

OPERATOR: **Extraction Oil & Gas**

WELL NAME: **Houlihan 4-64-22A 21-1**

FIELD NAME: DJ Basin - Wattenberg

DRILLING RIG: Patterson 341

API #: 05-005-07279

LAT/LONG: 39.690417, -104.531206

SURFACE HOLE: SENE S22-T4S-R64W, 1774' FNL, 1005' FEL

BOTTOM HOLE: S21-T4S-R64W, 460' FNL, 460' FWL



Earth Science Agency, LLC

COUNTY: Arapahoe

STATE: Colorado

GROUND ELEVATION: 5705'

KELLY BUSHING: 5730'

DRILLING FLUID: OBM

TVD VS. MD: 7562' / 17453'

SPUD DATE: October 18, 2017

TD DATE: October 21, 2017

DEPTHS LOGGED: 6000' - 17453'

DATES LOGGED: October 18, 2017 - October 21, 2017

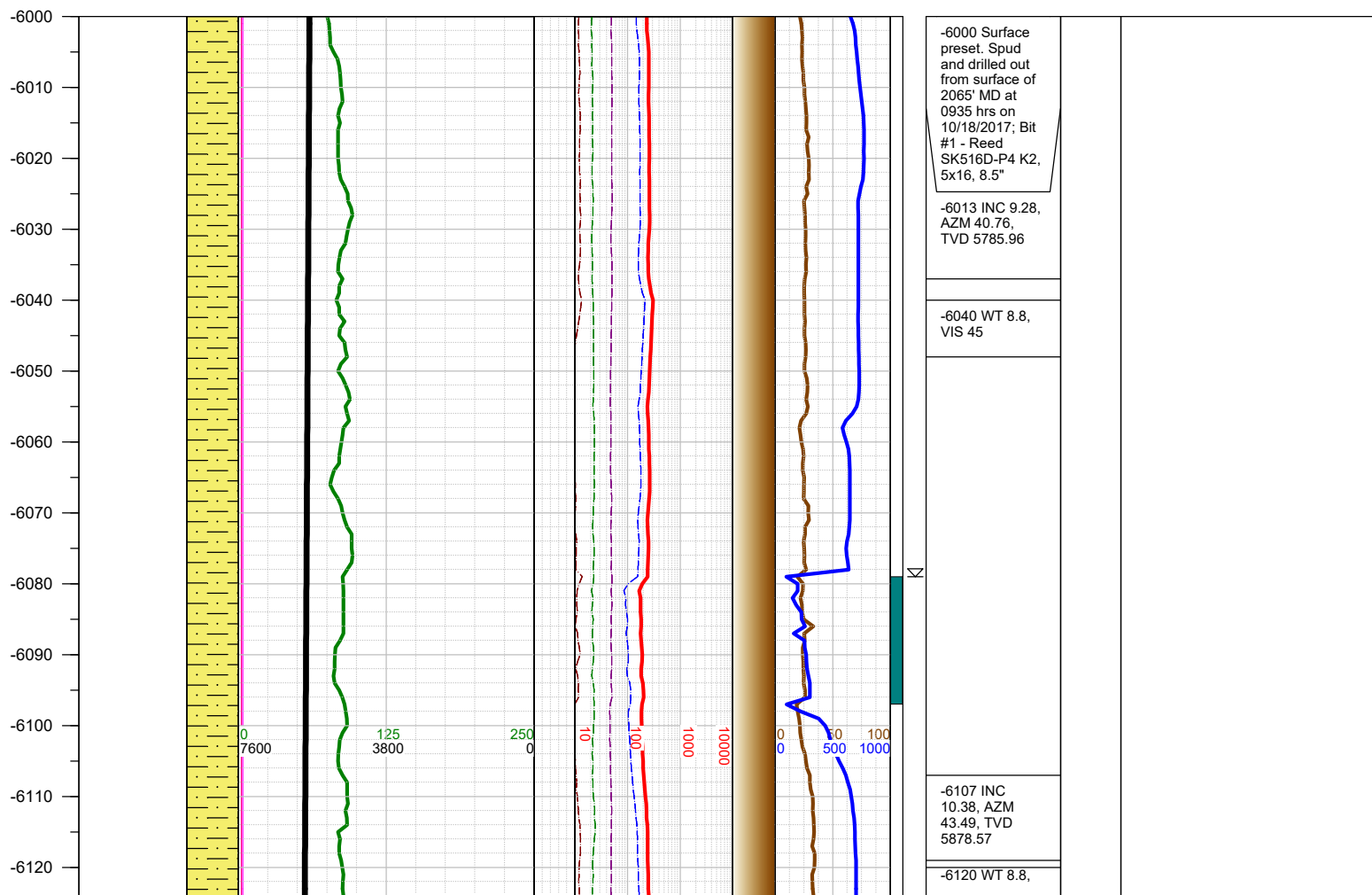
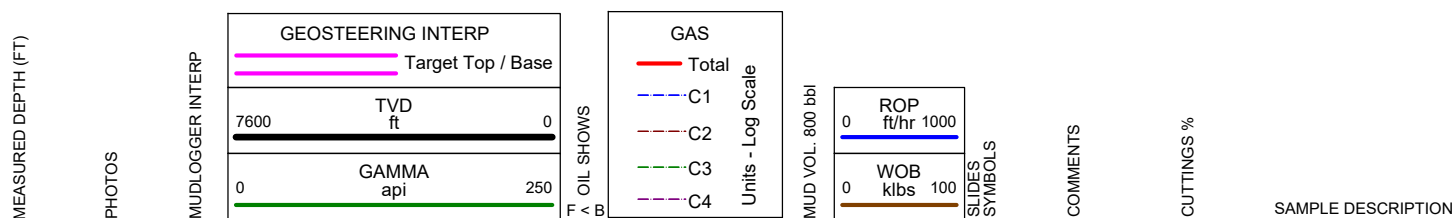
GEOLOGISTS: Blake Eatherton, Dominic Pitre

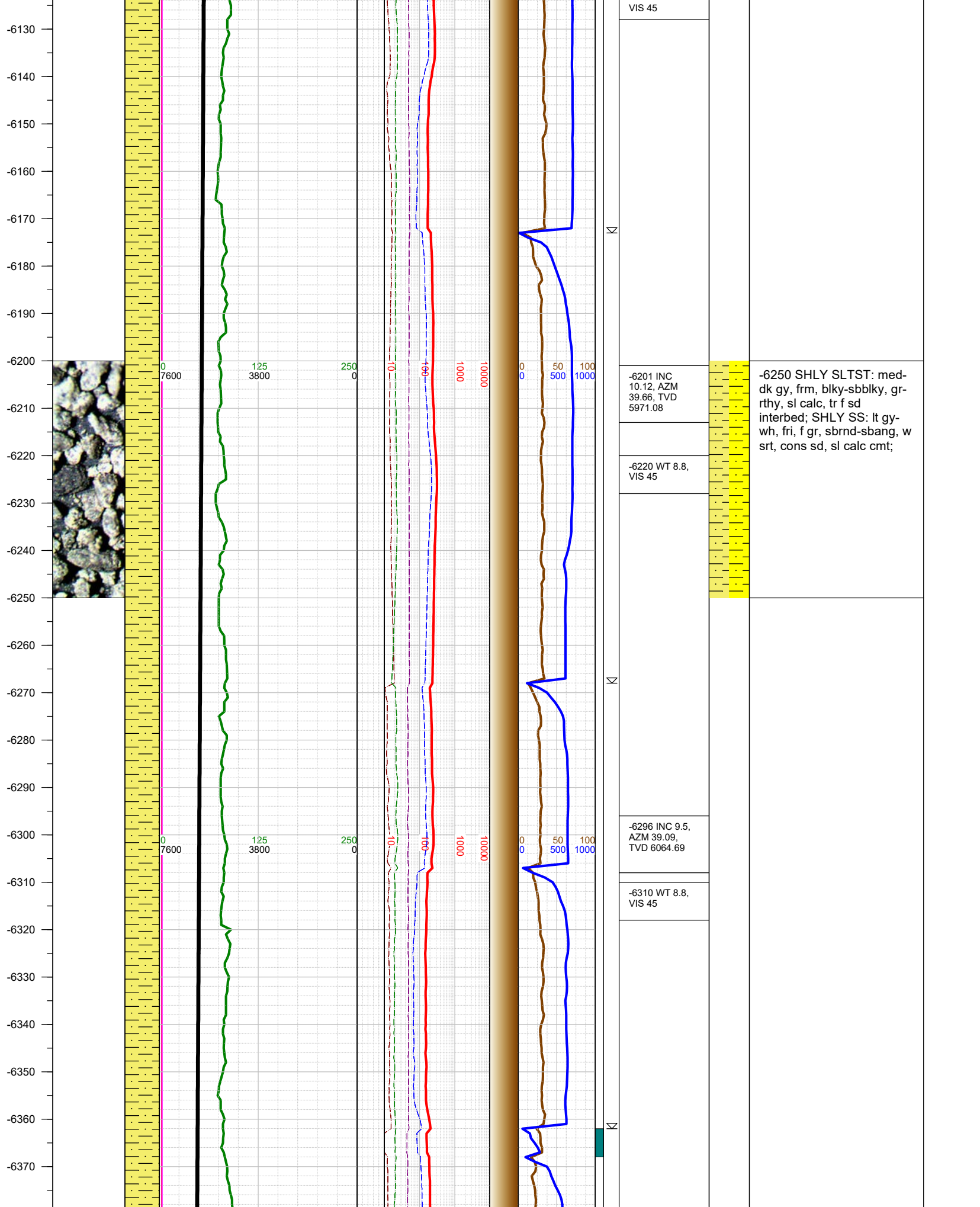
SCALE: 5" = 100'

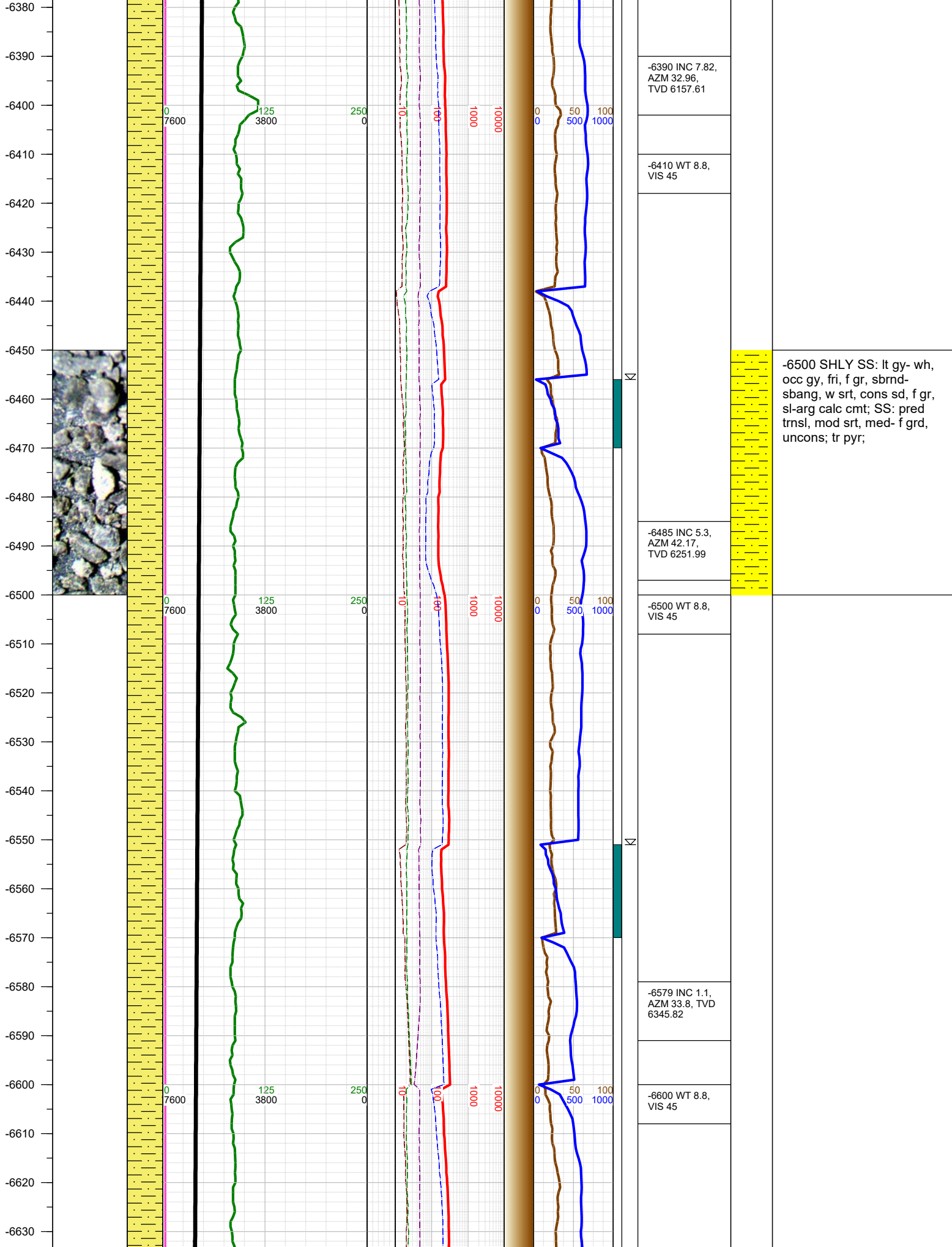
LEGEND

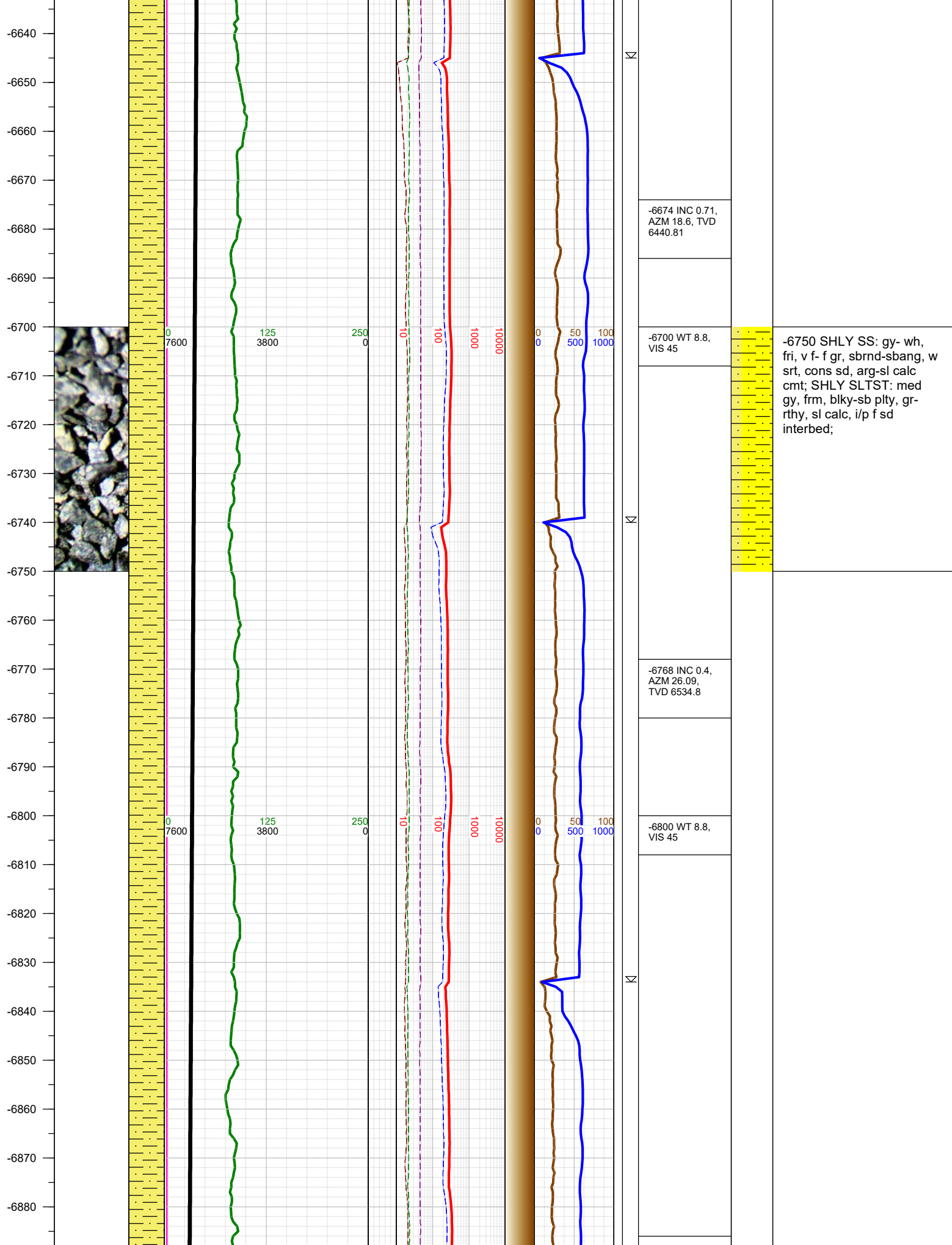
	CHALK		SHALE
	LIMESTONE		SILTY SHALE
	SHALY LIMESTONE		SHALY SILTSTONE
	MARLSTONE		SHALY SANDSTONE
	CALCAREOUS SHALE		SANDSTONE
	DOLOMITE		ANHYDRITE

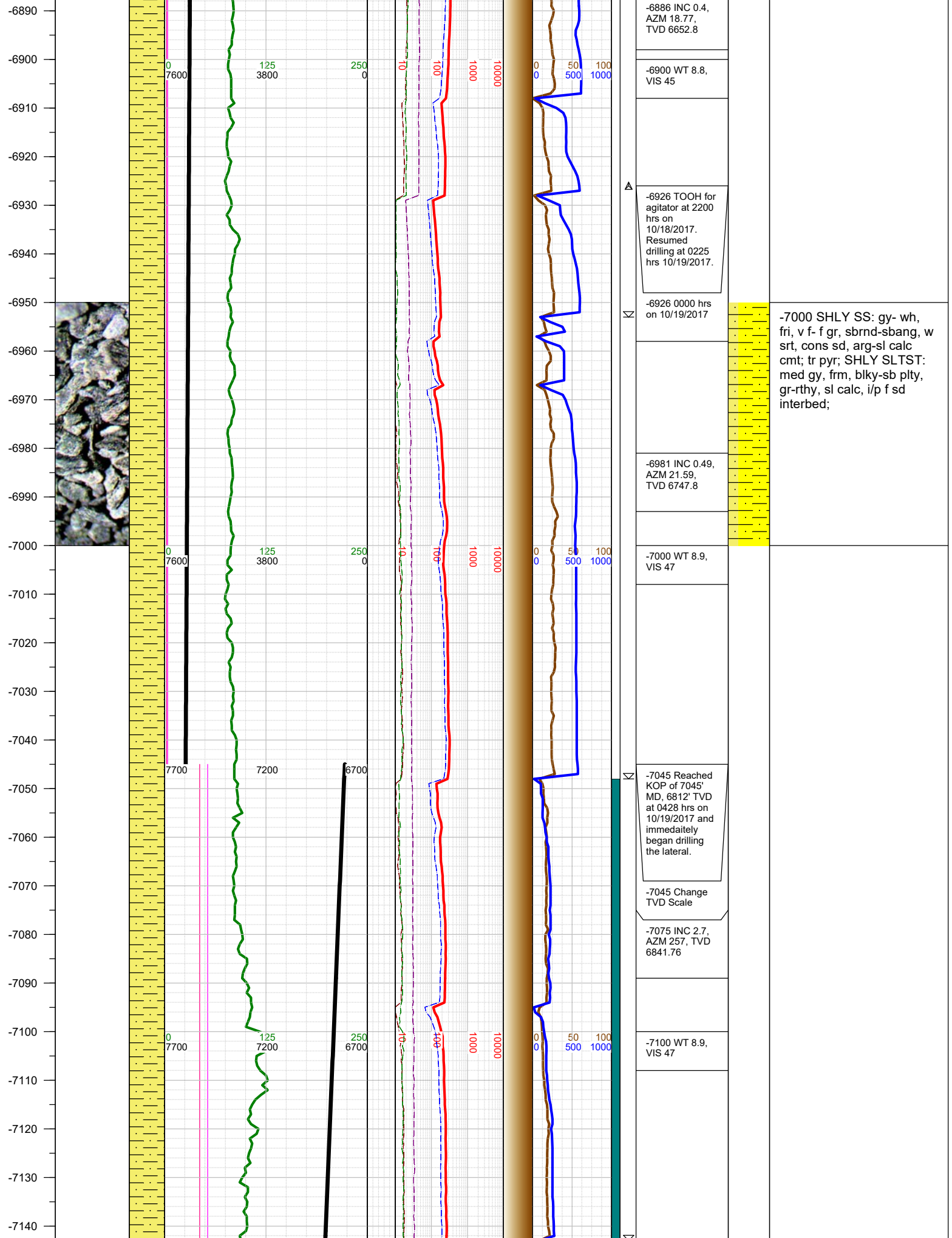
FORMATION \approx CONNECTION Δ MIDNIGHT NEW BIT GAS SHOW FAULT

