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	PCU296-5A05
FIELD	PICEANCE CREEK
REGION	ROCKYS
COORDINATES	39.911890000 Deg N
	108.198602000 Deg W
ELEVATION	7295.9'
COUNTY, STATE	RIO BLANCO, CO
API INDEX	051031124400
SPUD DATE	11/14/2009
CONTRACTOR	HP
CO. REP.	CANDICE CURTIS
RIG/TYPE	321, FLEX 4
LOGGING UNIT	31
GEOLOGISTS	C. RECORD / B. SMELSER
	M. FRANCO
ADD. PERSONS	M. PIPER
	R. McCANE
CO. GEOLOGIST	CHRIS ALBA

LOG INTERVAL

DEPTHS:	4400'	**TO**	13721'
DATES:	11/11/2010	**TO**	11/28/2010
SCALE:	5"=100'		

MUD TYPES

WATER BASED	**TO**	13721'
	TO	
	TO	
	TO	

CASING DATA

16.00"	**AT**	150'
10.75"	**AT**	4662'
7.00"	**AT**	9954'
4.5"	**AT**	13700'

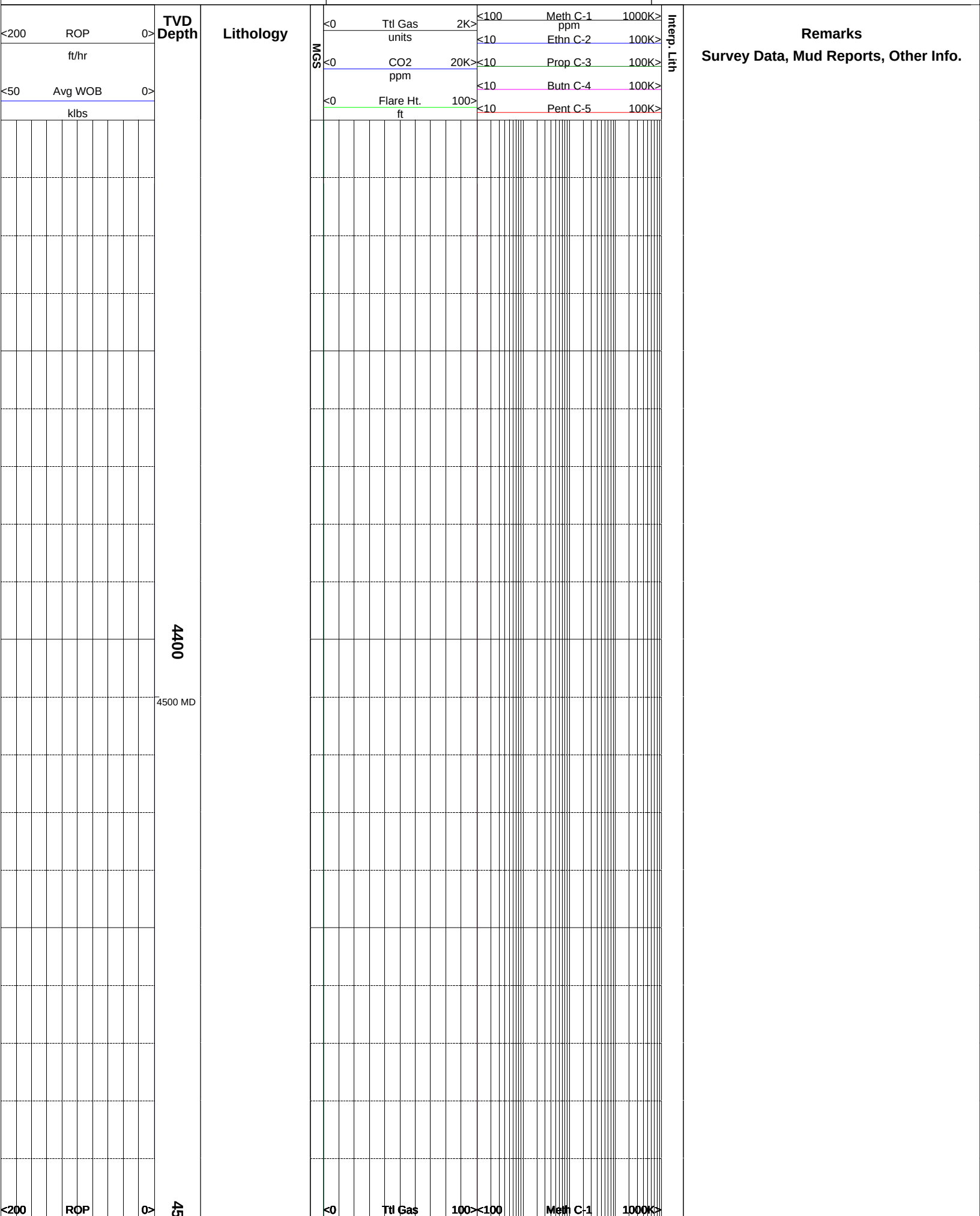
HOLE SIZE

14.75"	**TO**	4677'
9.875"	**TO**	9967'
6.125"	**TO**	13721'
	TO	

ABBREVIATIONS

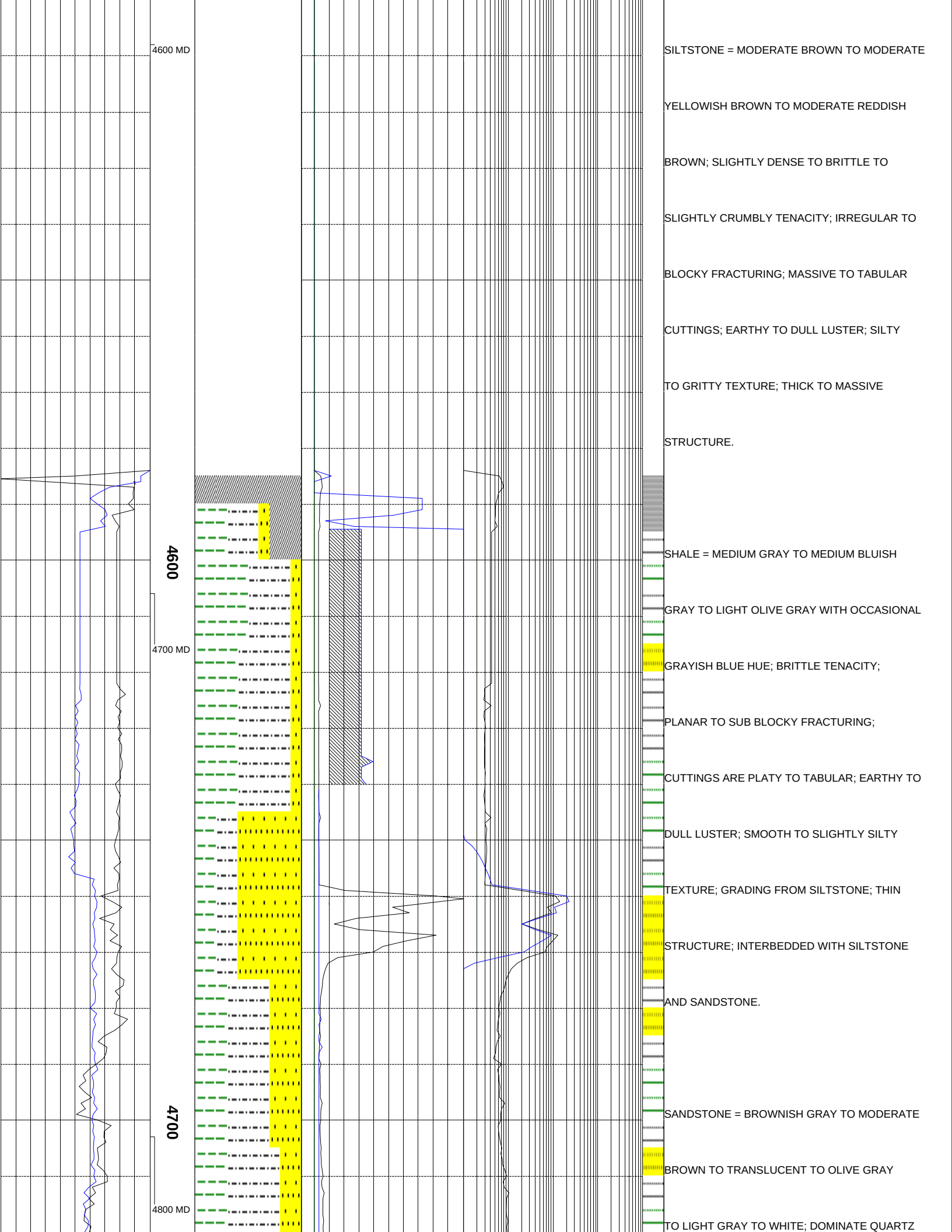
NB	NEWBIT	*PV*	PLASTIC VISCOSITY	*LC*	LOST CIRCULATION
RRB	RERUN BIT	*YP*	YIELD POINT	*CO*	CIRCULATE OUT
CB	CORE BIT	*FL*	FLUID LOSS	*NR*	NO RETURNS
WOB	WEIGHT ON BIT	*CL*	PPM CLORIDE ION	*TG*	TRIP GAS
RPM	ROTARY REV/MIN	*Rm*	MUD RESISTIVITY	*SG*	SURVEY GAS
PP	PUMP PRESSURE	*Rmf*	FILTRATE RESISTIVITY	*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		

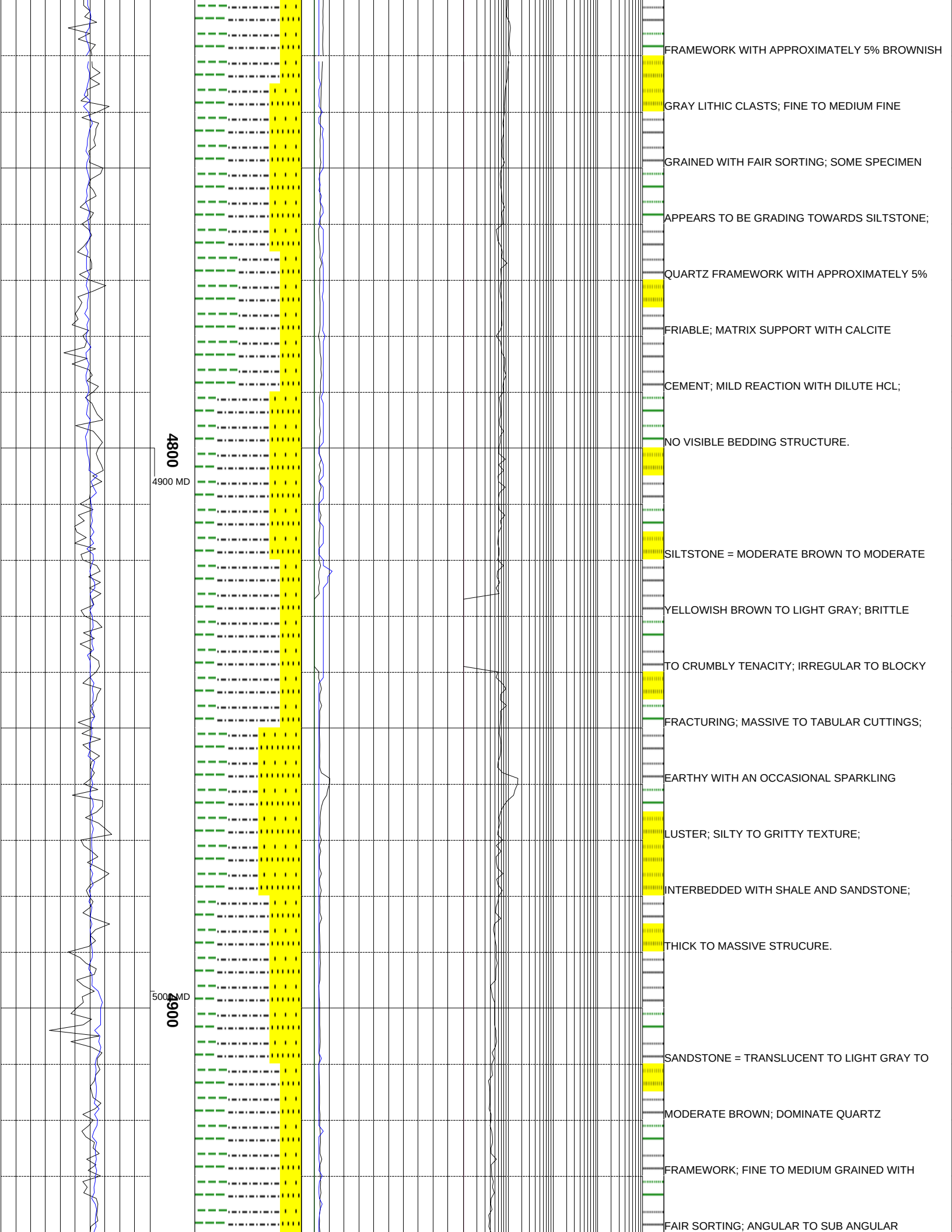
- ALTERED ZONE
- ANDESITE
- ANHYDRITE
- BASALT
- BENTONITE
- BIOTITIZATION
- BRECCIA
- CALCARENITE
- CALCAREOUS TUFF
- CALCILUTITE
- CARBONATES
- CARBONACEOUS MAT
- CARBONACEOUS SH
- CEMENT CONTAM.
- CHALK
- CRYSTALLINE TUFF
- CHERT - ARGILL
- CHERT - GLASSY
- CHERT - PORCEL
- CHERT - TIGER STRIPE
- CHERT - UNDIFF
- CLAY
- CLAY-MUDSTONE
- CLYST-TUFFACEOUS
- CHLORITIZATION
- COAL
- CONGLOMERATE
- CONGL. SAND
- CONGL. SANDSTONE
- COQUINA
- DACITE
- DIATOMITE
- DIORITE
- DOLOSTONE
- FELSIC SILIC DIKE
- FOSSIL
- GABBRO
- GLASSY TUFF
- GRANITE
- GRANITE WASH
- GRANODIORITE
- GYPSUM
- HALITE
- HORNBL-QTZ-DIO
- IGNEOUS (ACIDIC)
- IGNEOUS (BASIC)
- INTRUSIVES
- KAOLINITIC
- LIMESTONE
- LITHIC TUFF
- MARL - DOLO
- MARL - CALC
- METAMORPHICS
- MUDSTONE
- OBSIDIAN
- PALEOSOL
- PHOSPHATE
- PORCELANITE
- PORCELANEOUS CLYST
- PYRITE
- PYROCLASTICS
- QUARTZ DIORITE
- QUARTZ LATITE
- QUARTZ MONZONITE
- RECRYSTALLIZED CALCITE
- RHYOLITE
- SALT
- SAND
- SANDSTONE
- SANDSTONE-TUFFACEOUS
- SERICITIZATION
- SERPENTINE
- SHALE
- SHALE TUFFACEOUS
- SHELL FRAGMENTS
- SIDERITE
- SILICIFICATION
- SILTSTONE
- SILTST-TUFFACEOUS
- TUFF
- VOLCANICLASTICS SEDS
- VOLCANICS



Remarks

Survey Data, Mud Reports, Other Info.


4600 MD
4600
4700 MD
4700
4800 MD
SILTSTONE = MODERATE BROWN TO MODERATE YELLOWISH BROWN TO MODERATE REDDISH BROWN; SLIGHTLY DENSE TO BRITTLE TO SLIGHTLY CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY TO DULL LUSTER; SILTY TO GRITTY TEXTURE; THICK TO MASSIVE STRUCTURE.
SHALE = MEDIUM GRAY TO MEDIUM BLUISH GRAY TO LIGHT OLIVE GRAY WITH OCCASIONAL GRAYISH BLUE HUE; BRITTLE TENACITY; PLANAR TO SUB BLOCKY FRACTURING; CUTTINGS ARE PLATY TO TABULAR; EARTHY TO DULL LUSTER; SMOOTH TO SLIGHTLY SILTY TEXTURE; GRADING FROM SILTSTONE; THIN STRUCTURE; INTERBEDDED WITH SILTSTONE AND SANDSTONE.
SANDSTONE = BROWNISH GRAY TO MODERATE BROWN TO TRANSLUCENT TO OLIVE GRAY TO LIGHT GRAY TO WHITE; DOMINATE QUARTZ



FRAMEWORK WITH APPROXIMATELY 5% BROWNISH GRAY LITHIC CLASTS; FINE TO MEDIUM FINE GRAINED WITH FAIR SORTING; SOME SPECIMEN APPEARS TO BE GRADING TOWARDS SILTSTONE; QUARTZ FRAMEWORK WITH APPROXIMATELY 5% FRIABLE; MATRIX SUPPORT WITH CALCITE CEMENT; MILD REACTION WITH DILUTE HCL; NO VISIBLE BEDDING STRUCTURE.

SILTSTONE = MODERATE BROWN TO MODERATE YELLOWISH BROWN TO LIGHT GRAY; BRITTLE TO CRUMBLY TENACITY; IRREGULAR TO BLOCKY FRACTURING; MASSIVE TO TABULAR CUTTINGS; EARTHY WITH AN OCCASIONAL SPARKLING LUSTER; SILTY TO GRITTY TEXTURE; INTERBEDDED WITH SHALE AND SANDSTONE; THICK TO MASSIVE STRUCURE.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY TO MODERATE BROWN; DOMINATE QUARTZ FRAMEWORK; FINE TO MEDIUM GRAINED WITH FAIR SORTING; ANGULAR TO SUB ANGULAR

WITH LOW SPHERICITY; FIRMLY FRIABLE TO

FRIABLE WITH ABUNDENT LOOSE GRAINS IN

SAMPLE; MODERATE TO STRONG REACTION WITH

DILUTE HCL; CALCITE CEMENT WITH MATRIX

SUPPORT WITH OCCASIONAL SPECIMENS

DISPLAYING GRAIN SUPPORT; INTERBEDDED

WITH SILTSTONE AND SHALE; NO OTHER

VISIBLE BEDDING STRUCTURE.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM

BLUISH GRAY TO LIGHT OLIVE GRAY WITH

OCCASIONAL MODERATE OLIVE BROWN HUES;

BRITTLE TENACITY; PLANAR TO SPLINTERY

FRACTURING; CUTTINGS ARE PLATY TO FLAKY

TO SLIGHTLY TABULAR; DULL TO WAXY LUSTER

SMOOTH TO SILTY TEXTURE; SOME GRADING

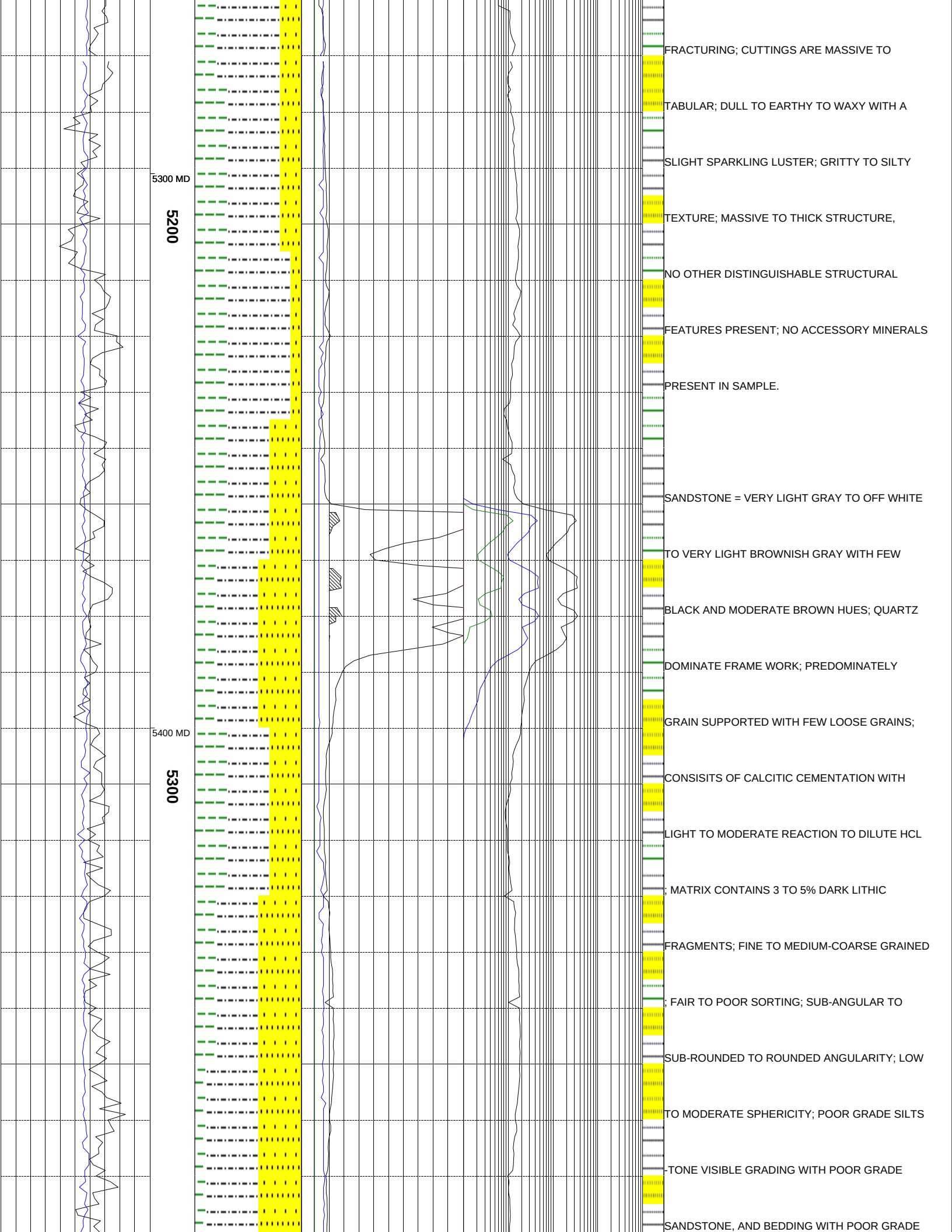
FROM SILTSTONE; THIN STRUCTURE.

SILTSTONE = BROWNISH GRAY TO MODERATE

BROWN TO MODERATE OLIVE BROWN TO

MODERATE YELLOWISH BROWN; SLIGHTLY DENSE

TO BRITTLE TENACITY; BLOCKY TO IRREGULAR



FRACTURING; CUTTINGS ARE MASSIVE TO

TABULAR; DULL TO EARTHY TO WAXY WITH A

SLIGHT SPARKLING LUSTER; GRITTY TO SILTY

TEXTURE; MASSIVE TO THICK STRUCTURE,

NO OTHER DISTINGUISHABLE STRUCTURAL

FEATURES PRESENT; NO ACCESSORY MINERALS

PRESENT IN SAMPLE.

