

**299-E24-33 (C4257)**  
**Log Data Report**

**Borehole Information:**

<b>Borehole:</b> 299-E24-33 (C4257)		<b>Site:</b> West of AX Tank Farm			
<b>Coordinates</b> (WA State Plane)		<b>GWL (ft)<sup>1</sup>:</b> 274.9		<b>GWL Date:</b> 5/20/04	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>2</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
Not available	Not available	May 2004	Not available	315	Cable Tool

**Casing Information:**

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Threaded steel	1.0	10 3/4	9 3/8	11/16	0	265
Threaded steel	4.6	8 5/8	7 3/4	7/16	0	315
Fluor FWS is the source of the casing data.						

**Borehole Notes:**

Zero reference is the ground surface. The drilling was stopped at perched water so the perched zone could be sealed and drilling resumed. This well will be completed as a new RCRA well monitoring the "A" complex of tank farms. This borehole was logged through a single strand of drill pipe.

**Logging Equipment Information:**

<b>Logging System:</b> Gamma 2A	<b>Type:</b> 35% HPGe (34TP20893A)
<b>Calibration Date:</b> 03/2004	<b>Calibration Reference:</b> DOE-EM/GJ642-2004
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

<b>Logging System:</b> Gamma 2F	<b>Type:</b> NMLS (H380932510)
<b>Calibration Date:</b> 09/03	<b>Calibration Reference:</b> GJO-2003-520-TAC
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

**Spectral Gamma Logging System (SGLS) Log Run Information:**

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4 / Repeat</b>	
Date	4/23/04	4/26/04	5/24/04	5/24/04	
Logging Engineer	Pearson	Pearson	Pearson	Pearson	
Start Depth (ft)	0.0	254.0	313.0	278.0	
Finish Depth (ft)	170.0	145.0	220.0	268.0	
Count Time (sec)	200	200	200	200	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	NA	NA	

Log Run	1	2	3	4 / Repeat
MSA Interval (ft)	1.0	1.0	1.0	1.0
ft/min	N/A <sup>3</sup>	N/A	N/A	N/A
Pre-Verification	BA324CAB	BA325CAB	BA338CAB	BA338CAB
Start File	BA324000	BA325000	BA338000	BA338094
Finish File	BA324170	BA325109	BA338093	BA338104
Post-Verification	BA324CAA	BA325CAA	BA338CAA	BA338CAA
Depth Return Error (in.)	½" high	½" high	N/A	¼" high
Comments	No gain adjustments.	Repeat section 145-170 ft. No gain adjustments.	No gain adjustments.	No gain adjustments.

**Neutron Moisture Logging System (NMLS) Log Run Information:**

Log Run	1	2
Date	4/23/04	4/26/04
Logging Engineer	Pearson	Pearson
Start Depth (ft)	0.0	175.0
Finish Depth (ft)	199.75	254.5
Count Time (sec)	N/A	N/A
Live/Real	N/A	N/A
Shield (Y/N)	N/A	N/A
MSA Interval (ft)	N/A	N/A
ft/min	1.0	1.0
Pre-Verification	BF173CAB	BF173CAB
Start File	BF173000	BF174000
Finish File	BF173799	BF174318
Post-Verification	BF174CAA	BF174CAA
Depth Return Error (ft)	N/A	1' high
Comments	None	Repeat section 175.0-199.75 ft

**Logging Operation Notes:**

Zero reference was the ground surface, and the borehole was logged through drill pipe. Logging operations were conducted in two separate events as the borehole was advanced. Each time the casing was “telescoped”, the borehole was logged, such that each interval was logged through a single casing string. The Fluor FTL requested that the third logging run extend to 220.0 ft. Logging was performed with a centralizer installed on the sonde. SGLS data were collected using Gamma 2A. Pre- and post-survey verification measurements employed the Amersham KUT (<sup>40</sup>K, <sup>238</sup>U, and <sup>232</sup>Th) verifier with serial number 082.

**Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	5/26/04	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits. All of the verification spectra were within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 0.8 percent higher and 4.0 percent lower at the end of the day. Examinations of spectra indicate that the detector functioned normally during all of the logging runs, and the spectra are accepted.

Pre-run and post-run verification spectra for the neutron tool were evaluated and were within the acceptance criteria.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2AMar04.xls). Zero reference was the ground surface. Based on measurements supplied by the driller, the casing configuration was assumed to be one string of 10-in. casing to 265 ft and one string of 8-in. casing to total depth. The casing correction factor was calculated using a 10-in. casing thickness of 11/16 in. and an 8-in. casing thickness of 7/16 in. Because the borehole was logged in stages, the casing correction is not additive; the borehole was logged through one string of casing during each logging run. However, the end of logging run 3 (i.e., 220 through 265 ft) was run in a dual string of pipe and the casing correction is additive (11/16 in. + 7/16 in. = 9/8 in.). Water and dead time corrections were not needed or applied.

NMLS log spectra were processed in batch mode using APTEC SUPERVISOR to determine count rates. Zero reference was the ground surface. Calibration data are available only for 8-in. casing. Thus, the volume fraction of water was not calculated since the only portion of the borehole logged with the NMLS was through 10-in. casing.

### **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 1764 keV was used to determine the naturally occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 609 keV because it exhibited higher net counts per second.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was the only man-made radionuclide detected in this borehole.  $^{137}\text{Cs}$  was detected near the ground surface in the interval from 7 ft through 9 ft at concentrations ranging from the 0.4 pCi/g to 1.2 pCi/g. The maximum concentration of  $^{137}\text{Cs}$  was measured at 9 ft.

Recognizable changes in the KUT logs occurred in this borehole. Significant changes occur at 18, 68, 126, 258, 263, and 310 ft. Relative to the surrounding sediments, total gamma decreases by about 25 cps, neutron-moisture counts per second decrease by 20 cps, and  $^{232}\text{Th}$  concentrations decrease by 0.2 pCi/g at 18 ft. At 68 ft, total gamma increases by 25 cps, neutron-moisture counts per second slightly decrease, and  $^{40}\text{K}$  activities increase by 3 pCi/g, which may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. At 126 ft, both total gamma and neutron-moisture increase by 20 cps,  $^{40}\text{K}$  concentrations increase by 3 pCi/g, and  $^{232}\text{Th}$  concentrations increase by 0.2 pCi/g. In the interval between 258 and 263 ft, total gamma increases by 20 cps, and  $^{232}\text{Th}$  concentrations increase by approximately 0.3 pCi/g. At 310 ft, total gamma increases by 30 cps, and  $^{40}\text{K}$  concentrations increase by more than 5 pCi/g. Because the 10-in. casing ends at 265 ft, there is an apparent increase in total gamma below this casing change. Below approximately 275 ft, total gamma counts per second is attenuated by groundwater.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS and NMLS data. The natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs. The neutron-moisture and its repeat are within the acceptance criteria.

