

299-E24-59 (A5916) Log Data Report

Borehole Information:

Borehole: 299-E24-59 (A5916)		Site: 216-A-10 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not deep enough		GWL Date: 2/24/2003	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
135,435.48 m	574,985.79 m	May 1956	219.779 m	151.86	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	2.0	8 5/8	7 15/16	0.344	+2.0	150
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS³, and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. A reference point survey "X" is located at the top of the casing stickup.

Logging Equipment Information:

Logging System: Gamma 3E (RLS-1)	Type: 70% HPGe
Calibration Date: 10/2002	Calibration Reference: GJO-2002-386-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Logging System: Gamma 1C	Type: High Rate Detector
Calibration Date: 02/07/02	Calibration Reference: GJO-2003-429-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2/Repeat	3		
Date	2/24/03	2/25/03	2/25/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	151.0	50.0	32.0		
Finish Depth (ft)	33.0	32.0	2.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		

Log Run	1	2/Repeat	3		
ft/min	N/A ⁴	N/A	N/A		
Pre-Verification	CE121CAB	CE131CAB	CE131CAB		
Start File	CE121000	CE131000	CE131018		
Finish File	CE121118	CE131018	CE131048		
Post-Verification	CE121CAA	CE141CAA	CE141CAA		
Depth Return Error (in.)	-1	N/A	0		
Comments	Fine-gain adjustment after files -000, -004, -012, and -021.	No fine-gain adjustment.	No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2/Repeat			
Date	4/7/03	4/7/03			
Logging Engineer	Pearson	Pearson			
Start Depth (ft)	78.0	65.0			
Finish Depth (ft)	57.0	60.0			
Count Time (sec)	300	300			
Live/Real	R	R			
Shield (Y/N)	None	None			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	AC060CAB	AC060CAB			
Start File	AC060000	AC060022			
Finish File	AC060021	AC060027			
Post-Verification	AC061CAA	AC061CAA			
Depth Return Error (in.)	N/A	-1			
Comments	No fine-gain adjustment.	Repeat section.			

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde.

Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (⁴⁰K, ²³⁸U, and ²³²Th) verifier with serial number 118.

HRLS data were collected using Gamma 1C. Pre- and post-survey verification measurements employed the ¹³⁷Cs verifier with serial number 1013.

Analysis Notes:

Analyst:	Sobczyk	Date:	04/14/03	Reference:	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 each day. The post-run verification spectra were all within the control limits established on 12/05/2002. Pre-run verification spectra CE121CAB and CE131CAB were slightly above the value for the 1461 peak counts per second (cps). The peak counts per second 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 3 percent lower and 1 percent higher 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.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of the day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

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 files: G3EOct02.xls and G1CApr03.xls). Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to the maximum depth of the logging (151 ft). The casing correction factor was calculated assuming a casing thickness of 0.344 in. This casing thickness is based upon the field measurement. A water correction was not needed or applied to the data.

Using the SGLS, dead time greater than 40 percent was encountered in the interval from 57 to 77 ft, and data from this region were considered unreliable. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. SGLS dead time corrections are applied when dead time is greater than 18 percent. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected in 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. 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.

Results and Interpretations:

^{137}Cs and ^{154}Eu were the man-made radionuclides detected in this borehole. ^{137}Cs was detected at log depths between 52 and 114 ft. The range of concentrations was from 0.3 pCi/g to 5,200 pCi/g, which was measured at 65 ft. ^{137}Cs was also detected near the MDL (0.2 pCi/g) at 38 ft. After examination of the spectrum at this depth, it was determined that there is no evidence of a photopeak at 662 keV. This reported peak is probably the result of statistical fluctuation and did not repeat. ^{154}Eu was detected at log depths between 81 and 127 ft. The range of concentrations was from 0.4 pCi/g to 2.2 pCi/g, which was measured

at 107.6 ft. Photopeaks (1173 keV and 1333 keV) indicative of ⁶⁰Co were observed near 108 ft, but these peaks were not statistically significant.

The plots of the repeat logs demonstrate reasonable repeatability of the HRLS and SGLS data for ¹³⁷Cs (662 keV) and natural radionuclides (609, 1461, 1764, and 2614 keV).

