



Scale: 5" / 100'  
Measured Depth Log

Well Name Reliance E23-65-1HN

Location NESE 23 6N 65W 6 PM

State COLORADO County WELD

Country UNITED STATES Rig Number HP 326

API Number 05-123-37604 Field WATTENBERG

Region DJ BASIN Drilling Completed 3/16/2015

Spud Date 3/1/2015

Surface Coordinates  
NESE 23 6N 65W 6 PM  
2125 FSL 280 FEL  
Lat/Long: 40.47004/-104.62185

Bottom Hole Coordinates  
Projected  
Sec: 23 Twp: 6N 65W  
2385 FSL 535 FWL

Ground Elevation 4695' K.B. Elevation 4725'  
Logged Interval 800' To 11193' Total Depth 11193'  
Formation A Marl

Operator

Company Noble Energy Inc  
Address 1625 Broadway Suite 2200  
Denver, CO 80202

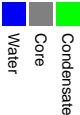
Geologist

Name HOLLY DUNCAN  
Company NOBLE ENERGY INC.  
Address 1625 Broadway Suite 2200  
Denver, CO 80202

Other

Well Site Geologist (Days) Brad Wilson  
Well Site Geologist (Nights) Andrew Martens

Zone Color Coding


























































## Rock Types

[illegible]

## Accessories

# Fossils

Fossils		Stringer	
 GASTROPOD	 ARGILLITE GRAIN	 HEAVY MINERAL	
 INOCERAMUS	 B BENTONITE	 K KAOLIN	
 ALGAE	 O OOLITE	 BITUMINOUS SUBSTANCE	 M MARCASITE
 AMPHIPORA	 O OSTRACOD	 BRECCIA FRAGMENTS	 T MARLSTONE
 BELEMNITE	 P PELECYPOD	 C CALCAREOUS	 U MICACEOUS
 BIOCLASTIC	 P PELLET	 F CARBONACEOUS FLAKES	 K MINERAL CRYSTALS
 BRACHIOPOD	 P PISOLITE	 CHTDK	 N NODULES
 BRYOZOA	 P PLANT REMAINS	 CHTLT	 P PHOSPHATE PELLETS
 CEPHALOPOD	 S PLANT SPORES	 C COAL - THIN BEDS	 P PYRITE
 CORAL	 S SCAPHOPOD	 D DOLOMITIC	 B SALT CAST
 CRINOID	 S STROMATOPOROID	 F FELDSPAR	 S SANDY
 ECHINOID		 F FERRUGINOUS PELLET	 S SIDERITE
 FISH		 F FERRUGINOUS	 S SILICEOUS
 FORAMINIFERA		 G GLAUCONITE	 S SILTY
 F FOSSIL	 A ARGILLACEOUS	 G GYPSIFEROUS	 T TUFFACEOUS

## Oil Show

✓ VUGGY





































# Engineering

- EVEN
- QUESTIONABLE
- BIT
- SPOTTED STAINING
- ▲ CONNECTION (UP)

## Porosity

✱ CONNECTION (DOWN)	CONNECTION GAS	CONNECTION GAS	E EARTHY	POROSITY
TRIP GAS	TRIP GAS (LEFT)	F FRACTURE	FENESTRAL	
DOWN TIME GAS	DOWN TIME GAS	✱ INTERCRYSTALLINE	✱ INTERMOLDIC	
DOWN TIME GAS	DOWN TIME GAS	✱ INTERMOLDIC	✱ INTERMOLDIC	
CORE - LOST	CORE - LOST	✱ CORE - LOST	✱ CORE - LOST	
CORE - RECOVERED	CORE - RECOVERED	✱ CORE - RECOVERED	✱ CORE - RECOVERED	

Other Symbols

	DST INTERVAL		WIRELINE TESTED - LEFT		E EARTHY
	FAULT		WIRELINE TESTED - RT		FX FINELYXLN
	FORMATION TOP		DRILL STEM TEST		GS GRAINSTONE
	GAS SHOW		MINDEPTH MN DEPTH		L LITHOGRAPHIC
	OIL SHOW				MX MICROXLN
	MINDEPTH MN DEPTH UP	<b>Rounding</b>			
	MINDEPTH MN DEPTH (DOWN)		ANGULAR		PS PACKSTONE
	NORMAL FAULT		ROUNDED		WS WACKESTONE
	(LEFT) OVERTURNED STRATA		SUBANG		
	REVERSE FAULT		SUBRND	<b>Sorting</b>	
	CASING				M MODERATE
<b>Textures</b>					
	SIDEWALL CORE (LEFT)				P POOR
	SIDEWALL CORE (RIGHT)		BS BOUNDSTONE		W WELL
	SLIDE		CHALKY		
	SURVEY		CRYPTOXLN		

Slide/Rotate

ROP  
ROP  
GAMMA

COLUMBINE LOGGING RIGGED UP ON  
3/13/15 MANNED 2-PERSON

ROP DATA IMPORTED FROM PASON EDR

Total Gas & Chromatograph

GAS  
C1  
C2  
C3  
C4

Mudlog Continued From "Reliance  
E23-65-1HN Vert.mplot"

GAS DATA FROM BLOODHOUND  
CHROMATOGRAPH UNIT #312 JOB NUMBER  
211 via IBALL GAS CHART DATA BASE  
"Reliance\_E23\_65\_1HN.mdb"

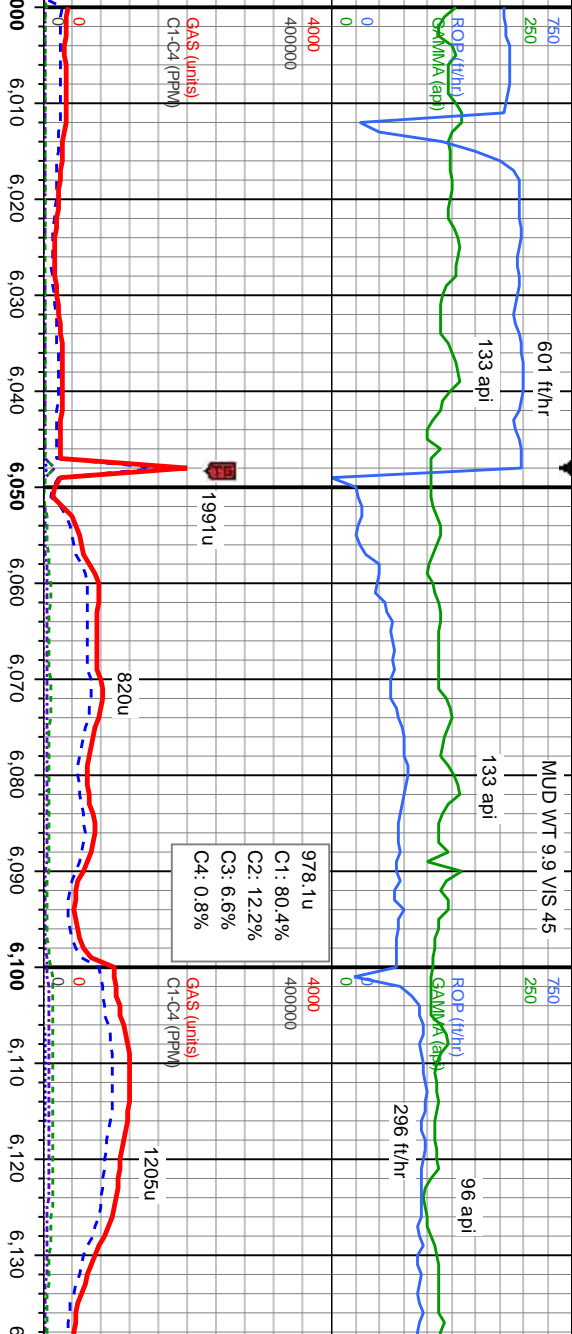
Depth Labels

% Lith

Well Bore  
TVD

Oil Show

Images



Survey and Gamma Data Provided by  
Ensign Directional Services

TVD (ft)

TOOH for Tools @ 6048MD  
21:37 MDT 3/13/2015  
Resumed drilling @ 06:00 MDT 3/14/15

MD: 6.090'  
TVD: 6.06455  
Inclination: 6.4°  
Azimuth: 282.5°  
VS: -209.84

TVD (ft)

SLTY SH: med gy- occ dk gy-lt gy, sb blk-  
ply occ ply, sl sft- frm, slt tex, sl rthy lstr, aren,  
ip arg, non calc  
SHY SLTST: gy - lt gy, sl sft - v sft, ply-sb blk,  
f-v f gr, sl gr - sl rthy tex

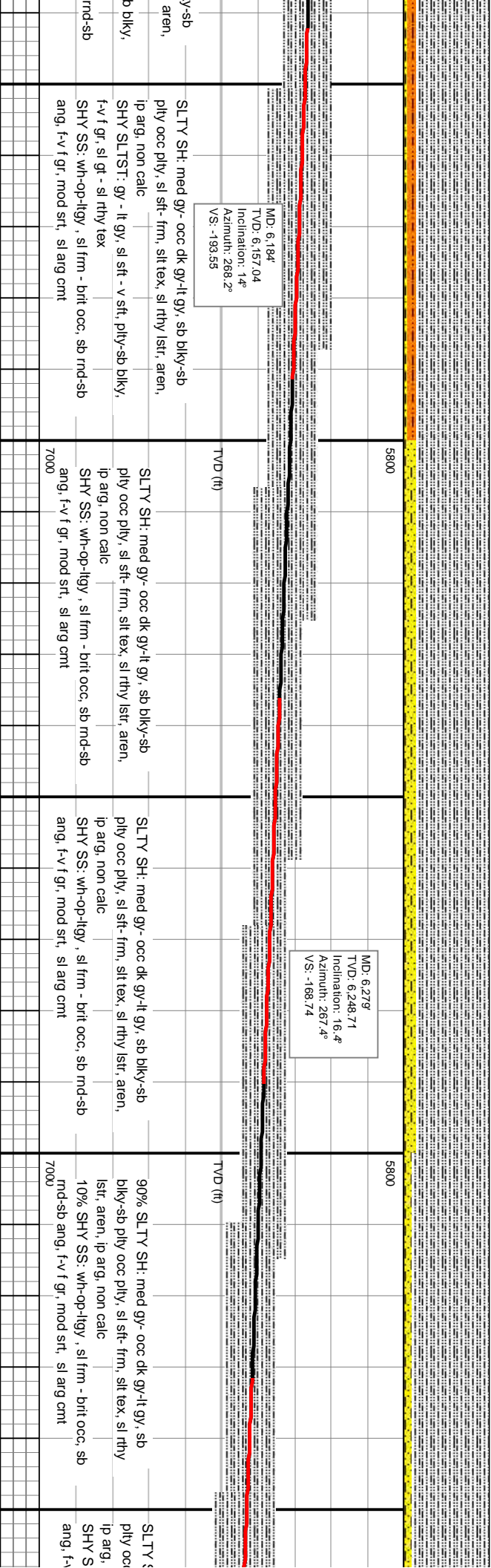
SLTY SH: med gy- occ dk gy-lt gy, sb blk-  
ply occ ply, sl sft- frm, slt tex, sl rthy lstr, aren,  
ip arg, non calc  
SHY SLTST: gy - lt gy, sl sft - v sft, ply-sb blk,  
f-v f gr, sl gr - sl rthy tex