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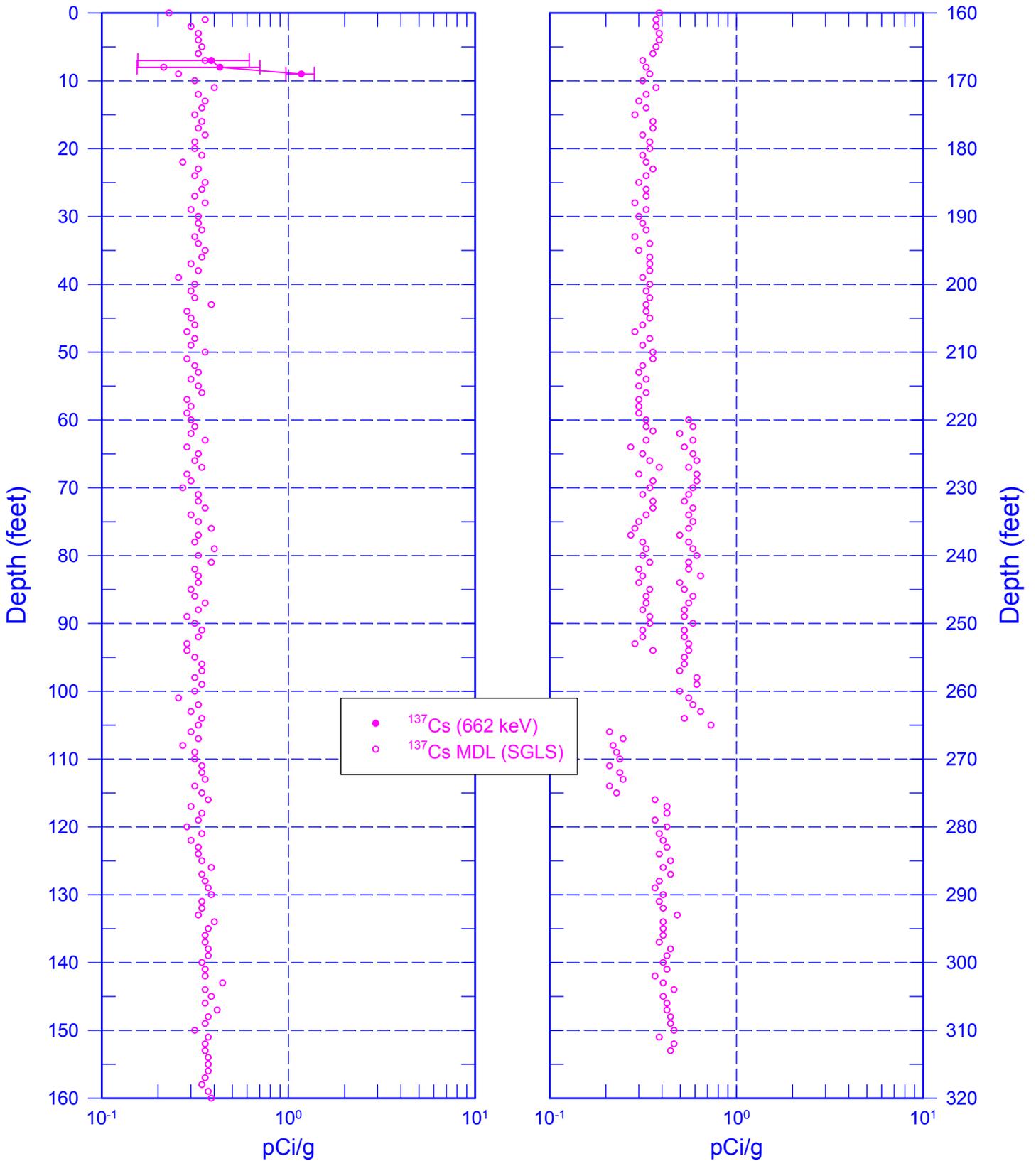
<sup>1</sup> GWL – groundwater level