SANDSTONE = VERY LIGHT GRAY TO OFF WHITE

TO VERY LIGHT BROWNISH GRAY WITH FEW

BLACK AND MODERATE BROWN HUES; QUARTZ

DOMINATE FRAME WORK; PREDOMINATELY

GRAIN SUPPORTED WITH FEW LOOSE GRAINS;

CONSISITS OF CALCITIC CEMENTATION WITH

LIGHT TO MODERATE REACTION TO DILUTE HCL

; MATRIX CONTAINS 3 TO 5% DARK LITHIC

FRAGMENTS; FINE TO MEDIUM-COARSE GRAINED

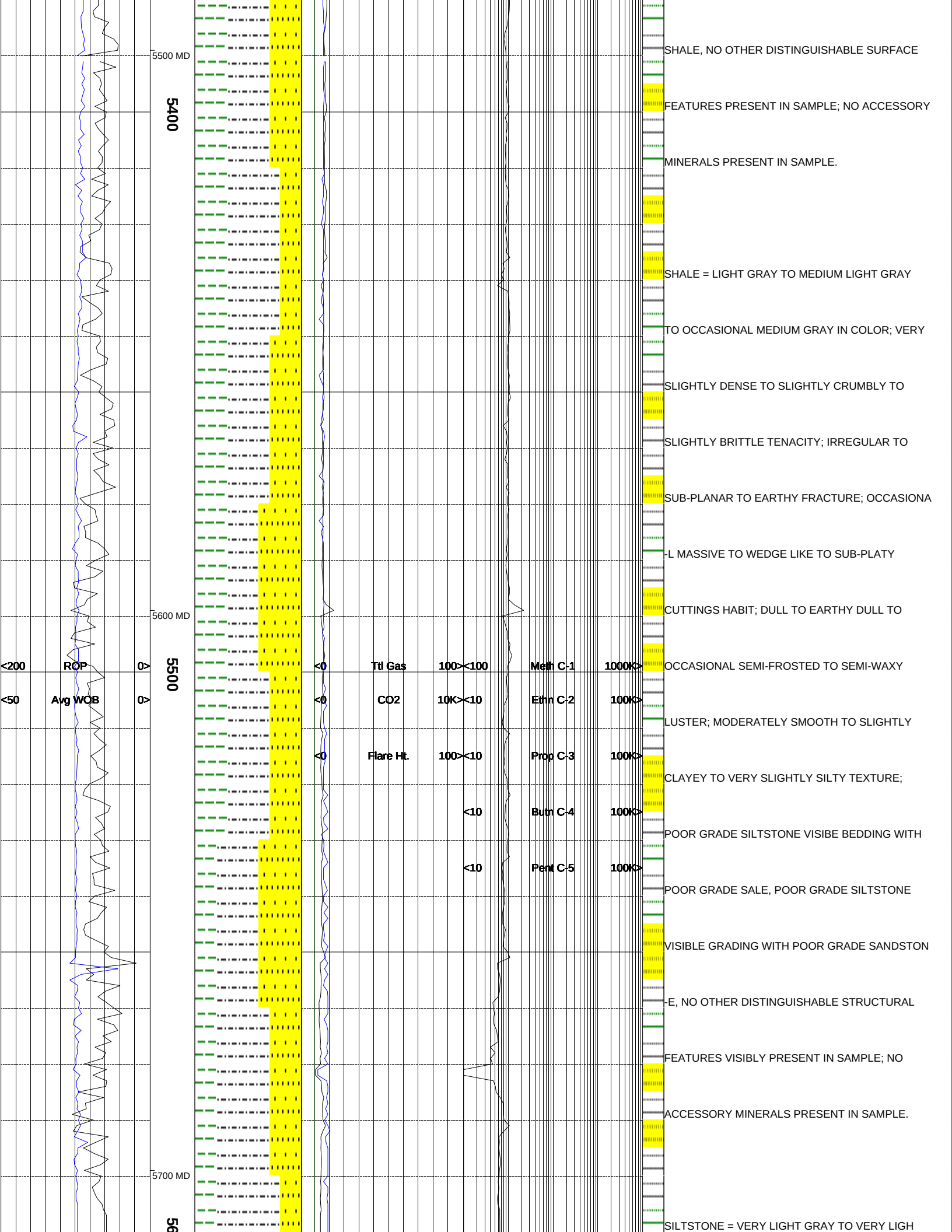
; FAIR TO POOR SORTING; SUB-ANGULAR TO

SUB-ROUNDED TO ROUNDED ANGULARITY; LOW

TO MODERATE SPHERICITY; POOR GRADE SILTS

-TONE VISIBLE GRADING WITH POOR GRADE

SANDSTONE, AND BEDDING WITH POOR GRADE


5500 MD
5400
5600 MD
<200
ROP
0>
<0
Ttl Gas
100><100
Meth C-1
1000K>
5500
<50
Avg WOB
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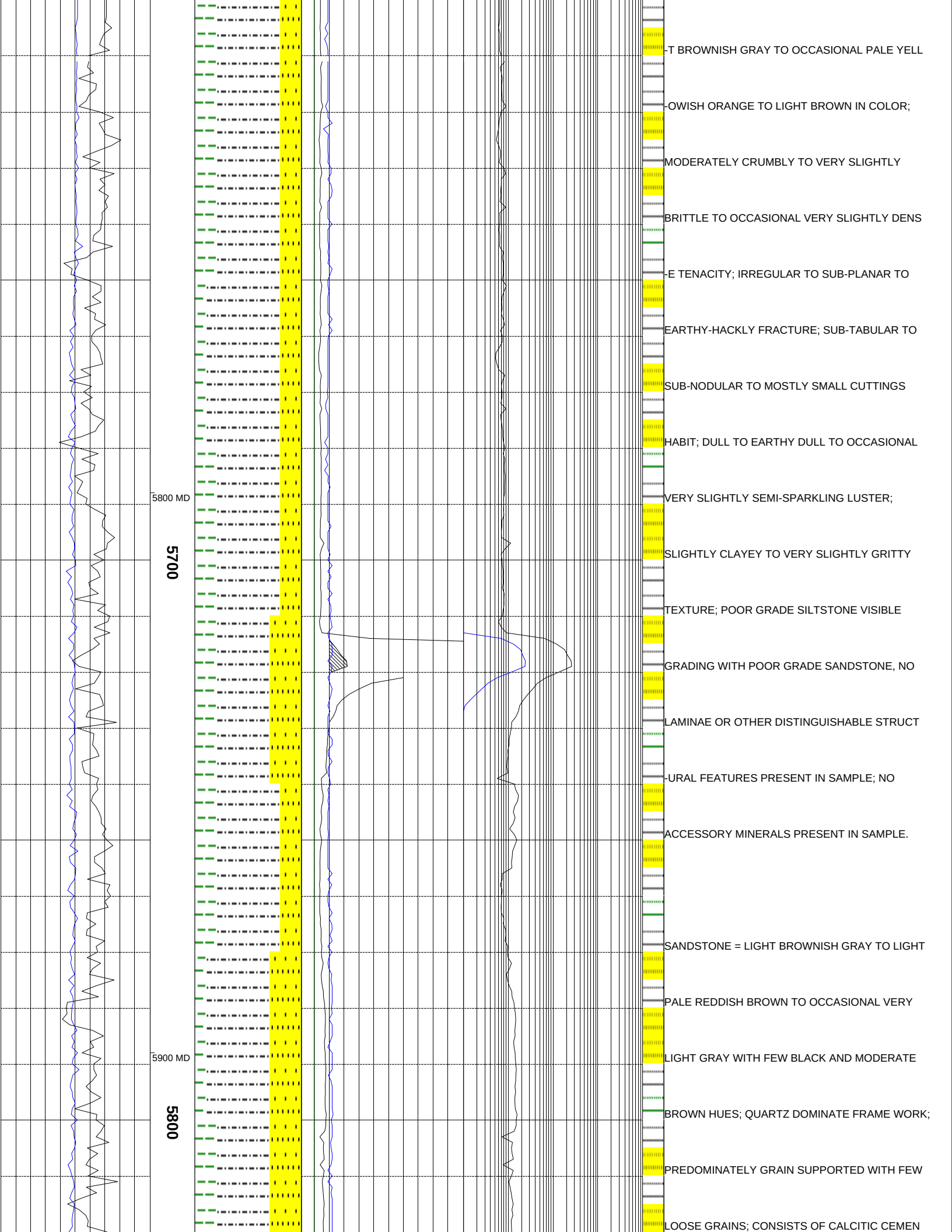
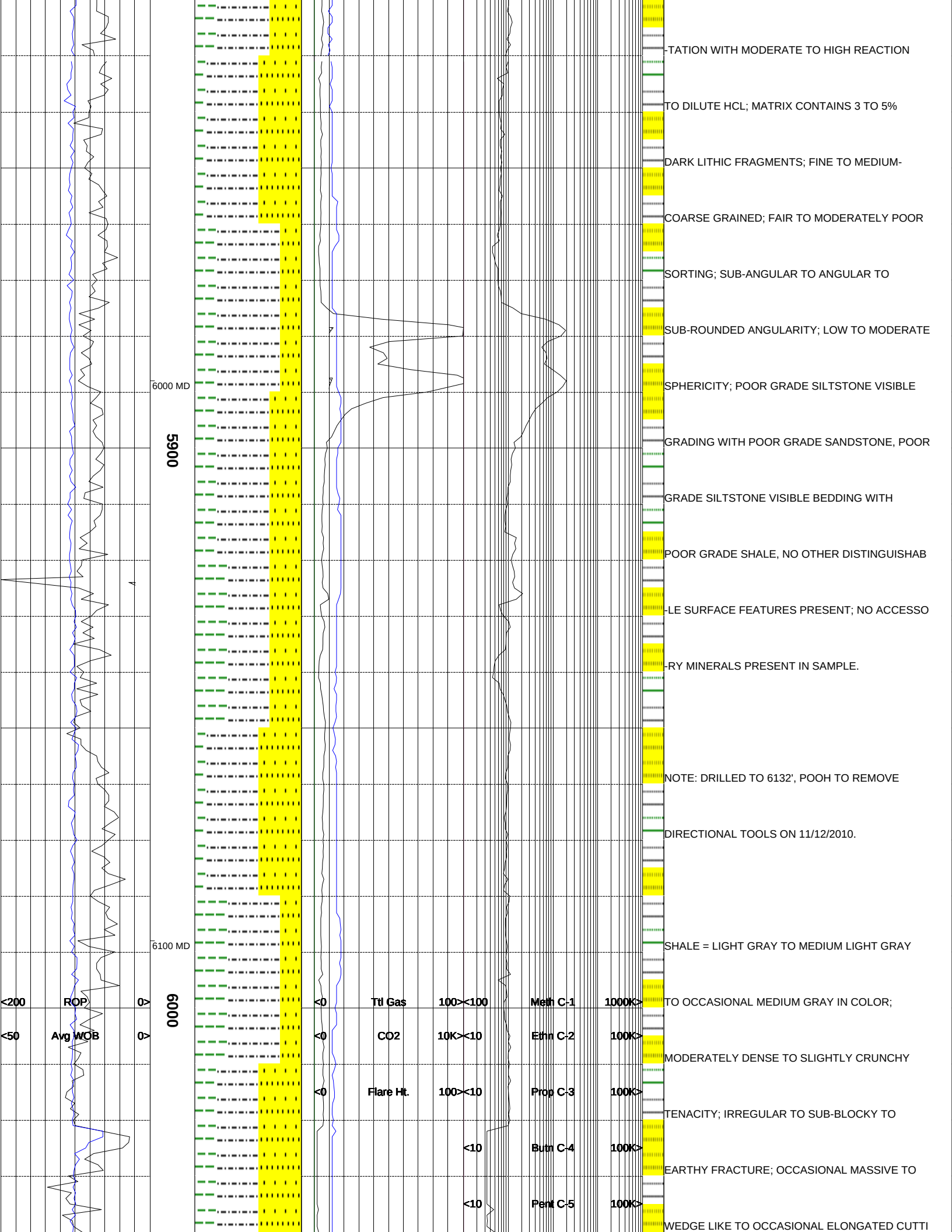
<0
CO2
10K><10
Ethn C-2
100K>
<0
Flare Ht.
100><10
Prop C-3
100K>
<10
Buth C-4
100K>
<10
Pent C-5
100K>
5700 MD
SHALE, NO OTHER DISTINGUISHABLE SURFACE
FEATURES PRESENT IN SAMPLE; NO ACCESSORY
MINERALS PRESENT IN SAMPLE.
SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY
TO OCCASIONAL MEDIUM GRAY IN COLOR; VERY
SLIGHTLY DENSE TO SLIGHTLY CRUMBLY TO
SLIGHTLY BRITTLE TENACITY; IRREGULAR TO
SUB-PLANAR TO EARTHY FRACTURE; OCCASIONA
-L MASSIVE TO WEDGE LIKE TO SUB-PLATY
CUTTINGS HABIT; DULL TO EARTHY DULL TO
OCCASIONAL SEMI-FROSTED TO SEMI-WAXY
LUSTER; MODERATELY SMOOTH TO SLIGHTLY
CLAYEY TO VERY SLIGHTLY SILTY TEXTURE;
POOR GRADE SILTSTONE VISIBE BEDDING WITH
POOR GRADE SALE, POOR GRADE SILTSTONE
VISIBLE GRADING WITH POOR GRADE SANDSTON
-E, NO OTHER DISTINGUISHABLE STRUCTURAL
FEATURES VISIBLY PRESENT IN SAMPLE; NO
ACCESSORY MINERALS PRESENT IN SAMPLE.
SILTSTONE = VERY LIGHT GRAY TO VERY LIGH


5800 MD
5700
5900 MD
5800
-T BROWNISH GRAY TO OCCASIONAL PALE YELL
-OWISH ORANGE TO LIGHT BROWN IN COLOR;
MODERATELY CRUMBLY TO VERY SLIGHTLY
BRITTLE TO OCCASIONAL VERY SLIGHTLY DENS
-E TENACITY; IRREGULAR TO SUB-PLANAR TO
EARTHY-HACKLY FRACTURE; SUB-TABULAR TO
SUB-NODULAR TO MOSTLY SMALL CUTTINGS
HABIT; DULL TO EARTHY DULL TO OCCASIONAL
VERY SLIGHTLY SEMI-SPARKLING LUSTER;
SLIGHTLY CLAYEY TO VERY SLIGHTLY GRITTY
TEXTURE; POOR GRADE SILTSTONE VISIBLE
GRADING WITH POOR GRADE SANDSTONE, NO
LAMINAE OR OTHER DISTINGUISHABLE STRUCT
-URAL FEATURES PRESENT IN SAMPLE; NO
ACCESSORY MINERALS PRESENT IN SAMPLE.
SANDSTONE = LIGHT BROWNISH GRAY TO LIGHT
PALE REDDISH BROWN TO OCCASIONAL VERY
LIGHT GRAY WITH FEW BLACK AND MODERATE
BROWN HUES; QUARTZ DOMINATE FRAME WORK;
PREDOMINATELY GRAIN SUPPORTED WITH FEW
LOOSE GRAINS; CONSISTS OF CALCITIC CEMEN



-TATION WITH MODERATE TO HIGH REACTION

TO DILUTE HCL; MATRIX CONTAINS 3 TO 5%

DARK LITHIC FRAGMENTS; FINE TO MEDIUM-

COARSE GRAINED; FAIR TO MODERATELY POOR

SORTING; SUB-ANGULAR TO ANGULAR TO

SUB-ROUNDED ANGULARITY; LOW TO MODERATE

SPHERICITY; POOR GRADE SILTSTONE VISIBLE

GRADING WITH POOR GRADE SANDSTONE, POOR

GRADE SILTSTONE VISIBLE BEDDING WITH

POOR GRADE SHALE, NO OTHER DISTINGUISHAB

-LE SURFACE FEATURES PRESENT; NO ACCESSO

-RY MINERALS PRESENT IN SAMPLE.

NOTE: DRILLED TO 6132', POOH TO REMOVE

DIRECTIONAL TOOLS ON 11/12/2010.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY

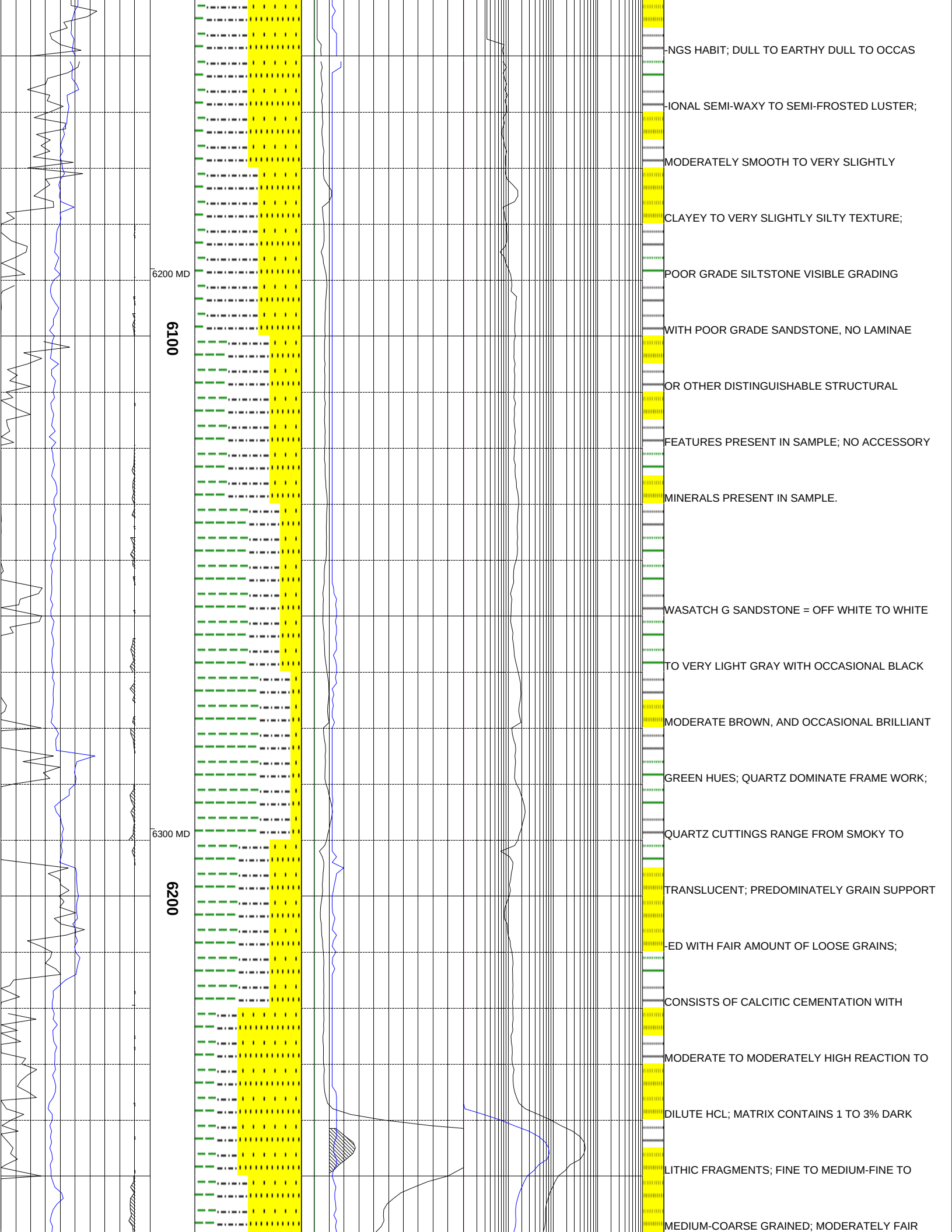
TO OCCASIONAL MEDIUM GRAY IN COLOR;

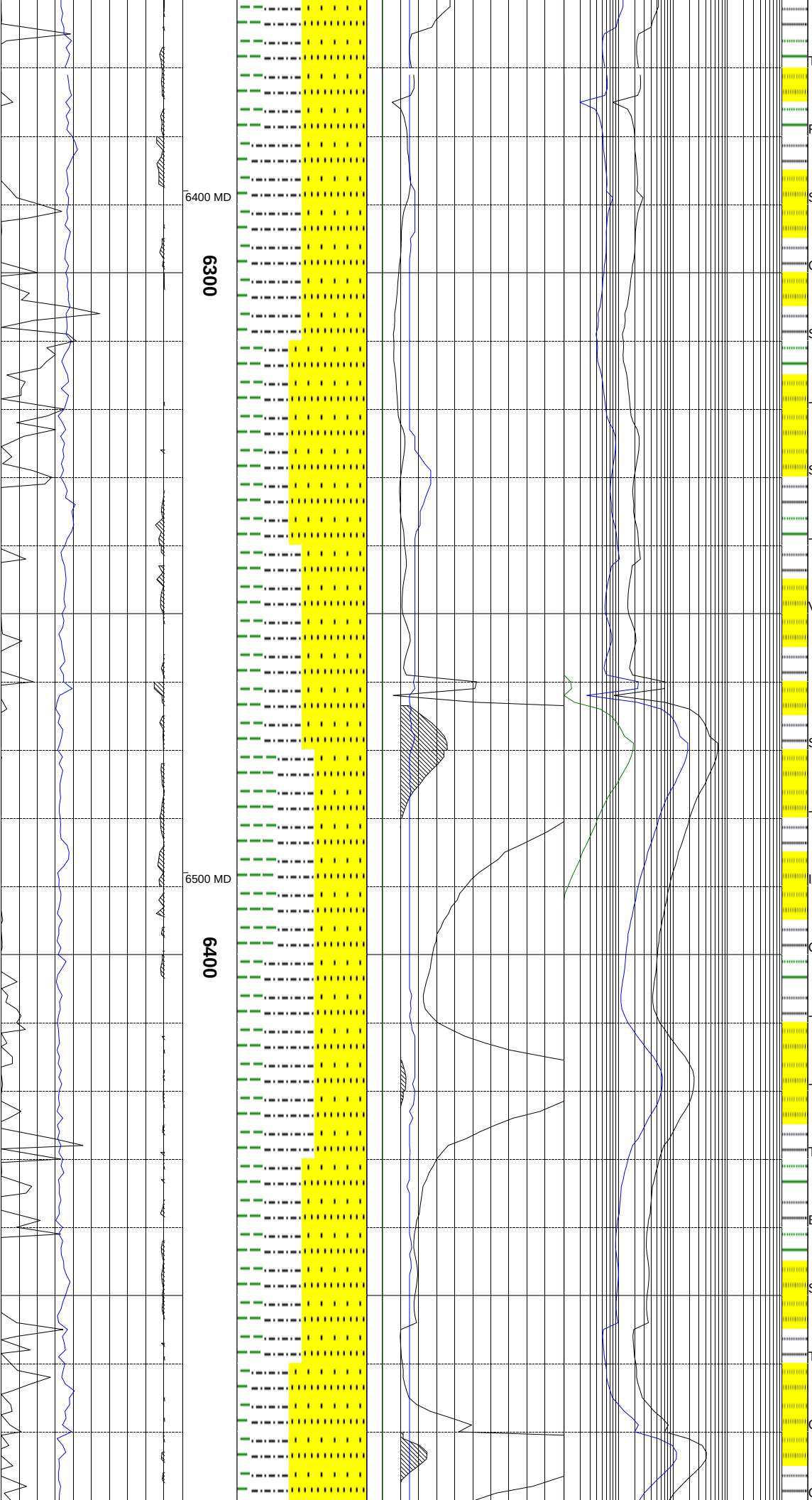
MODERATELY DENSE TO SLIGHTLY CRUNCHY

TENACITY; IRREGULAR TO SUB-BLOCKY TO

EARTHY FRACTURE; OCCASIONAL MASSIVE TO

WEDGE LIKE TO OCCASIONAL ELONGATED CUTTI


6200 MD
6100
6300 MD
6200
-NGS HABIT; DULL TO EARTHY DULL TO OCCAS
-IONAL SEMI-WAXY TO SEMI-FROSTED LUSTER;
MODERATELY SMOOTH TO VERY SLIGHTLY
CLAYEY TO VERY SLIGHTLY SILTY TEXTURE;
POOR GRADE SILTSTONE VISIBLE GRADING
WITH POOR GRADE SANDSTONE, NO LAMINAE
OR OTHER DISTINGUISHABLE STRUCTURAL
FEATURES PRESENT IN SAMPLE; NO ACCESSORY
MINERALS PRESENT IN SAMPLE.
WASATCH G SANDSTONE = OFF WHITE TO WHITE
TO VERY LIGHT GRAY WITH OCCASIONAL BLACK
MODERATE BROWN, AND OCCASIONAL BRILLIANT
GREEN HUES; QUARTZ DOMINATE FRAME WORK;
QUARTZ CUTTINGS RANGE FROM SMOKY TO
TRANSLUCENT; PREDOMINATELY GRAIN SUPPORT
-ED WITH FAIR AMOUNT OF LOOSE GRAINS;
CONSISTS OF CALCITIC CEMENTATION WITH
MODERATE TO MODERATELY HIGH REACTION TO
DILUTE HCL; MATRIX CONTAINS 1 TO 3% DARK
LITHIC FRAGMENTS; FINE TO MEDIUM-FINE TO
MEDIUM-COARSE GRAINED; MODERATELY FAIR



TO POOR SORTING; SUB-ANGULAR TO SUB-

ROUNDED ANGULARITY; LOW TO MODERATE

SPHERICITY; POOR GRADE SILTSTONE VISIBLE

GRADING WITH POOR GRADE SANDSTONE, VERY

SMALL AMOUNT OF COAL VISIBLY EFFERVESCIN

-G IN SAMPLE, NO OTHER DISTINGUISHABLE

SURFACE FEATURES PRESENT IN SAMPLE; TRAC

-E AMOUNTS OF ACCESSORY MINERAL PYRITE

VISIBLY PRESENT IN SAMPLE.

SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA

-Y TO OCCASIONAL MODERATE REDDISH BROWN

IN COLOR; MODERATELY DENSE TO SLIGHLTY

CRUMBLY TENACITY; IRREGULAR TO SUB-PLANA

-R TO EARTHY-HACKLY FRACTURE; SUBT-TABUL

-AR TO SUB-NODULAR TO OCCASIONAL PLATY

TO MOSTLY SMALL CUTTINGS HABIT; DULL TO

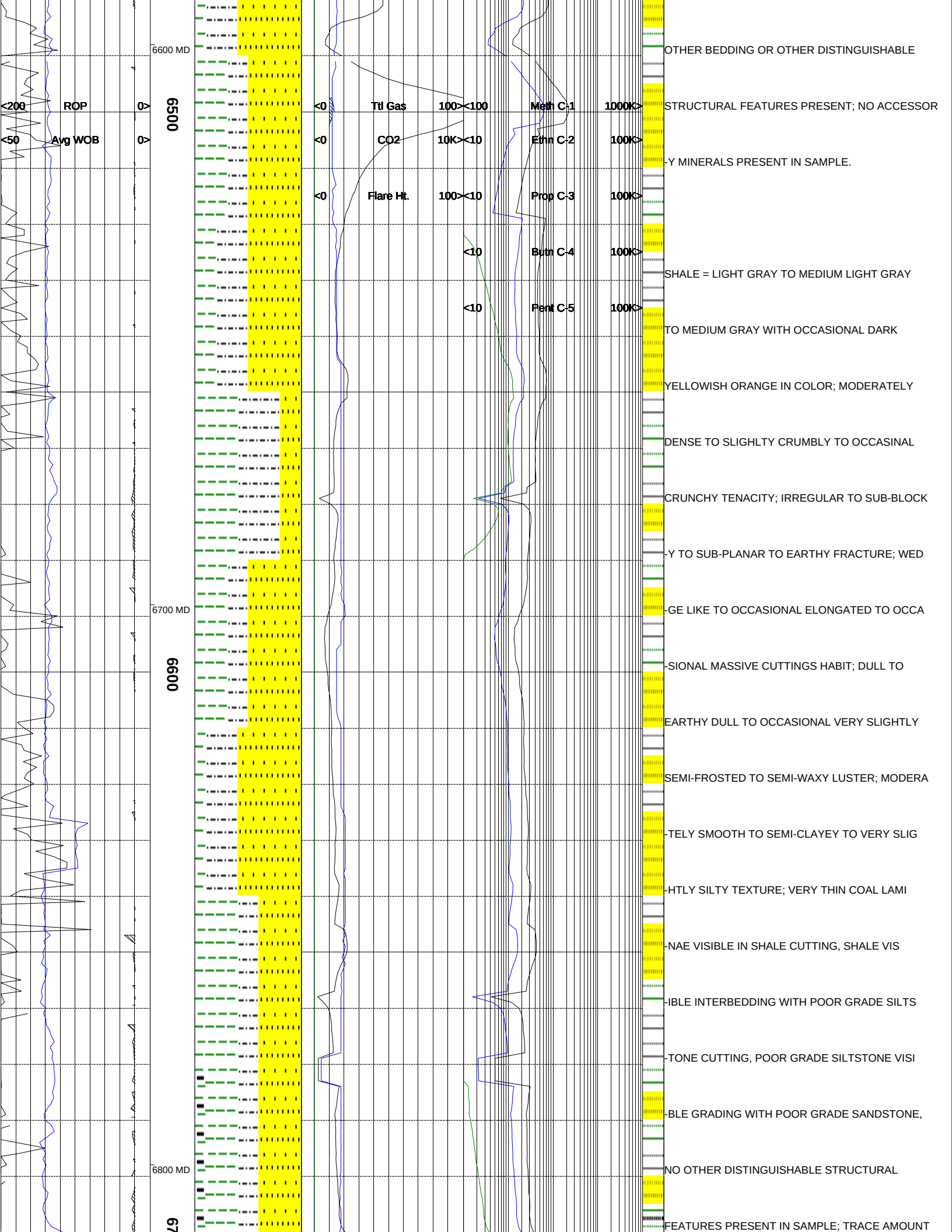
EARTHY DULL TO OCCASIONAL VERY SLIGHTLY

SEMI-SPARKLING LUSTER; SLIGHTLY CLAYEY

TO VERY SLIGHTLY GRITTY TEXTURE; POOR

GRADE SANDSTONE VISIBLE BEDDING AND

GRADING WITH POOR GRADE SILTSTONE, NO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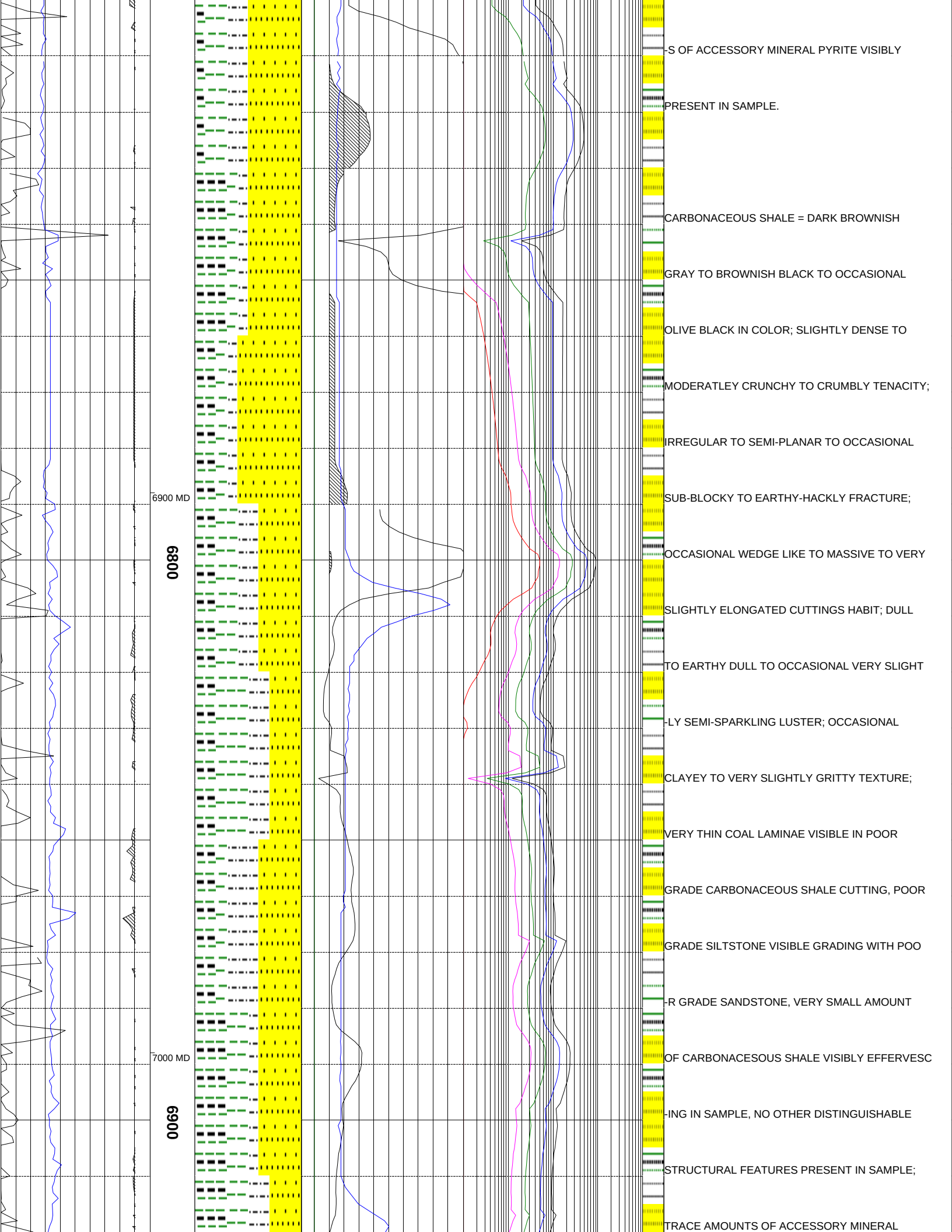
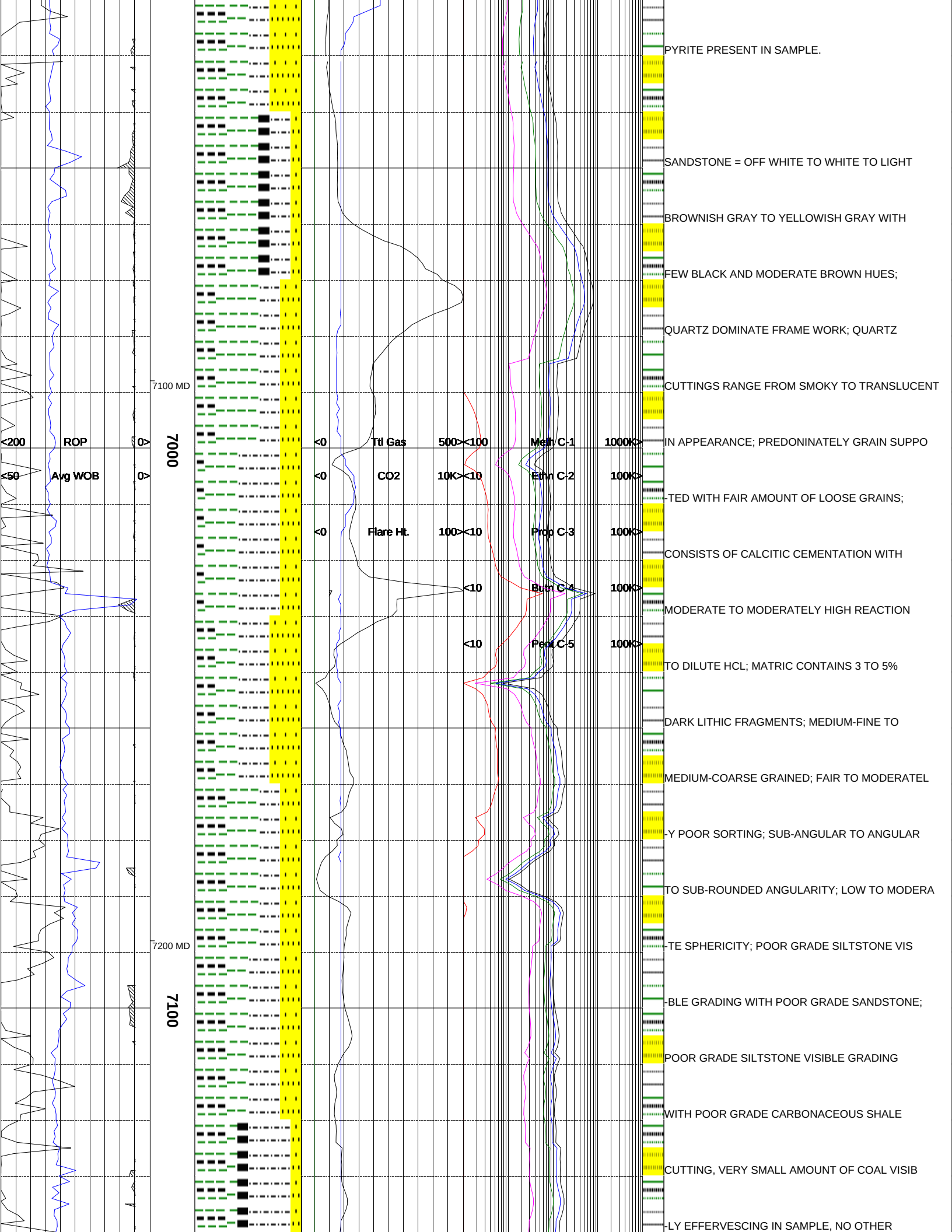
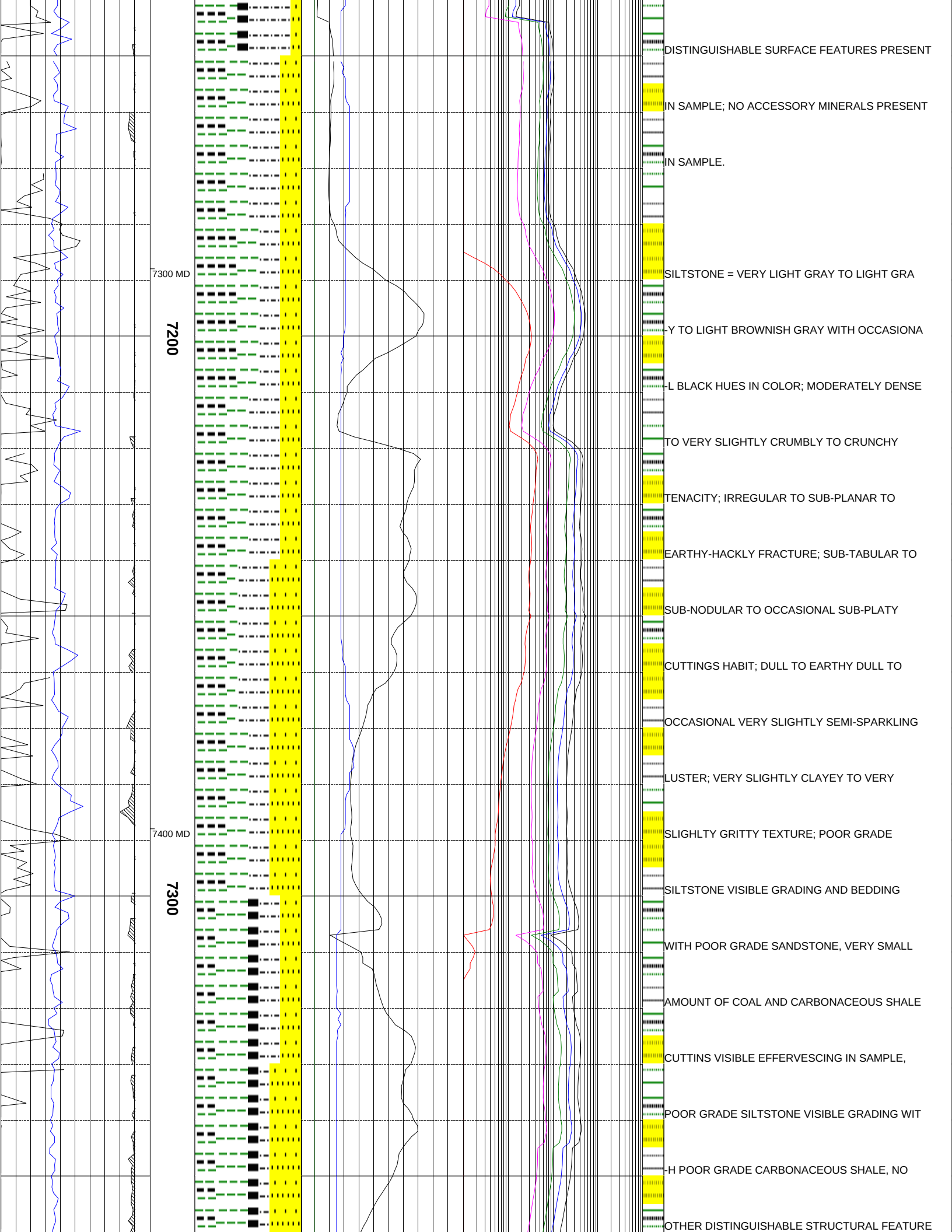
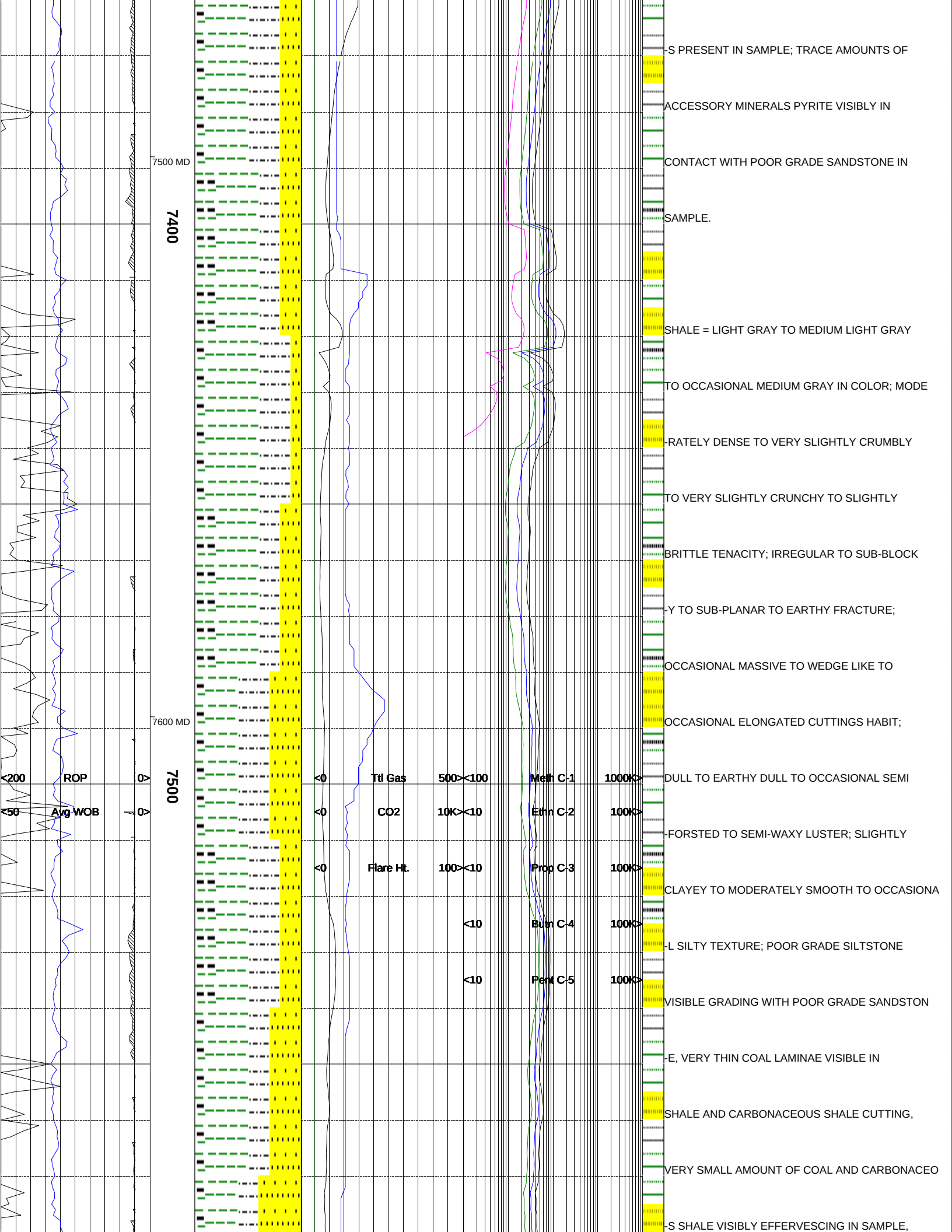
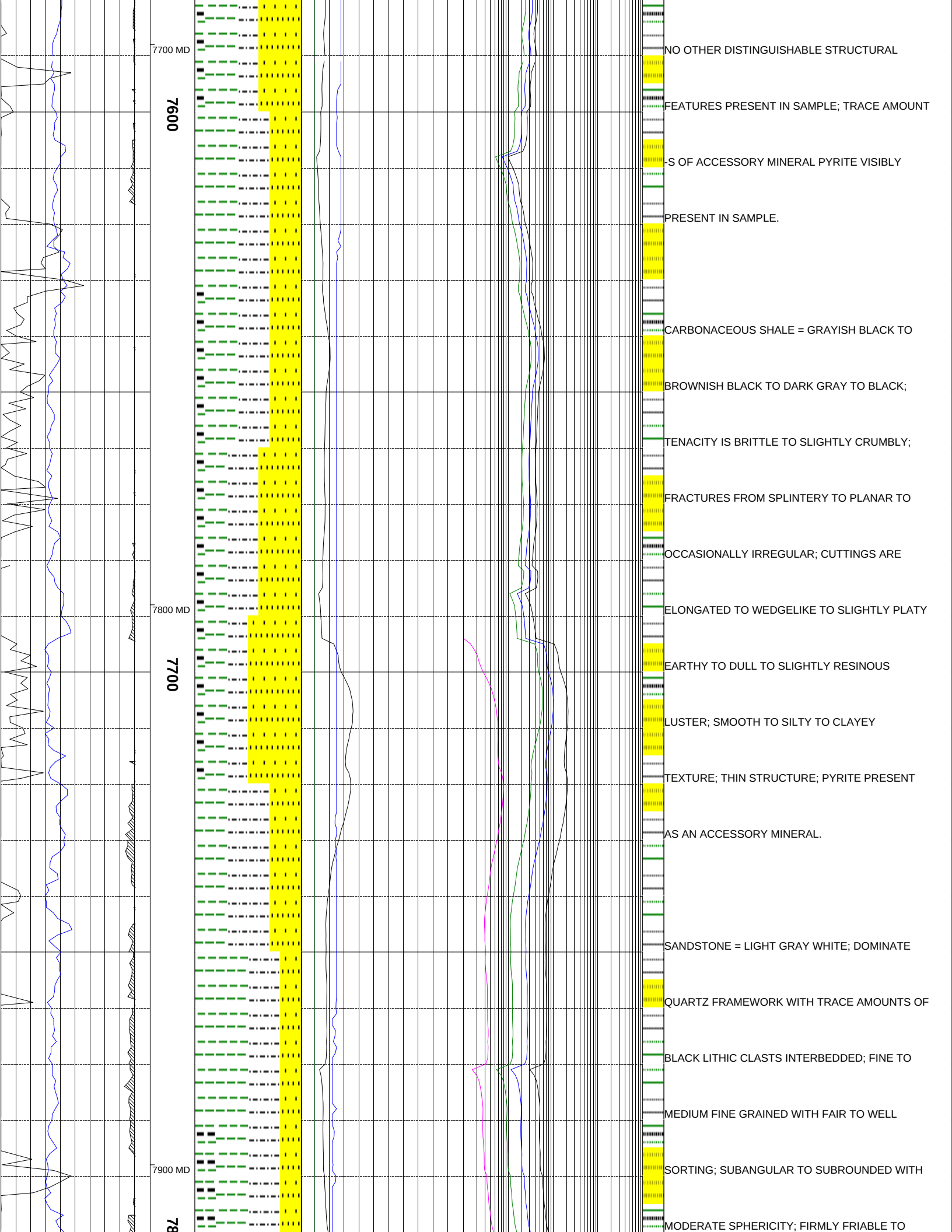
<0 Flare Ht. 100><10
<10
<10
Meth C-1 1000K>
Eth C-2 100K>
Prop C-3 100K>
Butn C-4 100K>
Pent C-5 100K>
6600 MD
6500
6700 MD
6600
6800 MD
6700
OTHER BEDDING OR OTHER DISTINGUISHABLE
STRUCTURAL FEATURES PRESENT; NO ACCESSOR
-Y MINERALS PRESENT IN SAMPLE.
SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY
TO MEDIUM GRAY WITH OCCASIONAL DARK
YELLOWISH ORANGE IN COLOR; MODERATELY
DENSE TO SLIGHLTY CRUMBLY TO OCCASINAL
CRUNCHY TENACITY; IRREGULAR TO SUB-BLOCK
-Y TO SUB-PLANAR TO EARTHY FRACTURE; WED
-GE LIKE TO OCCASIONAL ELONGATED TO OCCA
-SIONAL MASSIVE CUTTINGS HABIT; DULL TO
EARTHY DULL TO OCCASIONAL VERY SLIGHTLY
SEMI-FROSTED TO SEMI-WAXY LUSTER; MODERA
-TELY SMOOTH TO SEMI-CLAYEY TO VERY SLIG
-HTLY SILTY TEXTURE; VERY THIN COAL LAMI
-NAE VISIBLE IN SHALE CUTTING, SHALE VIS
-IBLE INTERBEDDING WITH POOR GRADE SILTS
-TONE CUTTING, POOR GRADE SILTSTONE VISI
-BLE GRADING WITH POOR GRADE SANDSTONE,
NO OTHER DISTINGUISHABLE STRUCTURAL
FEATURES PRESENT IN SAMPLE; TRACE AMOUNT

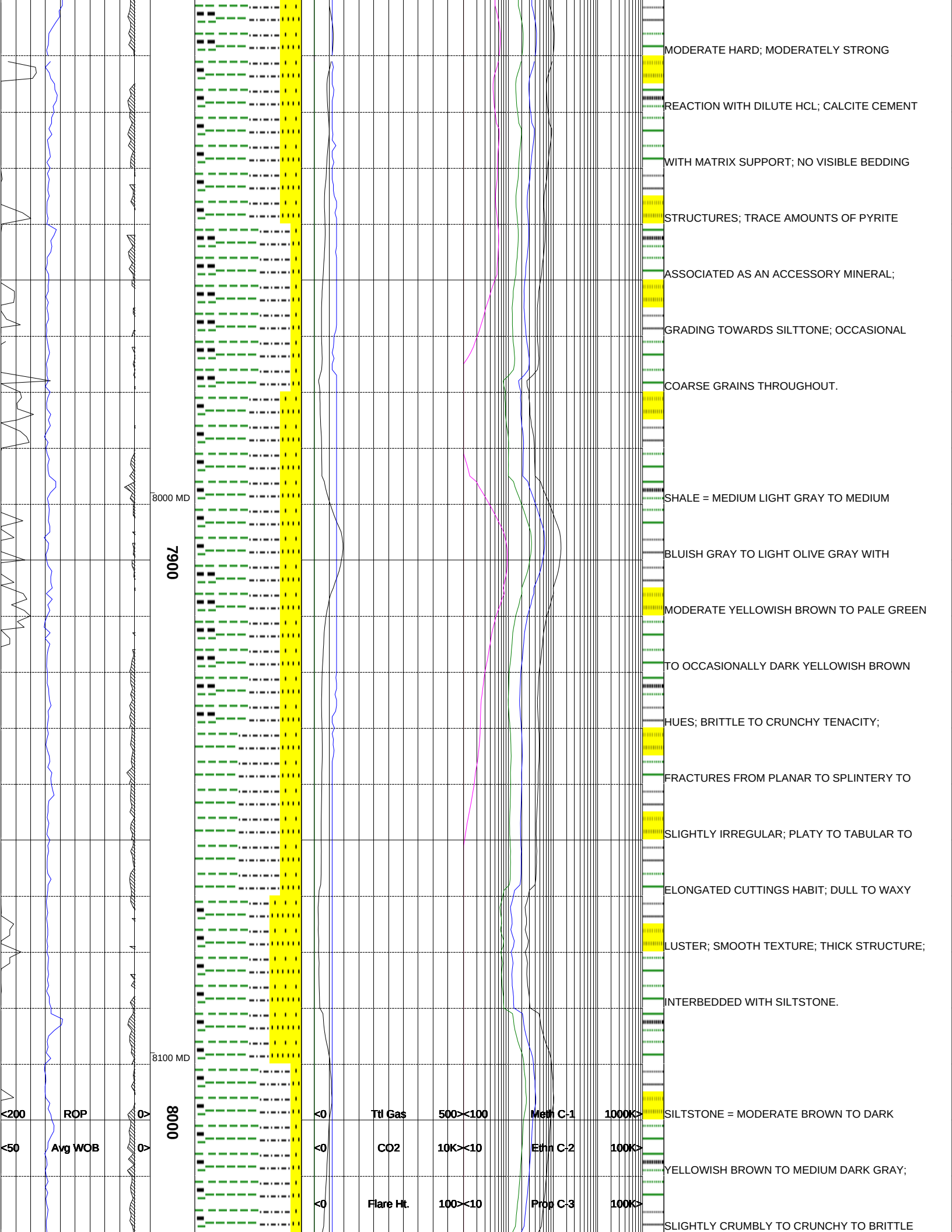

6900 MD
6800
7000 MD
6900
-S OF ACCESSORY MINERAL PYRITE VISIBLY
-PRESENT IN SAMPLE.
CARBONACEOUS SHALE = DARK BROWNISH
GRAY TO BROWNISH BLACK TO OCCASIONAL
OLIVE BLACK IN COLOR; SLIGHTLY DENSE TO
MODERATLEY CRUNCHY TO CRUMBLY TENACITY;
IRREGULAR TO SEMI-PLANAR TO OCCASIONAL
SUB-BLOCKY TO EARTHY-HACKLY FRACTURE;
OCCASIONAL WEDGE LIKE TO MASSIVE TO VERY
SLIGHTLY ELONGATED CUTTINGS HABIT; DULL
TO EARTHY DULL TO OCCASIONAL VERY SLIGHT
-LY SEMI-SPARKLING LUSTER; OCCASIONAL
CLAYEY TO VERY SLIGHTLY GRITTY TEXTURE;
VERY THIN COAL LAMINAE VISIBLE IN POOR
GRADE CARBONACEOUS SHALE CUTTING, POOR
GRADE SILTSTONE VISIBLE GRADING WITH POO
-R GRADE SANDSTONE, VERY SMALL AMOUNT
OF CARBONACESOUS SHALE VISIBLY EFFERVESC
-ING IN SAMPLE, NO OTHER DISTINGUISHABLE
STRUCTURAL FEATURES PRESENT IN SAMPLE;
TRACE AMOUNTS OF ACCESSORY MINERAL


7100 MD
7000
7200 MD
7100
<200 ROP 0>
<50 Avg WOB 0>
<0 Ttl Gas 500><100 Meth C-1 1000K>
<0 CO2 10K><10 Ethn C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Buta C-4 100K>
<10 Pent C-5 100K>
PYRITE PRESENT IN SAMPLE.
SANDSTONE = OFF WHITE TO WHITE TO LIGHT
BROWNISH GRAY TO YELLOWISH GRAY WITH
FEW BLACK AND MODERATE BROWN HUES;
QUARTZ DOMINATE FRAME WORK; QUARTZ
CUTTINGS RANGE FROM SMOKY TO TRANSLUCENT
IN APPEARANCE; PREDONINATELY GRAIN SUPPO
-TED WITH FAIR AMOUNT OF LOOSE GRAINS;
CONSISTS OF CALCITIC CEMENTATION WITH
MODERATE TO MODERATELY HIGH REACTION
TO DILUTE HCL; MATRIC CONTAINS 3 TO 5%
DARK LITHIC FRAGMENTS; MEDIUM-FINE TO
MEDIUM-COARSE GRAINED; FAIR TO MODERATEL
-Y POOR SORTING; SUB-ANGULAR TO ANGULAR
TO SUB-ROUNDED ANGULARITY; LOW TO MODERA
-TE SPHERICITY; POOR GRADE SILTSTONE VIS
-BLE GRADING WITH POOR GRADE SANDSTONE;
POOR GRADE SILTSTONE VISIBLE GRADING
WITH POOR GRADE CARBONACEOUS SHALE
CUTTING, VERY SMALL AMOUNT OF COAL VISIB
-LY EFFERVESCING IN SAMPLE, NO OTHER


