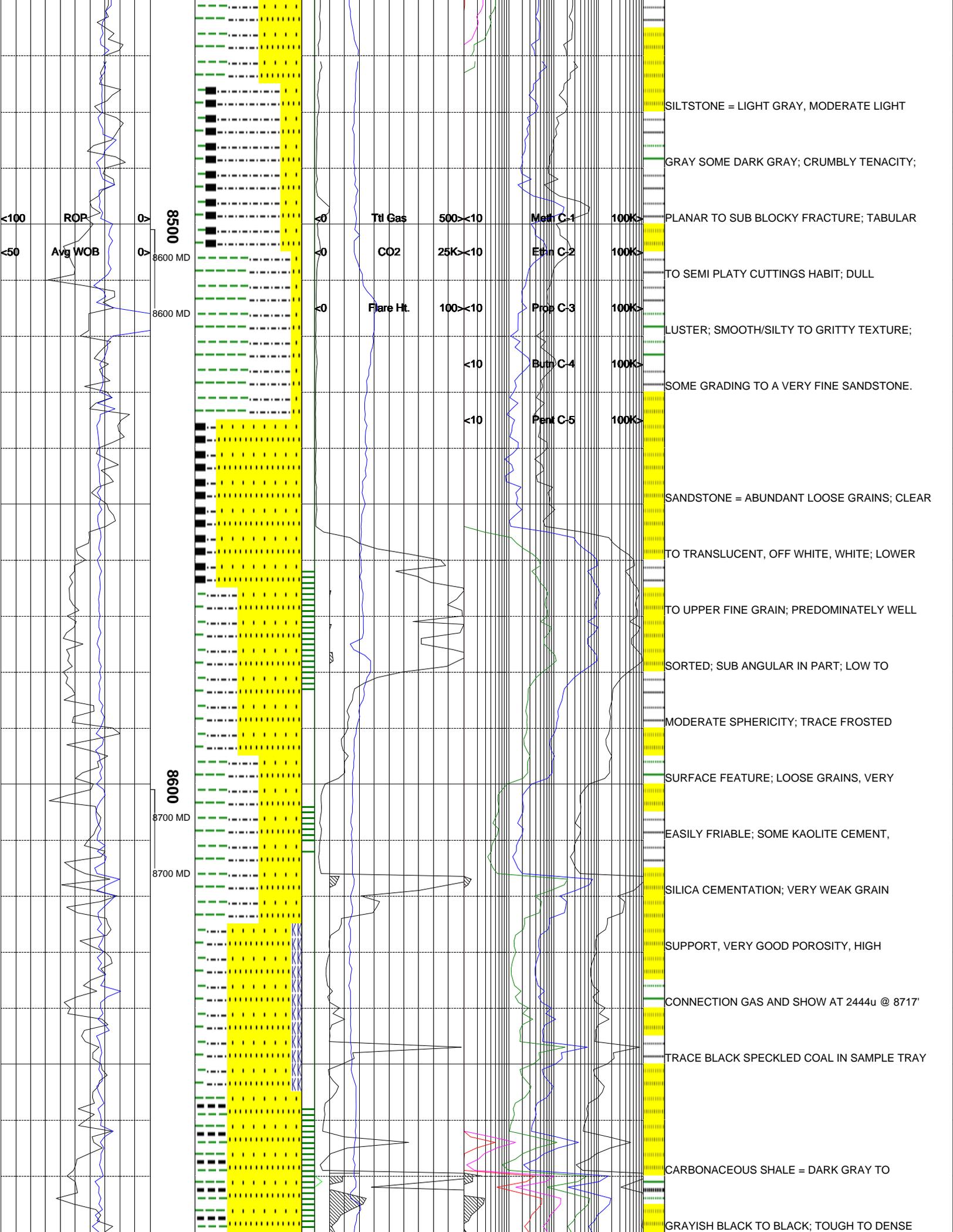


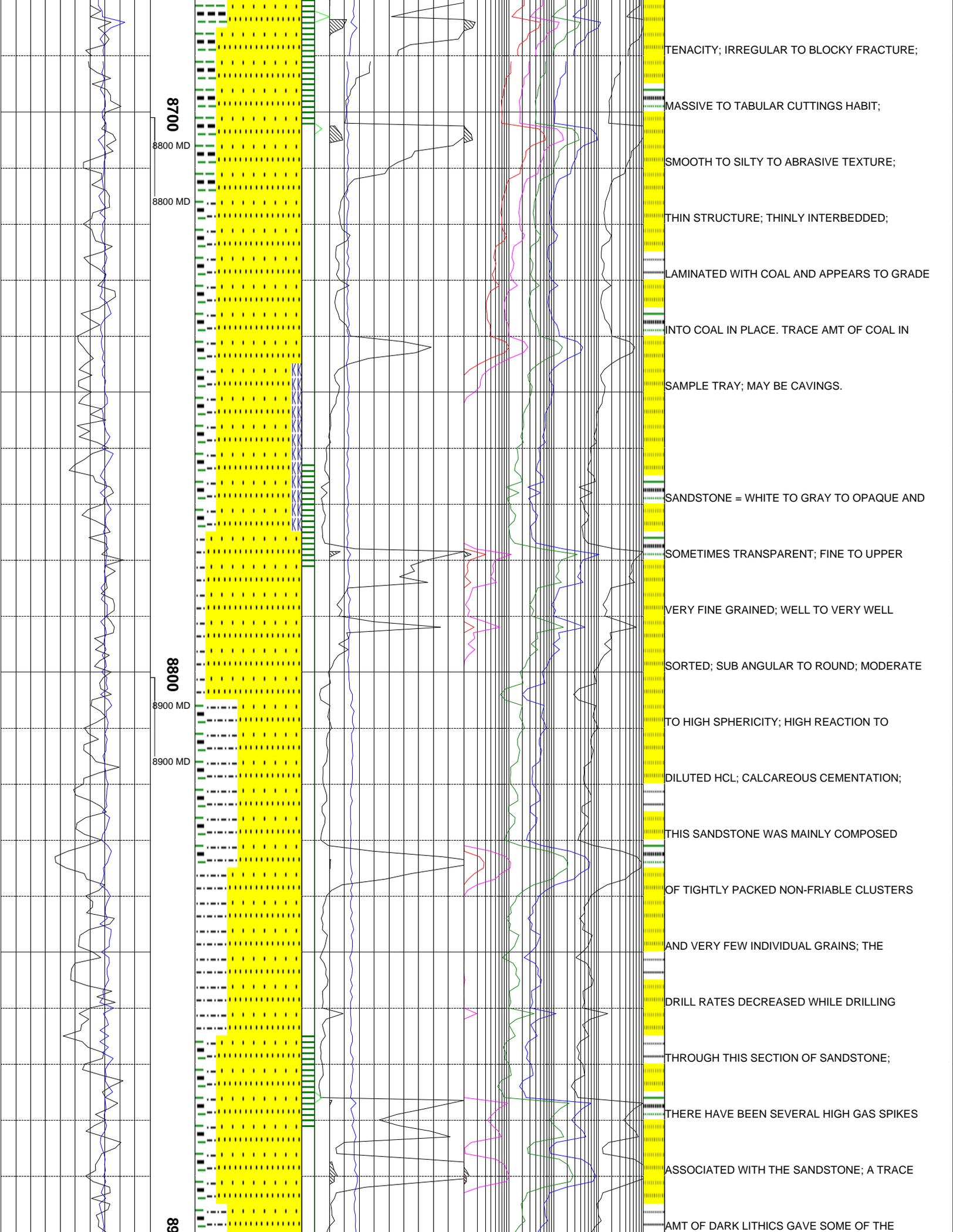
8300
8400 MD
8400 MD

8400
8500 MD
8500 MD

SANDSTONE = ABUNDANT LOOSE GRAINS; LIGHT
TO DARK GRAY PRESERVED SPECIMENS; ABNT
CLEAR TO TRANSLUCENT GRAINS; UPPER MED
TO LOWER MED GRAINS; MOD WELL SORTED;
SILICEOUS TO CALCAREOUS CEMENT; MOD TO
LOW SPHERICITY; NON TO MODERATE REACTION
TO DILUTE HCL; TRACE LOOSE GREEN GRAINS;
EUHEDRAL QUARTZ- PROBABLE FRACTURE FILL
IN THE 8330'-8360' SAMPLE.
SILTSTONE = DARK GRAY; HARD; PLATY TO
FLAKY; IRREGULAR FRACTURE; DULL EARTHY
TO SLI SPARKLING LUSTER WHEN DRIED;
CARBONACEOUS IN PART; THIN BLACK CARB
LAMINATIONS; SLI CALCAREOUS; SME LOOSE
COALY/PYRITE MASSES; SILTY TO ROUGH
TEXTURE; INTERBEDDED WITH CARBONACEOUS
SHALE.
REACHED INTERMEDIATE CASING DEPTH OF

8533' ON 01/10/2009.