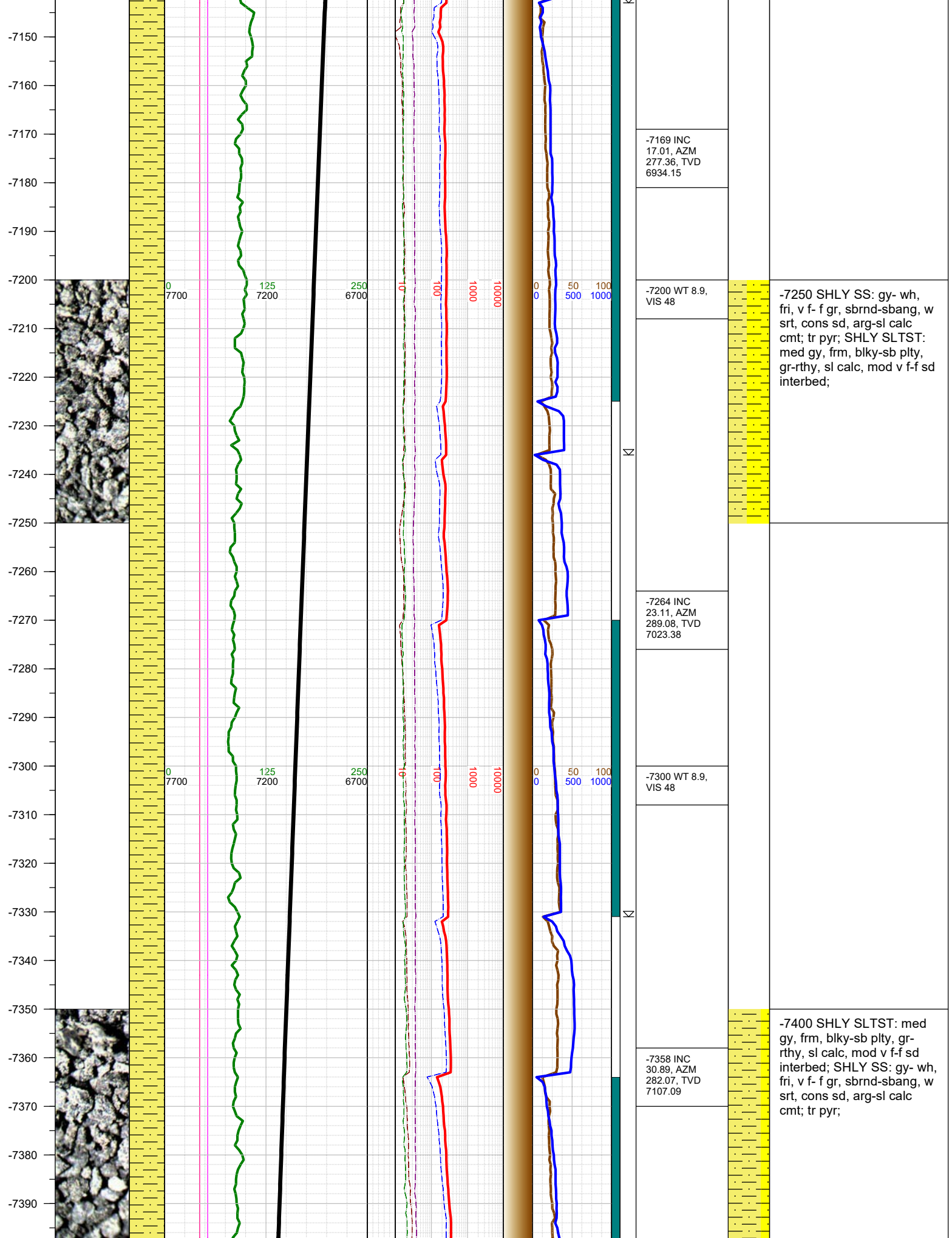


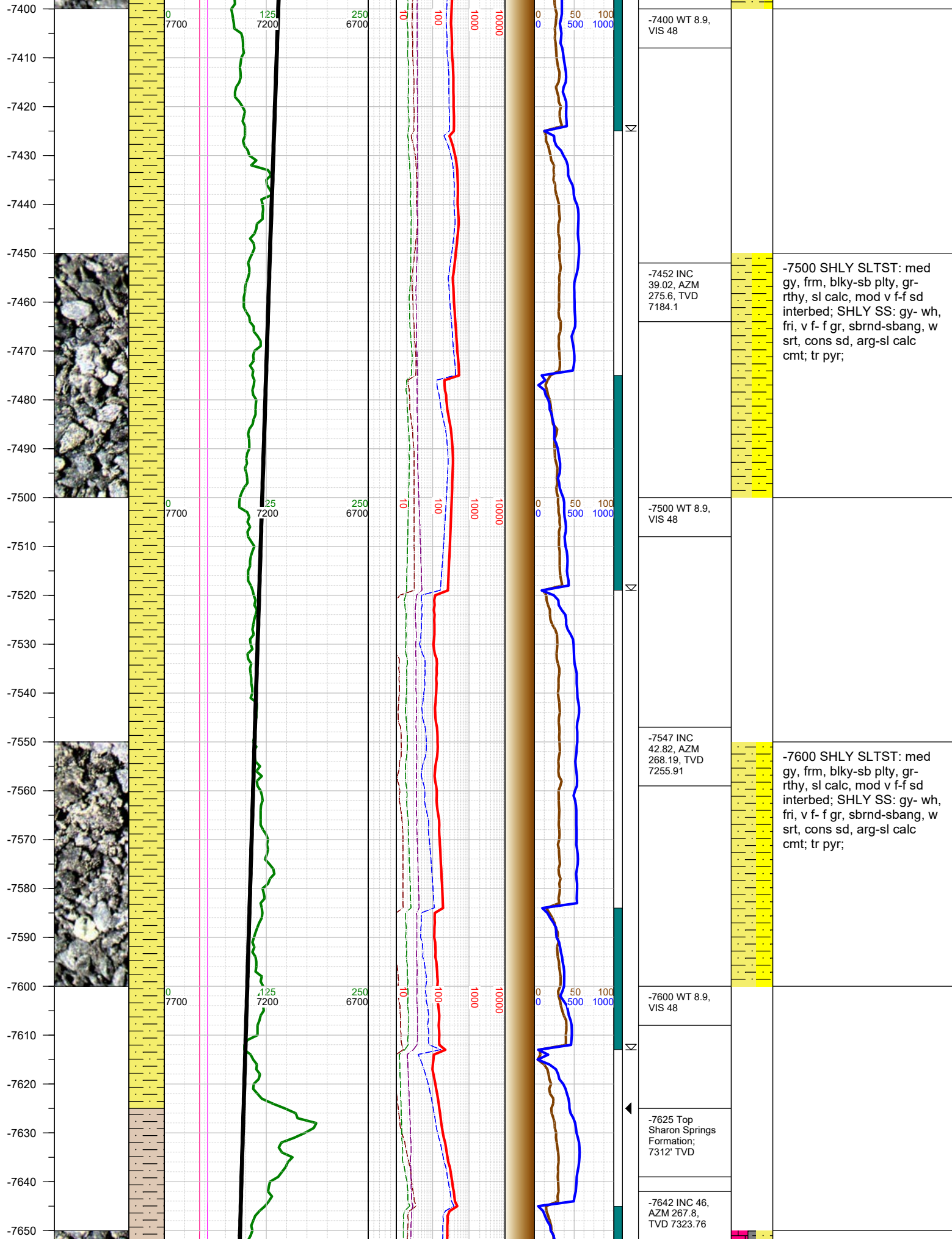












-7400 WT 8.9,
VIS 48

-7452 INC
39.02, AZM
275.6, TVD
7184.1

-7500 WT 8.9,
VIS 48

-7547 INC
42.82, AZM
268.19, TVD
7255.91

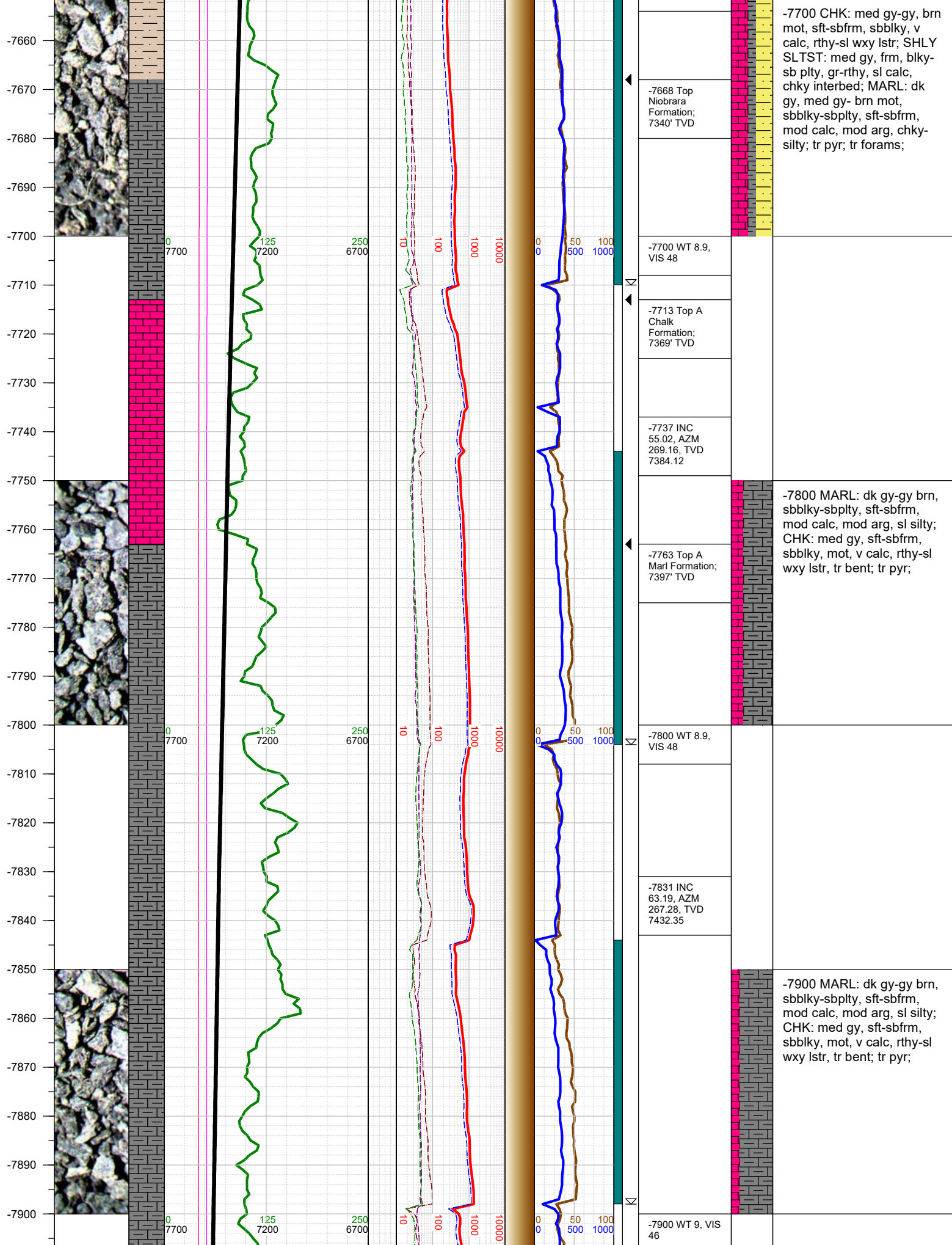
-7600 WT 8.9,
VIS 48

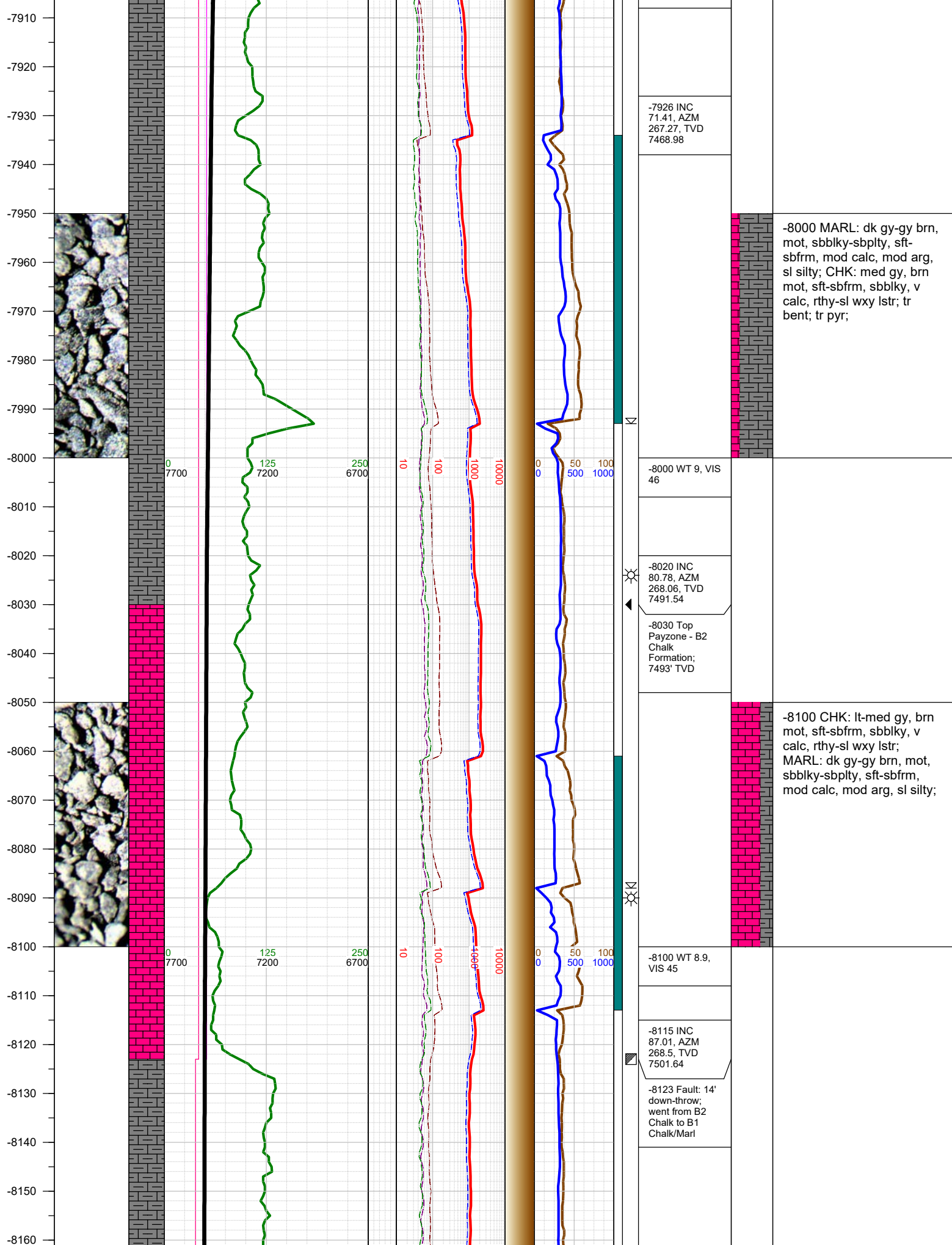
-7625 Top
Sharon Springs
Formation;
7312' TVD

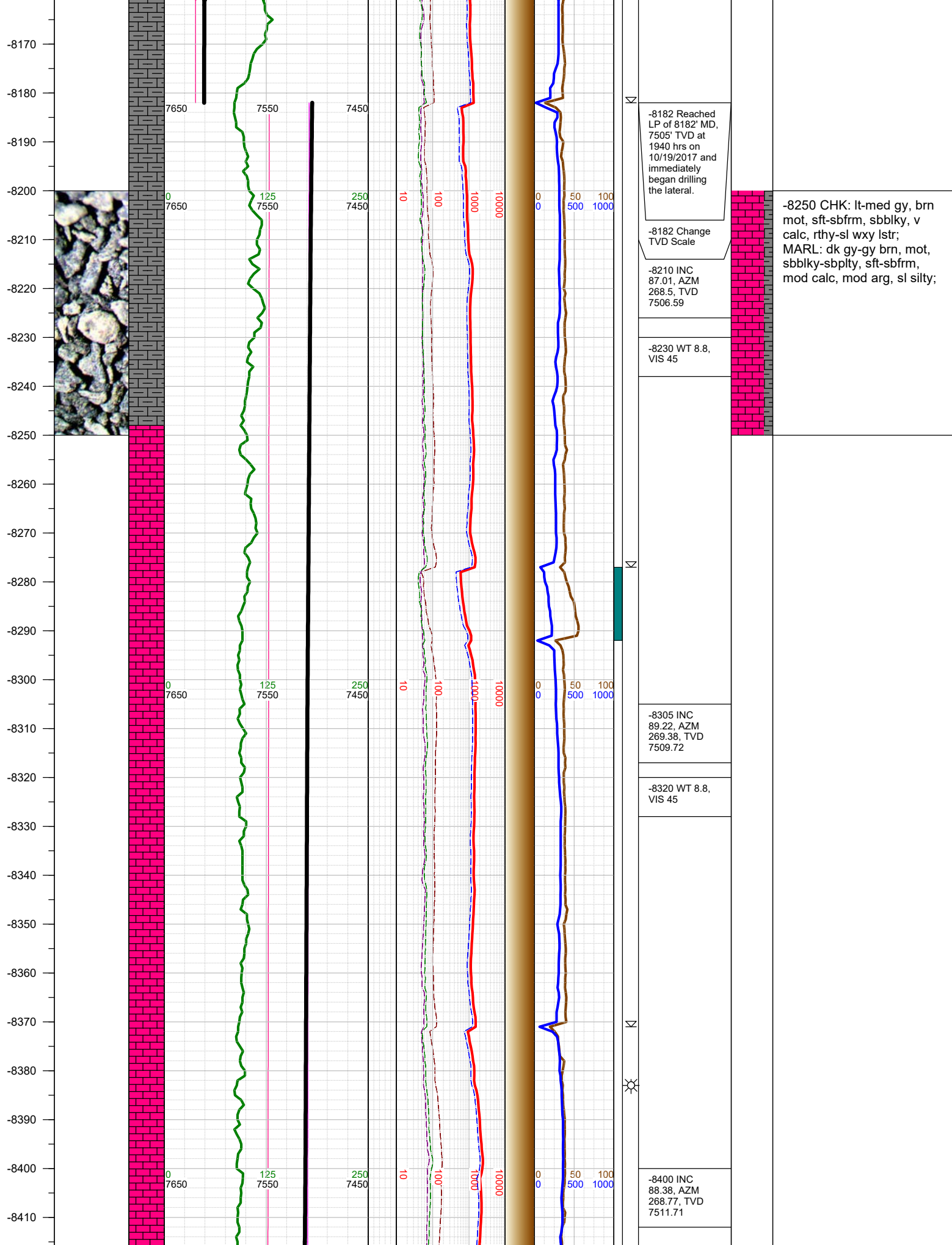
-7642 INC 46,
AZM 267.8,
TVD 7323.76

-7500 SHLY SLTST: med
gy, frm, blk-y-sb plty, gr-
rthy, sl calc, mod v f-f sd
interbed; SHLY SS: gy- wh,
fri, v f- f gr, sbrnd-sbang, w
srt, cons sd, arg-sl calc
cmt; tr pyr;

-7600 SHLY SLTST: med
gy, frm, blk-y-sb plty, gr-
rthy, sl calc, mod v f-f sd
interbed; SHLY SS: gy- wh,
fri, v f- f gr, sbrnd-sbang, w
srt, cons sd, arg-sl calc
cmt; tr pyr;