SLTY SH: med gy- occ dk gy-lt gy, sb blk  
ply occ ply, sl sft- frm, slt tex, sl rthy lstr,  
ip arg, non calc  
SHY SLTST: gy - lt gy, sl sft - v sft, ply-s  
f-v f gr, sl gr - sl rthy tex  
SHY SS: wh-op-llgy, sl frm - brt occ, sb  
ang, f-v f gr, mod str, sl arg cmt

EGMT  
ST



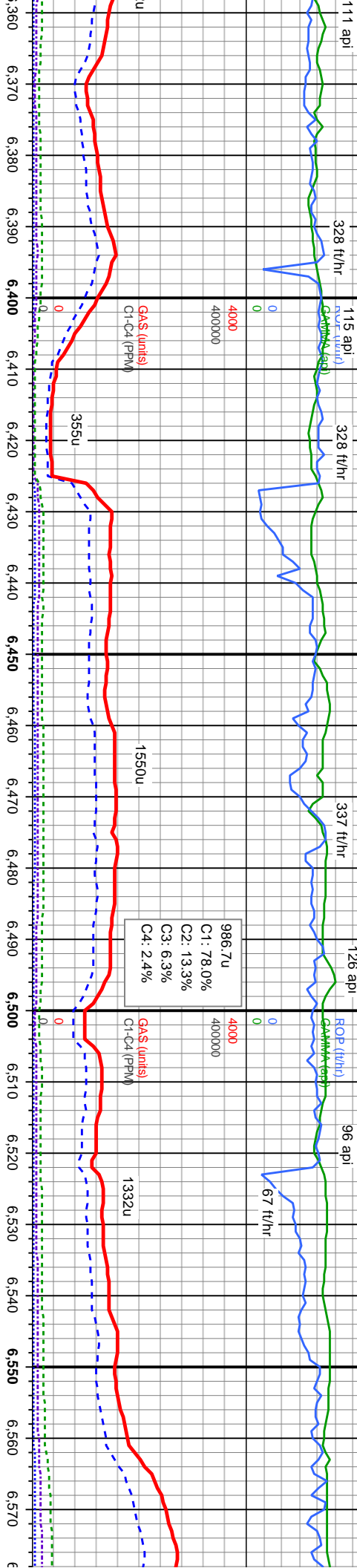






MUD WT 10.5 VIS 45  
OUT WT 10.1 VIS 40

MUD WT 10.5 VIS 43  
OUT WT 10.7 VIS 40



MD: 6.373  
TVD: 6.337.73  
Inclination: 21°  
Azimuth: 268.9°  
VS: -138.7

MD: 6.468  
TVD: 6.425.28  
Inclination: 24.7°  
Azimuth: 272.9°  
VS: -101.88

MD: 6.562  
TVD: 6.506.23  
Inclination: 36°  
Azimuth: 275°  
VS: -54.45

SH: med gy- occ dk gy-it gy, sb blk- sb  
p ply, sl sft- frm, slt tex, sl rthy lstr, aren,  
non calc  
S: wh-op- llyy , sl frm - brit occ, sb rnd-sb  
f gr, mod srl, sl arg cmt

90% SLTY SH: med gy- occ dk gy-it gy, sb  
blk- sb ply occ ply, sl sft- frm, slt tex, sl rthy lstr,  
aren, lp arg, non calc  
10% SHY SS: wh-op- llyy , sl frm - brit occ, sb  
rnd-sb ang, f-v f gr, mod srl, sl arg cmt

90% SLTY SH: med gy- occ dk gy-it gy, sb  
blk- sb ply occ ply, sl sft- frm, slt tex, sl rthy lstr,  
aren, lp arg, non calc  
10% SHY SS: wh-op- llyy , sl frm - brit occ, sb  
rnd-sb ang, f-v f gr, mod srl, sl arg cmt

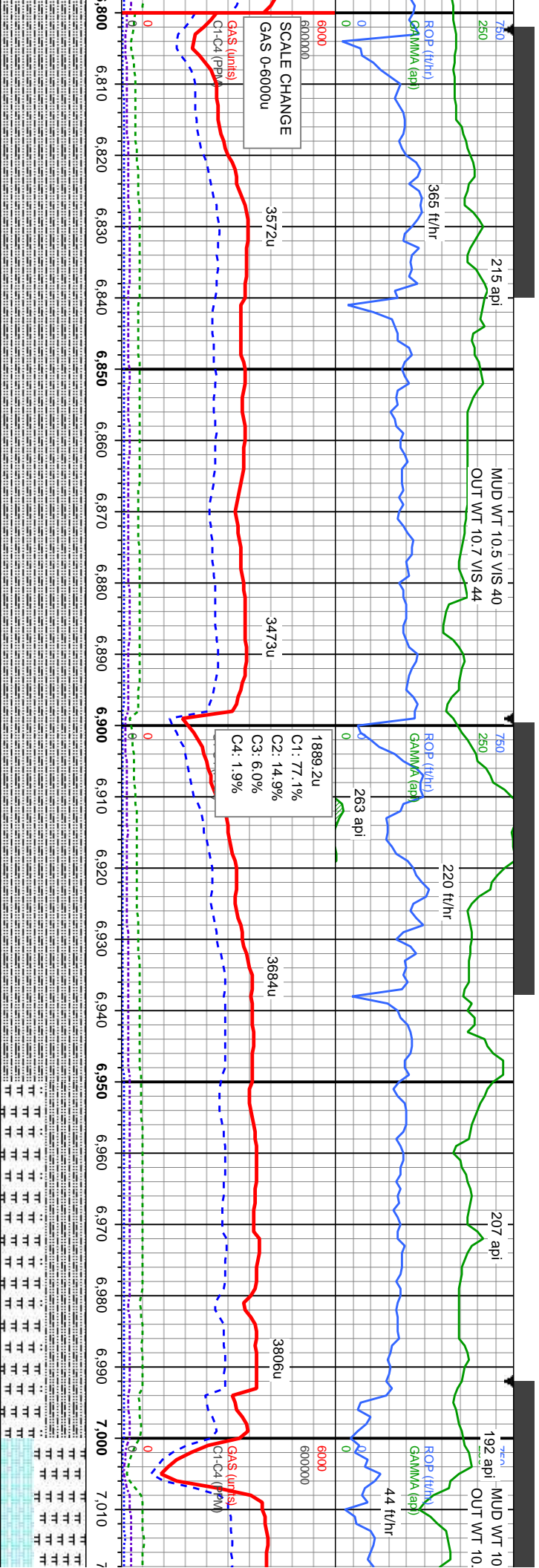
100% SLTY SH: med gy occ lt gyshbn, sb  
blk- sb ply occ ply, sl sft- frm, slt tex, sl rthy  
lstr, aren, lp arg, non calc, no bent, rr ss

100% SLTY SH: med gy occ  
blk- sb ply occ ply, sl sft- frm  
lstr, aren, lp arg, non calc, n









5800	100% SLTY SH: med -dk gy, sb blk-y-sb pily occ pily, sl sft-frm, slit tex, sl rthy lstr, aren, ip arg, non calc, tr bent	5800	100% SLTY SH: med -dk gy, sb blk-y-sb pily occ pily, sl sft-frm, slit tex, sl rthy lstr, aren, ip arg, non calc, abnt bent
TVD (ft)		TVD (ft)	
MD: 6,846' TVD: 6,671.61' Inclination: 67.1° Azimuth: 268.7° VS: 171.6		MD: 6,940' TVD: 6,704.37' Inclination: 72.1° Azimuth: 267.4° VS: 259.4	

7000		7000	
Sharon Springs Marker 6904' MD / 6691' TVD		Niobrara/Chalk 7004' MD / 6722' TVD	





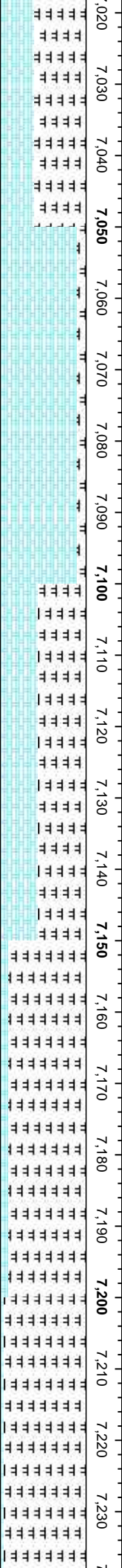
55 VIS 44  
55 VIS 41  
MUD WT 10.55 VIS 44  
185 api

ROP (ft/hr)  
GAMMA (api)  
274 ft/hr  
246 ft/hr  
226 ft/hr  
214 ft/hr  
80 api