7300 MD
7200
7400 MD
7300
DISTINGUISHABLE SURFACE FEATURES PRESENT
IN SAMPLE; NO ACCESSORY MINERALS PRESENT
IN SAMPLE.
SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA
-Y TO LIGHT BROWNISH GRAY WITH OCCASIONA
-L BLACK HUES IN COLOR; MODERATELY DENSE
TO VERY SLIGHTLY CRUMBLY TO CRUNCHY
TENACITY; IRREGULAR TO SUB-PLANAR TO
EARTHY-HACKLY FRACTURE; SUB-TABULAR TO
SUB-NODULAR TO OCCASIONAL SUB-PLATY
CUTTINGS HABIT; DULL TO EARTHY DULL TO
OCCASIONAL VERY SLIGHTLY SEMI-SPARKLING
LUSTER; VERY SLIGHTLY CLAYEY TO VERY
SLIGHLTY GRITTY TEXTURE; POOR GRADE
SILTSTONE VISIBLE GRADING AND BEDDING
WITH POOR GRADE SANDSTONE, VERY SMALL
AMOUNT OF COAL AND CARBONACEOUS SHALE
CUTTINS VISIBLE EFFERVESCING IN SAMPLE,
POOR GRADE SILTSTONE VISIBLE GRADING WIT
-H POOR GRADE CARBONACEOUS SHALE, NO
OTHER DISTINGUISHABLE STRUCTURAL FEATURE


7500 MD
7400
7600 MD
7500
<200 ROP 0>
<50 Avg WOB 0>
<0 Ttl Gas 500><100 Meth C-1 1000K>
<0 CO2 10K><10 Ethn C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Buta C-4 100K>
<10 Pent C-5 100K>
-S PRESENT IN SAMPLE; TRACE AMOUNTS OF
ACCESSORY MINERALS PYRITE VISIBLY IN
CONTACT WITH POOR GRADE SANDSTONE IN
SAMPLE.
SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY
TO OCCASIONAL MEDIUM GRAY IN COLOR; MODE
-RATELY DENSE TO VERY SLIGHTLY CRUMBLY
TO VERY SLIGHTLY CRUNCHY TO SLIGHTLY
BRITTLE TENACITY; IRREGULAR TO SUB-BLOCK
-Y TO SUB-PLANAR TO EARTHY FRACTURE;
OCCASIONAL MASSIVE TO WEDGE LIKE TO
OCCASIONAL ELONGATED CUTTINGS HABIT;
DULL TO EARTHY DULL TO OCCASIONAL SEMI
-FORSTED TO SEMI-WAXY LUSTER; SLIGHTLY
CLAYEY TO MODERATELY SMOOTH TO OCCASIONA
-L SILTY TEXTURE; POOR GRADE SILTSTONE
VISIBLE GRADING WITH POOR GRADE SANDSTON
-E, VERY THIN COAL LAMINAE VISIBLE IN
SHALE AND CARBONACEOUS SHALE CUTTING,
VERY SMALL AMOUNT OF COAL AND CARBONACEO
-S SHALE VISIBLY EFFERVESCING IN SAMPLE,


7700 MD
7600
7800 MD
7700
7900 MD
NO OTHER DISTINGUISHABLE STRUCTURAL
FEATURES PRESENT IN SAMPLE; TRACE AMOUNT
-S OF ACCESSORY MINERAL PYRITE VISIBLY
PRESENT IN SAMPLE.
CARBONACEOUS SHALE = GRAYISH BLACK TO
BROWNISH BLACK TO DARK GRAY TO BLACK;
TENACITY IS BRITTLE TO SLIGHTLY CRUMBLY;
FRACTURES FROM SPLINTERY TO PLANAR TO
OCCASIONALLY IRREGULAR; CUTTINGS ARE
ELONGATED TO WEDGELIKE TO SLIGHTLY PLATY
EARTHY TO DULL TO SLIGHTLY RESINOUS
LUSTER; SMOOTH TO SILTY TO CLAYEY
TEXTURE; THIN STRUCTURE; PYRITE PRESENT
AS AN ACCESSORY MINERAL.
SANDSTONE = LIGHT GRAY WHITE; DOMINATE
QUARTZ FRAMEWORK WITH TRACE AMOUNTS OF
BLACK LITHIC CLASTS INTERBEDDED; FINE TO
MEDIUM FINE GRAINED WITH FAIR TO WELL
SORTING; SUBANGULAR TO SUBROUNDED WITH
MODERATE SPHERICITY; FIRMLY FRIABLE TO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<200
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Avg WOB
0>
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Ttl Gas
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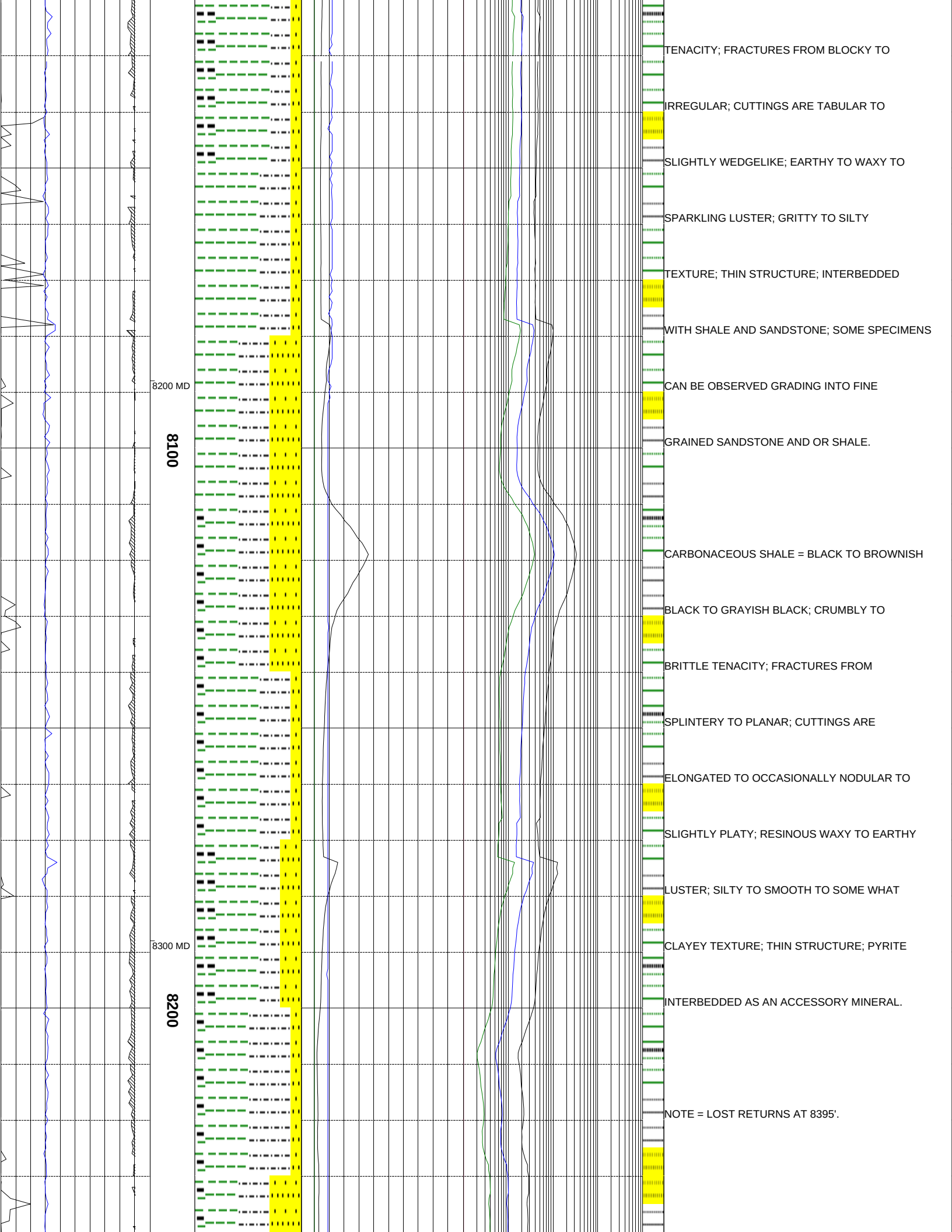
Meth C-1
1000K>
<0
CO2
10K><10
Ethn C-2
100K>
<0
Flare Ht.
100><10
Prop C-3
100K>
MODERATE HARD; MODERATELY STRONG
REACTION WITH DILUTE HCL; CALCITE CEMENT
WITH MATRIX SUPPORT; NO VISIBLE BEDDING
STRUCTURES; TRACE AMOUNTS OF PYRITE
ASSOCIATED AS AN ACCESSORY MINERAL;
GRADING TOWARDS SILTTONE; OCCASIONAL
COARSE GRAINS THROUGHOUT.
SHALE = MEDIUM LIGHT GRAY TO MEDIUM
BLUISH GRAY TO LIGHT OLIVE GRAY WITH
MODERATE YELLOWISH BROWN TO PALE GREEN
TO OCCASIONALLY DARK YELLOWISH BROWN
HUES; BRITTLE TO CRUNCHY TENACITY;
FRACTURES FROM PLANAR TO SPLINTERY TO
SLIGHTLY IRREGULAR; PLATY TO TABULAR TO
ELONGATED CUTTINGS HABIT; DULL TO WAXY
LUSTER; SMOOTH TEXTURE; THICK STRUCTURE;
INTERBEDDED WITH SILTSTONE.
SILTSTONE = MODERATE BROWN TO DARK
YELLOWISH BROWN TO MEDIUM DARK GRAY;
SLIGHTLY CRUMBLY TO CRUNCHY TO BRITTLE



TENACITY; FRACTURES FROM BLOCKY TO

IRREGULAR; CUTTINGS ARE TABULAR TO

SLIGHTLY WEDGELIKE; EARTHY TO WAXY TO

SPARKLING LUSTER; GRITTY TO SILTY

TEXTURE; THIN STRUCTURE; INTERBEDDED

WITH SHALE AND SANDSTONE; SOME SPECIMENS

CAN BE OBSERVED GRADING INTO FINE

GRAINED SANDSTONE AND OR SHALE.

CARBONACEOUS SHALE = BLACK TO BROWNISH

BLACK TO GRAYISH BLACK; CRUMBLY TO

BRITTLE TENACITY; FRACTURES FROM

SPLINTERY TO PLANAR; CUTTINGS ARE

ELONGATED TO OCCASIONALLY NODULAR TO

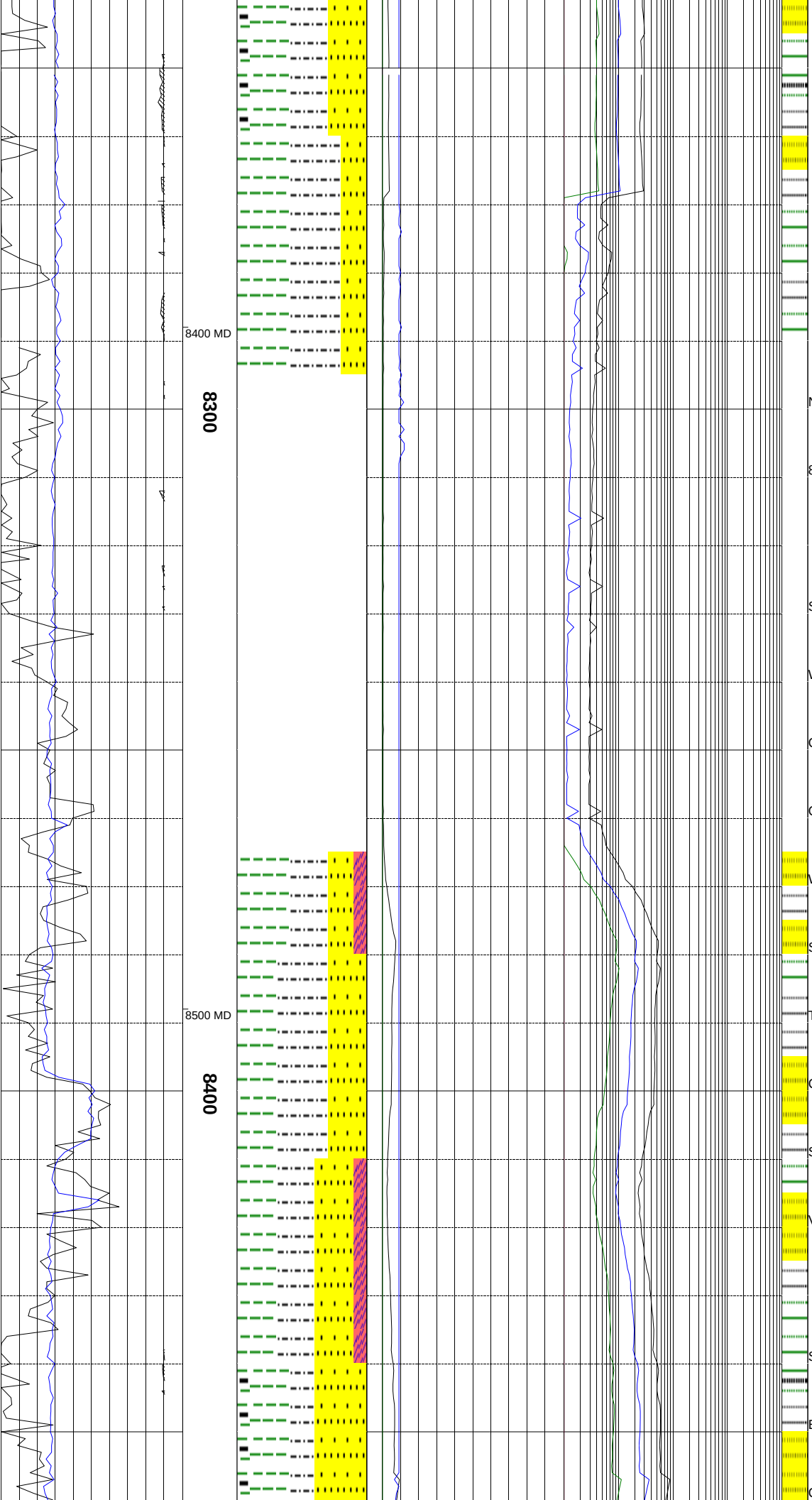
SLIGHTLY PLATY; RESINOUS WAXY TO EARTHY

LUSTER; SILTY TO SMOOTH TO SOME WHAT

CLAYEY TEXTURE; THIN STRUCTURE; PYRITE

INTERBEDDED AS AN ACCESSORY MINERAL.

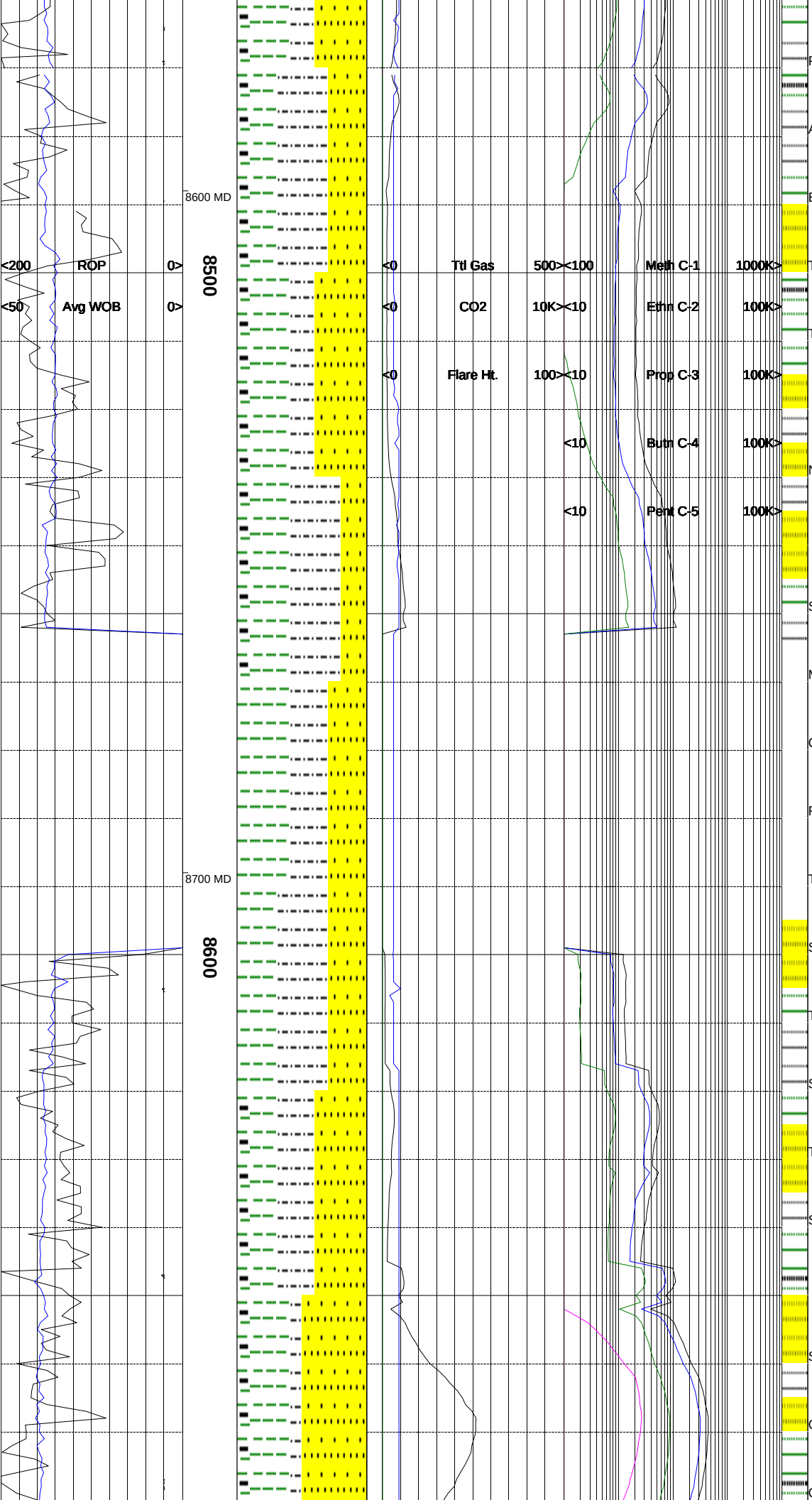
NOTE = LOST RETURNS AT 8395'.



NOTE = STARTED GETTING RETURNS BACK AT 8480'.

SANDSTONE = TRANSLUCENT TO LIGHT GRAY TO WHITE TO LIGHT BROWNISH GRAY WITH AN OCCASIONAL LIGHT GREEN HUE; DOMINATE QUARTZ FRAMEWORK; FINE TO COARSE GRAINED WITH POOR SORTING; ANULAR T OCCASIONALLY SUBANGULAR WITH LOW SPHERICITY; FRIABLE TO FIRMLY FRIABLE TO MODERTE HARD; CALCITE CEMENT WITH MATRIX SUPPORT; STRONG REACTION WITH DILUTE HCL; CALCITE VEINS IN SAMPLE INDICATE FRACTURE FILL.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM BLUISH GRAY TO PALE GREEN; BRITTLE TO CRUNCHY TO SLIGHTLY DENSE TENACITY;



PLANAR TO SPLINTERY FRACTURING; CUTTINGS

ARE PLATY TO SLIGHTLY TABULAR TO

ELONGATED; DULL TO WAXY LUSTER; SMOOTH

TO SEMI CLAYEY TEXTURE; THIN TO SLIGHTLY

THICK STRUCTURE.

NOTE = TOTCO DOWN FROM 8664' TO 8710'.

SILTSTONE = DARK REDDISH BROWN TO

MODERATE OLIVE BROWN TO MEDIUM GRAY;

CRUMBLY TO SLIGHTLY BRITTLE TENACITY;

FRACTURES FROM IRREGULAR TO BLOCKY;

TABULAR TO WEDGELIKE TO OCCASIONALLY

SLIGHTLY NODULAR; CUTTINGS HABIT; EARTHY

TO DULL TO OCCASIONALLY SPARKLING LUSTER

SILTY TO GRITTY TO SLIGHTLY CLAYEY

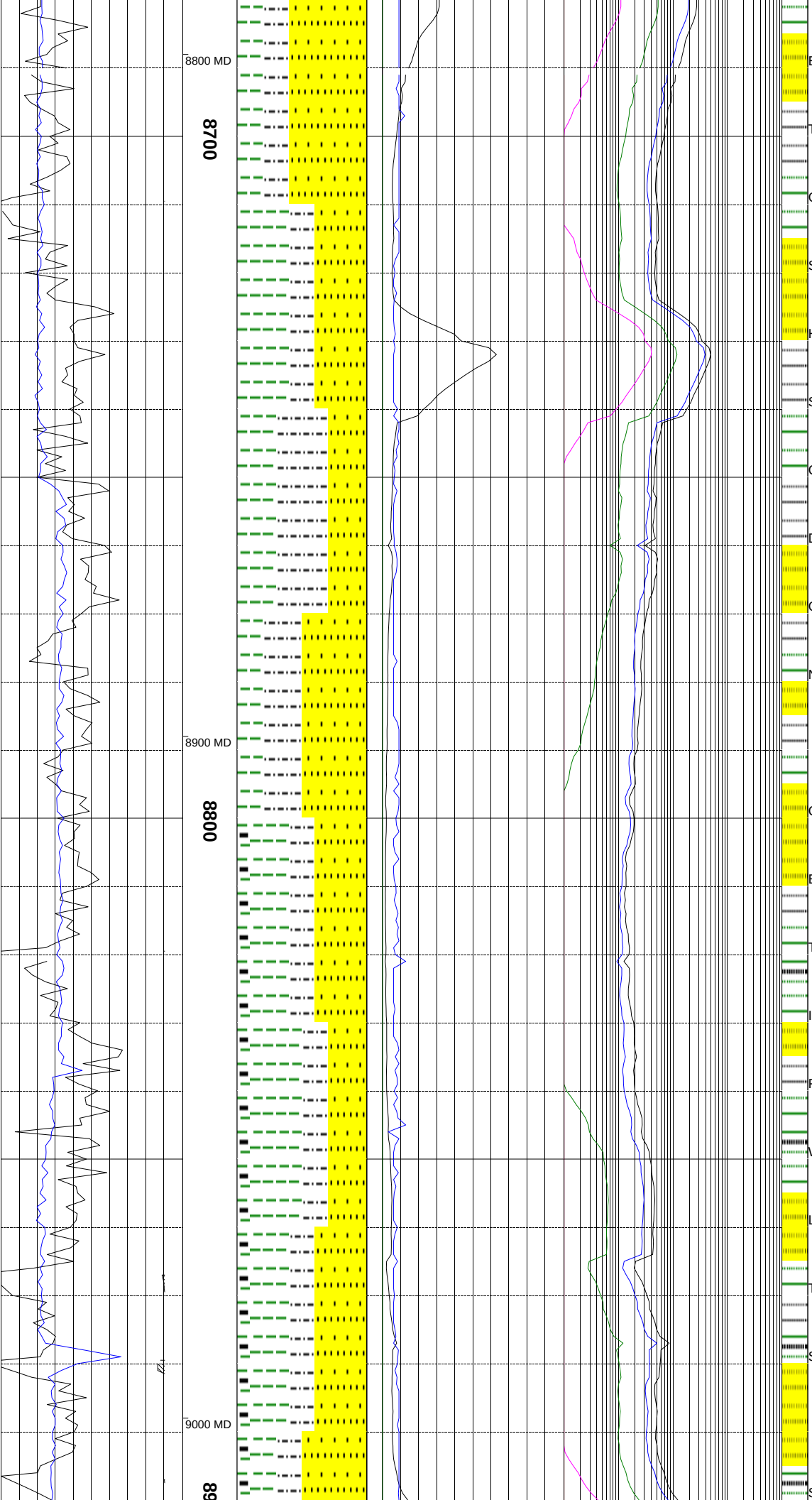
TEXTURE; THIN STRUCTURE; INTERBEDDD WITH

SANDSTONE AND SHALE.

SANDSTONE = MEDIUM DARK GRAY TO LIGHT

GRAY TO TRANSLUCENT TO WHITE; DOMINATE

QUARTZ FRAMEWORK APPROXIMATELY 2%



BLACK LITHIC CLASTS INTERBEDDED; MEDIUM

TO COARSE TO OCCASIONALLY MEDIUM FINE

GRAINED WITH POOR SORTING; ANGULAR TO

SUBANGULAR WITH LOW SPHERICITY; MODERATE

HARD TO OCCASIONALLY FIRMLY FRIABLE;

STRONG REACTION WITH HCL SUGGEST CALCITE

CEMENT; LIGHTER GRAY AND WHITE SPECIMENS

DISPLAY MATRIX SUPPORT; WITH THE DARKER

GRAY SPECIMENS DISPLAYING GRAIN SUPPORT;

NO VISIBLE BEDDING STRUCTURE.