8700

8800 MD

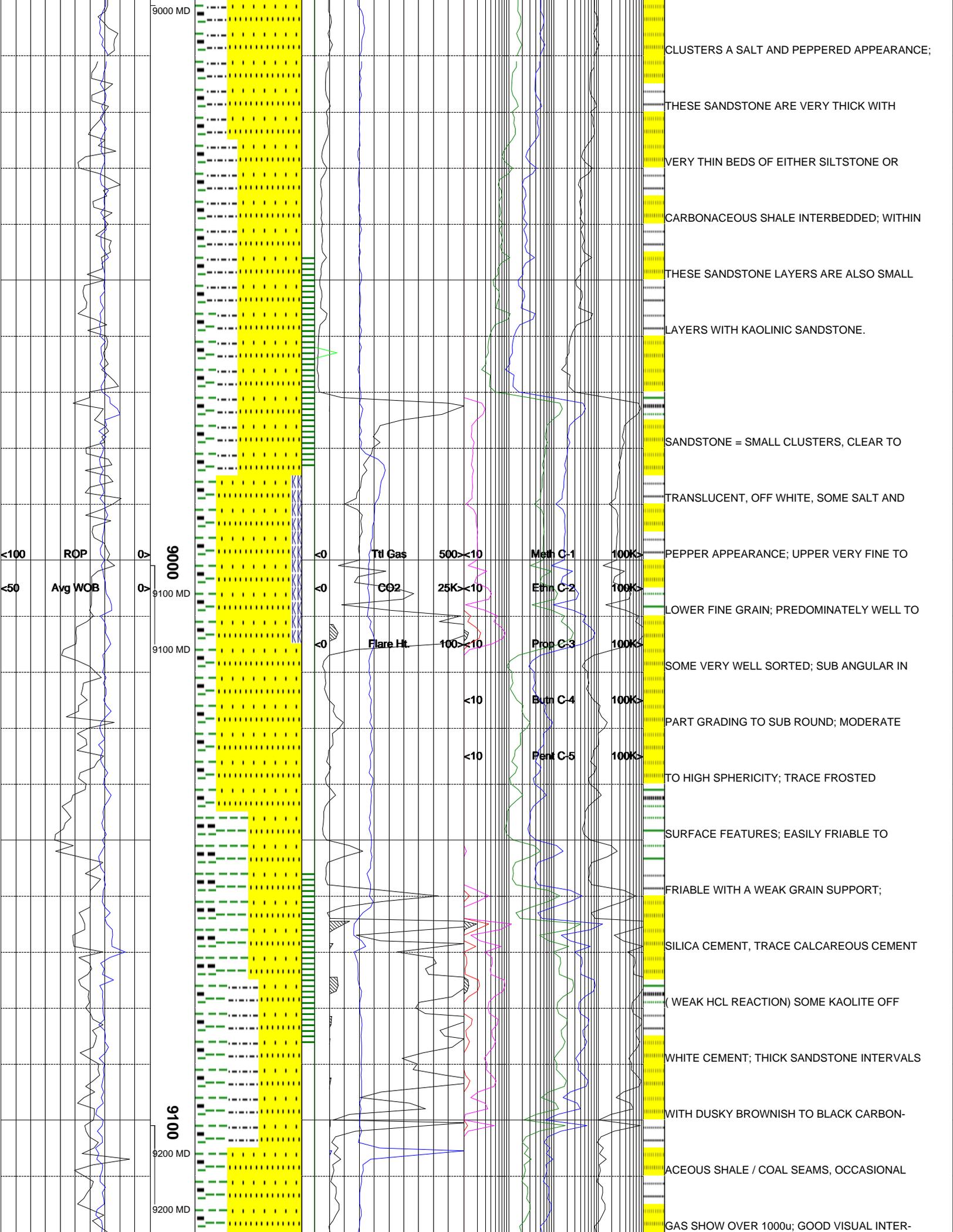
8800 MD

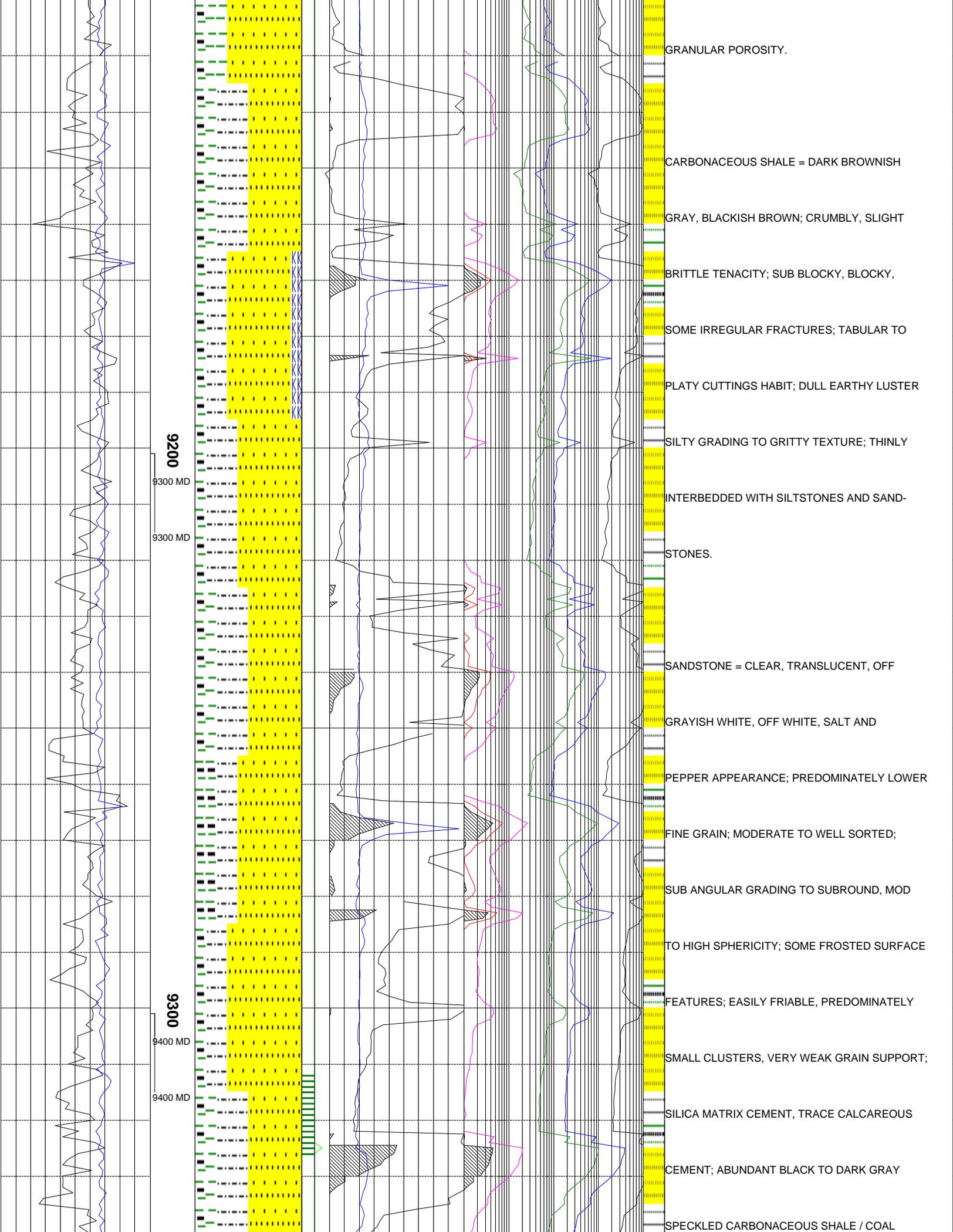
8800

