

**R Dual Gamma Ray
SP4 - Slim Phase 4**

1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	300				
Date run completed	05-May-13				
Rig Bit Number	0300				
Bit Size (in)	6.125				
Tool Nominal OD (in)	4.750				
Log Start Depth (MD, ft)	7,610.00				
Log End Depth (MD, ft)	11,607.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	02-May-13 16:42				
Drill/Wipe End Date and Time	04-May-13 19:40				
Min Inc (deg) @ Depth (MD, ft)	88.89 @ 9,823.00				
Max Inc (deg) @ Depth (MD, ft)	93.33 @ 9,309.00				
Bit TFA(in2) / Bit Type	.98 / PDC				
Flow Rate (gpm)	296.76				
Max AV (fpm) / CV (fpm) @ MWD	399.6 / 302.4				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	9.35 / 9.00				
Filtrate CL (ppm)	1,800.00				
pH / Fluid Loss (mptm)	10.00 / 6				
PV (cP) / YP (lbf2)	9 / 5.00				
% Solids / % Sand	6.50 / 0.10				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (degF) / Source	233.18 / HCIM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Matthew Busche				
Customer Representative	Will Pettijohn				

Sensor Information					
Directional Sensor Information					
Tool Type	PCDC				
Distance From Bit (ft)	43.78				
Software Version	6.21				
Sub Serial Number	11991621				
Sonde Serial Number	10859922				
Sensor ID Number	N/A				
Toolface Offset (deg)	270.36				
Gamma Ray Sensor Information					
Tool Type	DGR				
Distance From Bit (ft)	65.76				
Recorded Sample Period (sec)	8				
Software Version	N/A				
Sub Serial Number	90359217				
Insert/Sonde Serial Number	228097				
Resistivity Sensor Information					
Tool Type	Slim P4				
Distance From Bit (ft)	58.76				
Recorded Sample Period (sec)	12				
Software Version	5.55				
Sub Serial Number	62359				
Receiver Insert Serial Number	10506351				
Transmitter Insert Serial Number	10917716				
Receiver Orientation	Down				
DDSr-DGR Sensor Information					
Tool Type	DDSr-DGR				
Distance From Bit (ft)	68.66				
Recorded Sample Period (sec)	12				
Software Version	10.49				
Sub Serial Number	90359217				
Insert Serial Number	102482948				
Sensor ID Number	5949				
REMARKS					
1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the Kelly Bushing, unless otherwise specified. 2. No depth corrections have been made for pipe stretch or compression. 3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids. 4. All data presented is recorded data unless otherwise specified. 5. The following smoothing parameters have been applied to the data: DGRC (Dual Gamma Ray Corrected): Interval Resolution: 0.5 ft Interval Distance: 0.6 ft Gap Fill: 3.0 ft SP4 (Slim Phase 4 Resistivity): Interval Resolution: 0.5 ft Interval Distance: 0.6 ft Gap Fill: 3.0 ft					

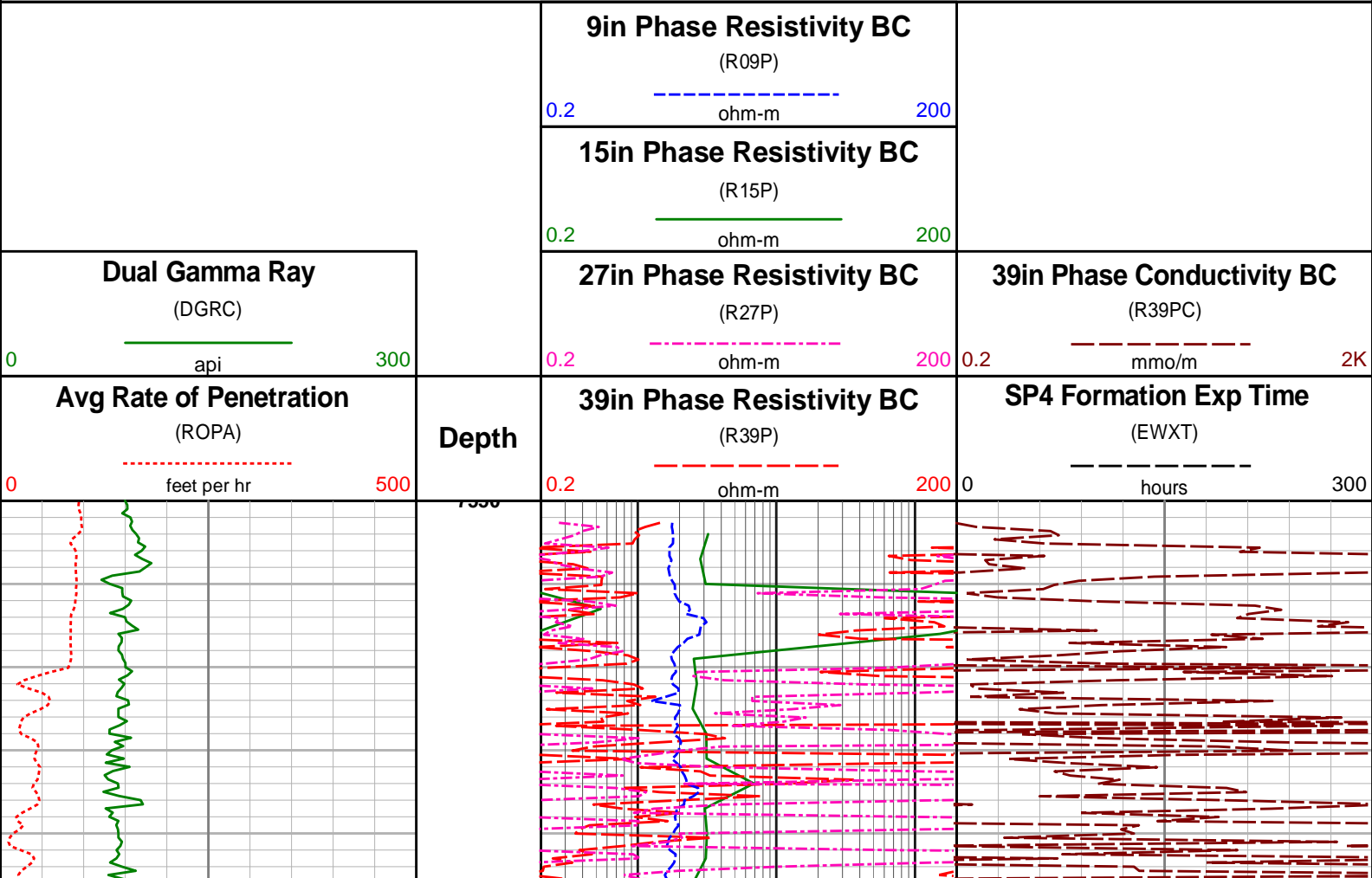
Gap Fill: 3.0 ft
ROPA (Average Rate Of Penetration):
Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill: 3.0 ft

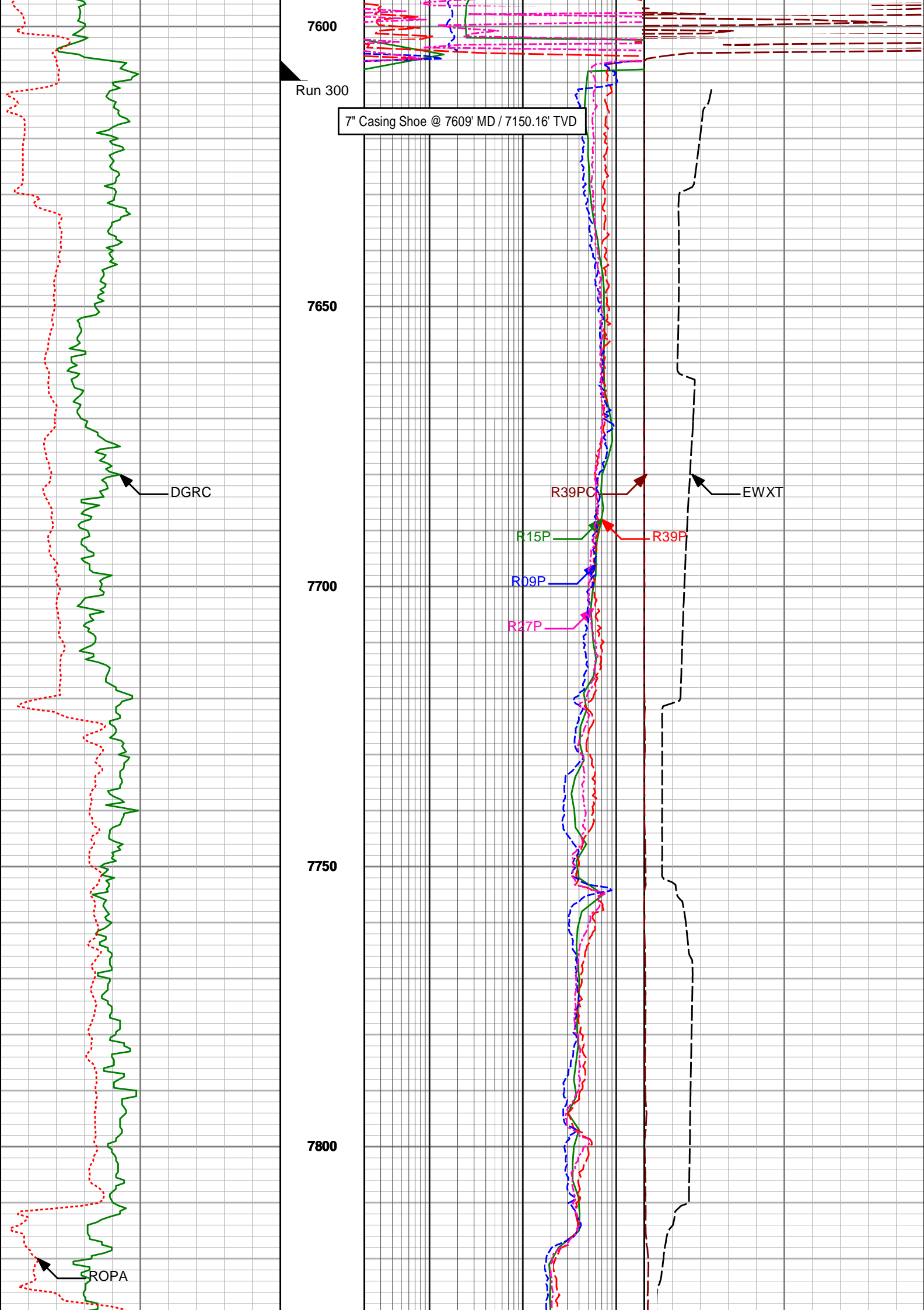
Insite version: 7.4.10

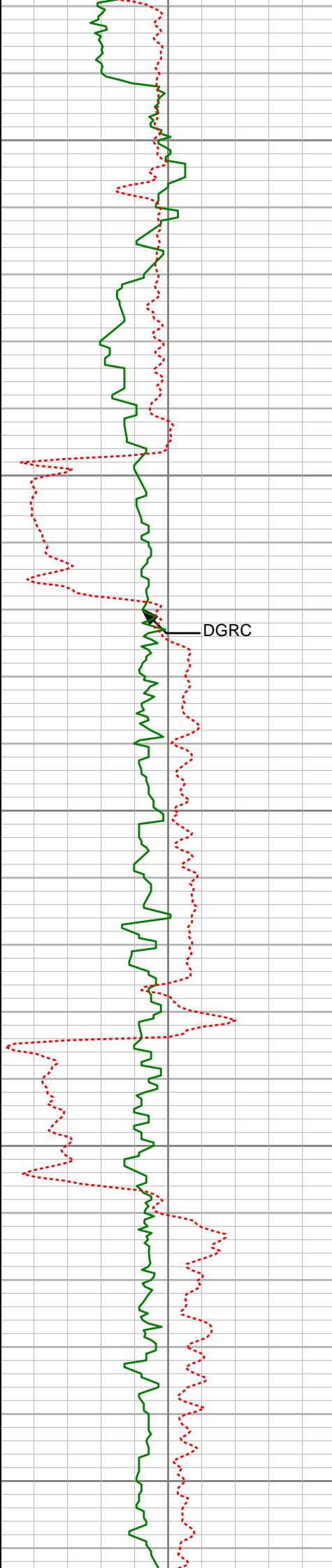
WARRANTY

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HALLIBURTON
MD Main Log 1:240







