



Scale: 5" / 100'
Measured Depth Log

Well Name Schaefer LD 13-032HN

Location SECTION 24, T1S, R67W

State COLORADO

County ADAMS

Country UNITED STATES

Rig Number PRECISION 460

API Number 050011025500

AFE # 19DC0005

Geographic Region DJ BASIN

Field WATTENBERG

Ground Elevation 5021.4'

K.B. Elevation 5041.4'

Logged Interval 6000' MD To 18011'MD

Total Depth 18011'MD

Formation NIOBRARA B CHALK

Type of Drilling Fluid OIL BASED MUD

Operator

Company Great Western Operating Company, LLC

Address 1001 17th Street, Suite 2000
Denver, CO 80202



Geologist

Name Zac Olds, Mark Sowinski

Company Terra Guidance

Address 67 W. Floyd Ave. Ste 105
Englewood, CO 80110
(970) 260-5408



Other

MUDLOGGER START DATE 2/12/19

MUDLOGGER END DATE 2/15/19

Color Coding

- Oil
- Condensate
- Gas
- Note
- Core
- Pressure
- Error
- Water
- Seal

Rock Types

- Sandstone
- SILTSTONE
- SIDERITE or LIMONITE
- CONGLOMERATE
- LIMESTONE
- SANDSTONE
- DOLomite
- BRECCIA
- Chalk
- BENTONITE
- CHERT
- Marl
- CEMENT
- COAL
- TUFF
- SHALE
- UNKNOWN
- MARLSTONE
- Silty Shale
- ANHYDRITE
- CLAYSTONE
- Shaly Siltstone
- GYPsUM
- SHALE GRAY
- Silty Sandstone
- SALT
- SHALE COLORED

Fossils

- GASTROPOD
- BENTON
- ALGAE
- BITUMEN
- AMPHIPORA
- OSTRACOD
- BRECCIA
- BELEMNITE
- PELECYPOD
- CALCARIA
- BIOCLASTIC
- PELLET
- CARBON
- PISOLITE
- CHTDK
- BRACHIOPOD
- PLANT REMAINS
- CHTLT
- BRYOZOA
- PLANT SPORES
- COAL - T
- CERPHALOPOD
- SCAPHOPOD
- DOLOMITE
- CORAL
- STROMATOPOROID
- FELDSPAR
- CRINOID
- FERRUG
- ECHINOID
- FERRUG
- FISH
- GLAUCC
- FORAMINIFERA
- ARGILLACEOUS
- GYPsIF
- FOSSIL
- ARGILLITE GRAIN
- HEAVY W

Minerals

Oil Show

- ORGANIC
- PINPOINT
- DEAD
- VUGGY
- EVEN

Engineering

- QUESTIONABLE
- CASING
- SPOTTED STAINING
- BIT
- Porosity
- CONNECTION (LEFT)
- E EARTHY
- CONNECTION (RIGHT)
- FENESTRAL
- CONNECTION GAS
- F FRACTURE
- CORE - LOST
- INTERCRYSTALLINE
- CORE - RECOVERED
- INTEROOULTIC
- DST INTERVAL
- MOLDIC
- FAULT

O

Accessories

ITE	K KAOLIN	COAL STRINGER
IOUS SUBSTANCE	⌘ MARLSTONE	DOLOMITE STRINGER
A FRAGMENTS	⌘ MINERAL CRYSTALS	GYPSUM STRINGER
IOUS	⌘ NODULES	LIMESTONE STRINGER
ACEOUS FLAKES	⌘ PHOSPHATE PELLETS	⌘ MARLSTONE (CALC) STRG
	P PYRITE	⌘ MARLSTONE (DOL) STRG
HIN BEDS	⌘ SALT CAST	⌘ SANDSTONE STRINGER
ITIC	⌘ SANDY	SHALE STRINGER
AR	⌘ SILICEOUS	⌘ SILTSTONE STRINGER
	⌘ SILTY	CALC SHALE
INOUS PELLET	✓ TUFFACEOUS	CHALK
INOUS		
ONITE		
EROUS		
MINERAL		

Stringer

ANHYDRITE STRINGER
BENTONITE STRINGER

Other Symbols

<div>FORMATION TOP</div>	<div>L LITHOGRAPHIC</div>
<div>GAS SHOW</div>	<div>MX MICROXLN</div>
<div><div>DEPTH</div></div>	<div></div>
<div>MN DEPTH</div>	<div>A ANGULAR</div>
<div>ORMAL FAULT</div>	<div>R ROUNDED</div>
<div>IL SHOW</div>	<div>B SUBANG</div>
<div>VERTURNED STRATA</div>	<div>n SUBRND</div>
<div>EVERSE FAULT</div>	
<div>IDEWALL CORE (LEFT)</div>	
<div>IDEWALL CORE (RIGHT)</div>	<div>B BOUNDSTONE</div>
<div>IDE</div>	<div>C CHALKY</div>
	<div>W WELL</div>
<div>SURVEY</div>	<div>CX CRYPTOXLN</div>
<div>TRIP GAS</div>	<div>E EARTHY</div>
<div>IRELINE TESTED - LEFT</div>	<div>FX FINELYXLN</div>
<div>IRELINE TESTED - RT</div>	<div>GS GRAINSTONE</div>

ROUNDING

L LITHOGRAPHIC

MX MICROXLN

M MUDSTONE

PS PACKSTONE

W WACKESTONE

Textures

M MODERATE

P POOR

Sorting

CALCARIUOS SHALE

CALCARIOUS SHALE

CALCARIUOS SHALE

CALCARIOUS SHALE

TERRA GUIDANCE
BEGAN LOGGING @ 18:35 MST 02/12/2019
BLOODHOUND GAS CHROMATOGRAPH #5122
100' Sample Collection

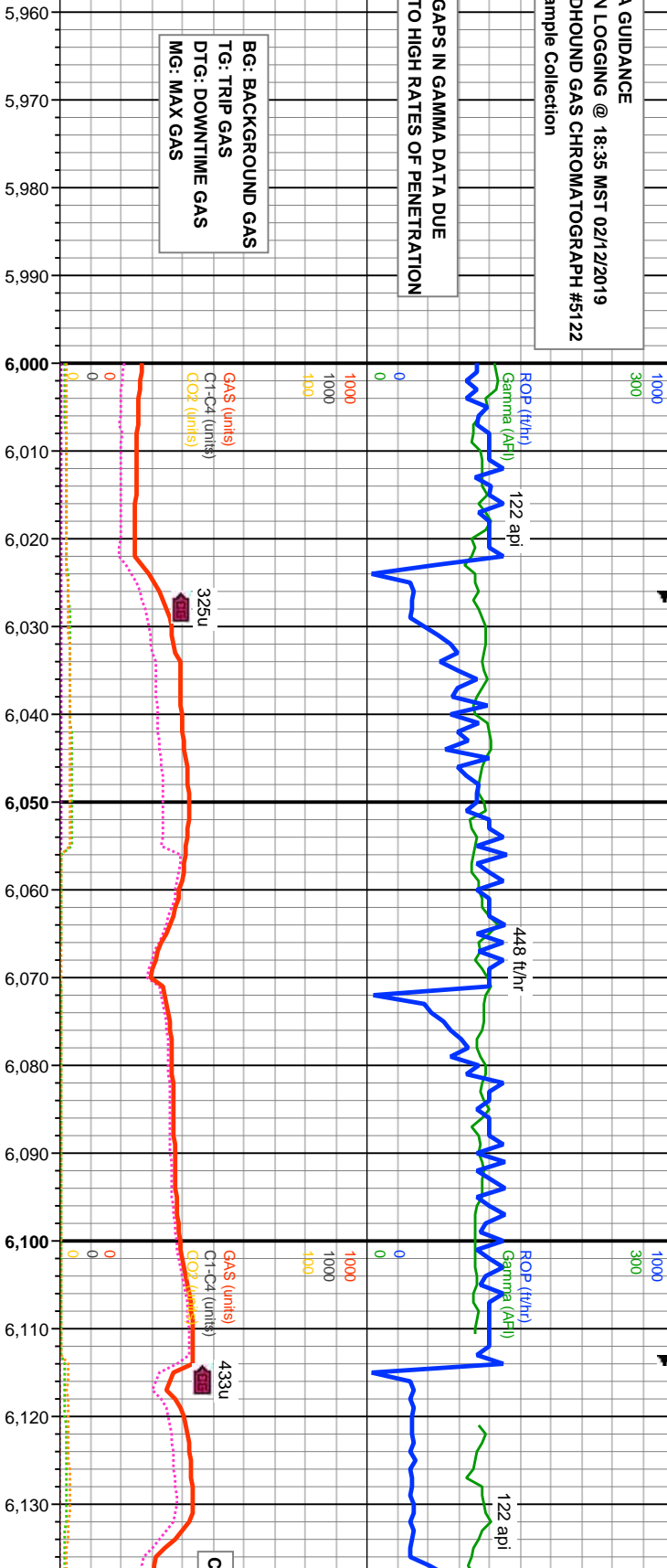
ROP
ROP
Gamma

GAPS IN GAMMA DATA DUE
TO HIGH RATES OF PENETRATION

BG: BACKGROUND GAS
TG: TRIP GAS
DTG: DOWNTIME GAS
MG: MAX GAS

Total Gas & Chromatograph
GAS
C1
C2
C3
C4
CO2

Depth



Images



% Lithology

TVD Scale
5800' - 8500'

MD: 6.001°
INC: 30.04°
AZM: 199.77°
TVD: 5,958.38'
VS: -227.71'

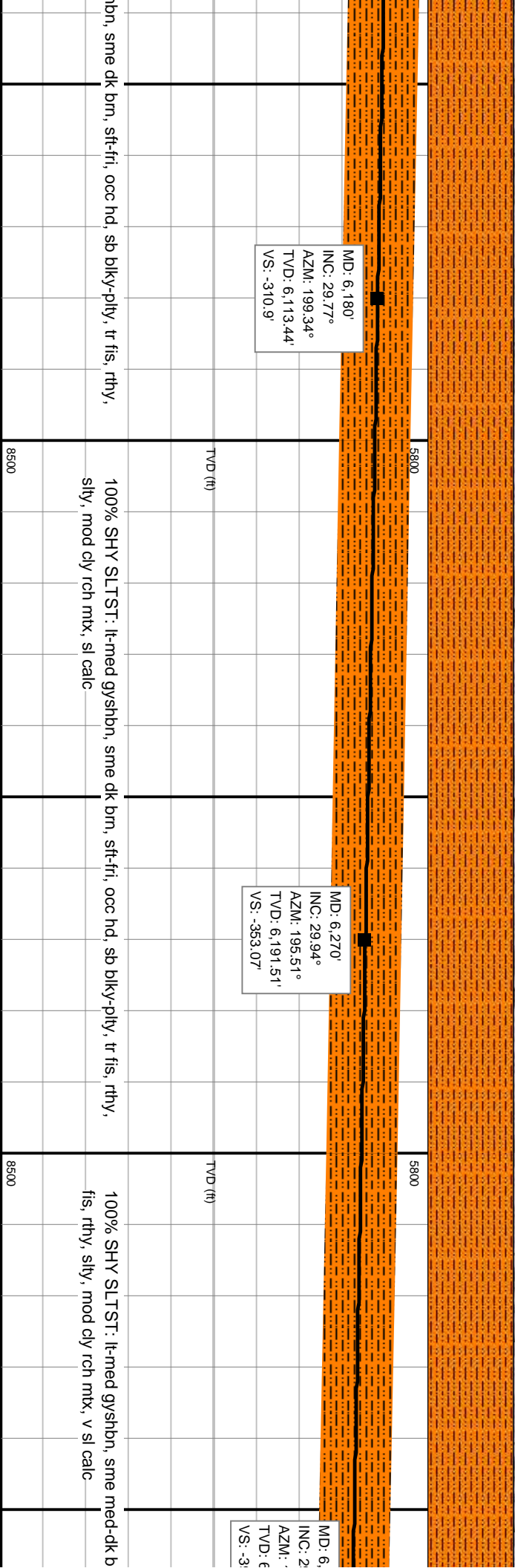
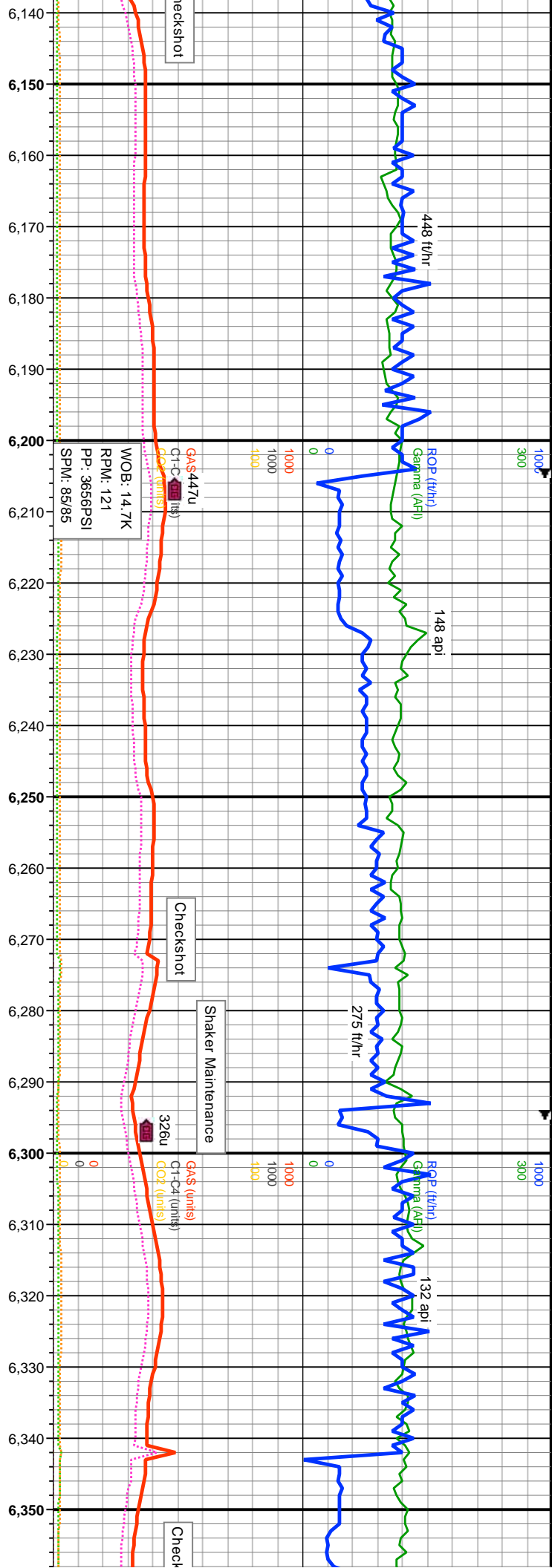
MD: 6.090°
INC: 30.04°
AZM: 199.02°
TVD: 6,035.43'
VS: -269.13'

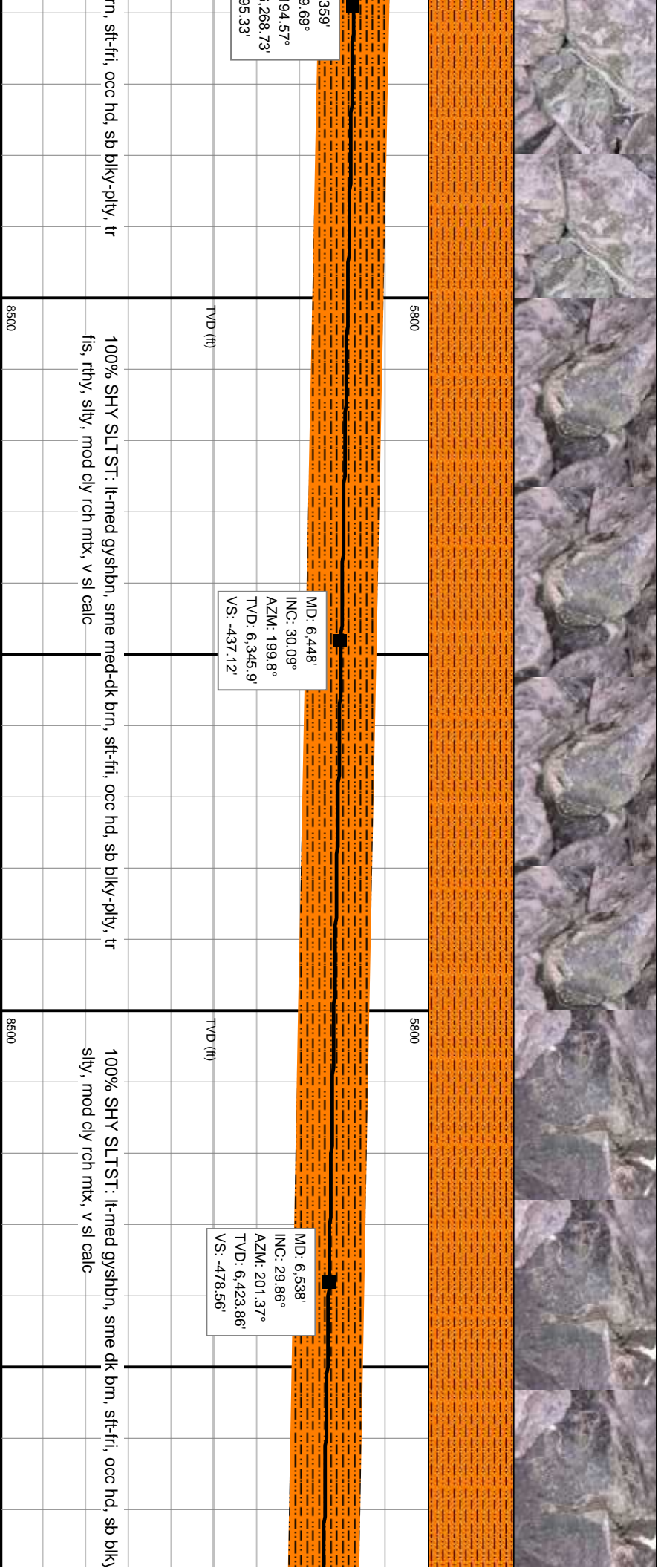
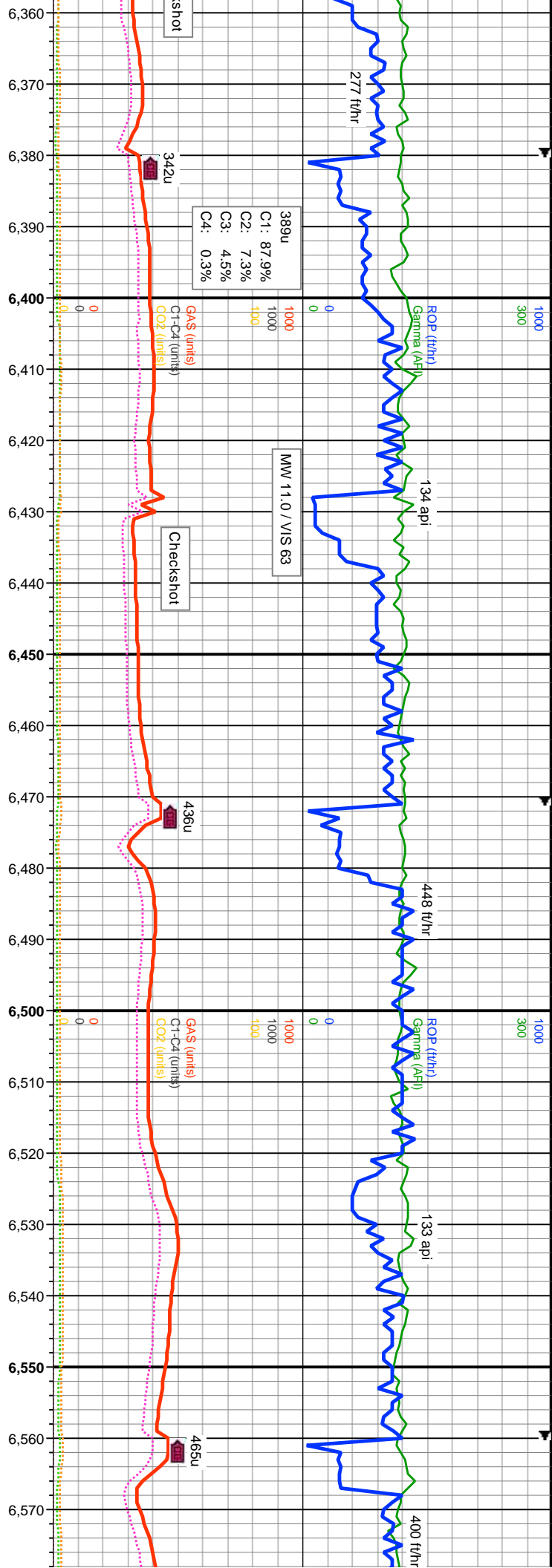
Well Bore
TVD