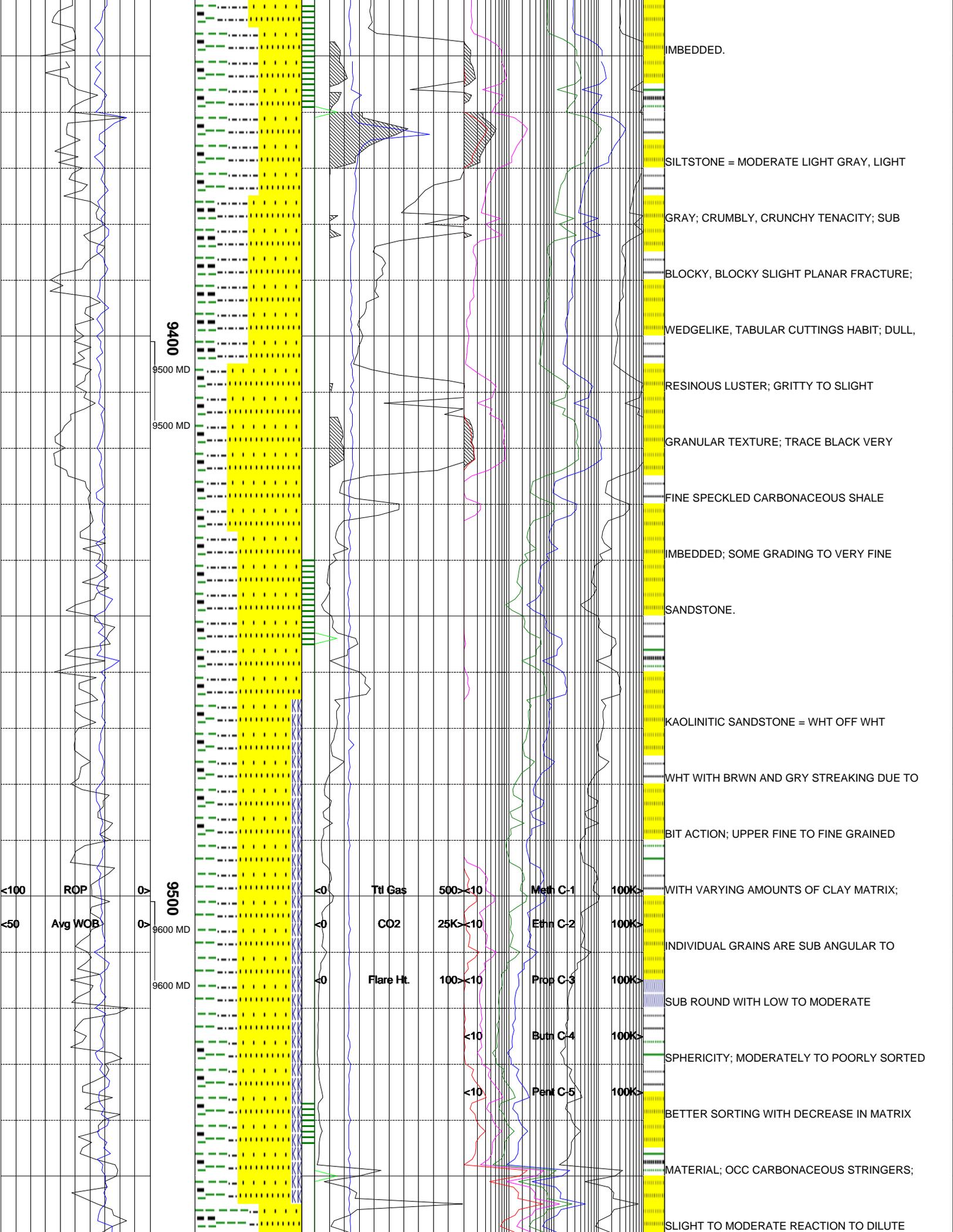
8900 MD

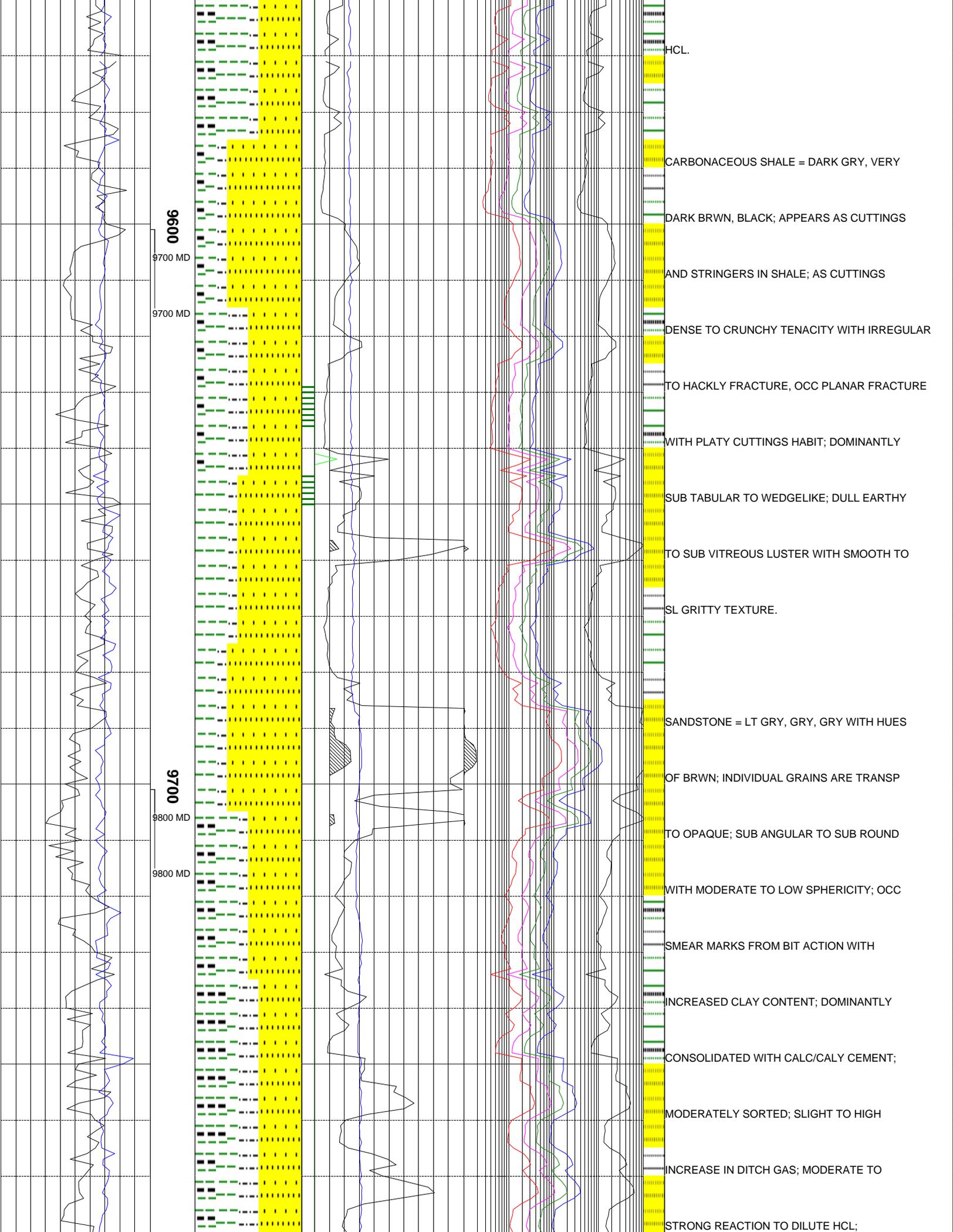
8900 MD

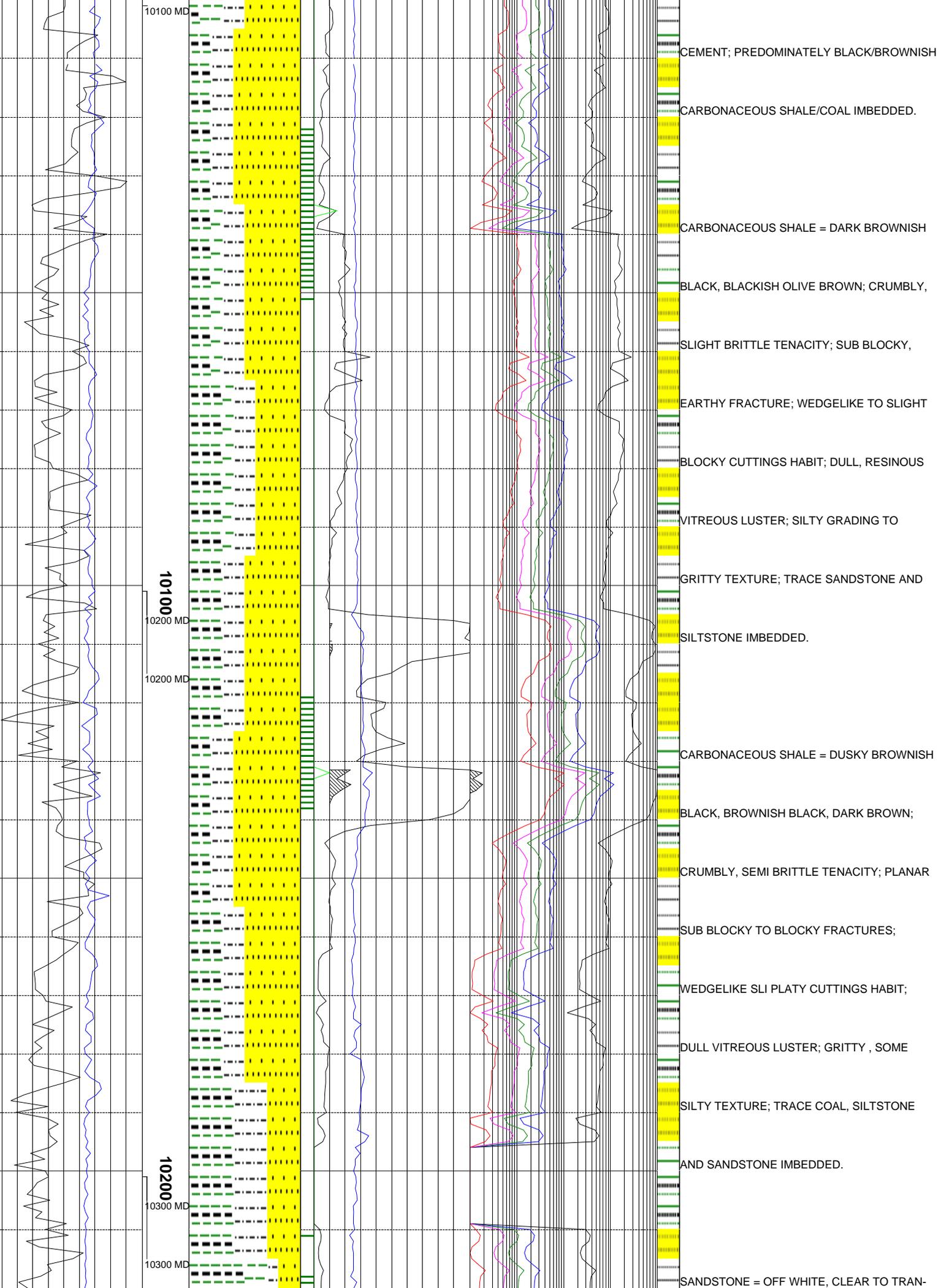
