Stoller
Hanford Office

DOE-EM/GJ837-2005

299-W11-25B (C4669)
Log Data Report

Borehole Information:

Borehole:	299-W11-25B (C4669)		Site:	Near T Tank Farm	
Coordinates (WA State Plane)		GWL (ft)[1]:	241.8	GWL Date:	03/08/05
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
Not Available	Not Available	Mar. 2005	Not Applicable	408	Becker

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	0.15	6 5/8	5 3/8	0.625	0.15	50
Becker dual wall (outer)	3.33	9	8	0.5	3.33	408
Becker dual wall (inner)	3.33	6.24	6	0.12	3.33	408

Borehole Notes:

This borehole was first drilled and logged in January 2005 to approximately 50 ft. The borehole was completed in March 2005 to an approximate depth of 408 ft. Casing diameter for the threaded steel casing was measured by the logging engineer using a steel tape. The Becker casing dimensions are derived from published specifications. Zero reference is the ground surface.

Logging Equipment Information:

Logging System:	Gamma 4E		Type:	SGLS (70%) 34TP40587A
Calibration Date:	05/04	Calibration Reference:	DOE-EM/GJ692-2004	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Repeat	3	4	5
Date	01/12/05	01/12/05	03/09/05	03/10/05	03/14/05
Logging Engineer	Spatz	Spatz	Pope	Pope	Pope
Start Depth (ft)	48.5	36.5	47.0	172.0	266.0
Finish Depth (ft)	0.5	31.5	173.0	267.0	408.0
Count Time (sec)	100	100	200	200	200
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A[3]	N/A	N/A	N/A	N/A
Pre-Verification	DE561CAB	DE561CAB	DE691CAB	DE701CAB	DE711CAB
Start File	DE561000	DE561049	DE691000	DE701000	DE711000
Finish File	DE561048	DE561054	DE691126	DE701095	DE711141

Log Run	1	2 Repeat	3	4	5
Post-Verification	DE561CAA	DE561CAA	DE691CAA	DE691CAA	DE711CAA
Depth Return Error (in.)	0	0	+ 1	- 3.5	- 2
Comments	No fine-gain adjustment made.	No fine-gain adjustment made.	No fine-gain adjustment made.	No fine-gain adjustment made.	Fine-gain adjustment made at 361 ft.

Log Run	6 Repeat	7 Repeat	8 Repeat		
Date	03/15/05	03/15/05	03/15/05		
Logging Engineer	Pope	Pope	Pope		
Start Depth (ft)	360.0	381.0	400.0		
Finish Depth (ft)	401.0	381.0	400.0		
Count Time (sec)	200	500	500		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	DE721CAB	DE721CAB	DE721CAB		
Start File	DE721000	DE721100	DE721101		
Finish File	DE721041	DE721100	DE721101		
Post-Verification	DE721CAA	DE721CAA	DE721CAA		
Depth Return Error (in.)	N/A	N/A	N/A		
Comments	No fine-gain adjustment made.	No fine-gain adjustment made.	No fine-gain adjustment made.		

Logging Operation Notes:

Zero reference was ground surface. Before starting log event 1 (January, 2005), the borehole was swabbed and no contamination was observed. Before placing the sonde in the borehole for log event 2 (March 2005), the Radiological Control Technician (RCT) noted there was ^{99}Tc on the pump and pipe that had been removed from the borehole. Consequently, a plastic sleeve was placed over the sonde before logging to prevent possible contamination. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the Spectral Gamma Logging System (SGLS) employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 115. Repeat log sections were acquired from 31.5 to 36.5 ft and 360 to 401 ft. Two depth intervals (381 and 400 ft) were selected for a 500-sec counting time.

Analysis Notes:

Analyst:	Henwood	Date:	03/17/05	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day of logging. All of the verification spectra were within the acceptance criteria. Examination of spectra indicates the detector functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The 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: G4EJul04.xls). The casing configuration for log event 1 (January 2005) was assumed as one string of 6-in. casing with a thickness of 5/8 in. to 48.9 ft (total logging depth). Dead time and water corrections were not required for log event 1. For log event 2 (March 2005), the casing configuration was assumed to be dual wall casing (8 and 6-in. ID) with an additive thickness of 0.620-in. from 50 to 408 ft. Corrections for these casing thicknesses were applied to the data. Joints where the casings are connected

have an additive thickness of 1.115-in.; no additional correction for the thicker joints was applied. A water correction was applied to the data below 241 ft.

Log Plot Notes:

Separate log plots are provided for naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of 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}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Separate plots are included for ^{60}Co (1173 and 1333 keV energy peaks) and total gamma. Because ^{60}Co is believed to exist in the groundwater, and not in the formation for which the calibration is valid, all detections of ^{60}Co are reported in counts per second (cps).

Results and Interpretations:

^{137}Cs was detected at the surface and at a few sporadic depth locations throughout the borehole near the MDL of 0.2 pCi/g. Except for the surface measurement, these detections are probably the result of statistical fluctuations and may not be valid.

^{60}Co was generally detected throughout the depth interval below the groundwater level of approximately 242 ft to total depth. The detections shown on the log plots are near the MDL of 0.05 cps. Close scrutiny of spectra recorded in the groundwater where detections are not shown suggests ^{60}Co exists, but the peaks were not considered statistically valid by the routine processing. This consistency of the existence of ^{60}Co at essentially indistinguishable count rates throughout the groundwater interval suggests the contaminant is in solution in the groundwater and not in the formation. Therefore, the calibration function based on uniform distribution in the formation is not considered valid for these occurrences of ^{60}Co. Consequently, all ^{60}Co detections are reported in cps.

Modeling of radiation was used for a scenario of the detector immersed in water contaminated with ^{60}Co (count rates determined from the SGLS measurements) inside a 6-in. ID casing and assuming no formation contamination. Modeling results suggest the concentration of ^{60}Co in the groundwater (determined from the 1333 keV energy peak) at the MDL of 0.05 cps would be approximately 50 pCi/L.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 1461, 1764, and 2614 keV. The repeat section plot of ^{60}Co in cps as determined from the 1173 and 1333 keV energy peaks indicate a lack of repeatability at these low levels of activity. Additional counting time would be necessary to reduce the MDL and improve the repeatability.

Enhanced levels of radon were observed in the borehole for the depth intervals from 172 to 267 ft (03/10/05) and from 266 to 408 ft (03/14/05).