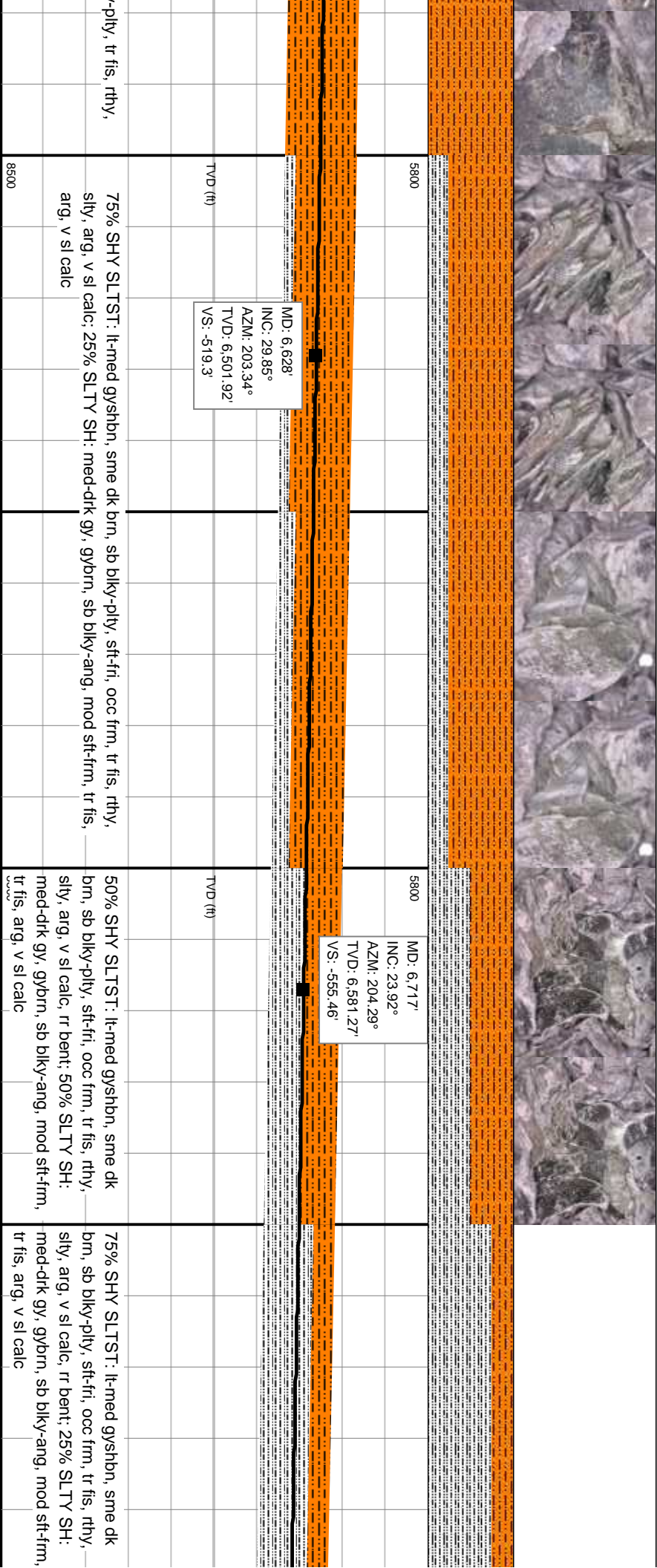
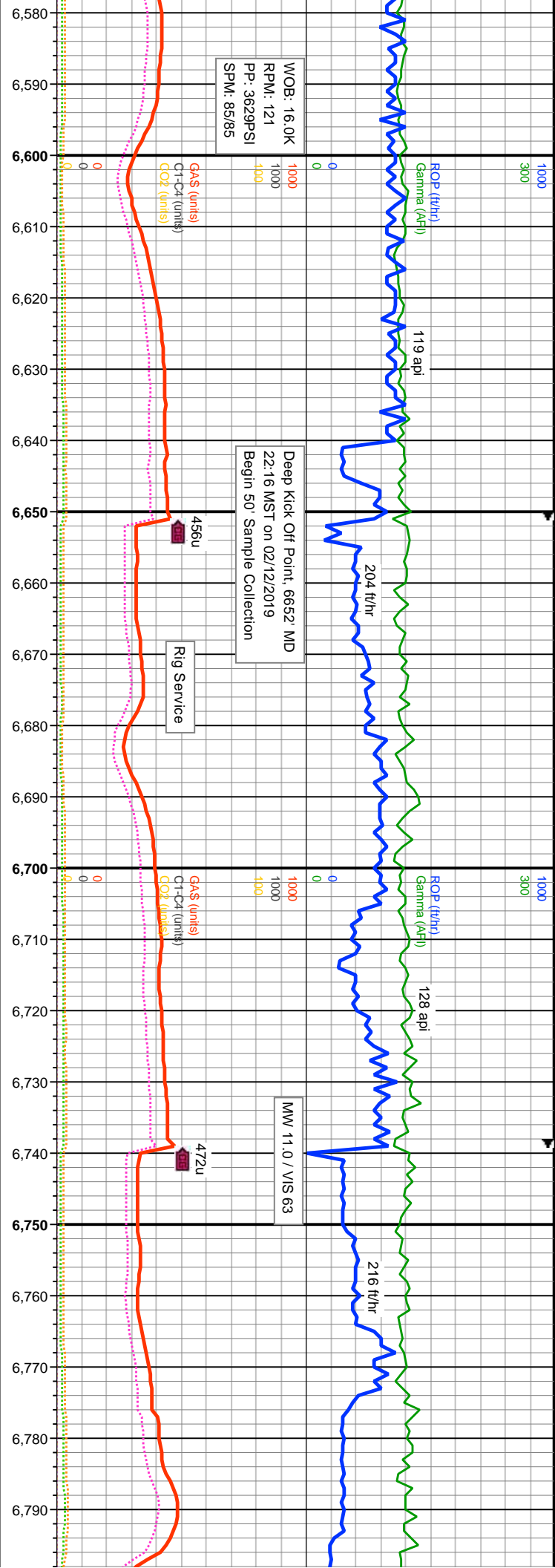
Bit #: 1
Size: 8.5
Make: Ulterra
Model: SPL516
Depth In: 1,788
Jets: 4x11, 4x12
S/N: 45225

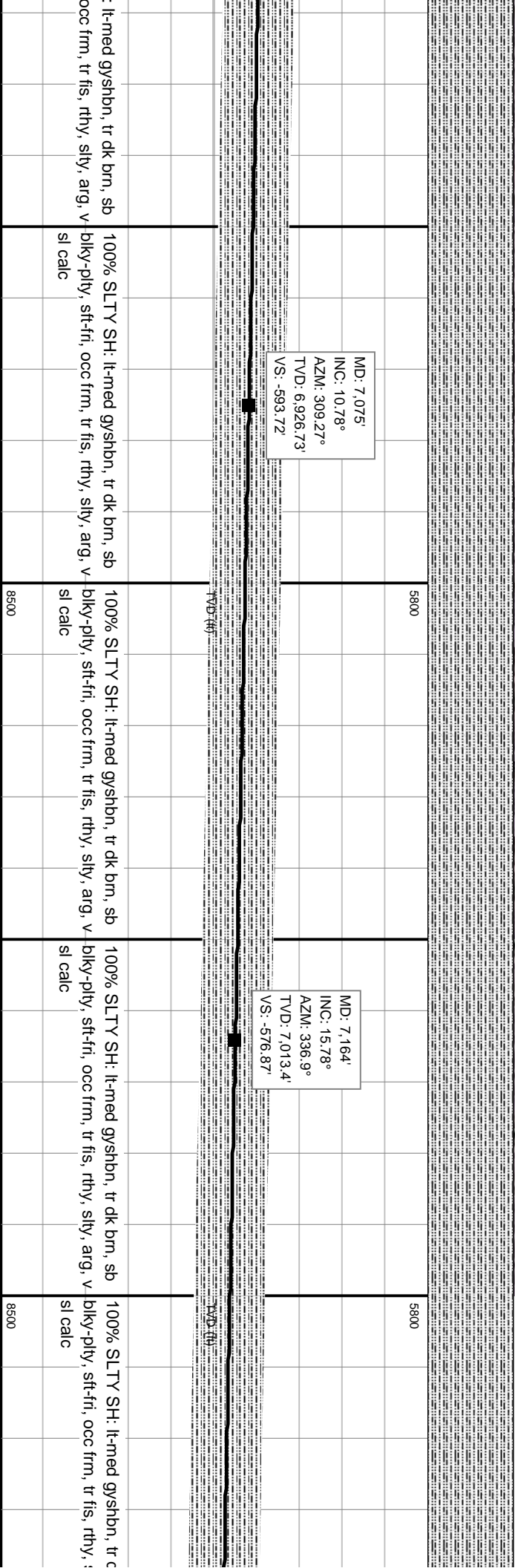
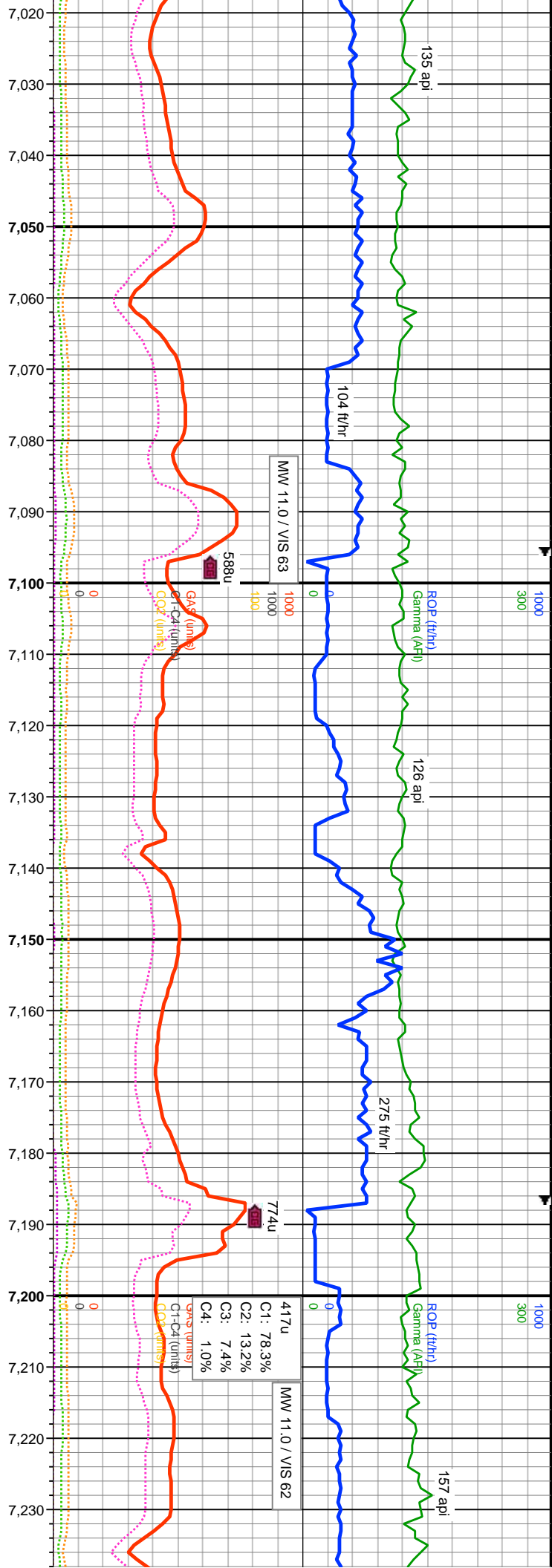
100% SHY SLTST: lt-med gysbhn, sme dk brn, sft-fri, occ hd, sb blkv-ply, tr fis, rthy,
sily, mod cly rch mtz, v sl calc

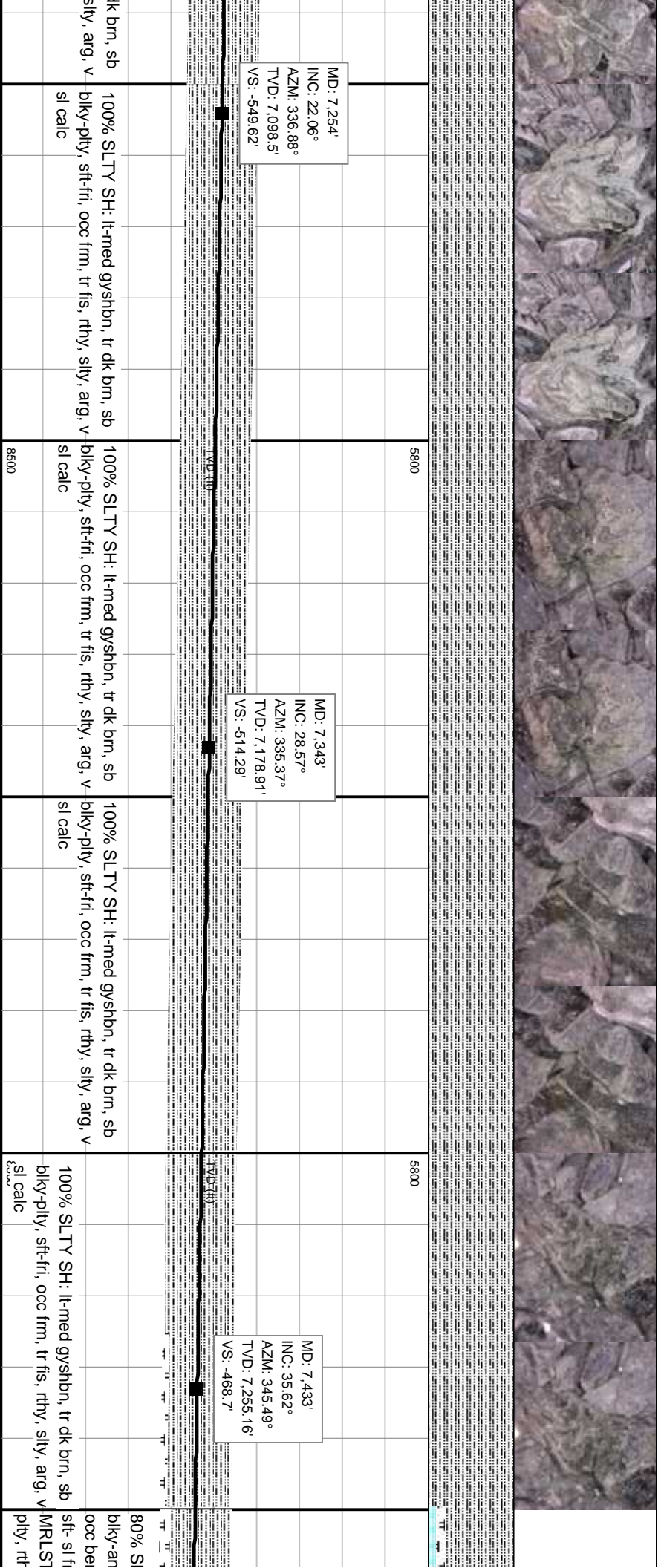
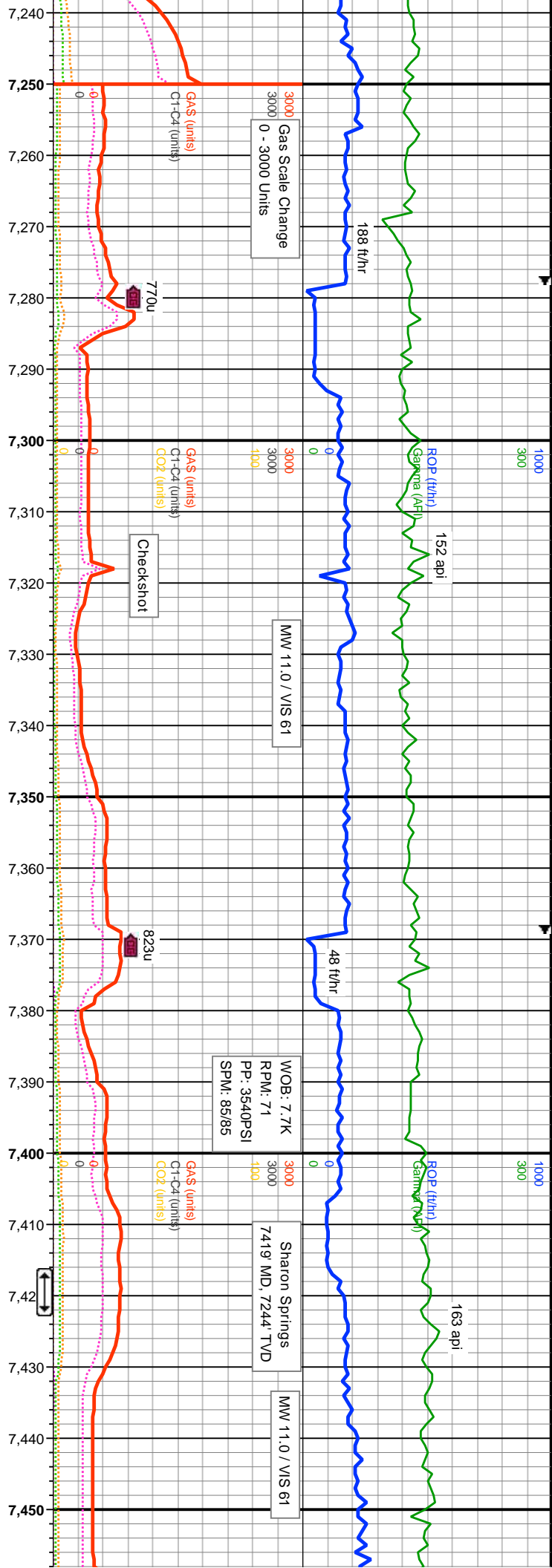
100% SHY SLTST: lt-med gysl
sily, mod cly rch mtz, calc