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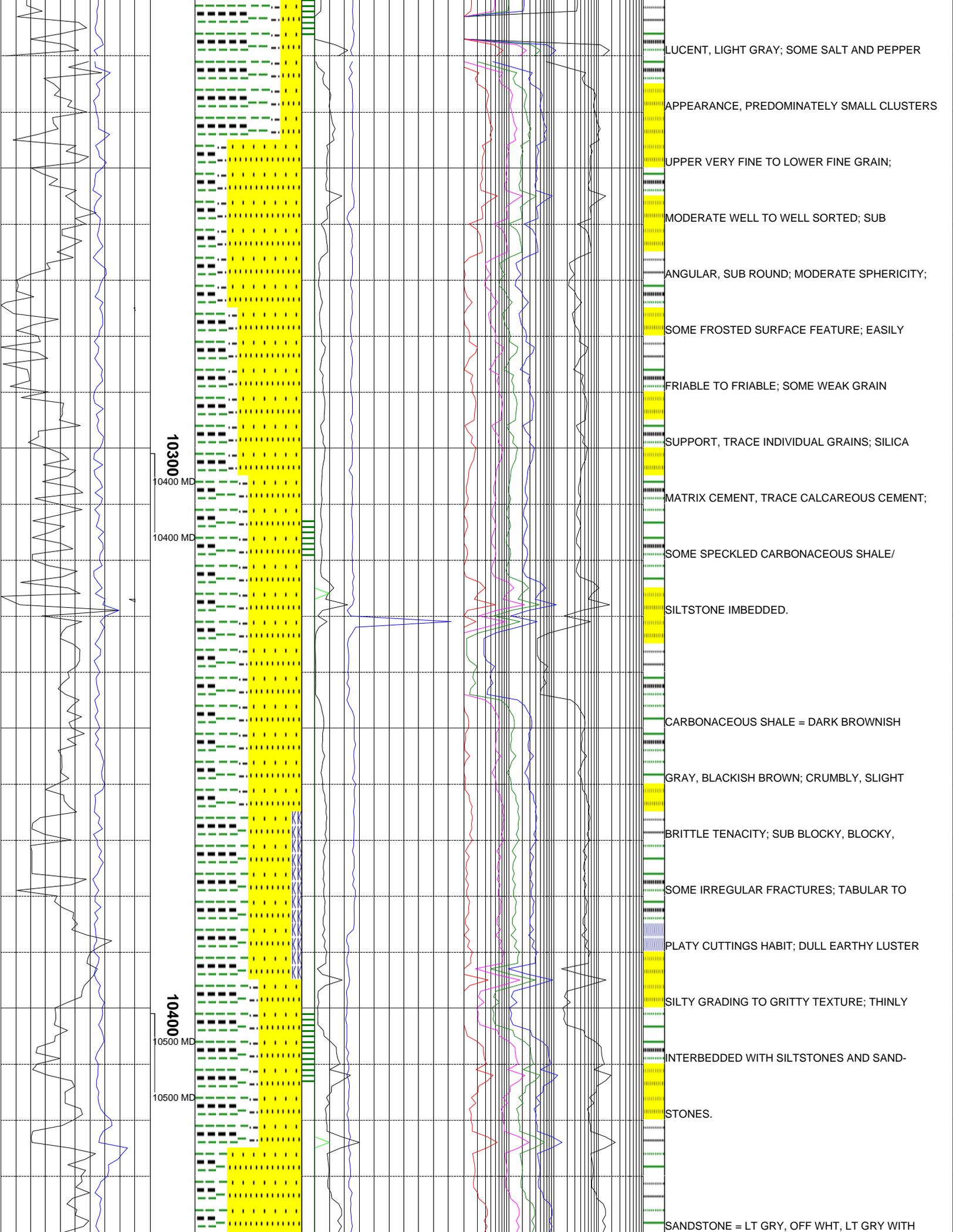