4434u  
4680u  
4309u  
4094u  
4375u

3781.6u  
C1: 75.2%  
C2: 15.6%  
C3: 6.8%  
C4: 2.4%

3781.6u  
C1: 75.2%  
C2: 15.6%  
C3: 6.8%  
C4: 2.4%



dk gy - blk, sb blk, sft - sl frm, mot, v calc  
gy brn, sb blk, sl sft, v mot, sl ags, occ bent, abnt pyr  
90% CHK: gy brn-med gy, sb blk, v sft, sl mot, sl wxy, v calc  
10% MRLST: med-dk gy - blk, sb blk, sft - sl frm, rthy - sl sily, arg, sl mot, v calc, occ pyr  
MRLST: med-dk gy - silver, sb blk, sft - sl frm, sl silver lstr, occ rthy, sl sily tex, arg, sl mot, v calc  
CHK: gy brn-med gy, sb blk, v sft, sl mot, sl wxy, v calc, occ bent  
90% MRLST: med-dk gy - silver, sb blk, sft - sl frm, sl silver lstr, occ rthy, sl sily tex, arg, sl mot, v calc  
10% CHK: gy brn-med gy, sb blk, v sft, sl mot, sl wxy, v calc, occ bent  
95% MRLST: med-dk gy - silver, sb blk, sft - sl frm, sl silver lstr, occ rthy, sl sily tex, arg, sl mot, v calc  
5% CHK: gy brn-med gy, sb blk, v sft, sl mot, sl wxy, v calc, occ bent

MD: 7.035'  
TVD: 6,730.39  
Inclination: 76.4°  
Azimuth: 267.4°  
VS: 350.37

TVD (ft)

MD: 7.130'  
TVD: 6,748.83  
Inclination: 81.3°  
Azimuth: 266.8°  
VS: 443.1

TVD (ft)

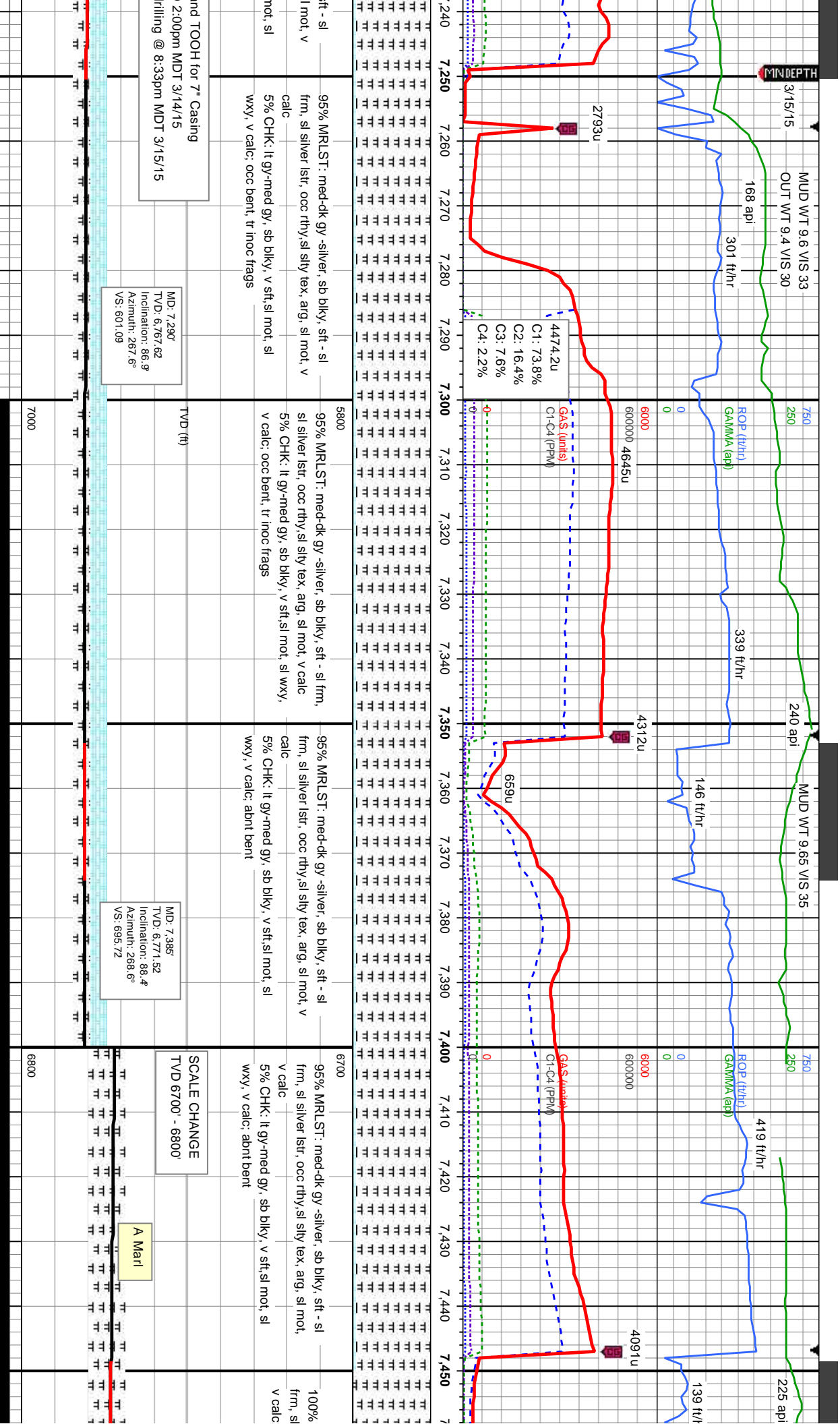
MD: 7.198'  
TVD: 6,758.65  
Inclination: 81.9°  
Azimuth: 266.3°  
VS: 510.07