<sup>2</sup> TOC – top of casing

<sup>3</sup> N/A – not applicable

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## Man-Made Radionuclides

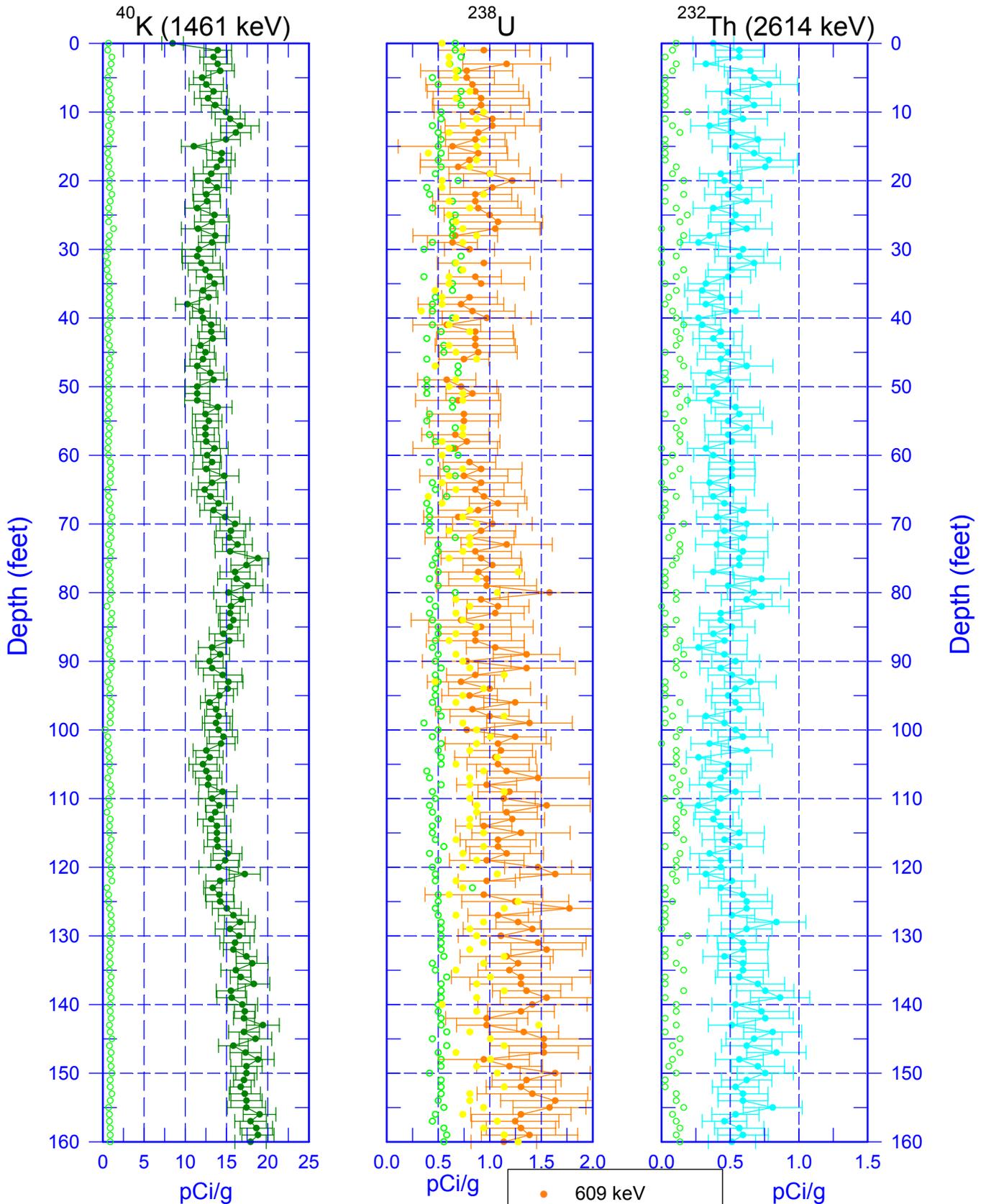


Zero Reference = Ground Surface

Date of Last Logging Run  
5/24/2004

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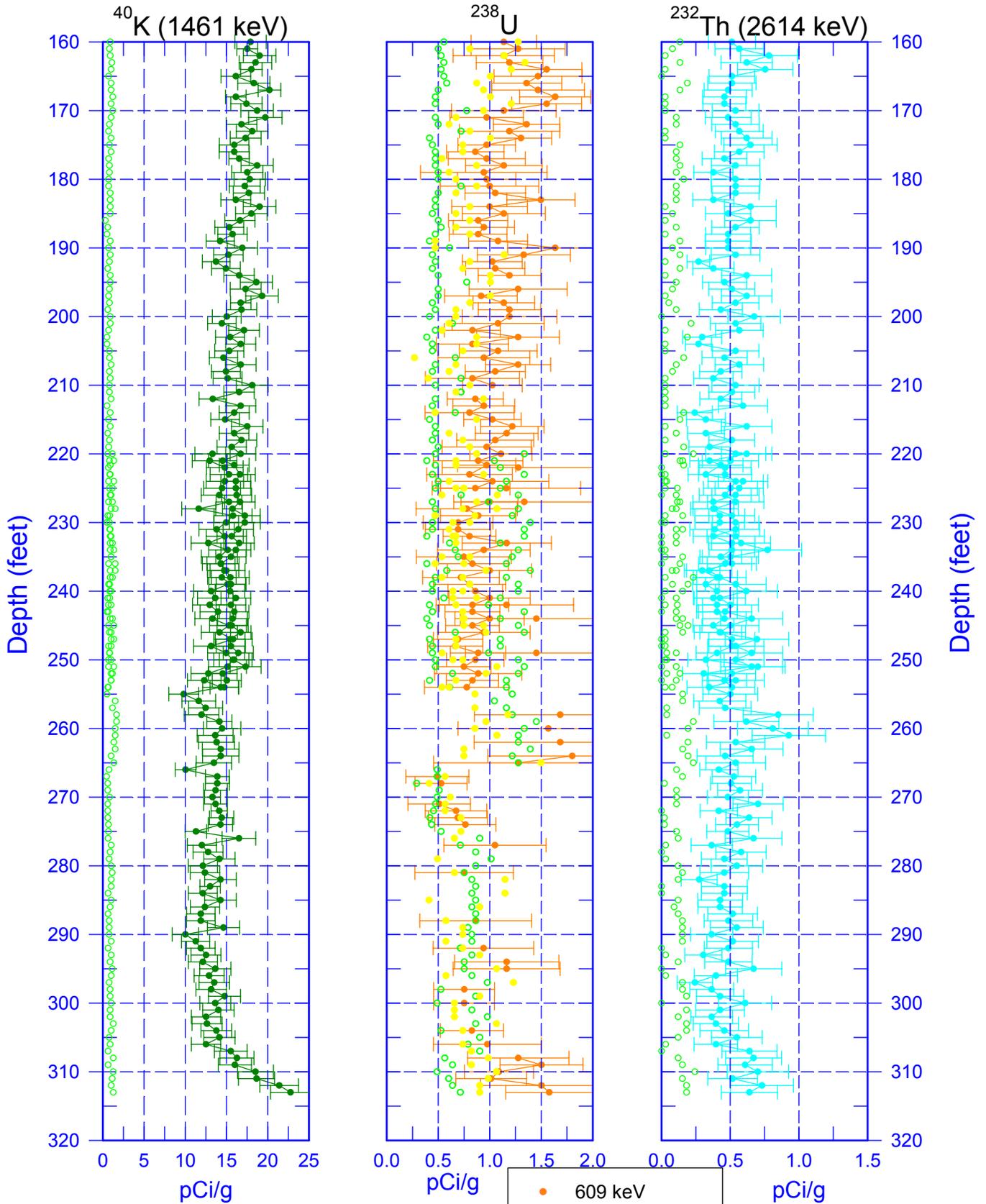
## Natural Gamma Logs