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-8420 WT 8.6,
VIS 43

-8494 INC 87.5,
AZM 268.28,
TVD 7515.09

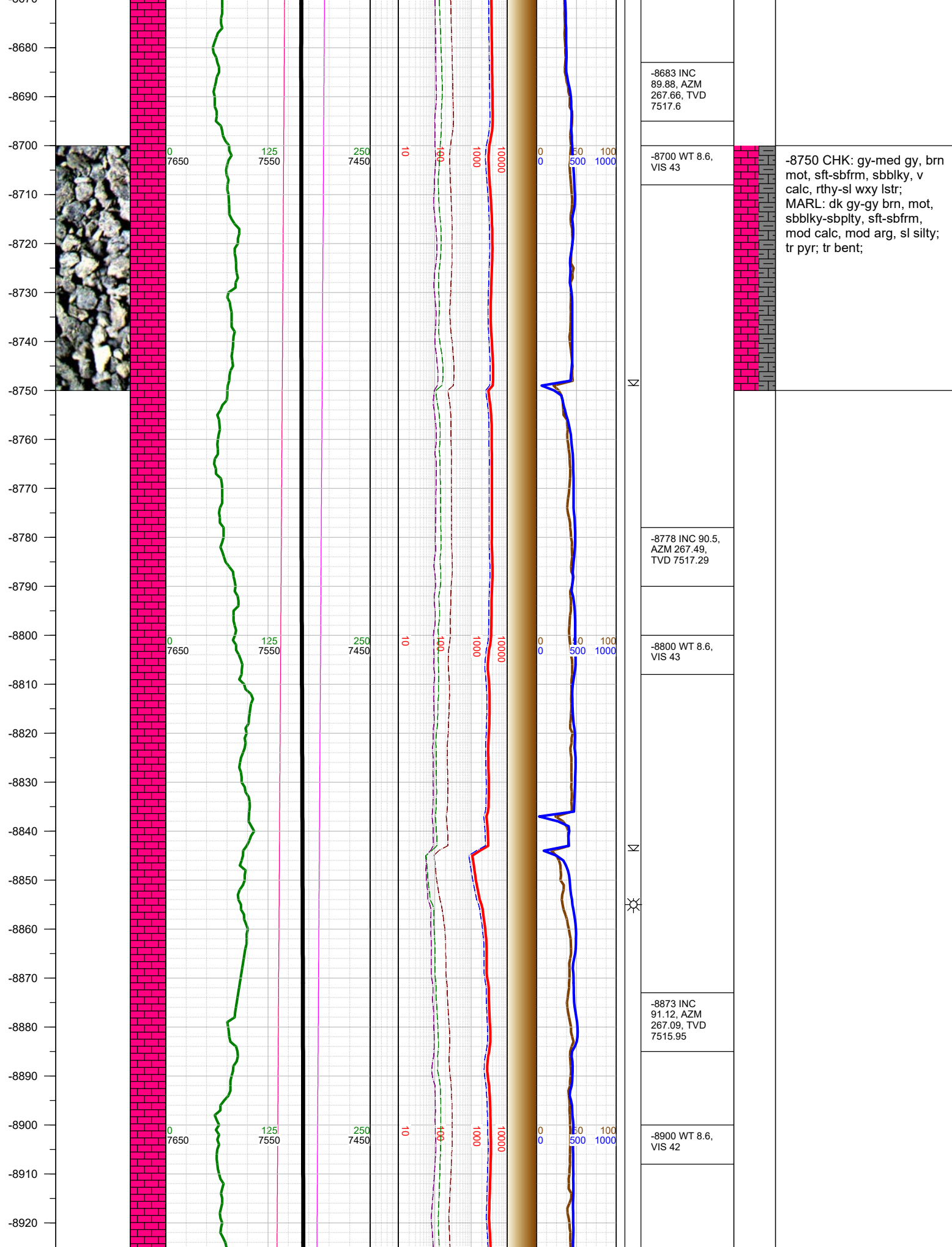
-8510 WT 8.6,
VIS 43

-8589 INC
89.79, AZM
268.28, TVD
7517.33

-8596 Fault: 17'
up-throw; stayed
in B2 Chalk

-8620 WT 8.6,
VIS 43

-8500 CHK: gy-med gy, brn
mot, sft-sbfrm, sbblky, v
calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sbblky-sbplty, sft-sbfrm,
mod calc, mod arg, sl silty;
tr pyr; tr bent;



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-9000 WT 8.6,
VIS 42

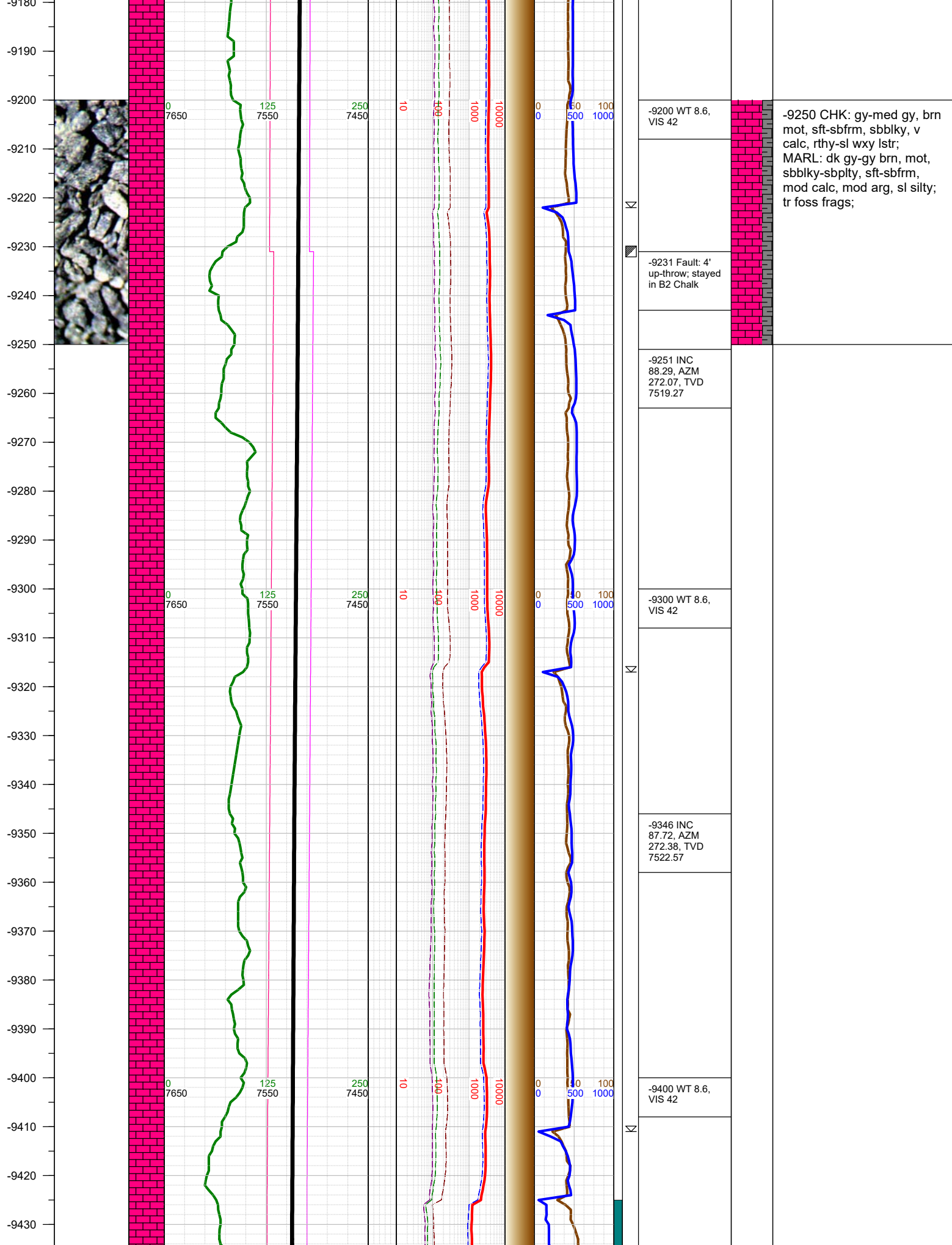
-9062 INC
89.99, AZM
271.5, TVD
7515.53

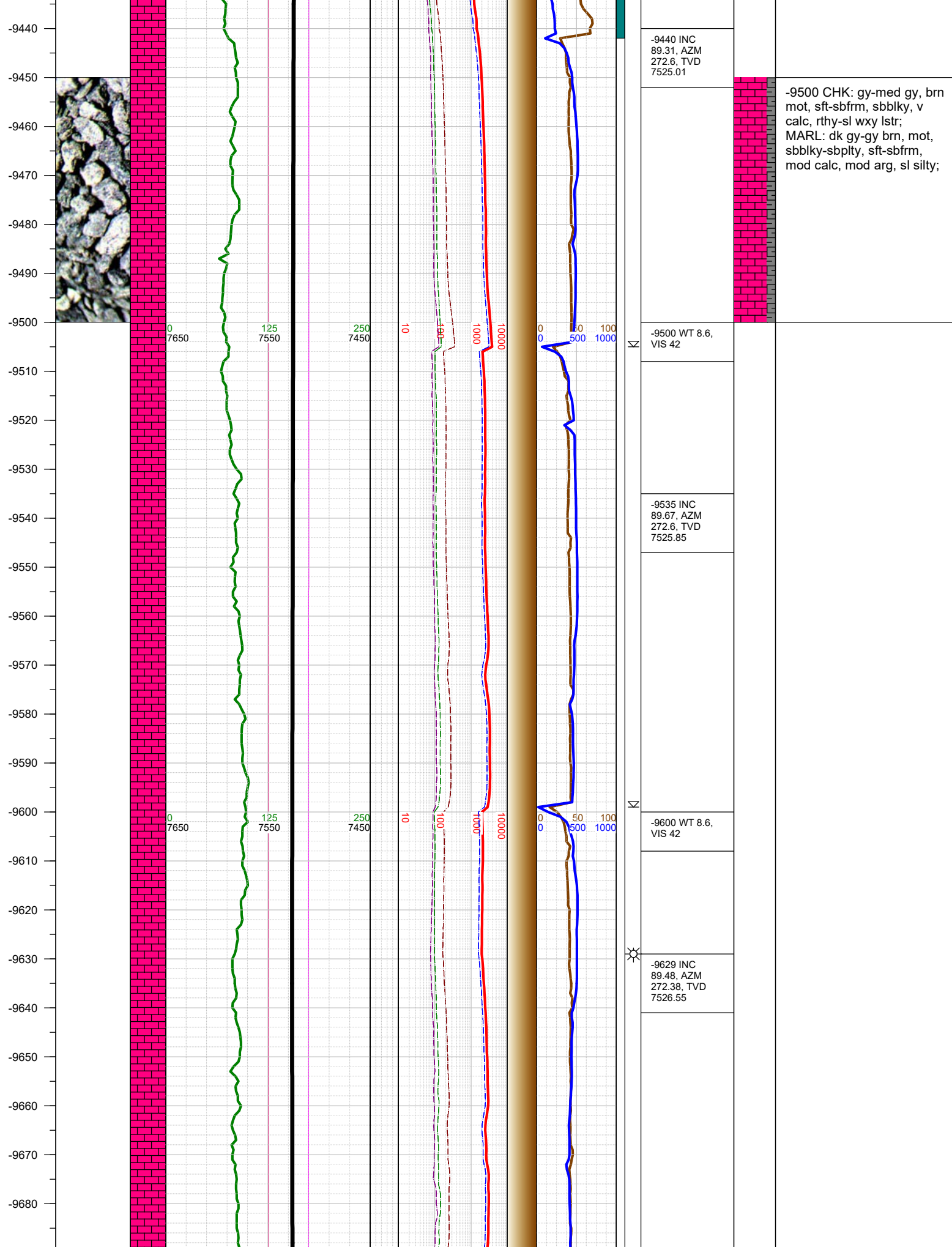
-9100 WT 8.6,
VIS 42

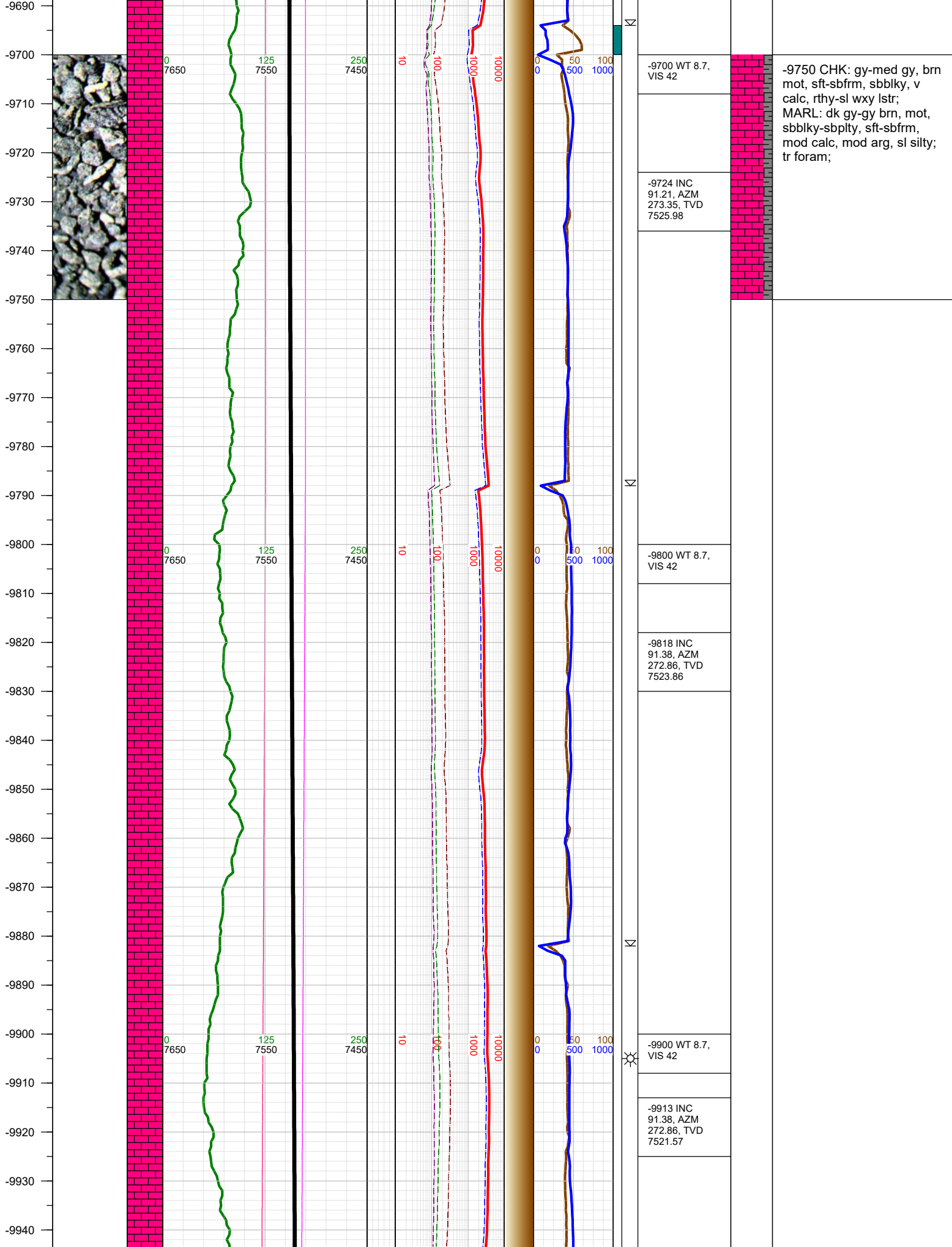
-9130 0000 hrs
on 10/20/2017

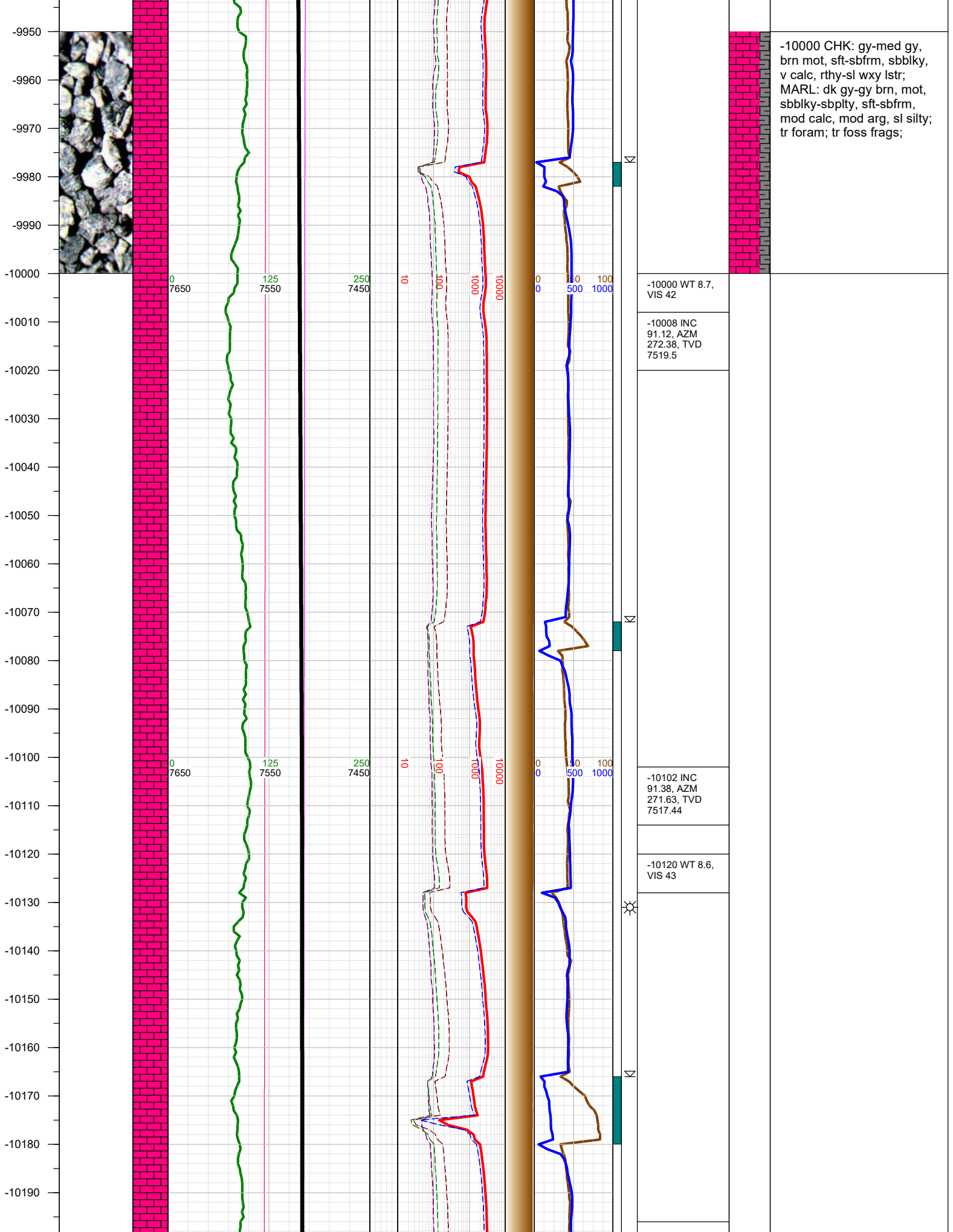
-9156 INC 88.6,
AZM 272.07,
TVD 7516.69

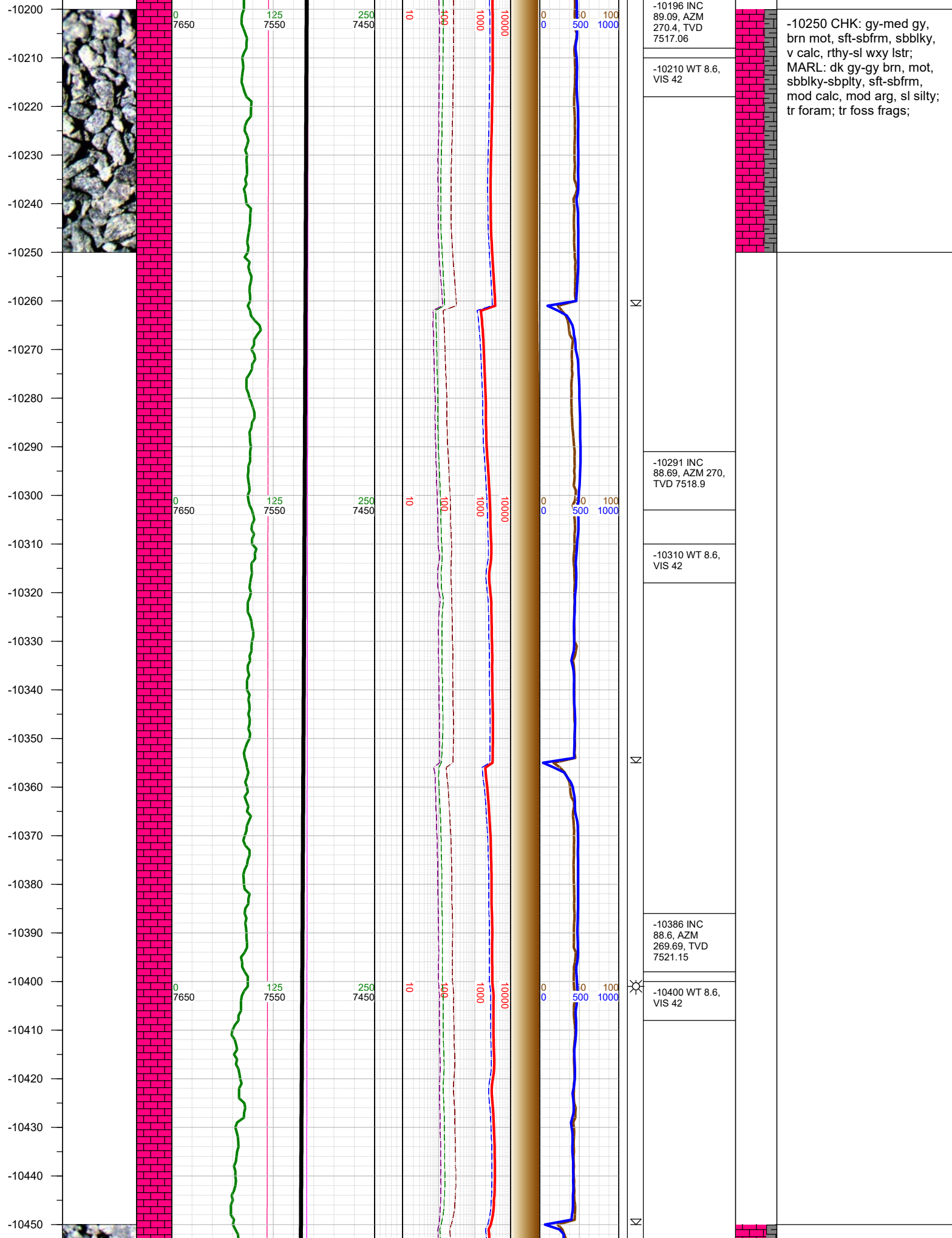
-9000 CHK: gy-med gy, brn
mot, sft-sbfrm, sbblky, v
calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sbblky-sbply, sft-sbfrm,
mod calc, mod arg, sl silty;
tr pyr; tr bent; tr foss frags;