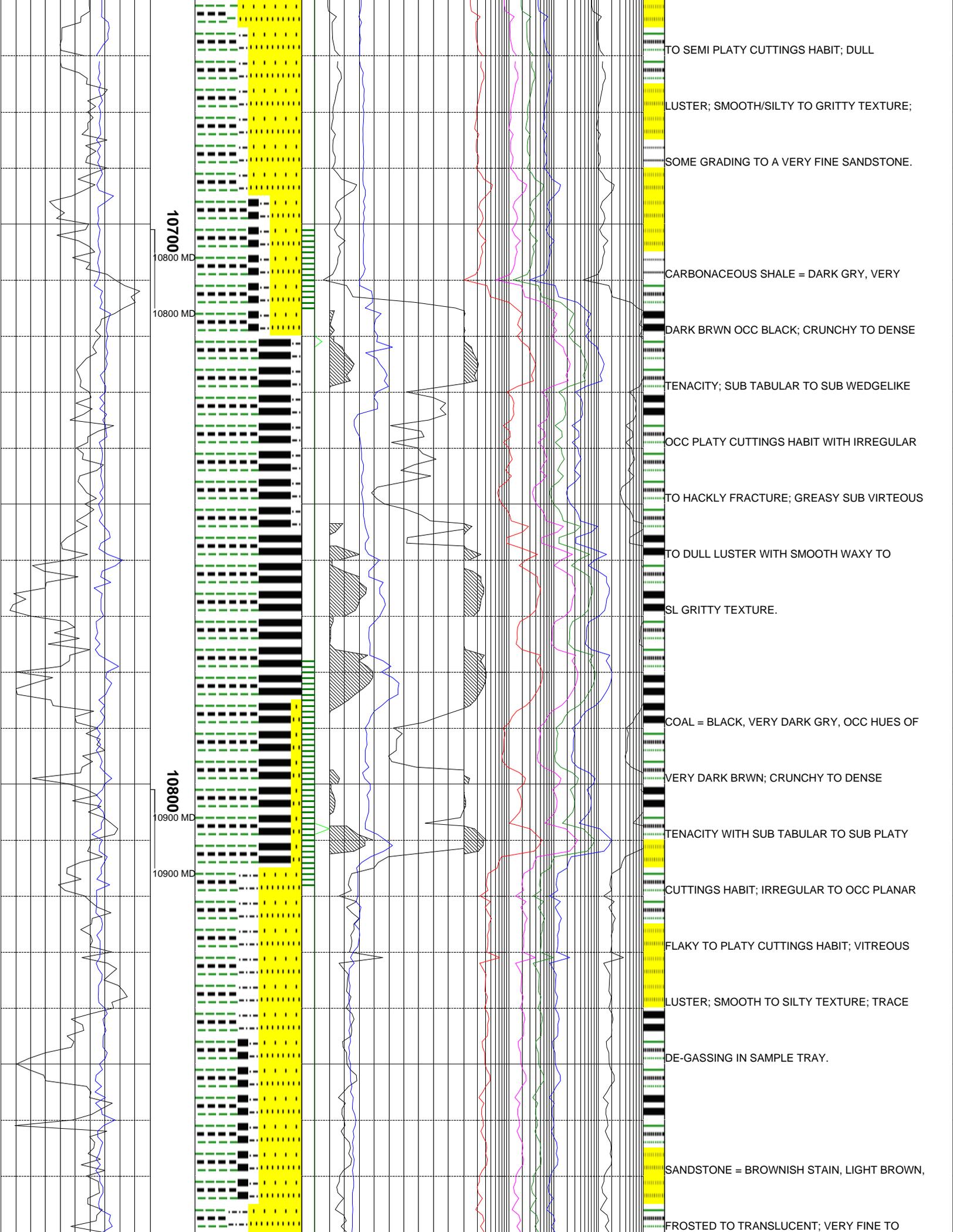


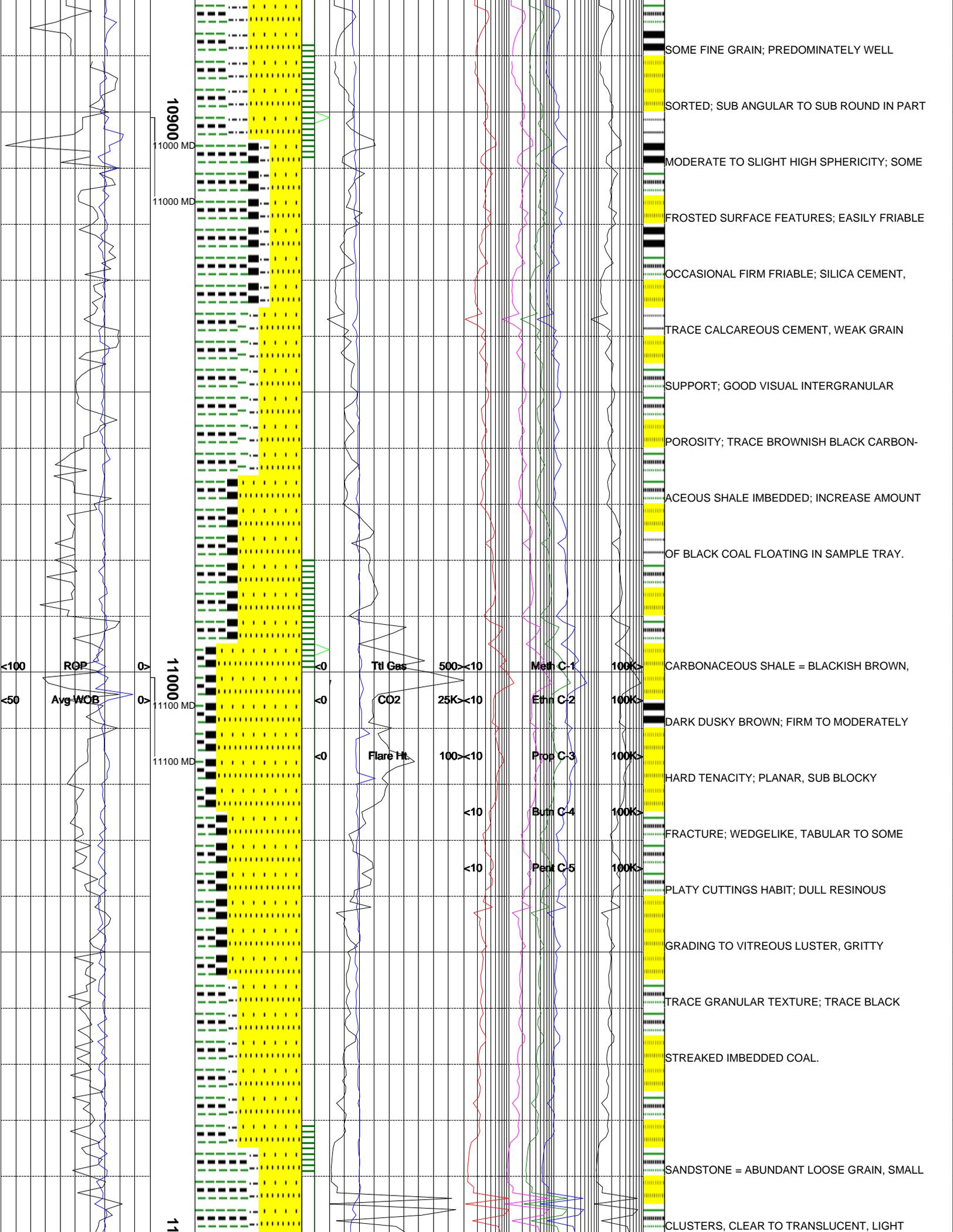


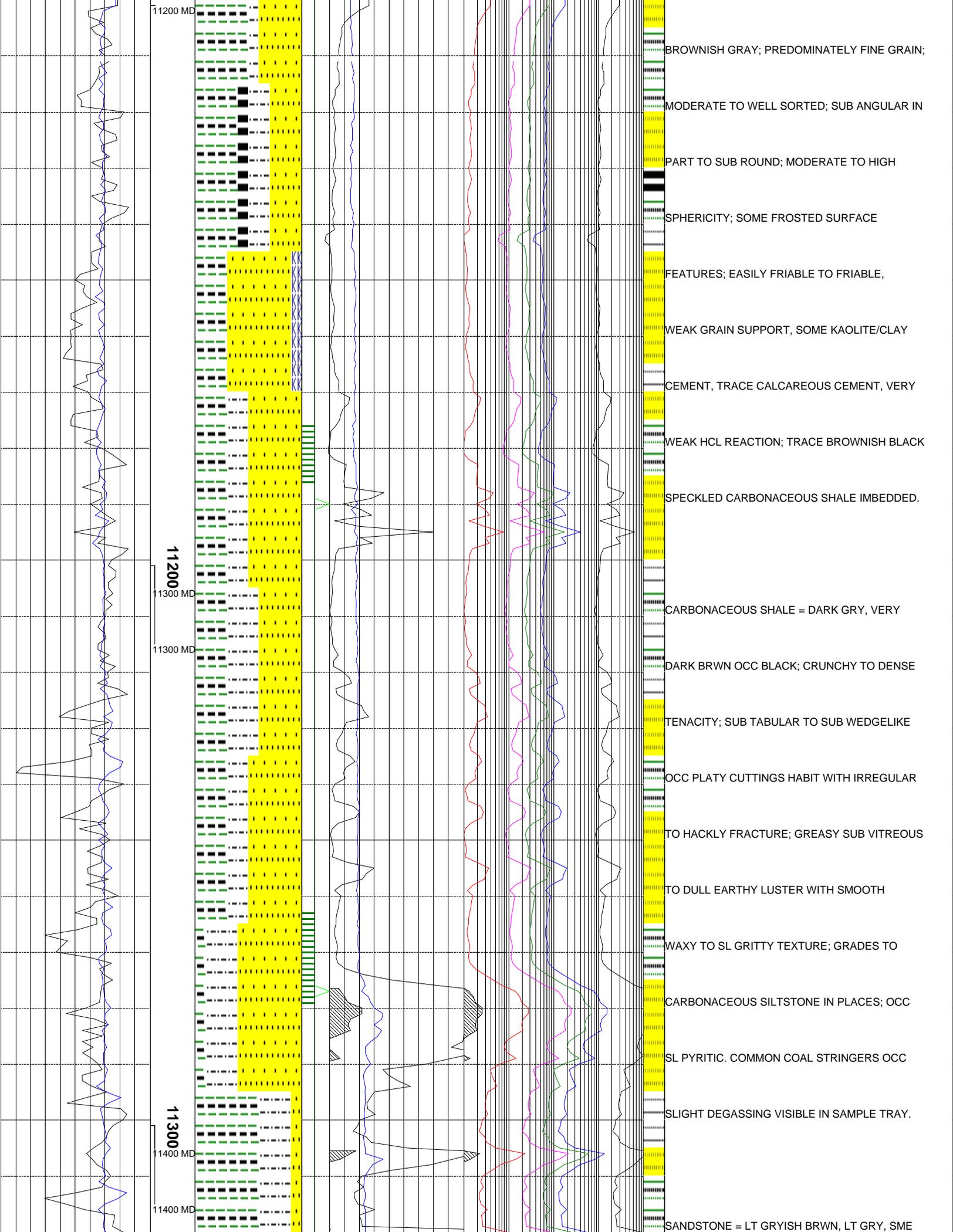
10300
10400 MD
10400 MD

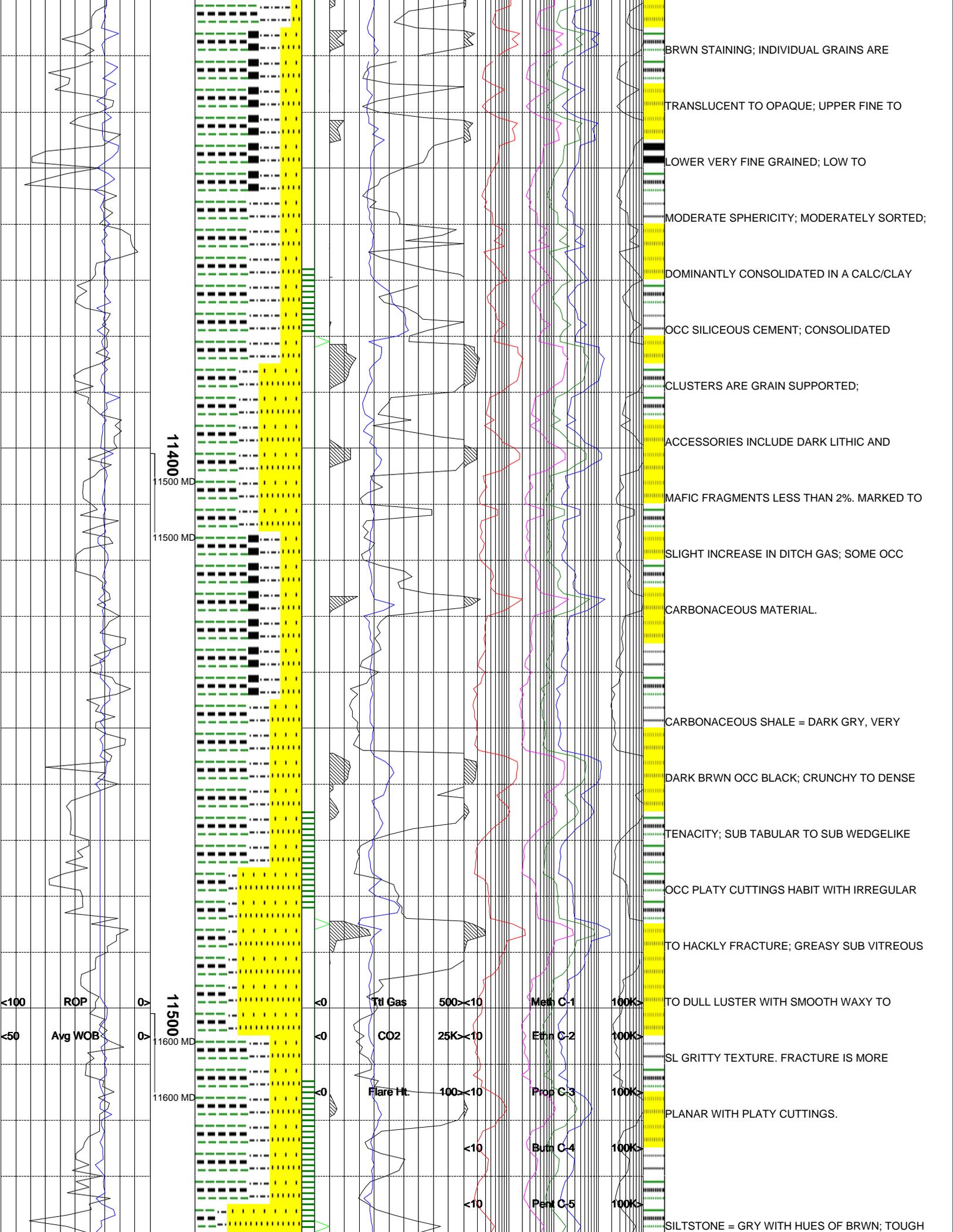
10400
10500 MD
10500 MD

LUCENT, LIGHT GRAY; SOME SALT AND PEPPER
 APPEARANCE, PREDOMINATELY SMALL CLUSTERS
 UPPER VERY FINE TO LOWER FINE GRAIN;
 MODERATE WELL TO WELL SORTED; SUB
 ANGULAR, SUB ROUND; MODERATE SPHERICITY;
 SOME FROSTED SURFACE FEATURE; EASILY
 FRIABLE TO FRIABLE; SOME WEAK GRAIN
 SUPPORT, TRACE INDIVIDUAL GRAINS; SILICA
 MATRIX CEMENT, TRACE CALCAREOUS CEMENT;
 SOME SPECKLED CARBONACEOUS SHALE/
 SILTSTONE IMBEDDED.
 CARBONACEOUS SHALE = DARK BROWNISH
 GRAY, BLACKISH BROWN; CRUMBLY, SLIGHT
 BRITTLE TENACITY; SUB BLOCKY, BLOCKY,
 SOME IRREGULAR FRACTURES; TABULAR TO
 PLATY CUTTINGS HABIT; DULL EARTHY LUSTER
 SILTY GRADING TO GRITTY TEXTURE; THINLY
 INTERBEDDED WITH SILTSTONES AND SAND-
 STONES.
 SANDSTONE = LT GRY, OFF WHT, LT GRY WITH