Zero Reference = Ground Surface

Date of Last Logging Run  
4/26/2004

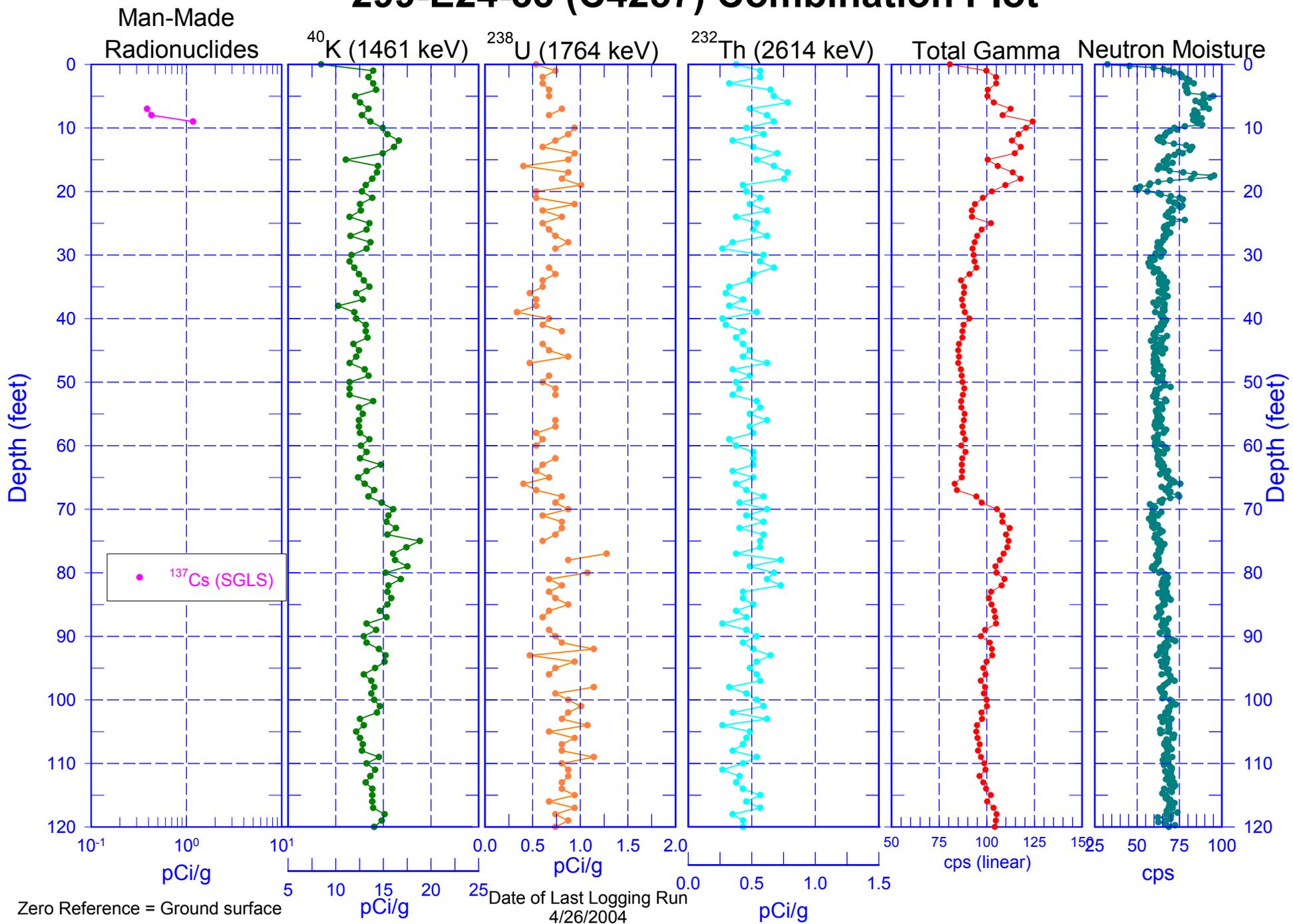
# 299-E24-33 (C4257) Natural Gamma Logs



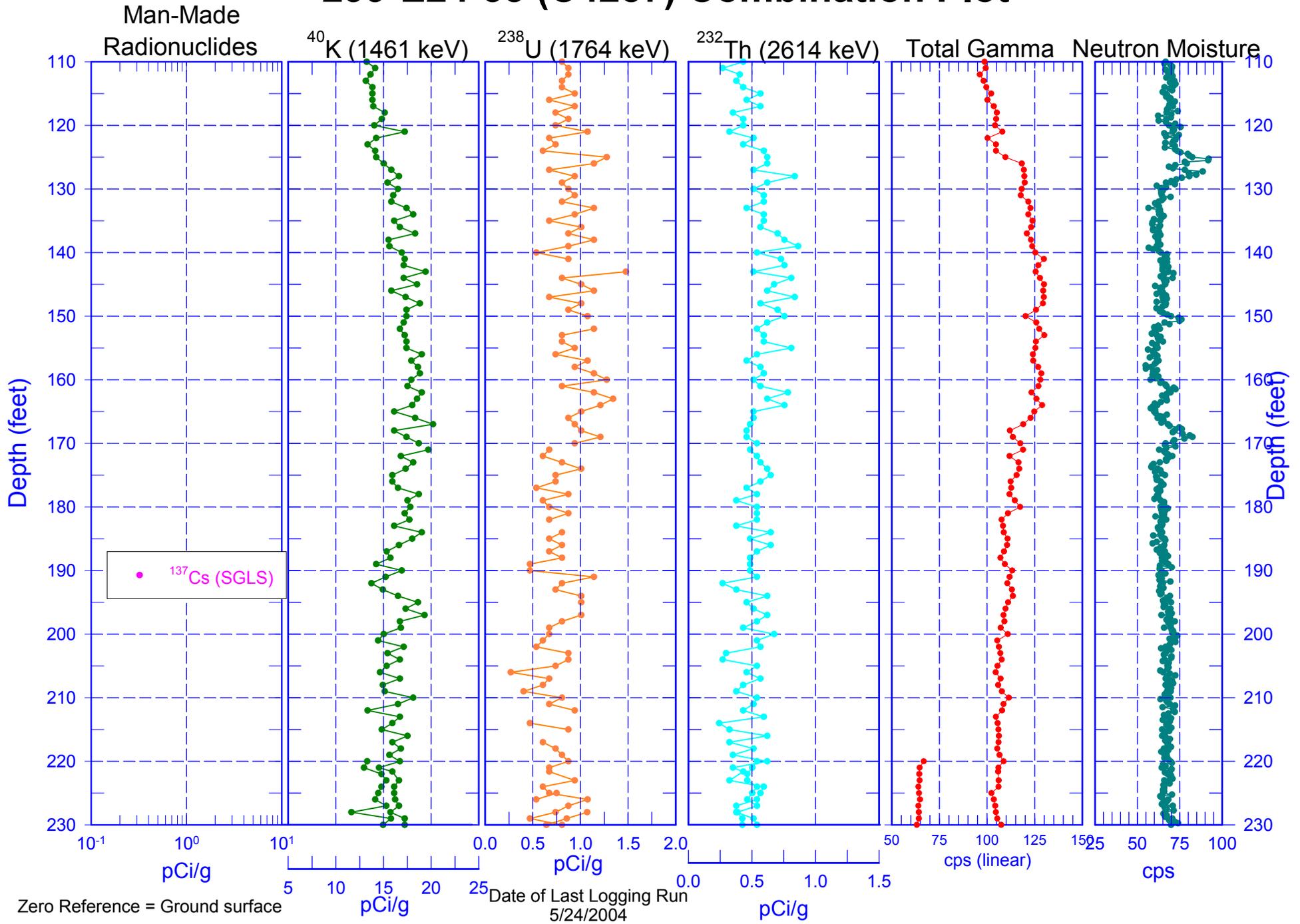
Zero Reference = Ground Surface

Date of Last Logging Run  
5/24/2004