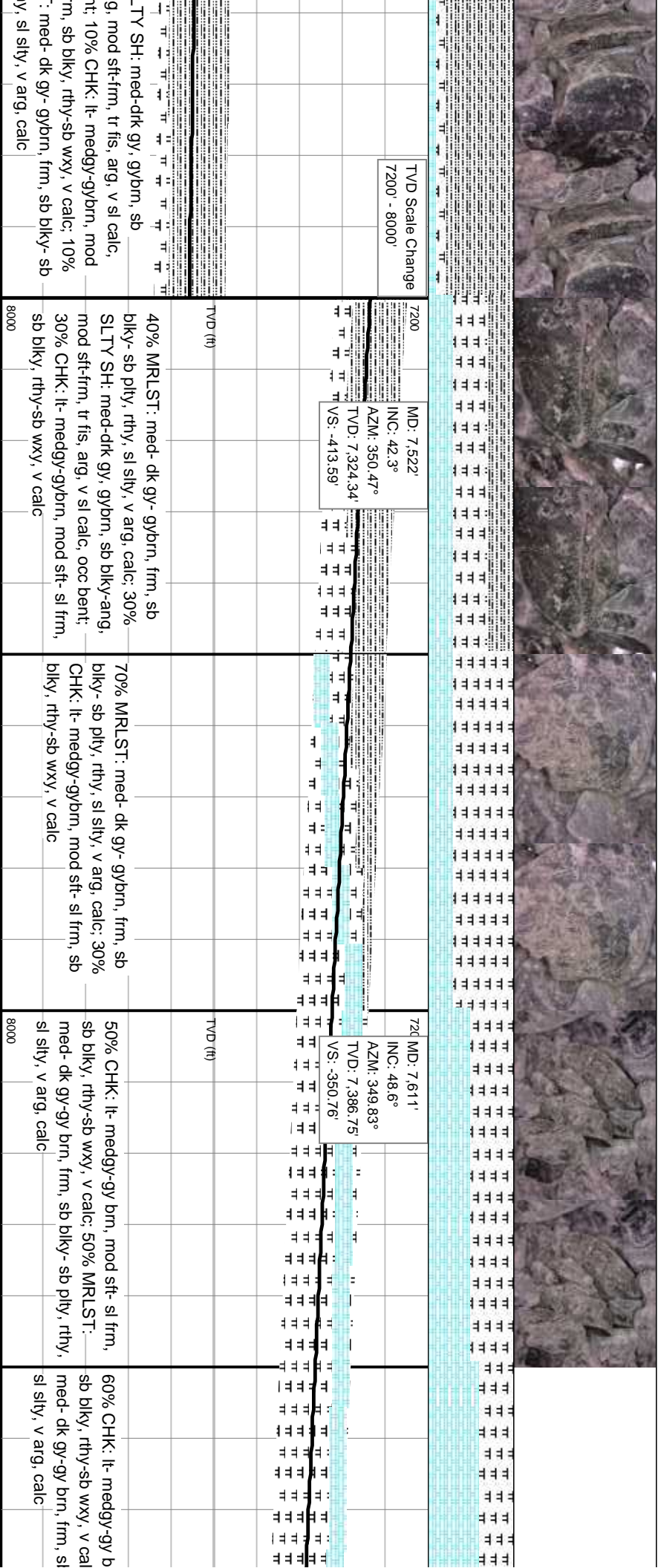
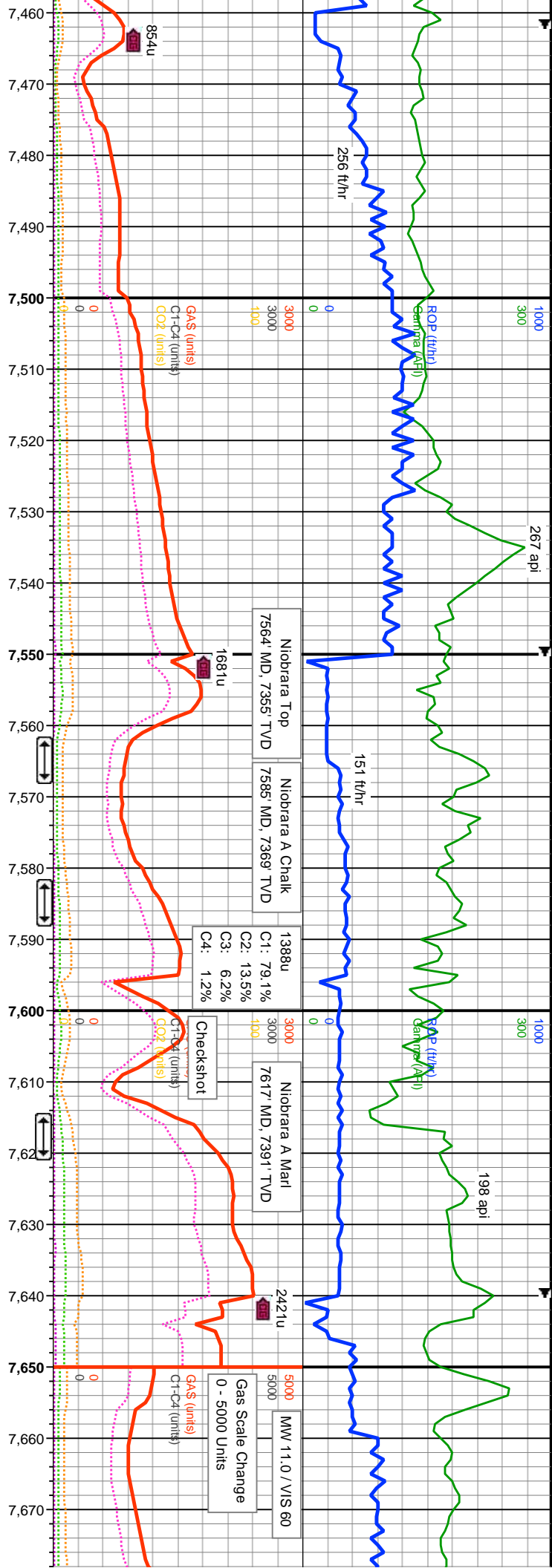


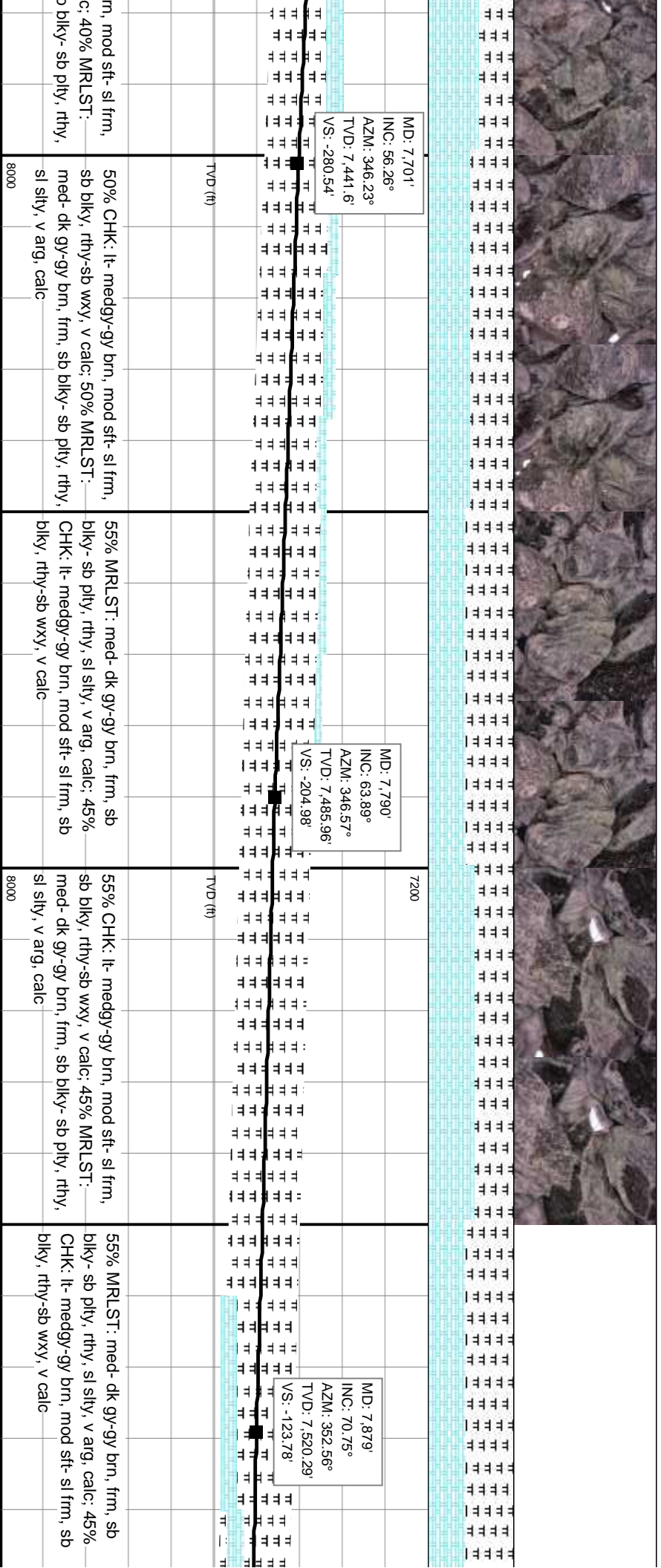
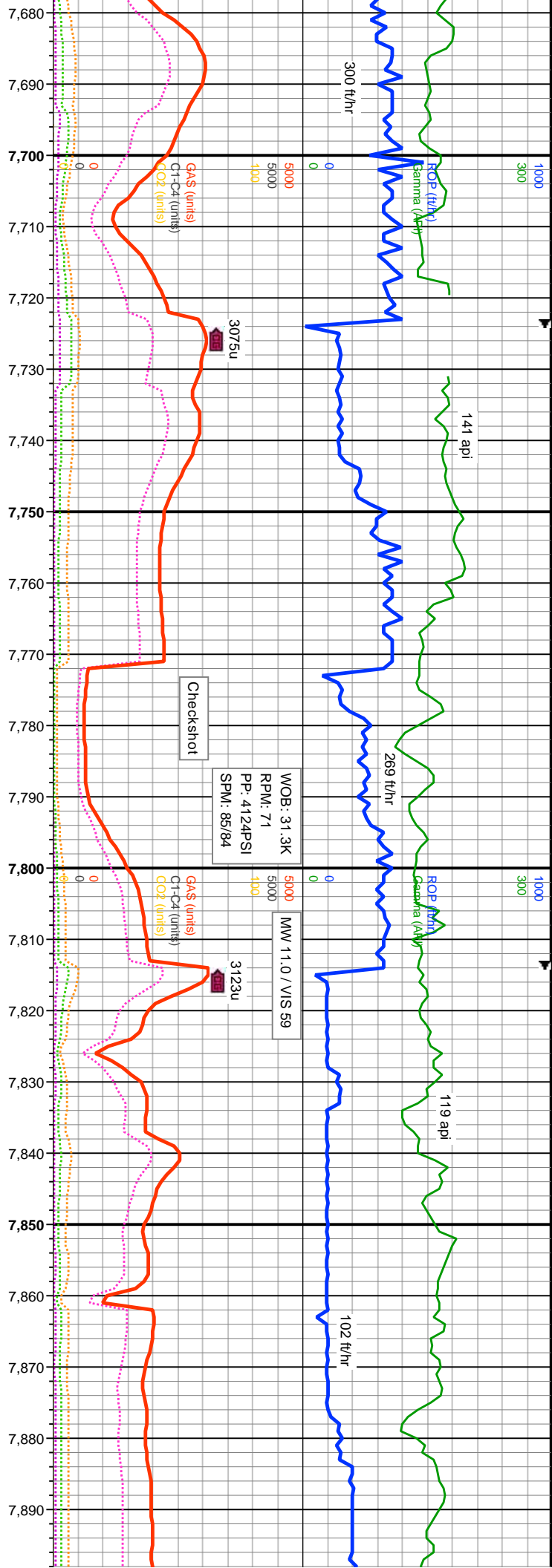


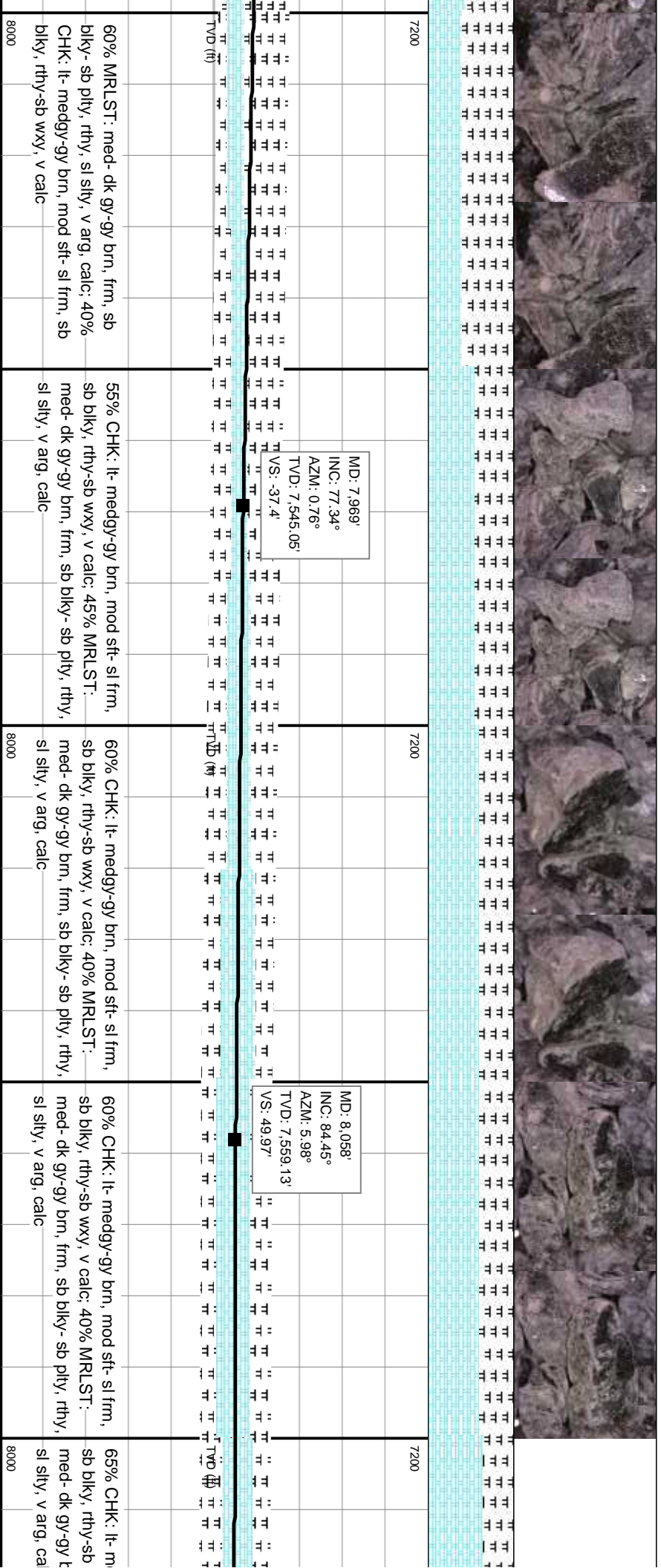
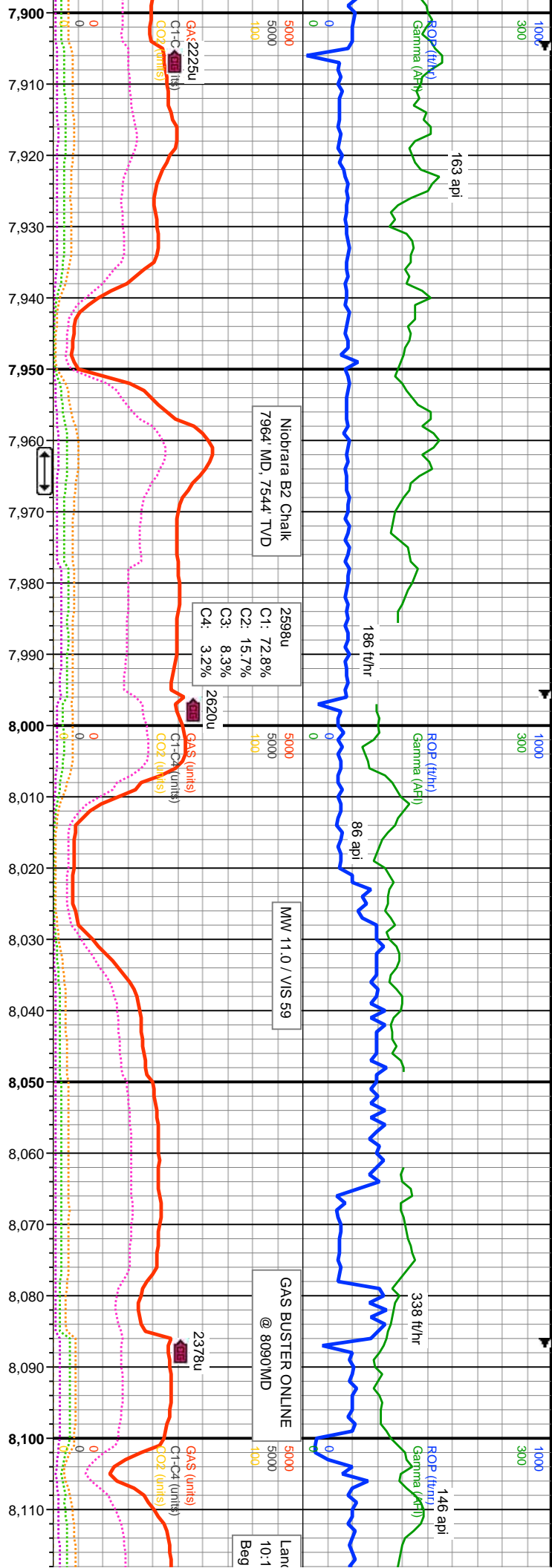