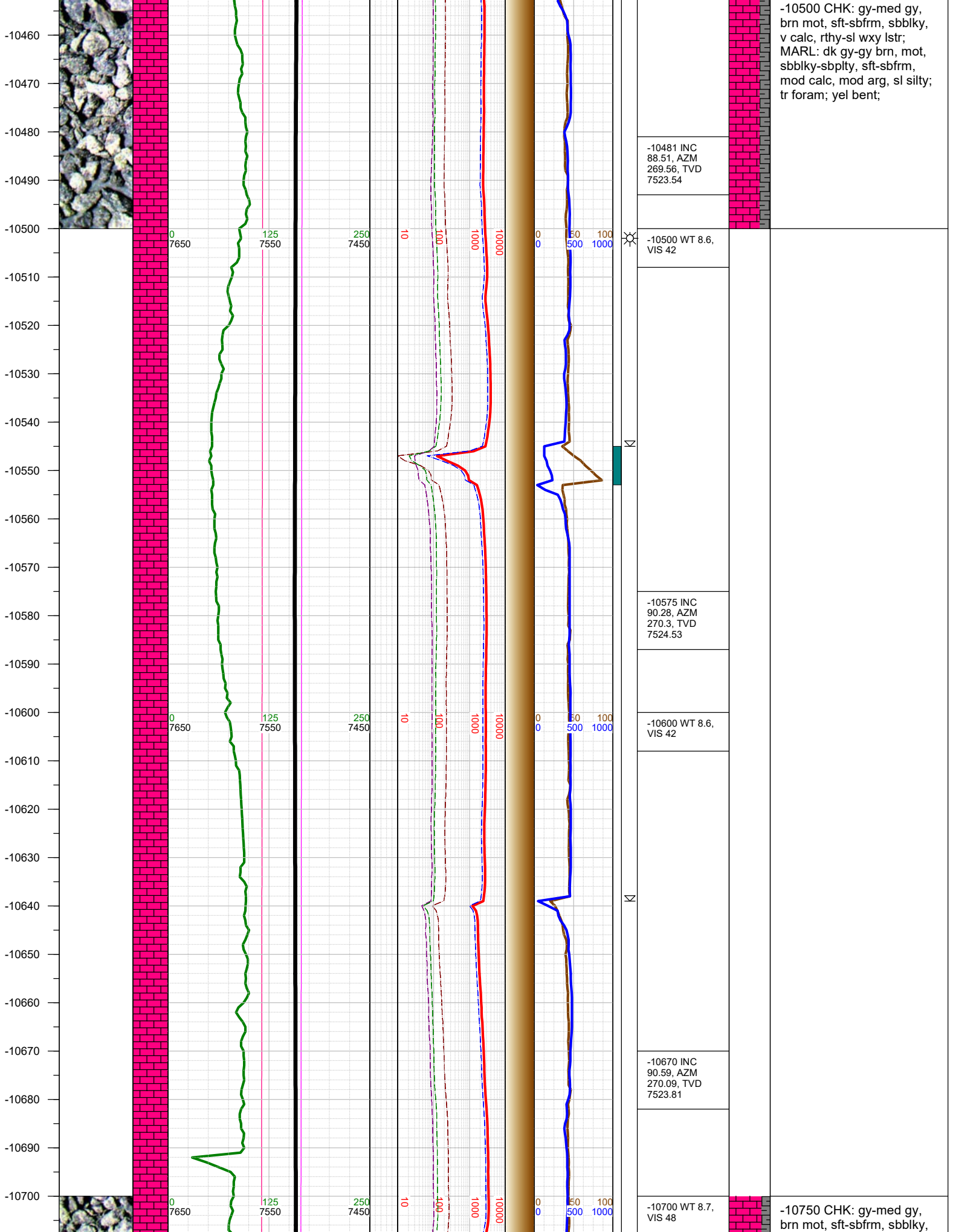






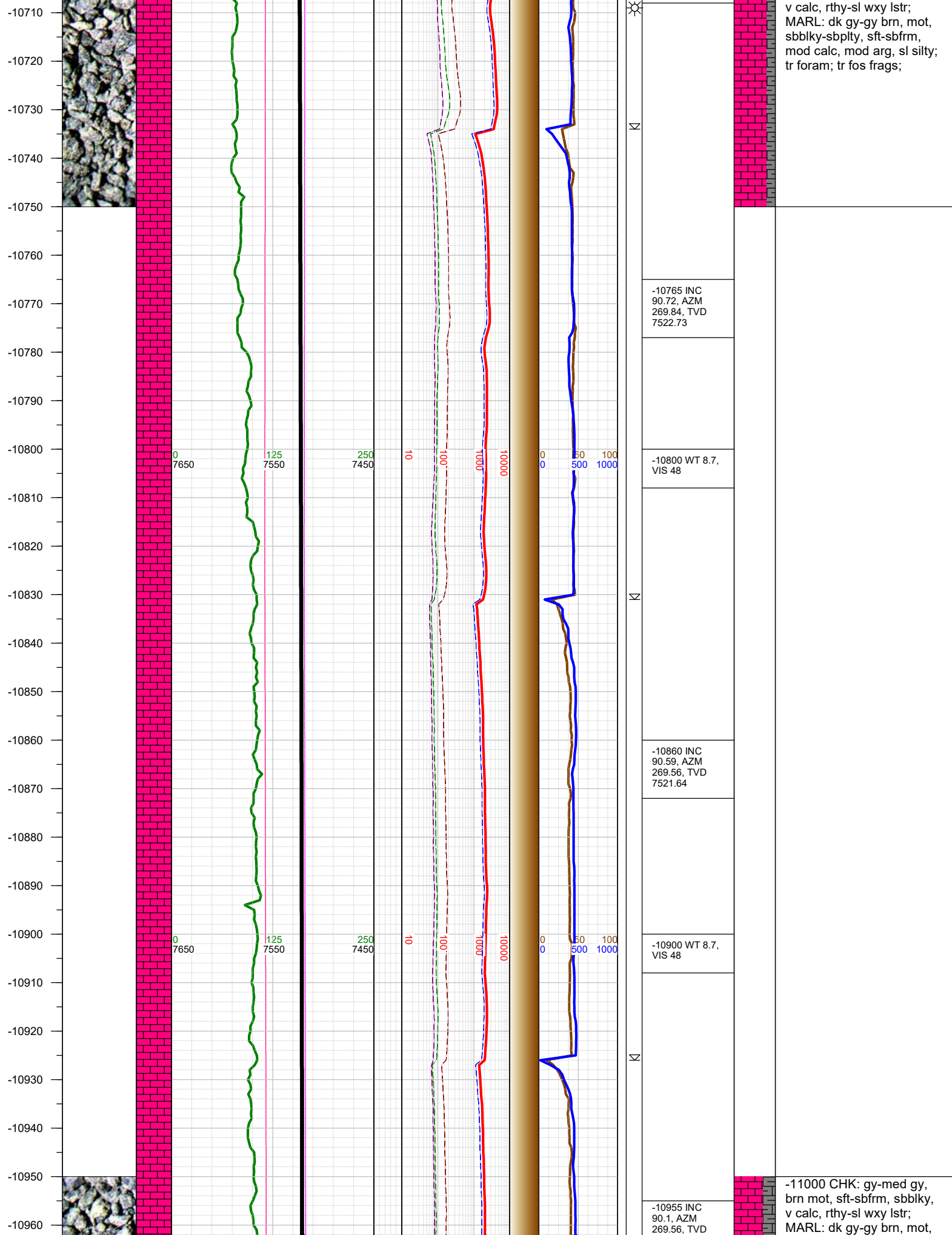


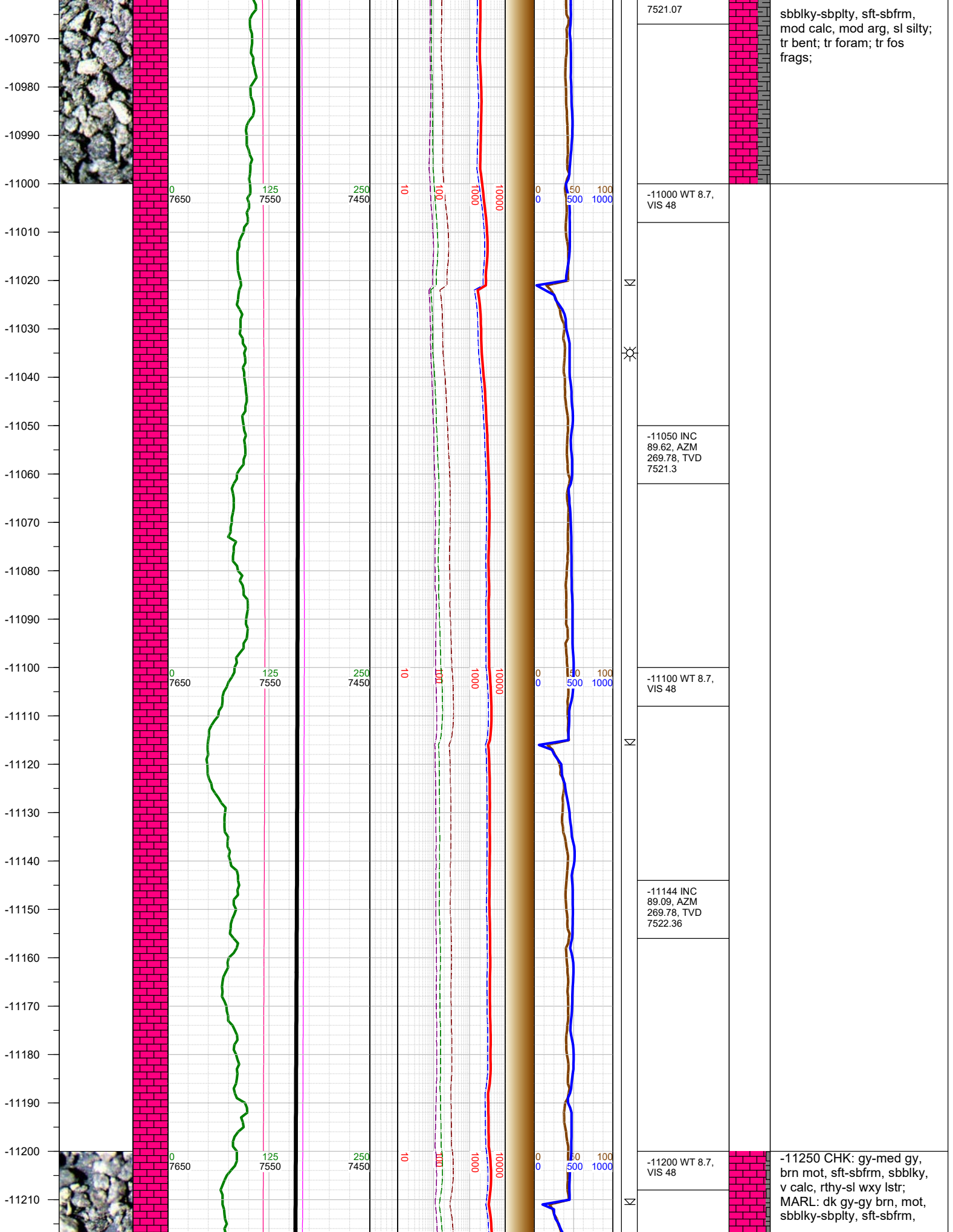


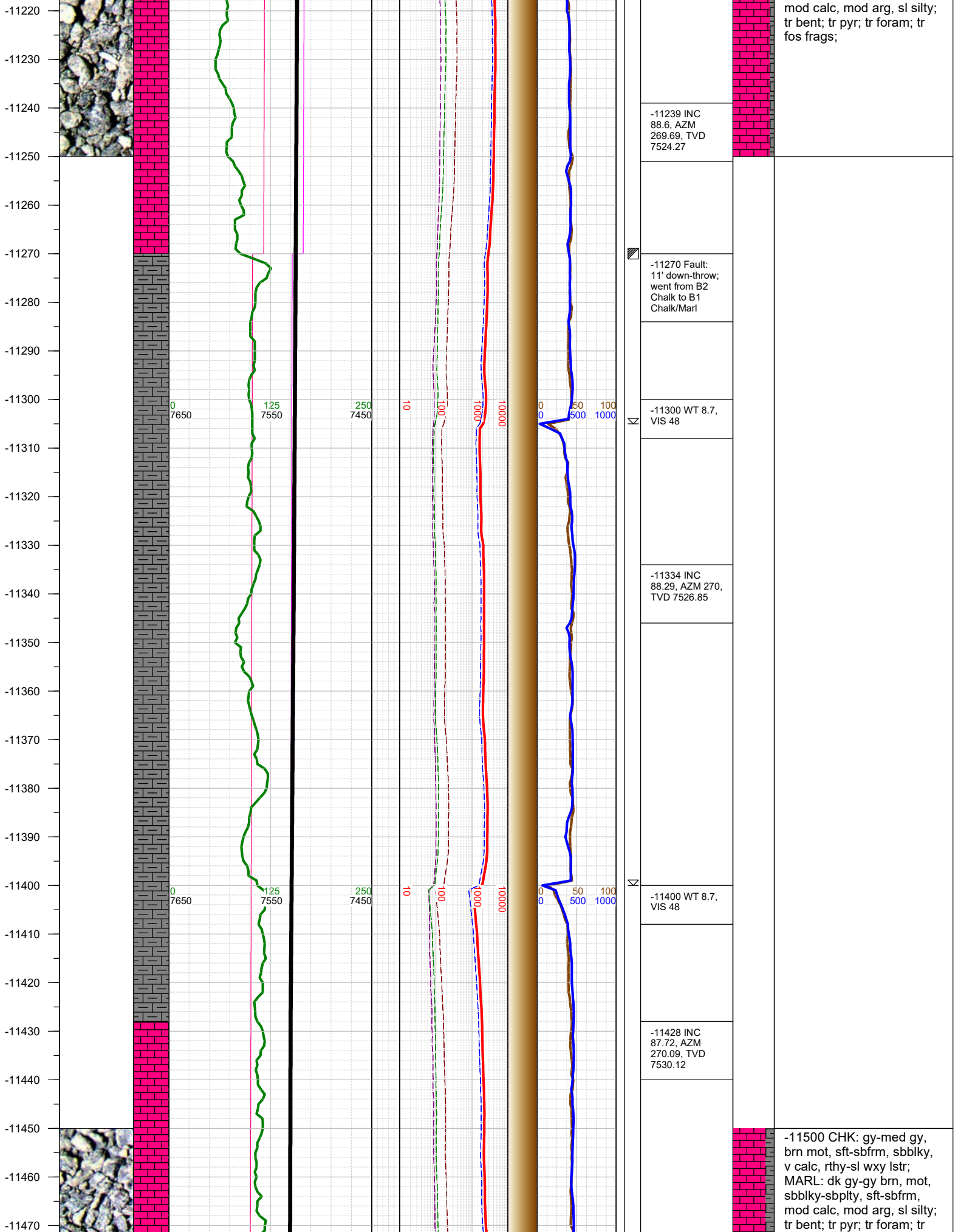


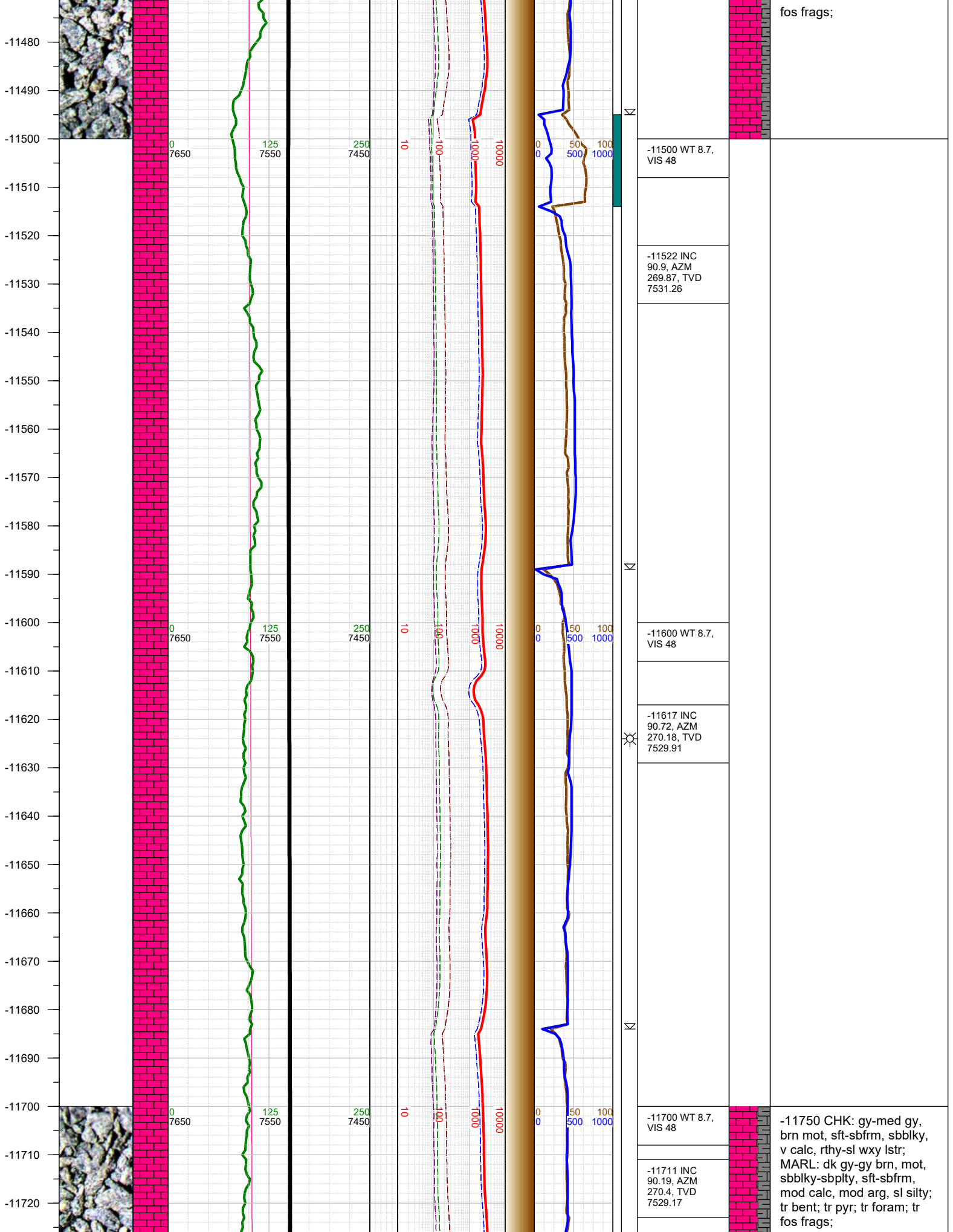
-10500 CHK: gy-med gy, brn mot, sft-sbfrm, sbblky, v calc, rthy-sl wxy lstr; MARL: dk gy-gy brn, mot, sbblky-sbplty, sft-sbfrm, mod calc, mod arg, sl silty; tr foram; yel bent;