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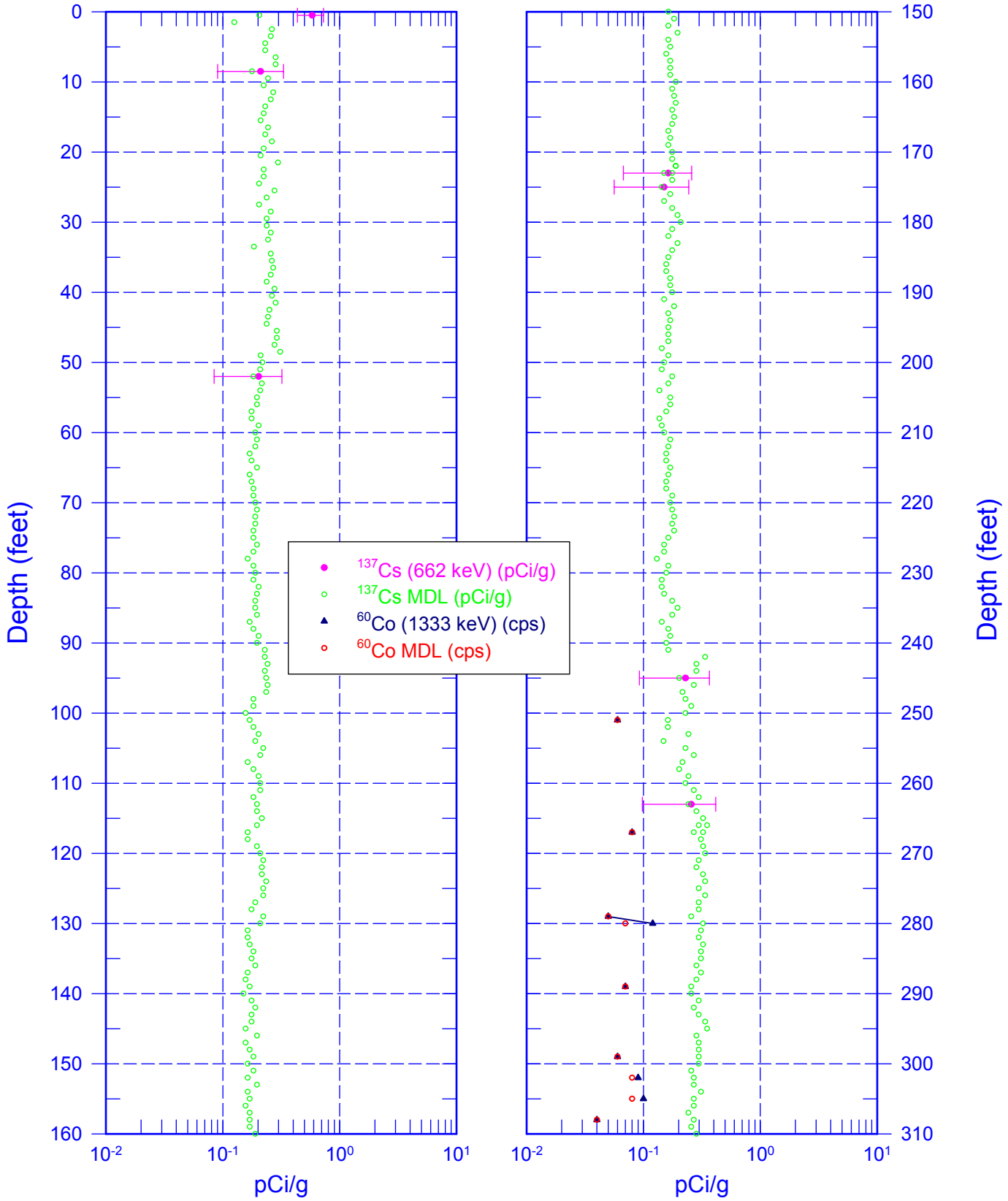
[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable

299-W11-25B (C4669)
Man-Made Radionuclides

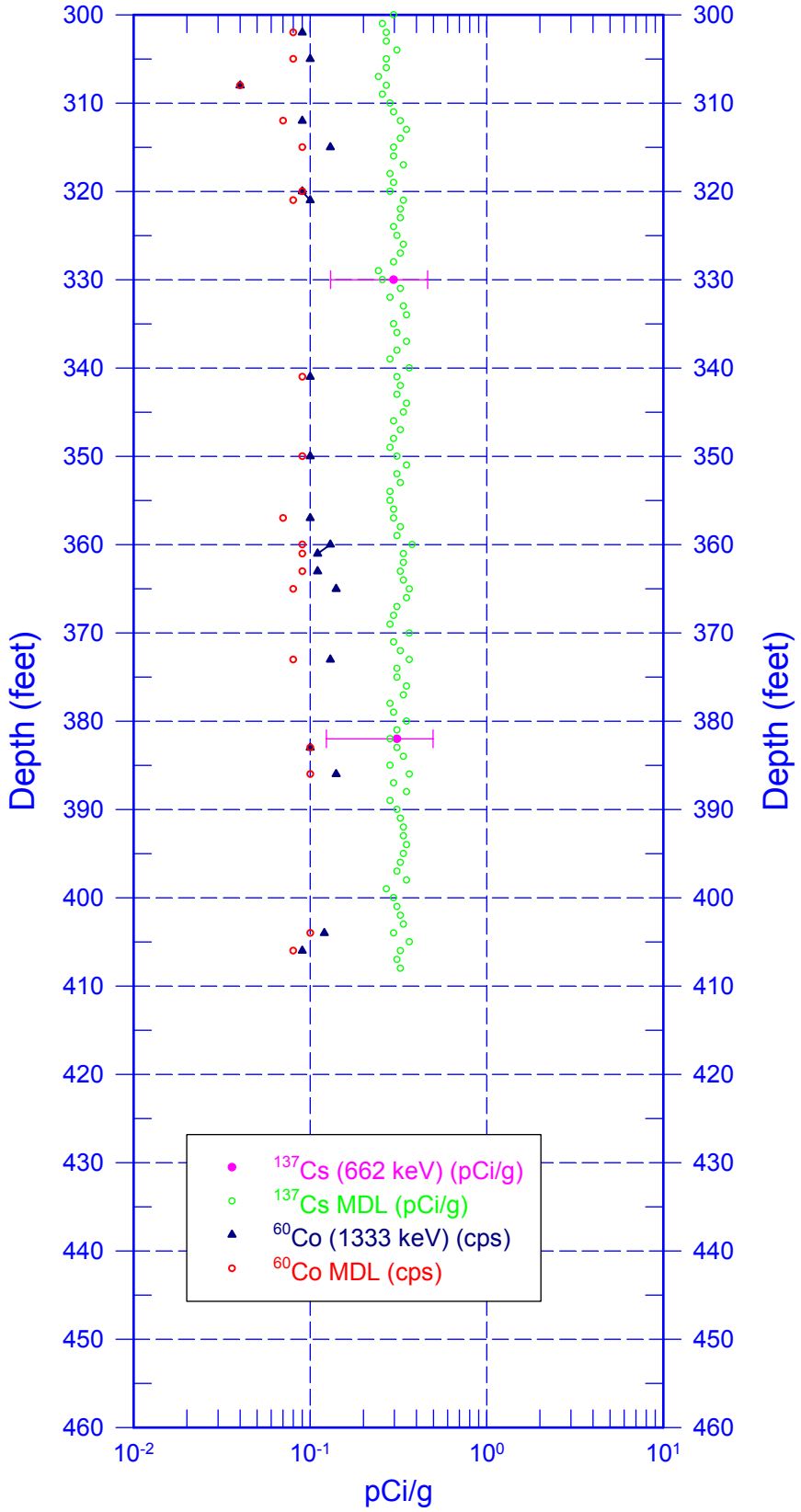


Zero Reference = Ground Surface

Depth Scale: 1"=20 ft

Last Log Date - 03/15/05

299-W11-25B (C4669)
Man-Made Radionuclides

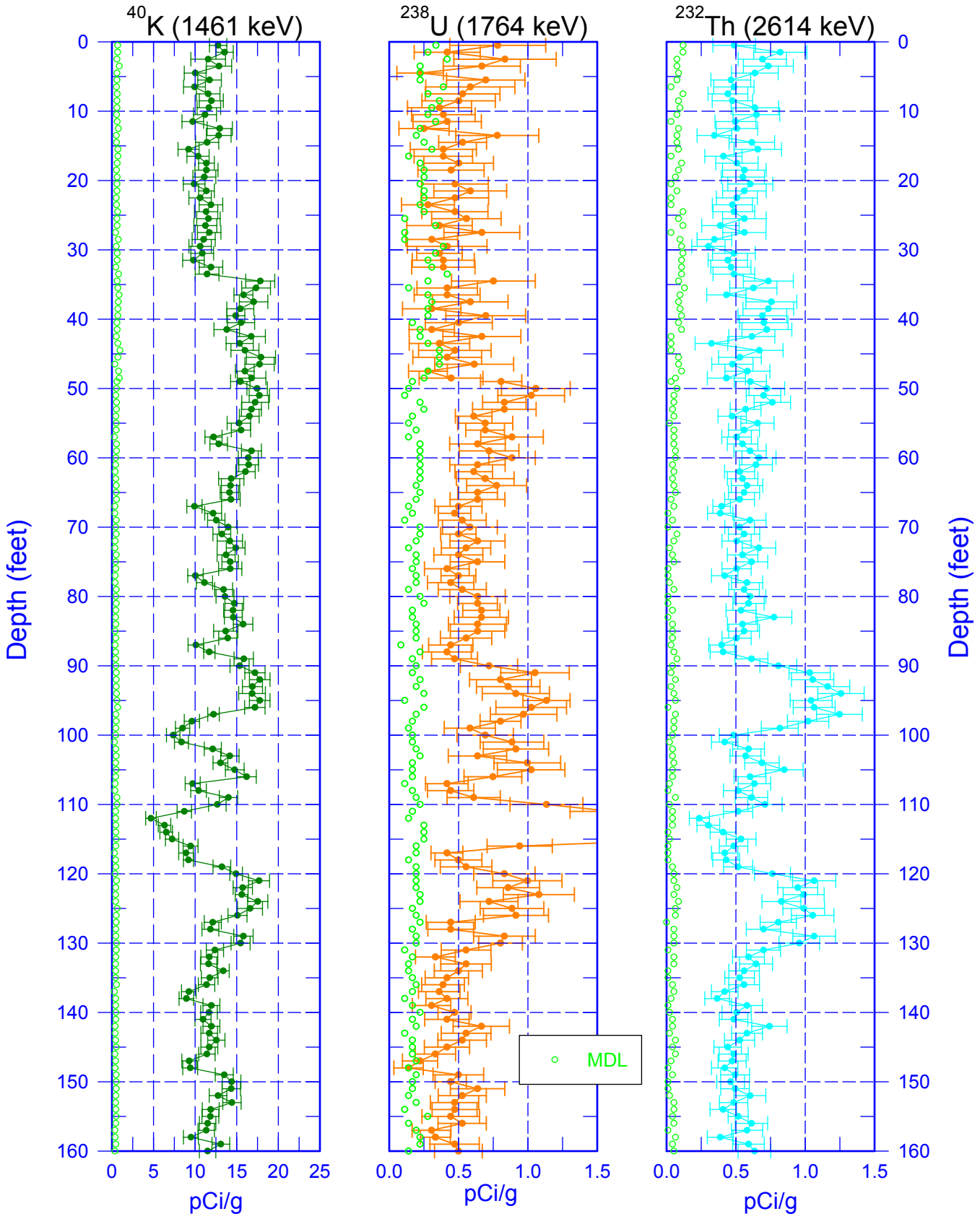


Zero Reference = Ground Surface

Depth Scale: 1"=20 ft

Last Log Date - 03/15/05

299-W11-25B (C4669)
Natural Gamma Logs



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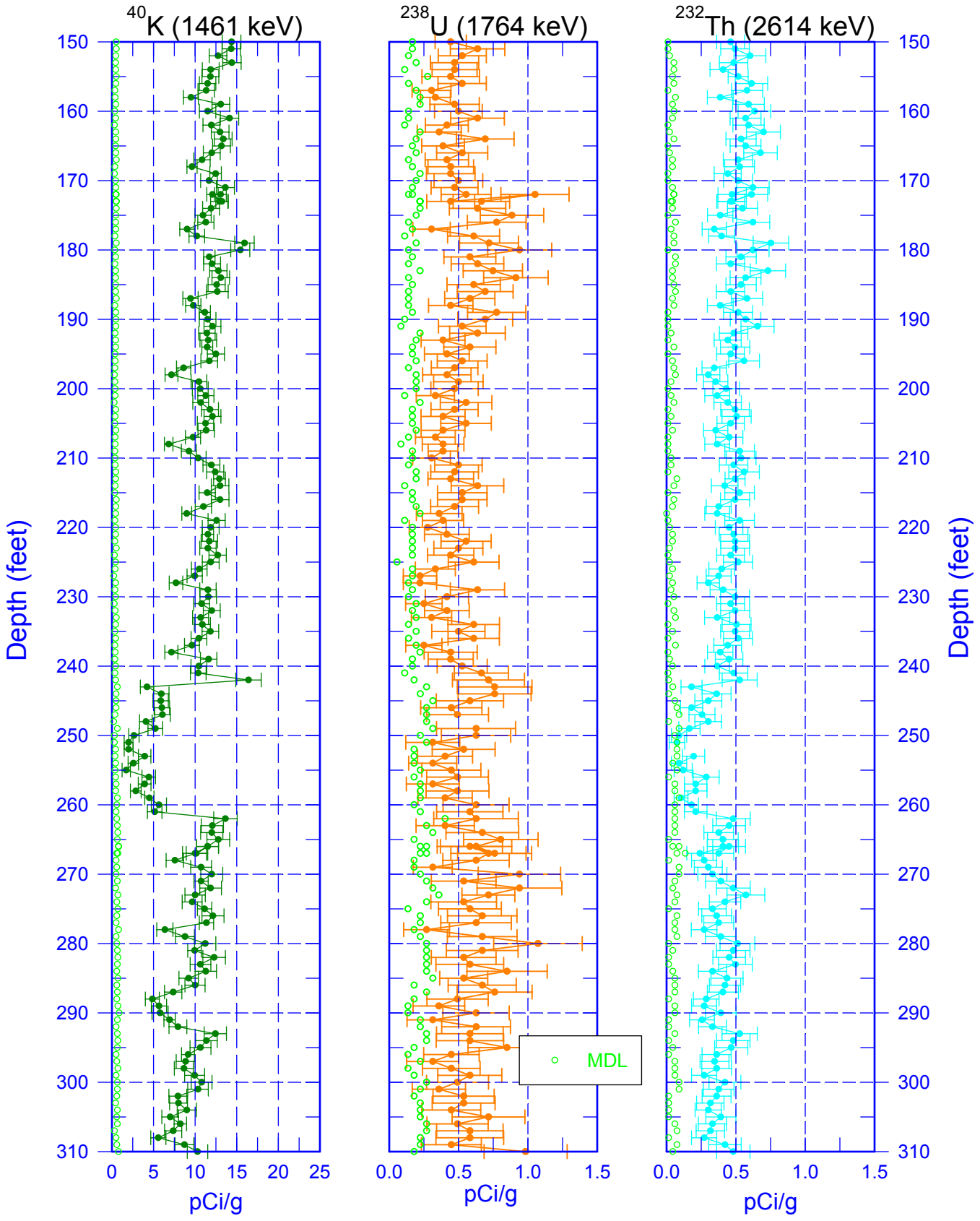
Natural Gamma Logs