# 299-E24-33 (C4257) Combination Plot



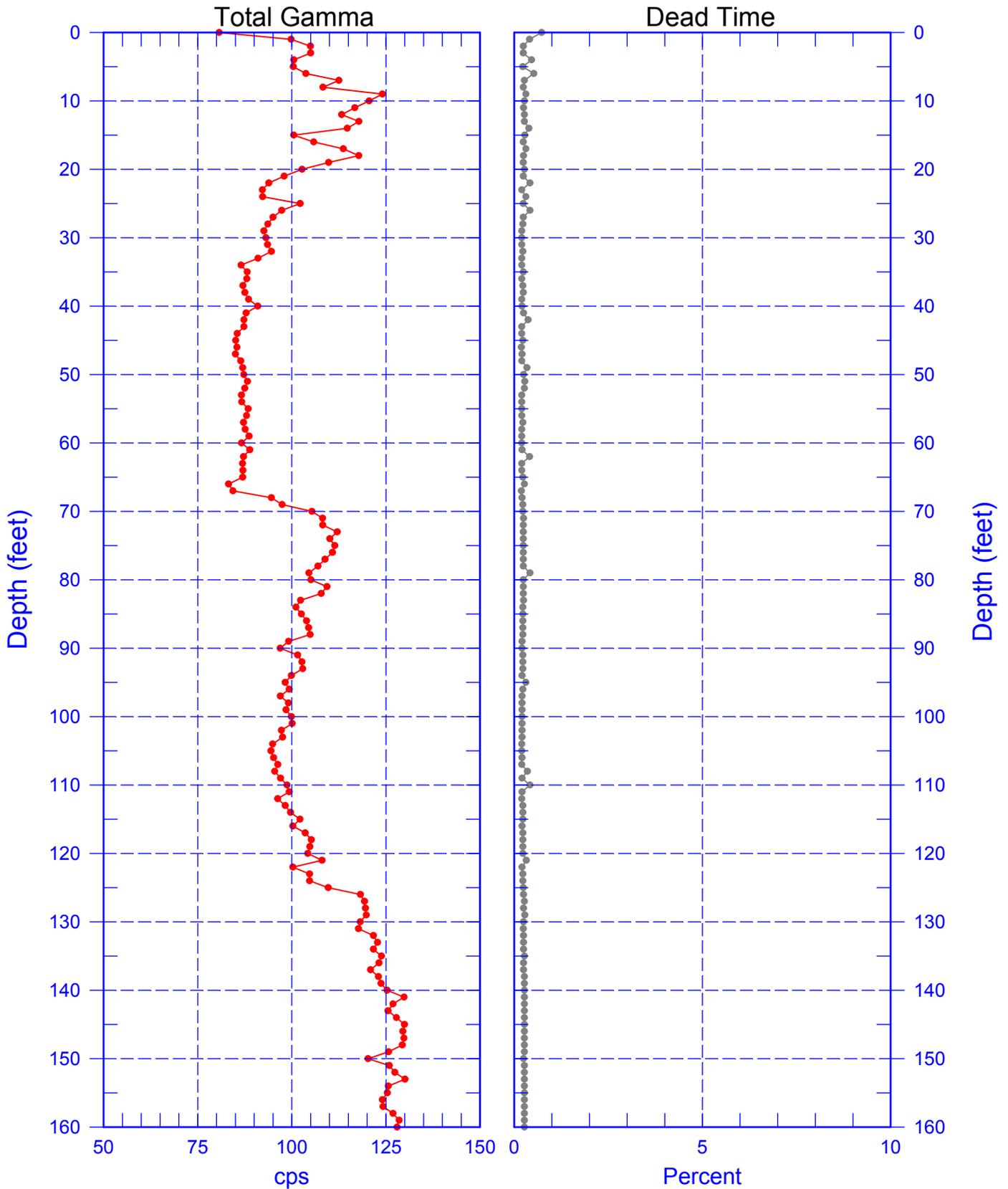
# 299-E24-33 (C4257) Combination Plot





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## Total Gamma & Dead Time

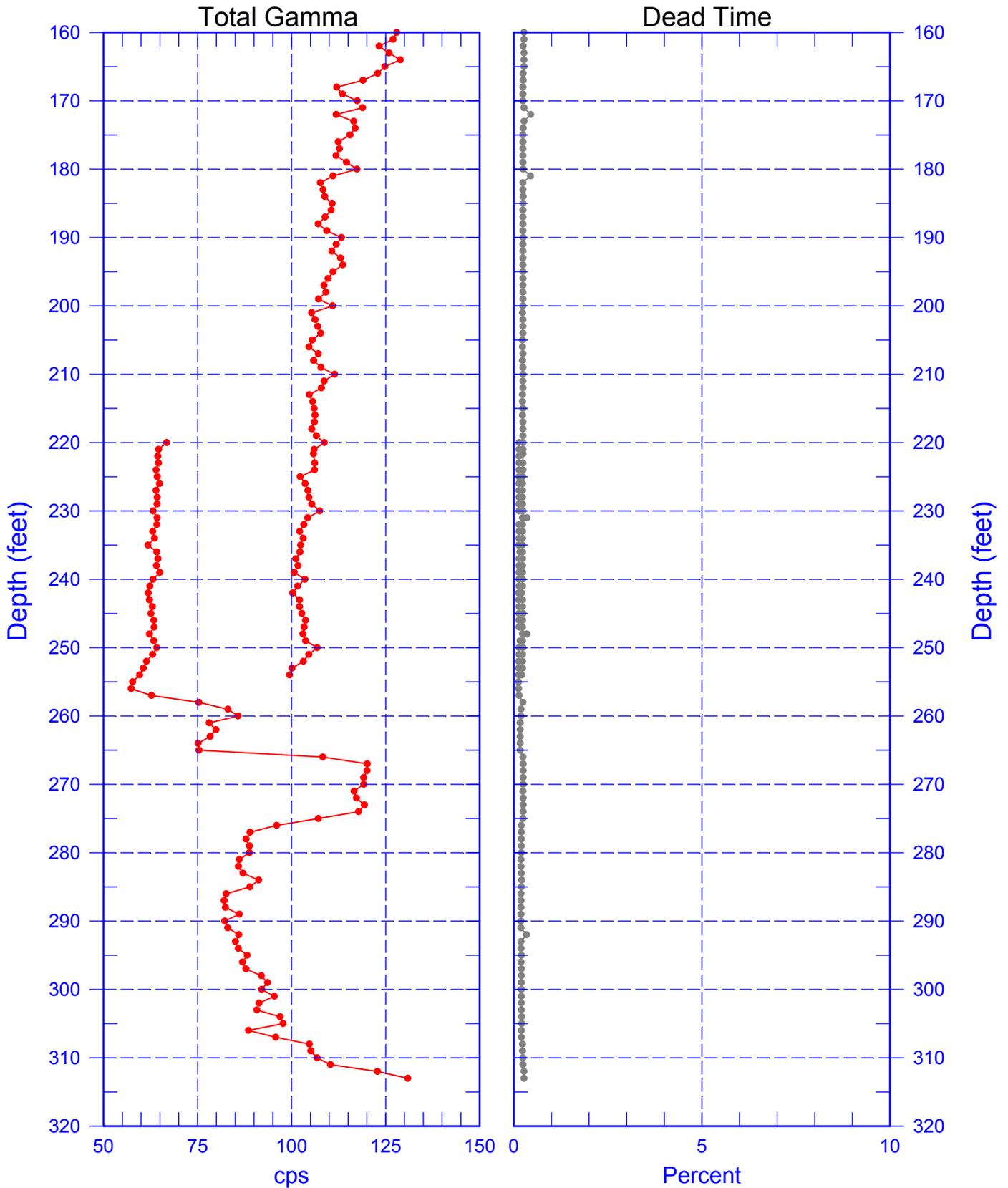


Zero Reference = Ground Surface