-10750 CHK: gy-med gy, brn mot, sft-sbfrm, sbblky,









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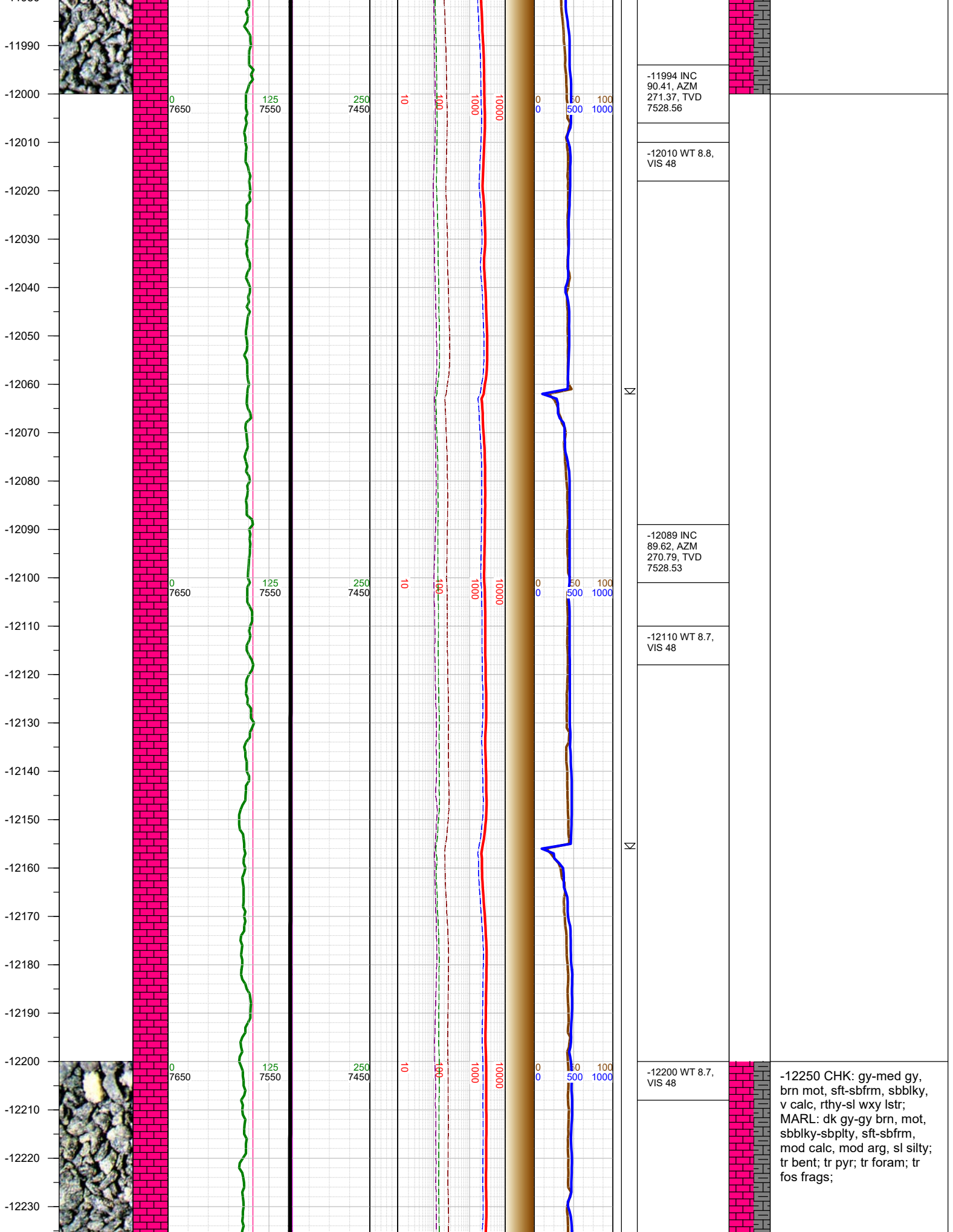
-11806 INC
89.88, AZM
270.48, TVD
7529.11

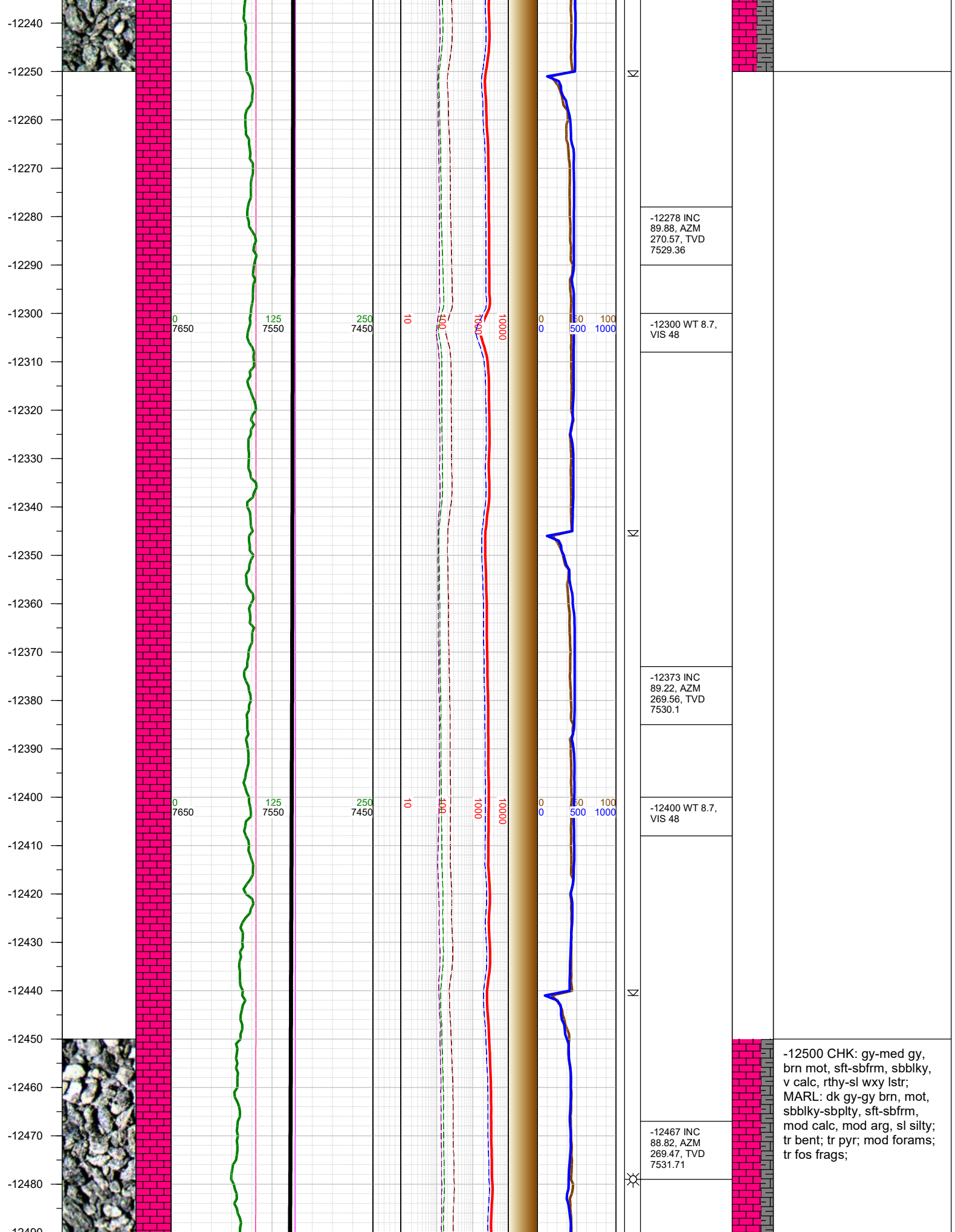
-11820 WT 8.8,
VIS 48

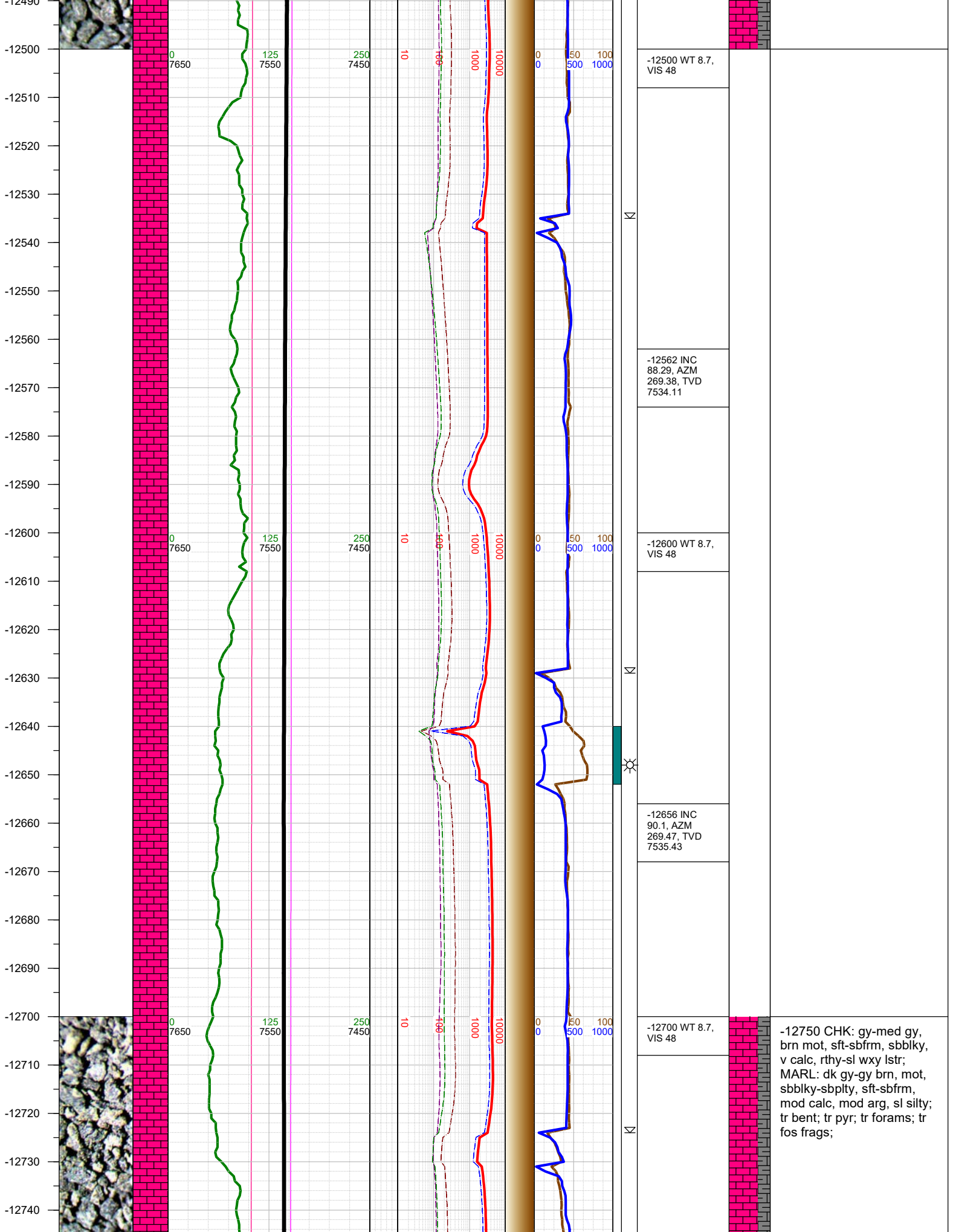
-11900 INC
90.19, AZM
270.66, TVD
7529.05

-11920 WT 8.8,
VIS 48

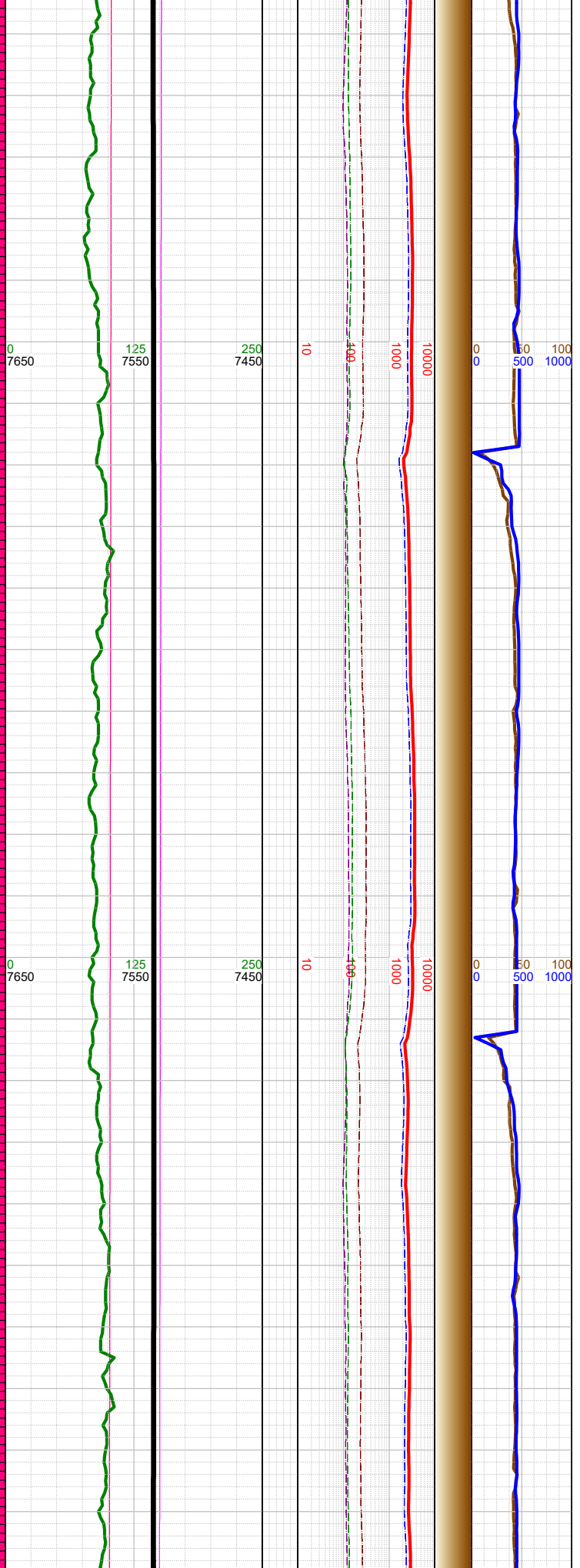
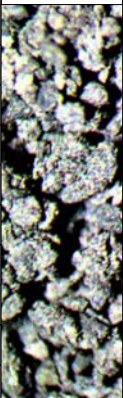
-12000 CHK: gy-med gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sbblky-sbpity, sft-sbfrm,
mod calc, mod arg, sl silty;
tr bent; tr pyr; tr foram; tr
fos frags;







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-12990



-12751 INC
90.28, AZM
268.9, TVD
7535.11

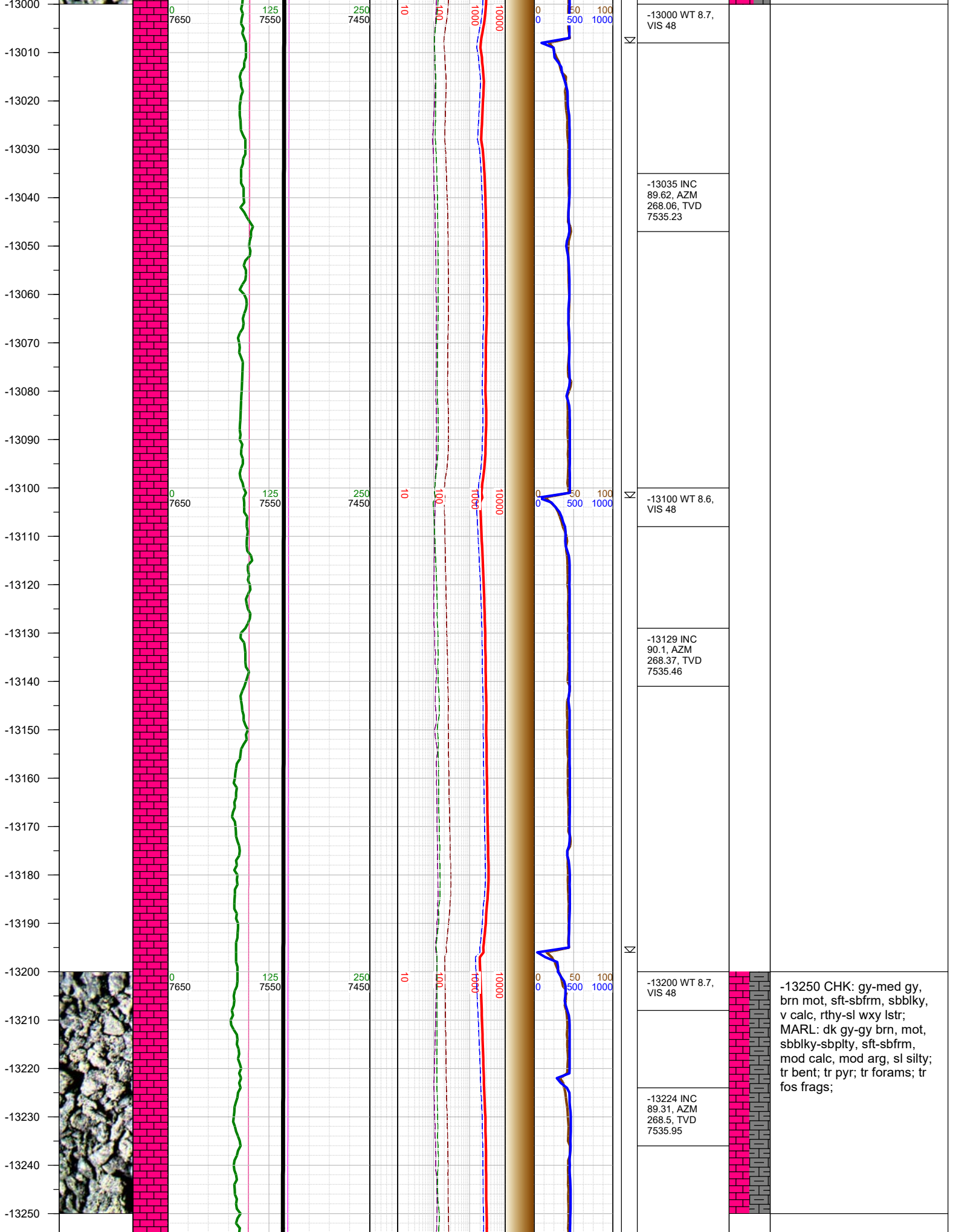
-12800 WT 8.7,
VIS 48

-12846 INC
90.5, AZM
268.77, TVD
7534.47

-12900 WT 8.7,
VIS 48

-12940 INC
89.48, AZM
267.88, TVD
7534.48

-13000 CHK: gy-med gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sbblky-sbplty, sft-sbfrm,
mod calc, mod arg, sl silty;
tr bent; tr pyr; tr forams; tr
fos frags;



-13000 WT 8.7,
VIS 48

-13035 INC
89.62, AZM
268.06, TVD
7535.23

-13100 WT 8.6,
VIS 48

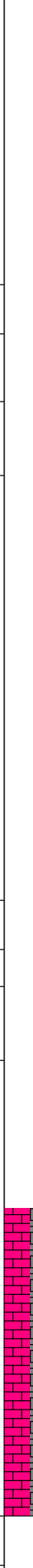
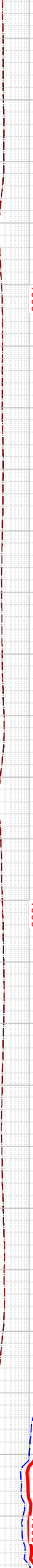
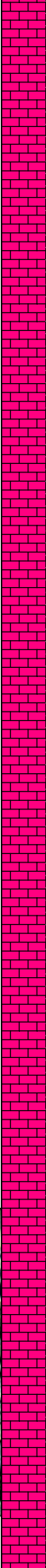
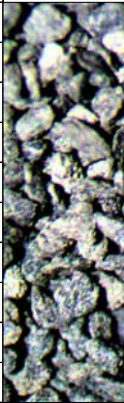
-13129 INC
90.1, AZM
268.37, TVD
7535.46