Gross gamma logs from Additon et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of man-made gamma radiation from 1963 through at least 1976. The log from 5/13/59 appears to detect background levels of gamma radiation. The logs from 4/26/63 and 4/17/68 appear to detect relatively high gamma activity in the interval from 23 ft (7 m) to total depth. The log from 4/28/76 appears to detect relatively high gamma activity in the interval from 46 ft (14 m) to 121 ft (37 m). The SGLS detected man-made radionuclides from 52 ft through 127 ft.

Comparison log plots of data collected in 1995 by Westinghouse Hanford Company (WHC) and in 2003 by Stoller are included. The WHC concentration data for ¹³⁷Cs and ¹⁵⁴Eu are decayed to the date of the SGLS logging event in February 2003. The SGLS and RLS logs appear to use a slightly different depth reference. Taking into account the differences in depth registration, the apparent ¹⁵⁴Eu and ¹³⁷Cs concentrations show good agreement between the logging systems. Since 1995, ¹³⁷Cs and ¹⁵⁴Eu activities have decreased as predicted by radioactive decay. In 1995, ⁶⁰Co was observed in the borehole near the detection limit. The maximum concentration was 0.15 pCi/g (decayed to 2003) at 107.5 ft.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Wells*, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

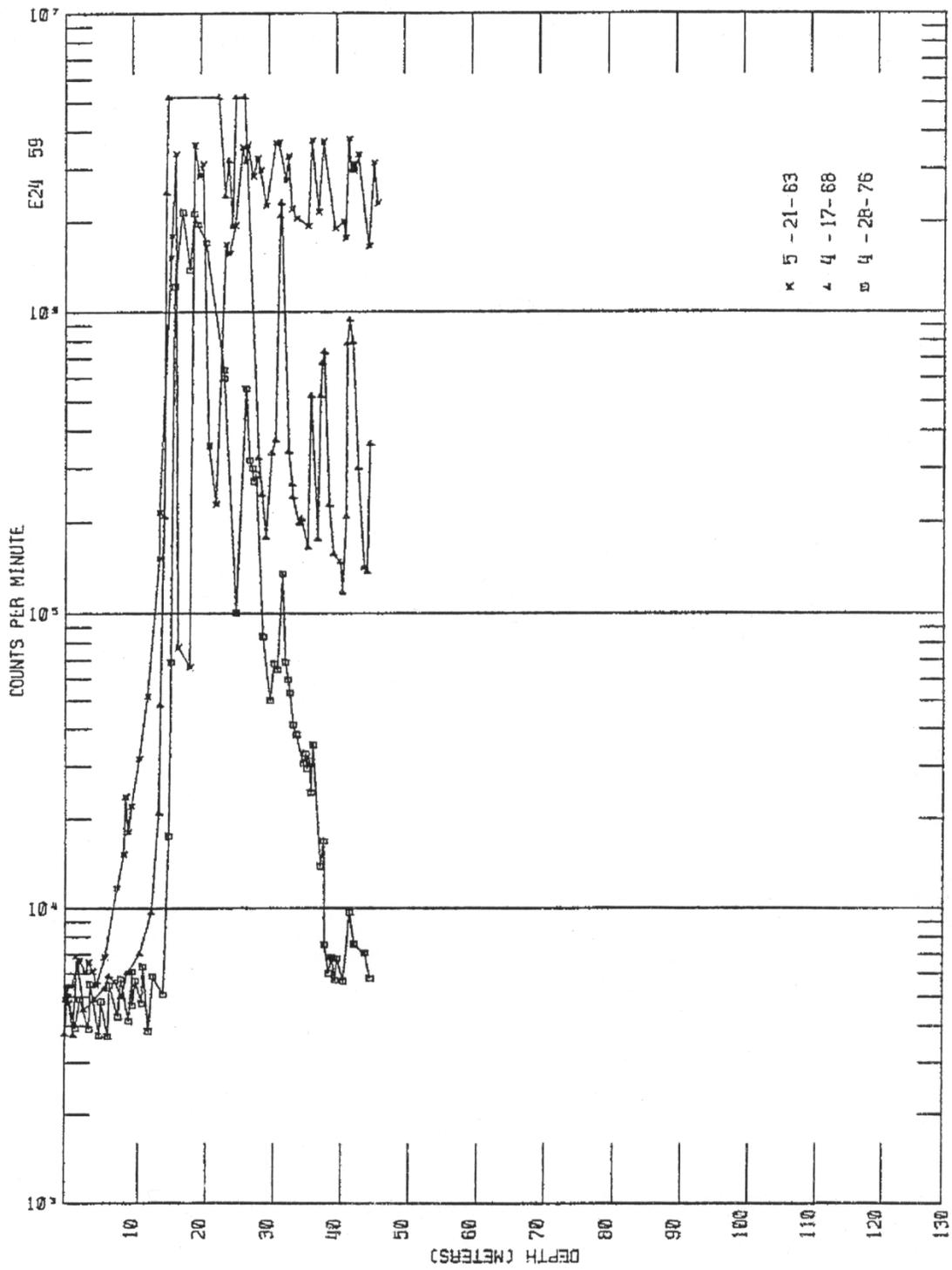
Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