Zero Reference = Ground Surface

Depth Scale = 1" = 20 ft

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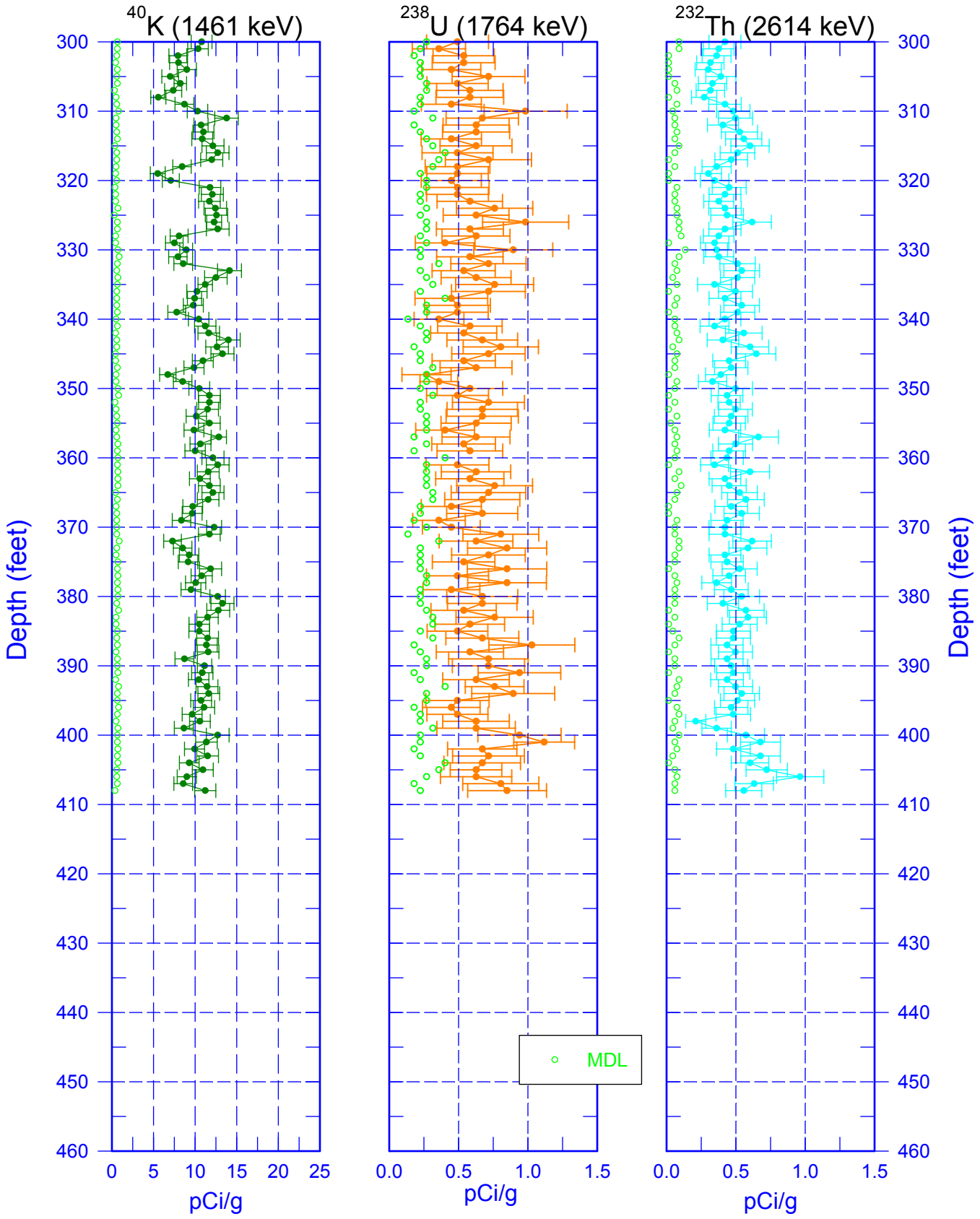
299-W11-25B (C4669)
Natural Gamma Logs