TD Curve @ 6992 MD  
Resumed c

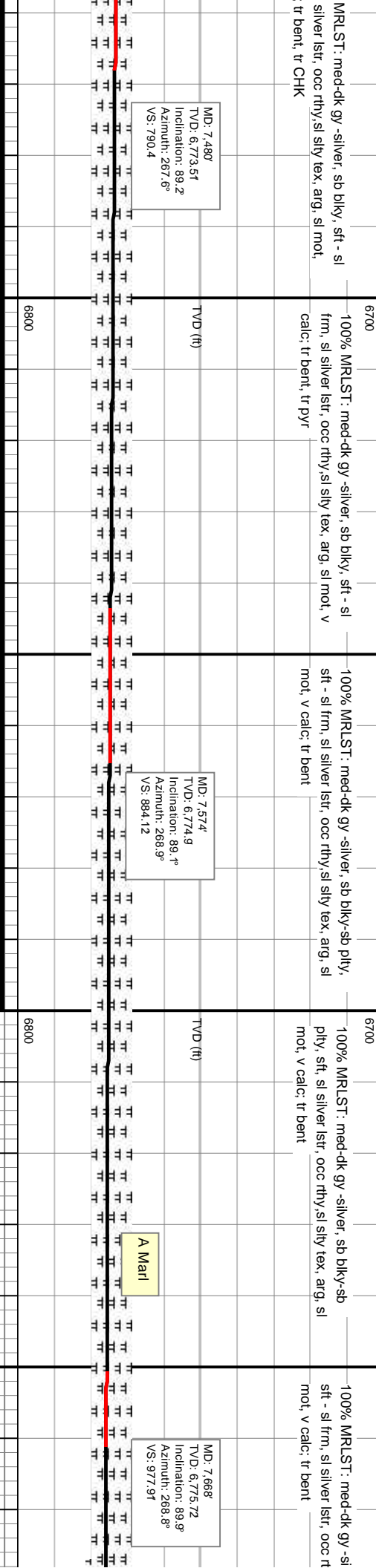
Niobrara/A Marl  
7088 MD / 6740' TVD

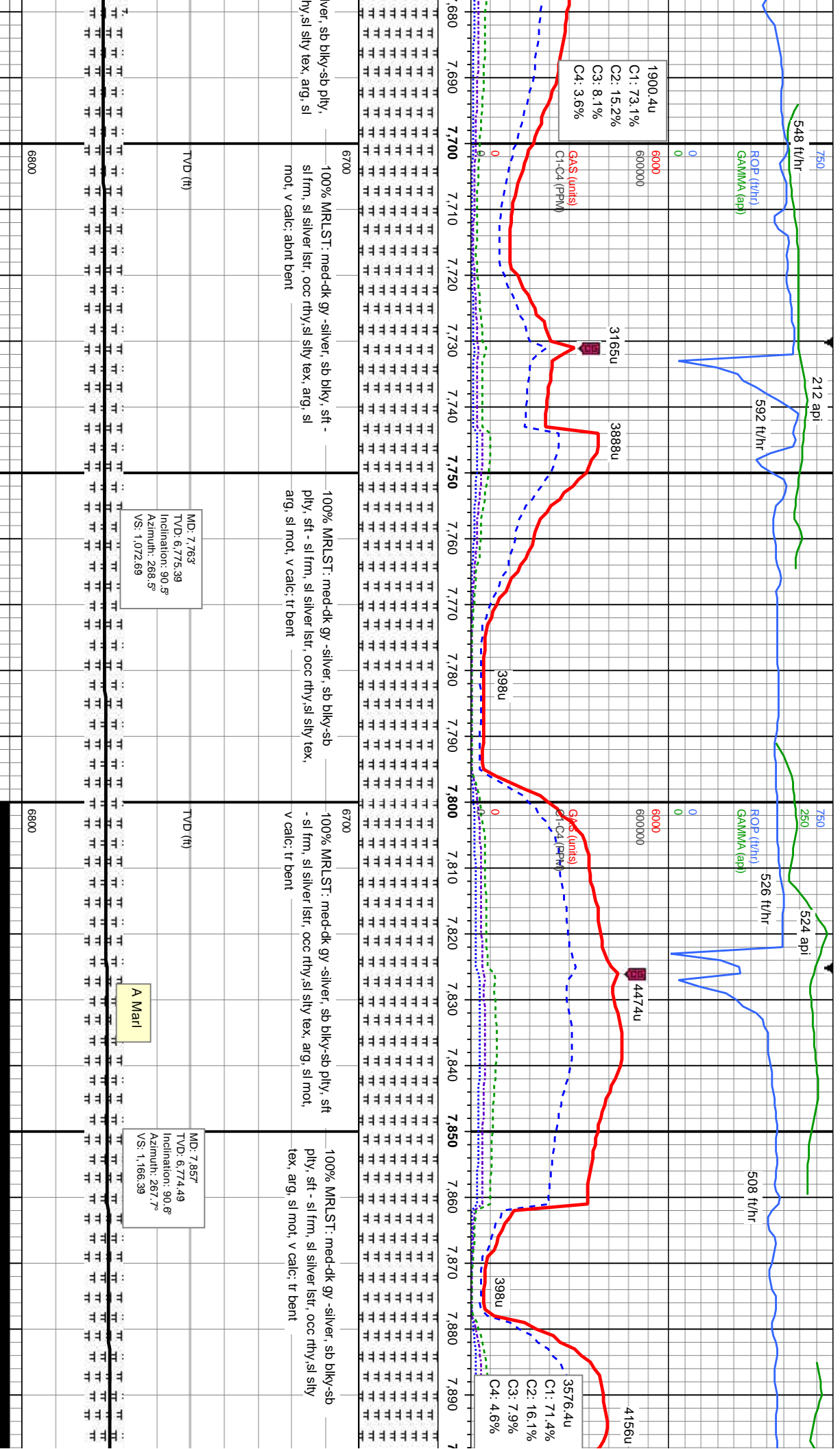
7000



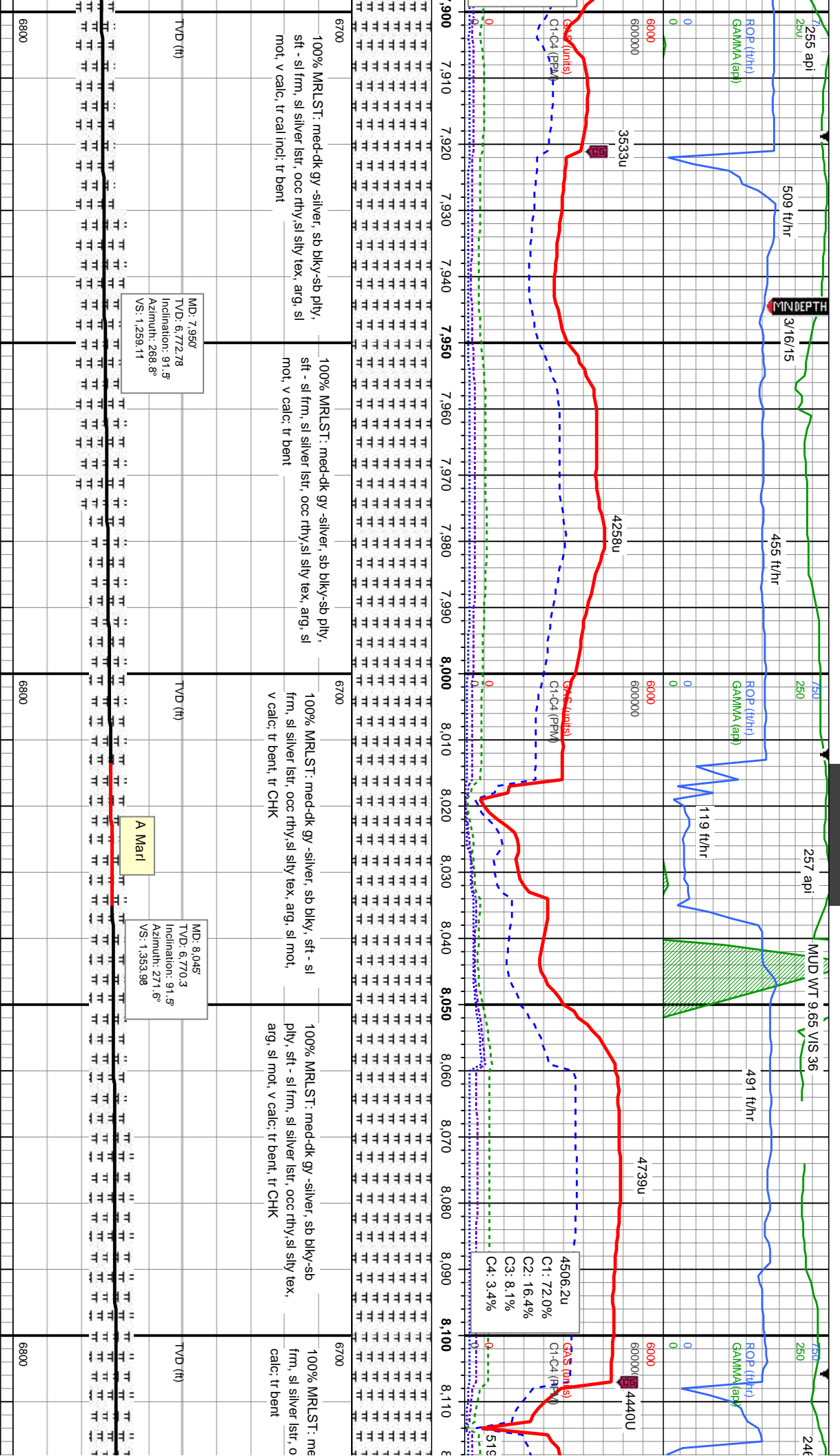


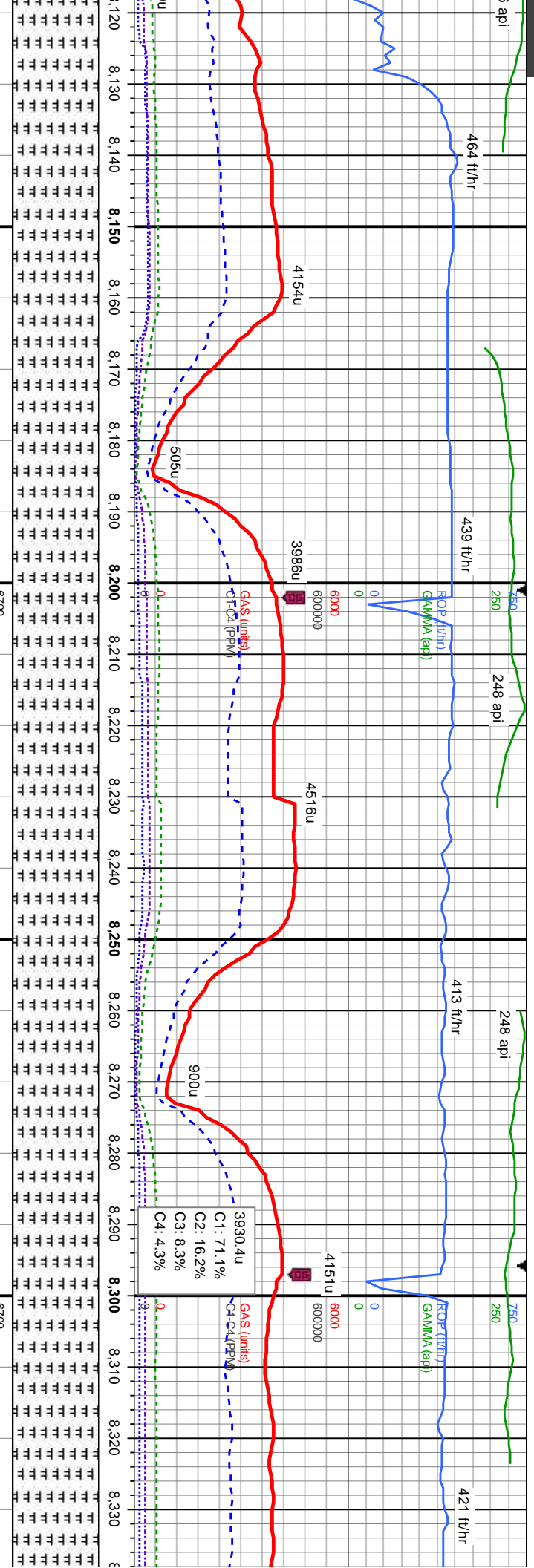












100% MRLST: med-dk gy -silver, sb blk, sft - sl  
frm, sl silver lstr, occ rthy, sl silty tex, arg, sl mot,  
v calc; tr bent

100% MRLST: med-dk gy -silver, sb blk, sft - sl  
frm, sl silver lstr, occ rthy, sl silty tex, arg, sl mot,  
v calc; tr bent

100% MRLST: med-dk gy -silver, sb blk, sft - sl  
frm, sl silver lstr, occ rthy, sl silty tex, arg, sl  
mot, v calc; tr bent, tr pyr

100% MRLST: med-dk gy -silver, sb blk, sft - sl  
frm, sl silver lstr, occ rthy, sl silty tex, arg,  
v calc; tr bent, tr CHK

MD: 8,139'  
TVD: 6,769.23  
Inclination: 89.8°  
Azimuth: 271.3°  
VS: 1,447.95

TVD (ft)