¹ GWL – groundwater level

² TOC – top of casing

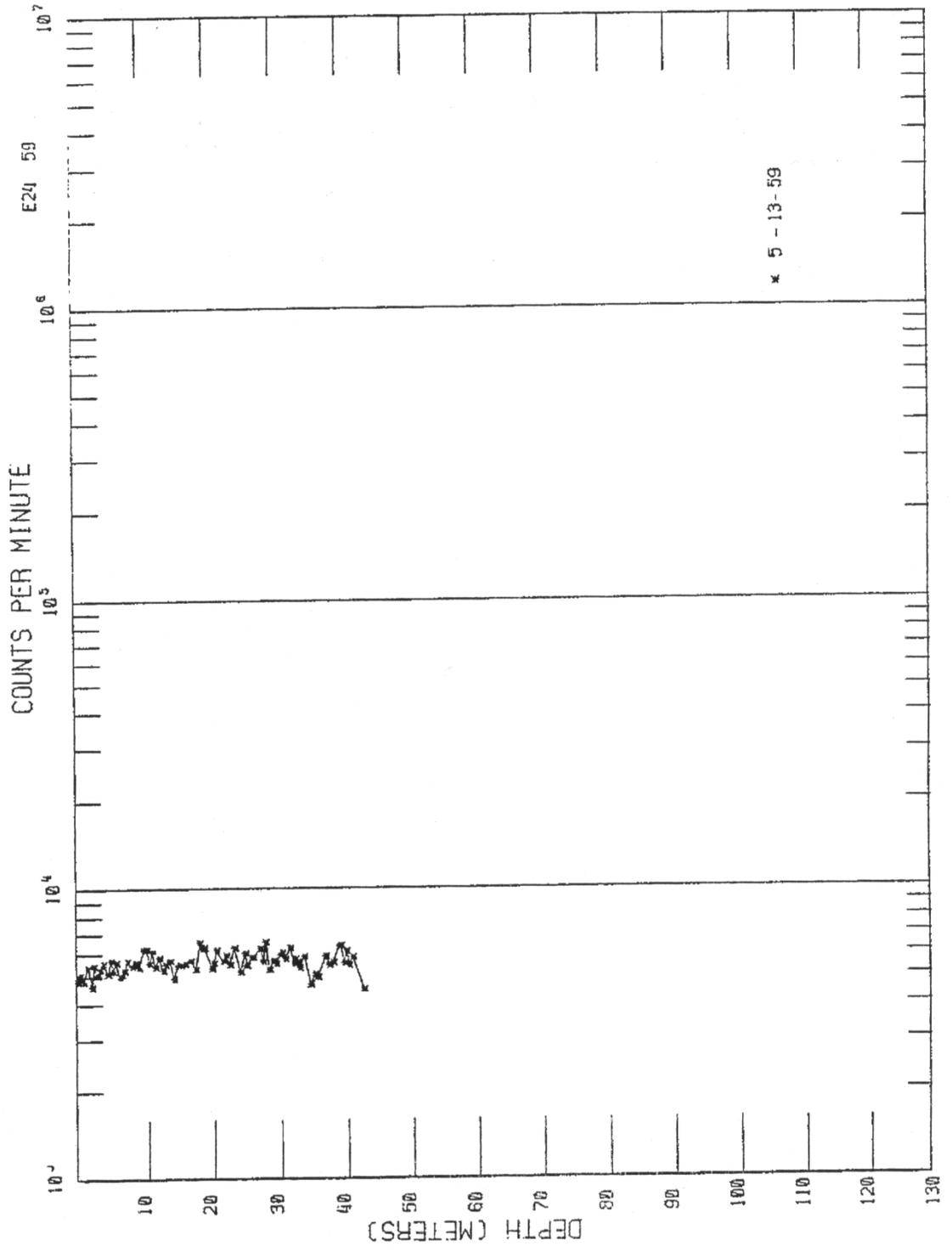
³ HWIS – Hanford Well Information System