Date of Last Logging Run  
4/26/2004

# 299-E24-33 (C4257)

## Total Gamma & Dead Time

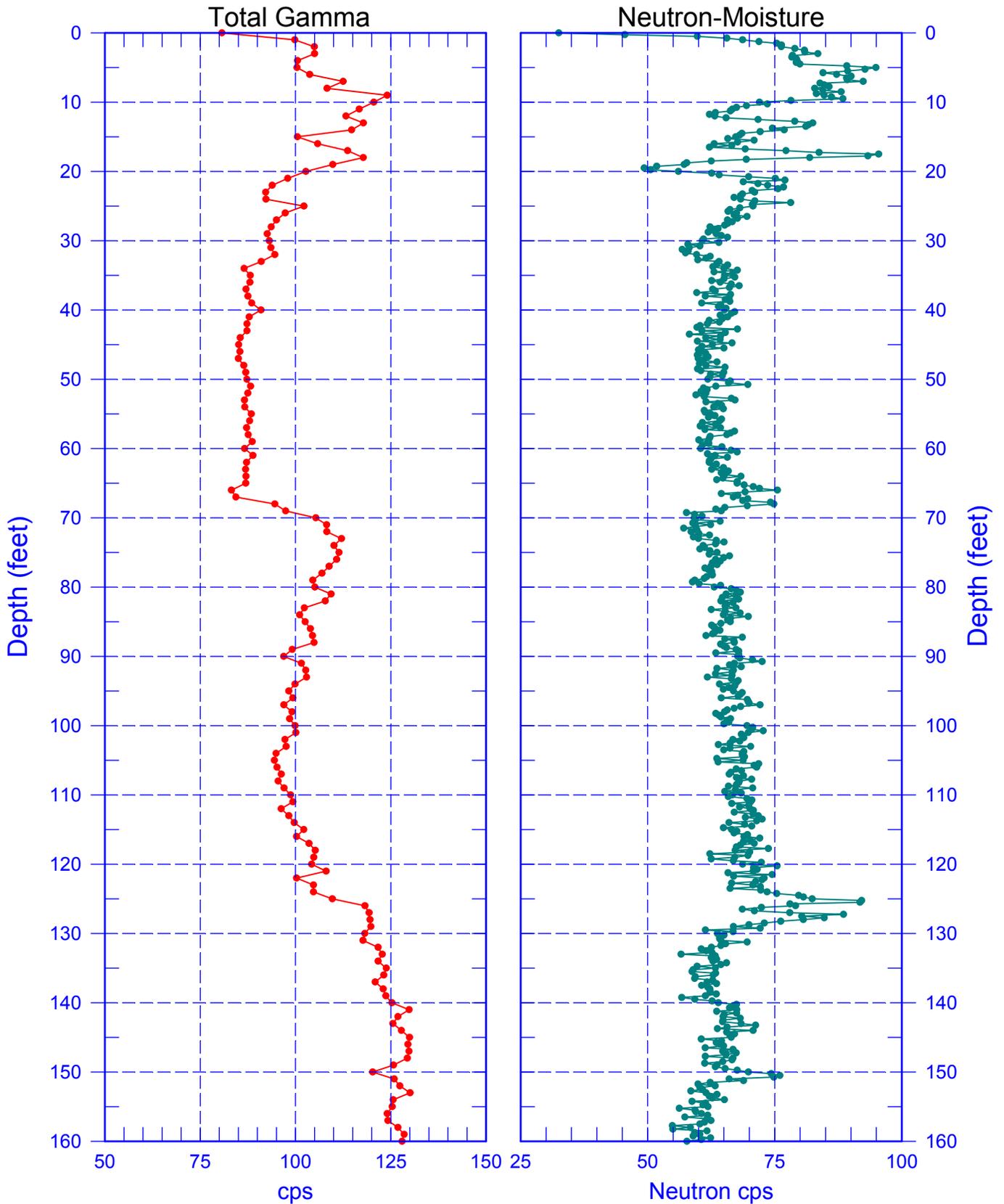


Zero Reference = Ground Surface

Date of Last Logging Run  
5/24/2004

# 299-E24-33 (C4257)

## Total Gamma & Neutron

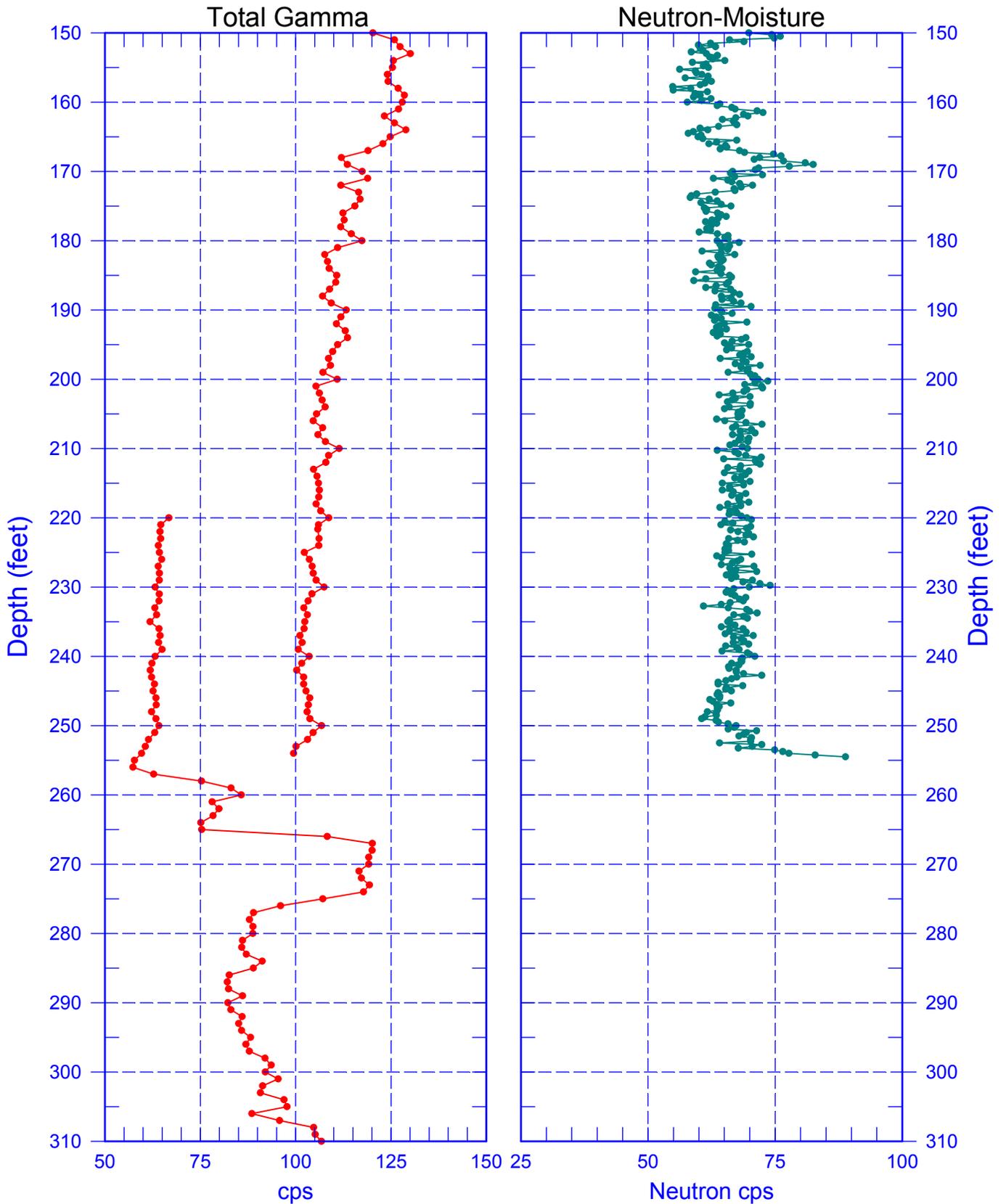