-13200 WT 8.7,
VIS 48

-13224 INC
89.31, AZM
268.5, TVD
7535.95

-13250 CHK: gy-med gy,
brn mot, sft-sbfrm, sblky,
v calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sblky-sbplty, sft-sbfrm,
mod calc, mod arg, sl silty;
tr bent; tr pyr; tr forams; tr
fos frags;

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-13300 WT 8.7,
VIS 48

-13319 INC
89.22, AZM
268.5, TVD
7537.17

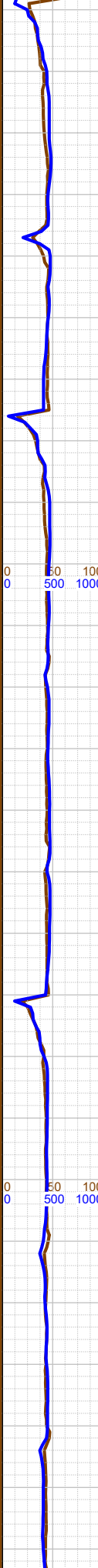
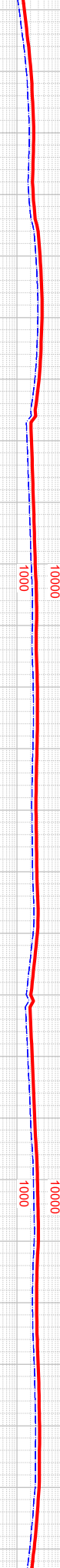
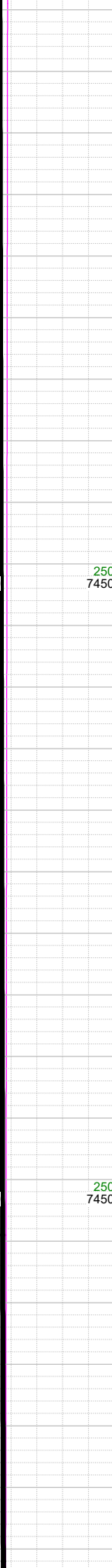
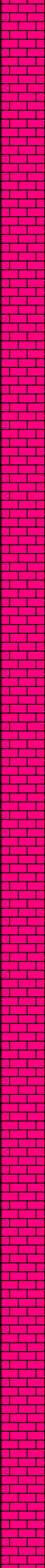
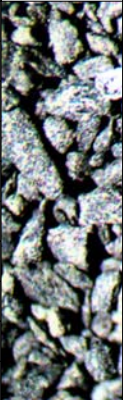
-13400 WT 8.7,
VIS 48

-13414 INC
89.09, AZM
268.5, TVD
7538.57

-13500 CHK: gy-med gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr;
MARL: dk gy-gy brn, mot,
sbblky-sbplty, sft-sbfrm,
mod calc, mod arg, sl silty;
tr bent; tr pyr; tr forams; tr
fos frags;

-13500 WT 8.7,
VIS 48

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-13508 INC
90.5, AZM
269.69, TVD
7538.9

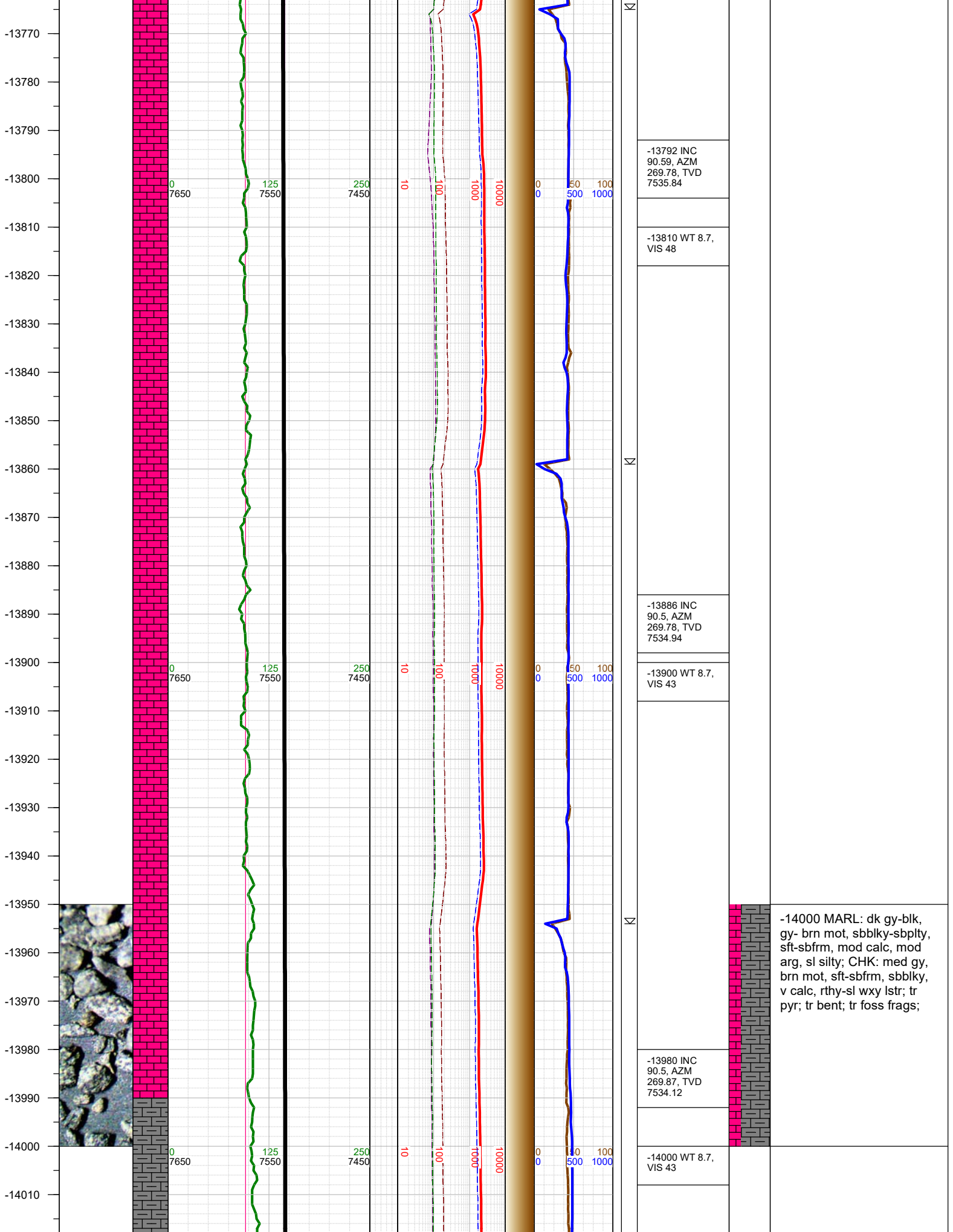
-13603 INC
90.72, AZM
270.09, TVD
7537.89

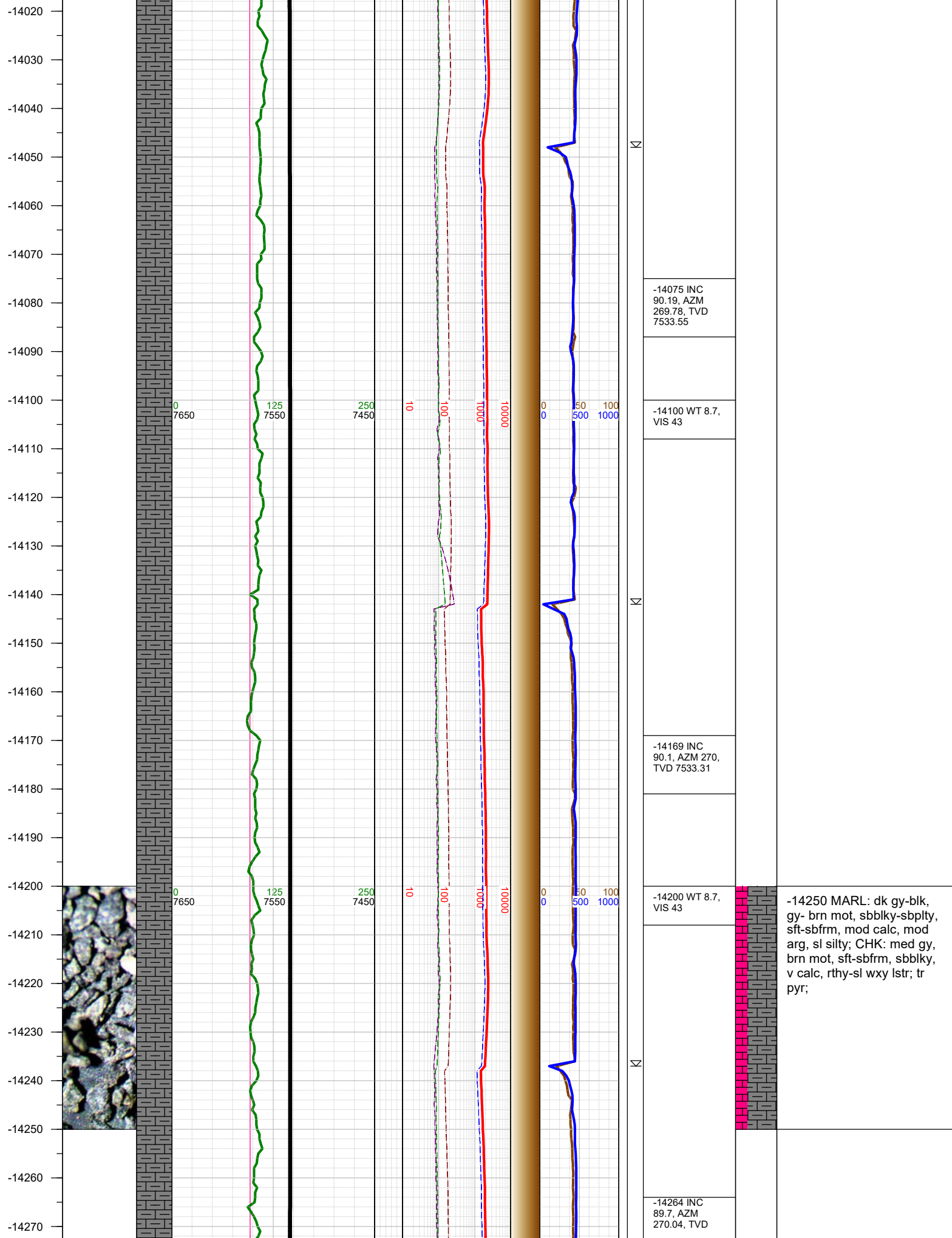
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VIS 48

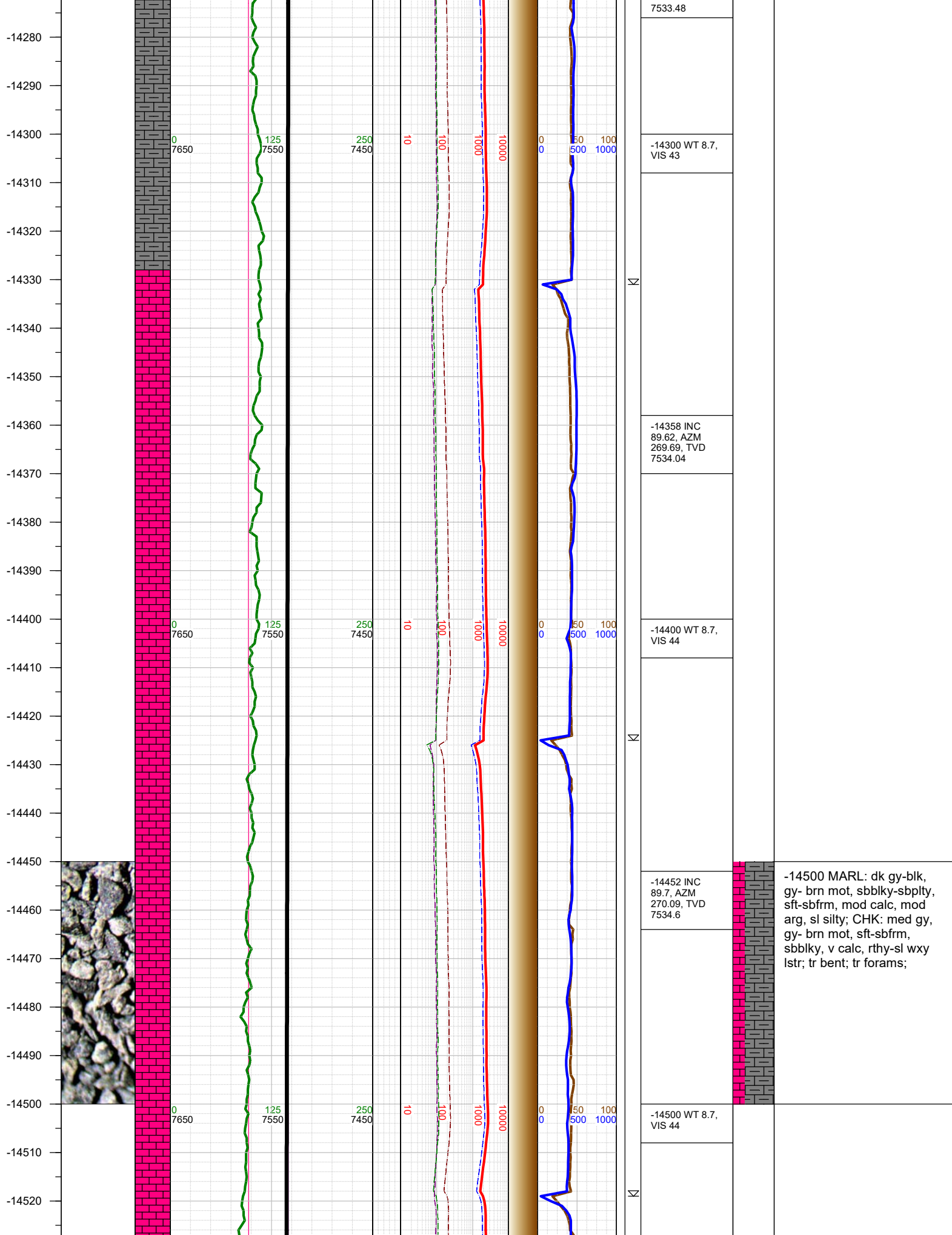
-13698 INC
90.59, AZM 270,
TVD 7536.81

-13710 WT 8.7,
VIS 48

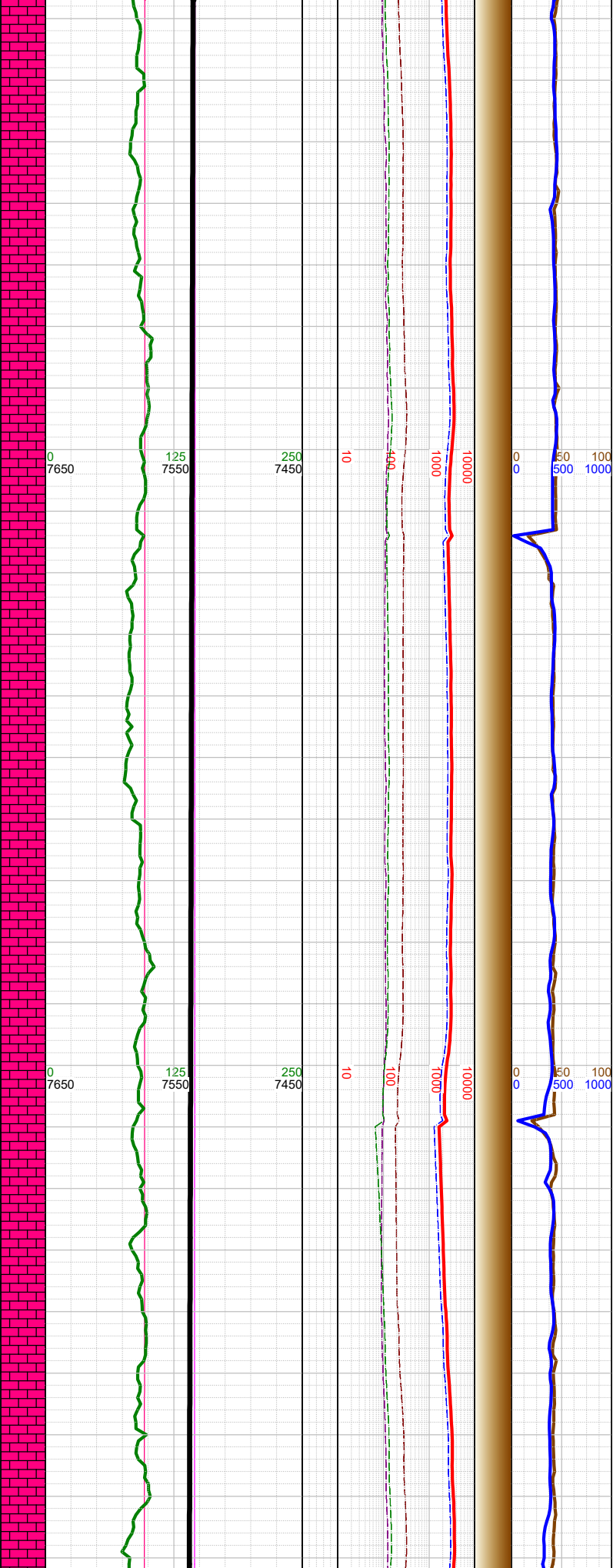
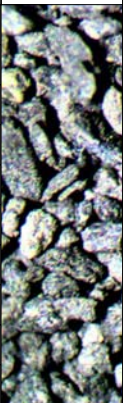
-13750 MARL: dk gy-blk,
gy- brn mot, sbblky-sbplty,
sft-sbfrm, mod calc, mod
arg, sl silty; CHK: med gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr; tr
pyr; tr bent;