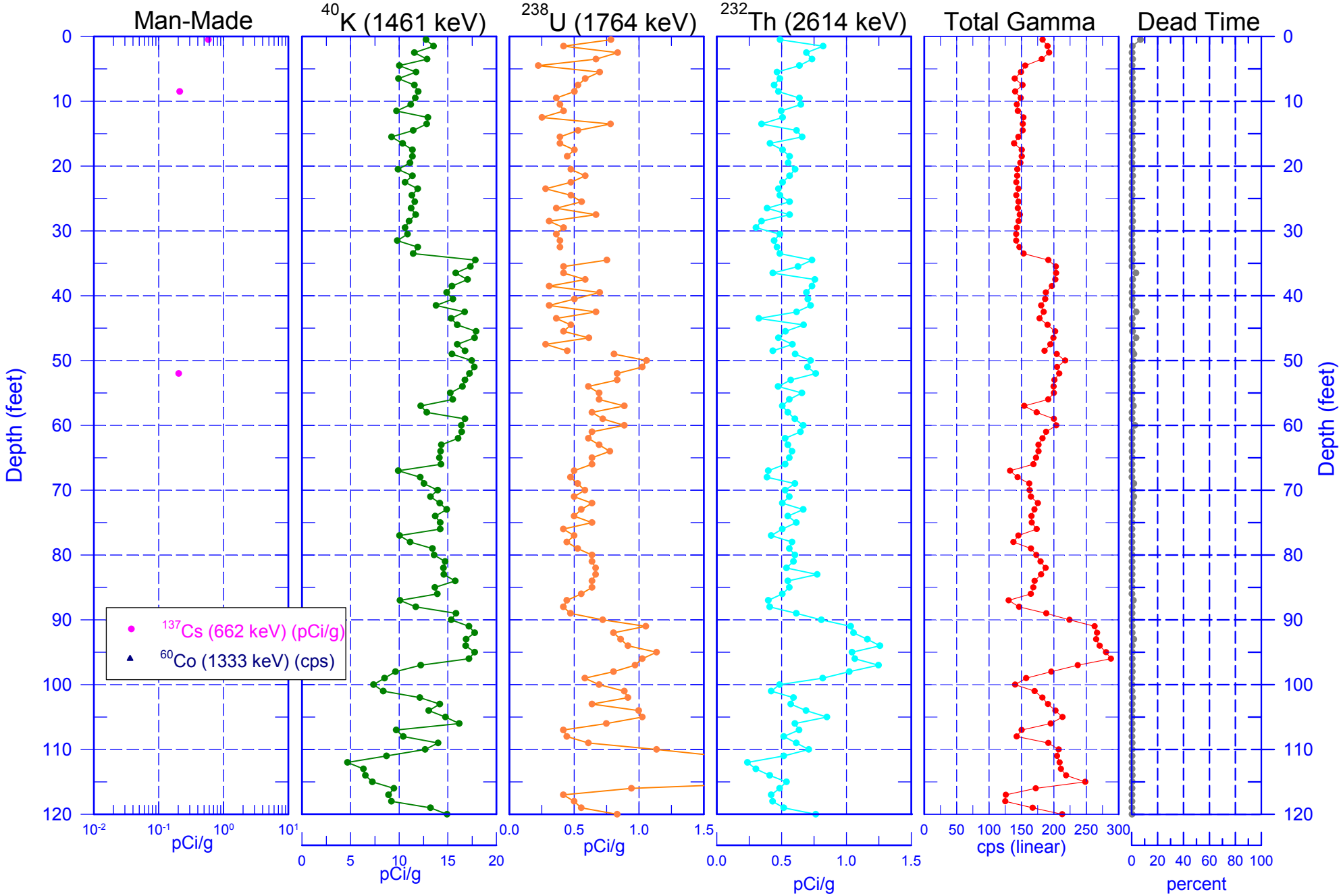


Zero Reference = Ground Surface

Depth Scale = 1" = 20 ft

Last Log Date - 03/15/05

299-W11-25B (C4669) Combination Plot

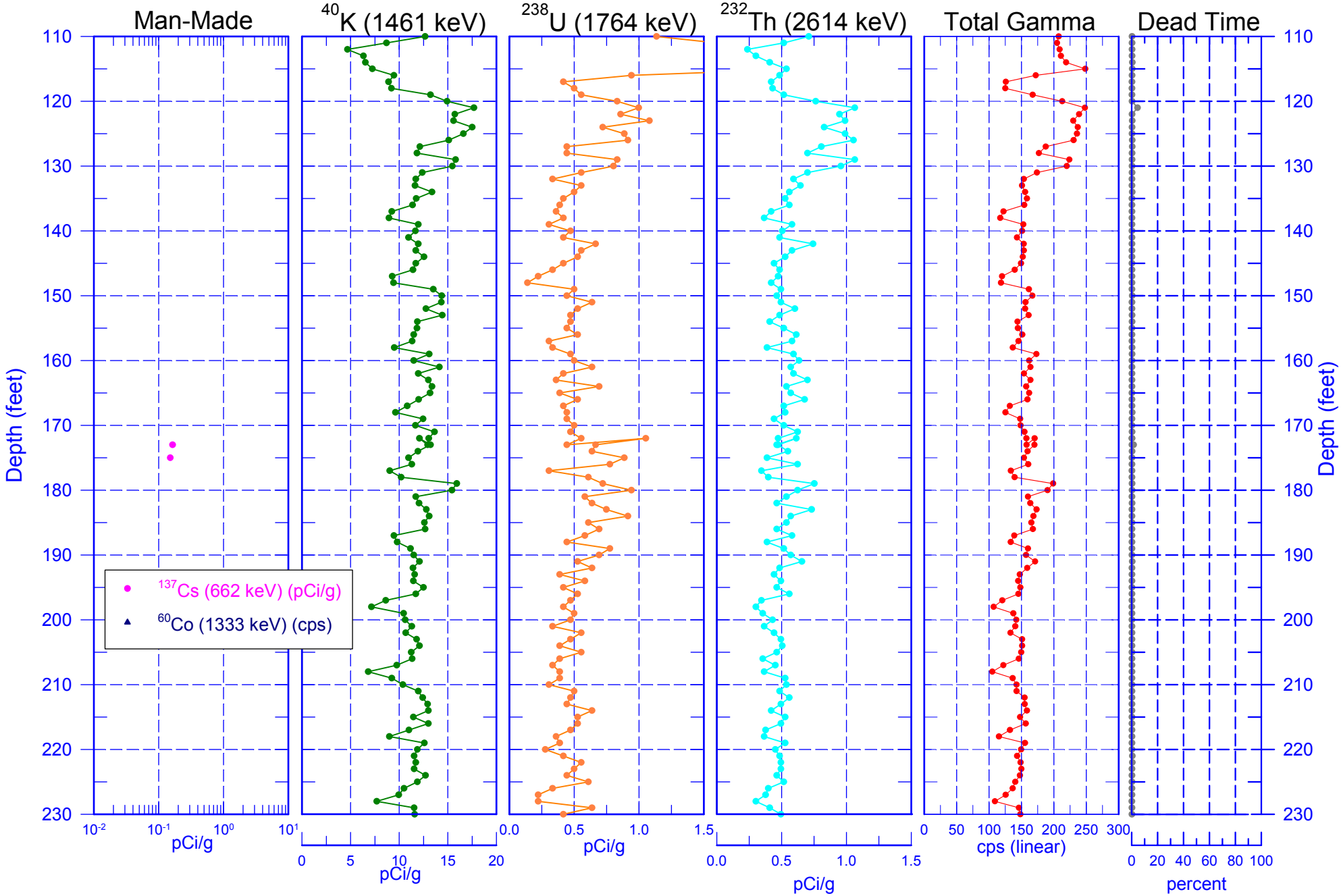


Zero Reference = Ground Surface

Depth scale: 1"=20 ft

Last Logging Date - 03/15/05

299-W11-25B (C4669) Combination Plot



Zero Reference = Ground Surface

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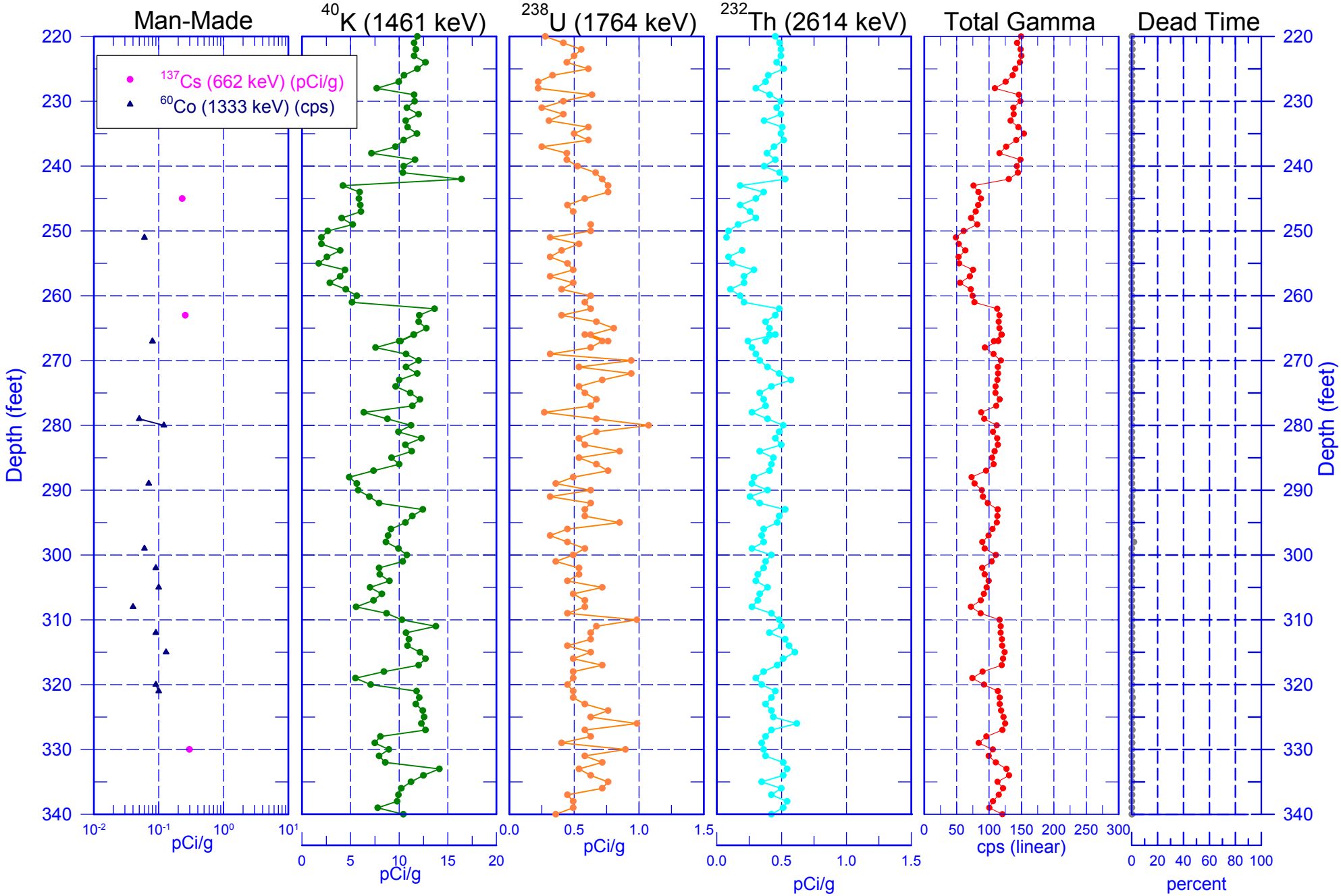