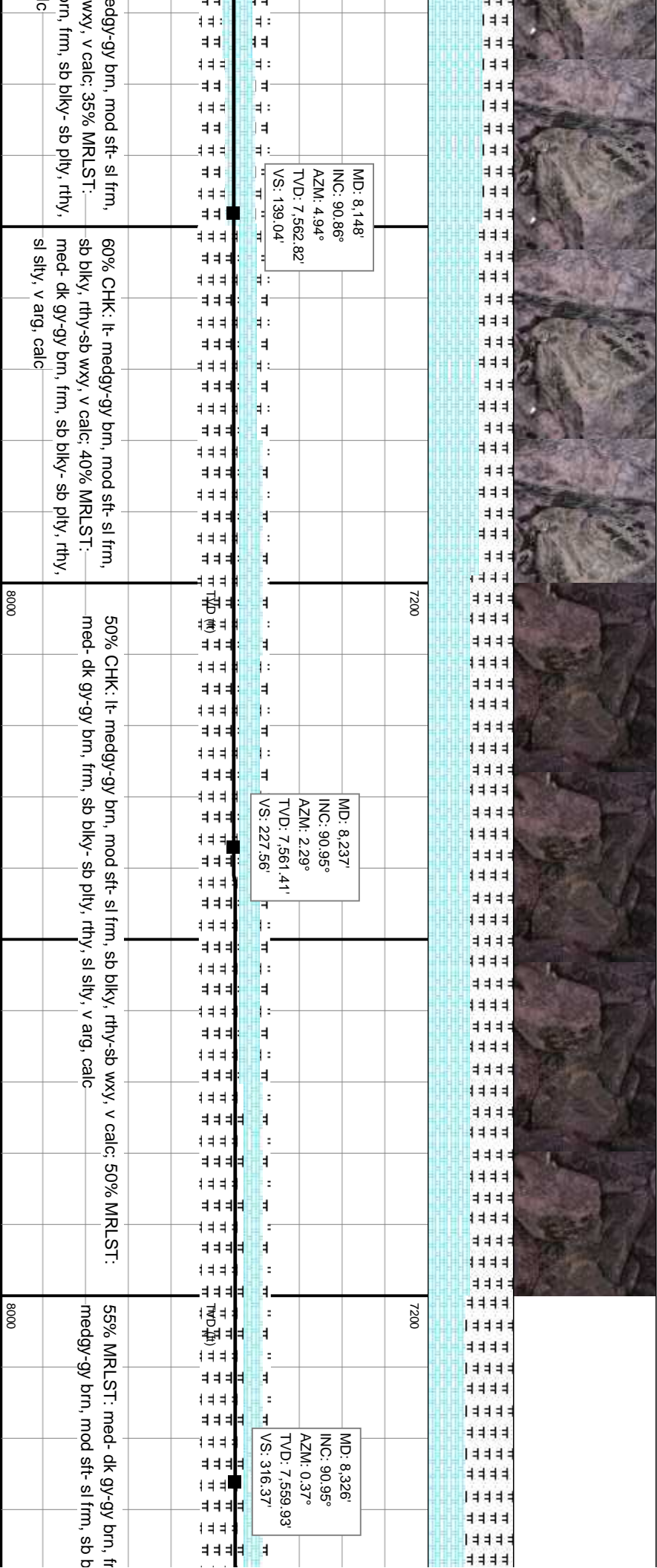
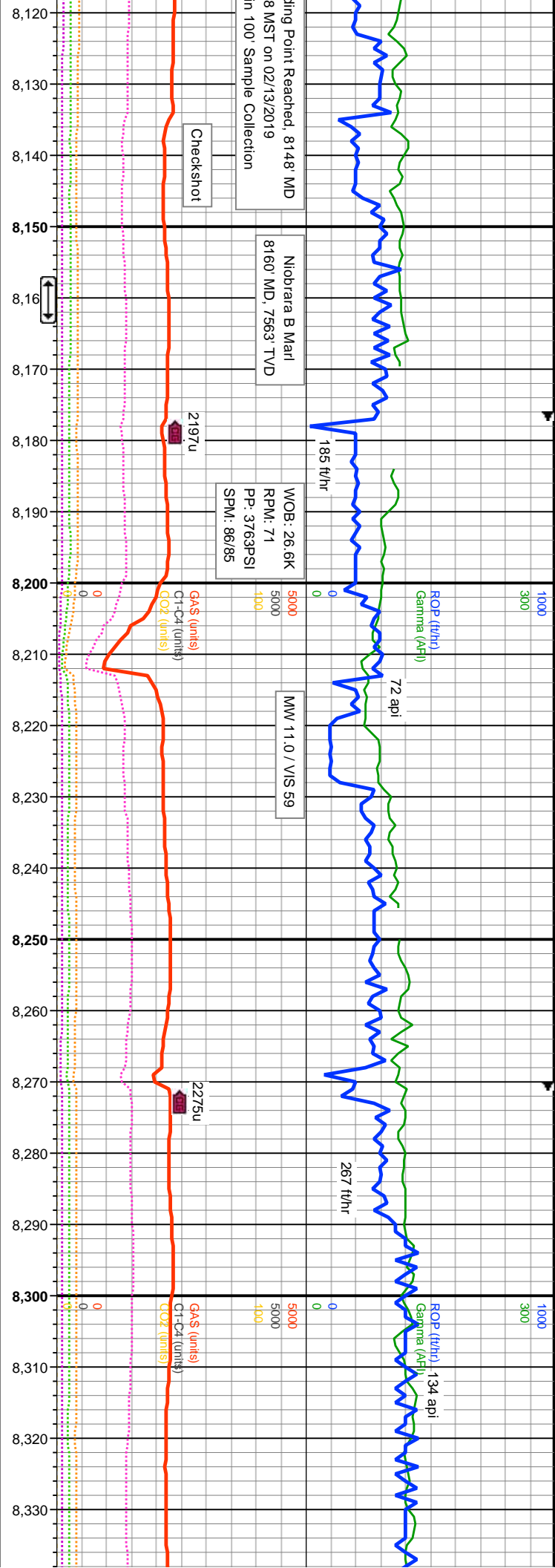


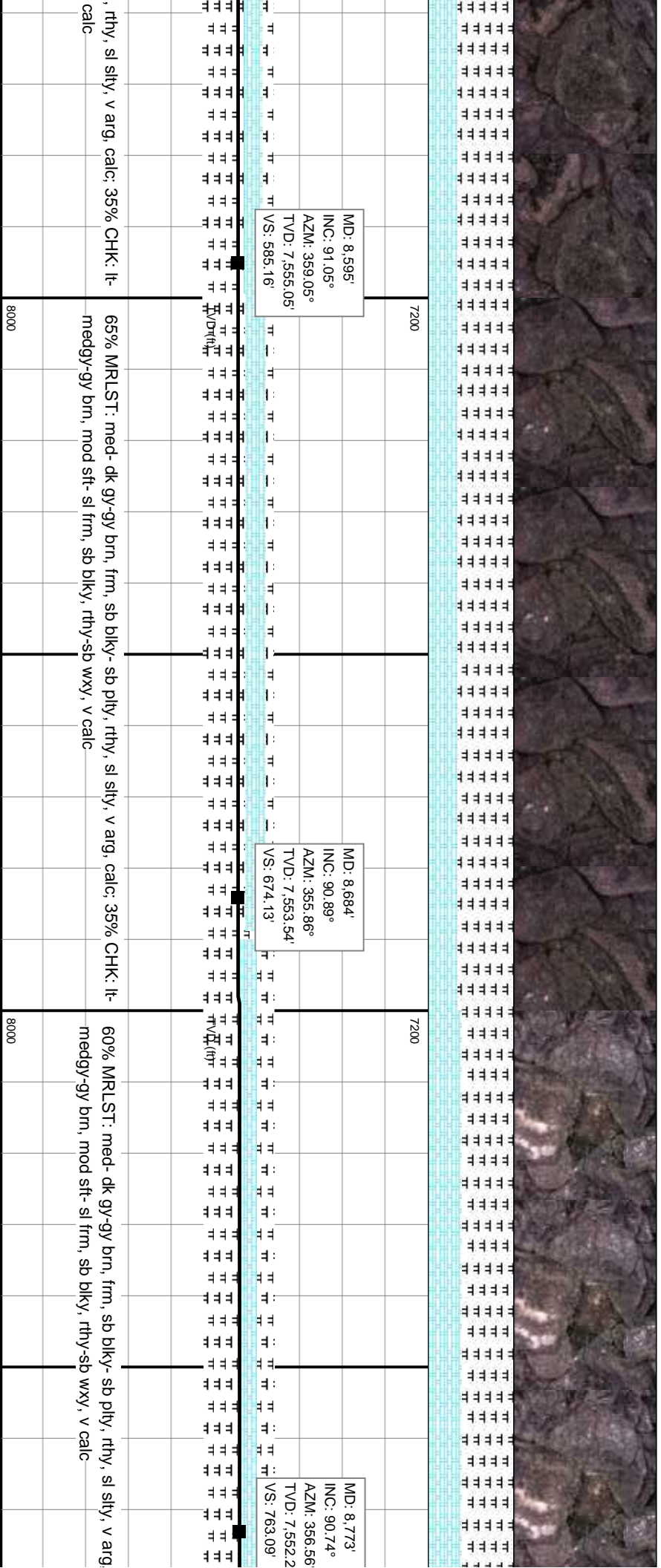
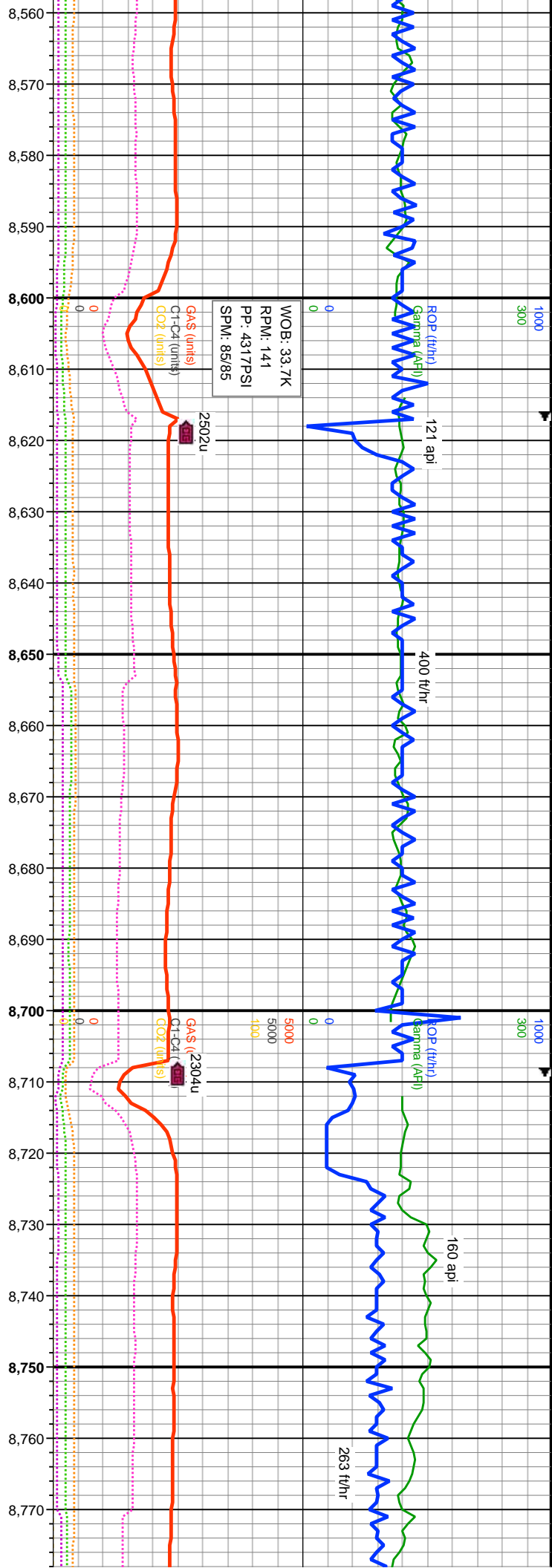


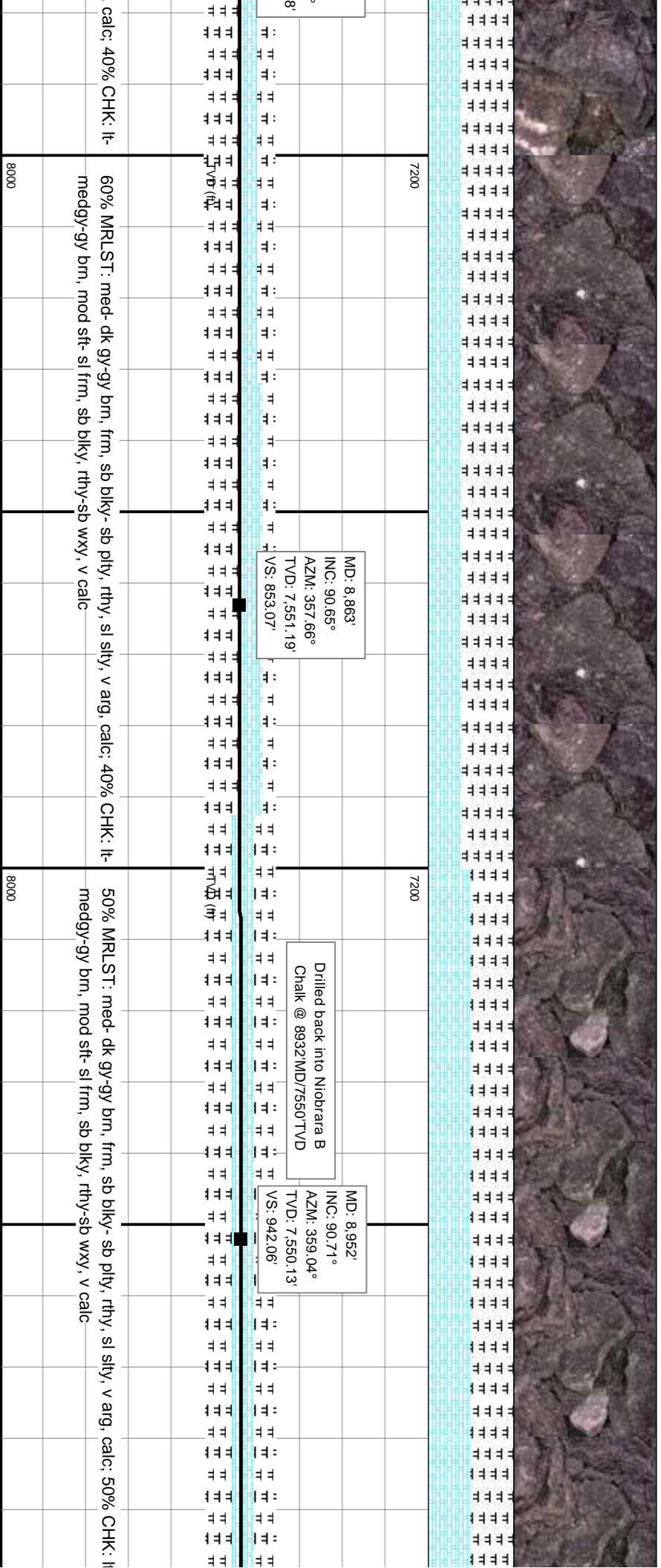
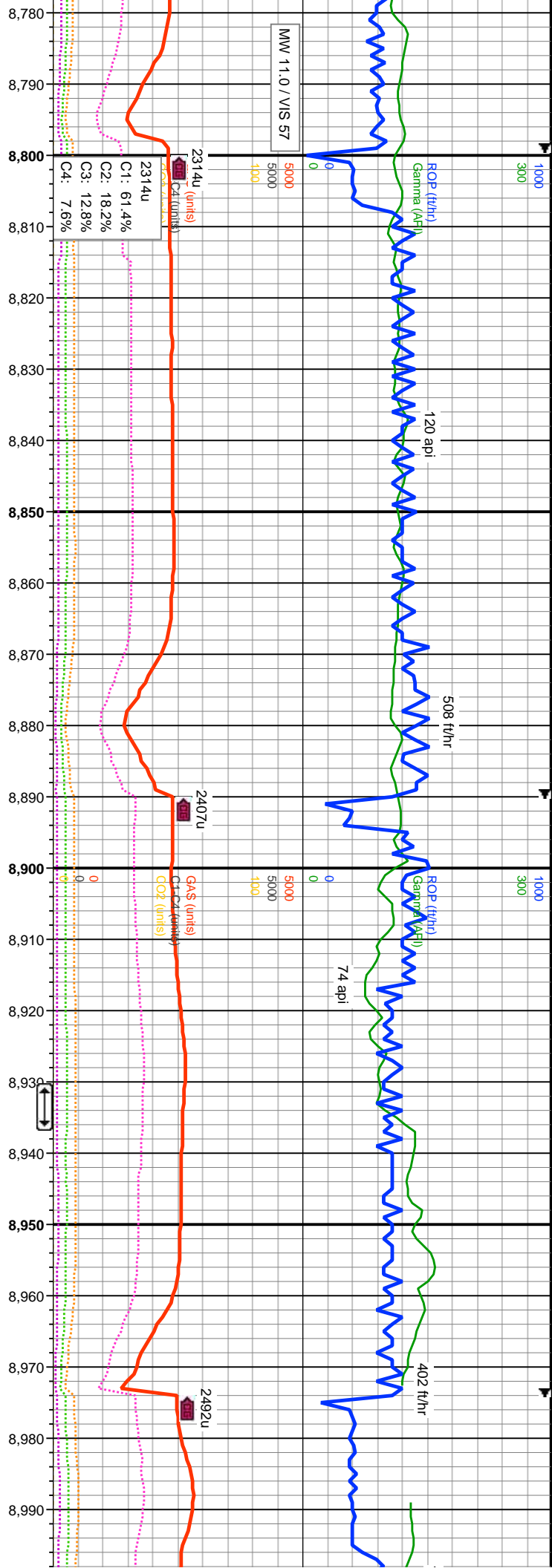