7850

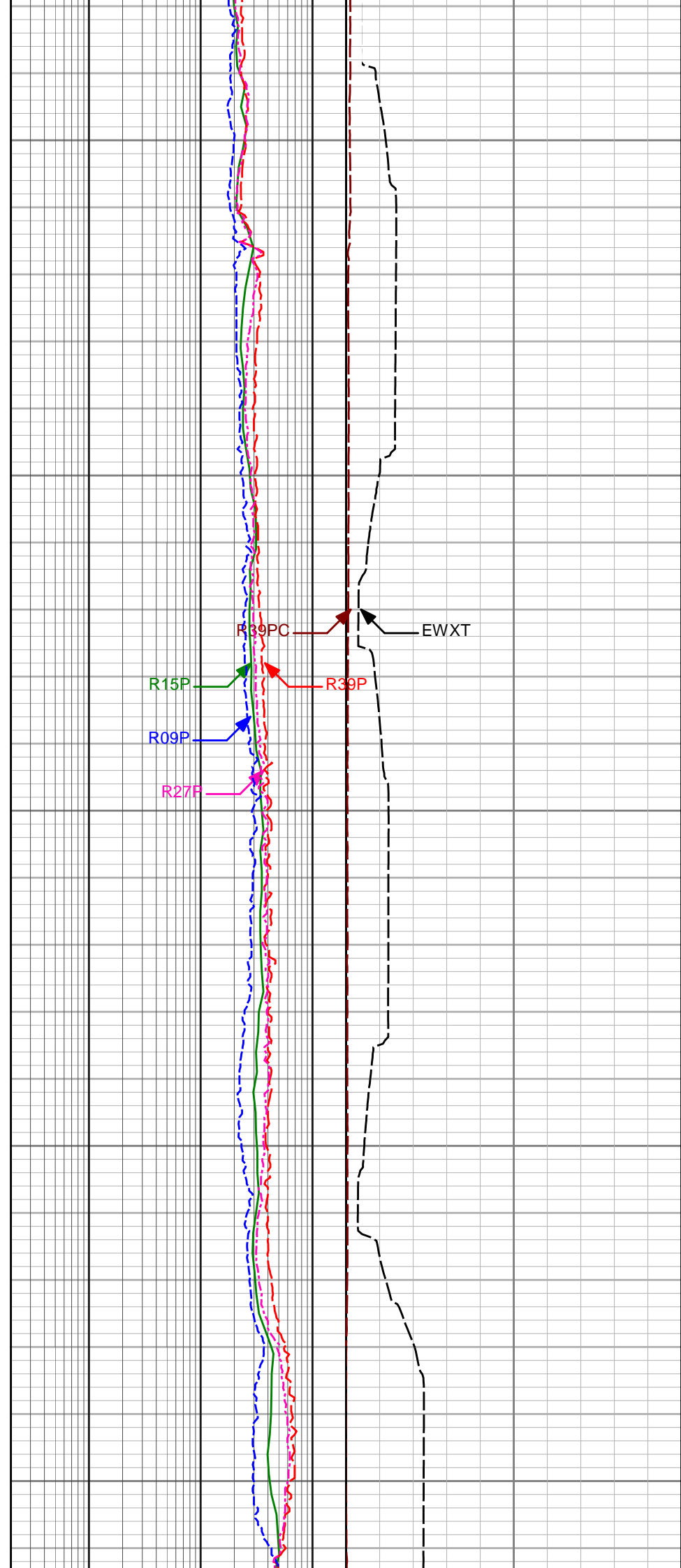
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DGRC



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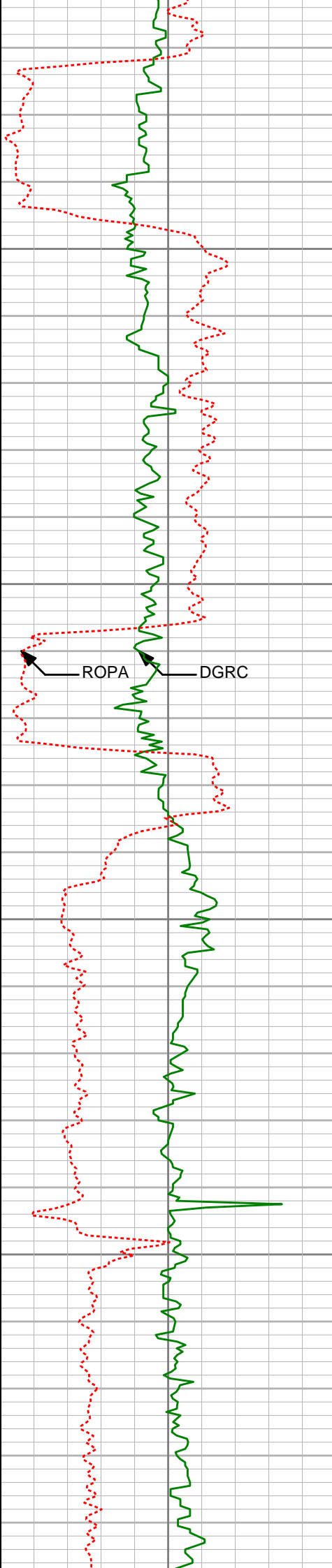
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R39P

R09P

R27P



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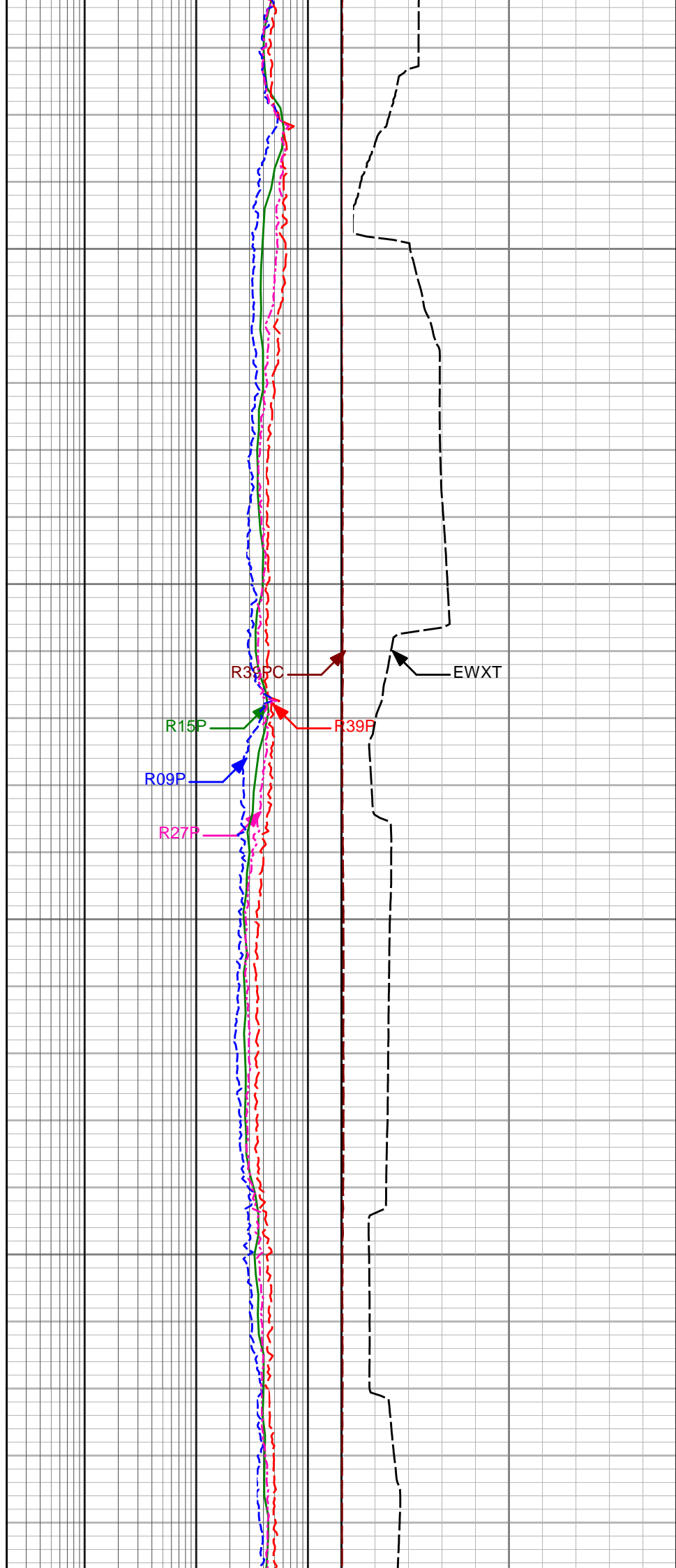
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ROPA