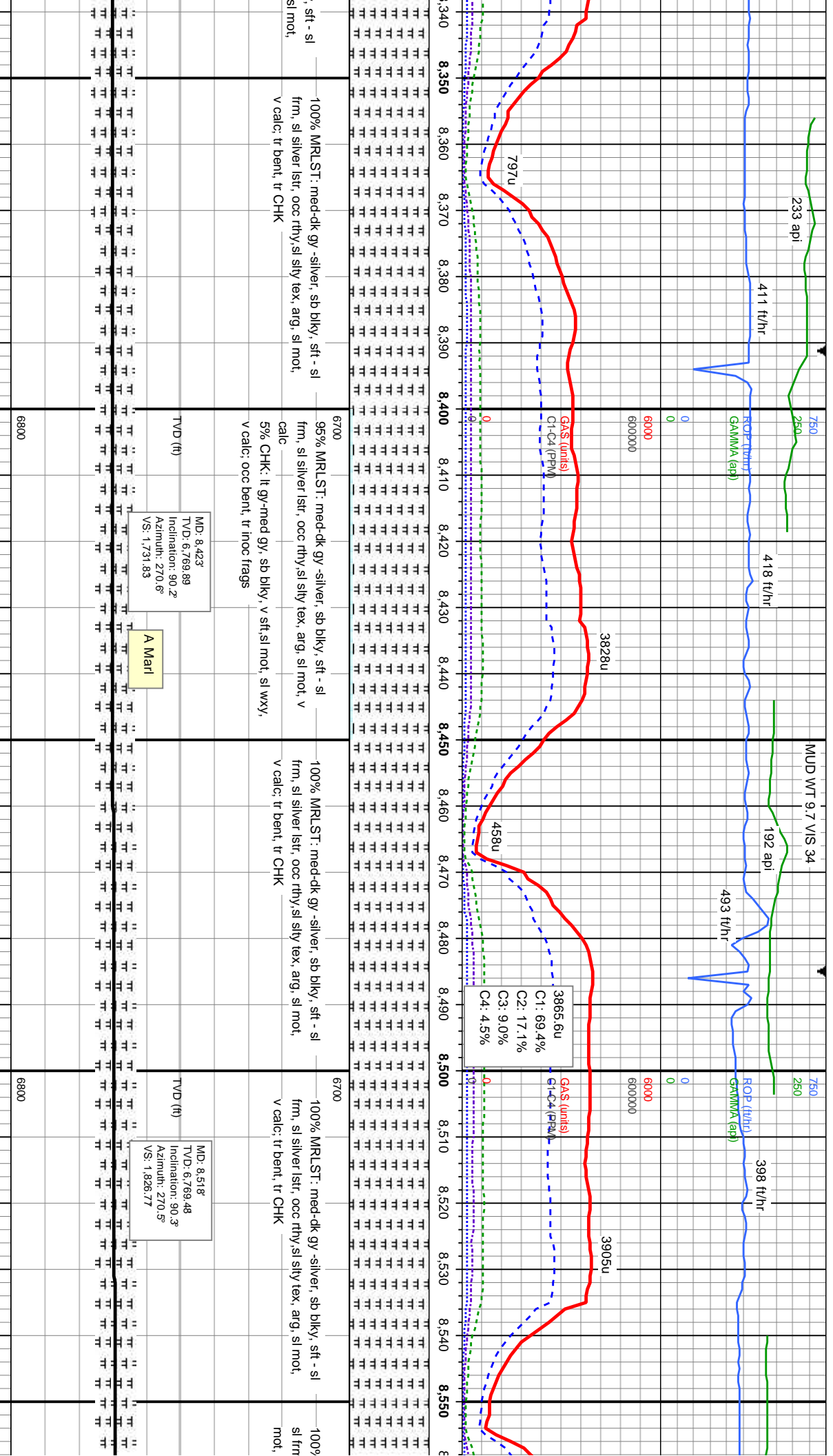
MD: 8,234'  
TVD: 6,769.56  
Inclination: 89.8°  
Azimuth: 271.1°  
VS: 1,542.92

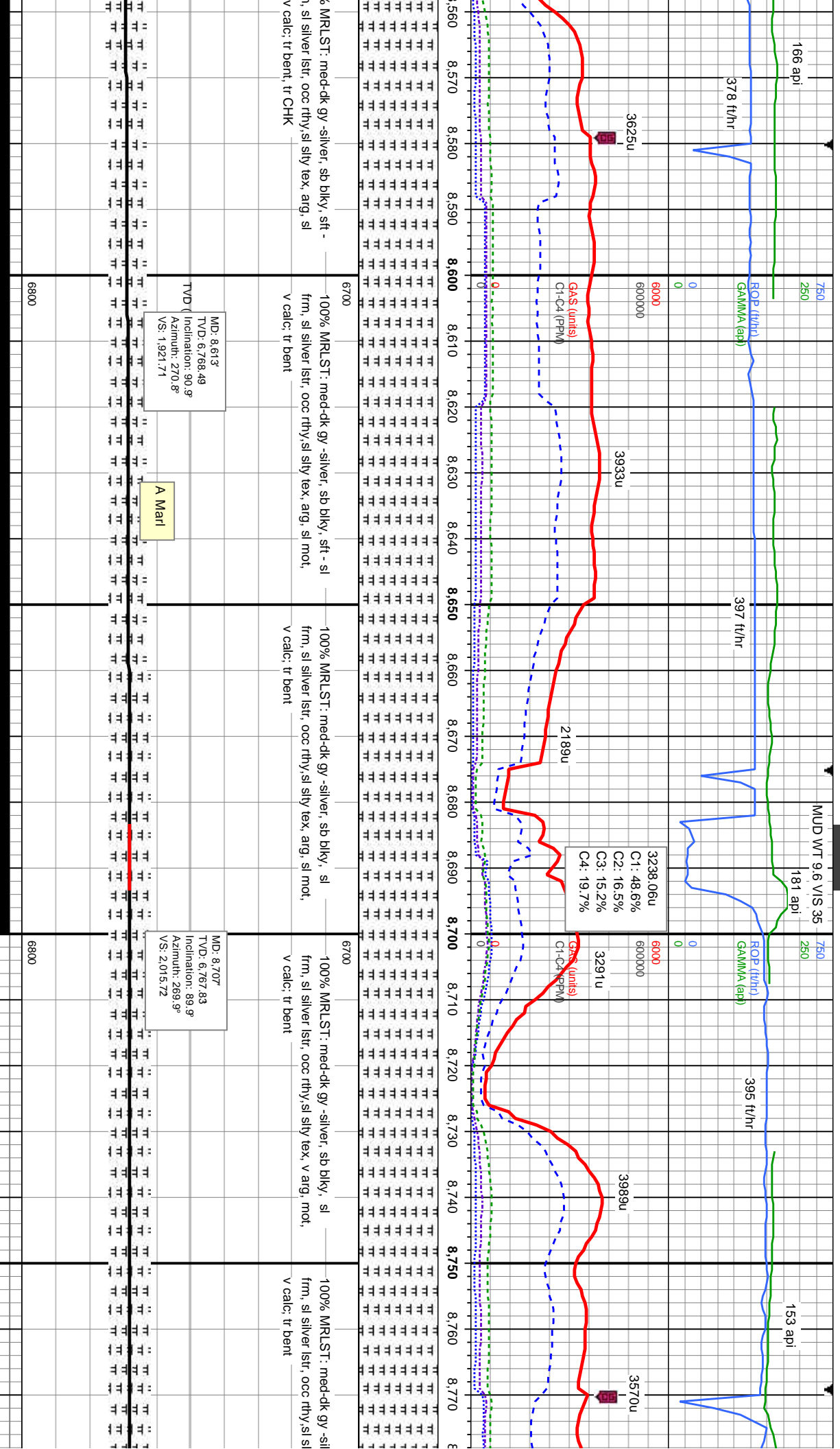
TVD (ft)