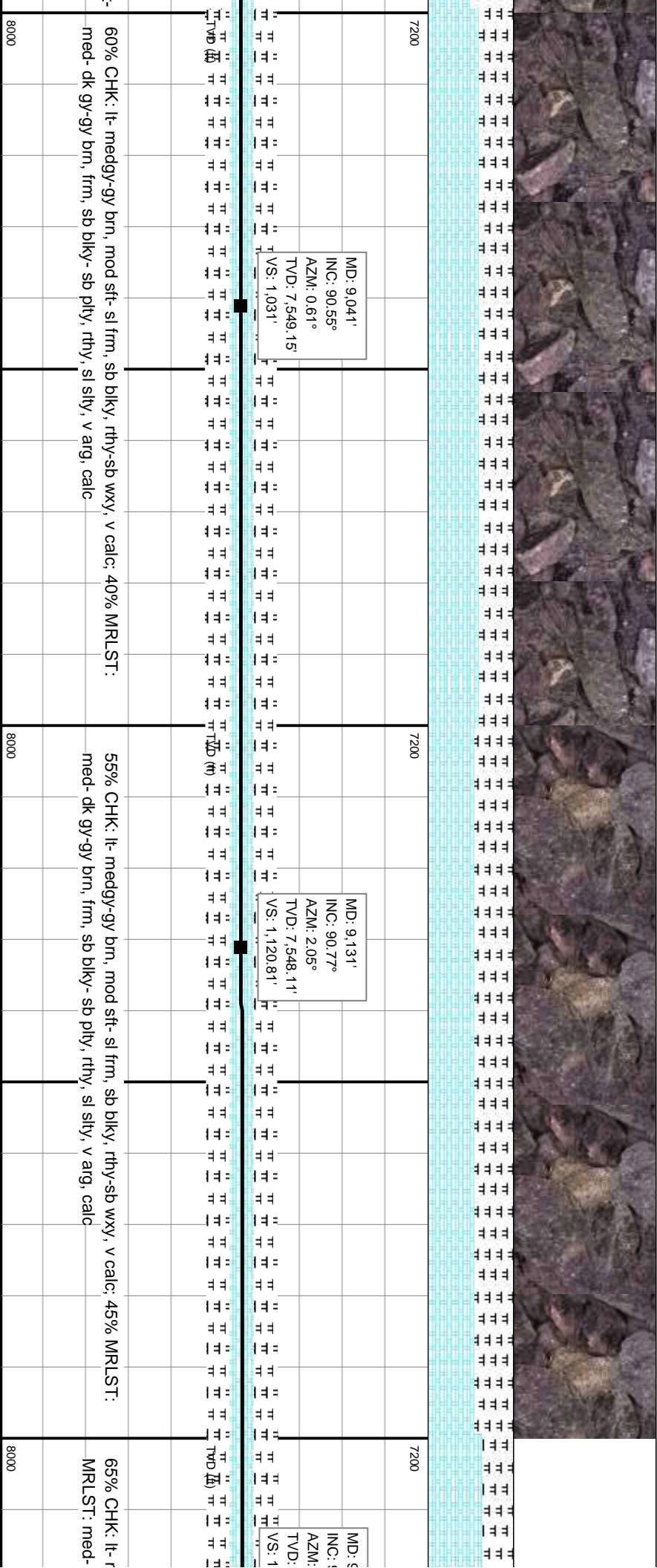
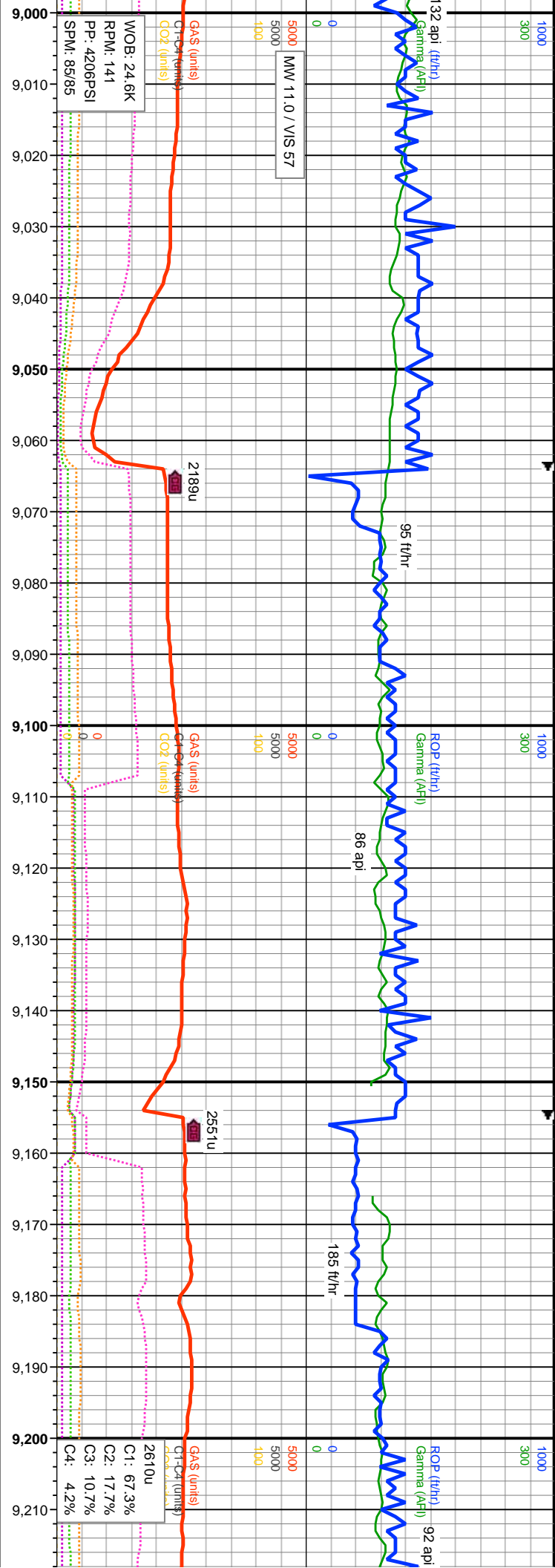


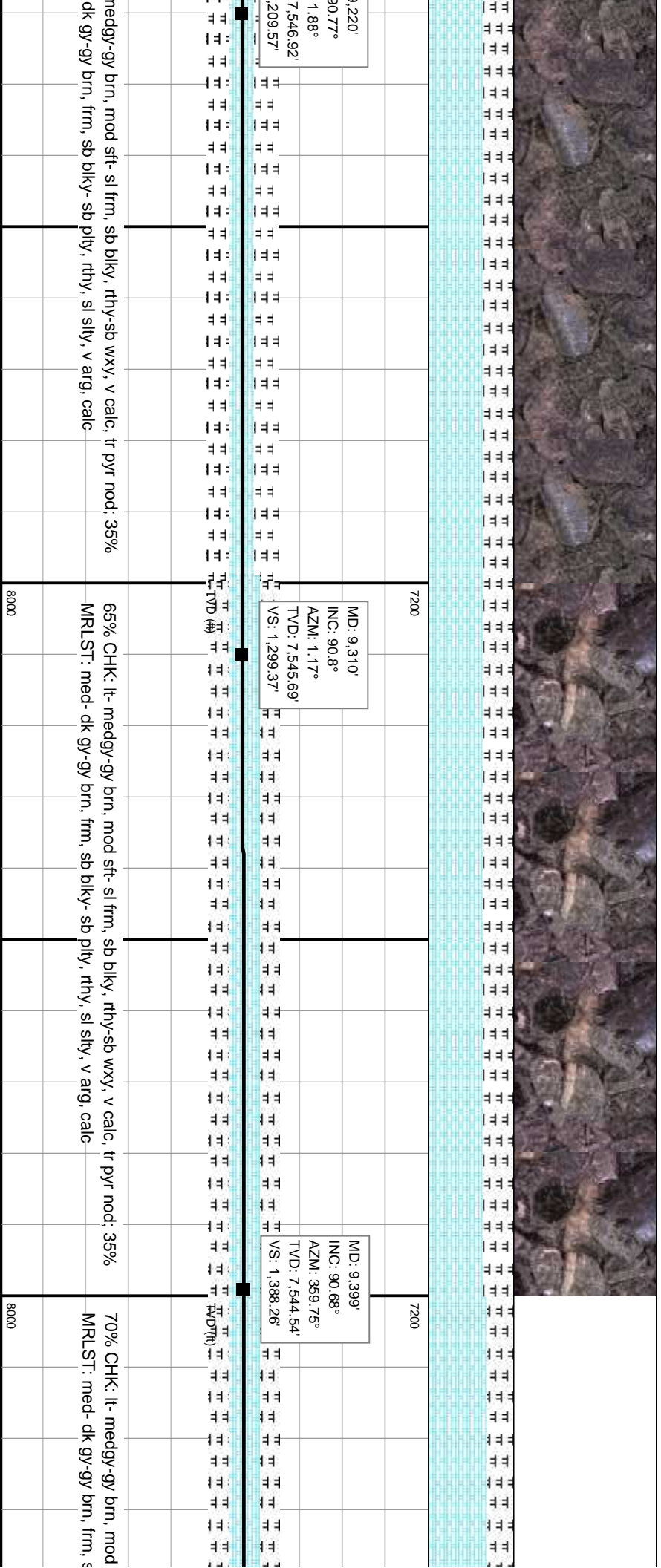
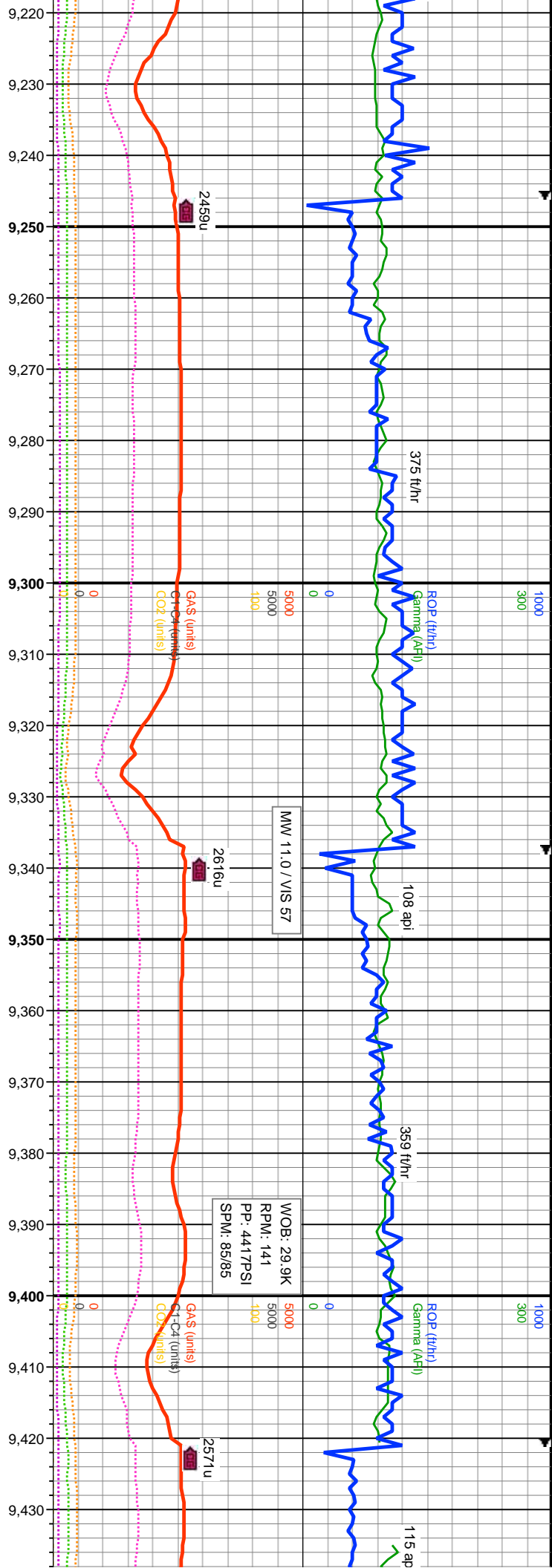


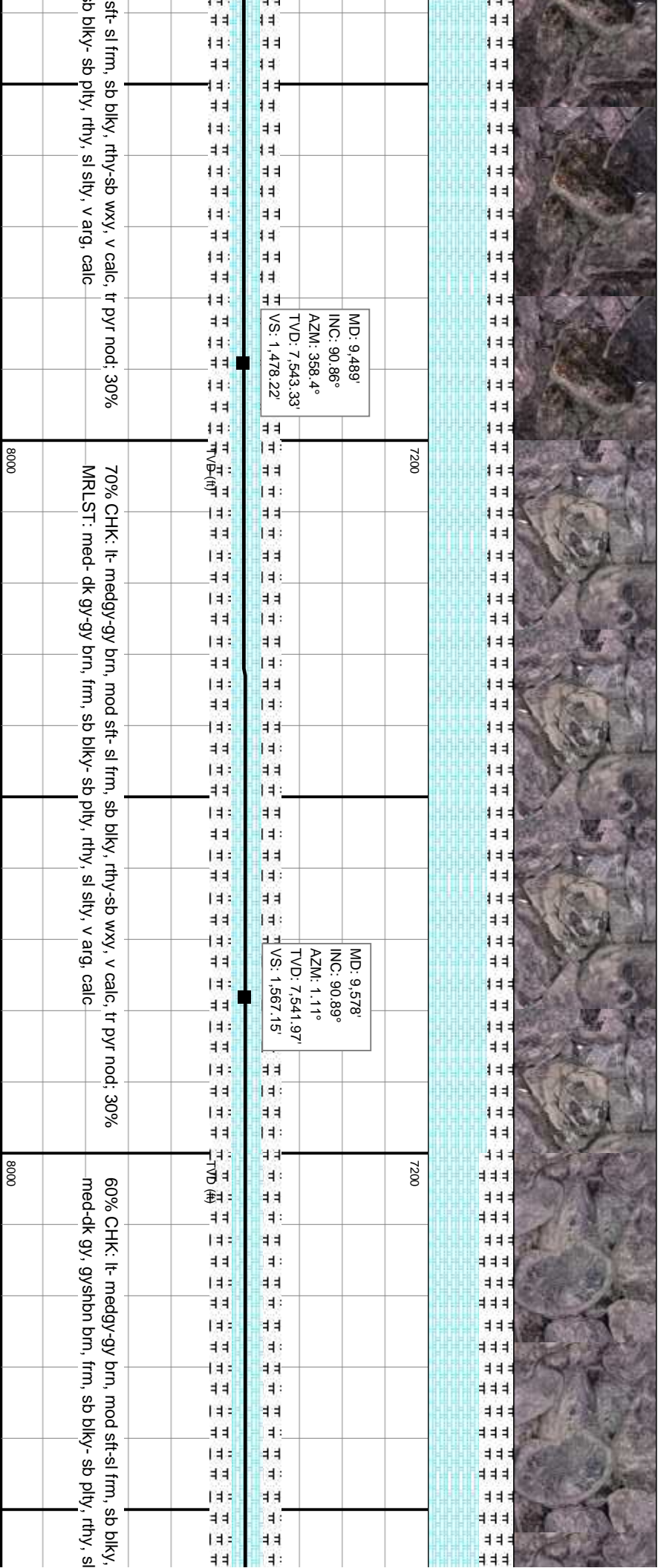
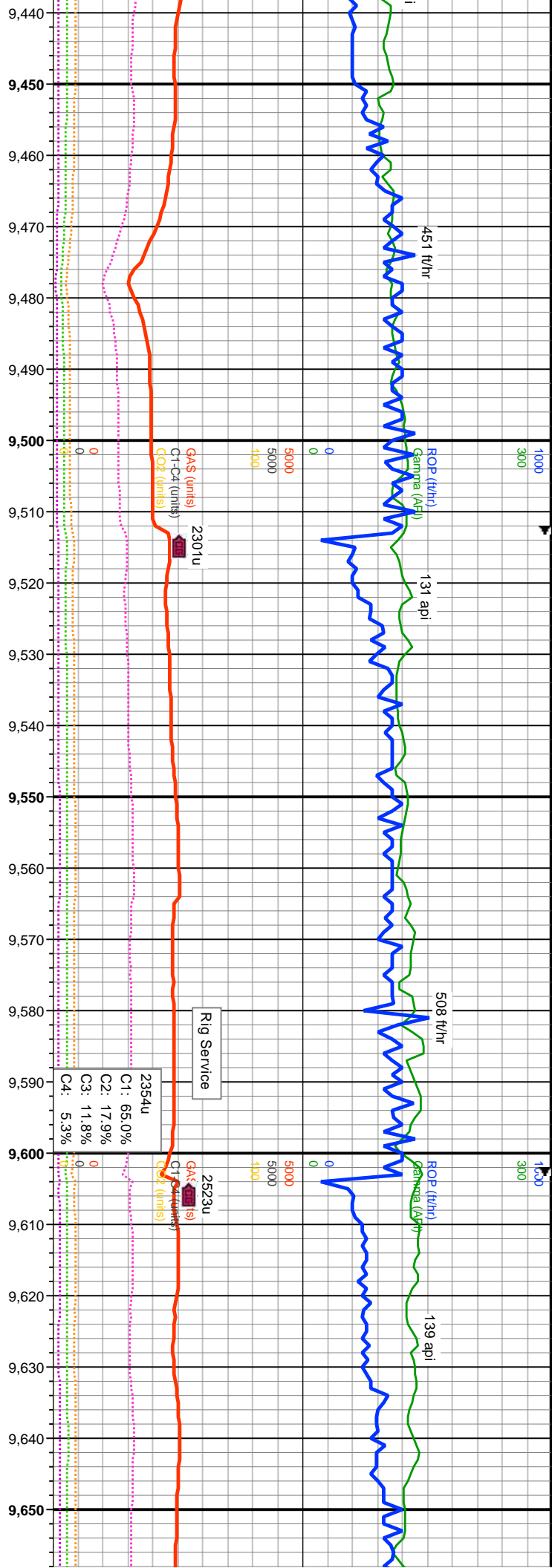