DGRC



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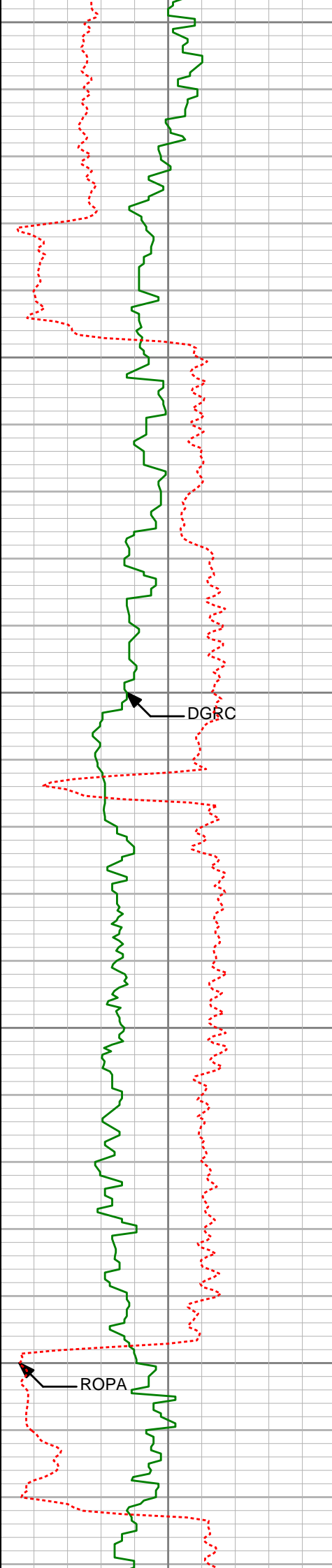
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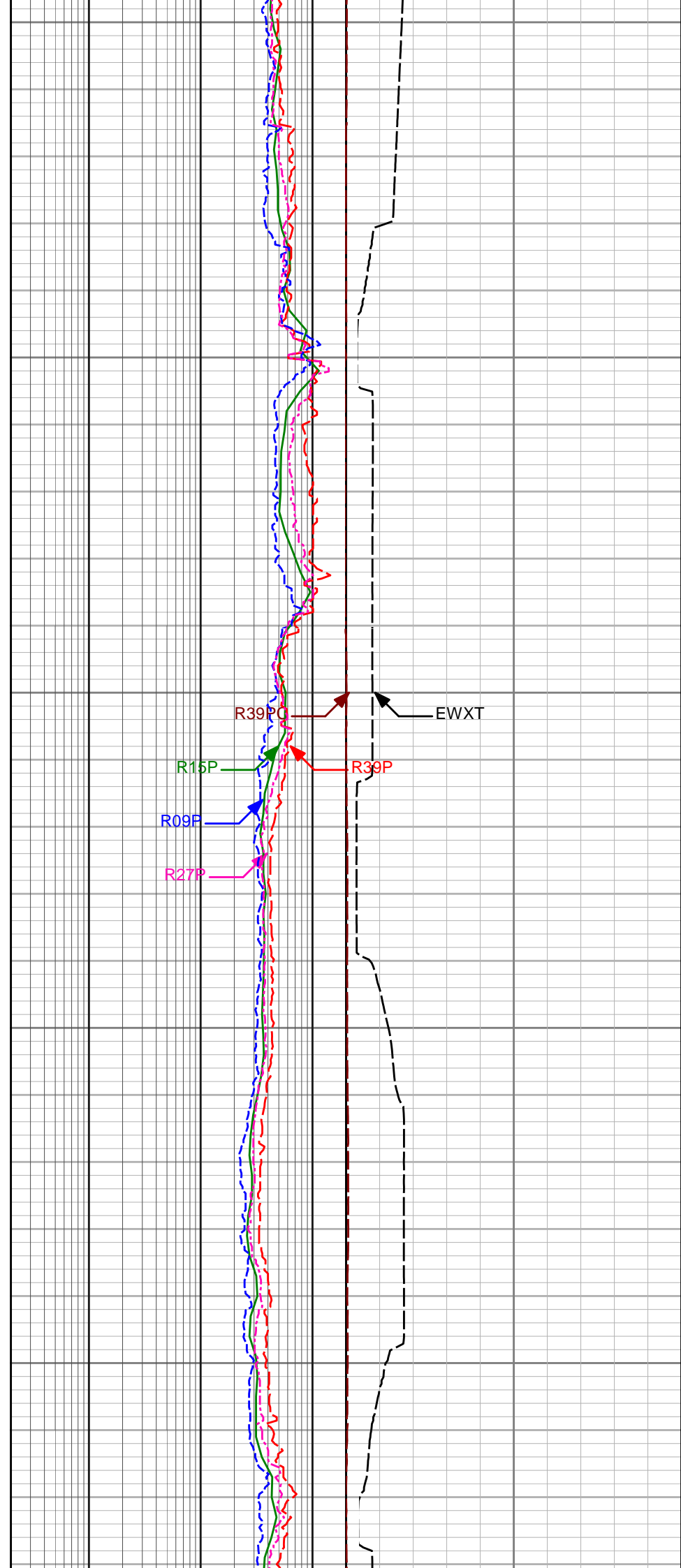
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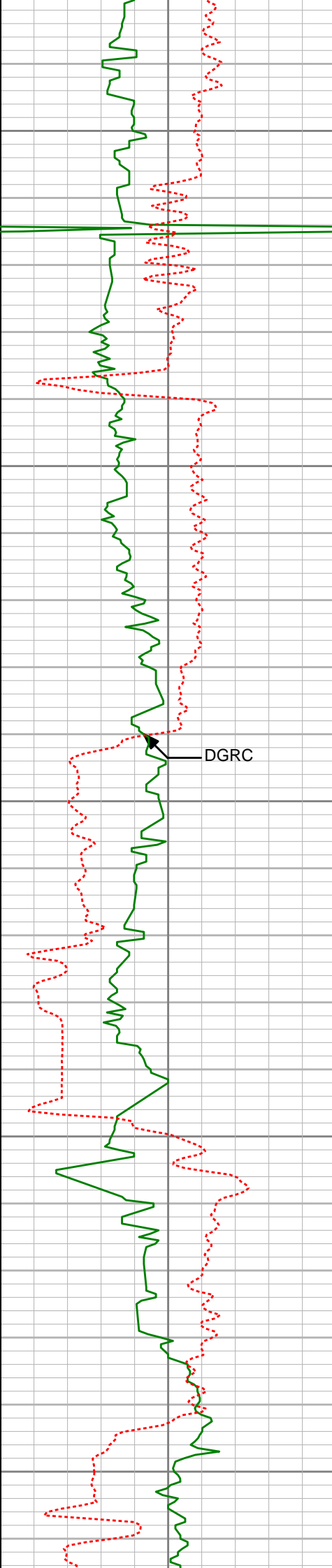
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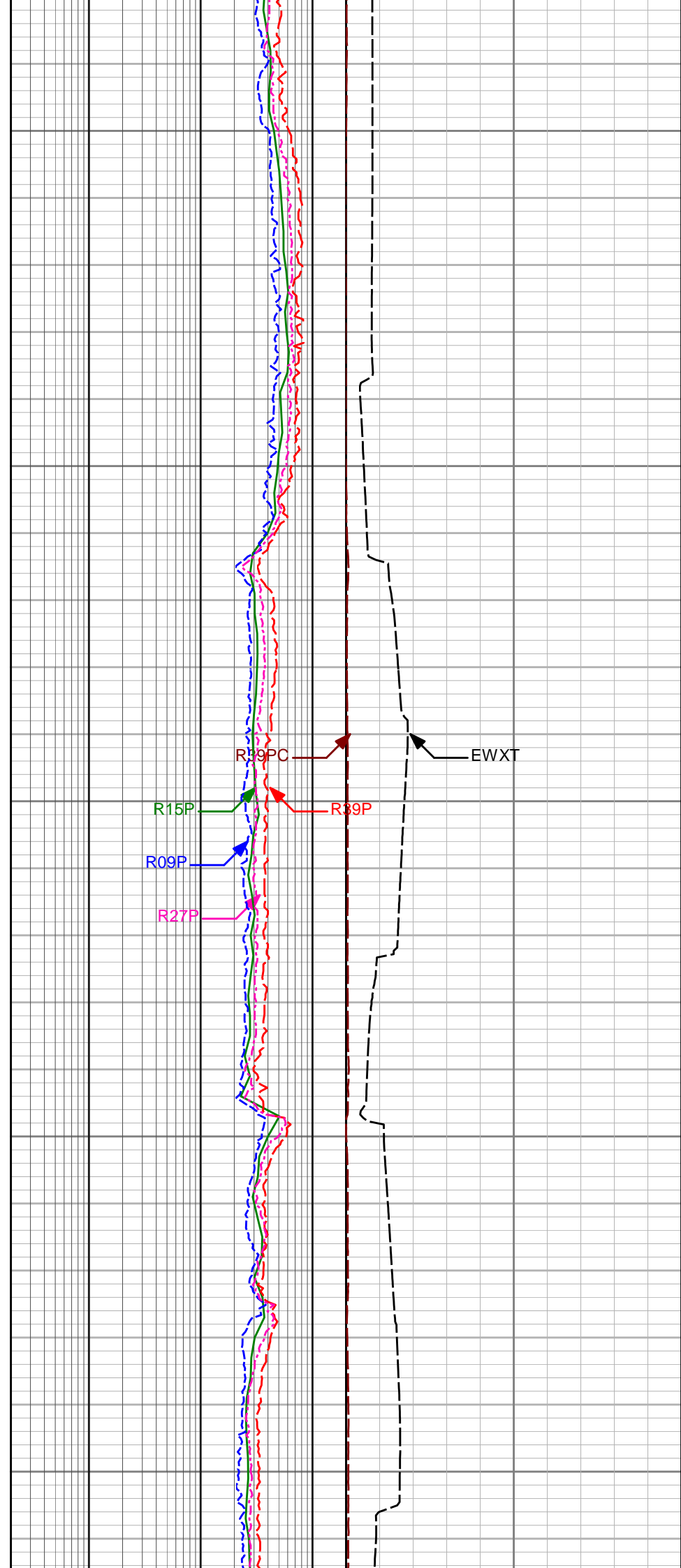
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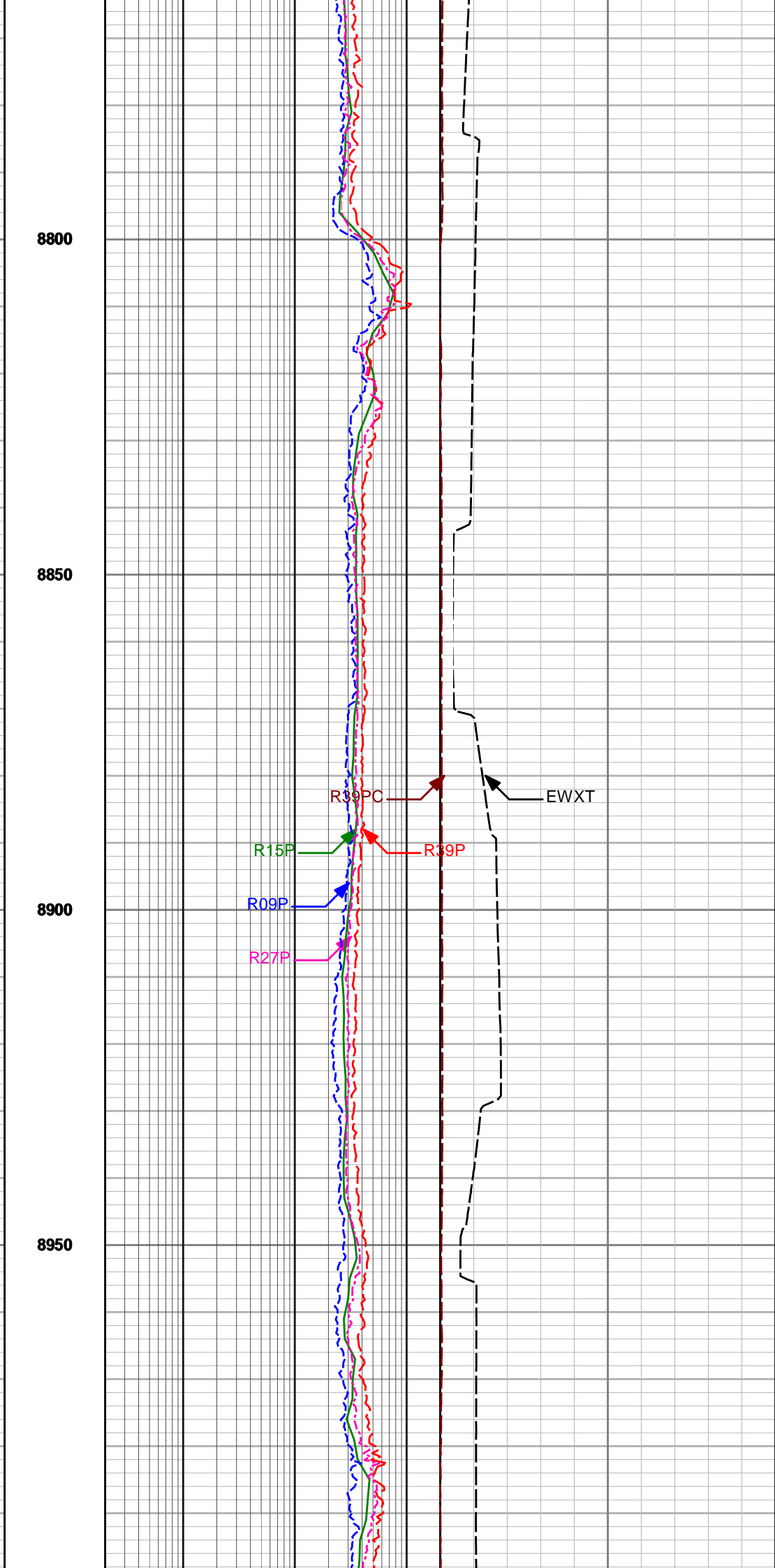