CARBONACEOUS SHALE = BLACK TO BROWNISH

BLACK TO GRAYISH BLACK; SLIGHTLY DENSE

TO BRITTLE TO SLIGHTLY CRUNCHY TENACITY;

IRREGULAR TO SPLINTERY TO SUB BLOCKY

FRACTURING; CUTINGS ARE NODULAR TO

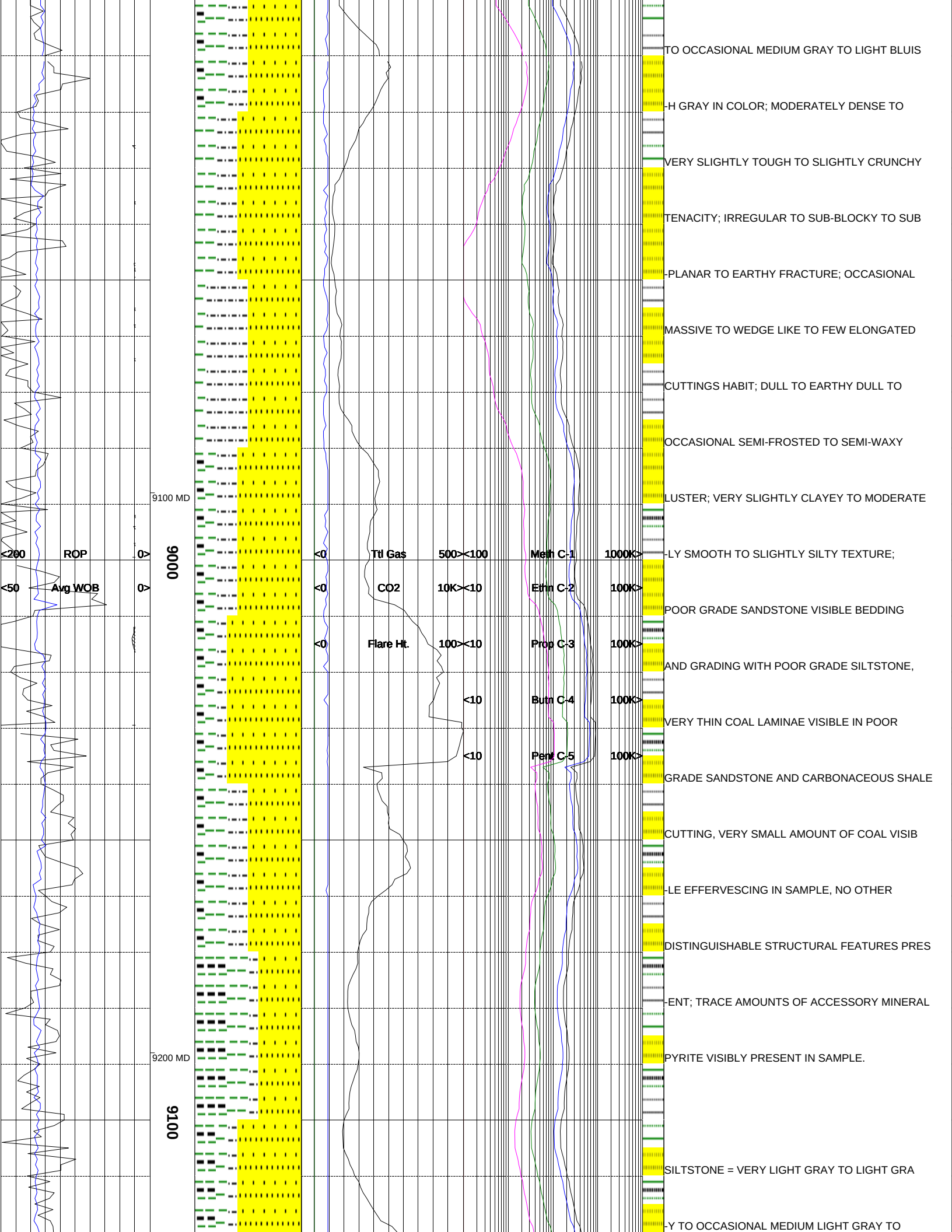
WEDGELIKE; RESINOUS TO SLIGHTLY WAXY

LUSTER; SMOOTH TO CLAYEY TO SILTY

TEXTURE; INTERBEDDED WITH SHALE,

SILTSTONE AND SANDSTONE.

SHALE = LIGHT GRAY TO MEDIUM LIGHT GRAY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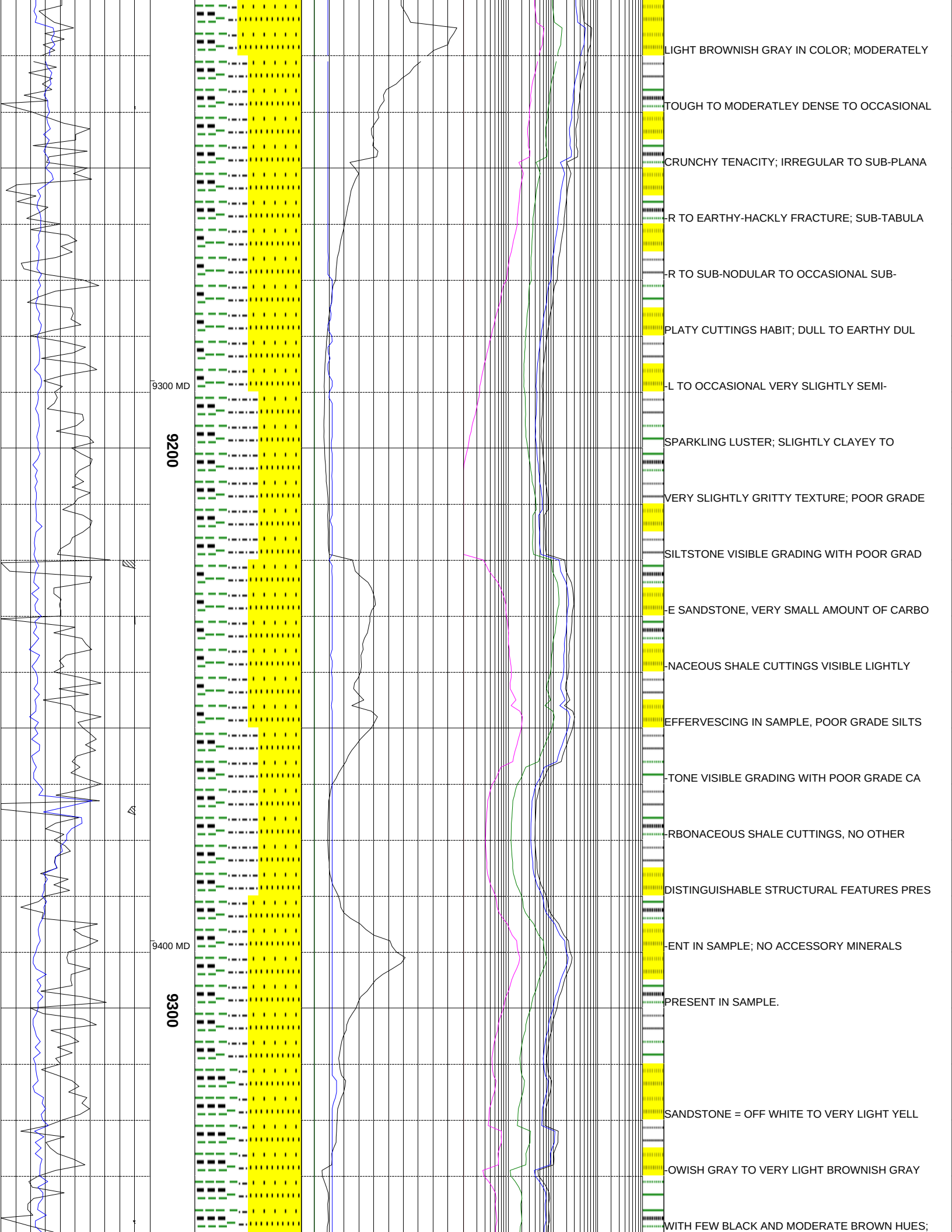
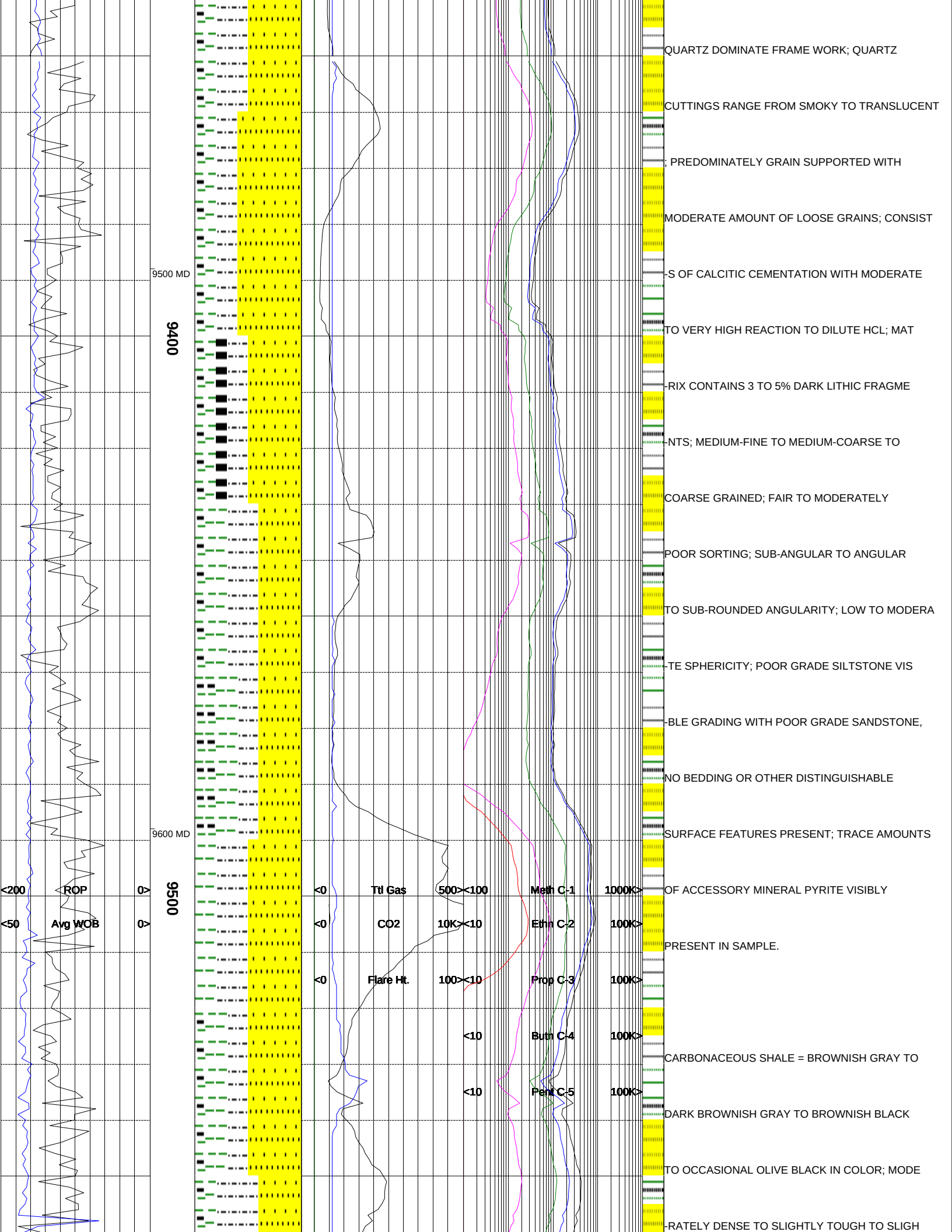
<10 Butn C-4 100K>
<10 Pent C-5 100K>
TO OCCASIONAL MEDIUM GRAY TO LIGHT BLUIS
-H GRAY IN COLOR; MODERATELY DENSE TO
VERY SLIGHTLY TOUGH TO SLIGHTLY CRUNCHY
TENACITY; IRREGULAR TO SUB-BLOCKY TO SUB
-PLANAR TO EARTHY FRACTURE; OCCASIONAL
MASSIVE TO WEDGE LIKE TO FEW ELONGATED
CUTTINGS HABIT; DULL TO EARTHY DULL TO
OCCASIONAL SEMI-FROSTED TO SEMI-WAXY
LUSTER; VERY SLIGHTLY CLAYEY TO MODERATE
-LY SMOOTH TO SLIGHTLY SILTY TEXTURE;
POOR GRADE SANDSTONE VISIBLE BEDDING
AND GRADING WITH POOR GRADE SILTSTONE,
VERY THIN COAL LAMINAE VISIBLE IN POOR
GRADE SANDSTONE AND CARBONACEOUS SHALE
CUTTING, VERY SMALL AMOUNT OF COAL VISIB
-LE EFFERVESCING IN SAMPLE, NO OTHER
DISTINGUISHABLE STRUCTURAL FEATURES PRES
-ENT; TRACE AMOUNTS OF ACCESSORY MINERAL
PYRITE VISIBLY PRESENT IN SAMPLE.
SILTSTONE = VERY LIGHT GRAY TO LIGHT GRA
-Y TO OCCASIONAL MEDIUM LIGHT GRAY TO


9300 MD
9200
9400 MD
9300
LIGHT BROWNISH GRAY IN COLOR; MODERATELY
TOUGH TO MODERATLEY DENSE TO OCCASIONAL
CRUNCHY TENACITY; IRREGULAR TO SUB-PLANA
-R TO EARTHY-HACKLY FRACTURE; SUB-TABULA
-R TO SUB-NODULAR TO OCCASIONAL SUB-
PLATY CUTTINGS HABIT; DULL TO EARTHY DUL
-L TO OCCASIONAL VERY SLIGHTLY SEMI-
SPARKLING LUSTER; SLIGHTLY CLAYEY TO
VERY SLIGHTLY GRITTY TEXTURE; POOR GRADE
SILTSTONE VISIBLE GRADING WITH POOR GRAD
-E SANDSTONE, VERY SMALL AMOUNT OF CARBO
-NACEOUS SHALE CUTTINGS VISIBLE LIGHTLY
EFFERVESCING IN SAMPLE, POOR GRADE SILTS
-TONE VISIBLE GRADING WITH POOR GRADE CA
-RBONACEOUS SHALE CUTTINGS, NO OTHER
DISTINGUISHABLE STRUCTURAL FEATURES PRES
-ENT IN SAMPLE; NO ACCESSORY MINERALS
-PRESENT IN SAMPLE.
SANDSTONE = OFF WHITE TO VERY LIGHT YELL
-OWISH GRAY TO VERY LIGHT BROWNISH GRAY
WITH FEW BLACK AND MODERATE BROWN HUES;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9400
9600 MD
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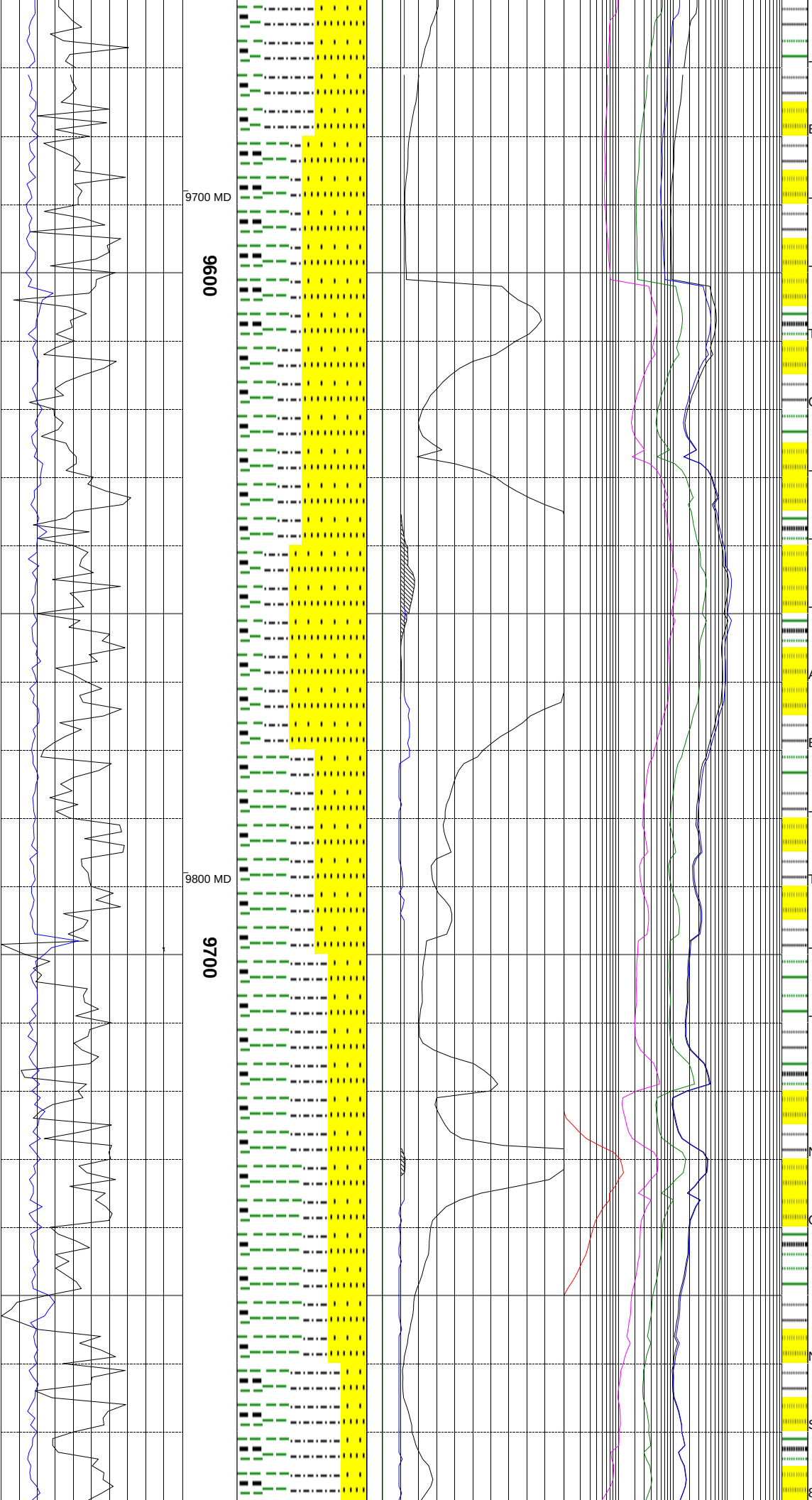
<0 CO2 10K><10 Etha C-2 100K>
<0 Flare Ht. 100><10 Prop C-3 100K>
<10 Buta C-4 100K>
<10 Pent C-5 100K>
QUARTZ DOMINATE FRAME WORK; QUARTZ
CUTTINGS RANGE FROM SMOKY TO TRANSLUCENT
; PREDOMINATELY GRAIN SUPPORTED WITH
MODERATE AMOUNT OF LOOSE GRAINS; CONSIST
-S OF CALCITIC CEMENTATION WITH MODERATE
TO VERY HIGH REACTION TO DILUTE HCL; MAT
-RIX CONTAINS 3 TO 5% DARK LITHIC FRAGME
-NTS; MEDIUM-FINE TO MEDIUM-COARSE TO
COARSE GRAINED; FAIR TO MODERATELY
POOR SORTING; SUB-ANGULAR TO ANGULAR
TO SUB-ROUNDED ANGULARITY; LOW TO MODERA
-TE SPHERICITY; POOR GRADE SILTSTONE VIS
-BLE GRADING WITH POOR GRADE SANDSTONE,
NO BEDDING OR OTHER DISTINGUISHABLE
SURFACE FEATURES PRESENT; TRACE AMOUNTS
OF ACCESSORY MINERAL PYRITE VISIBLY
PRESENT IN SAMPLE.
CARBONACEOUS SHALE = BROWNISH GRAY TO
DARK BROWNISH GRAY TO BROWNISH BLACK
TO OCCASIONAL OLIVE BLACK IN COLOR; MODE
-RATELY DENSE TO SLIGHTLY TOUGH TO SLIGH



-TLY CRUNCHY TENACITY; IRREGULAR TO SUB-

BLOCKY TO EARTHY-HACKLY FRACTURE; OCCASI

-ONAL MASSIVE TO WEDGE LIKE TO SUB-TABUL

-AR TO SUB-NODULAR CUTTINGS HABIT; DULL

TO EARTHY DULL TO SLIGHTLY GREASY TO

OCCASIONAL SEMI-SPARKLING LUSTER; SLIGHT

-LY CLAYEY TO VERY SLIGHTLY GRITTY TEXTU

-RE; POOR GRADE SILTSTONE VISIBLE GRADIN

-G WITH POOR GRADE SANDSTONE, VERY SMALL

AMOUNT OF CARBONACEOUS SHALE VISIBLE

EFFERVESCING IN SAMPLE, NO OTHER DISTING

-UISHABLE STRUCTURAL FEATURES PRESENT;

TRACE AMOUNTS OF ACCESSORY MINERAL PYRIT

-E VISIBLY PRESENT IN CONTACT WITH CARON

-ACEOUS SHALE CUTTING IN SAMPLE.

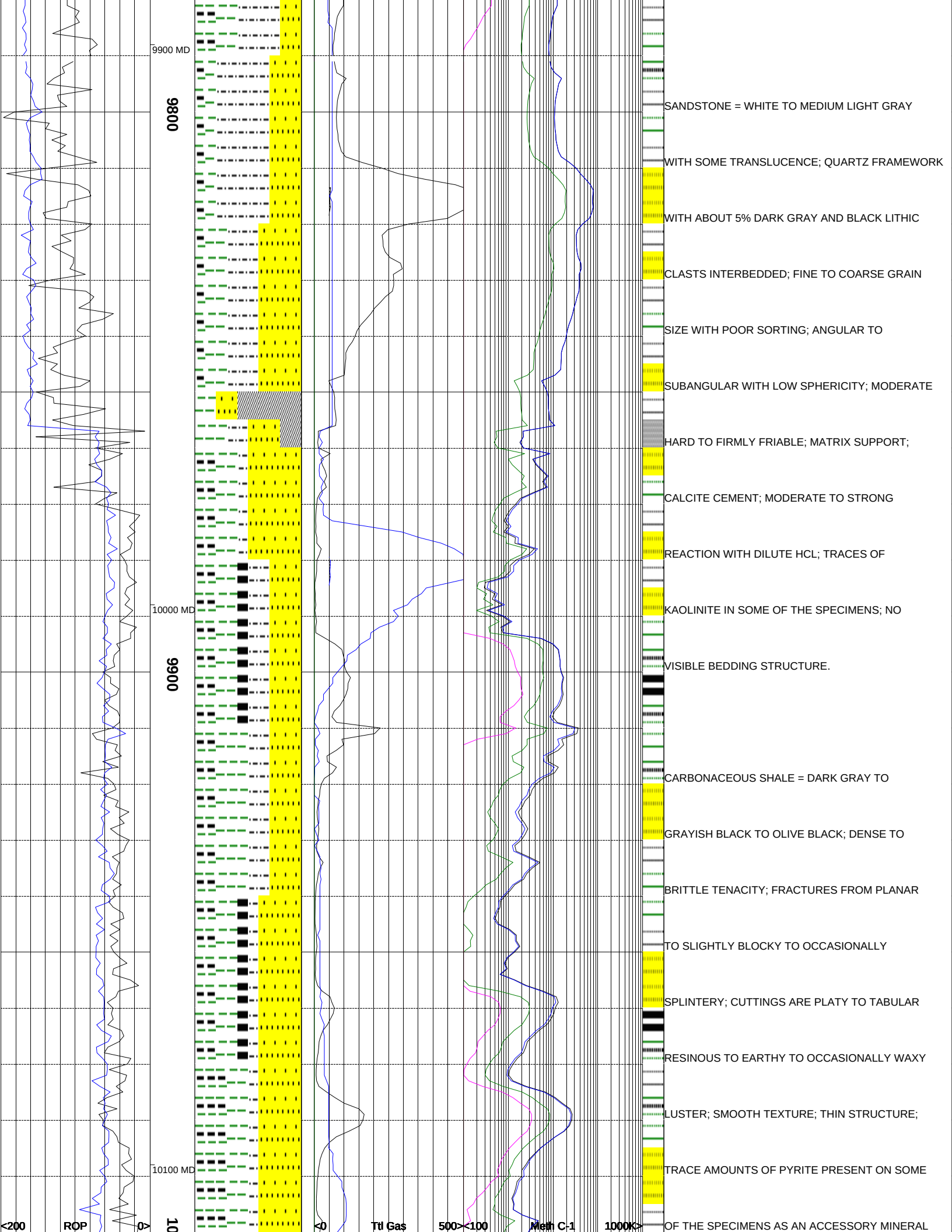
NOTE = DRILLED INTERMEDIATE TD @ 9967'