11400

11500 MD

11500 MD

11500

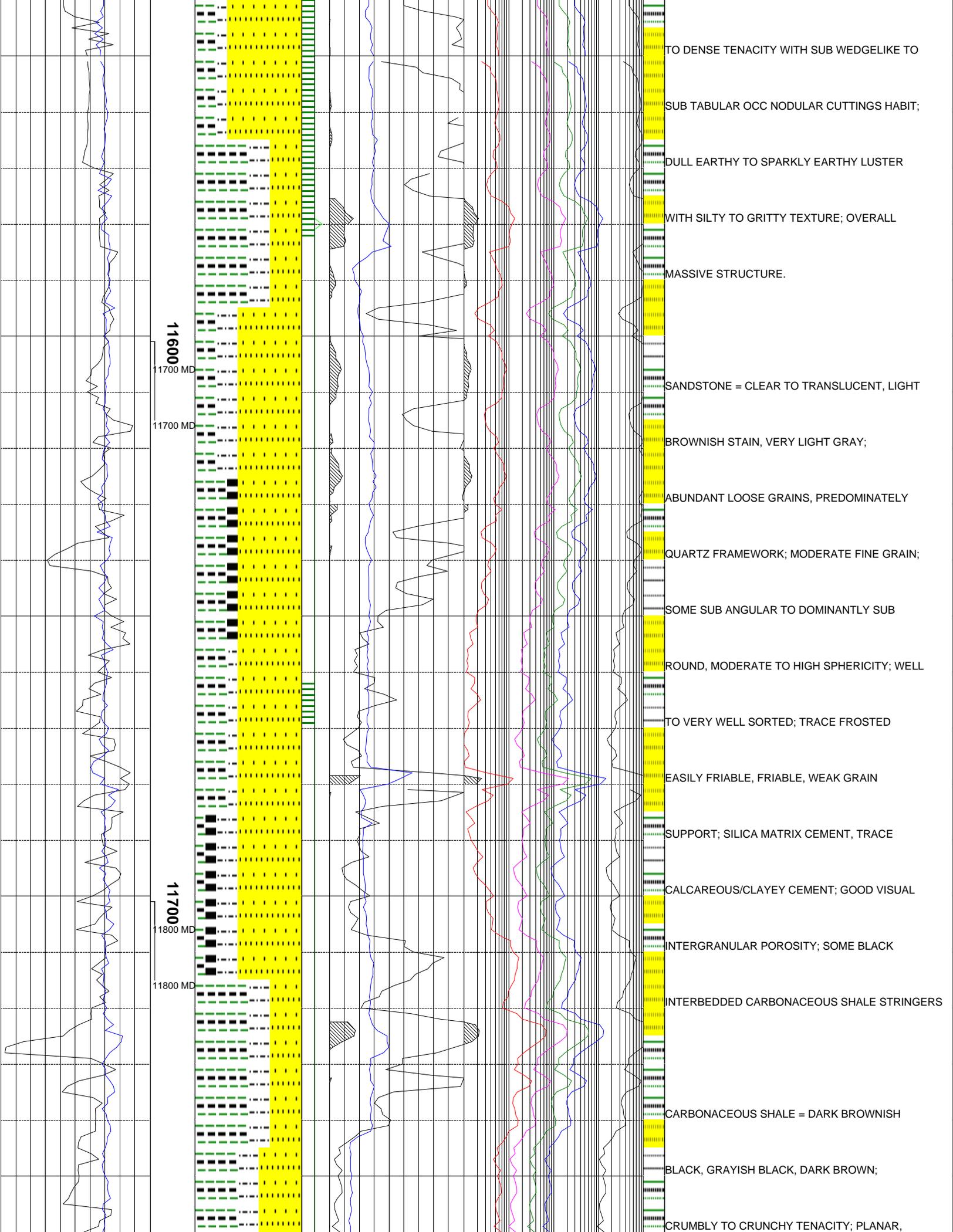
11600 MD

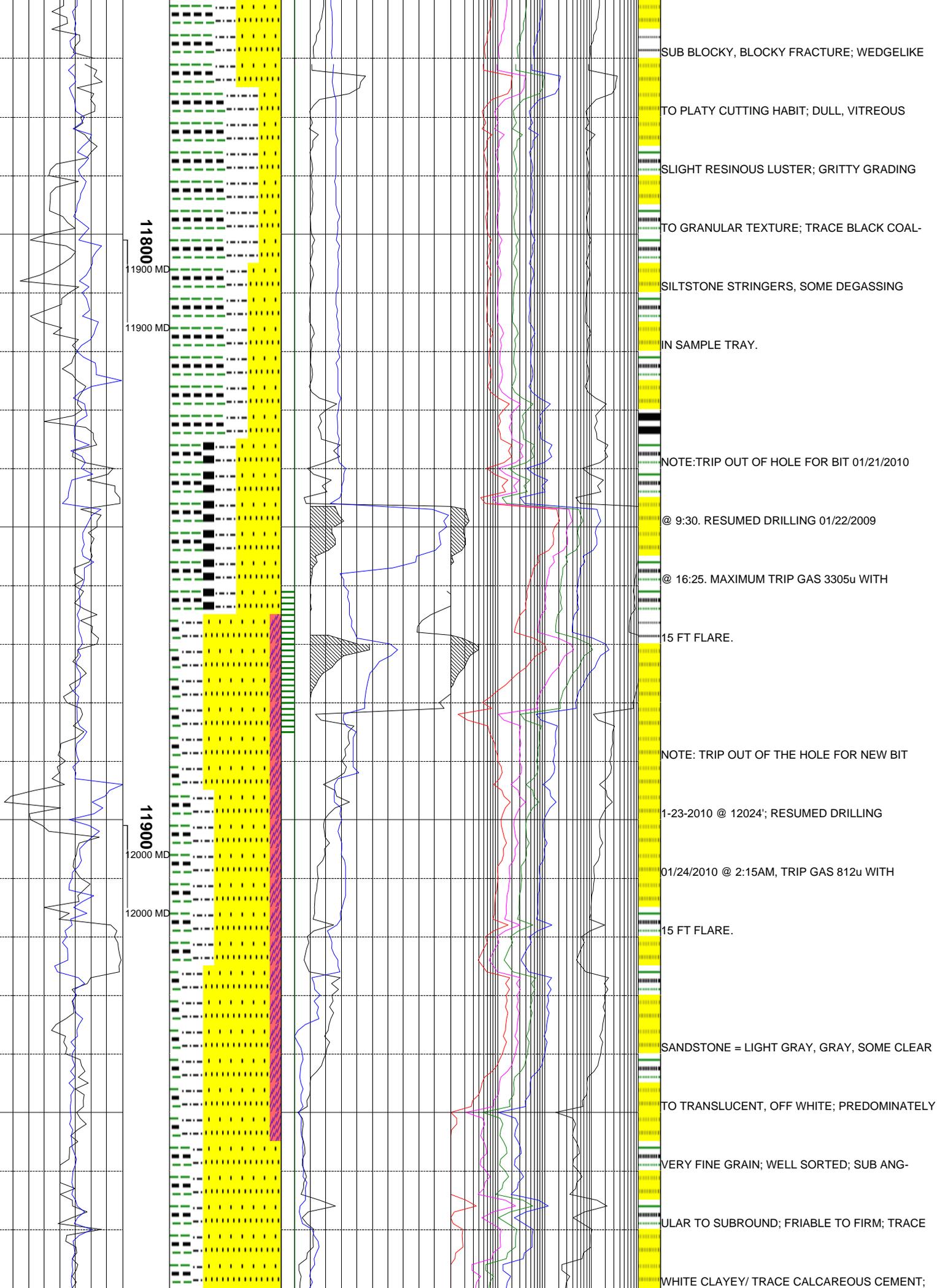
11600 MD

<100 ROP
<50 Avg WOB

Ttl Gas 500<10
CO2 25K<10
Flare Ht. 100<10
Meth C-1 100K<
Ethn C-2 100K<
Prop C-3 100K<
Butn C-4 100K<
Pent C-5 100K<

BRWN STAINING; INDIVIDUAL GRAINS ARE
TRANSLUCENT TO OPAQUE; UPPER FINE TO
LOWER VERY FINE GRAINED; LOW TO
MODERATE SPHERICITY; MODERATELY SORTED;
DOMINANTLY CONSOLIDATED IN A CALC/CLAY
OCC SILICEOUS CEMENT; CONSOLIDATED
CLUSTERS ARE GRAIN SUPPORTED;
ACCESSORIES INCLUDE DARK LITHIC AND
MAFIC FRAGMENTS LESS THAN 2%. MARKED TO
SLIGHT INCREASE IN DITCH GAS; SOME OCC
CARBONACEOUS MATERIAL.
CARBONACEOUS SHALE = DARK GRY, VERY
DARK BRWN OCC BLACK; CRUNCHY TO DENSE
TENACITY; SUB TABULAR TO SUB WEDGELIKE
OCC PLATY CUTTINGS HABIT WITH IRREGULAR
TO HACKLY FRACTURE; GREASY SUB VITREOUS
TO DULL LUSTER WITH SMOOTH WAXY TO
SL GRITTY TEXTURE. FRACTURE IS MORE