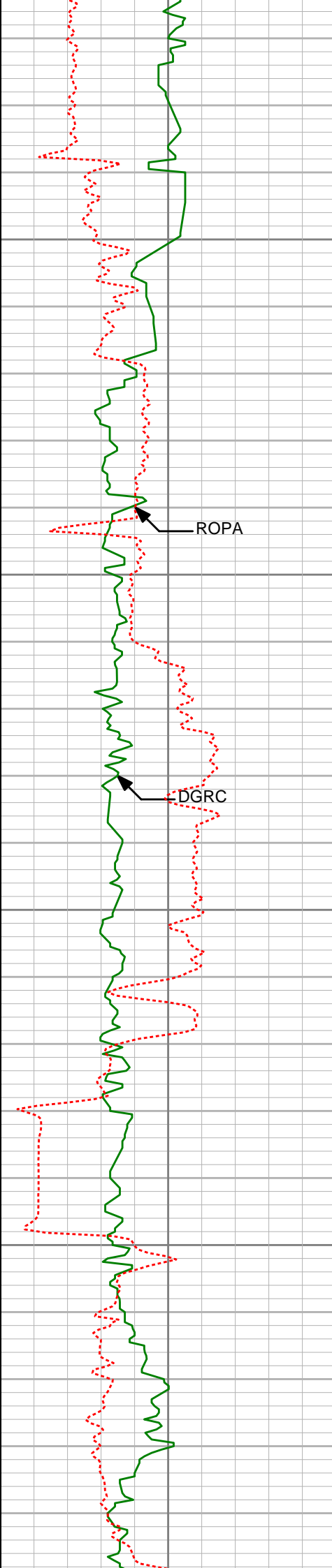
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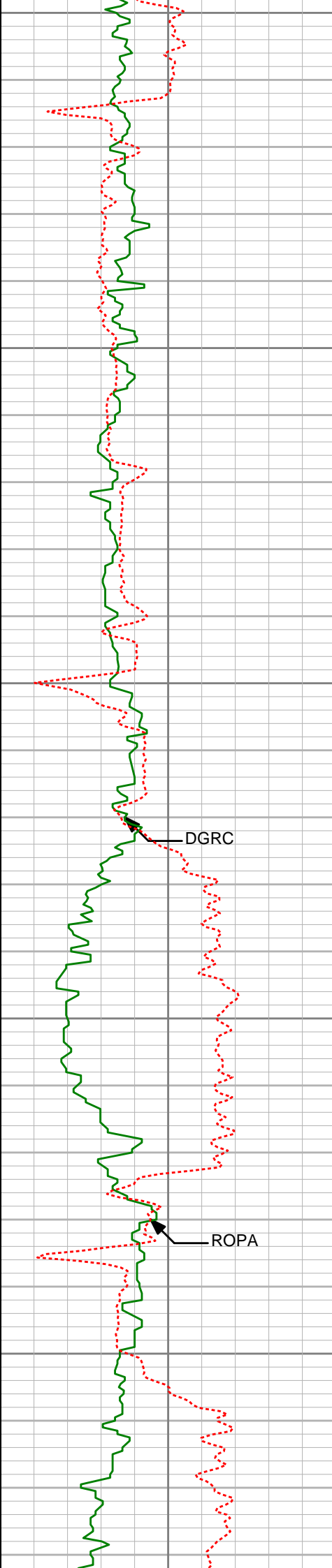
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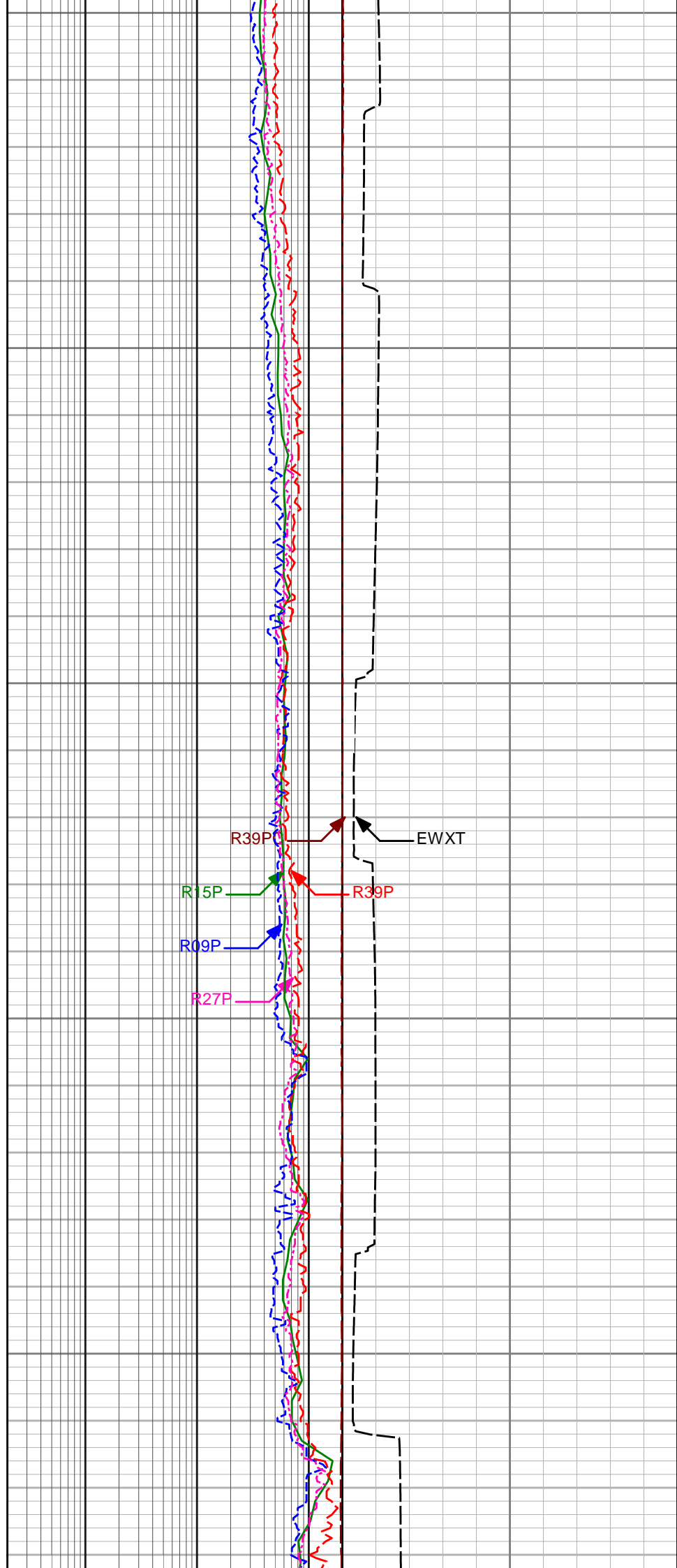
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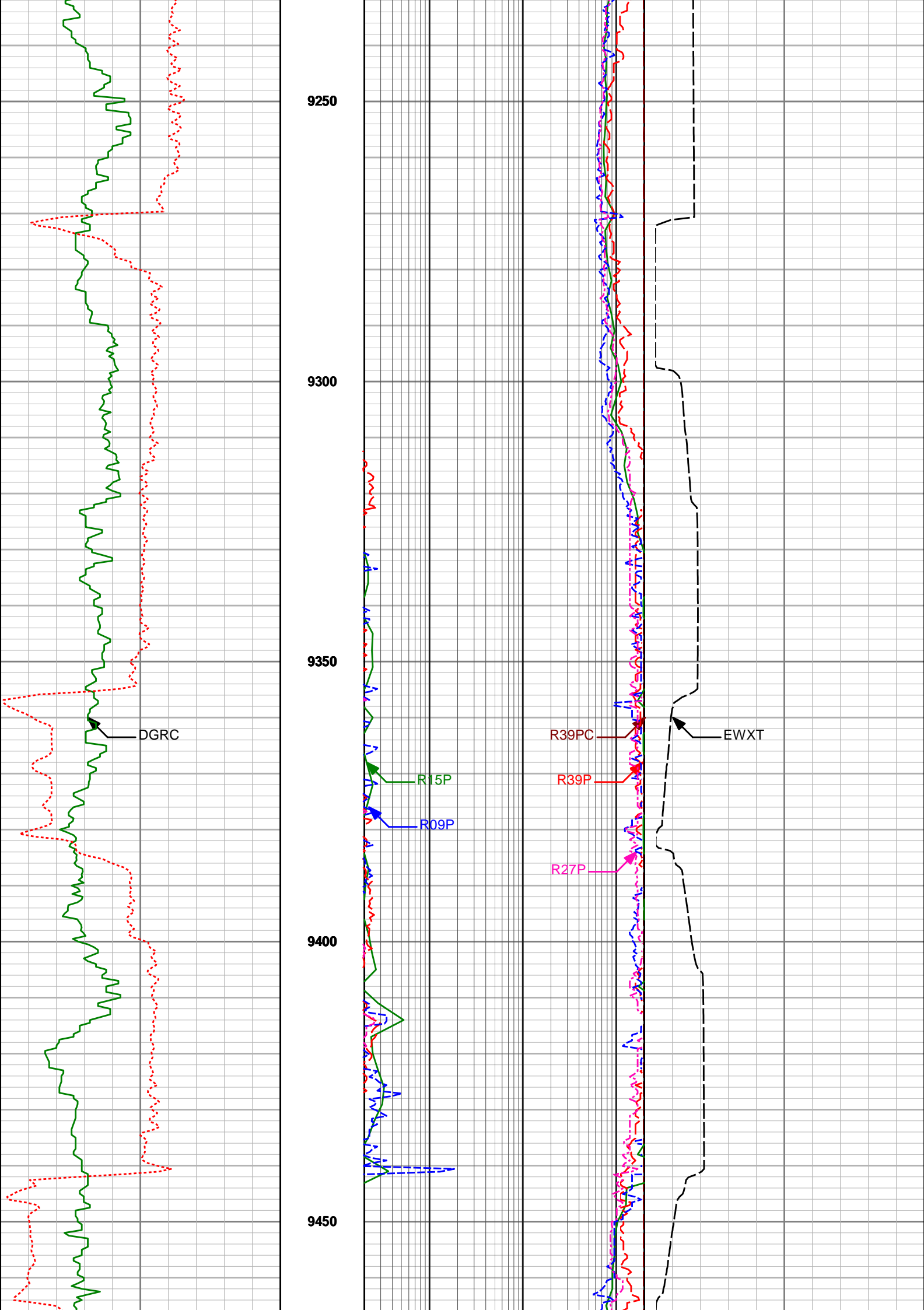
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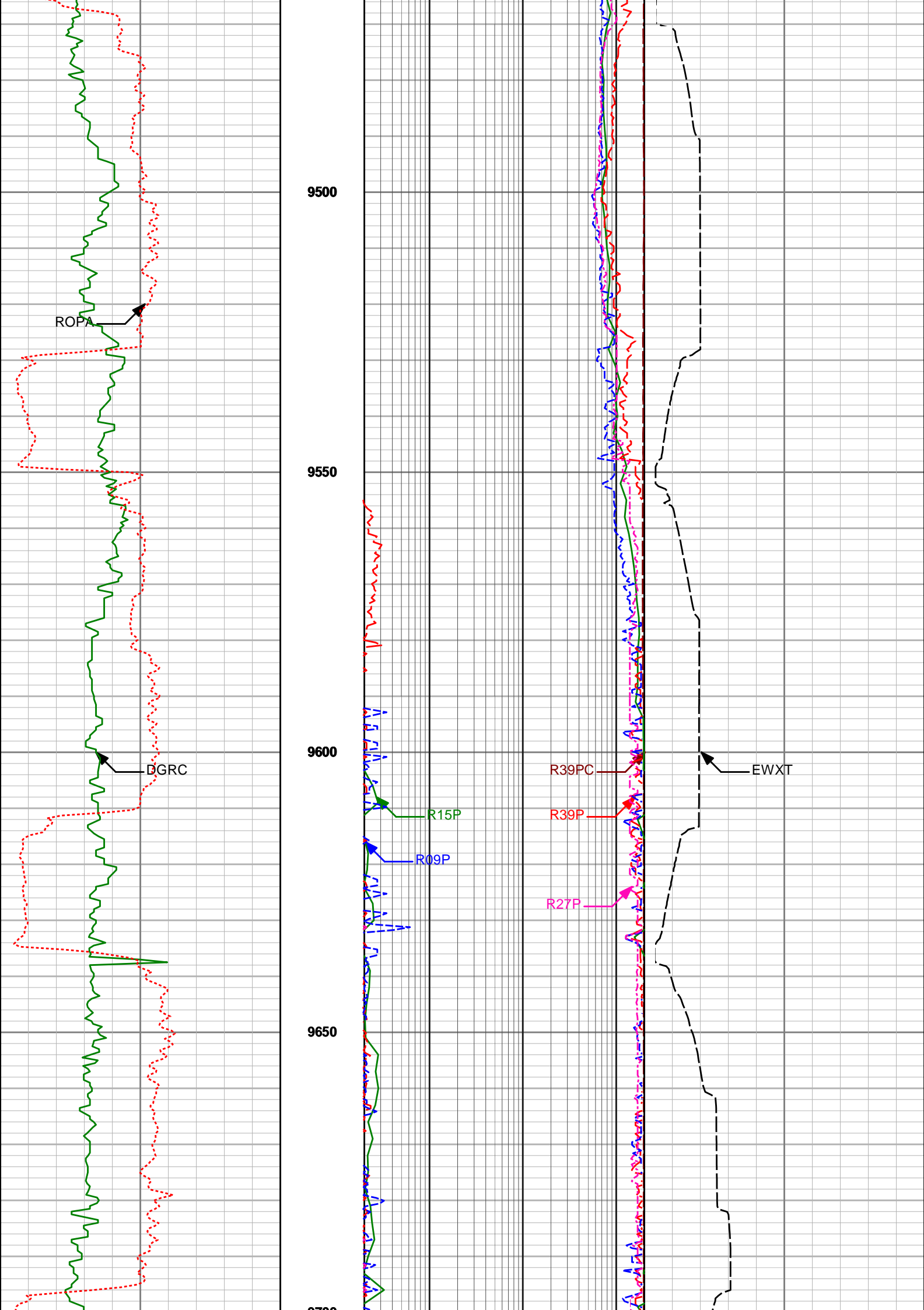