⁴ N/A – not applicable



from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E24-59, Logged on 5/21/63, 4/17/68, and 4/28/76

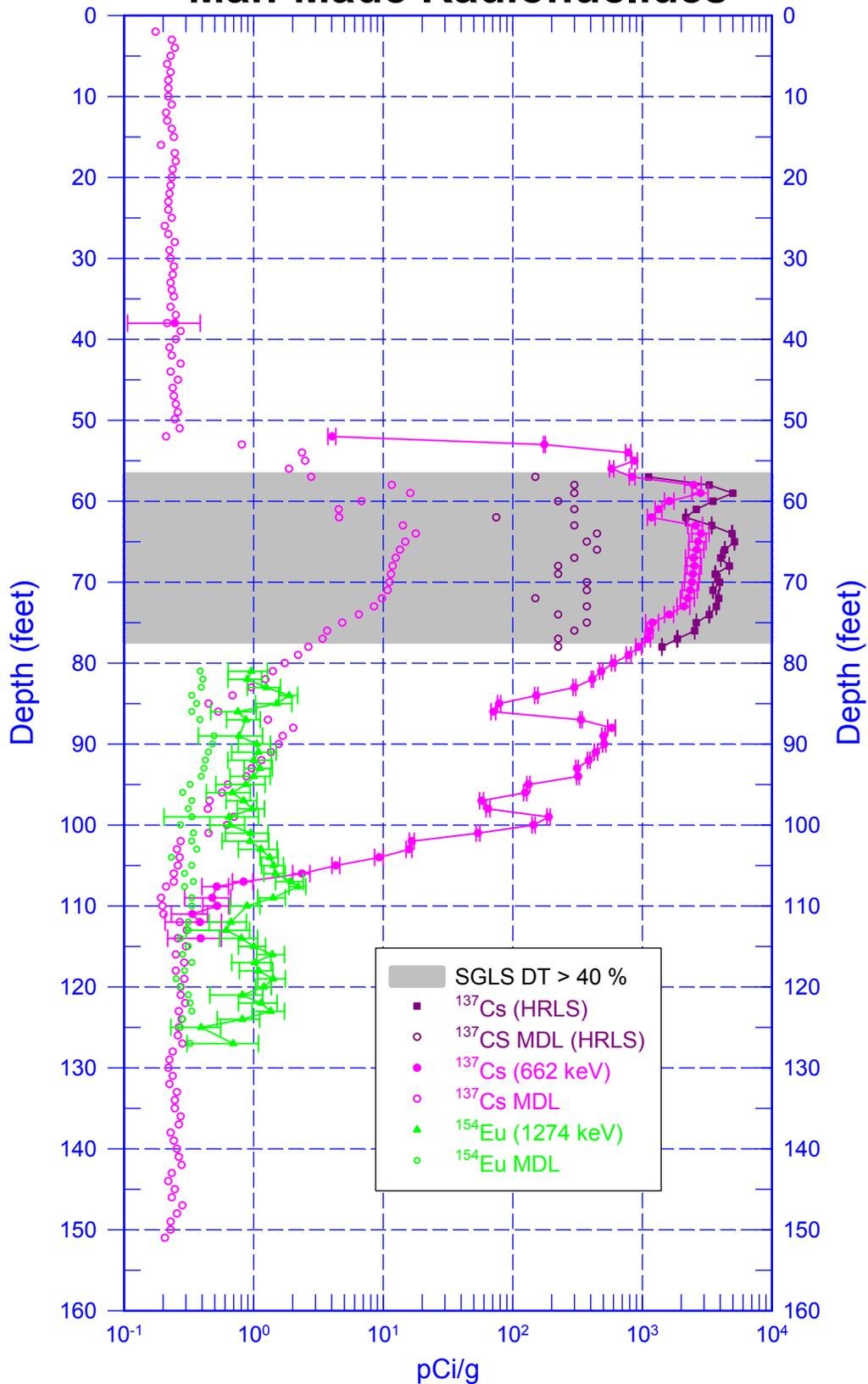