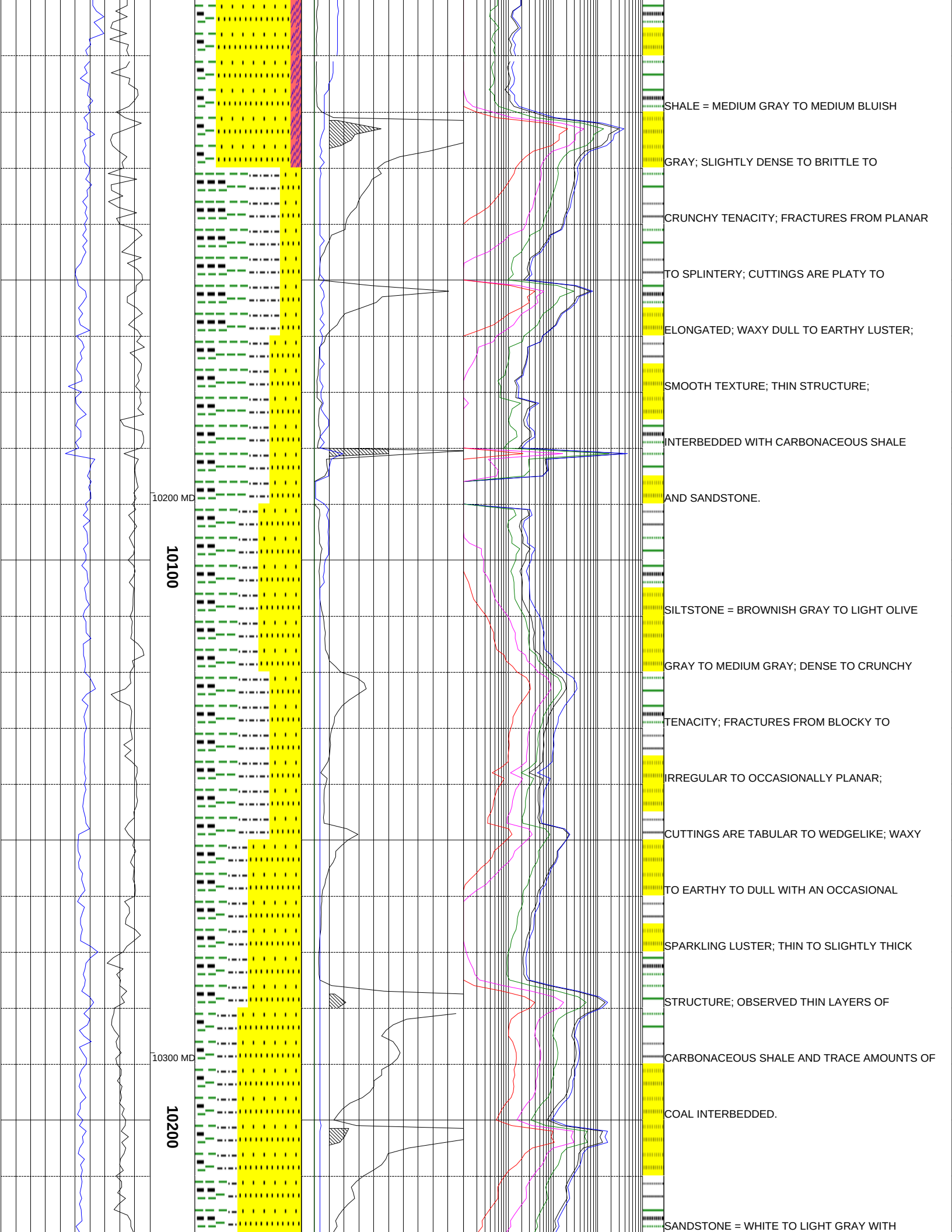
ON 11/14/2010

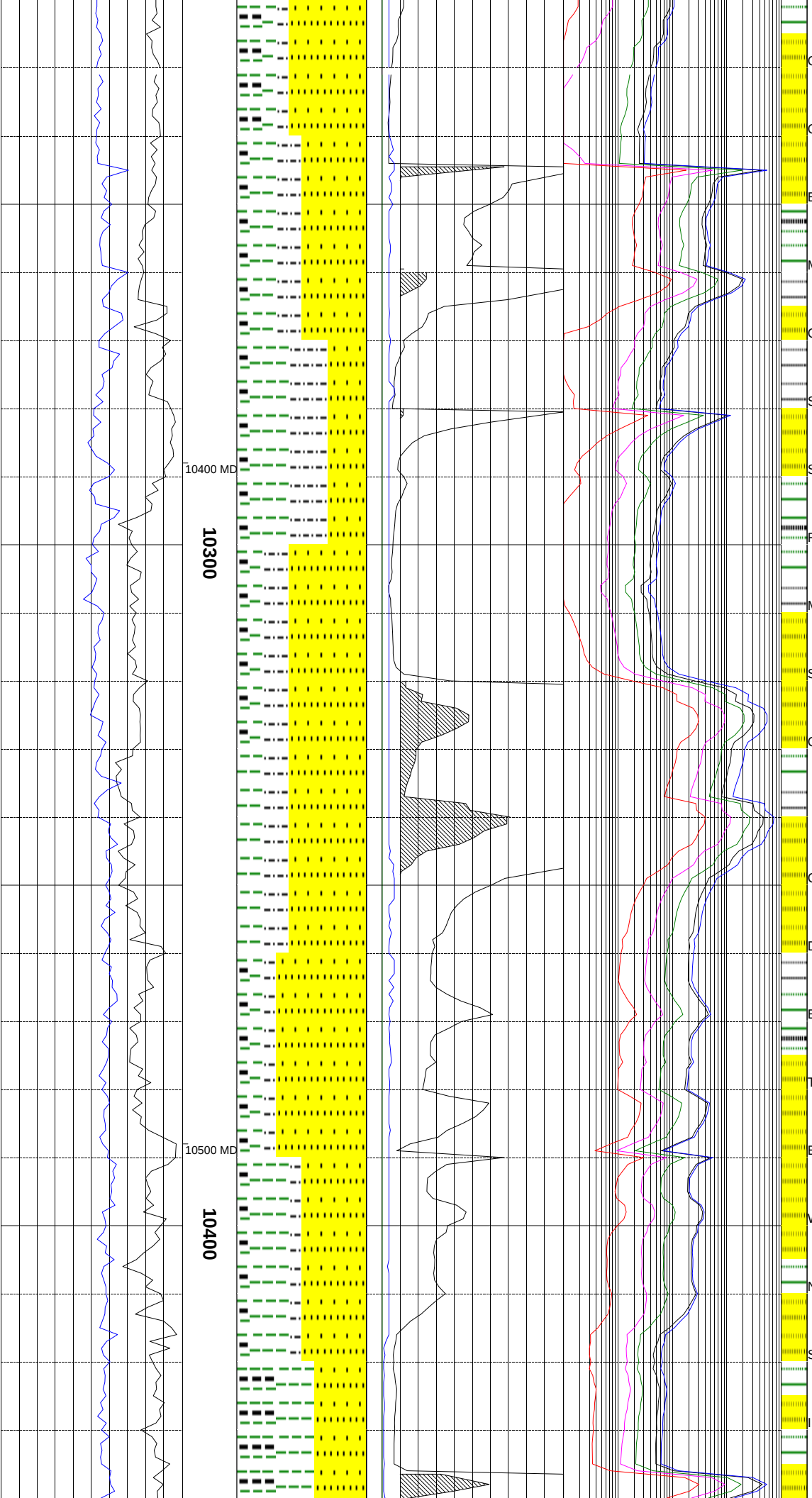
NOTE = STARTED DRILLING THE PRODUCTION

SECTION ON 11/22/2010 AT APPROXIMATELY

8:00 AM.


9900 MD
9800
10000 MD
9900
10100 MD
<200
ROP
0>
<0
Ttl Gas
500><100
Meth C-1
1000K>
SANDSTONE = WHITE TO MEDIUM LIGHT GRAY
WITH SOME TRANSLUCENCE; QUARTZ FRAMEWORK
WITH ABOUT 5% DARK GRAY AND BLACK LITHIC
CLASTS INTERBEDDED; FINE TO COARSE GRAIN
SIZE WITH POOR SORTING; ANGULAR TO
SUBANGULAR WITH LOW SPHERICITY; MODERATE
HARD TO FIRMLY FRIABLE; MATRIX SUPPORT;
CALCITE CEMENT; MODERATE TO STRONG
REACTION WITH DILUTE HCL; TRACES OF
KAOLINITE IN SOME OF THE SPECIMENS; NO
VISIBLE BEDDING STRUCTURE.
CARBONACEOUS SHALE = DARK GRAY TO
GRAYISH BLACK TO OLIVE BLACK; DENSE TO
BRITTLE TENACITY; FRACTURES FROM PLANAR
TO SLIGHTLY BLOCKY TO OCCASIONALLY
SPLINTERY; CUTTINGS ARE PLATY TO TABULAR
RESINOUS TO EARTHY TO OCCASIONALLY WAXY
LUSTER; SMOOTH TEXTURE; THIN STRUCTURE;
TRACE AMOUNTS OF PYRITE PRESENT ON SOME
OF THE SPECIMENS AS AN ACCESSORY MINERAL


10200 MD
10100
10300 MD
10200
SHALE = MEDIUM GRAY TO MEDIUM BLUISH
GRAY; SLIGHTLY DENSE TO BRITTLE TO
CRUNCHY TENACITY; FRACTURES FROM PLANAR
TO SPLINTERY; CUTTINGS ARE PLATY TO
ELONGATED; WAXY DULL TO EARTHY LUSTER;
SMOOTH TEXTURE; THIN STRUCTURE;
INTERBEDDED WITH CARBONACEOUS SHALE
AND SANDSTONE.
SILTSTONE = BROWNISH GRAY TO LIGHT OLIVE
GRAY TO MEDIUM GRAY; DENSE TO CRUNCHY
TENACITY; FRACTURES FROM BLOCKY TO
IRREGULAR TO OCCASIONALLY PLANAR;
CUTTINGS ARE TABULAR TO WEDGELIKE; WAXY
TO EARTHY TO DULL WITH AN OCCASIONAL
SPARKLING LUSTER; THIN TO SLIGHTLY THICK
STRUCTURE; OBSERVED THIN LAYERS OF
CARBONACEOUS SHALE AND TRACE AMOUNTS OF
COAL INTERBEDDED.
SANDSTONE = WHITE TO LIGHT GRAY WITH



OCCASIONAL TRANSLUCENT GRAINS; DOMINATE

QUARTZ FRAMEWORK WITH APPROXIMATELY 10%

BLACK LITHIC CLASTS INTERBEDDED; FINE TO

MEDIUM GRAINED WITH OCCASIONAL COARSE

GRAINS; FAIR TO SEMI WELL SORTED;

SUBROUND TO SUBANGULAR WITH MODERATE

SPHERICITY; MODERATE HARD TO FIRMLY

FRIABLE TO OCCASIONALLY EASILY FRIABLE;

MATRIX SUPPORT WITH CALCITE CEMENT;

STRONG REACTION WITH HCL; INTERBEDDED

CARBONACEOUS SHALE AND SILTSTONE.

CARBONACEOUS SHALE = BLACK TO A VERY

DARK GRAY COLOR; TOUGH TO DENSE TO

BRITTLE TENACITY; IRREGULAR TO BLOCKY

TO WEDGELIKE TO BLADED CUTTINGS HABIT;

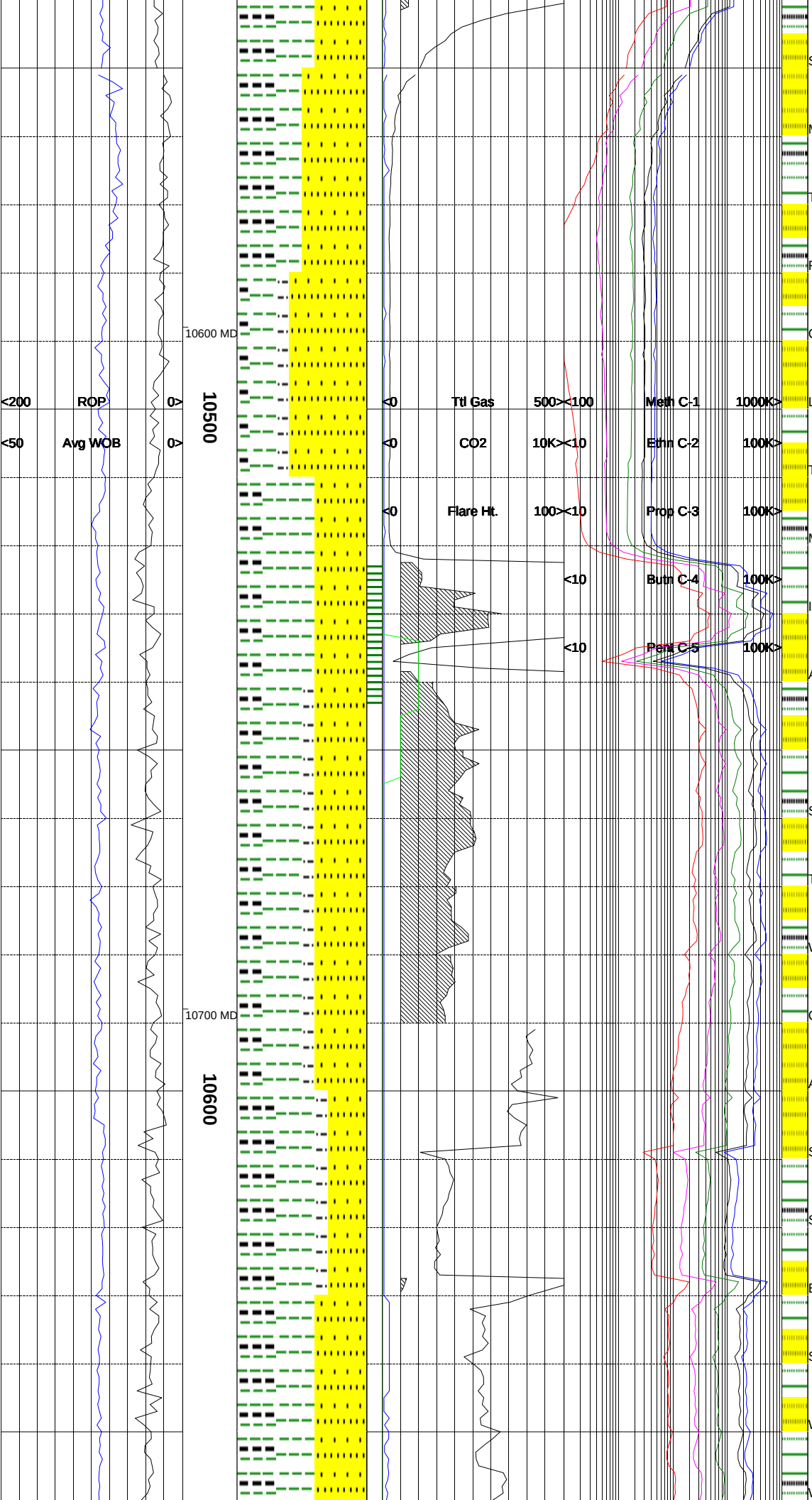
EARTHY TO DULL TO OCCASIONALLY GREASY TO

WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE;

NO VISIBLE STRUCTURE PRESENT IN THE

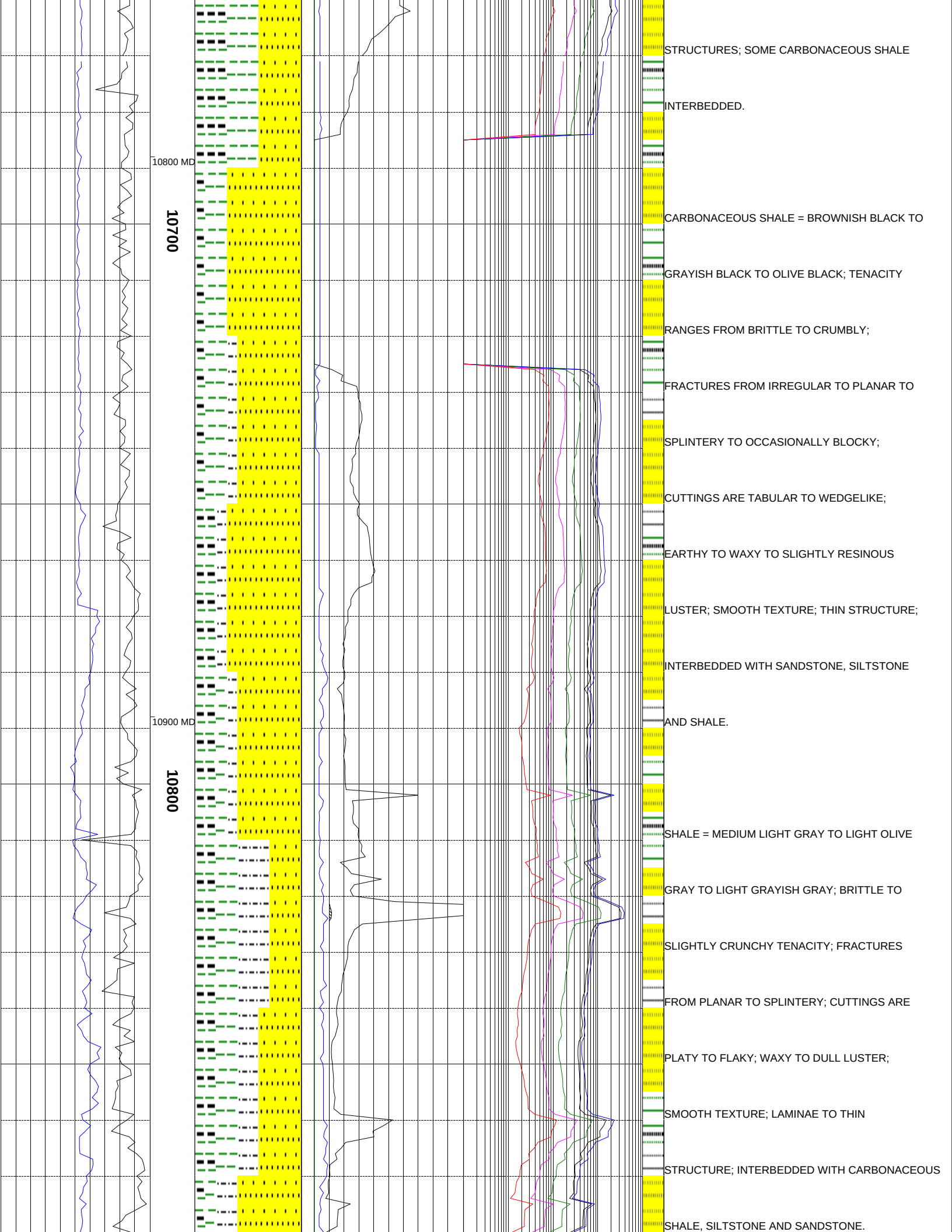
SAMPLE; NO ACCESSORY MINERALS VISIBLE

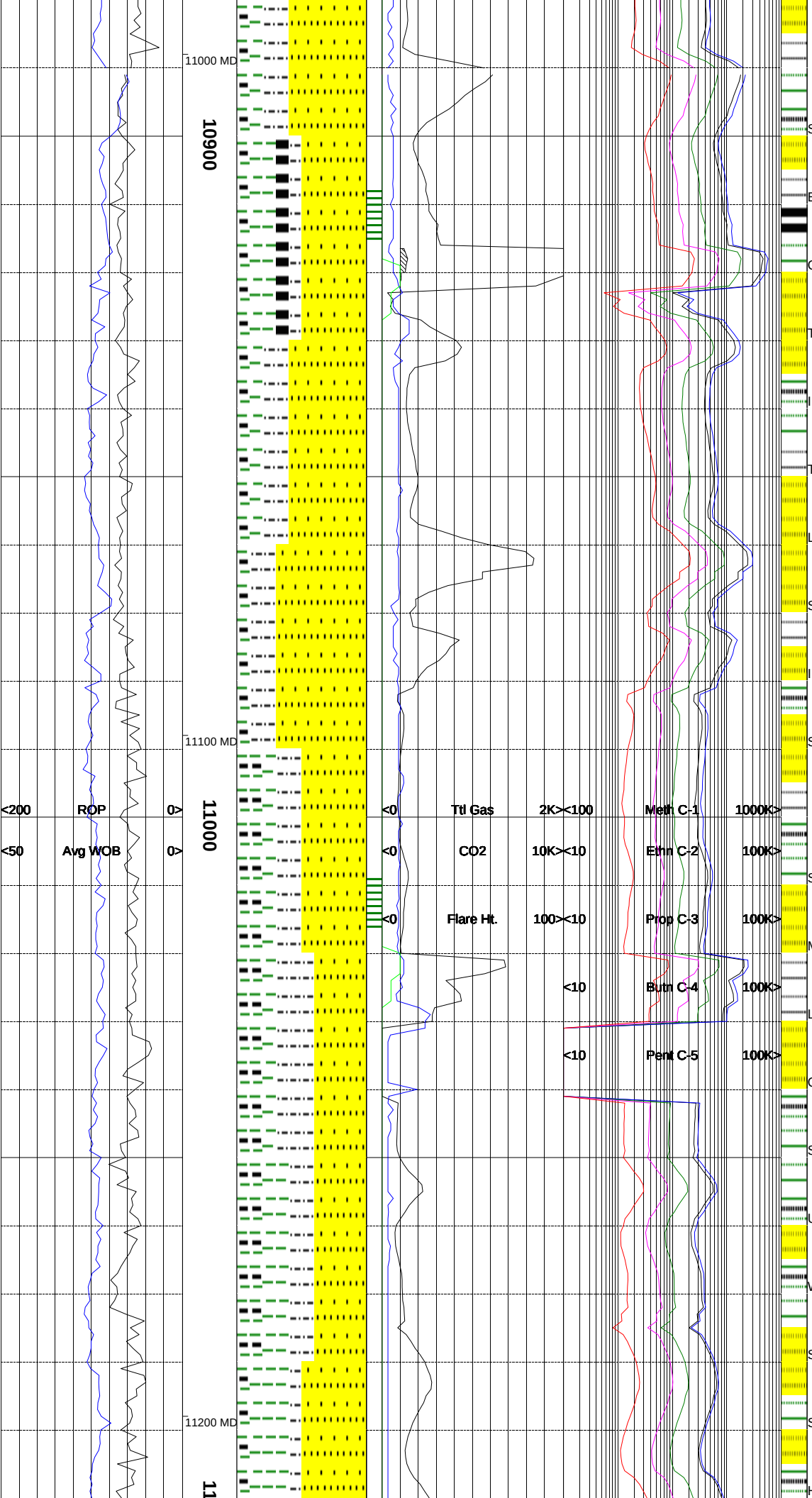
IN THE SAMPLE.



SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO MODERATELY DARK GRAY; BRITTLE TO CRUMBLY TO CRUNCHY TENACITY; BLOCKY TO PLANAR FRACTURE; TABULAR TO WEDGELIKE TO PLATY CUTTINGS HABIT; DULL TO EARTHY TO WAXY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN TO LAMINAE STRUCTURE; NO ACCESSORY MINERAL VISIBLE IN THE SAMPLE; SAMPLE INTERBEDDED WITH CARBONACEOUS SHALE AND SANDSTONE.

SANDSTONE = WHITE TO VERY LIGHT GRAY TO TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK WITH TRACE CALCITE AMOUNTS; FINE TO COARSE GRAINED WITH POOR SORTING; ANGULAR TO SUBANGULAR WITH LOW SPHERICITY; GRAINS DISPLAY FROSTED SURFACE FEATURES; FIRMLY FRIABLE TO EASILY FRIABLE; ABUNDANT LOOSE GRAINS IN SAMPLE; KAOLINITIC AND CALCAREOUS CEMENT WITH MATRIX SUPPORT; STRONG REACTION WITH DILUTE HCL; NO VISIBLE BEDDING


10800 MD
10700
10900 MD
10800
STRUCTURES; SOME CARBONACEOUS SHALE
INTERBEDDED.
CARBONACEOUS SHALE = BROWNISH BLACK TO
GRAYISH BLACK TO OLIVE BLACK; TENACITY
RANGES FROM BRITTLE TO CRUMBLY;
FRACTURES FROM IRREGULAR TO PLANAR TO
SPLINTERY TO OCCASIONALLY BLOCKY;
CUTTINGS ARE TABULAR TO WEDGELIKE;
EARTHY TO WAXY TO SLIGHTLY RESINOUS
LUSTER; SMOOTH TEXTURE; THIN STRUCTURE;
INTERBEDDED WITH SANDSTONE, SILTSTONE
AND SHALE.
SHALE = MEDIUM LIGHT GRAY TO LIGHT OLIVE
GRAY TO LIGHT GRAYISH GRAY; BRITTLE TO
SLIGHTLY CRUNCHY TENACITY; FRACTURES
FROM PLANAR TO SPLINTERY; CUTTINGS ARE
PLATY TO FLAKY; WAXY TO DULL LUSTER;
SMOOTH TEXTURE; LAMINAE TO THIN
STRUCTURE; INTERBEDDED WITH CARBONACEOUS
SHALE, SILTSTONE AND SANDSTONE.



SILTSTONE = BROWNISH GRAY TO LIGHT

BROWNISH GRAY TO LIGHT GRAY TO

OCCASIONALLY GRAYISH RED PURPLE; DENSE

TO SLIGHTLY BRITTLE TENACITY; BLOCKY TO

IRREGULAR FRACTURING; CUTTINGS ARE

TABULAR TO WEDGELIKE; EARTHY TO DULL

LUSTER; SILTY TO GRITTY TEXTURE; THIN

STRUCTURE; TRACE AMOUNTS OF COAL

INTERBEDDED; INTERBEDDED WITH SANDSTONE

SHALE AND CARBONACEOUS SHALE.

SANDSTONE = WHITE TO LIGHT GRAY TO A

MEDIUM LIGHT GRAY TO MEDIUM DARK GRAY

LIGHT OLIVE GRAY TO BROWNISH GRAY COLOR;

QUARTZ FRAMEWORK WITH A FEW SAMPLES

SHOWING HIGHER % OF K-SPAR AN OTHERS;

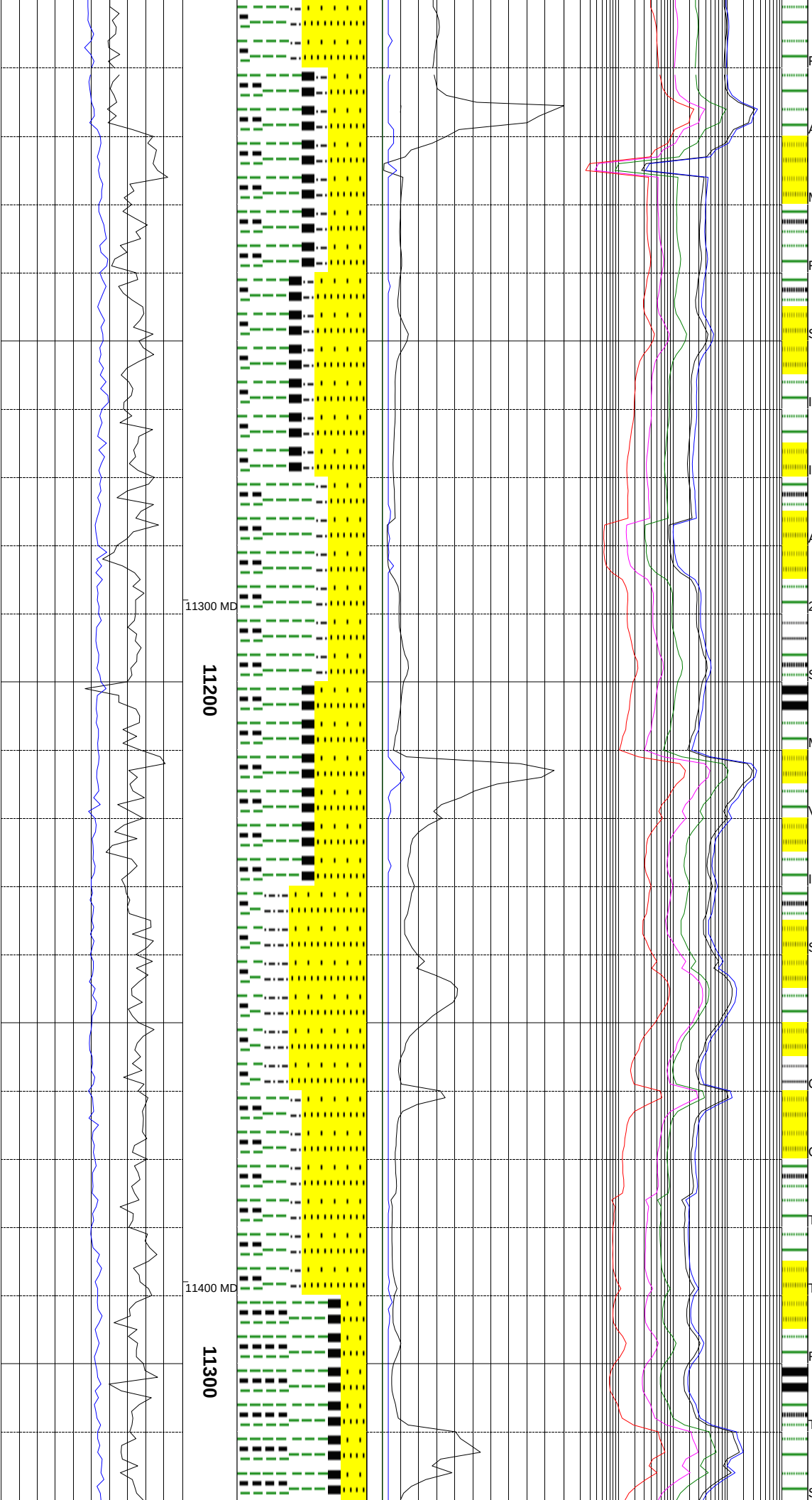
UPPER FINE TO LOWER MEDIUM GRAIN SIZE;

WELL TO FAIR SORTING WITH SOME SAMPLES

SHOWING FAIR TO SLIGHTLY POOR SORTING;

SUBANGULAR TO SUBROUND ANGULARITY;

HIGH TO MODERATE SPHERICITY; SURFACE



FEATURES OF GRAINS INCLUDE POLISHING

AND FROSTING OF GRAINS POSSIBLY DUE TO

MECHANICAL ABRASION; EASILY FRIABLE TO

FRIABLE TO FIRMLY FRIABLE WITH SOME

SAMPLES BEING MODERATELY HARD; SAMPLE

IS REACTIVE WITH A 10% SOLUTION OF HCL

INDICATING CALCITE CEMENTATION; SAMPLES

ARE GRAIN SUPPORTED AND INCLUDE 10% TO

20% LITHIC FRAGMENTS; SOME BEDDING

SURFACES VISIBLE IN A VERY FEW SAMPLES;

MANY LOOSE GRAINS IN THE SAMPLE AND NO

VISIBLE ACCESSORY MINERAL PRESENT;

INTERBEDDED WITH CARBONACEOUS SHALE,

SHALE AND SOME SILTSTONE.