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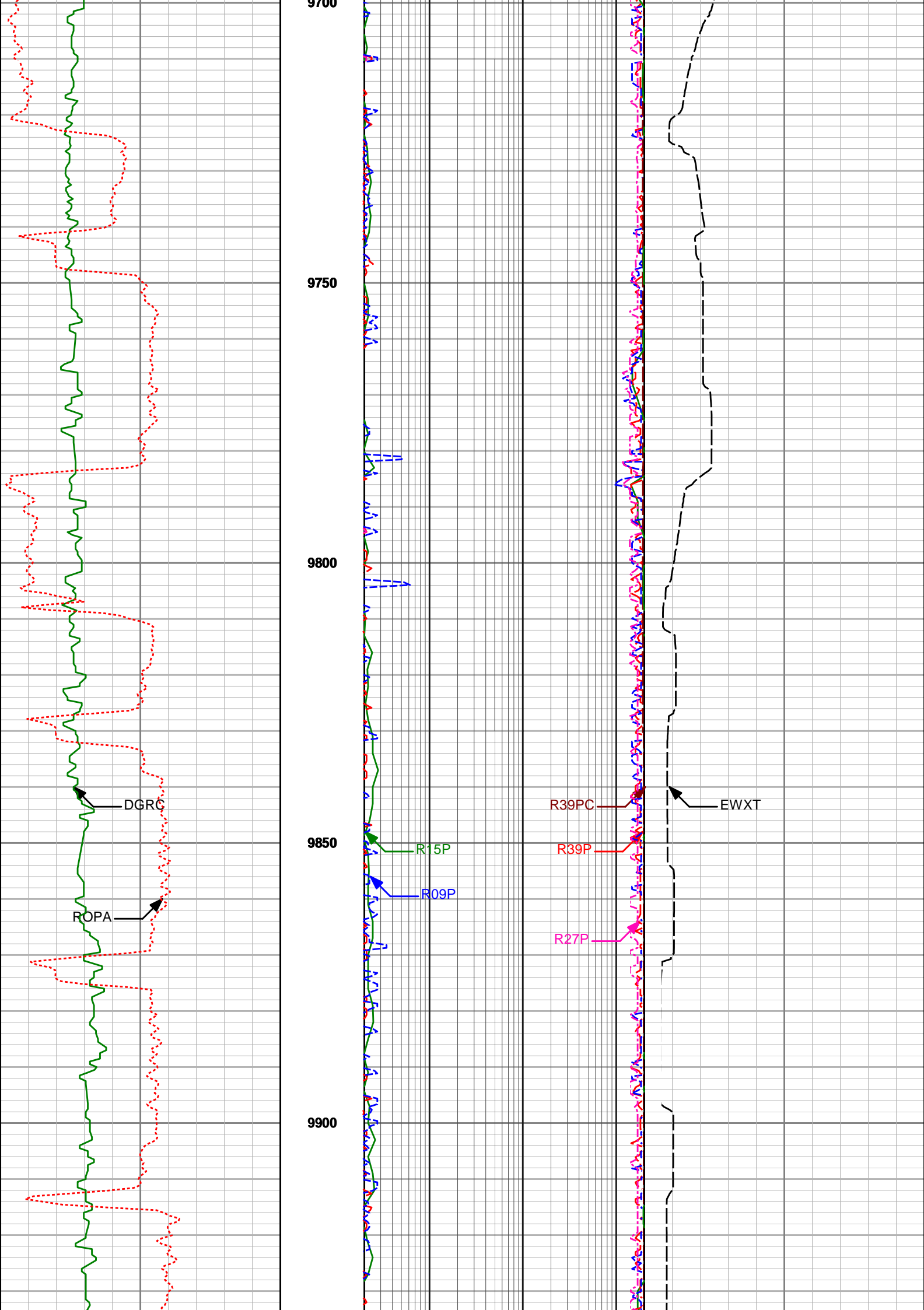
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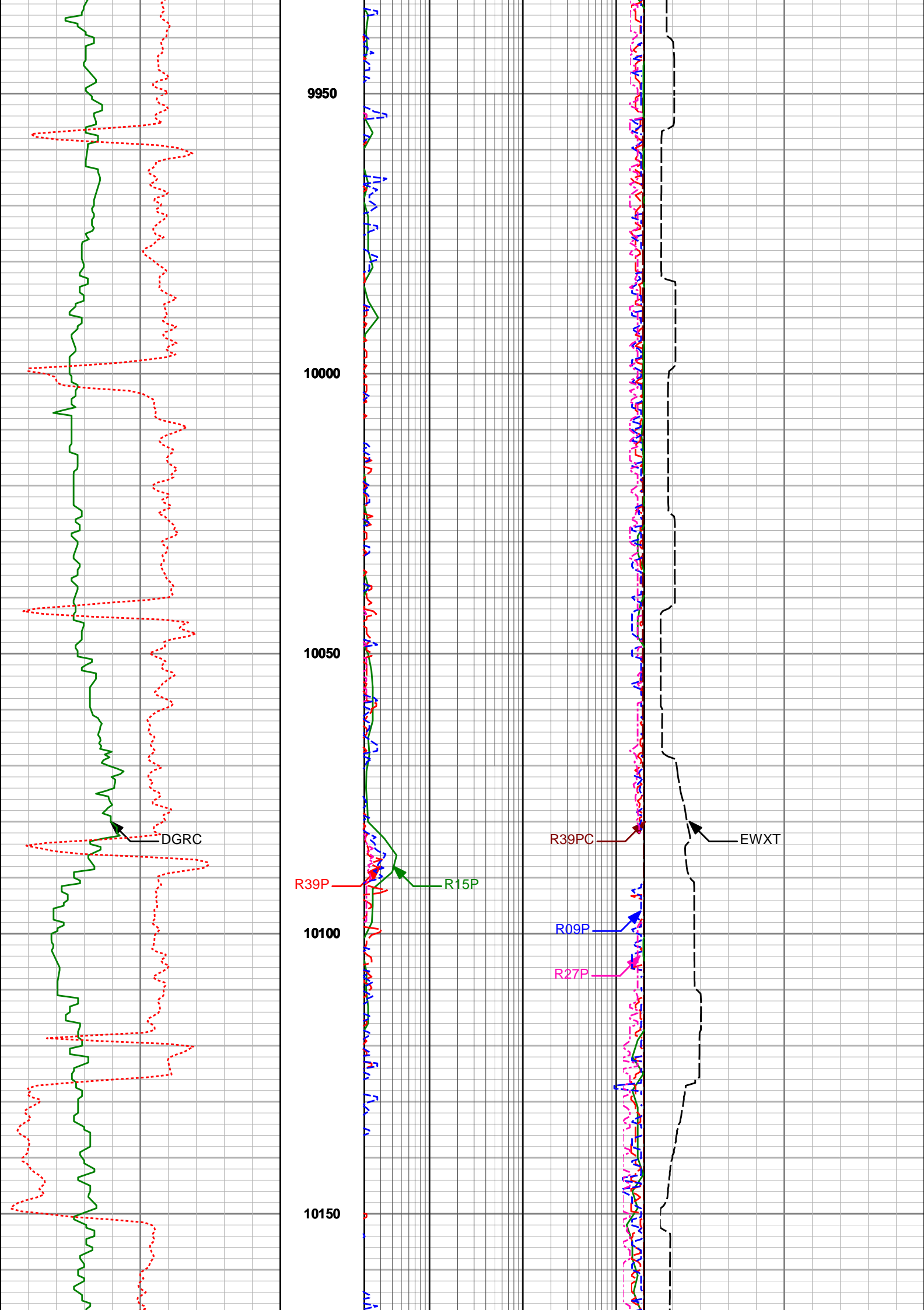
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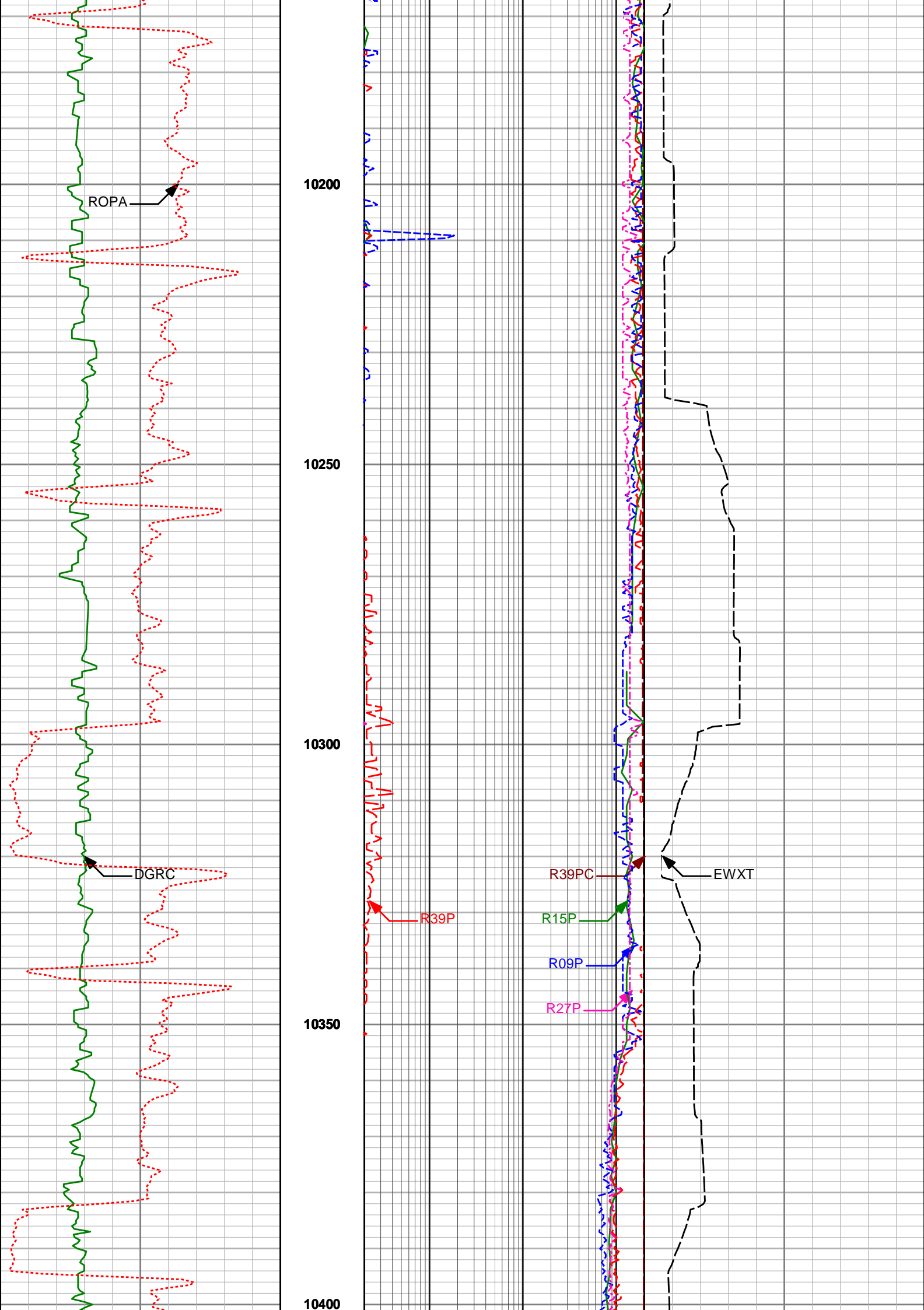
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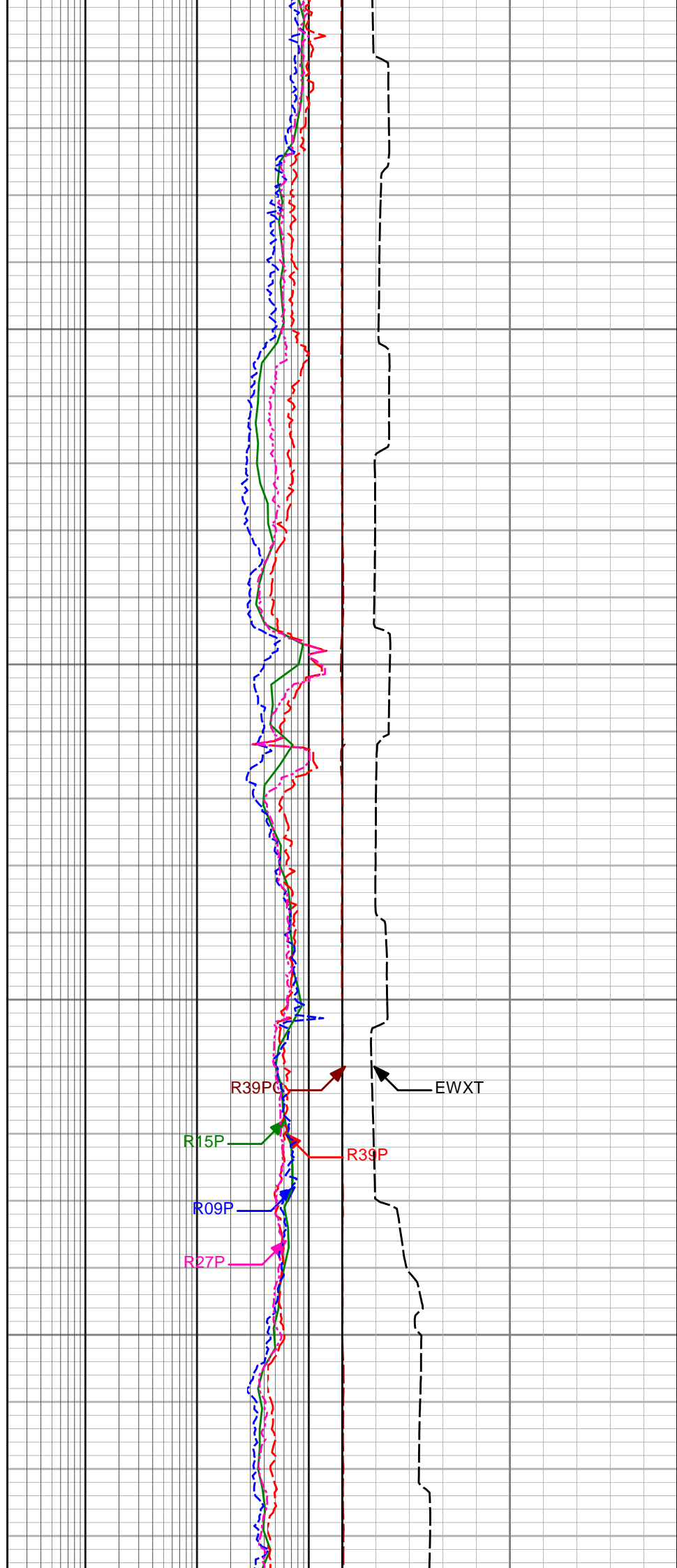
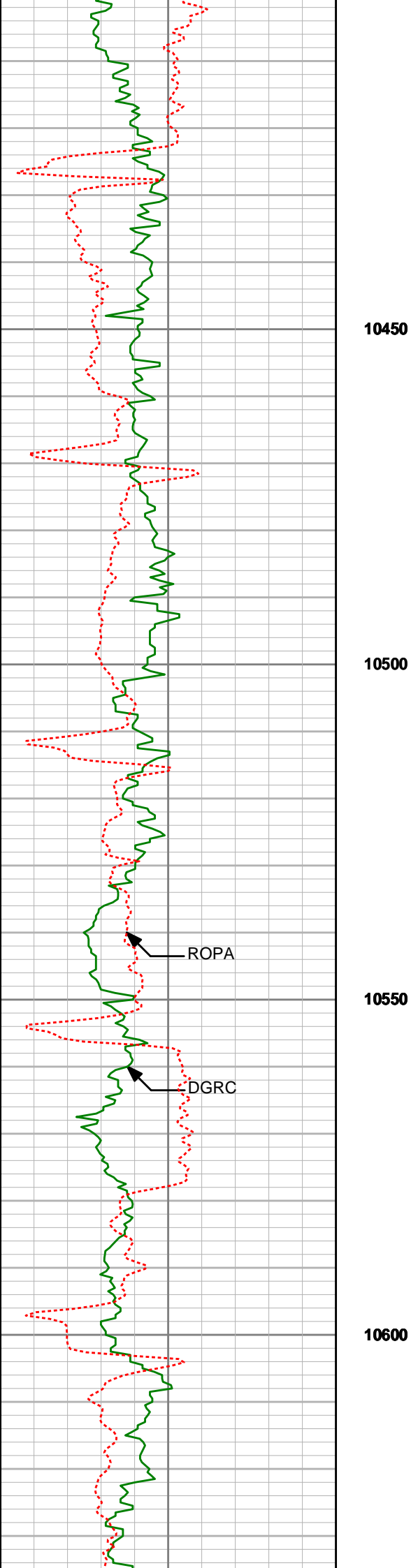