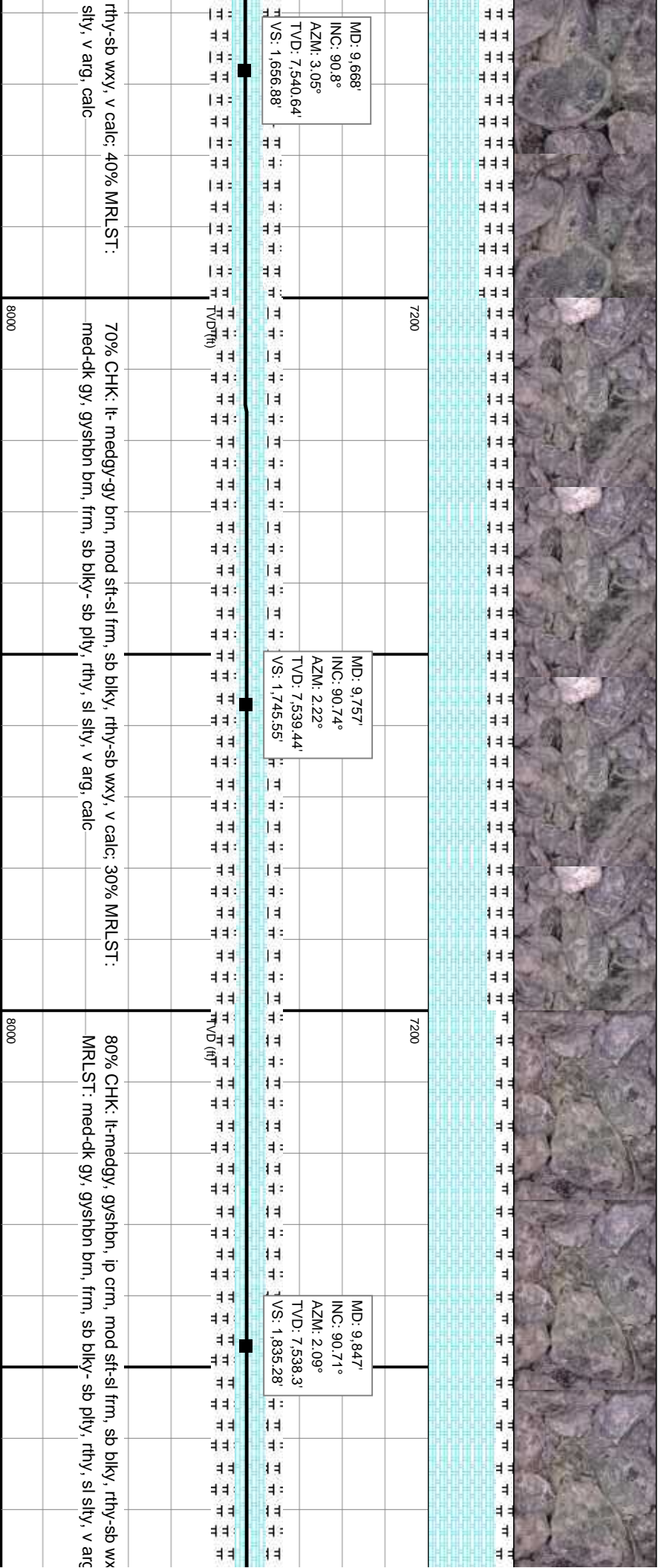
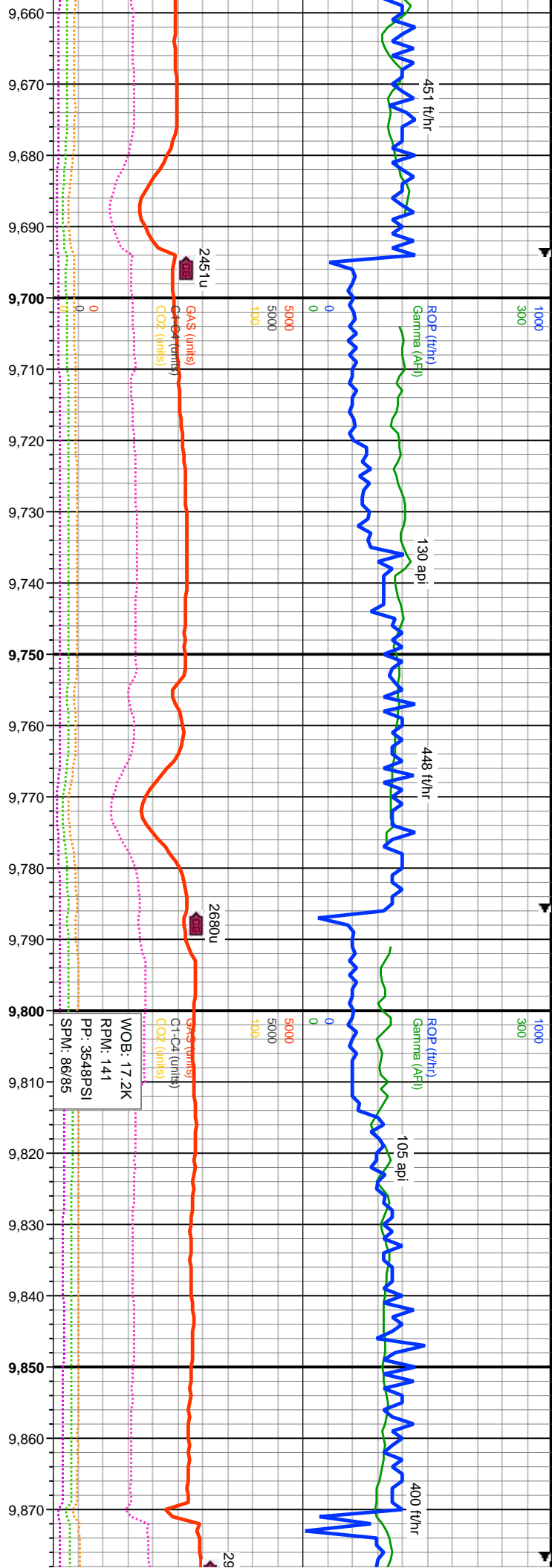