PLANAR WITH PLATY CUTTINGS.
SILTSTONE = GRY WITH HUES OF BRWN; TOUGH





11800

11900 MD

11900 MD

11900

12000 MD

12000 MD

SUB BLOCKY, BLOCKY FRACTURE; WEDGELIKE

TO PLATY CUTTING HABIT; DULL, VITREOUS

SLIGHT RESINOUS LUSTER; GRITTY GRADING

TO GRANULAR TEXTURE; TRACE BLACK COAL-

SILTSTONE STRINGERS, SOME DEGASSING

IN SAMPLE TRAY.

NOTE: TRIP OUT OF HOLE FOR BIT 01/21/2010

@ 9:30. RESUMED DRILLING 01/22/2009

@ 16:25. MAXIMUM TRIP GAS 3305u WITH

15 FT FLARE.

NOTE: TRIP OUT OF THE HOLE FOR NEW BIT

1-23-2010 @ 12024'; RESUMED DRILLING

01/24/2010 @ 2:15AM, TRIP GAS 812u WITH

15 FT FLARE.

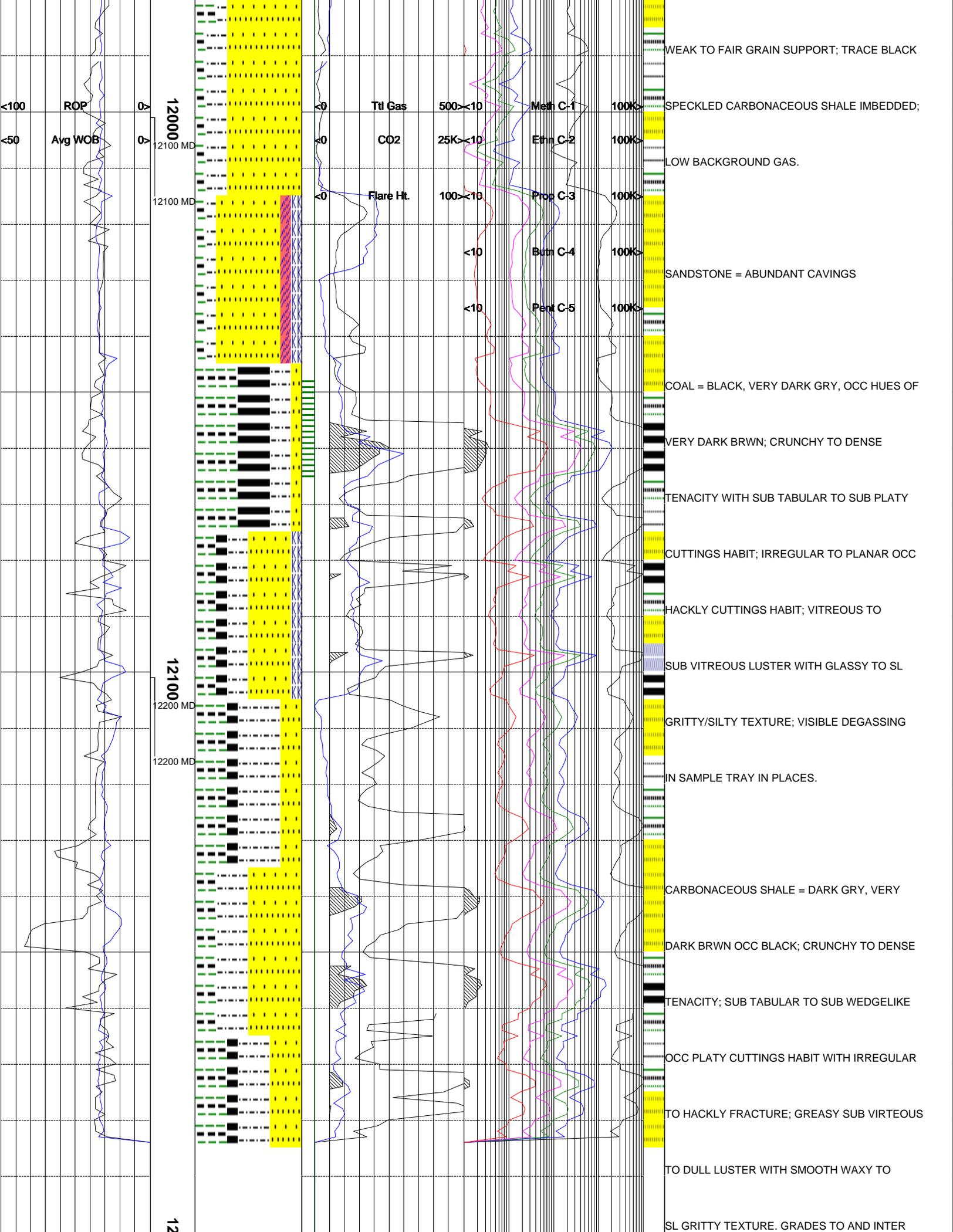
SANDSTONE = LIGHT GRAY, GRAY, SOME CLEAR

TO TRANSLUCENT, OFF WHITE; PREDOMINATELY

VERY FINE GRAIN; WELL SORTED; SUB ANG-

ULAR TO SUBROUND; FRIABLE TO FIRM; TRACE

WHITE CLAYEY/ TRACE CALCAREOUS CEMENT;



12300 MD

BEDDED WITH MARINE SILTSTONES.

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