from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E24-59, Logged on 5/13/59

299-E24-59 (A5916)

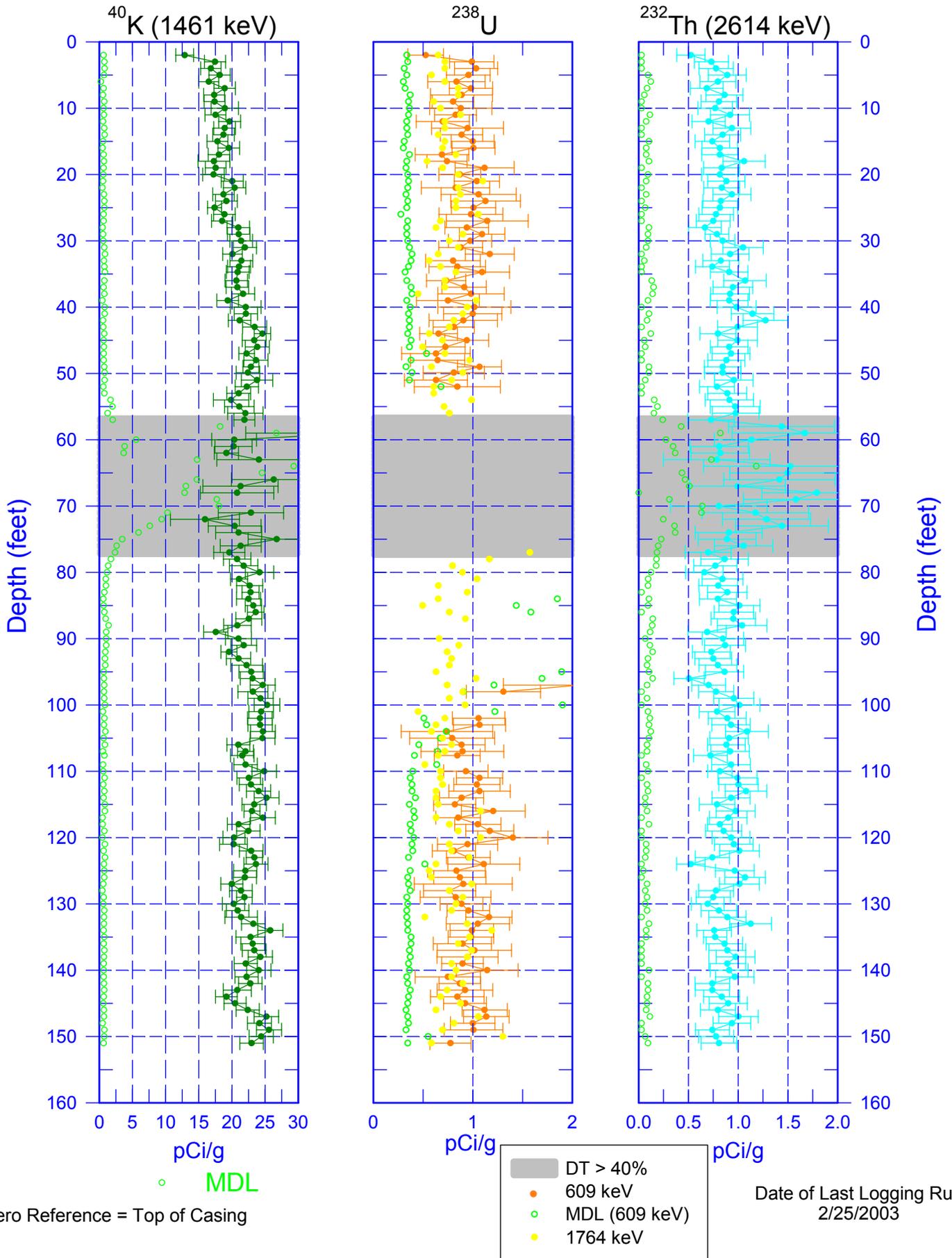
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last SGLS Logging Run
2/25/2003