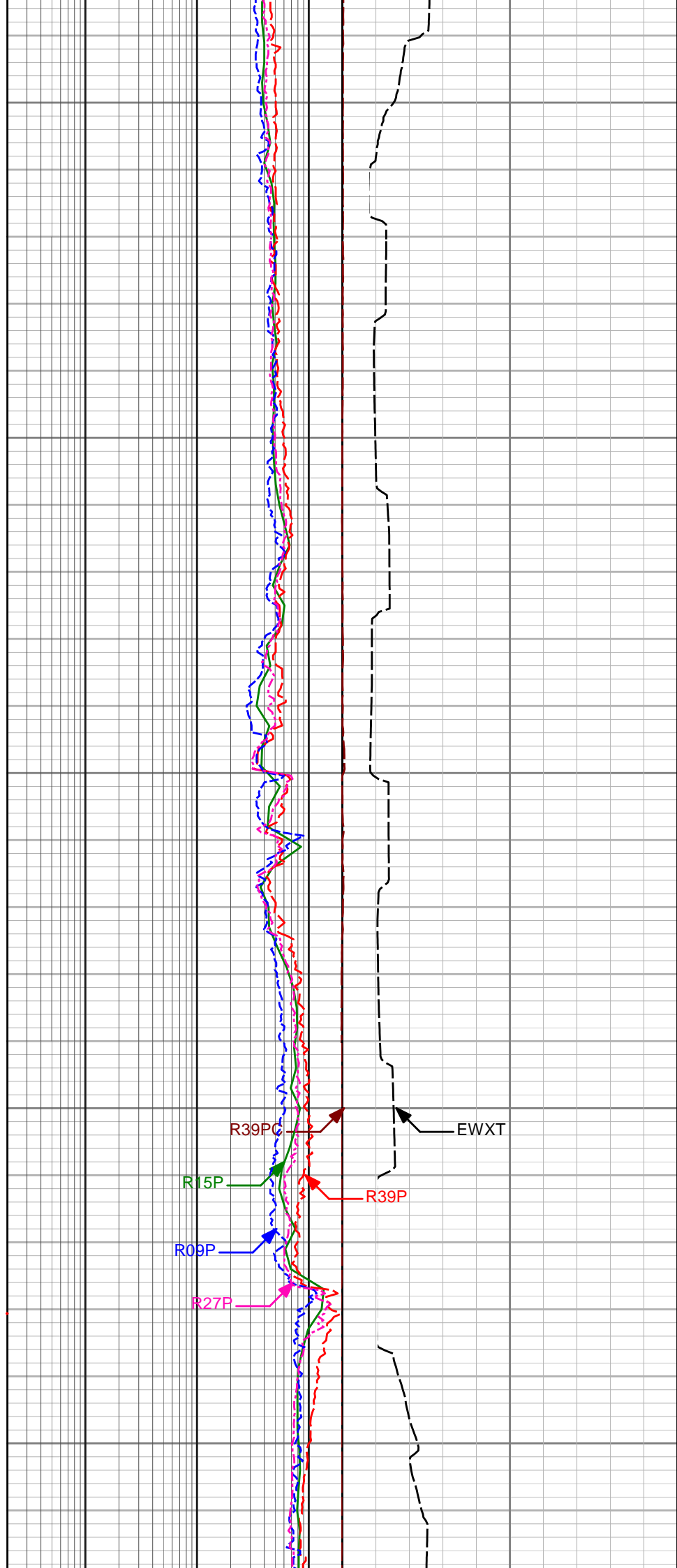
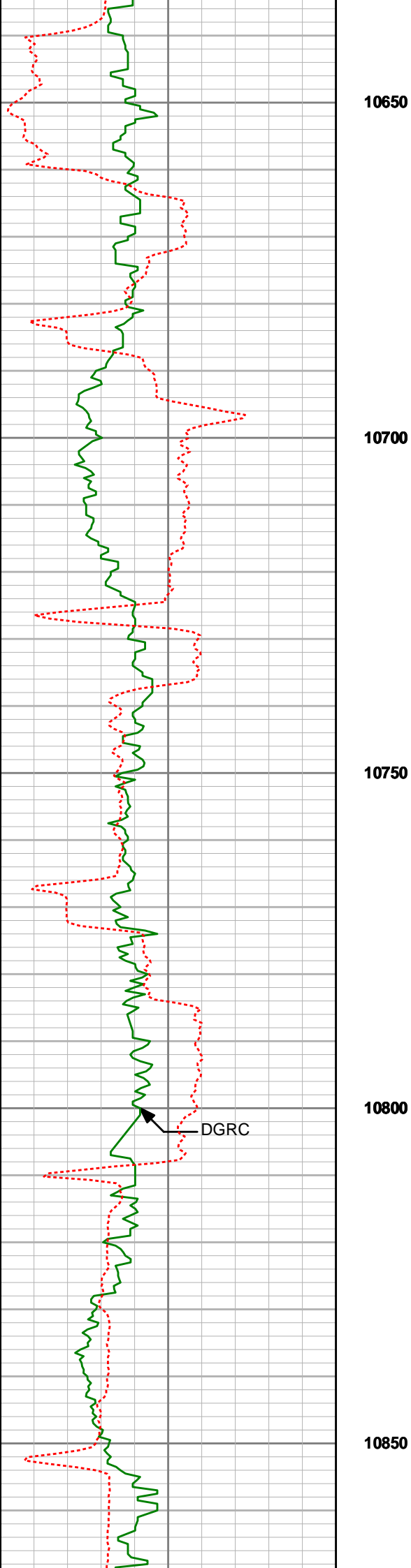