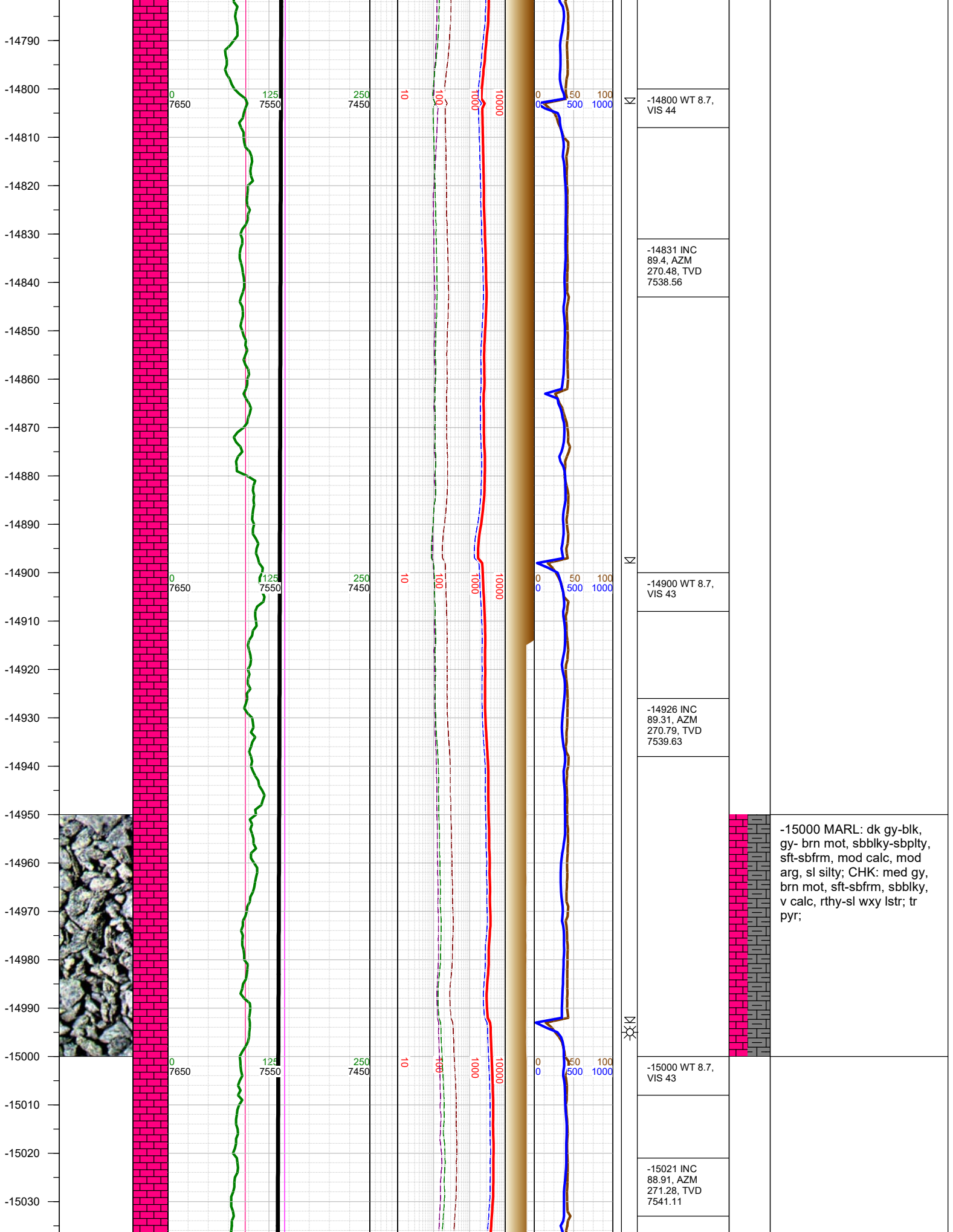


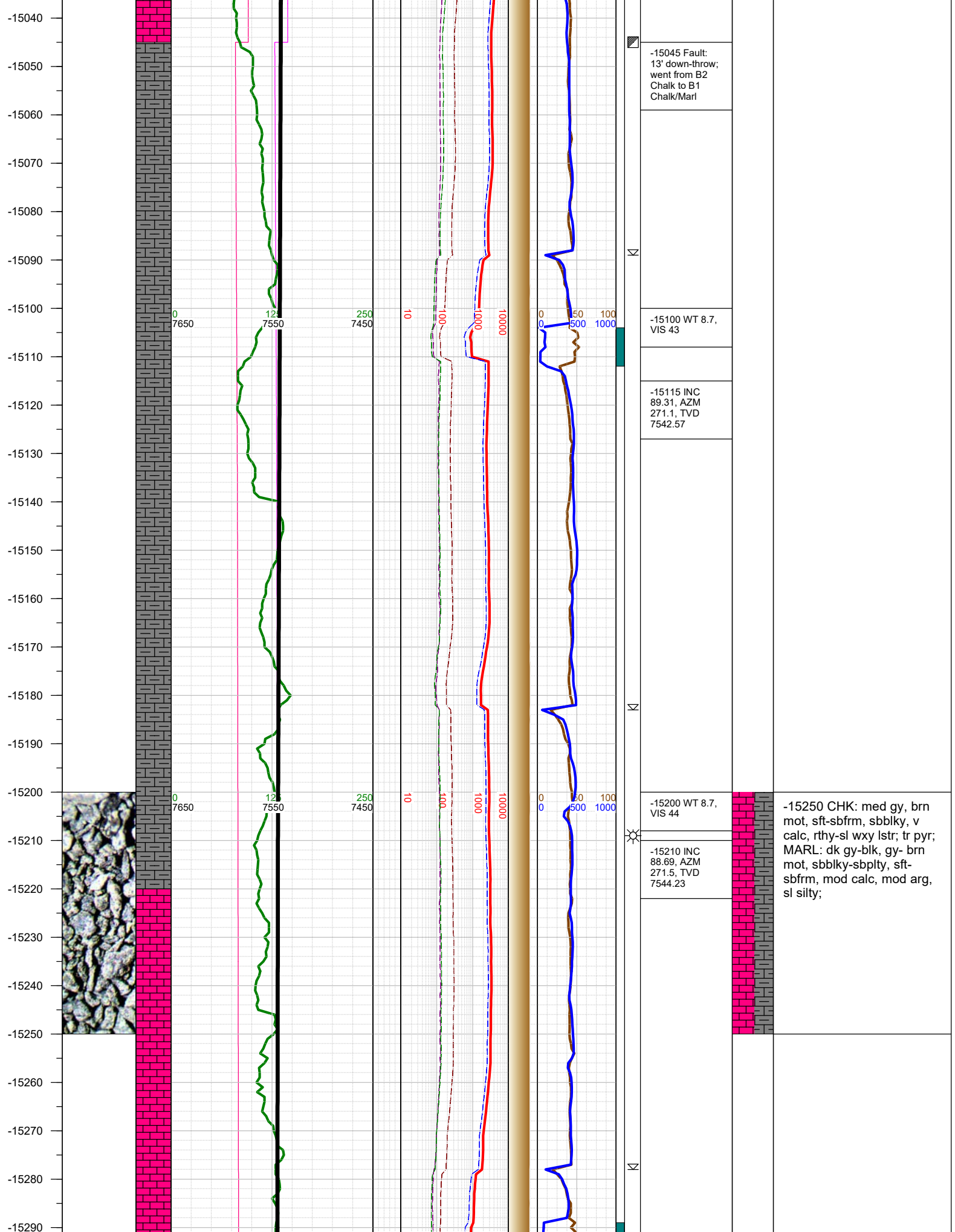


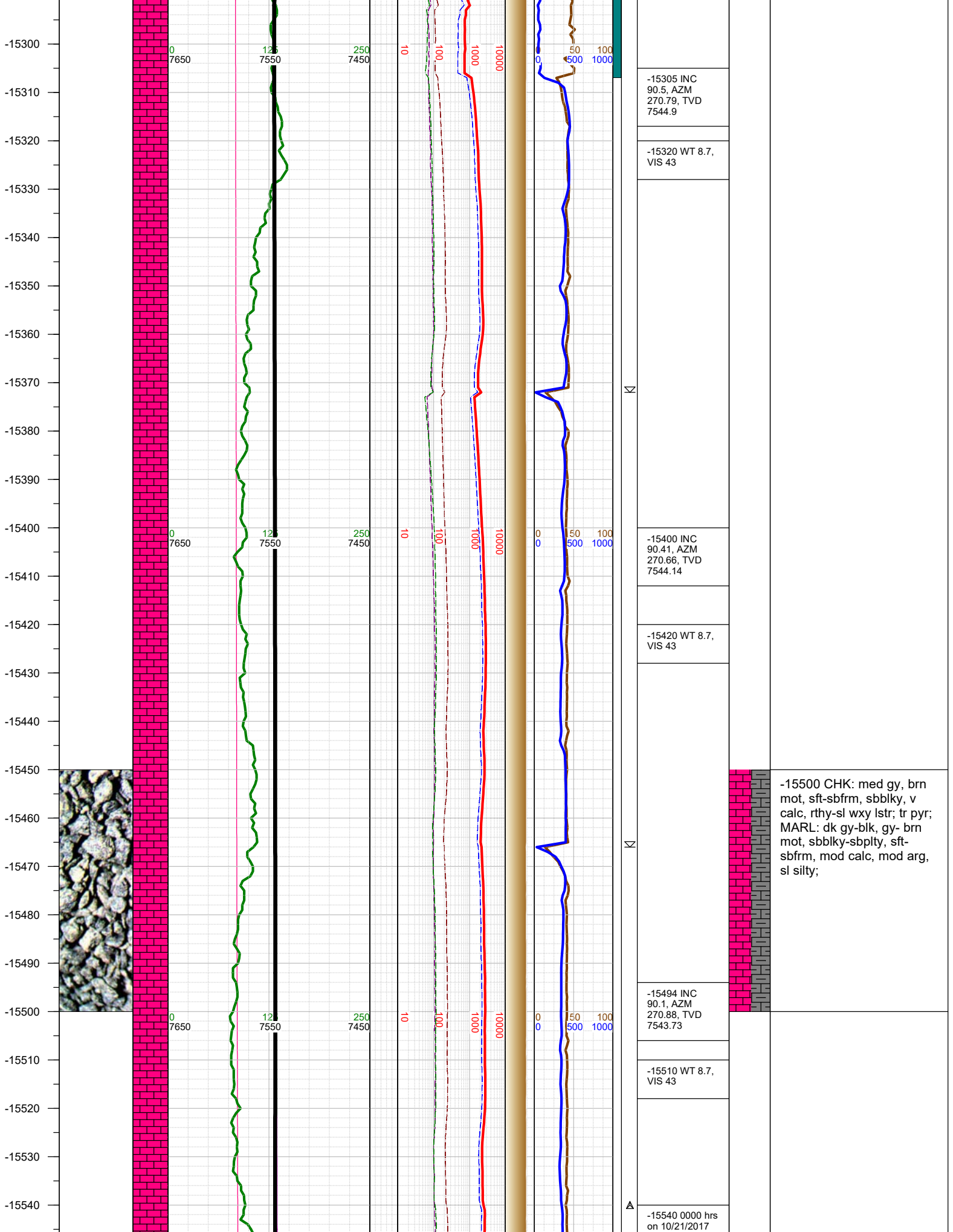
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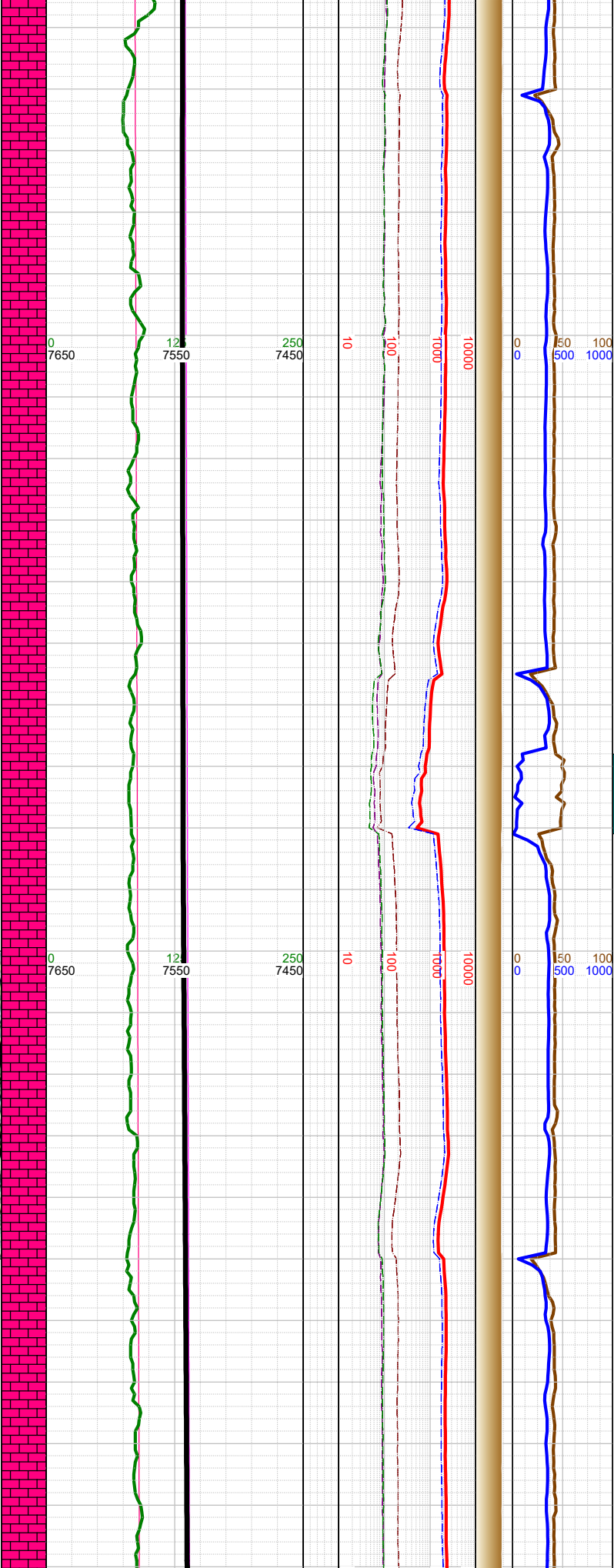
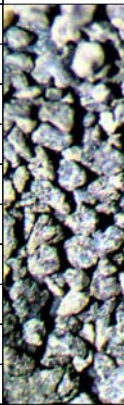
☀	-14547 INC 89.43, AZM 270.09, TVD 7535.32		
	-14600 WT 8.7, VIS 44		
☀	-14641 INC 89.31, AZM 270.4, TVD 7536.35		
	-14700 WT 8.7, VIS 44	-14750 MARL: dk gy-blk, gy- brn mot, sbblky-sbplty, sft-sbfrm, mod calc, mod arg, sl silty; CHK: med gy, brn mot, sft-sbfrm, sbblky, v calc, rthy-sl wxy lstr; tr pyr;	
☀	-14736 INC 89.31, AZM 270.48, TVD 7537.5		





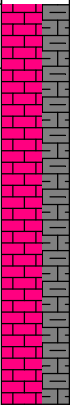


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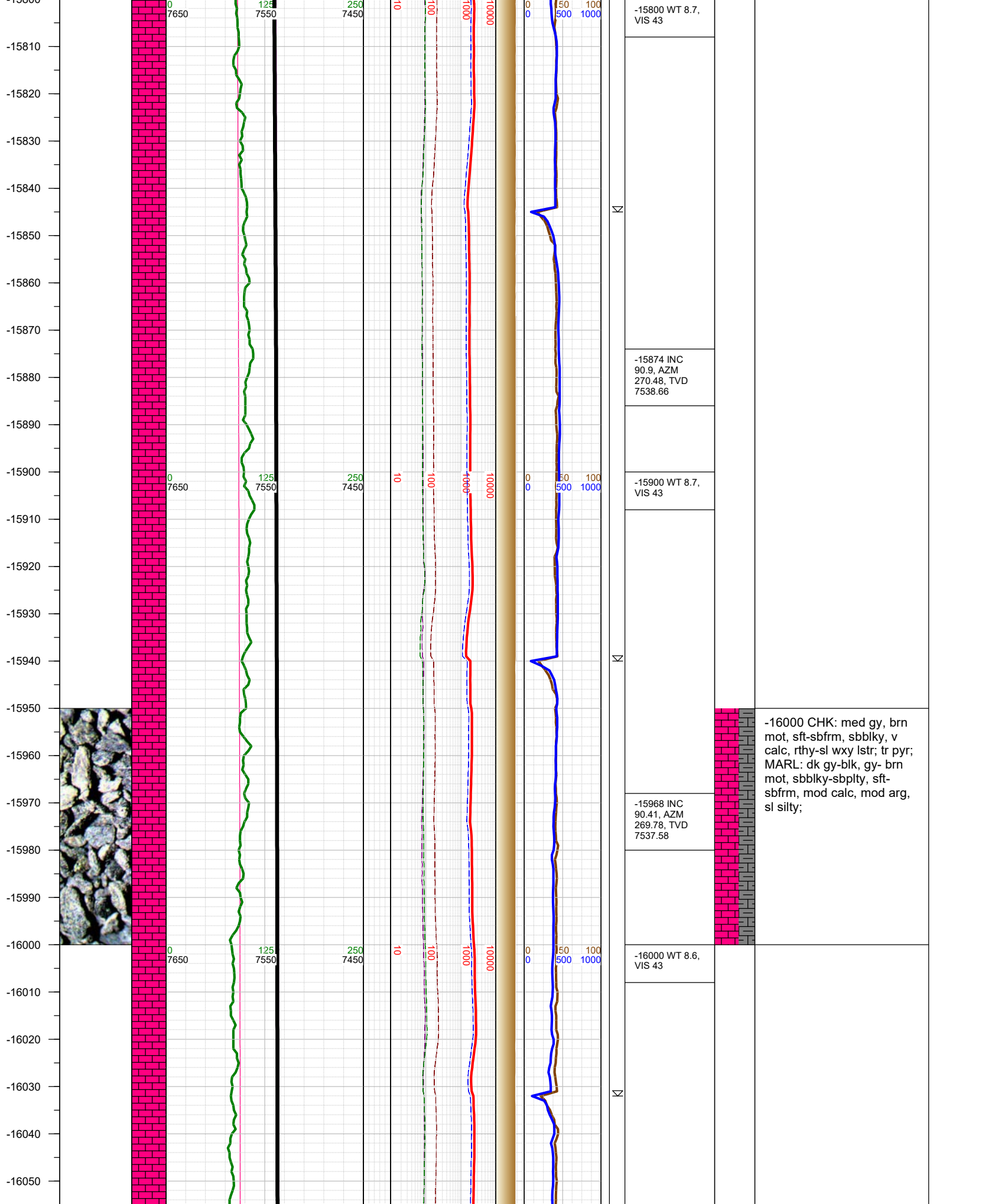


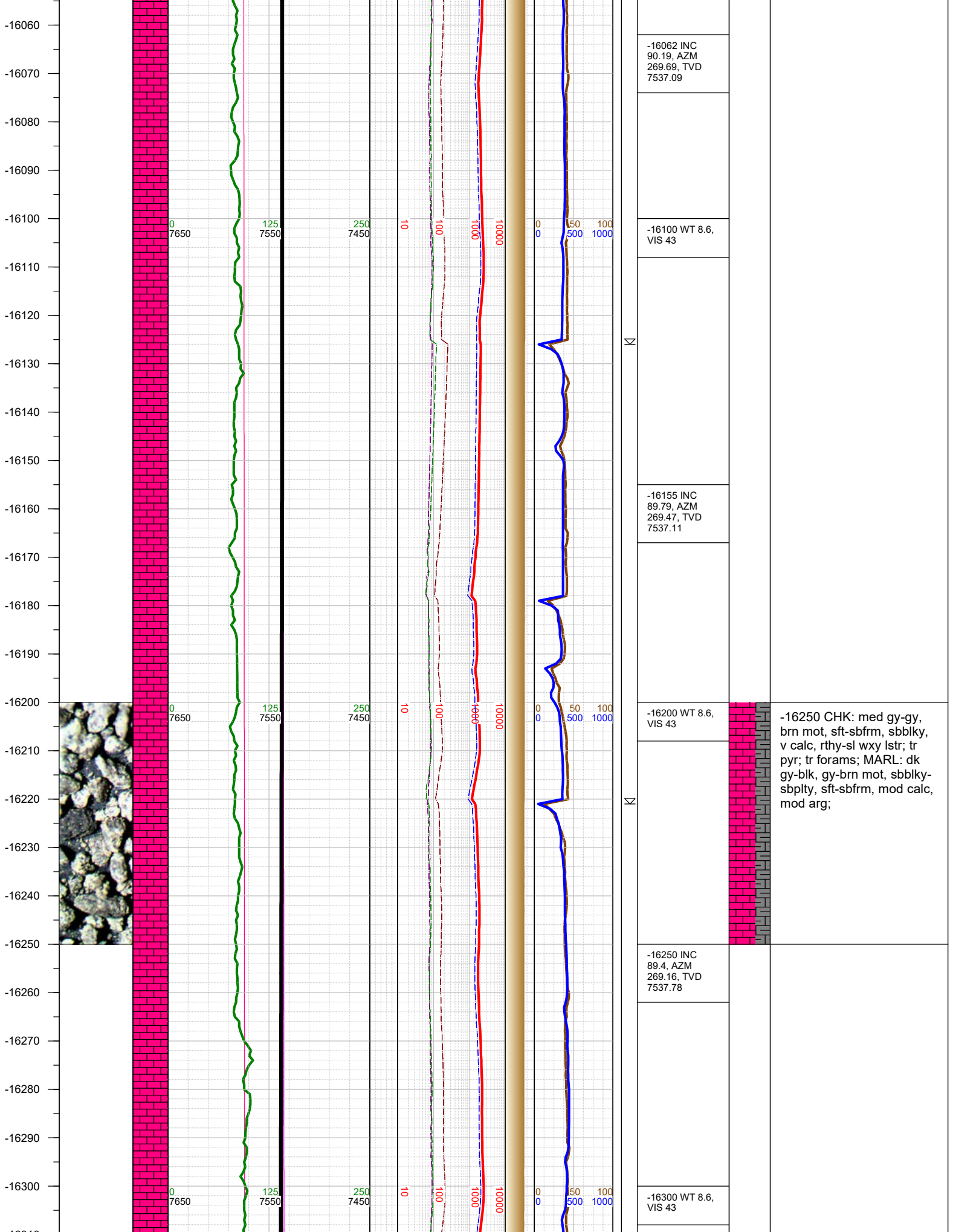
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	-15589 INC 89.4, AZM 270.57, TVD 7544.14
	-15610 WT 8.7, VIS 43
	-15684 INC 91.38, AZM 270.66, TVD 7543.49
	-15700 WT 8.7, VIS 43
	-15778 INC 91.78, AZM 270.88, TVD 7540.9