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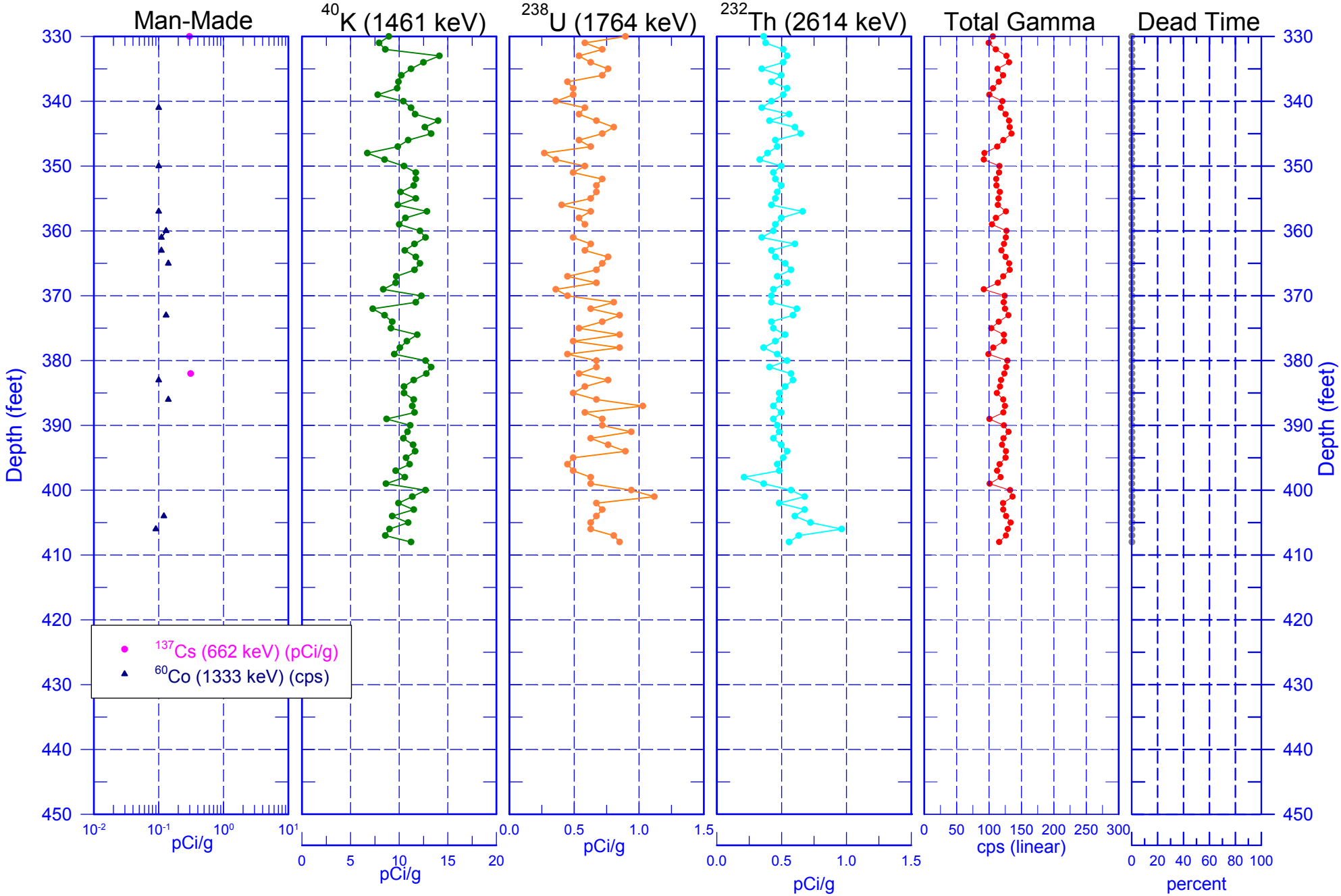

Zero Reference = Ground Surface

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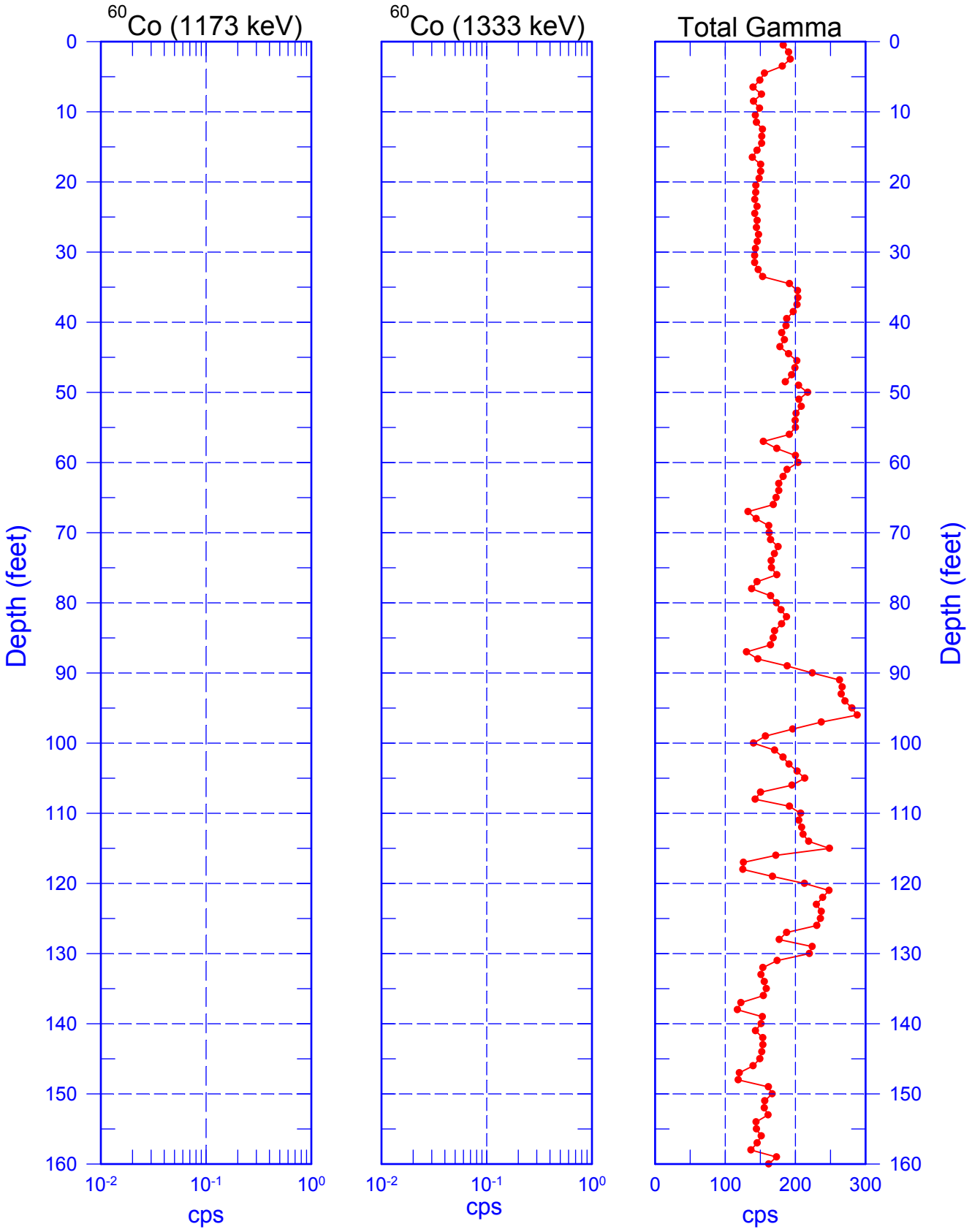
299-W11-25B (C4669)