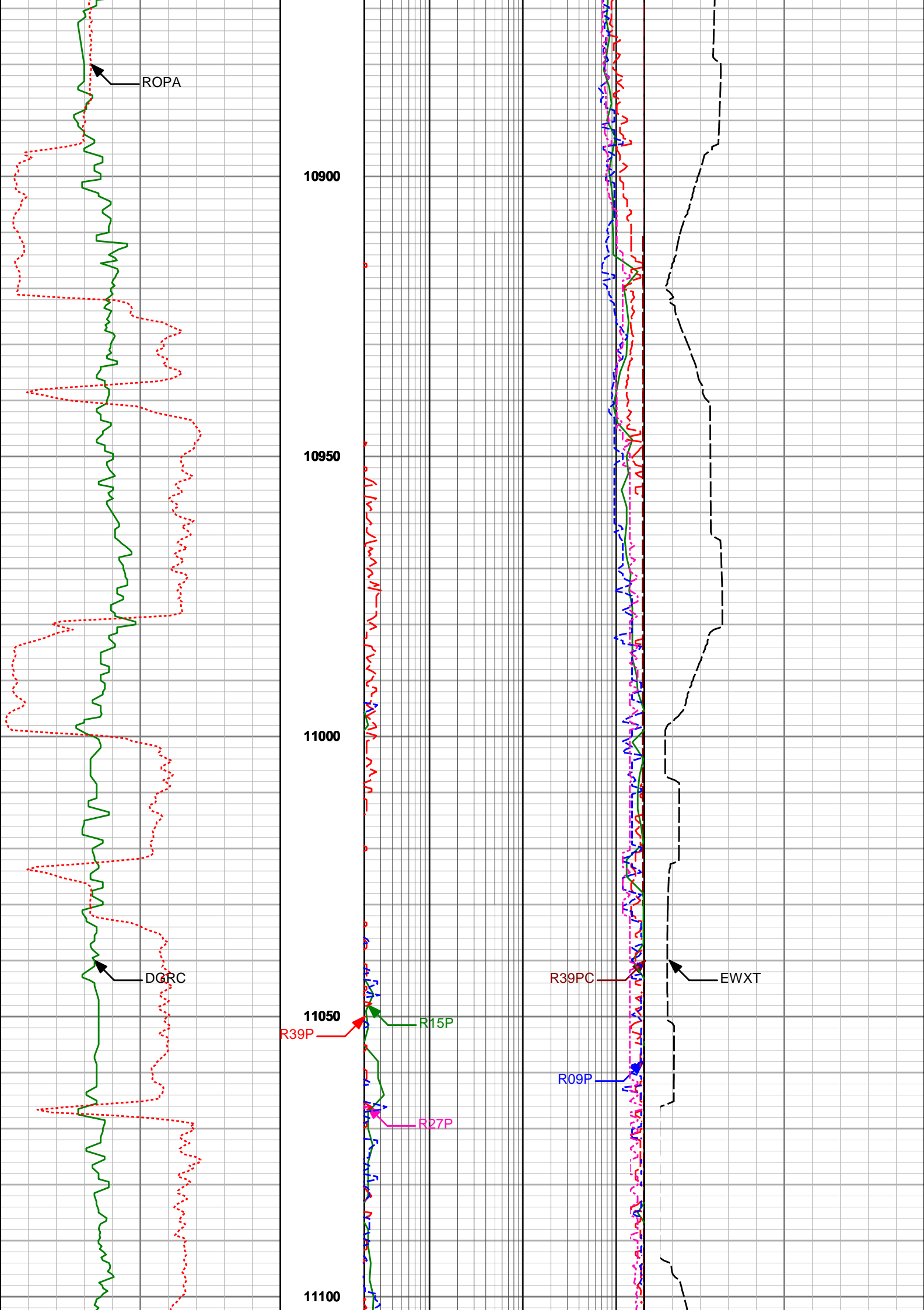


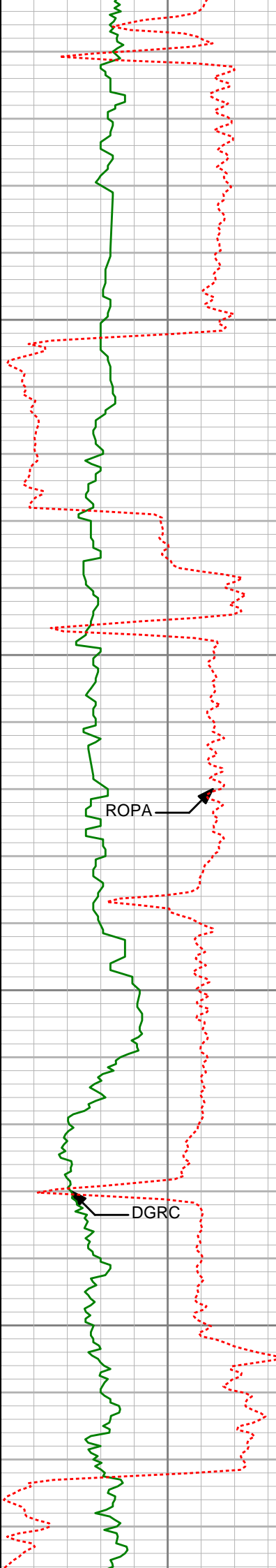










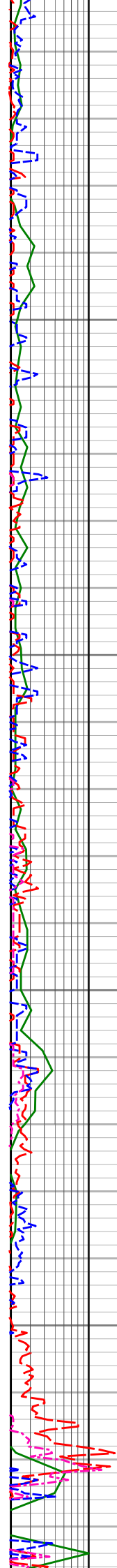


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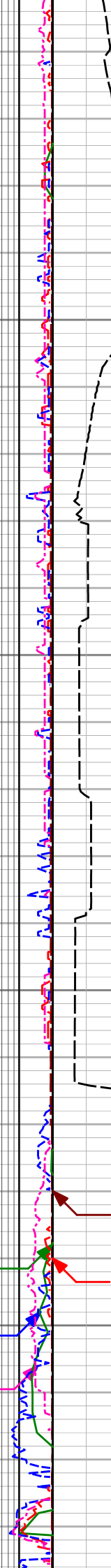
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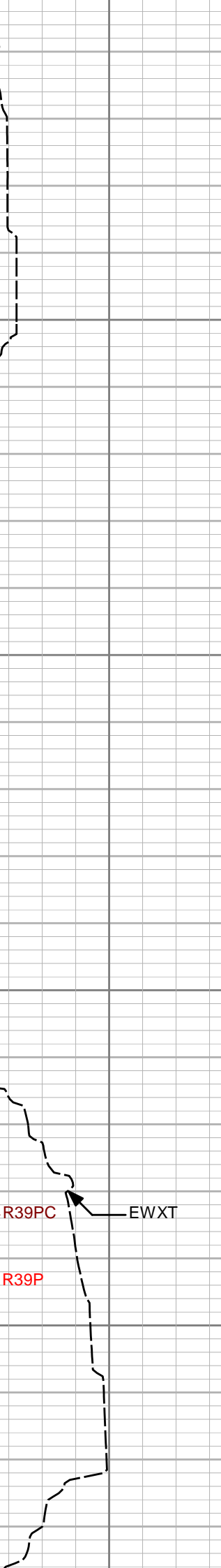
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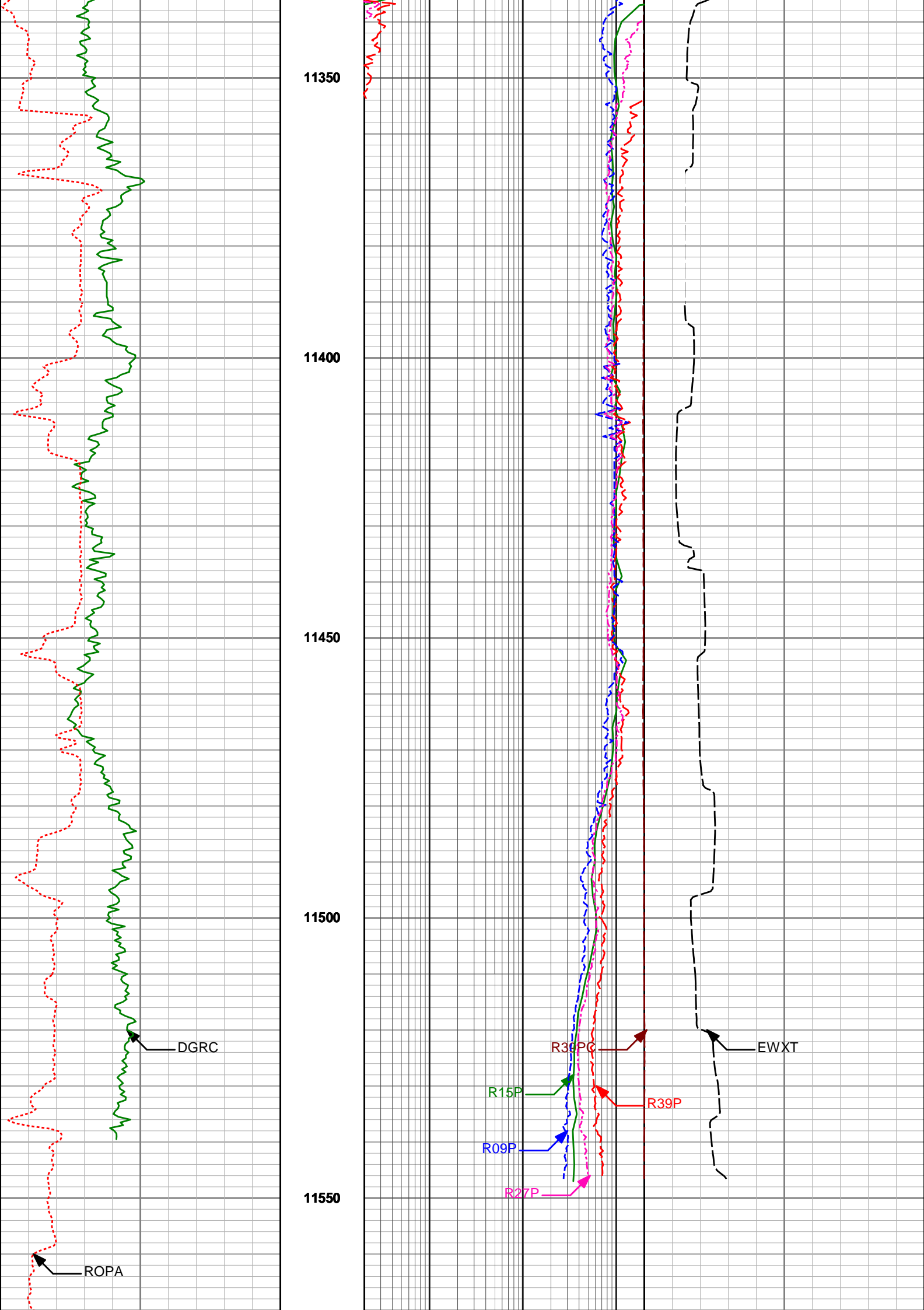


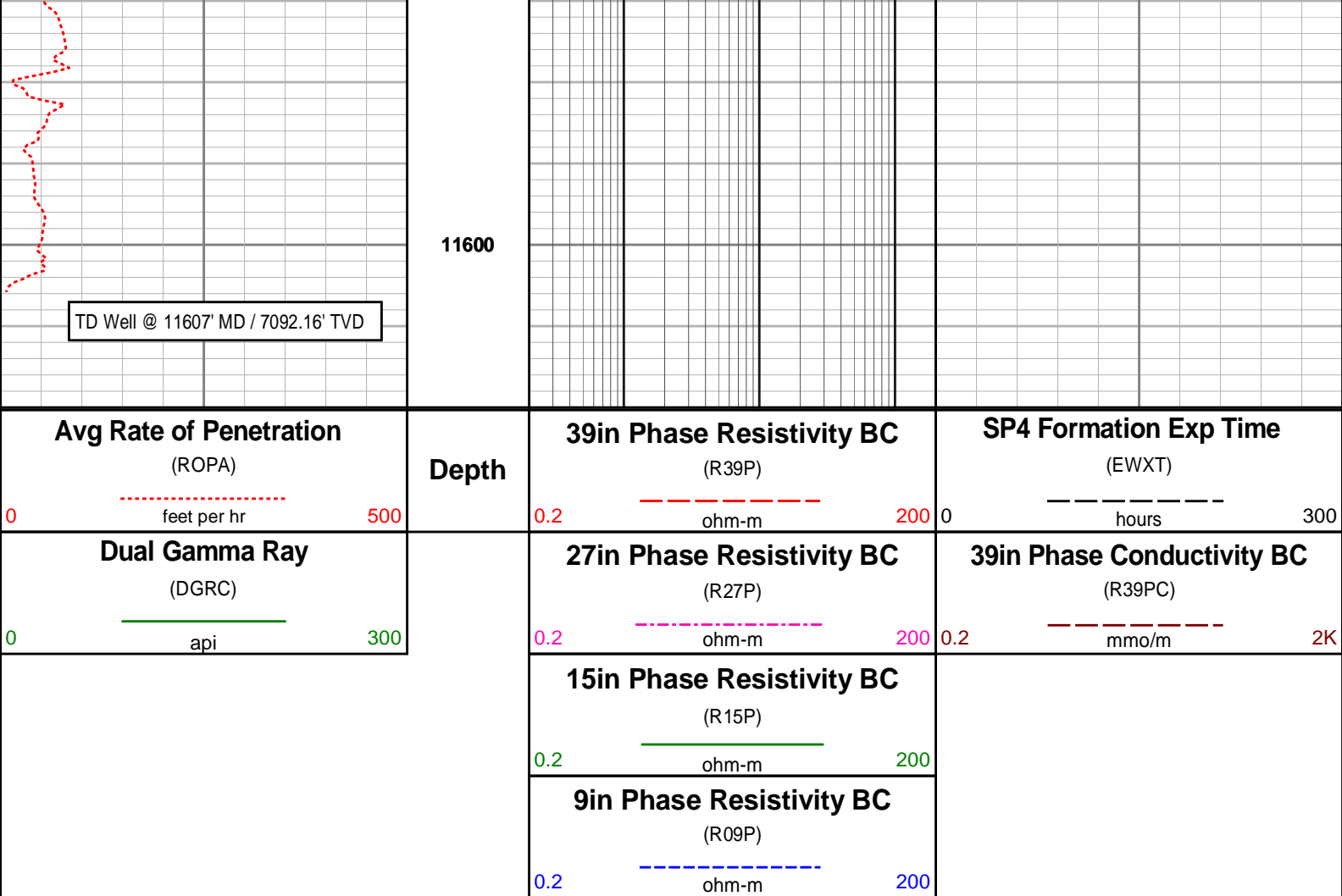
R39PC

R39P



EWXT





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DIRECTIONAL SURVEY REPORT

Anadarko PC
Melbon 19N-E8HZ
Wattenburg
Weld Colorado
USA
CA-XX-0900217525

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
976.00	0.91	325.63	975.91	6.13 N	11.23 W	6.12	TIE-IN
1345.00	0.68	356.05	1344.88	10.73 N	13.03 W	10.72	0.13
1619.00	0.84	328.78	1618.85	14.07 N	14.19 W	14.05	0.14
1745.00	0.71	105.07	1744.85	14.65 N	13.91 W	14.64	1.14
1802.00	2.08	114.06	1801.83	14.14 N	12.63 W	14.13	2.43
1894.00	5.01	110.08	1893.64	12.08 N	7.32 W	12.07	3.19
1986.00	4.95	112.72	1985.30	9.16 N	0.11 E	9.17	0.26
2077.00	6.47	111.16	2075.84	5.80 N	8.52 E	5.80	1.68
2169.00	7.36	113.17	2167.17	1.60 N	18.78 E	1.62	1.00
2261.00	8.86	108.81	2258.25	3.00 S	30.90 E	-2.97	1.75
2352.00	9.98	106.04	2348.02	7.44 S	45.11 E	-7.39	1.33
2444.00	10.20	99.73	2438.60	11.02 S	60.80 E	-10.95	1.22
2535.00	8.90	99.94	2528.34	13.59 S	75.67 E	-13.51	1.43
2627.00	9.27	95.70	2619.19	15.56 S	90.04 E	-15.46	0.83
2718.00	9.42	100.93	2708.98	17.70 S	104.65 E	-17.59	0.95
2810.00	11.17	101.93	2799.50	20.97 S	120.76 E	-20.84	1.91
2902.00	10.00	104.64	2889.93	24.83 S	137.21 E	-24.69	1.38
2993.00	11.34	102.87	2979.35	28.82 S	153.58 E	-28.66	1.51
3086.00	10.10	103.88	3070.73	32.81 S	170.41 E	-32.63	1.34
3172.00	10.60	98.18	3155.33	35.75 S	185.56 E	-35.55	1.32
3258.00	9.82	96.49	3239.97	37.70 S	200.68 E	-37.49	0.97
3343.00	10.73	99.61	3323.61	39.84 S	215.68 E	-39.62	1.25
3429.00	9.59	97.69	3408.26	42.13 S	230.67 E	-41.88	1.28