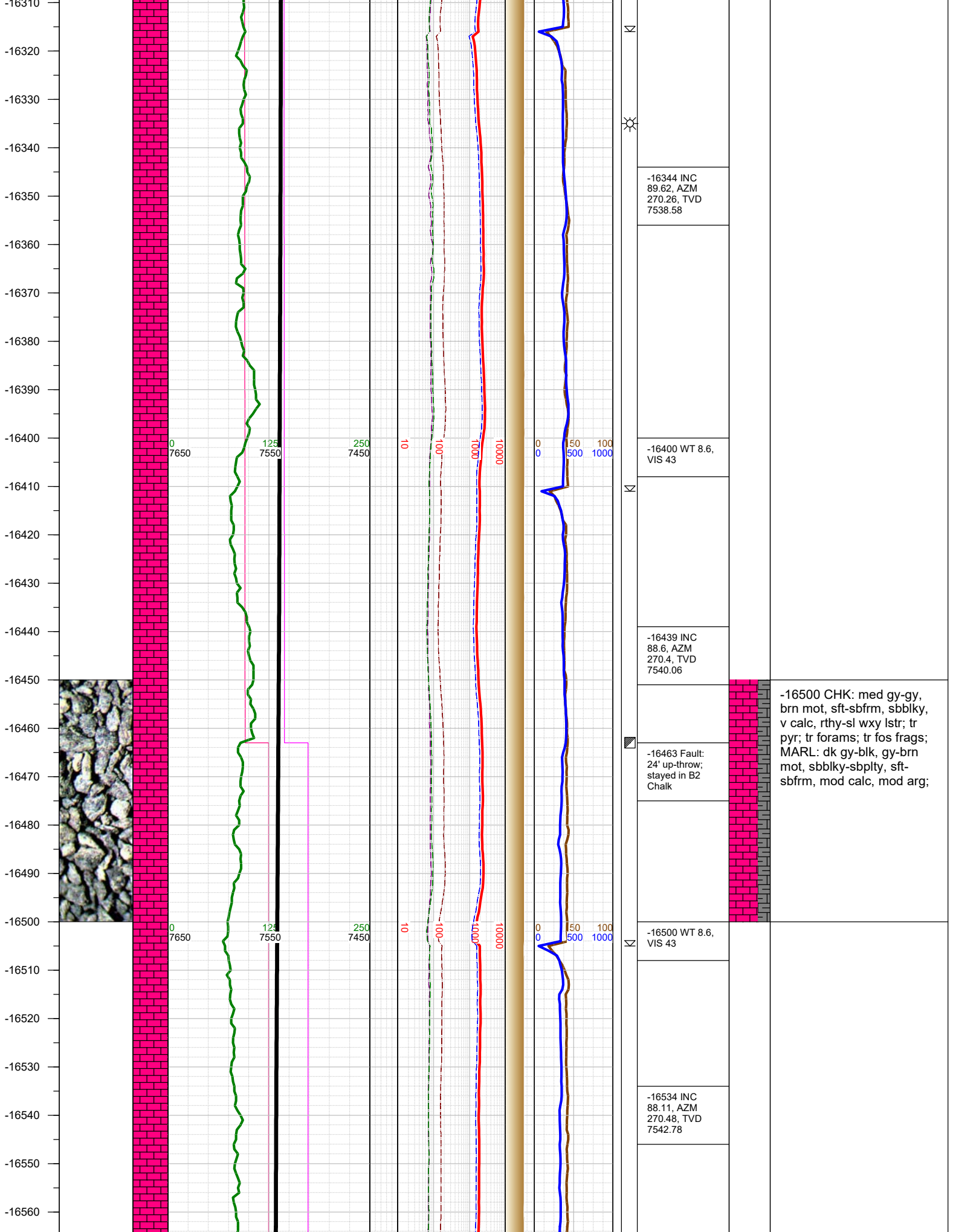


-15750 CHK: med gy, brn
mot, sft-sbfrm, sbblky, v
calc, rthy-sl wxy lstr; tr pyr;
MARL: dk gy-blk, gy- brn
mot, sbblky-sbplty, sft-
sbfrm, mod calc, mod arg,
sl silty;

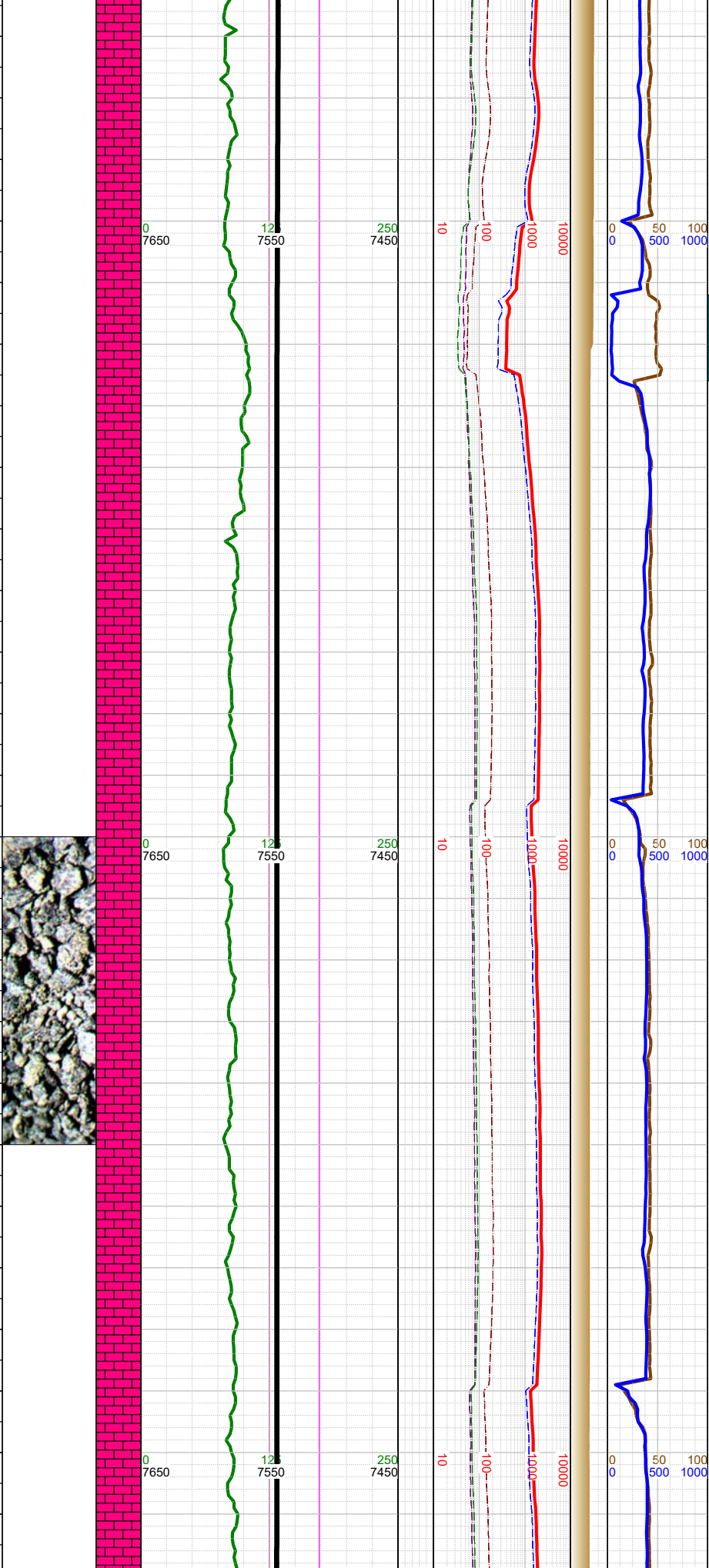




-16250 CHK: med gy-gy, brn mot, sft-sbfrm, sbblky, v calc, rthy-sl wxy lstr; tr pyr; tr forams; MARL: dk gy-blk, gy-brn mot, sbblky-sbplty, sft-sbfrm, mod calc, mod arg;



-16570
-16580
-16590
-16600
-16610
-16620
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-16690
-16700
-16710
-16720
-16730
-16740
-16750
-16760
-16770
-16780
-16790
-16800
-16810



-16600 WT 8.6,
VIS 43



-16629 INC
90.01, AZM 270,
TVD 7544.34



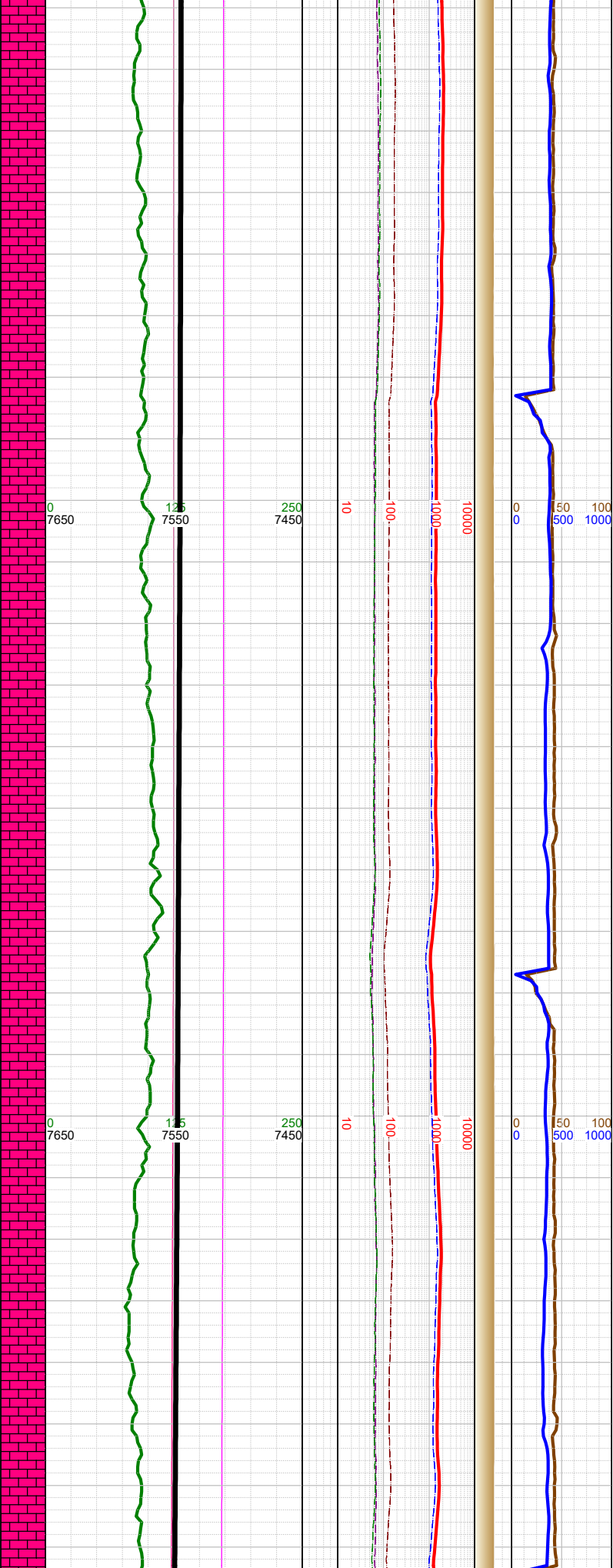
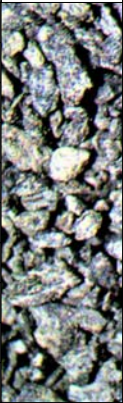
-16700 WT 8.6,
VIS 43



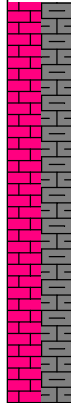
-16800 WT 8.7,
VIS 47

-16750 CHK: med gy-gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr; tr
pyr; tr forams; tr fos frags;
MARL: dk gy-blk, gy-brn
mot, sbblky-sbplty, sft-
sbfrm, mod calc, mod arg;

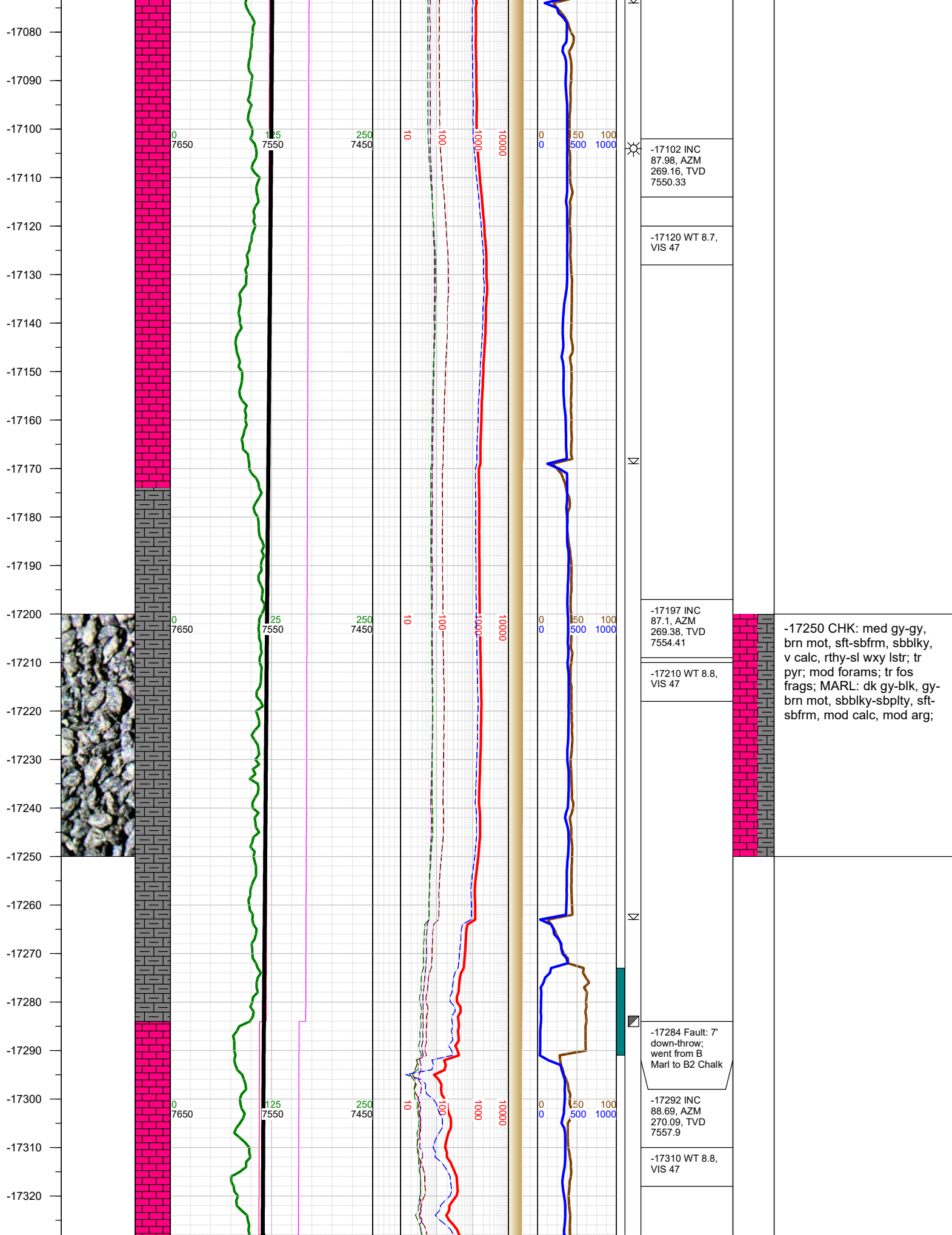
-16820
-16830
-16840
-16850
-16860
-16870
-16880
-16890
-16900
-16910
-16920
-16930
-16940
-16950
-16960
-16970
-16980
-16990
-17000
-17010
-17020
-17030
-17040
-17050
-17060
-17070



-16817 INC 89.7, AZM 270.2, TVD 7544.42
-16900 WT 8.7, VIS 47
-16911 INC 89.09, AZM 269.47, TVD 7545.41
-17007 INC 88.51, AZM 269.29, TVD 7547.42
-17020 WT 8.7, VIS 47

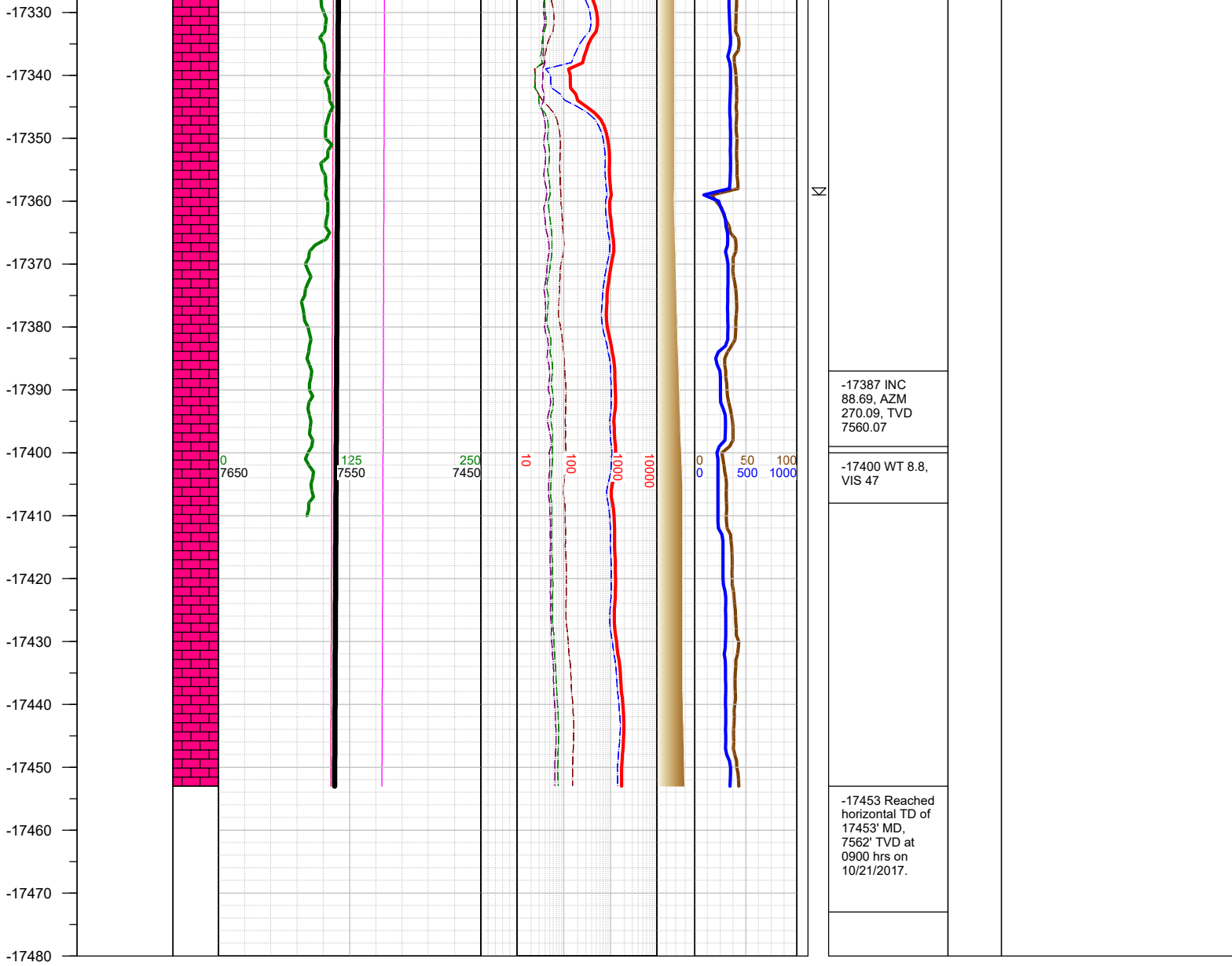


-17000 CHK: med gy-gy,
brn mot, sft-sbfrm, sbblky,
v calc, rthy-sl wxy lstr; tr
pyr; mod forams; tr fos
frags; MARL: dk gy-blk, gy-
brn mot, sbblky-sbplty, sft-
sbfrm, mod calc, mod arg;



-17250 CHK: med gy-gy, brn mot, sft-sbfrm, sbblky, v calc, rthy-sl wxy lstr; tr pyr; mod forams; tr fos frags; MARL: dk gy-blk, gy-brn mot, sbblky-sbplty, sft-sbfrm, mod calc, mod arg;

-17284 Fault: 7' down-throw; went from B Marl to B2 Chalk



TOTAL DEPTH = 17453'

Thank you for using Earth Science Agency