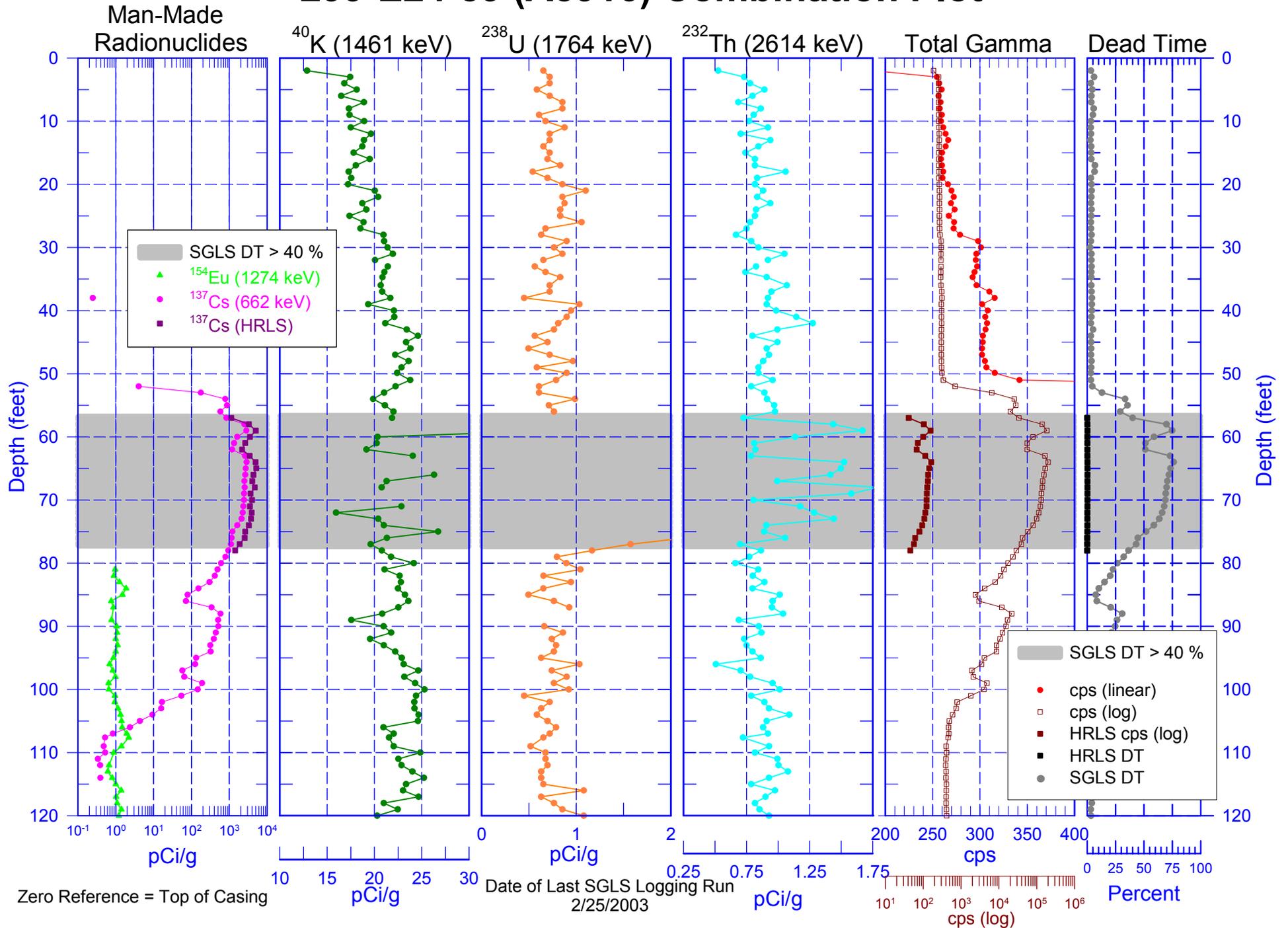
299-E24-59 (A5916) Natural Gamma Logs



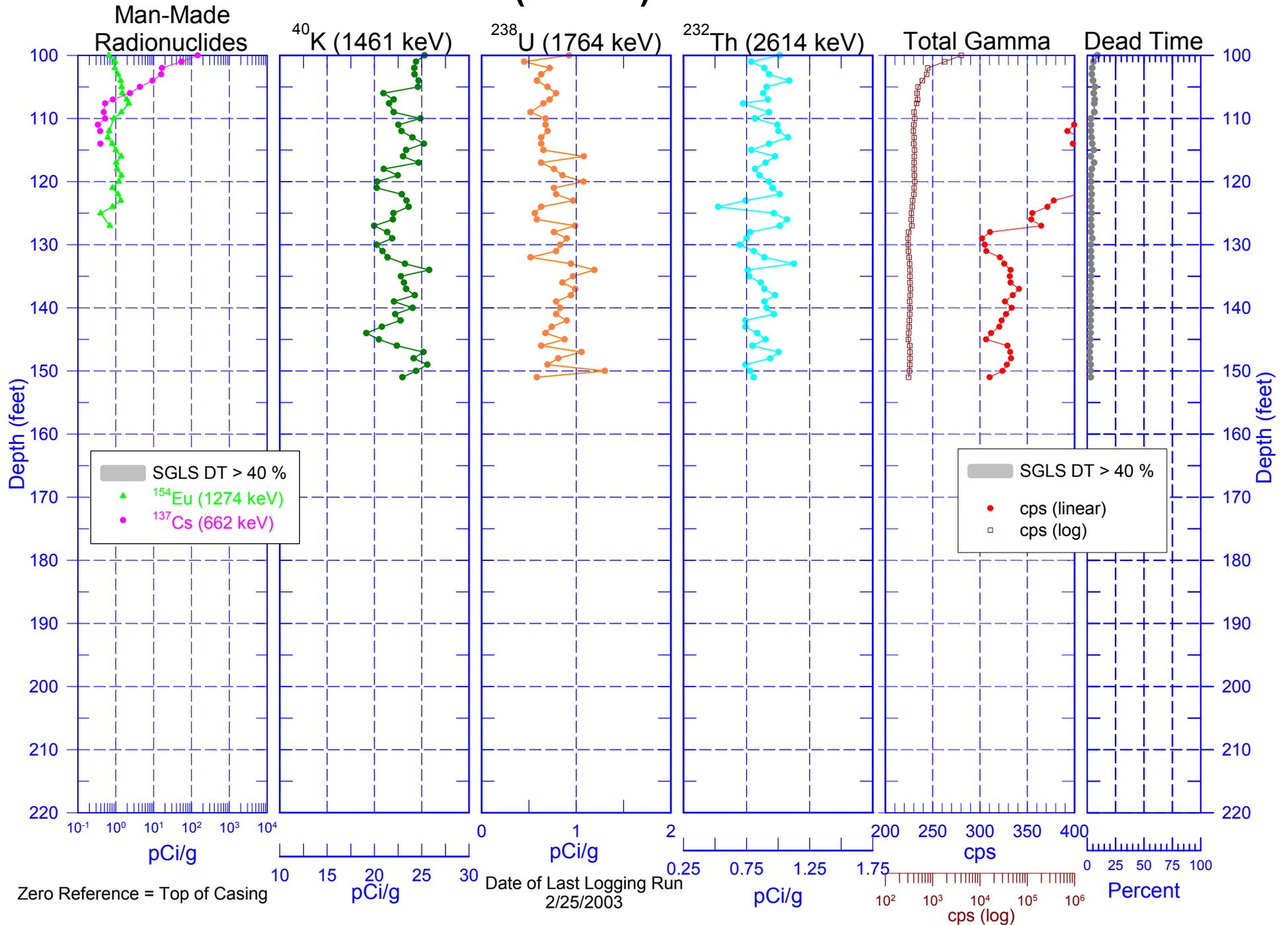