COAL = BLACK IN COLOR; VERY BRITTLE TO

CRUMBLY TENACITY; IRREGULAR TO BLOCKY

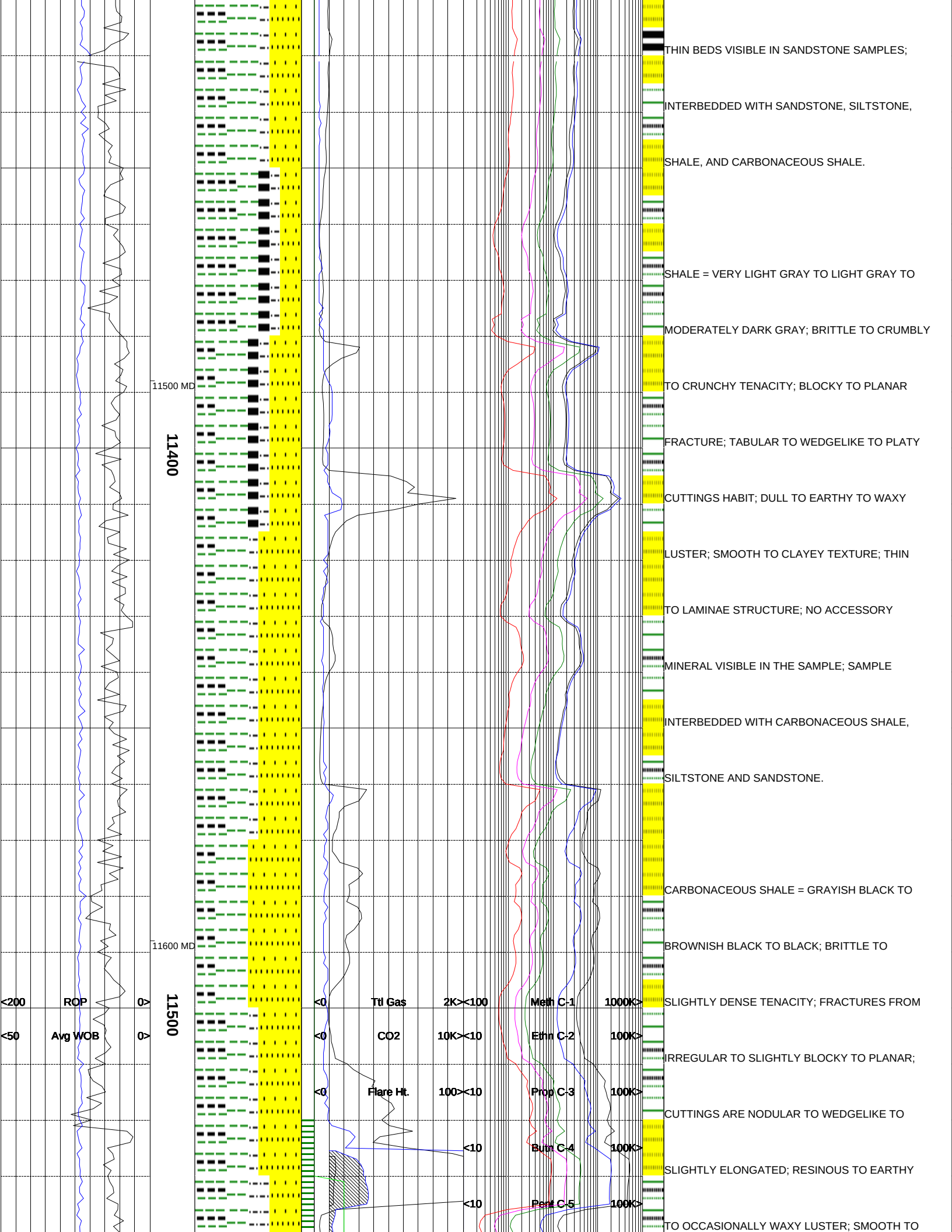
TO SPLINTERY FRACTURE; MASSIVE TO FLAKY

TO BLADED CUTTINGS HABIT; GREASY TO

RESINOUS LUSTER; SMOOTH TO CLAYEY

TEXTURE; VISIBLE EFFERVESCING IN THE

SAMPLE; THIN TO LAMINAE STRUCTURE;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11600 MD
11500
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Avg WOB
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Ttl Gas
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Meth C-1
1000K>
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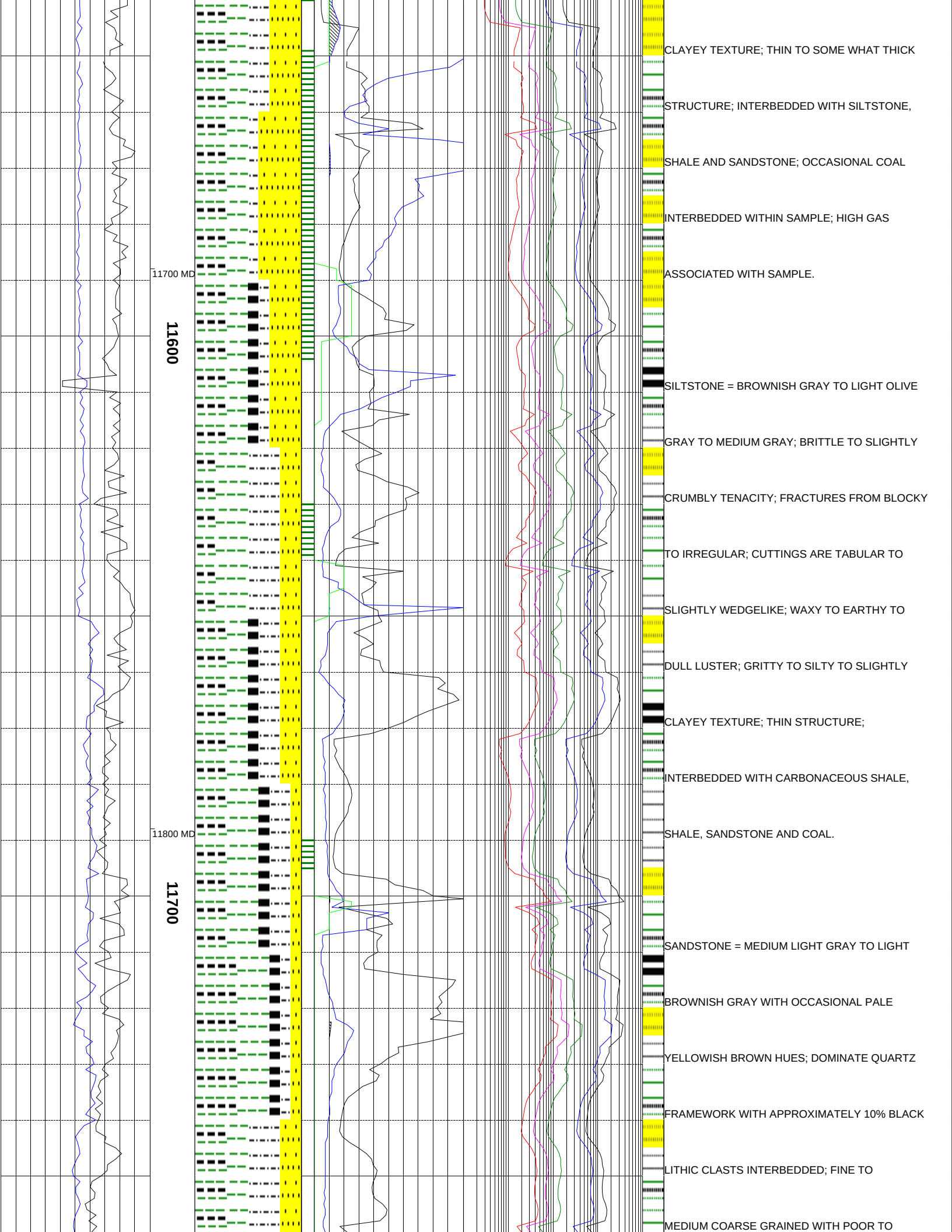
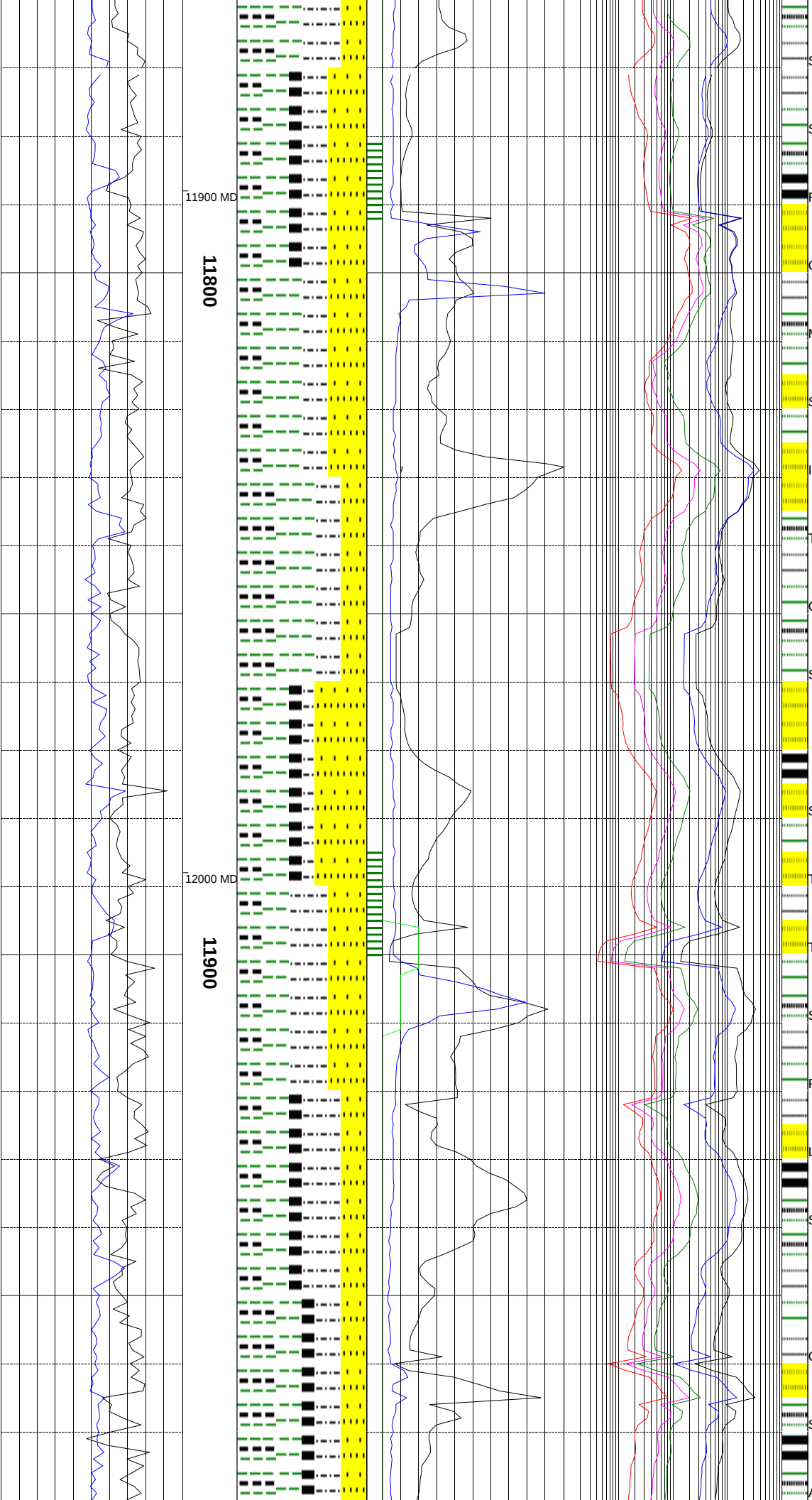
CO2
10K><10
Eth C-2
100K>
<0
Flare Ht.
100><10
Prop C-3
100K>
<10
Buta C-4
100K>
<10
Pent C-5
100K>
THIN BEDS VISIBLE IN SANDSTONE SAMPLES;
INTERBEDDED WITH SANDSTONE, SILTSTONE,
SHALE, AND CARBONACEOUS SHALE.
SHALE = VERY LIGHT GRAY TO LIGHT GRAY TO
MODERATELY DARK GRAY; BRITTLE TO CRUMBLY
TO CRUNCHY TENACITY; BLOCKY TO PLANAR
FRACTURE; TABULAR TO WEDGELIKE TO PLATY
CUTTINGS HABIT; DULL TO EARTHY TO WAXY
LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN
TO LAMINAE STRUCTURE; NO ACCESSORY
MINERAL VISIBLE IN THE SAMPLE; SAMPLE
INTERBEDDED WITH CARBONACEOUS SHALE,
SILTSTONE AND SANDSTONE.
CARBONACEOUS SHALE = GRAYISH BLACK TO
BROWNISH BLACK TO BLACK; BRITTLE TO
SLIGHTLY DENSE TENACITY; FRACTURES FROM
IRREGULAR TO SLIGHTLY BLOCKY TO PLANAR;
CUTTINGS ARE NODULAR TO WEDGELIKE TO
SLIGHTLY ELONGATED; RESINOUS TO EARTHY
TO OCCASIONALLY WAXY LUSTER; SMOOTH TO


11700 MD
11600
11800 MD
11700
CLAYEY TEXTURE; THIN TO SOME WHAT THICK
STRUCTURE; INTERBEDDED WITH SILTSTONE,
SHALE AND SANDSTONE; OCCASIONAL COAL
INTERBEDDED WITHIN SAMPLE; HIGH GAS
ASSOCIATED WITH SAMPLE.
SILTSTONE = BROWNISH GRAY TO LIGHT OLIVE
GRAY TO MEDIUM GRAY; BRITTLE TO SLIGHTLY
CRUMBLY TENACITY; FRACTURES FROM BLOCKY
TO IRREGULAR; CUTTINGS ARE TABULAR TO
SLIGHTLY WEDGELIKE; WAXY TO EARTHY TO
DULL LUSTER; GRITTY TO SILTY TO SLIGHTLY
CLAYEY TEXTURE; THIN STRUCTURE;
INTERBEDDED WITH CARBONACEOUS SHALE,
SHALE, SANDSTONE AND COAL.
SANDSTONE = MEDIUM LIGHT GRAY TO LIGHT
BROWNISH GRAY WITH OCCASIONAL PALE
YELLOWISH BROWN HUES; DOMINATE QUARTZ
FRAMEWORK WITH APPROXIMATELY 10% BLACK
LITHIC CLASTS INTERBEDDED; FINE TO
MEDIUM COARSE GRAINED WITH POOR TO



SLIGHTLY FAIR SORTING; ANGULAR TO

SUBANGULAR WITH LOW SPHERICITY; FIRMLY

FRIABLE TO FRIABLE WITH FREQUENT LOOSE

GRAINS IN SAMPLE; MATRIX SUPPORT;

MODERATE TO LOW REACTION WITH HCL

SUGGESTS CALCAREOUS / SILICEOUS CEMENT;

INTERBEDDED WITH SILTSTONE; OCCASIONAL

THIN SEAMS OF CARBONACEOUS SHALE AND

COAL CAN BE OBSERVED IN A FEW OF THE

SPECIMENS.

SHALE = MEDIUM LIGHT GRAY TO MEDIUM GRAY

TO LIGHT BLUISH GRAY; DENSE TO BRITTLE

TENACITY; FRACTURES FROM PLANAR TO

SPLINTERY; CUTTINGS ARE ELONGATED TO

PLATY TO SLIGHTLY FLAKY; WAXY TO DULL

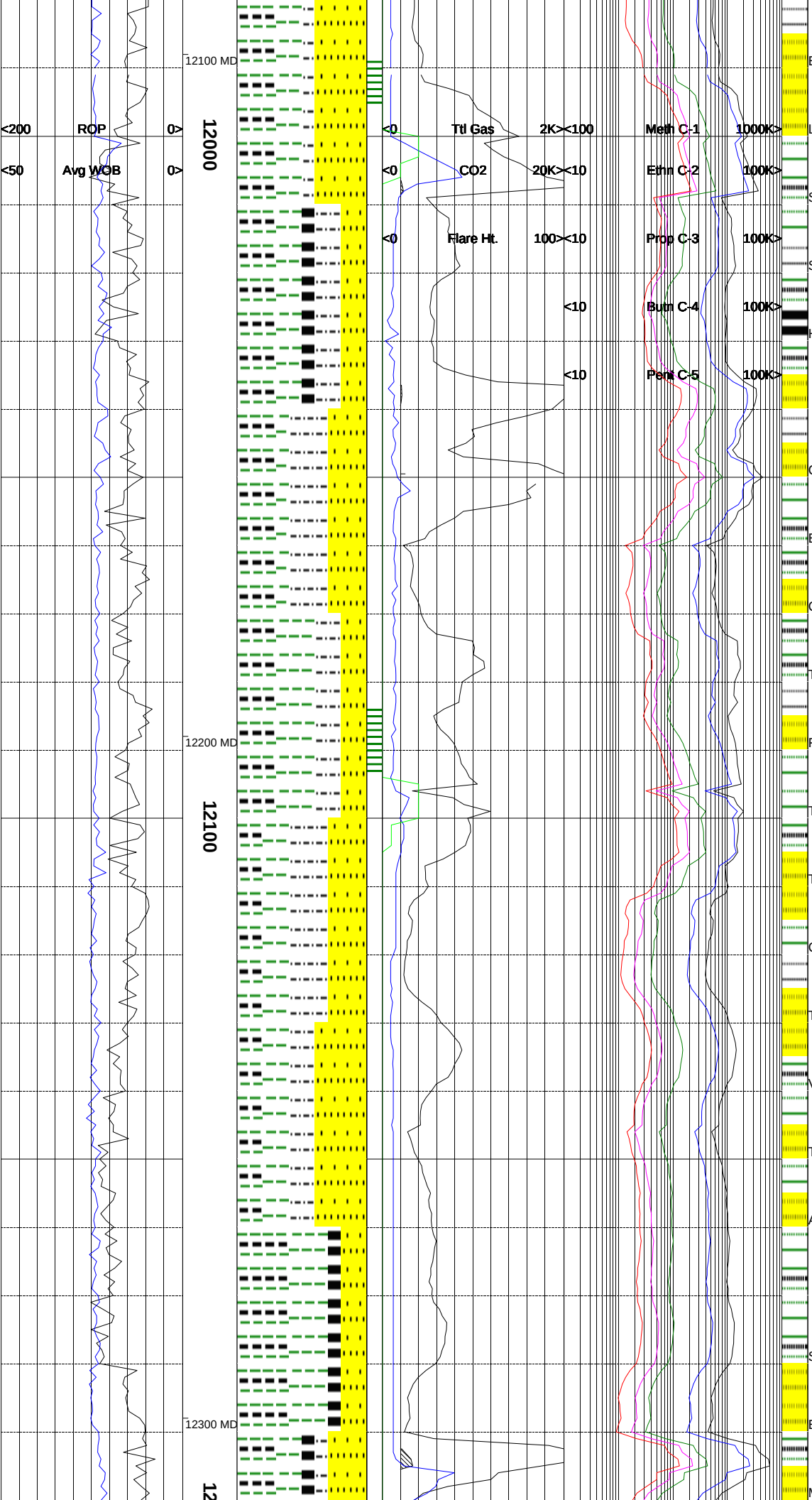
LUSTER; SMOOTH TEXTURE; LAMINAE TO THIN

STRUCTURE.

COAL = BLACK; BRITTLE TO CRUMBLY TO

SLIGHTLY PULVERULENT TENACITY; CUTTINGS

ARE FLAKY TO NODULAR; FRACTURES FROM



BLOCKY TO IRREGULAR; EARTHY TO GREASY

LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN

STRUCTURE; INTERBEDDED WITH CARBONACEOUS

SHALE, SILTSTONE, SANDSTONE AND SHALE;

HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = BLACK TO GRAYISH

BLACK TO DARK GRAY TO BROWNISH BLACK

COLOR; DENSE TO BRITTLE TO CRUMBLY

TENACITY; IRREGULAR TO BLOCKY TO PLANAR

FRACTURE; MASSIVE TO PLATY TO WEDGELIKE

TO BLADED CUTTING HABIT; EARTHY TO DULL

TO WAXY TO GREASY LUSTER; SMOOTH TO

CLAYEY TEXTURE; STRUCTURES VISIBLE IN

THE SAMPLE ARE LAMINAE TO THIN; NO

VISIBLE ACCESSORY MINERALS PRESENT IN

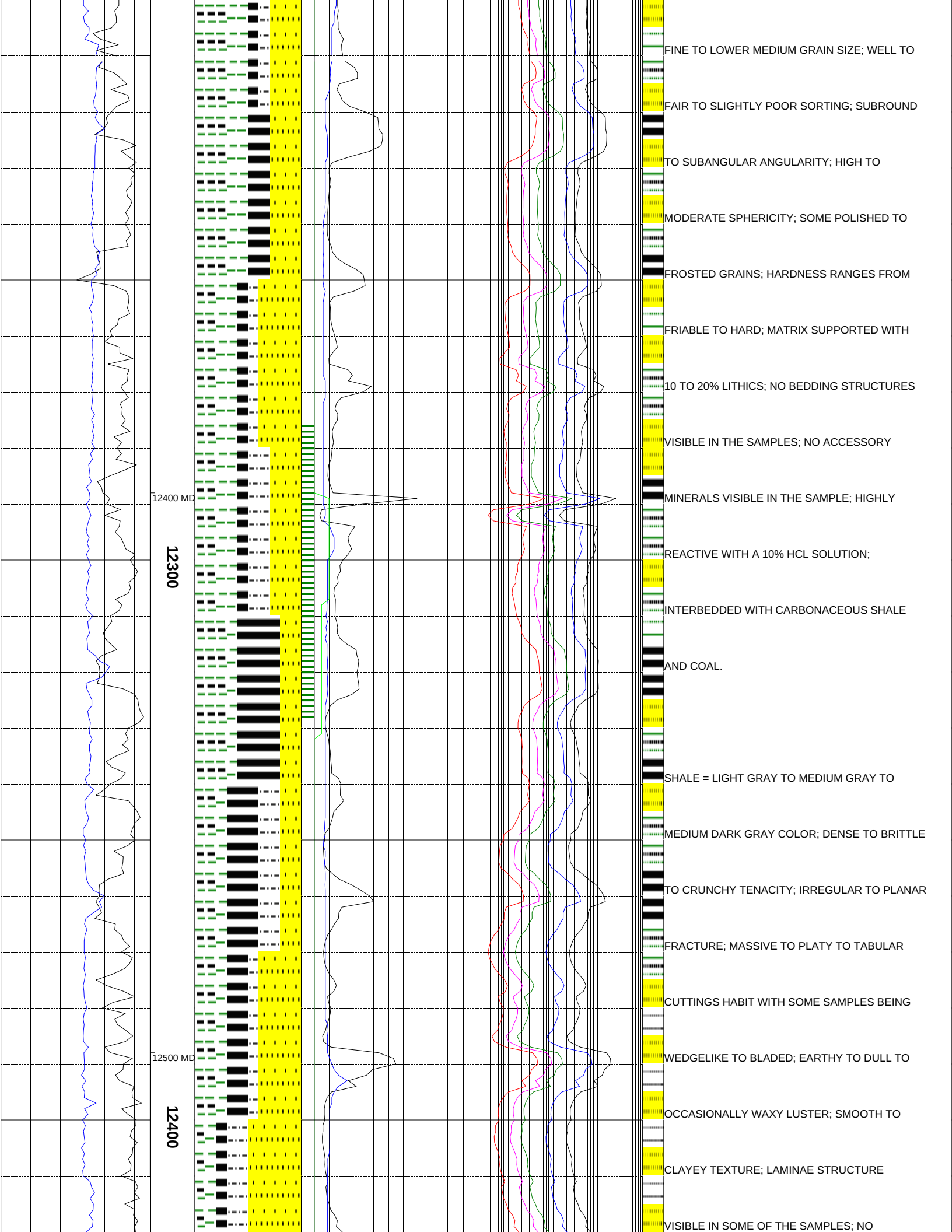
THE SAMPLE; INTERBEDDED WITH SANDSTONE

AND COAL.