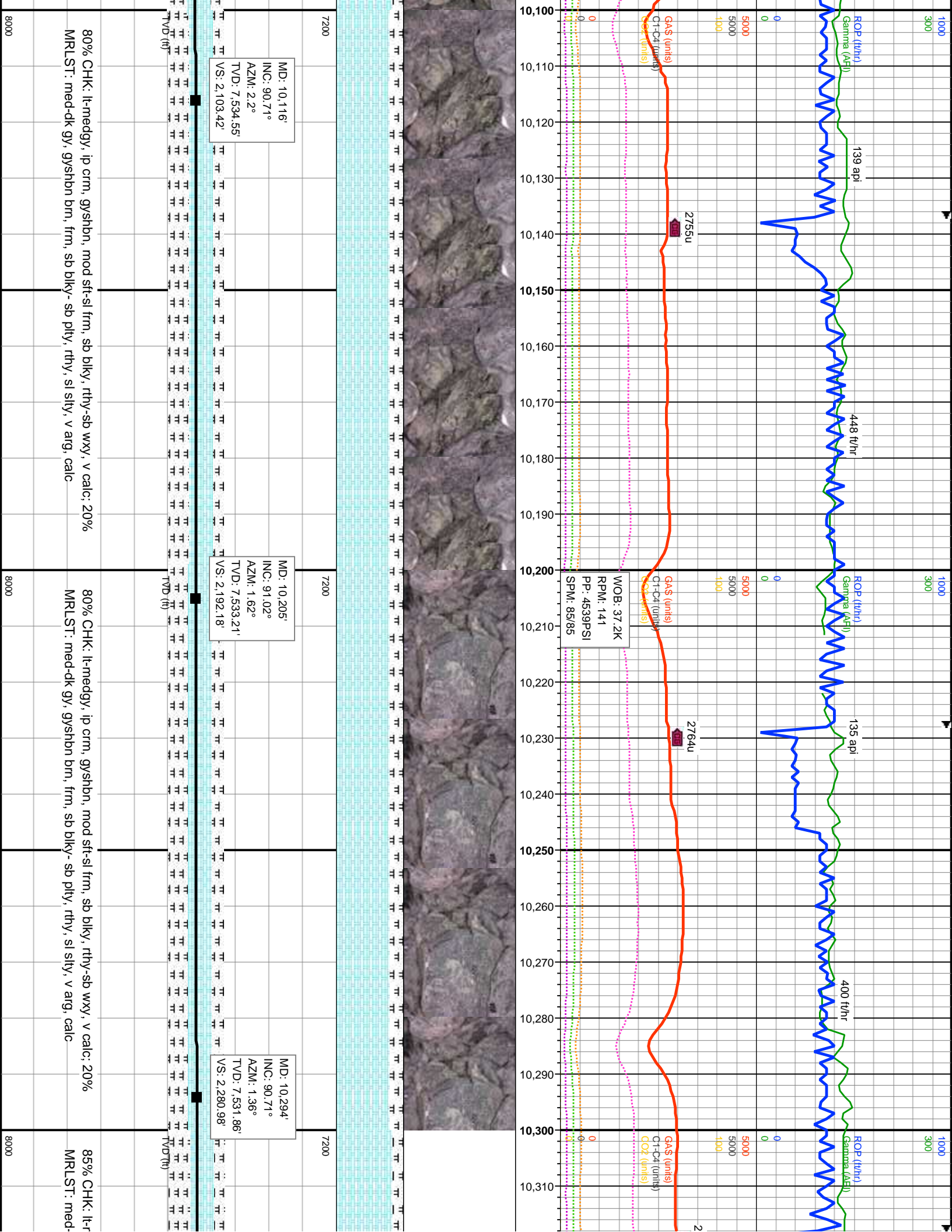


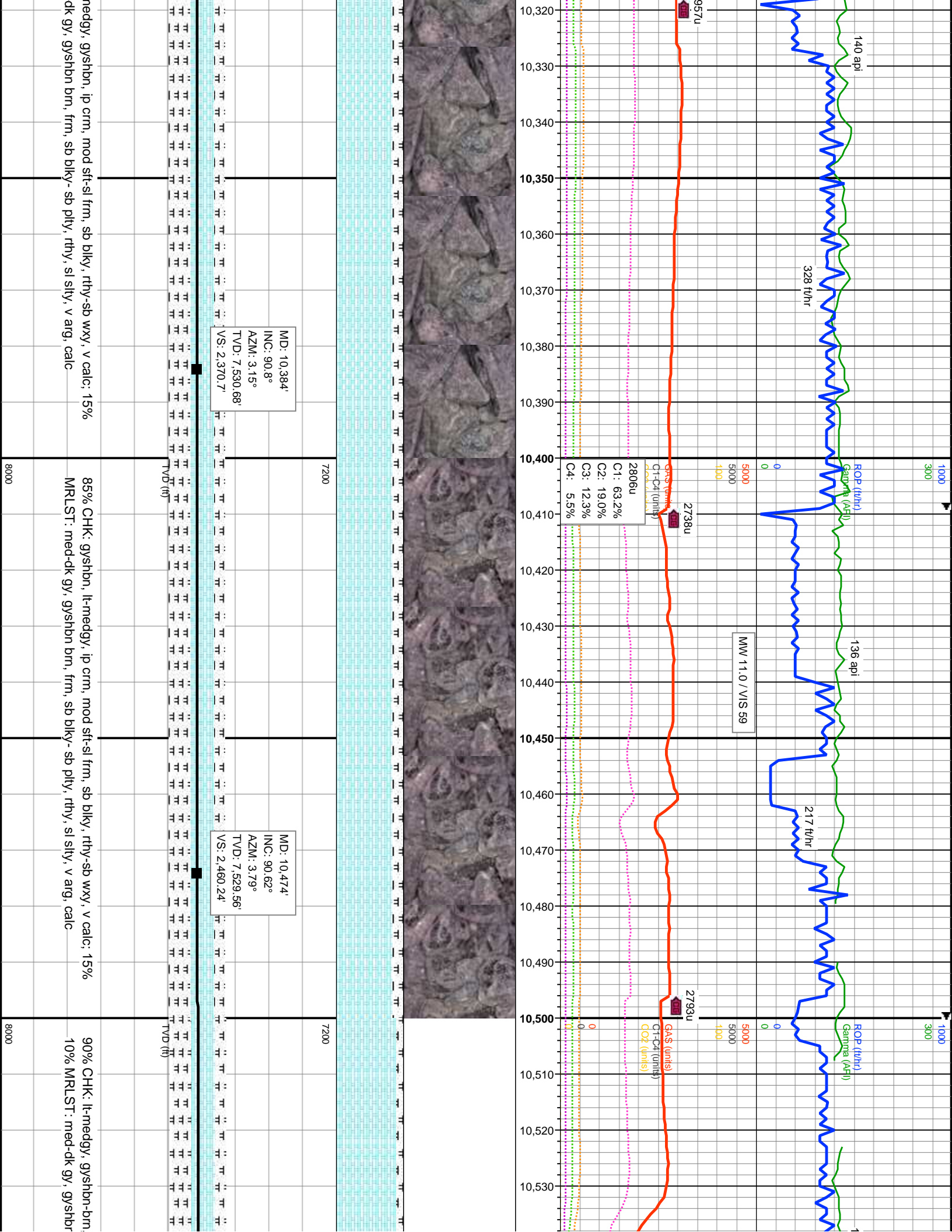


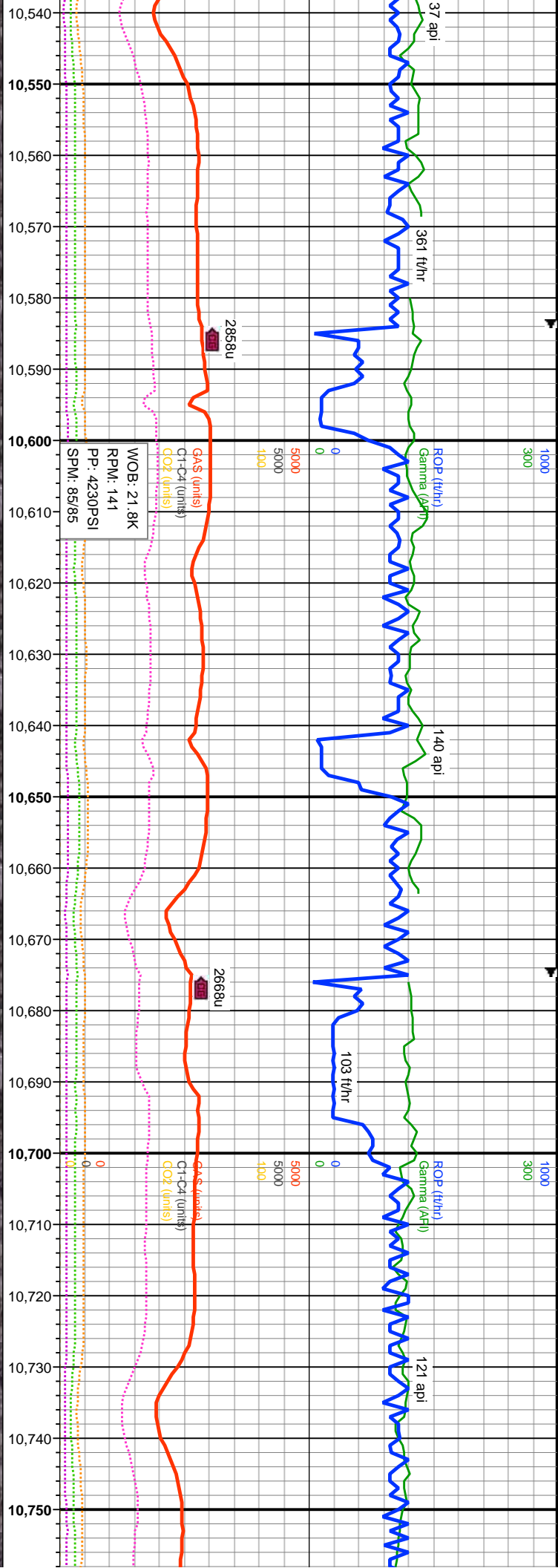








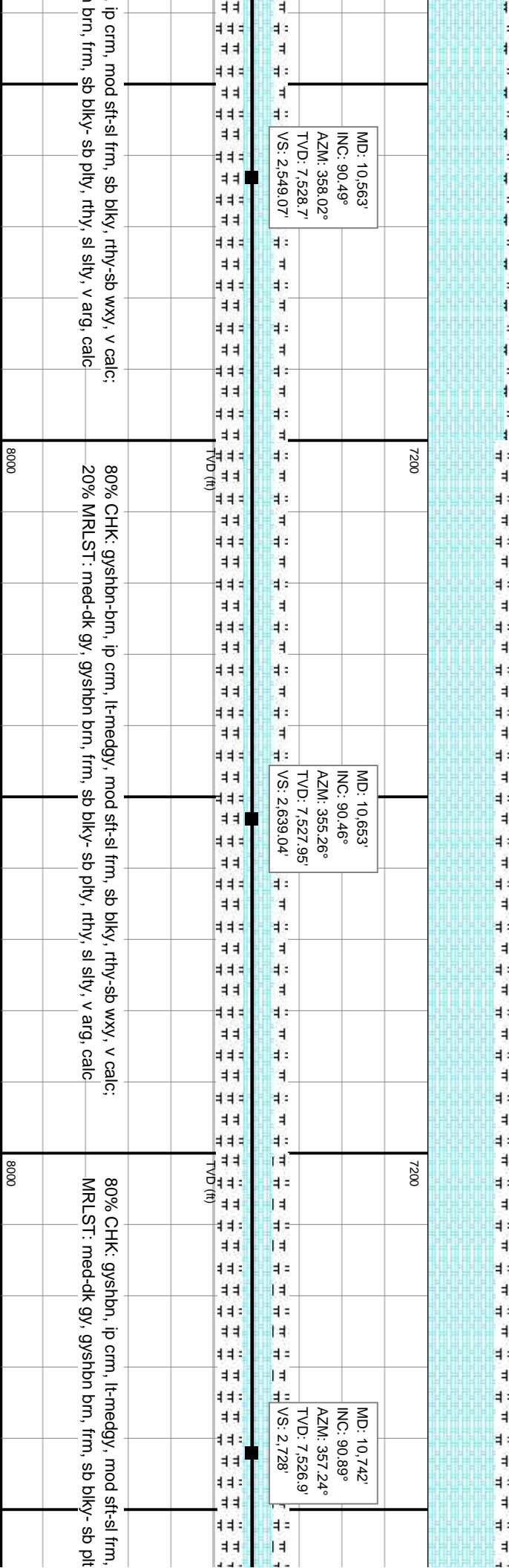


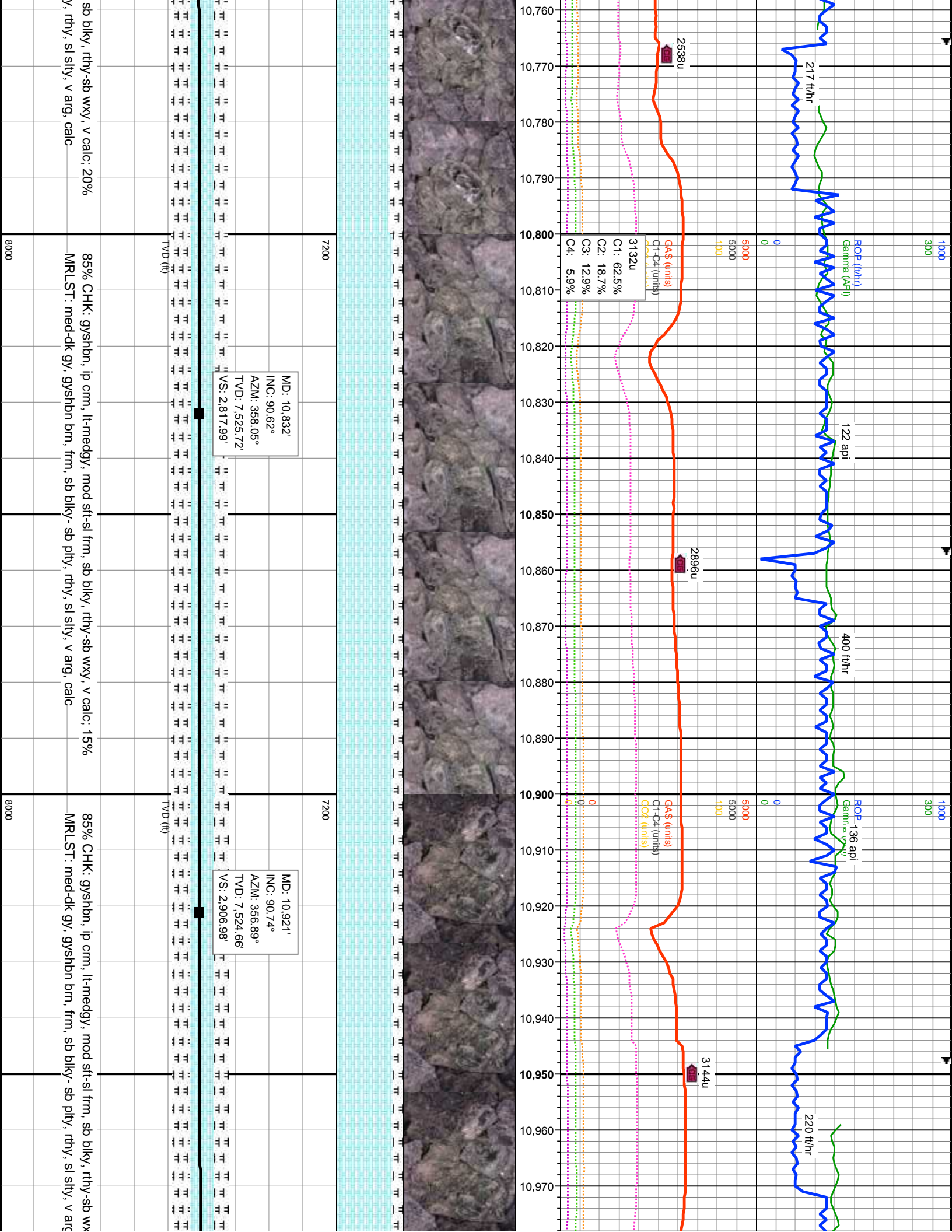


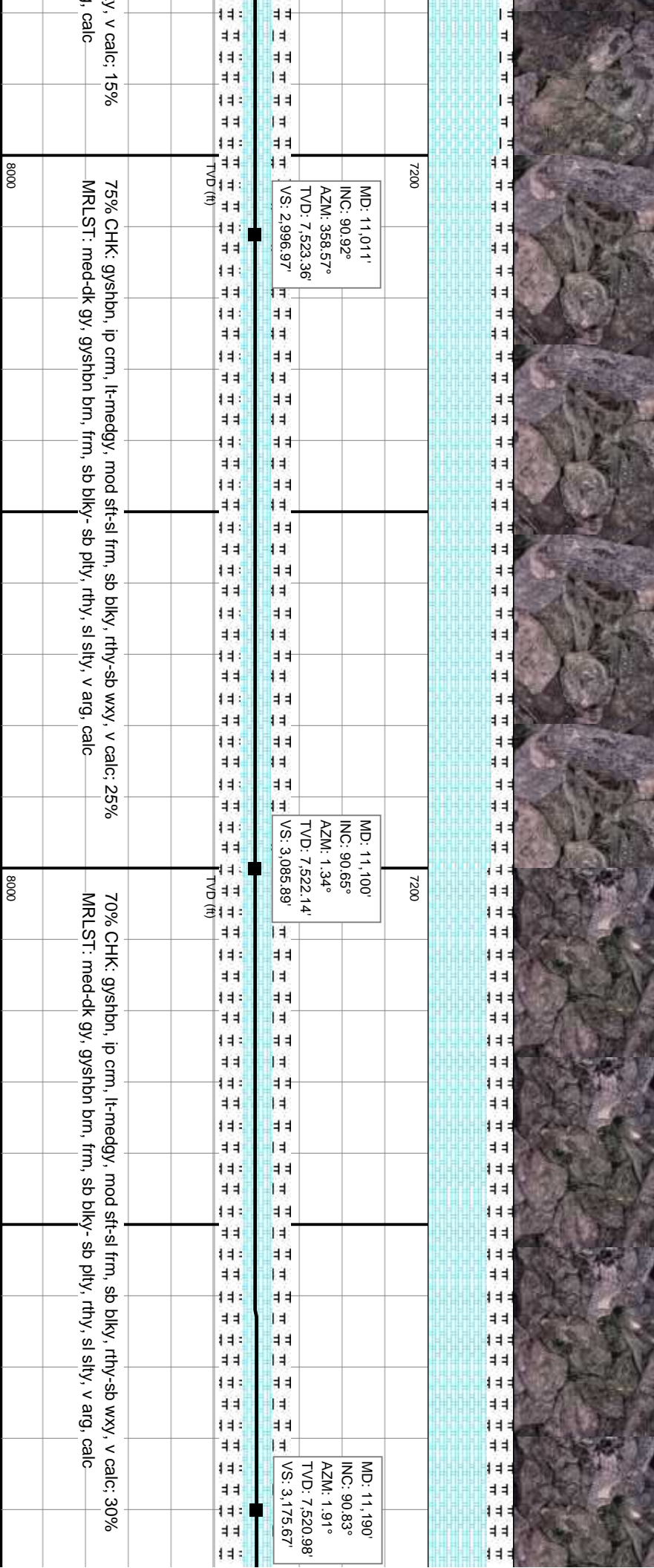
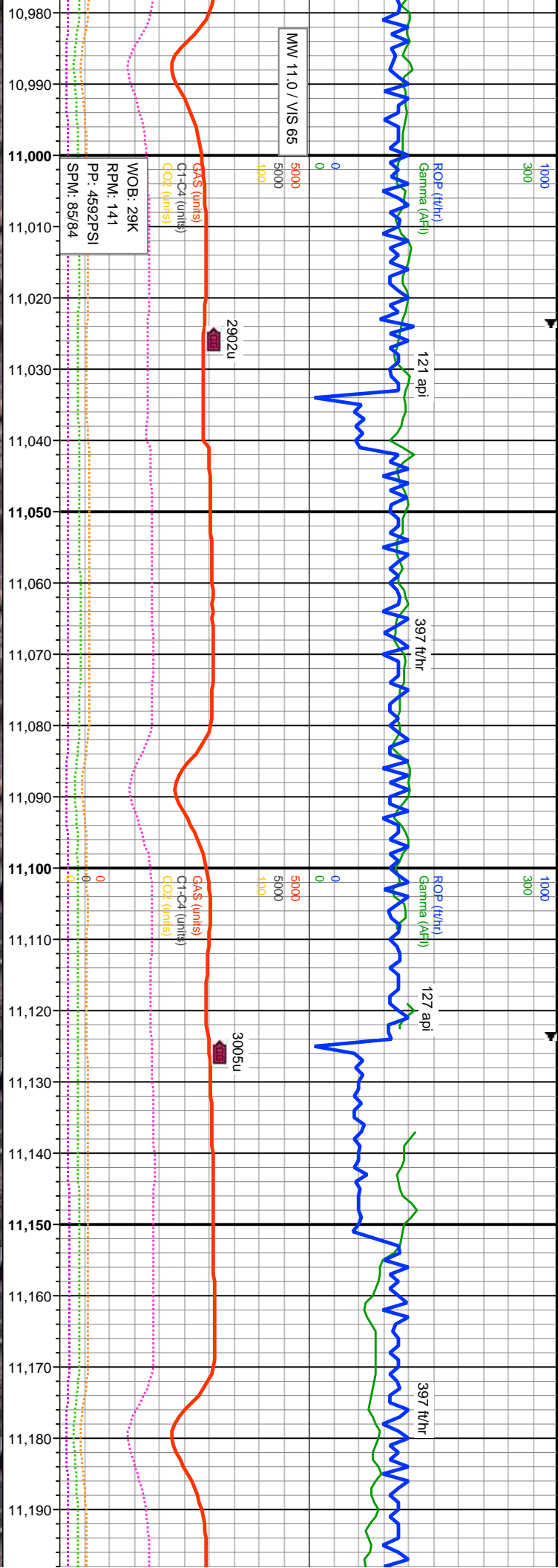
MD: 10.563'
INC: 90.49°
AZM: 358.02°
TVD: 7.528.7'
VS: 2.549.07'

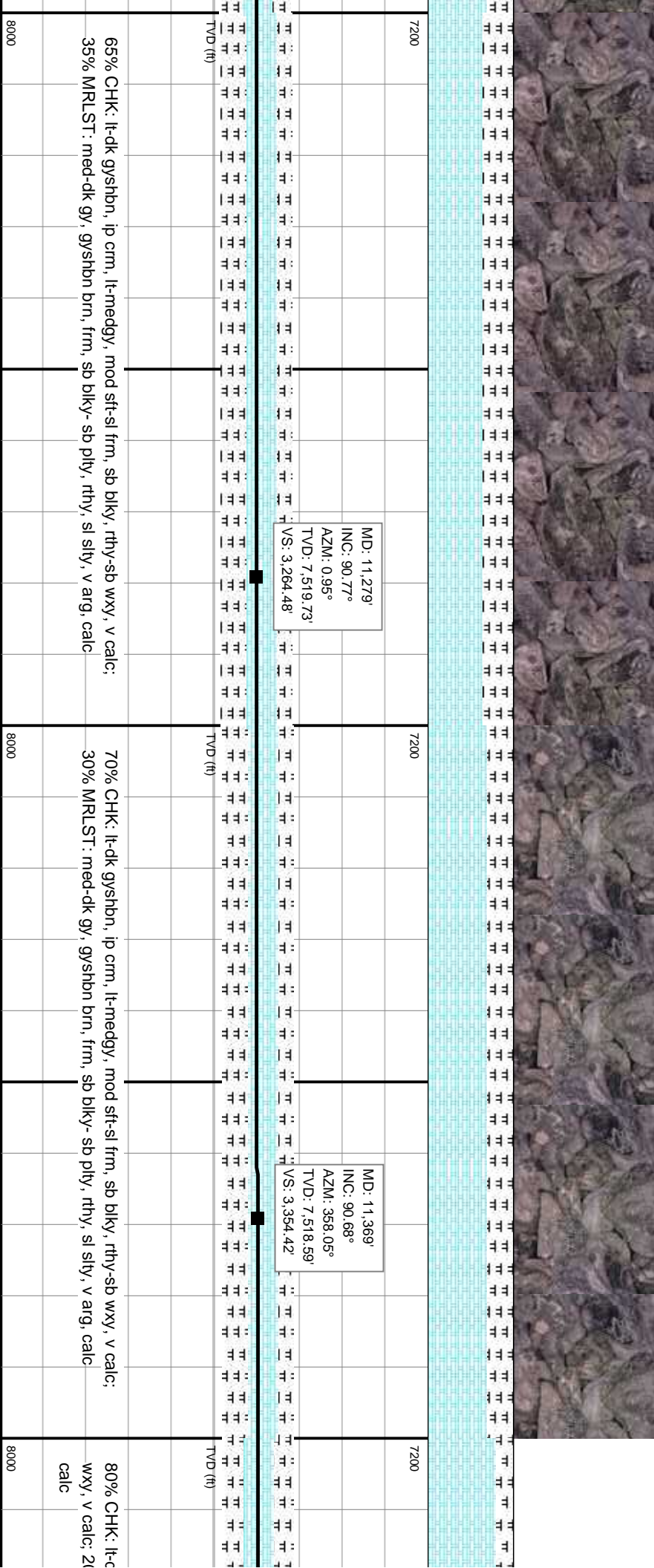
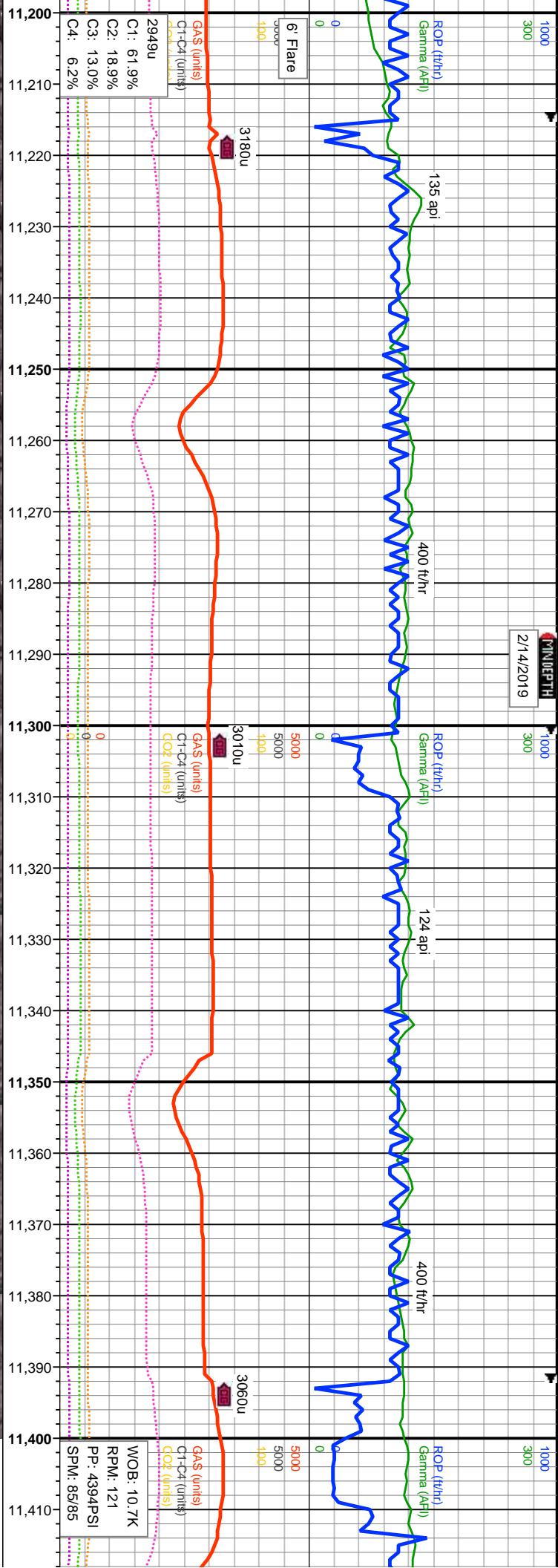
MD: 10.653'
INC: 90.46°
AZM: 355.26°
TVD: 7.527.95'
VS: 2.639.04'

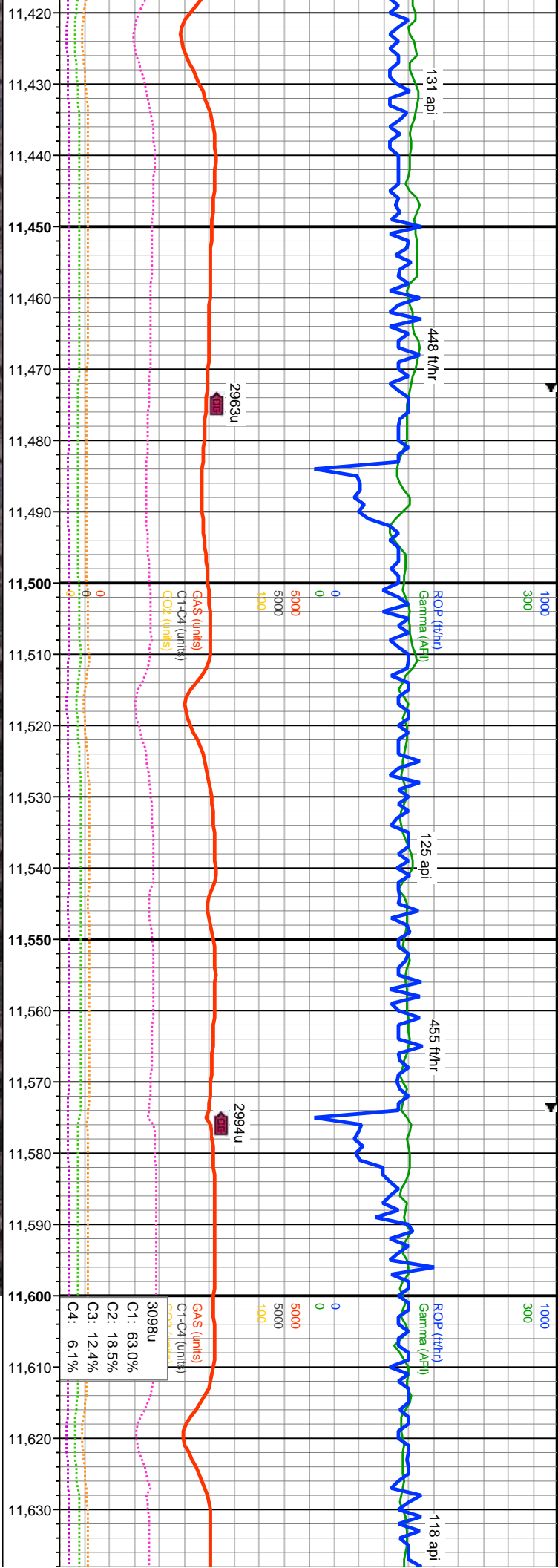
MD: 10.742'
INC: 90.89°
AZM: 357.24°
TVD: 7.526.9'
VS: 2.728'