MD: 8,329'  
TVD: 6,769.89  
Inclination: 89.8°  
Azimuth: 270.8°  
VS: 1,637.88

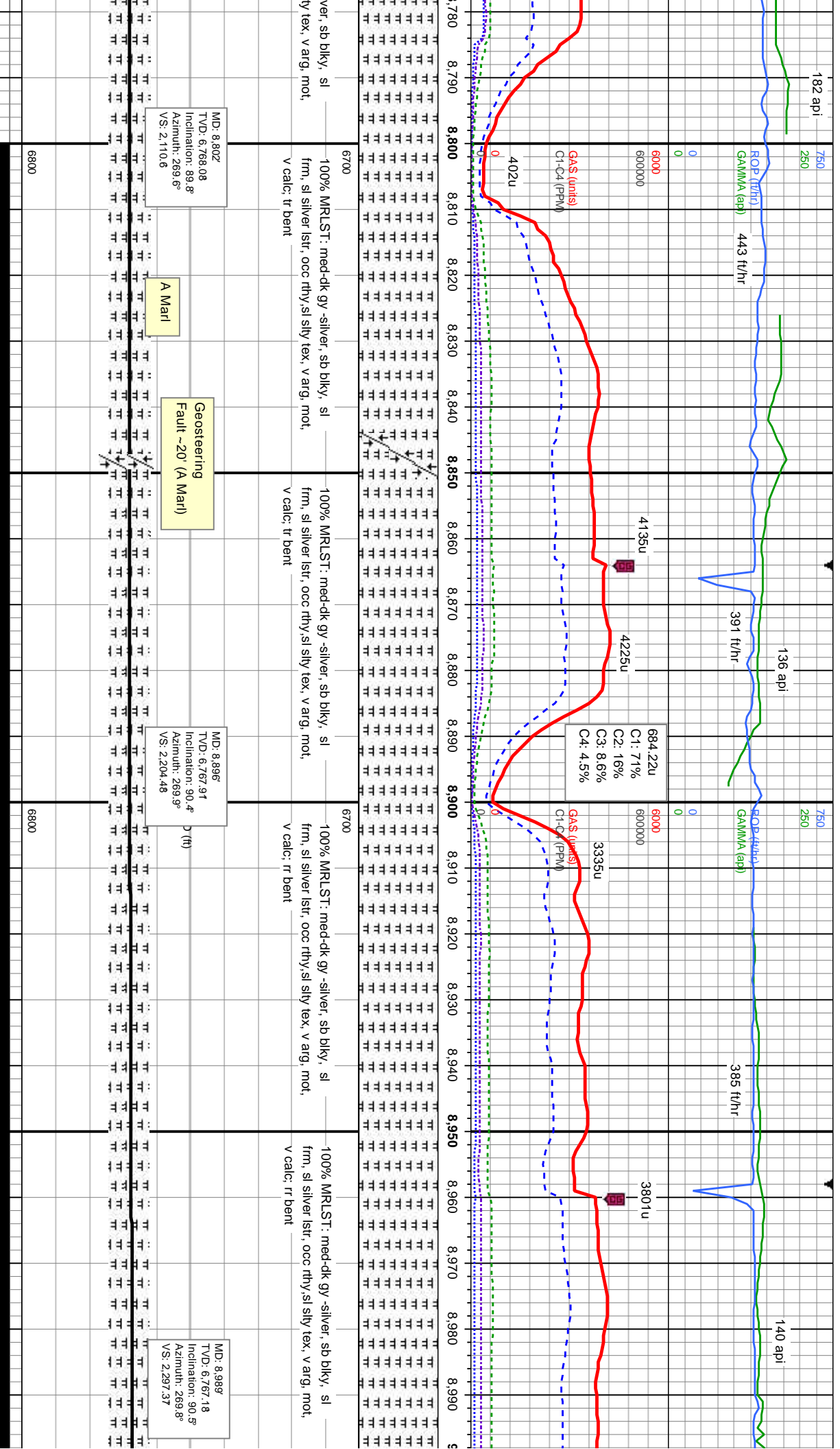






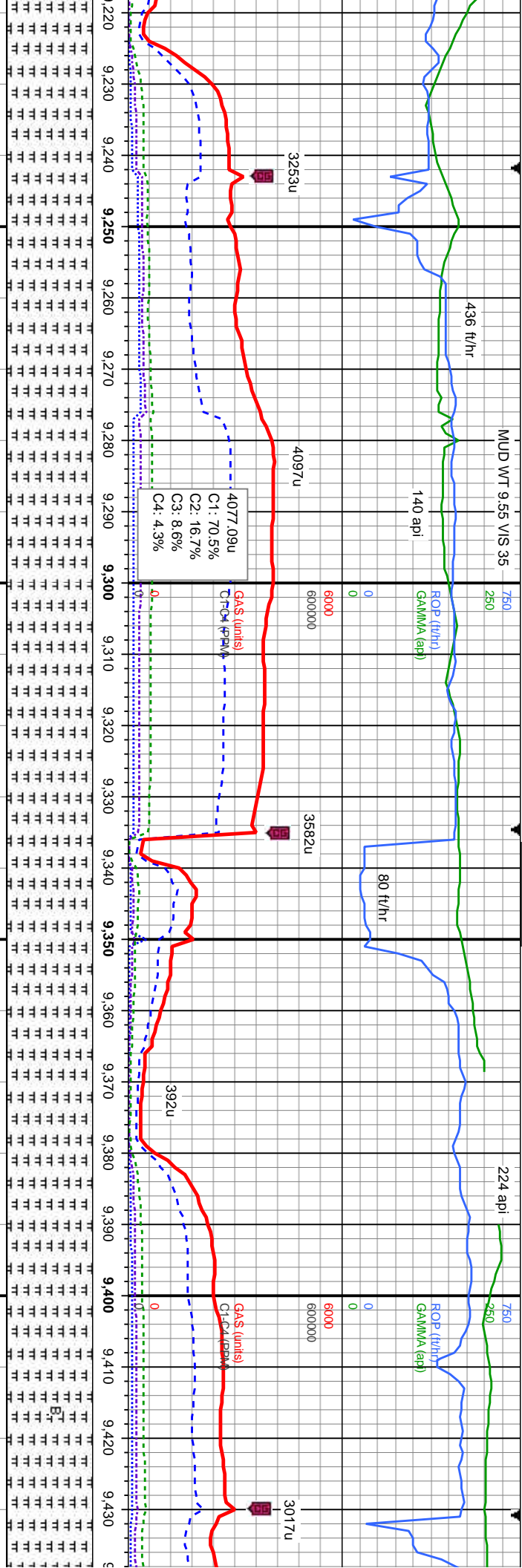












med-dk gy -silver, sb blk, sl  
occ rthy, sl silty tex, v arg, mot,  
100% MRLST: med-dk gy -silver, sb blk, sl  
frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot,  
v calc

A Marl

MD: 9.274'  
TVD: 6.767, 1'  
Inclination: 90°  
Azimuth: 269.9°  
VS: 2.582.07

TVD (ft)

6800

100% MRLST: med-dk gy -silver, sb blk, sl  
frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot,  
v calc; occ bent

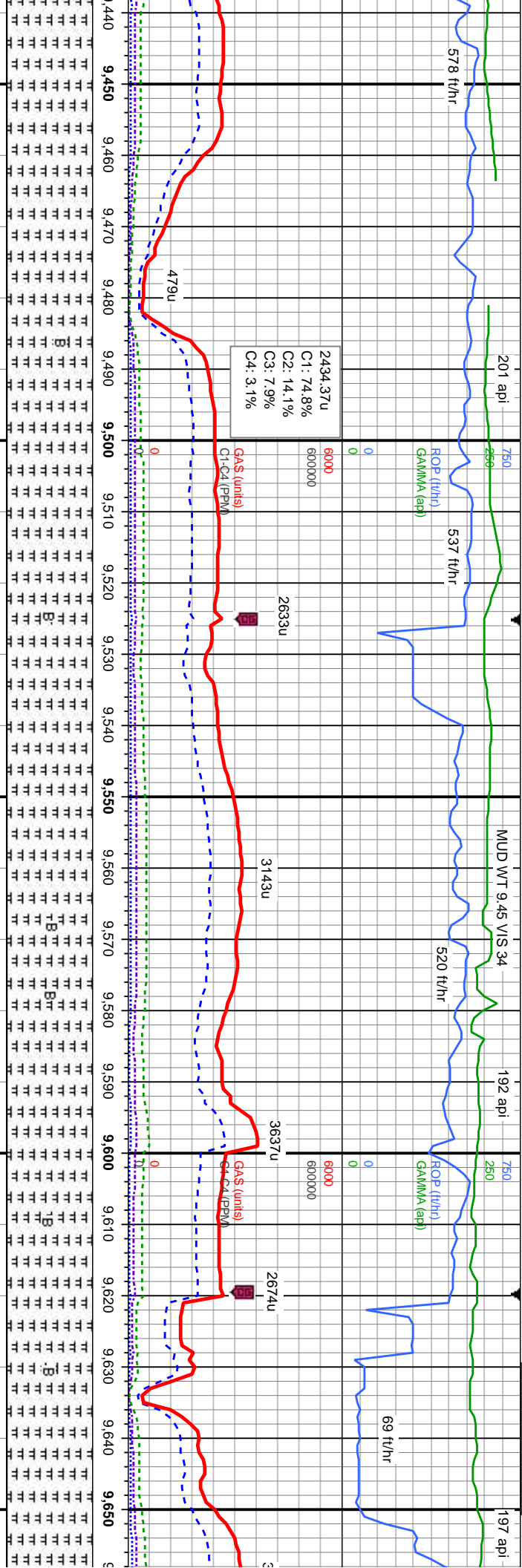
MD: 9.369'  
TVD: 6.768, 0.1'  
Inclination: 88.9°  
Azimuth: 268°  
VS: 2.676.87

TVD (ft)

6800

A Marl





100% MRLST: med-dk gy -silver, sb blk, sl  
frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot,  
v calc; occ - abnt bent

100% MRLST: med-dk gy -silver, sb blk, sl  
silver lstr, occ rthy, sl silty tex, v arg, mot, v calc;  
occ - abnt bent

100% MRLST: med-dk gy -silver, sb blk, sl  
silver lstr, occ rthy, sl silty tex, v arg, mot, v calc;  
abnt bent

100% MRLST: med-dk gy -silver, sb blk, sl  
silver lstr, occ rthy, sl silty tex, v arg, mot, v calc;  
abnt bent