^{60}Co & Total Gamma



Zero Reference = Ground Surface

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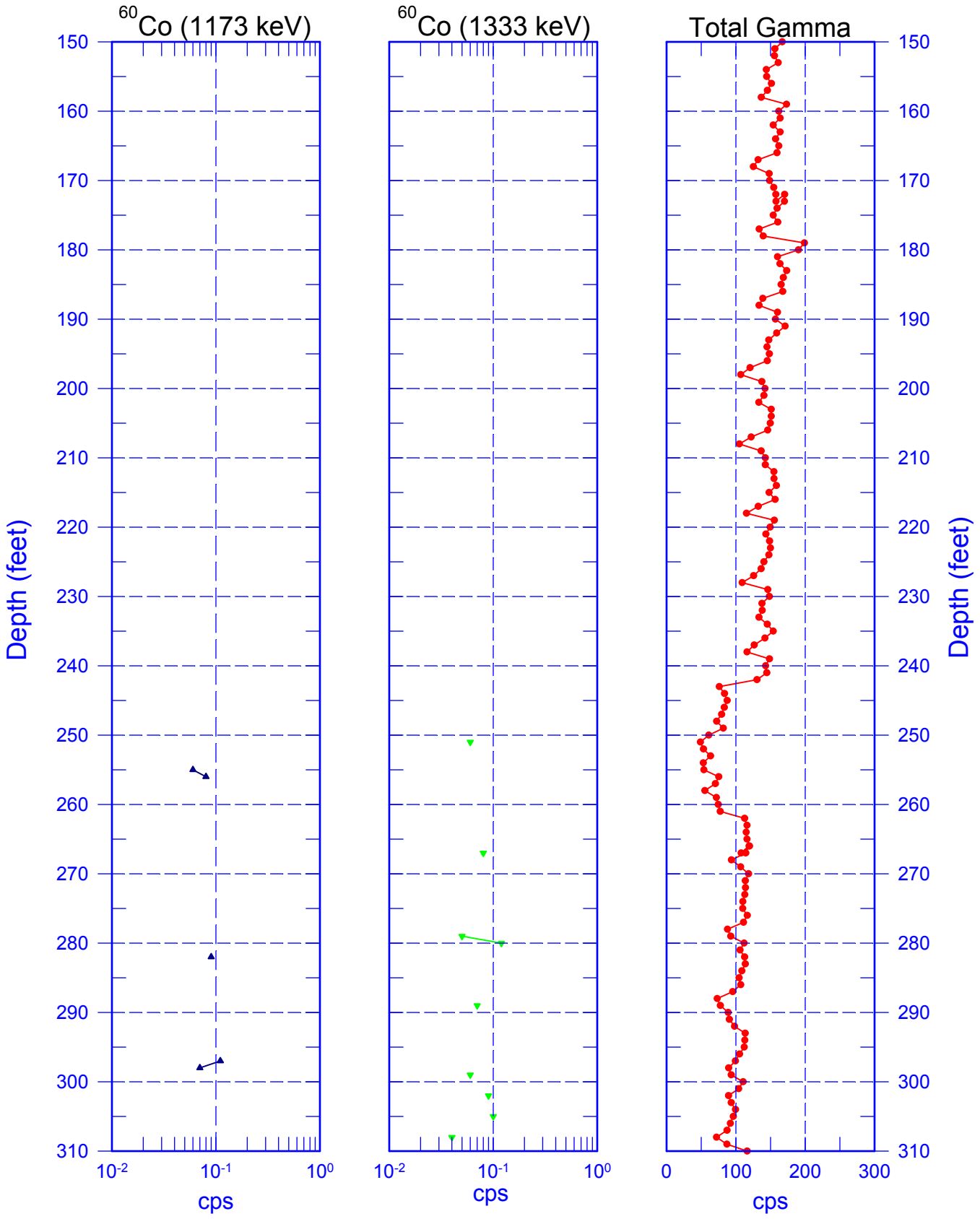

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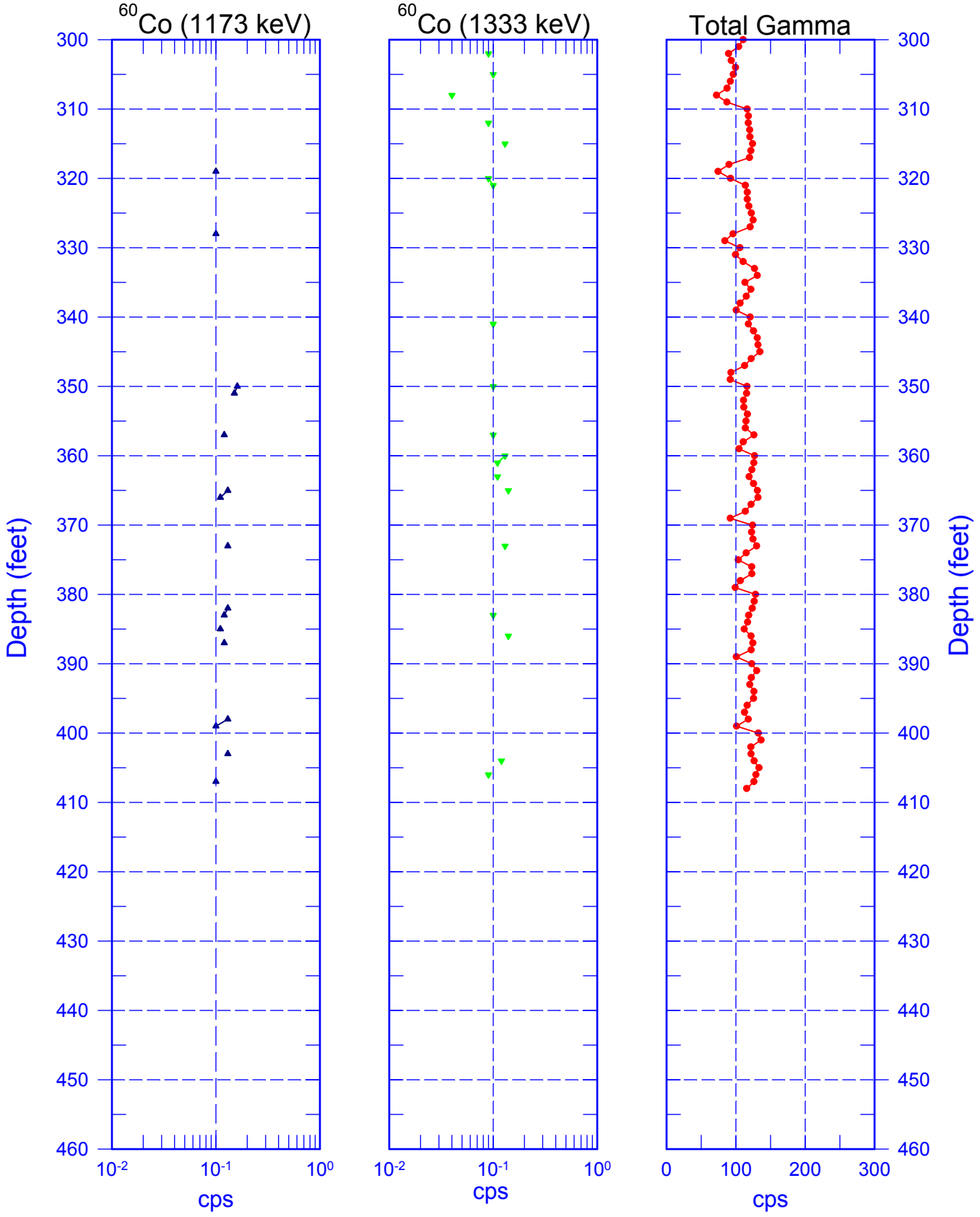