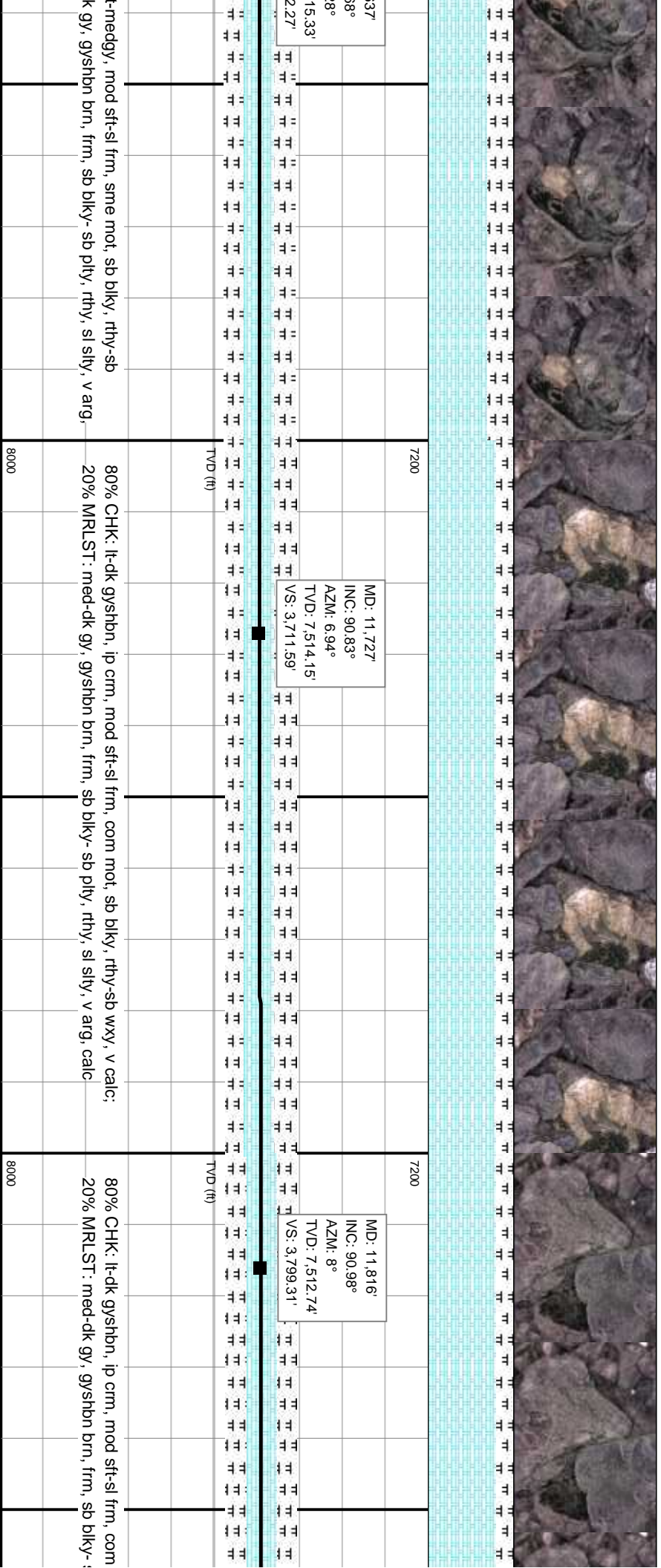
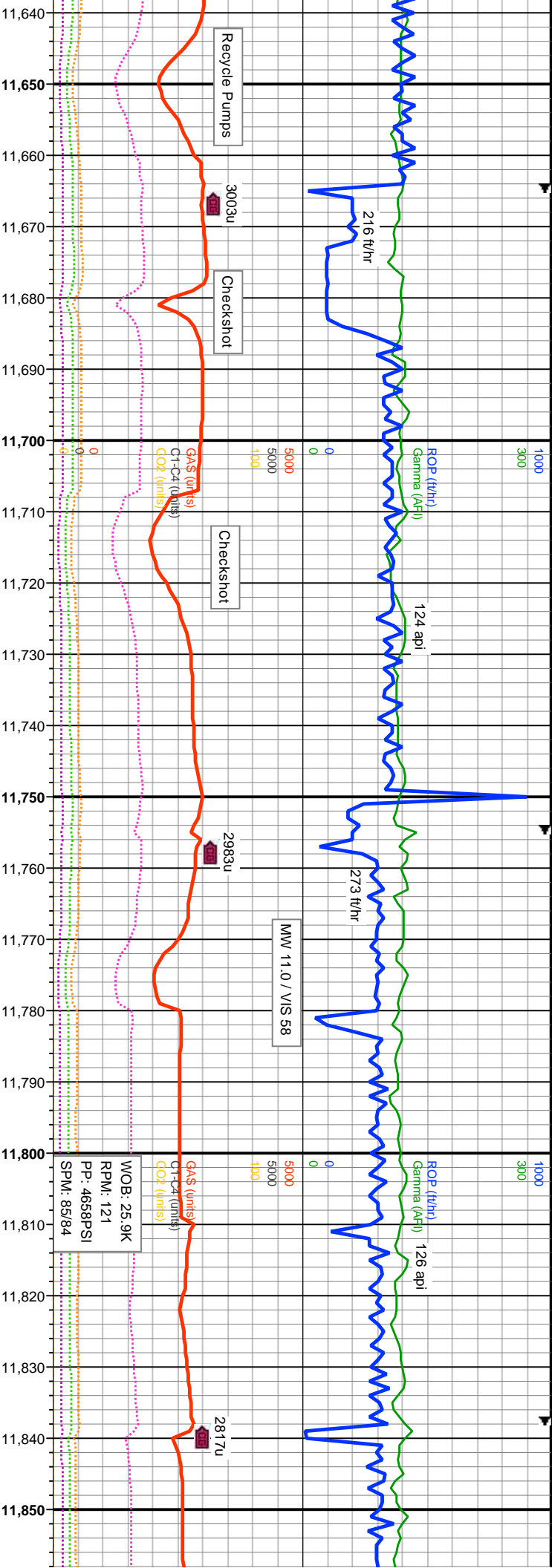


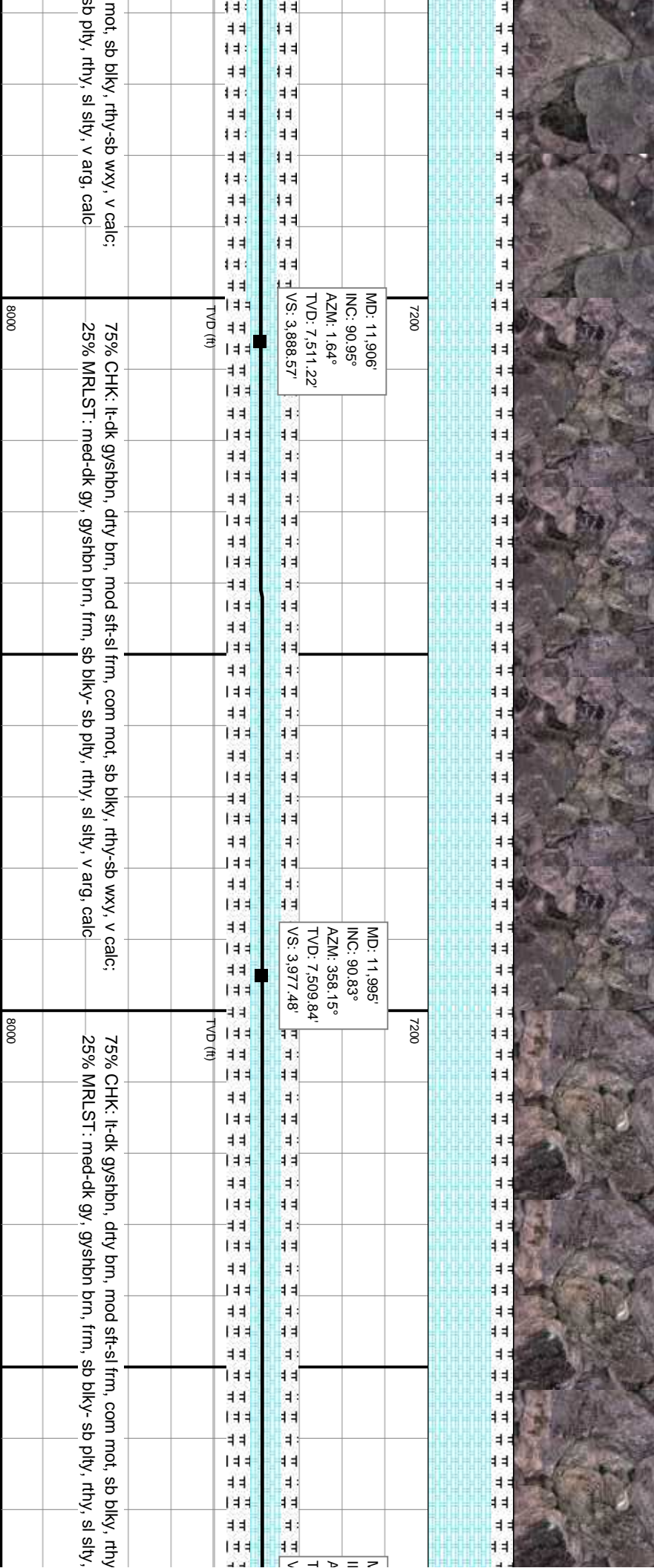
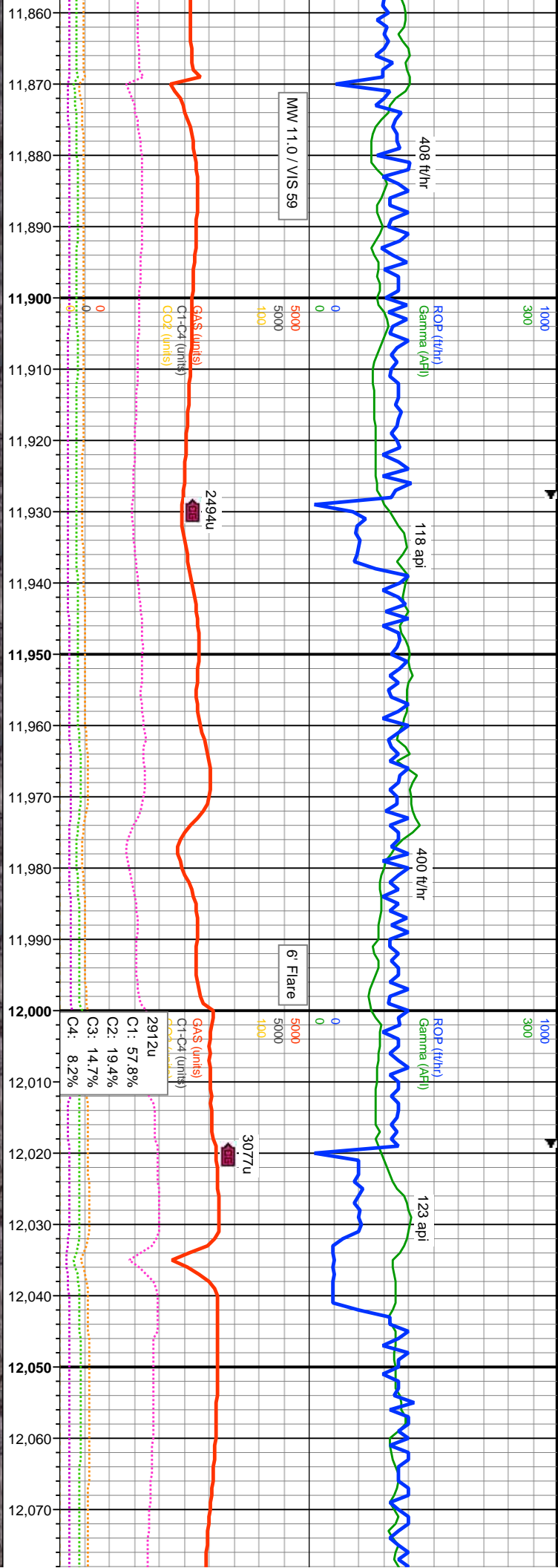


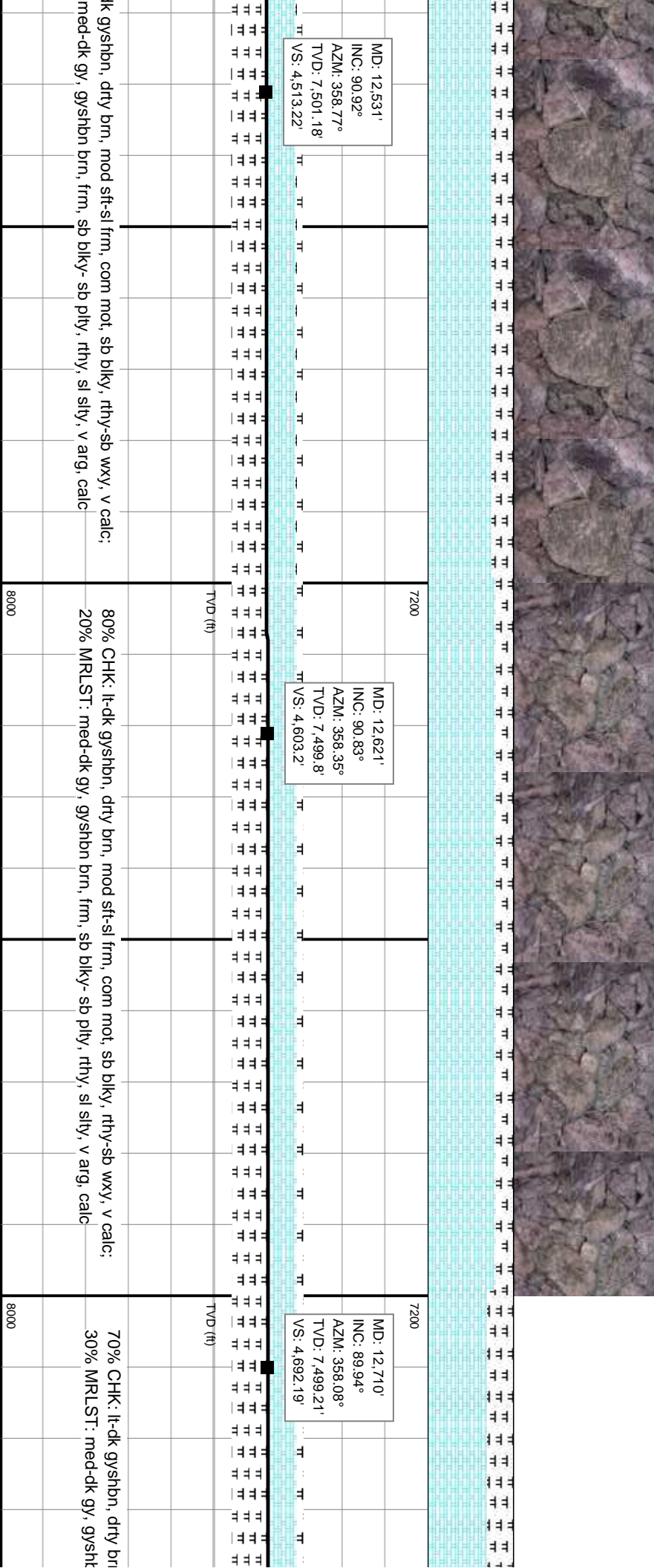
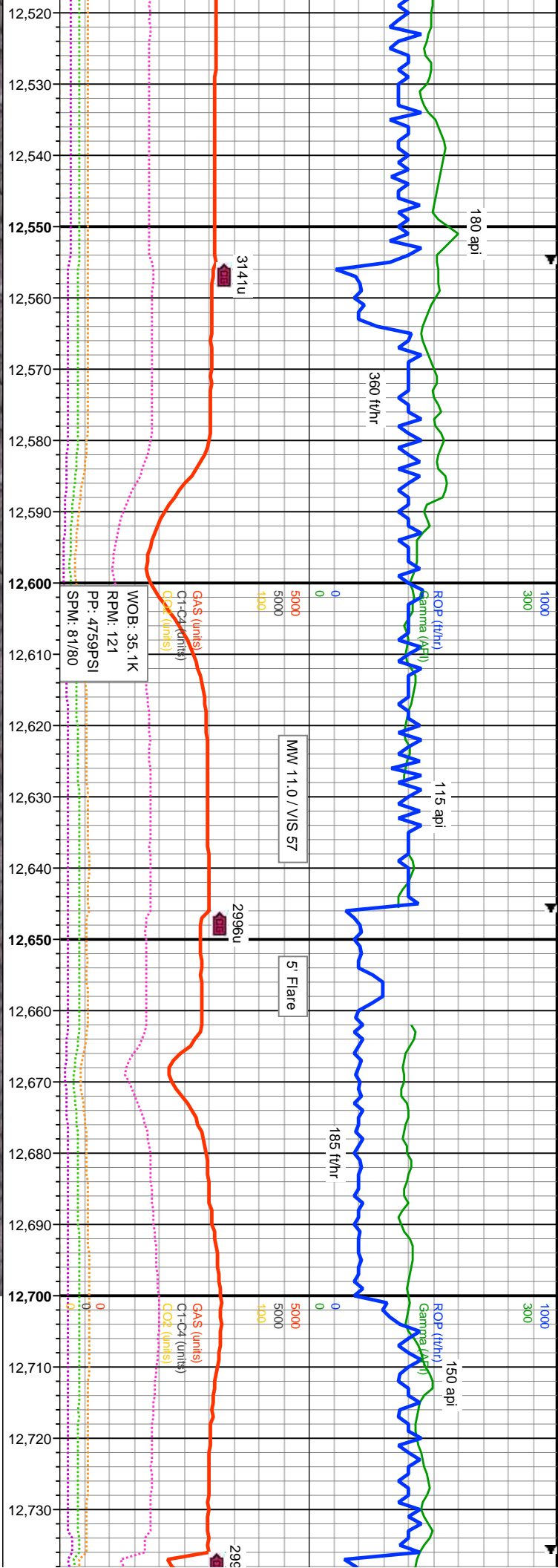




MD: 11,459' INC: 90.92° AZM: 358.1° TVD: 7,517.34' VS: 3,444.41'		MD: 11,548' INC: 90.49° AZM: 359.06° TVD: 7,516.24' VS: 3,533.4'		MD: 11,616' INC: 90.6° AZM: 2.2° TVD: 7,516.24' VS: 3,662'	
80% MRLST: med-dk gy, gysbhn brn, frm, sb blk-y- sb pty, rthy, sl sily, v arg, calc		80% CHK: lt-dk gysbhn, ip cm, lt-medgy, mod sft-sl frm, sme mot, sb blk-y, rthy-sb wxy, v calc; 20% MRLST: med-dk gy, gysbhn brn, frm, sb blk-y- sb pty, rthy, sl sily, v arg, calc		70% CHK: lt-dk gysbhn, ip cm, l wxy, v calc; 30% MRLST: med-d	
TVD (ft)		TVD (ft)		TVD (ft)	
7200		7200		7200	
8000		8000		8000	







80% CHK: lt-dk gysbhn, dty brn, mod sft-sl frm, com mot, sb blkly, rthy-sb wxy, v calc;
20% MRLST: med-dk gy, gysbhn brn, frm, sb blkly-sb ply, rthy, sl slty, v arg, calc

80% CHK: lt-dk gysbhn, dty brn, mod sft-sl frm, com mot, sb blkly, rthy-sb wxy, v calc;
20% MRLST: med-dk gy, gysbhn brn, frm, sb blkly-sb ply, rthy, sl slty, v arg, calc

70% CHK: lt-dk gysbhn, dty brn
30% MRLST: med-dk gy, gysbhn