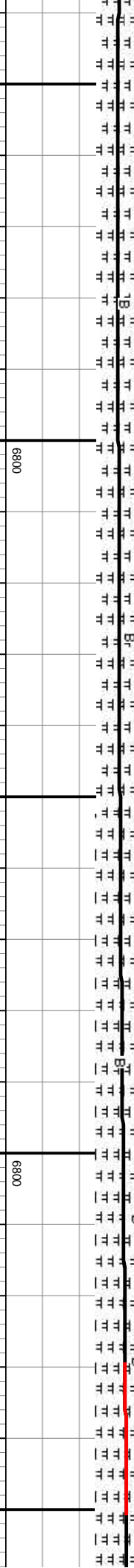
100% I  
silver ls  
abnt be

MD: 9.463  
TVD: 6,769.24  
Inclination: 89.6°  
Azimuth: 269.5°  
VS: 2.770.64

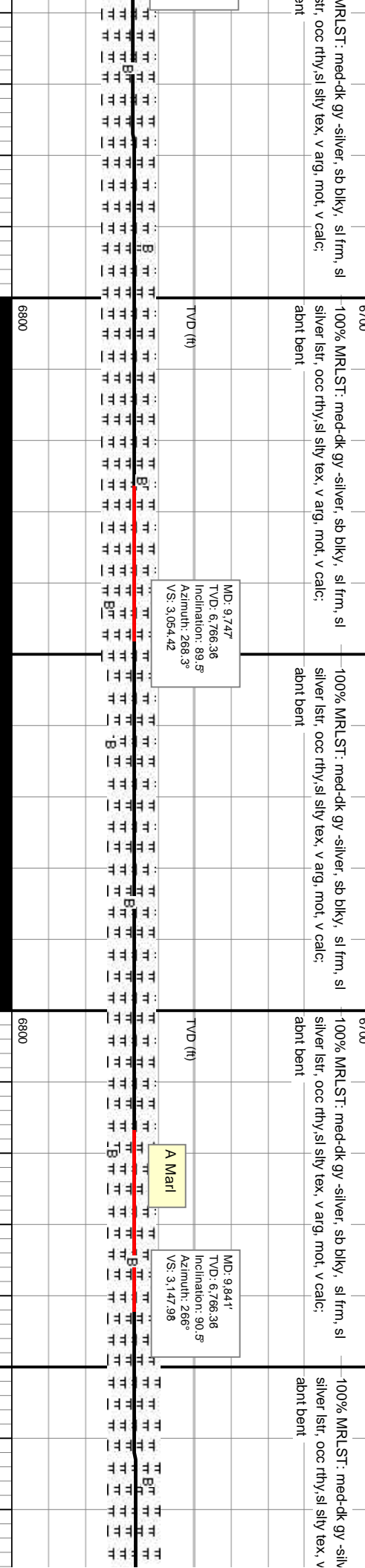
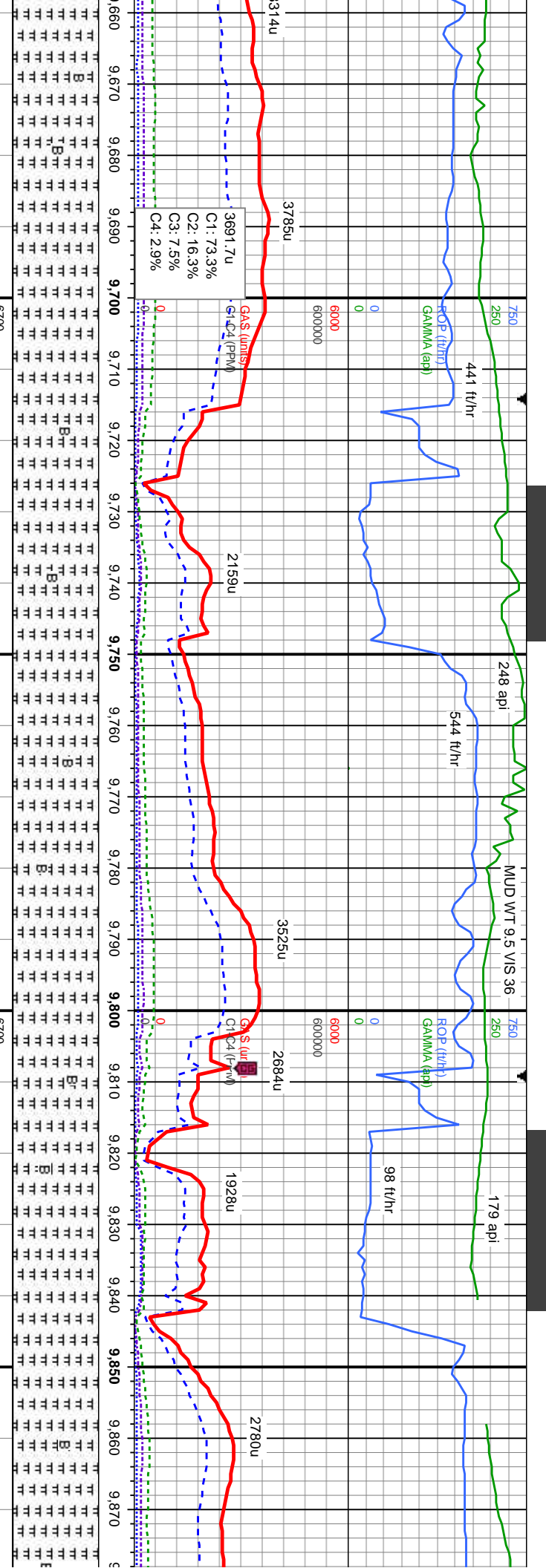
MD: 9.558  
TVD: 6,768.49  
Inclination: 91.3°  
Azimuth: 273°  
VS: 2.866.6

MD: 9.652  
TVD: 6,766.69  
Inclination: 90.9°  
Azimuth: 270.7°  
VS: 2.959.57

A Marl



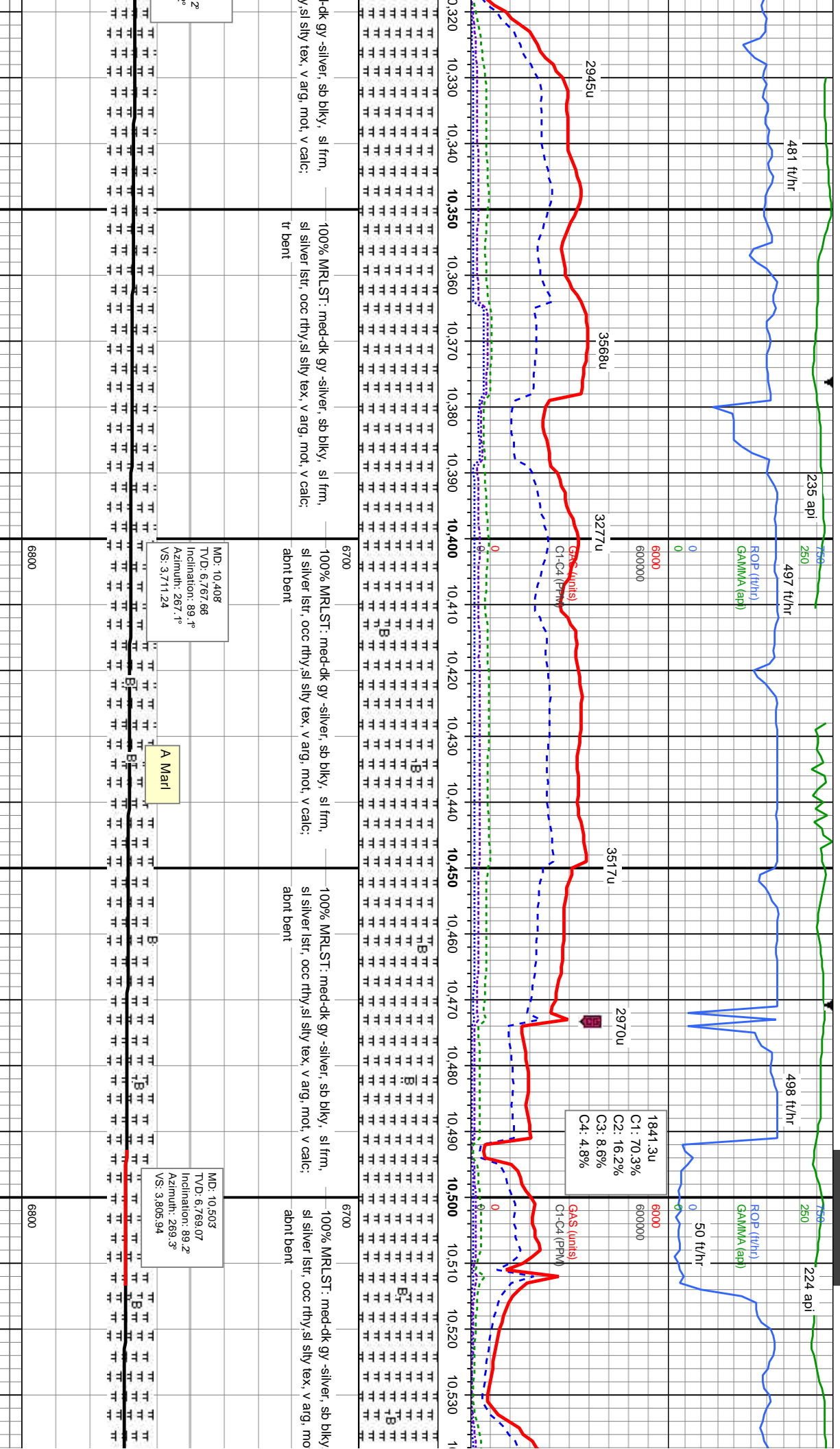












100% MRLST: med-dk gy -silver, sb blk, sl frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot, v calc; tr bent

100% MRLST: med-dk gy -silver, sb blk, sl frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot, v calc; abnt bent

100% MRLST: med-dk gy -silver, sb blk, sl frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot, v calc; abnt bent

100% MRLST: med-dk gy -silver, sb blk, sl frm, sl silver lstr, occ rthy, sl silty tex, v arg, mot, v calc; abnt bent

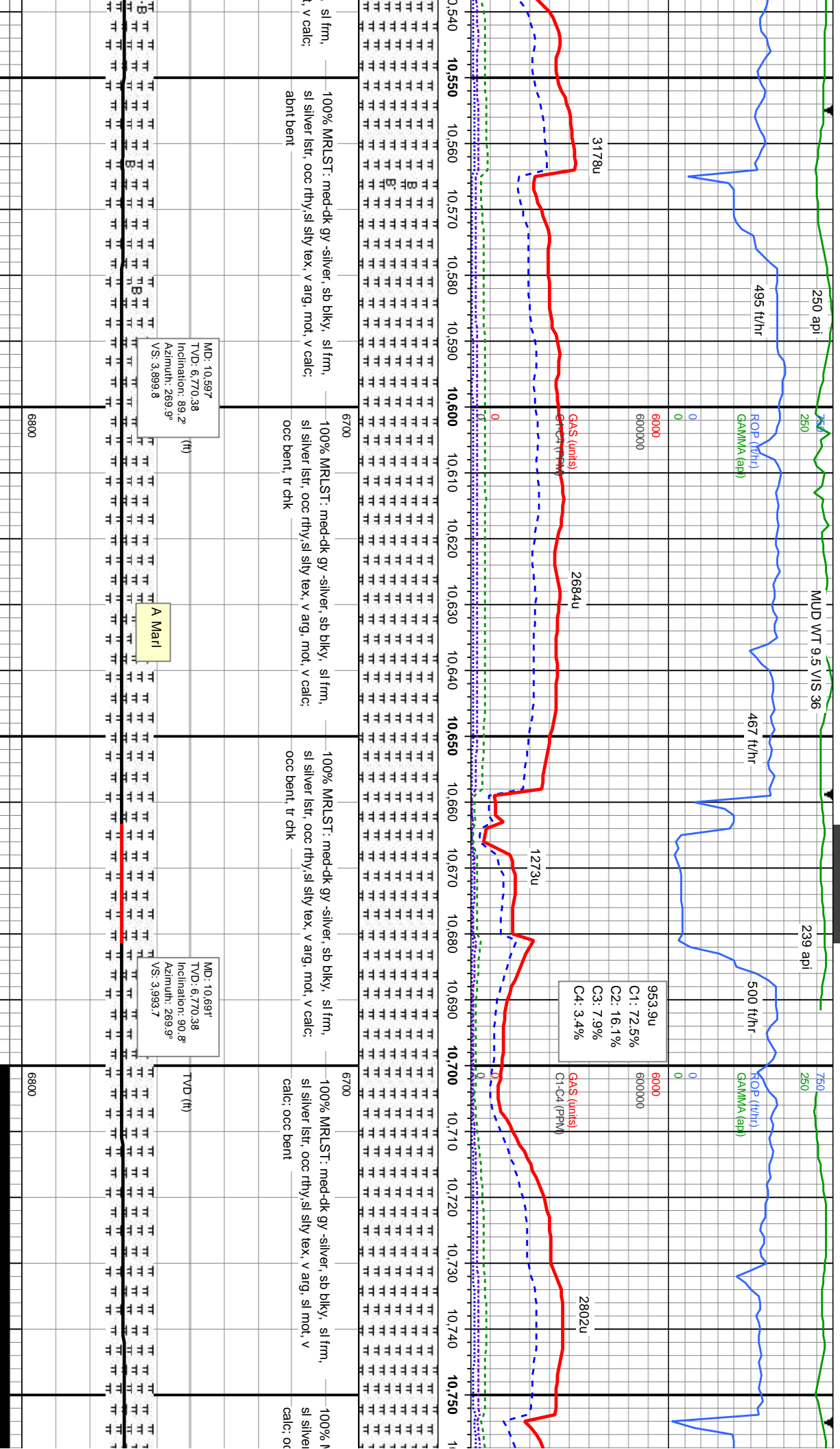
MD: 10,408  
TVD: 6,767.66  
Inclination: 89.1°  
Azimuth: 267.1°  
VS: 3,711.24