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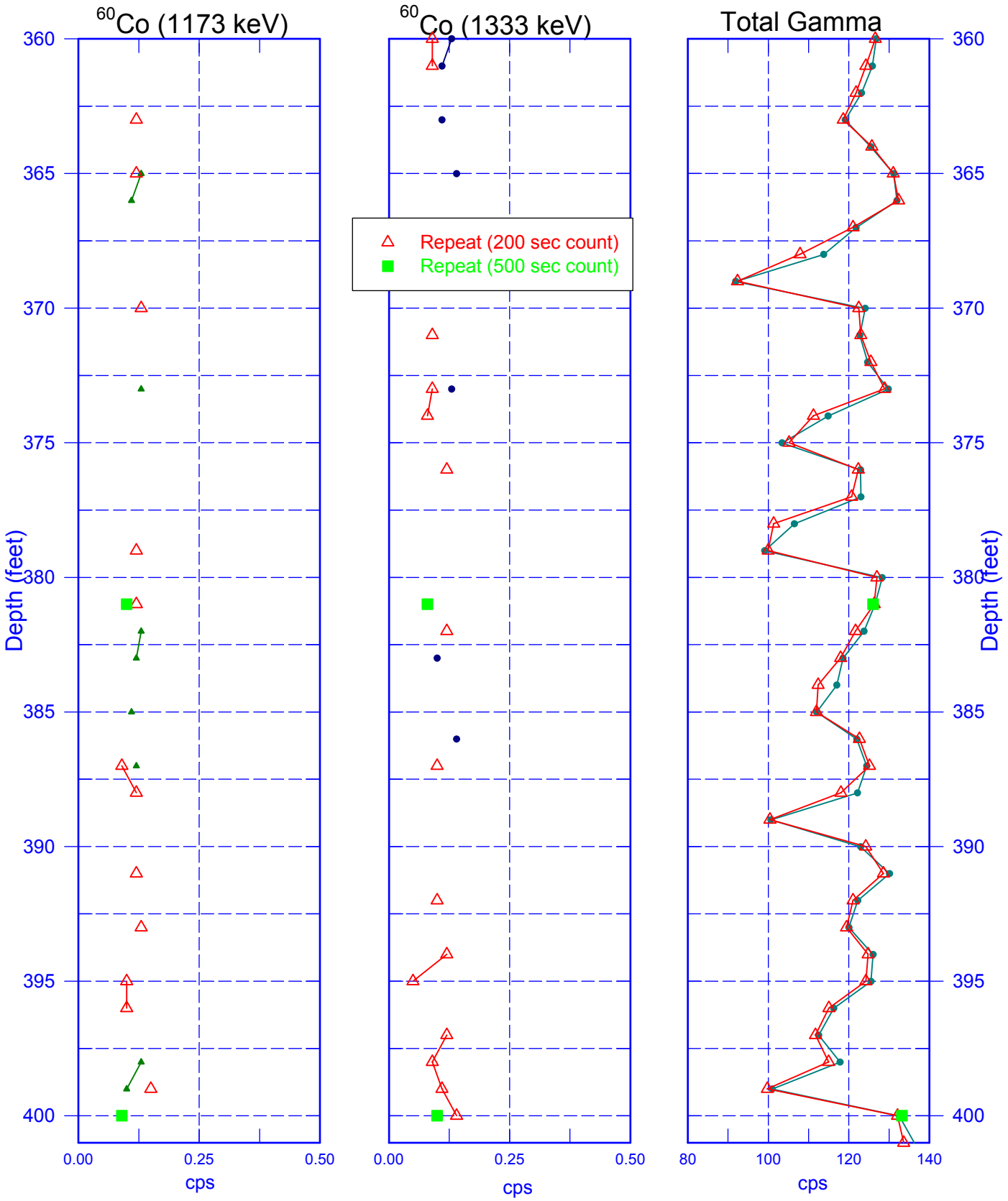
299-W11-25B (C4669)

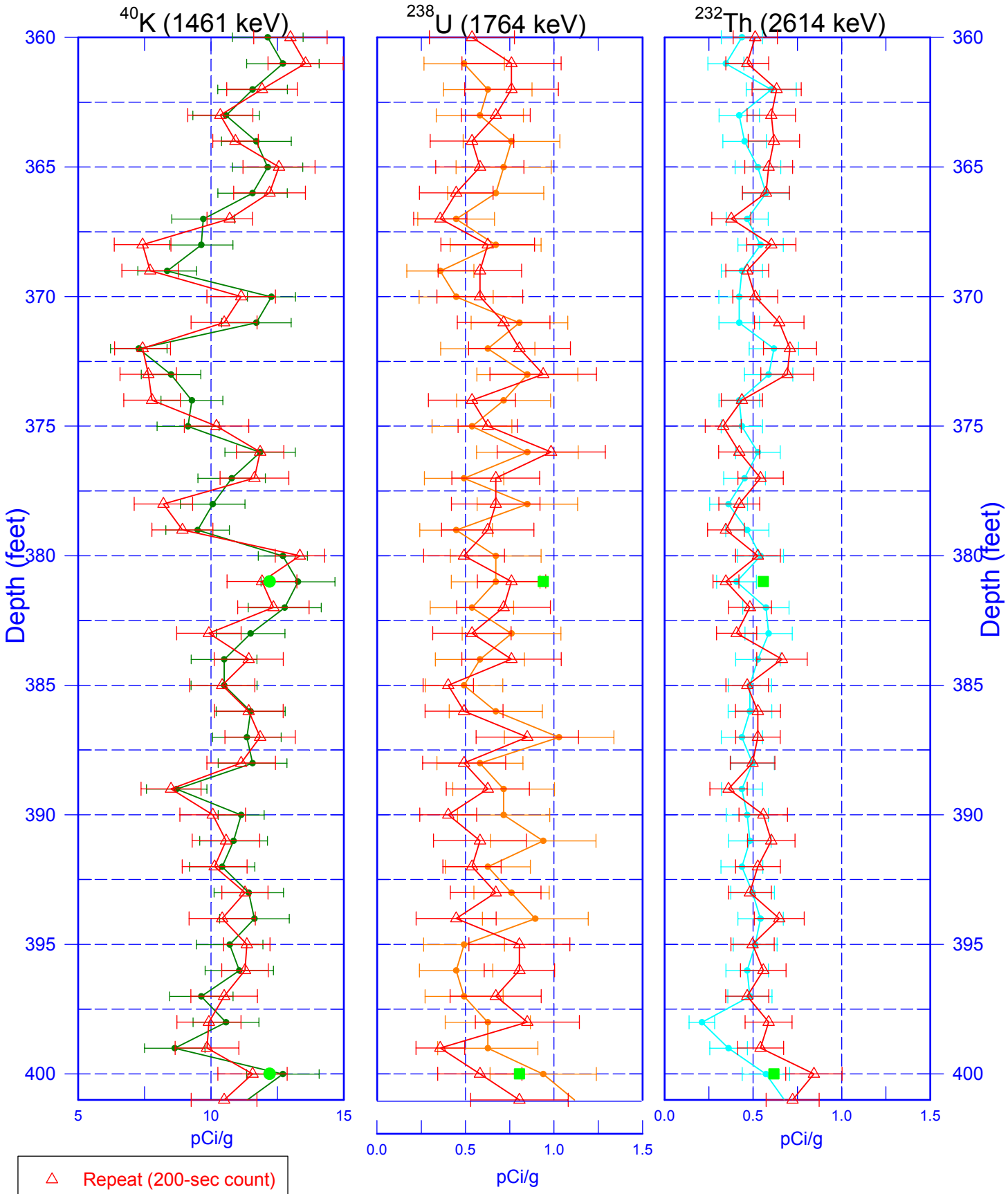
Repeat Section of ^{60}Co & Total Gamma



Last Log Date - 03/15/05

299-W11-25B (C4669)

Repeat Section of Natural Gamma Logs



Last Log Date - 03/15/05