Zero Reference = Ground Surface

Date of Last Logging Run  
4/26/2004

# 299-E24-33 (C4257)

## Total Gamma & Neutron

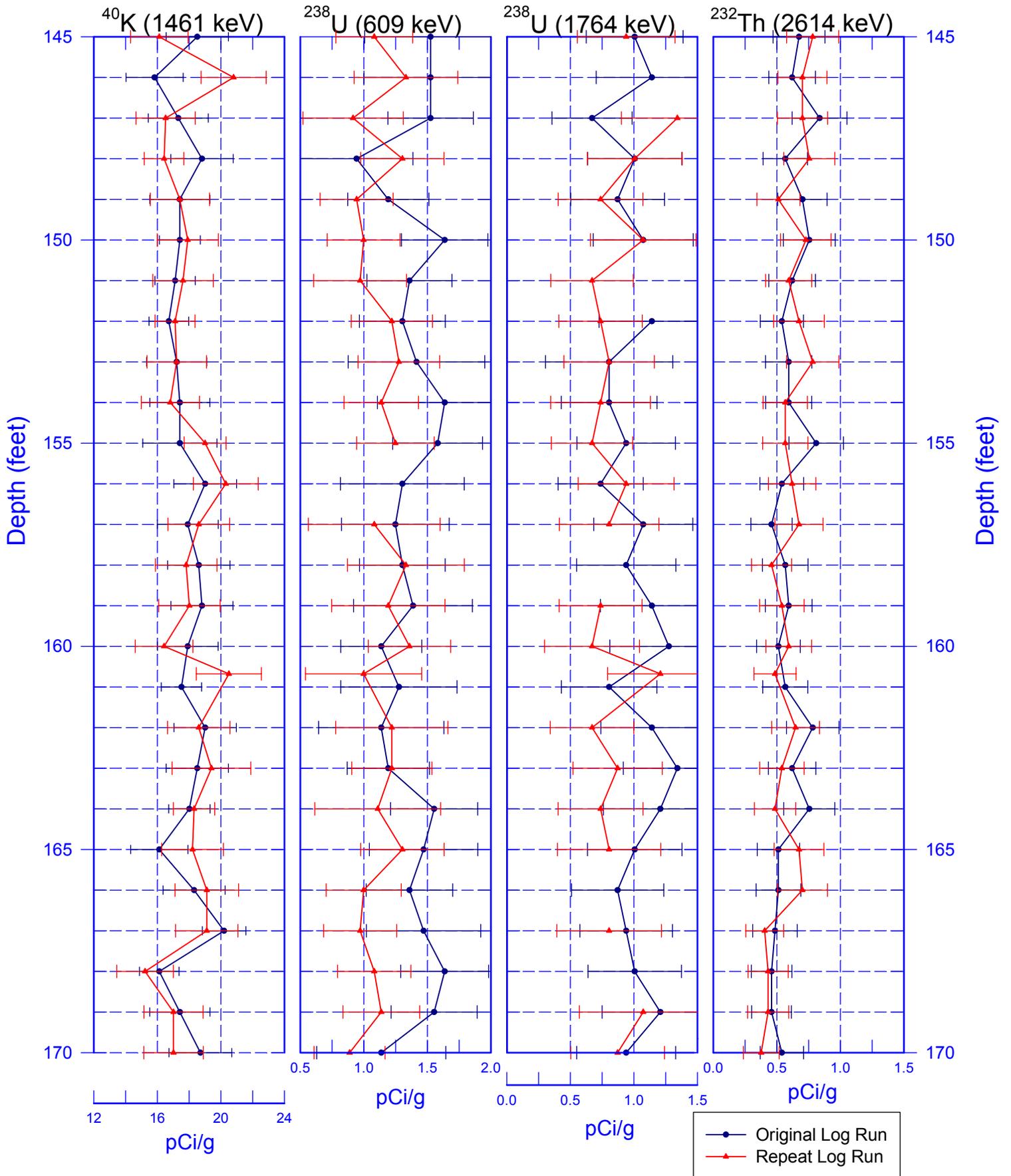


Zero Reference = Ground Surface

Date of Last Logging Run  
5/24/2004

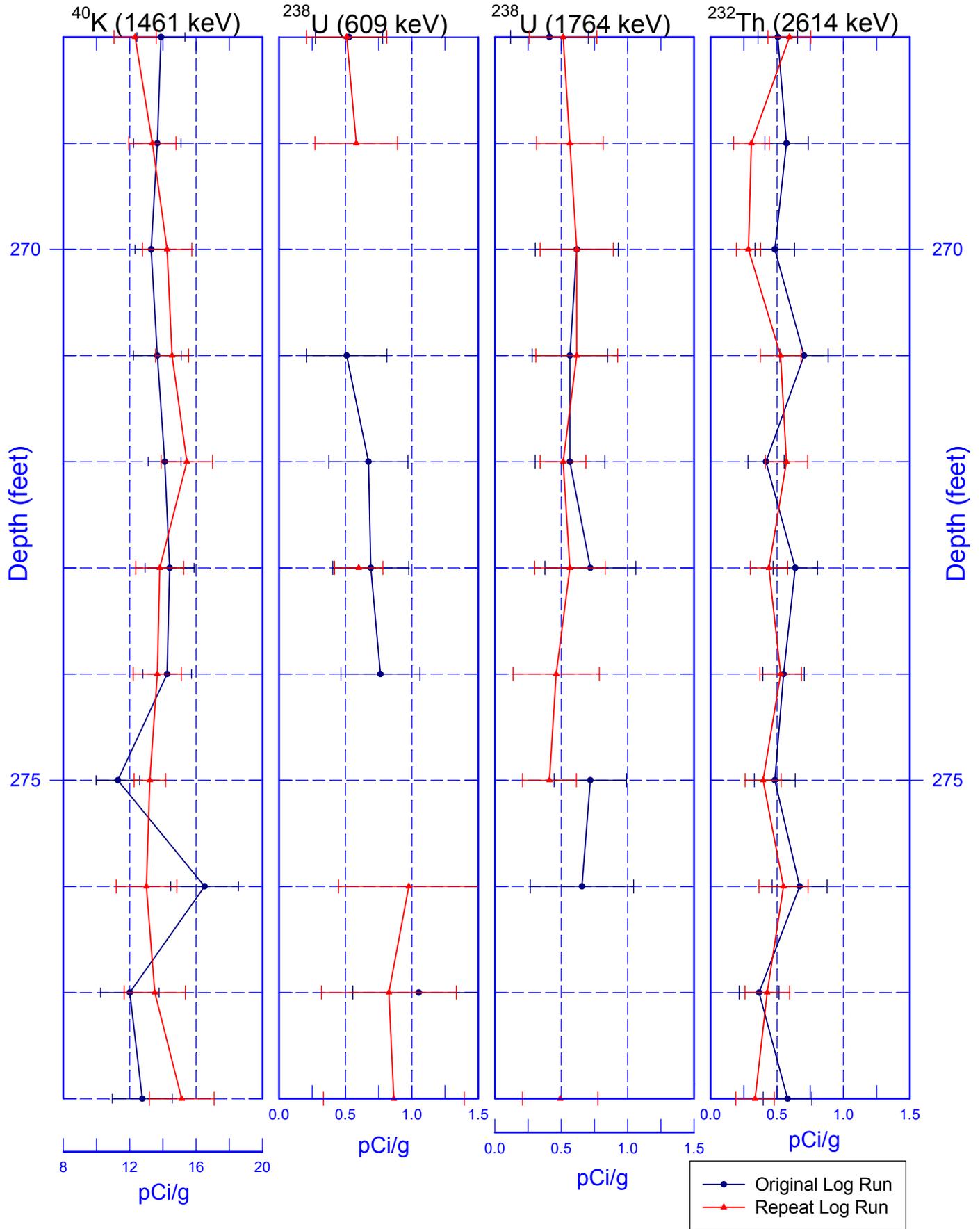
# 299-E24-33 (C4257)

## Rerun of Natural Gamma Logs (170.0 to 145.0 ft)



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## Rerun of Natural Gamma Logs (278.0 to 268.0 ft)



# 299-E24-33 (C4257)

## Rerun of Neutron-Moisture (175.0 to 199.75 ft)