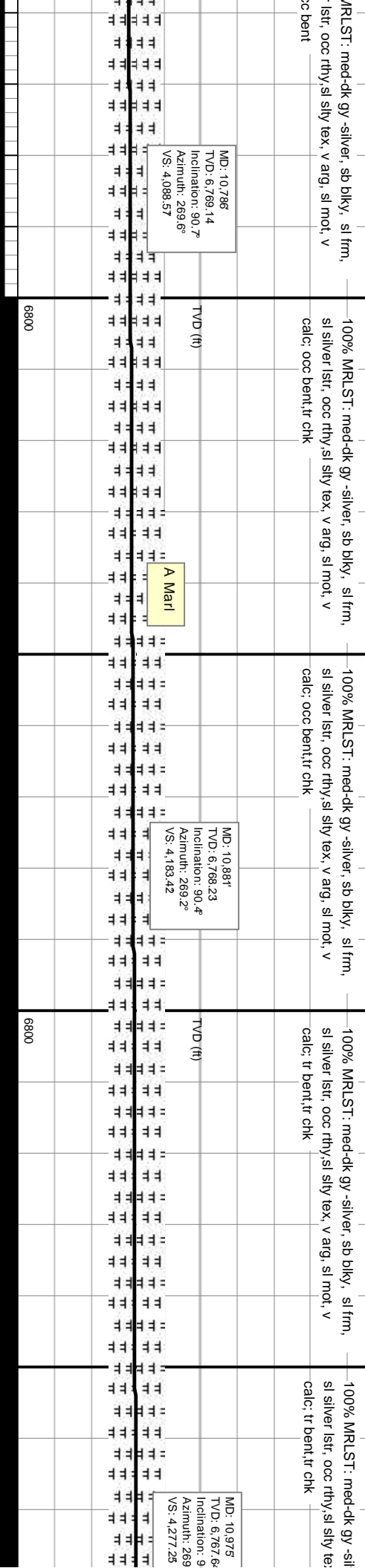
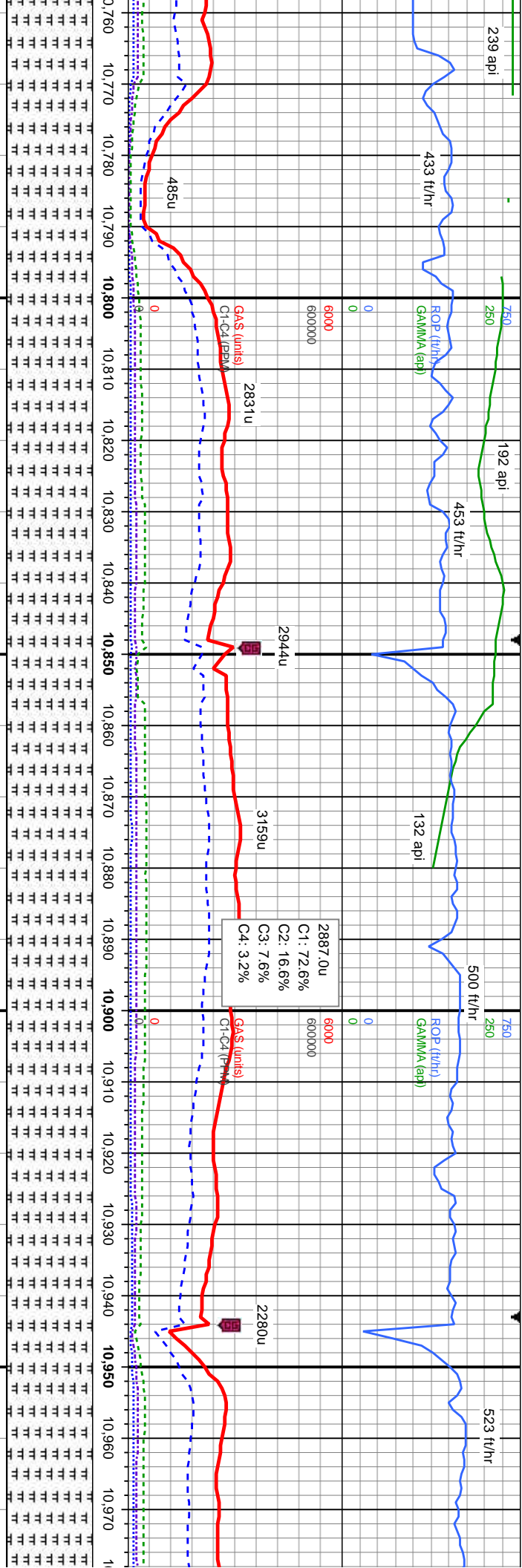
A Marl

MD: 10,503  
TVD: 6,769.07  
Inclination: 89.2°  
Azimuth: 269.3°  
VS: 3,806.94

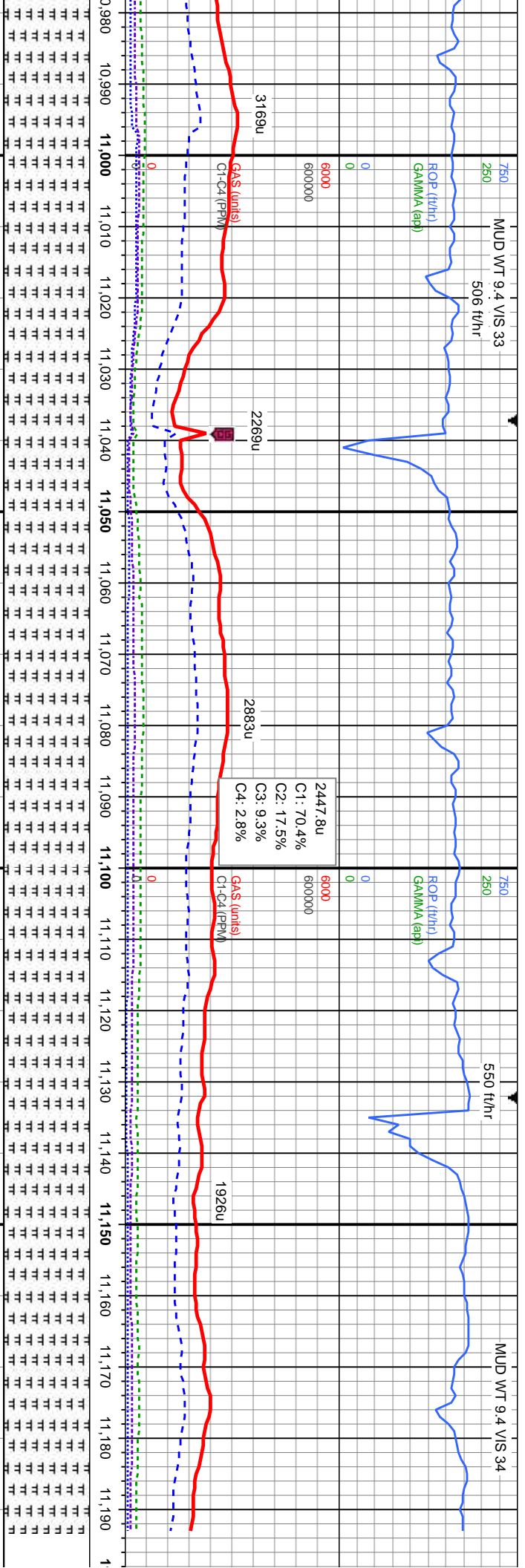












er, sb blky, sl frm, —	100% MR.LST: med-dk gy -silver, sb blky, sl frm, —	100% MR.LST: med-dk gy -silver, sb blky, sl frm, —	100% MR.LST: med-dk gy -silver, sb blky, sl frm, —
k, v arg, sl mot, v	sl silver lstr, occ rthy, sl silty tex, v arg, sl mot, v	sl silver lstr, occ rthy, sl silty tex, v arg, sl mot, v	sl silver lstr, occ rthy, sl silty tex, v arg, sl mot, v
calc; tr bent	calc; tr bent	calc; tr bent	calc; tr bent

MD	TVD (ft)	Inclination	Azimuth	VS
MD: 11.070	TVD: 6,767.23	Inclination: 90.2°	Azimuth: 269.3°	VS: 4,372.09
MD: 11.131	TVD: 6,767.23	Inclination: 89.8°	Azimuth: 269°	VS: 4,432.98
MD: 11.133	TVD: 6,767.44	Inclination: 89.8°	Azimuth: 269°	VS: 4,494.85

[illegible]

Projection To Bit

MD: 11,193  
TVD: 6767.44'  
Inclination: 89.8°  
Azimuth: 269°  
VS: 4,494.85