3429.00	9.59	97.60	3408.26	42.13 S	230.67 E	-41.88	1.38
3515.00	10.29	98.21	3492.97	44.17 S	245.37 E	-43.91	0.82
3601.00	10.39	98.88	3577.57	46.47 S	260.64 E	-46.19	0.18
3686.00	8.67	99.63	3661.39	48.72 S	274.53 E	-48.43	2.02
3772.00	9.09	106.52	3746.37	51.74 S	287.43 E	-51.43	1.33
3858.00	7.62	105.94	3831.45	55.23 S	299.43 E	-54.92	1.71
3943.00	8.90	106.58	3915.57	58.66 S	311.15 E	-58.33	1.50
4029.00	9.35	97.27	4000.48	61.44 S	324.45 E	-61.10	1.79
4115.00	11.21	100.02	4085.10	63.78 S	339.62 E	-63.42	2.24
4286.00	9.27	96.13	4253.37	68.14 S	369.69 E	-67.75	1.20
4372.00	9.56	101.28	4338.21	70.28 S	383.59 E	-69.88	1.04
4458.00	10.31	104.39	4422.92	73.59 S	398.04 E	-73.17	1.07
4543.00	11.39	98.11	4506.40	76.66 S	413.72 E	-76.23	1.88
4629.00	10.57	96.11	4590.83	78.70 S	429.97 E	-78.25	1.04
4715.00	11.42	101.42	4675.25	81.22 S	446.16 E	-80.76	1.53
4800.00	10.98	99.75	4758.63	84.26 S	462.38 E	-83.78	0.65
4886.00	7.66	90.67	4843.49	85.72 S	476.19 E	-85.22	4.20
4972.00	5.23	78.35	4928.94	84.99 S	485.77 E	-84.48	3.24
5057.00	4.15	65.06	5013.66	82.91 S	492.35 E	-82.40	1.80
5143.00	3.80	69.00	5099.45	80.58 S	497.83 E	-80.06	0.52
5229.00	3.38	69.92	5185.29	78.69 S	502.87 E	-78.16	0.49
5315.00	3.88	97.16	5271.12	78.18 S	508.14 E	-77.65	2.06
5400.00	4.14	93.24	5355.91	78.71 S	514.06 E	-78.17	0.44
5486.00	3.46	98.99	5441.72	79.29 S	519.72 E	-78.75	0.91
5572.00	3.21	91.67	5527.58	79.77 S	524.68 E	-79.22	0.57
5657.00	2.62	102.67	5612.47	80.26 S	528.95 E	-79.71	0.95
5743.00	1.79	107.97	5698.40	81.11 S	532.15 E	-80.55	0.98
5829.00	1.59	100.11	5784.37	81.73 S	534.61 E	-81.17	0.36
5914.00	0.84	76.11	5869.35	81.79 S	536.37 E	-81.23	1.05
6000.00	0.25	193.02	5955.34	81.82 S	536.94 E	-81.26	1.14
6086.00	0.17	69.80	6041.34	81.95 S	537.02 E	-81.39	0.43
6172.00	0.16	298.20	6127.34	81.85 S	537.04 E	-81.29	0.35
6257.00	0.03	203.22	6212.34	81.82 S	536.93 E	-81.26	0.19
6343.00	0.17	324.10	6298.34	81.74 S	536.85 E	-81.18	0.21
6429.00	0.33	325.37	6384.34	81.43 S	536.63 E	-80.87	0.19
6502.00	0.39	266.31	6457.34	81.27 S	536.26 E	-80.71	0.49
6537.00	0.31	263.47	6492.34	81.29 S	536.05 E	-80.73	0.24
6580.00	2.52	340.98	6535.33	80.41 S	535.63 E	-79.85	5.76
6623.00	6.99	354.15	6578.17	76.91 S	535.05 E	-76.35	10.64
6665.00	11.77	0.25	6619.59	70.08 S	534.81 E	-69.52	11.59
6708.00	16.43	2.93	6661.29	59.61 S	535.14 E	-59.05	10.96
6751.00	19.42	3.42	6702.20	46.40 S	535.88 E	-45.84	6.94
6794.00	22.64	4.30	6742.33	31.01 S	536.92 E	-30.45	7.53
6837.00	25.40	3.91	6781.60	13.55 S	538.17 E	-12.99	6.44
6880.00	28.28	0.87	6819.96	5.84 N	538.96 E	6.40	7.41
6922.00	32.34	0.75	6856.22	27.03 N	539.25 E	27.59	9.68
6965.00	38.47	3.39	6891.25	51.91 N	540.20 E	52.47	14.69
7008.00	43.96	3.87	6923.58	80.17 N	542.00 E	80.74	12.79
7051.00	46.83	4.14	6953.77	110.71 N	544.14 E	111.28	6.68
7094.00	49.55	3.79	6982.44	142.68 N	546.35 E	143.25	6.36
7137.00	53.94	1.59	7009.06	176.40 N	547.92 E	176.97	10.97
7180.00	57.91	0.29	7033.15	212.00 N	548.49 E	212.58	9.56
7223.00	62.10	359.98	7054.64	249.23 N	548.58 E	249.81	9.78
7265.00	65.45	0.51	7073.19	286.91 N	548.74 E	287.48	8.06
7308.00	68.71	0.76	7089.93	326.51 N	549.18 E	327.08	7.59
7350.00	71.73	360.00	7104.14	366.02 N	549.44 E	366.60	7.38
7393.00	74.31	357.50	7116.70	407.13 N	548.54 E	407.70	8.18
7436.00	76.24	356.89	7127.63	448.67 N	546.50 E	449.24	4.70
7479.00	79.77	355.32	7136.57	490.62 N	543.64 E	491.19	8.94
7522.00	83.07	355.60	7142.98	533.00 N	540.28 E	533.57	7.72
7561.00	85.09	355.37	7147.01	571.67 N	537.23 E	572.23	5.21
7674.00	90.43	355.57	7151.42	684.19 N	528.31 E	684.74	4.73
7767.00	91.60	354.94	7149.76	776.85 N	520.62 E	777.40	1.43
7853.00	91.79	355.59	7147.22	862.52 N	513.52 E	863.06	0.79
7939.00	91.11	356.21	7145.04	948.27 N	507.37 E	948.81	1.07
8024.00	91.85	356.90	7142.84	1033.09 N	502.27 E	1033.62	1.19
8110.00	92.04	357.66	7139.92	1118.94 N	498.19 E	1119.47	0.91
8196.00	91.67	358.35	7137.14	1204.85 N	495.20 E	1205.36	0.91
8281.00	91.85	358.06	7134.52	1289.76 N	492.53 E	1290.28	0.40
8367.00	90.86	358.38	7132.48	1375.70 N	489.86 E	1376.21	1.21
8453.00	91.73	358.50	7130.54	1461.64 N	487.52 E	1462.15	1.01
8539.00	91.30	0.12	7128.27	1547.60 N	486.49 E	1548.11	1.95
8624.00	90.80	359.09	7126.71	1632.59 N	485.90 E	1633.09	1.34
8710.00	91.05	1.10	7125.32	1718.57 N	486.04 E	1719.08	2.35
8796.00	90.80	1.05	7123.93	1804.54 N	487.66 E	1805.05	0.29
8881.00	90.86	0.55	7122.69	1889.53 N	488.84 E	1890.04	0.59

8967.00	91.36	2.30	7121.02	1975.48 N	490.98 E	1975.99	2.11
9053.00	91.23	2.07	7119.08	2061.40 N	494.26 E	2061.91	0.30
9139.00	91.61	1.85	7116.95	2147.32 N	497.20 E	2147.84	0.50
9224.00	92.22	1.66	7114.10	2232.23 N	499.80 E	2232.75	0.76
9309.00	93.33	1.81	7109.98	2317.09 N	502.37 E	2317.61	1.32
9395.00	92.16	1.50	7105.86	2402.95 N	504.85 E	2403.48	1.41
9481.00	92.04	2.12	7102.71	2488.85 N	507.57 E	2489.38	0.74
9566.00	91.36	2.30	7100.19	2573.75 N	510.84 E	2574.29	0.83
9652.00	90.80	3.16	7098.56	2659.64 N	514.94 E	2660.18	1.19
9738.00	89.75	3.18	7098.15	2745.50 N	519.70 E	2746.05	1.22
9823.00	88.89	1.98	7099.15	2830.41 N	523.52 E	2830.96	1.74
9909.00	89.44	1.97	7100.40	2916.35 N	526.49 E	2916.90	0.65
9994.00	90.00	1.70	7100.82	3001.30 N	529.21 E	3001.86	0.73
10079.00	91.17	1.74	7099.95	3086.26 N	531.76 E	3086.81	1.38
10165.00	89.57	1.48	7099.39	3172.22 N	534.17 E	3172.78	1.89
10250.00	90.68	1.55	7099.21	3257.19 N	536.42 E	3257.75	1.31
10336.00	89.81	0.83	7098.84	3343.17 N	538.21 E	3343.73	1.31
10421.00	89.88	0.87	7099.07	3428.16 N	539.47 E	3428.72	0.09
10506.00	89.51	0.10	7099.52	3513.15 N	540.19 E	3513.72	1.01
10592.00	90.12	0.39	7099.80	3599.15 N	540.56 E	3599.72	0.79
10678.00	89.32	0.03	7100.22	3685.15 N	540.87 E	3685.71	1.02
10763.00	90.00	359.64	7100.72	3770.15 N	540.63 E	3770.71	0.92
10848.00	90.74	359.72	7100.17	3855.14 N	540.15 E	3855.71	0.88
10934.00	90.19	359.91	7099.48	3941.14 N	539.87 E	3941.70	0.68
11020.00	89.14	0.16	7099.99	4027.14 N	539.93 E	4027.70	1.25
11105.00	90.49	359.93	7100.26	4112.13 N	539.99 E	4112.70	1.62
11191.00	90.19	0.60	7099.75	4198.13 N	540.39 E	4198.70	0.86
11277.00	91.48	0.88	7098.50	4284.11 N	541.50 E	4284.68	1.54
11362.00	90.37	1.17	7097.13	4369.09 N	543.02 E	4369.65	1.35
11447.00	90.99	1.00	7096.12	4454.07 N	544.63 E	4454.63	0.75
11533.00	91.55	0.74	7094.22	4540.03 N	545.94 E	4540.60	0.72
11561.00	91.61	0.47	7093.45	4568.02 N	546.23 E	4568.59	0.99
11607.00	91.61	0.47	7092.16	4614.00 N	546.61 E	4614.57	0.00

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 0.06 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.61 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11607.00 FEET
IS 4646.27 FEET ALONG 6.76 DEGREES (TRUE)**

All directional surveys tied onto gyro survey at 976' MD. Final survey is a straight line projection to the bit.