SANDSTONE = PALE YELLOWISH BROWN TO PALE

BROWN TO A DARK YELLOWISH BROWN TO

MODERATE YELLOWISH BROWN COLOR; UPPER



FINE TO LOWER MEDIUM GRAIN SIZE; WELL TO

FAIR TO SLIGHTLY POOR SORTING; SUBROUND

TO SUBANGULAR ANGULARITY; HIGH TO

MODERATE SPHERICITY; SOME POLISHED TO

FROSTED GRAINS; HARDNESS RANGES FROM

FRIABLE TO HARD; MATRIX SUPPORTED WITH

10 TO 20% LITHICS; NO BEDDING STRUCTURES

VISIBLE IN THE SAMPLES; NO ACCESSORY

MINERALS VISIBLE IN THE SAMPLE; HIGHLY

REACTIVE WITH A 10% HCL SOLUTION;

INTERBEDDED WITH CARBONACEOUS SHALE

AND COAL.

SHALE = LIGHT GRAY TO MEDIUM GRAY TO

MEDIUM DARK GRAY COLOR; DENSE TO BRITTLE

TO CRUNCHY TENACITY; IRREGULAR TO PLANAR

FRACTURE; MASSIVE TO PLATY TO TABULAR

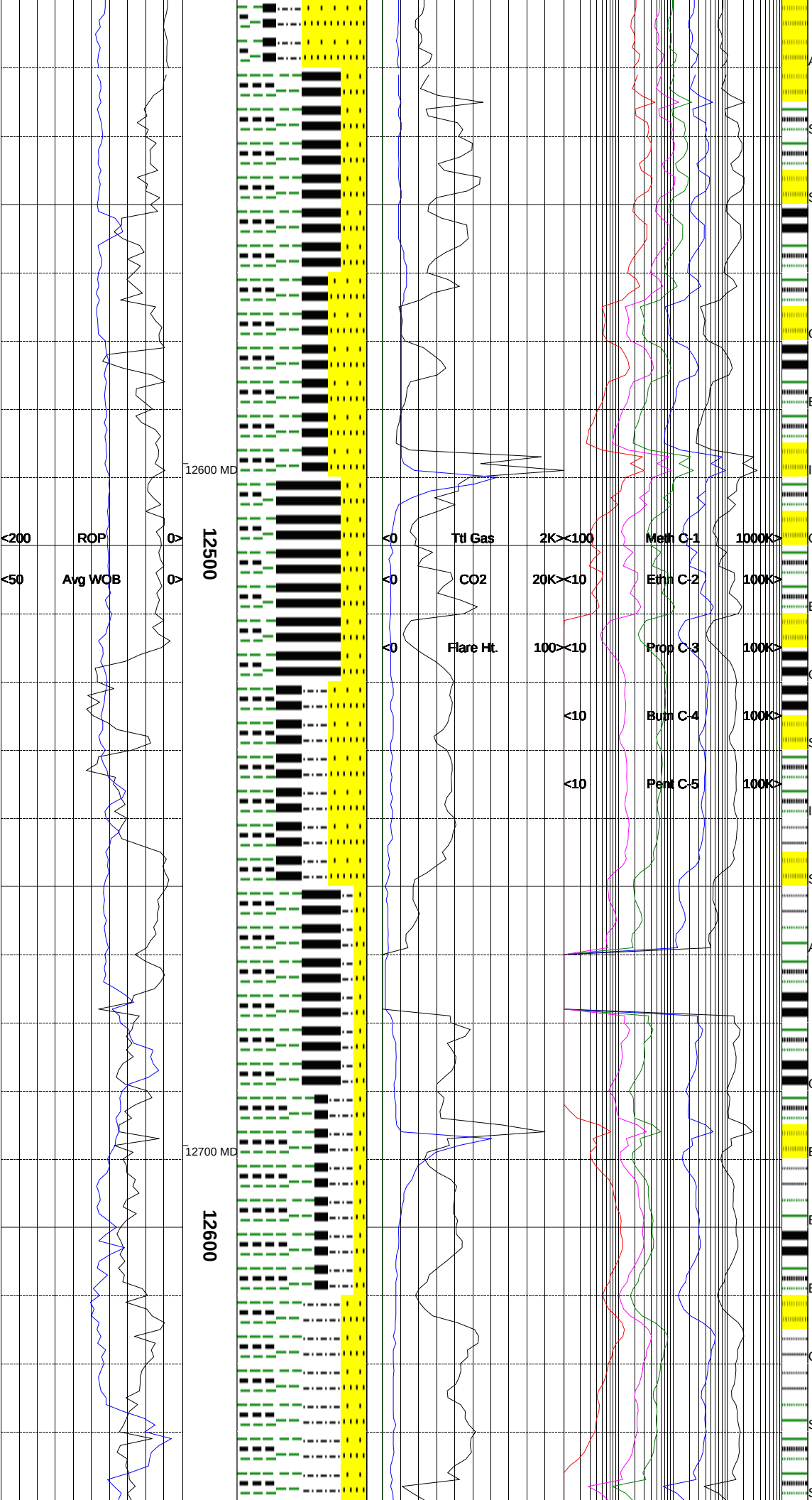
CUTTINGS HABIT WITH SOME SAMPLES BEING

WEDGELIKE TO BLADED; EARTHY TO DULL TO

OCCASIONALLY WAXY LUSTER; SMOOTH TO

CLAYEY TEXTURE; LAMINAE STRUCTURE

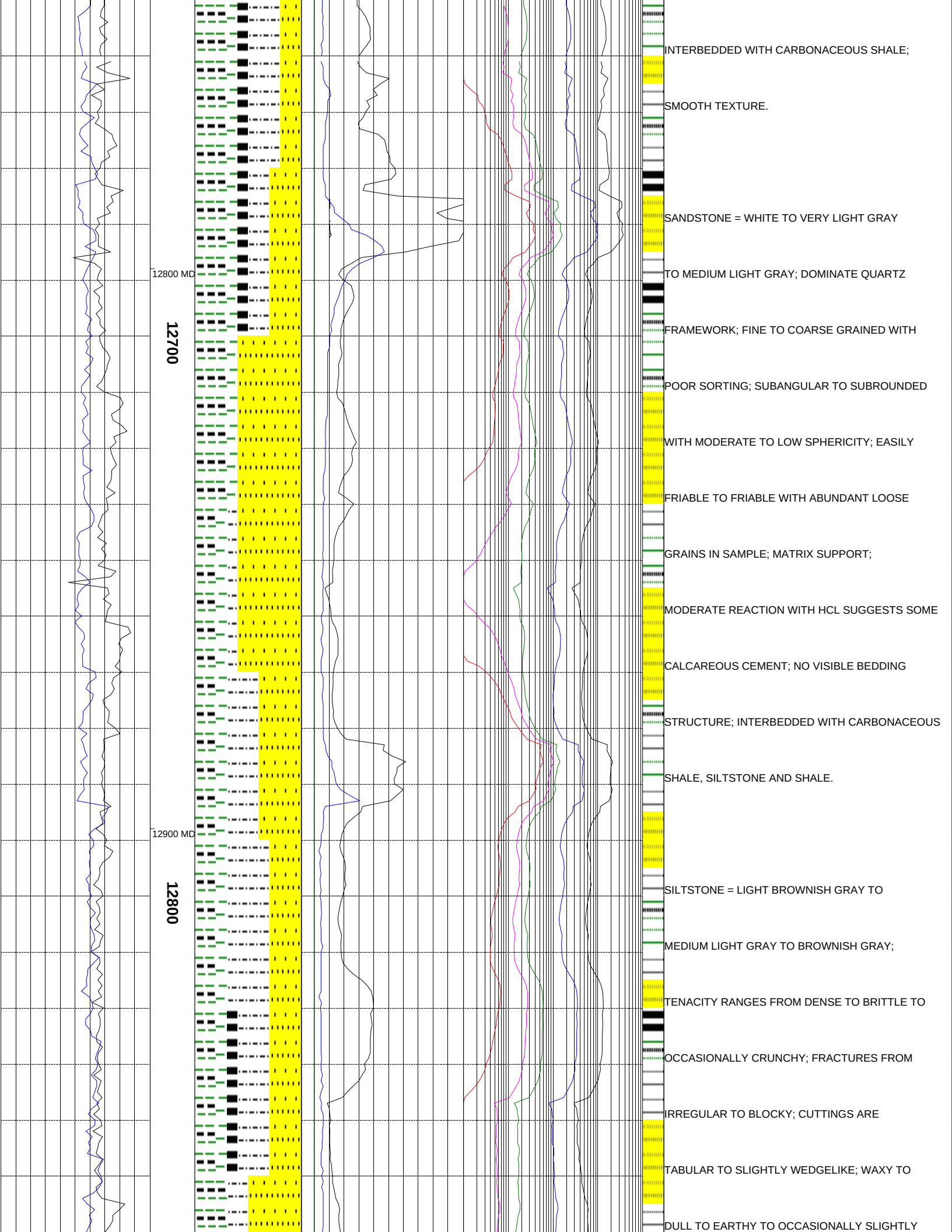
VISIBLE IN SOME OF THE SAMPLES; NO



ACCESSORY MINERALS PRESENT IN THE SAMPLE; INTERBEDDED WITH SANDSTONE; SHALE AND COAL.

COAL = BLACK; CRUMBLY TO PULVERULENT TO BRITTLE TENACITY; FRACTURES FROM IRREGULAR TO BLOCKY TO OCCASIONALLY CONCHOIDAL; CUTTINGS ARE FLAKY TO ELONGATED TO SLIGHTLY NODULAR; SLIGHTLY GREASY TO RESINOUS TO EARTHY LUSTER; SMOOTH TO CLAYEY TEXTURE; THIN STRUCTURE INTERBEDDED WITH CARBONACEOUS SHALE SILTSTONE AND SANDSTONE; HIGH GAS ASSOCIATED WITH SAMPLE.

CARBONACEOUS SHALE = BLACK TO GRAYISH BLACK TO BROWNISH BLACK; DENSE TO BRITTLE TENACITY; FRACTURES FROM SUB BLOCKY TO IRREGULAR TO SLIGHTLY PLANAR; CUTTINGS ARE ELONGATED TO PLATY TO SLIGHTLY FLAKY; RESINOUS TO POLISHED TO SLIGHTLY EARTHY LUSTER; THICK STRUCTURE;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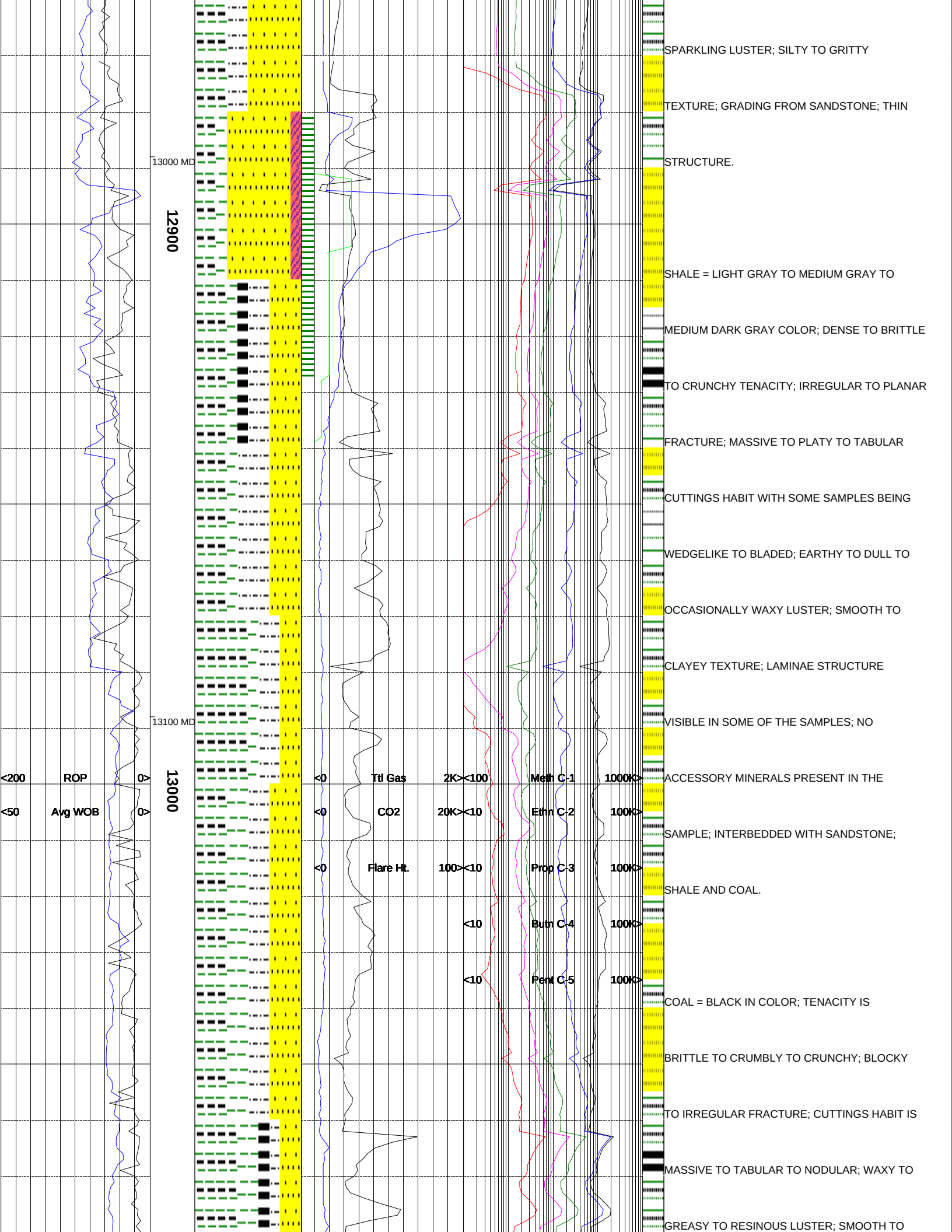
INTERBEDDED WITH CARBONACEOUS SHALE;
SMOOTH TEXTURE.
SANDSTONE = WHITE TO VERY LIGHT GRAY
TO MEDIUM LIGHT GRAY; DOMINATE QUARTZ
FRAMEWORK; FINE TO COARSE GRAINED WITH
POOR SORTING; SUBANGULAR TO SUBROUNDED
WITH MODERATE TO LOW SPHERICITY; EASILY
FRIABLE TO FRIABLE WITH ABUNDANT LOOSE
GRAINS IN SAMPLE; MATRIX SUPPORT;
MODERATE REACTION WITH HCL SUGGESTS SOME
CALCAREOUS CEMENT; NO VISIBLE BEDDING
STRUCTURE; INTERBEDDED WITH CARBONACEOUS
SHALE, SILTSTONE AND SHALE.
SILTSTONE = LIGHT BROWNISH GRAY TO
MEDIUM LIGHT GRAY TO BROWNISH GRAY;
TENACITY RANGES FROM DENSE TO BRITTLE TO
OCCASIONALLY CRUNCHY; FRACTURES FROM
IRREGULAR TO BLOCKY; CUTTINGS ARE
TABULAR TO SLIGHTLY WEDGELIKE; WAXY TO
DULL TO EARTHY TO OCCASIONALLY SLIGHTLY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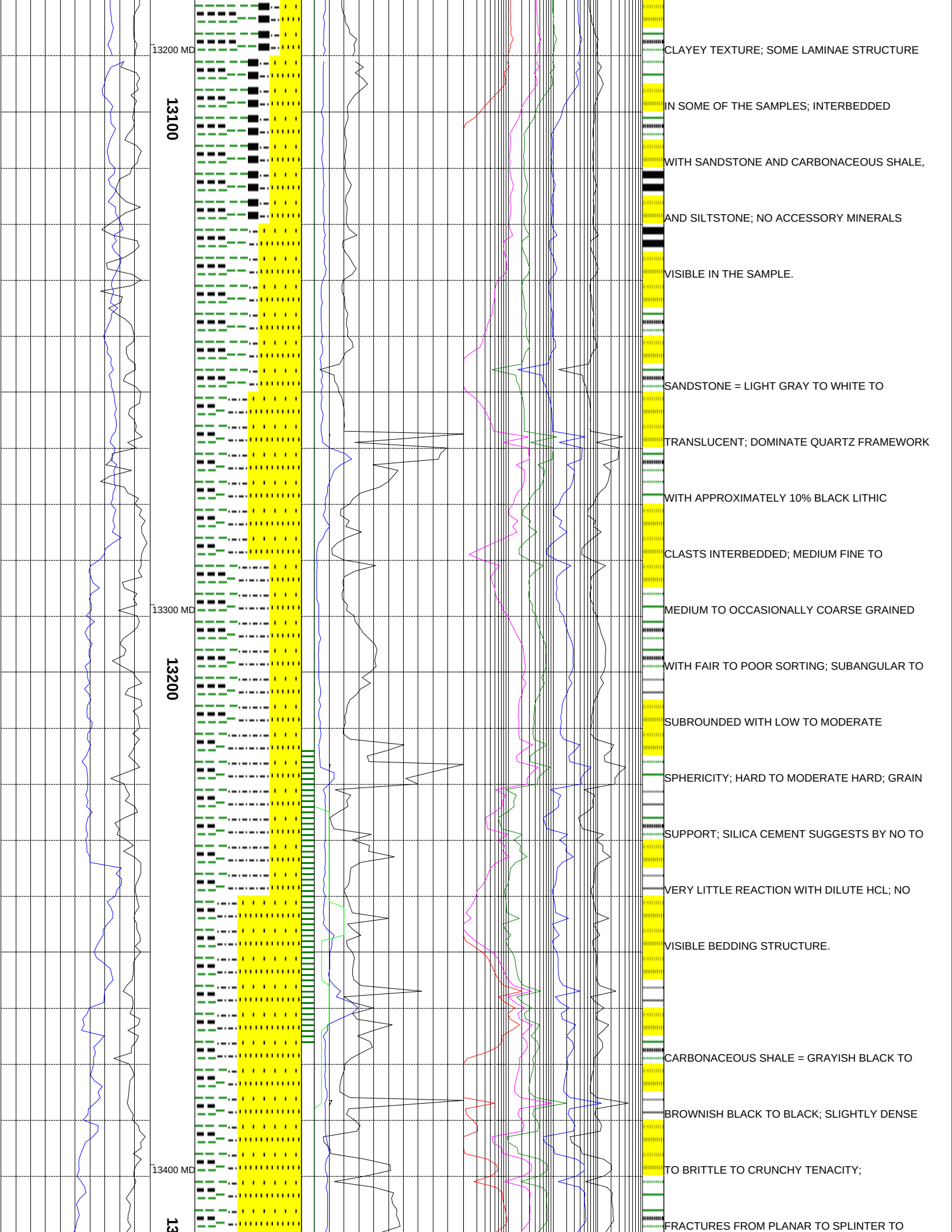
SPARKLING LUSTER; SILTY TO GRITTY
TEXTURE; GRADING FROM SANDSTONE; THIN
STRUCTURE.
SHALE = LIGHT GRAY TO MEDIUM GRAY TO
MEDIUM DARK GRAY COLOR; DENSE TO BRITTLE
TO CRUNCHY TENACITY; IRREGULAR TO PLANAR
FRACTURE; MASSIVE TO PLATY TO TABULAR
CUTTINGS HABIT WITH SOME SAMPLES BEING
WEDGELIKE TO BLADED; EARTHY TO DULL TO
OCCASIONALLY WAXY LUSTER; SMOOTH TO
CLAYEY TEXTURE; LAMINAE STRUCTURE
VISIBLE IN SOME OF THE SAMPLES; NO
ACCESSORY MINERALS PRESENT IN THE
SAMPLE; INTERBEDDED WITH SANDSTONE;
SHALE AND COAL.
COAL = BLACK IN COLOR; TENACITY IS
BRITTLE TO CRUMBLY TO CRUNCHY; BLOCKY
TO IRREGULAR FRACTURE; CUTTINGS HABIT IS
MASSIVE TO TABULAR TO NODULAR; WAXY TO
GREASY TO RESINOUS LUSTER; SMOOTH TO


13200 MD
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13300 MD
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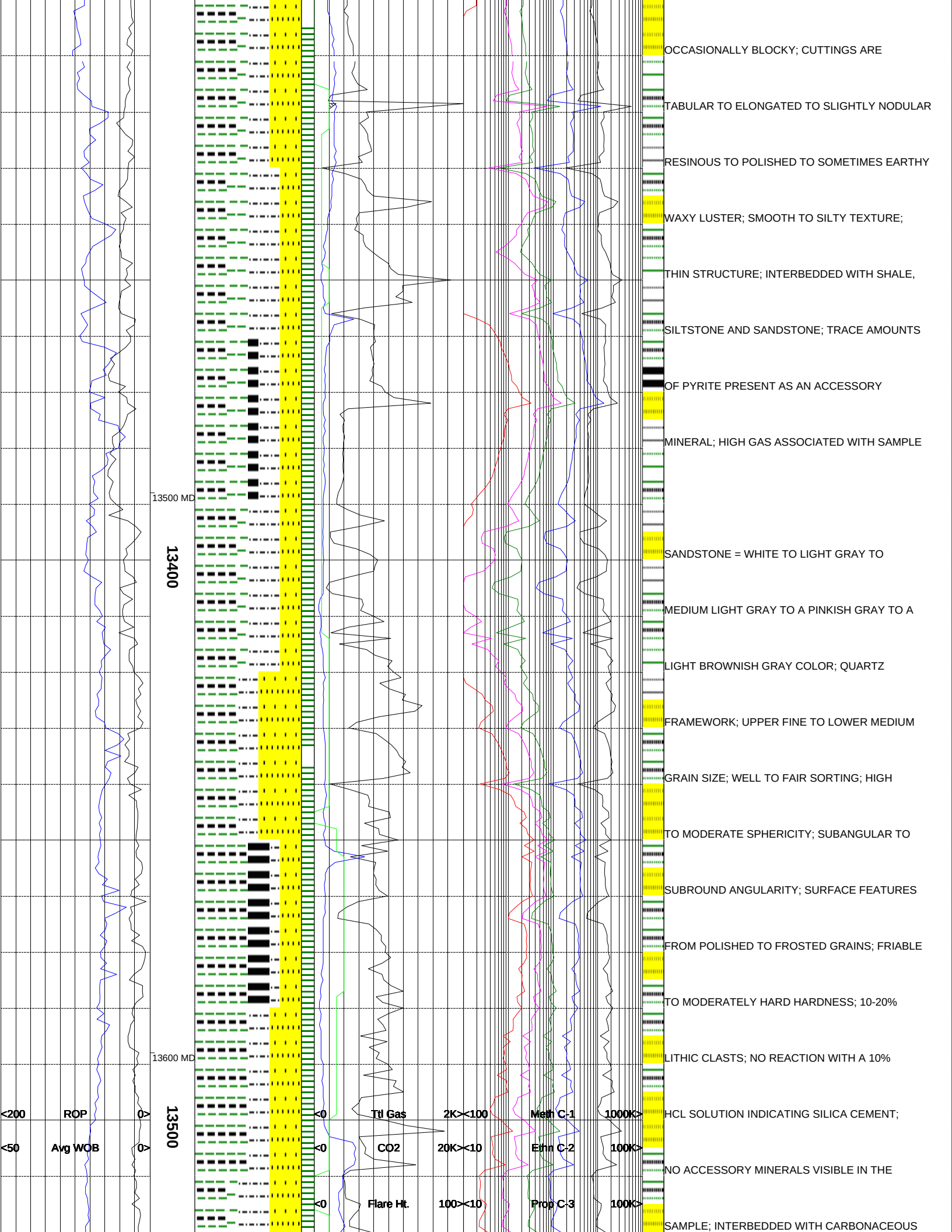
13400 MD
CLAYEY TEXTURE; SOME LAMINAE STRUCTURE
IN SOME OF THE SAMPLES; INTERBEDDED
WITH SANDSTONE AND CARBONACEOUS SHALE,
AND SILTSTONE; NO ACCESSORY MINERALS
VISIBLE IN THE SAMPLE.
SANDSTONE = LIGHT GRAY TO WHITE TO
TRANSLUCENT; DOMINATE QUARTZ FRAMEWORK
WITH APPROXIMATELY 10% BLACK LITHIC
CLASTS INTERBEDDED; MEDIUM FINE TO
MEDIUM TO OCCASIONALLY COARSE GRAINED
WITH FAIR TO POOR SORTING; SUBANGULAR TO
SUBROUNDED WITH LOW TO MODERATE
SPHERICITY; HARD TO MODERATE HARD; GRAIN
SUPPORT; SILICA CEMENT SUGGESTS BY NO TO
VERY LITTLE REACTION WITH DILUTE HCL; NO
VISIBLE BEDDING STRUCTURE.
CARBONACEOUS SHALE = GRAYISH BLACK TO
BROWNISH BLACK TO BLACK; SLIGHTLY DENSE
TO BRITTLE TO CRUNCHY TENACITY;
FRACTURES FROM PLANAR TO SPLINTER TO



OCCASIONALLY BLOCKY; CUTTINGS ARE

TABULAR TO ELONGATED TO SLIGHTLY NODULAR

RESINOUS TO POLISHED TO SOMETIMES EARTHY

WAXY LUSTER; SMOOTH TO SILTY TEXTURE;

THIN STRUCTURE; INTERBEDDED WITH SHALE,

SILTSTONE AND SANDSTONE; TRACE AMOUNTS

OF PYRITE PRESENT AS AN ACCESSORY

MINERAL; HIGH GAS ASSOCIATED WITH SAMPLE

SANDSTONE = WHITE TO LIGHT GRAY TO

MEDIUM LIGHT GRAY TO A PINKISH GRAY TO A

LIGHT BROWNISH GRAY COLOR; QUARTZ

FRAMEWORK; UPPER FINE TO LOWER MEDIUM

GRAIN SIZE; WELL TO FAIR SORTING; HIGH

TO MODERATE SPHERICITY; SUBANGULAR TO

SUBROUND ANGULARITY; SURFACE FEATURES

FROM POLISHED TO FROSTED GRAINS; FRIABLE

TO MODERATELY HARD HARDNESS; 10-20%

LITHIC CLASTS; NO REACTION WITH A 10%

HCL SOLUTION INDICATING SILICA CEMENT;

NO ACCESSORY MINERALS VISIBLE IN THE

SAMPLE; INTERBEDDED WITH CARBONACEOUS