Zero Reference = Top of Casing

Date of Last Logging Run
2/25/2003

299-E24-59 (A5916) Combination Plot

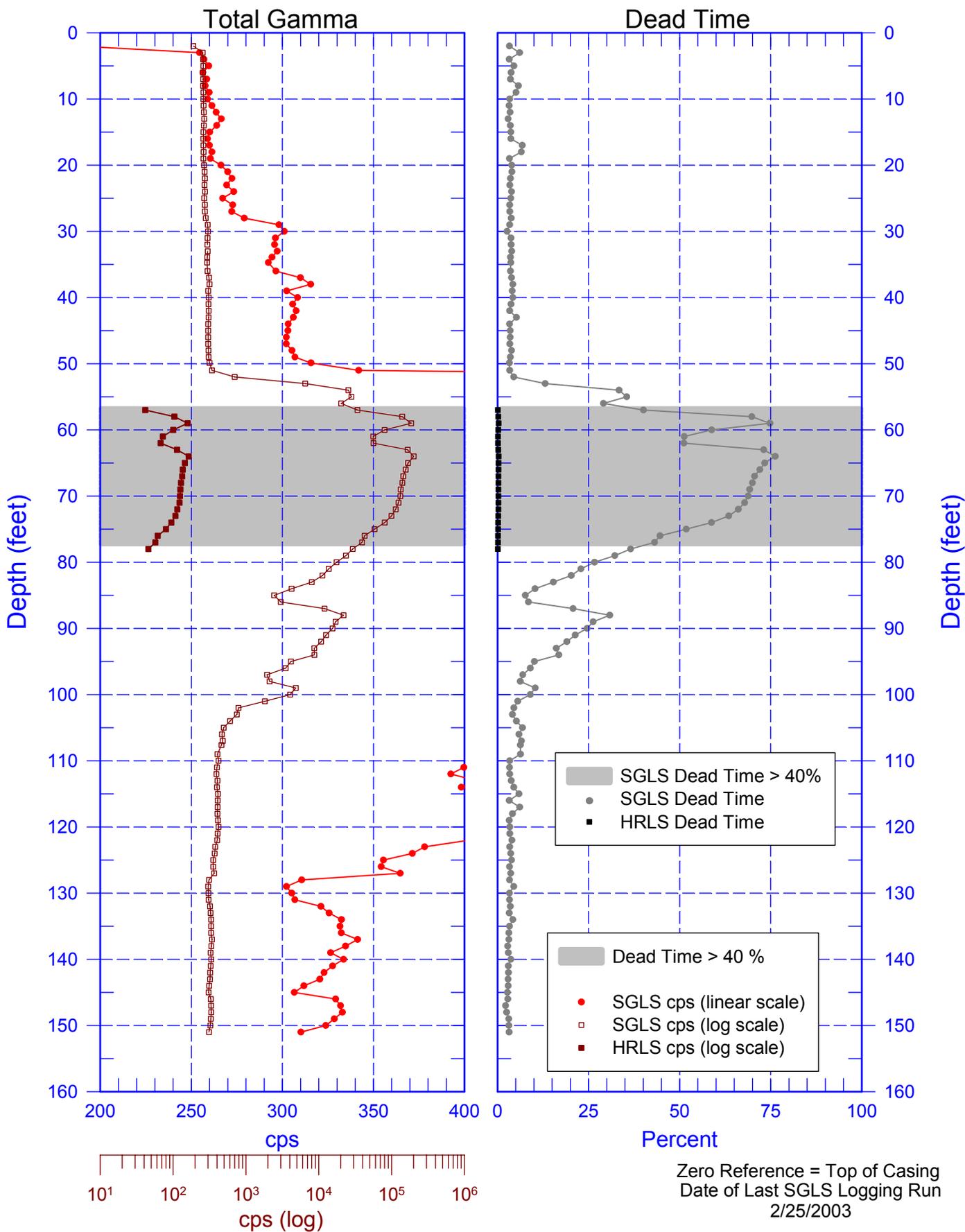


299-E24-59 (A5916) Combination Plot



299-E24-59 (A5916)

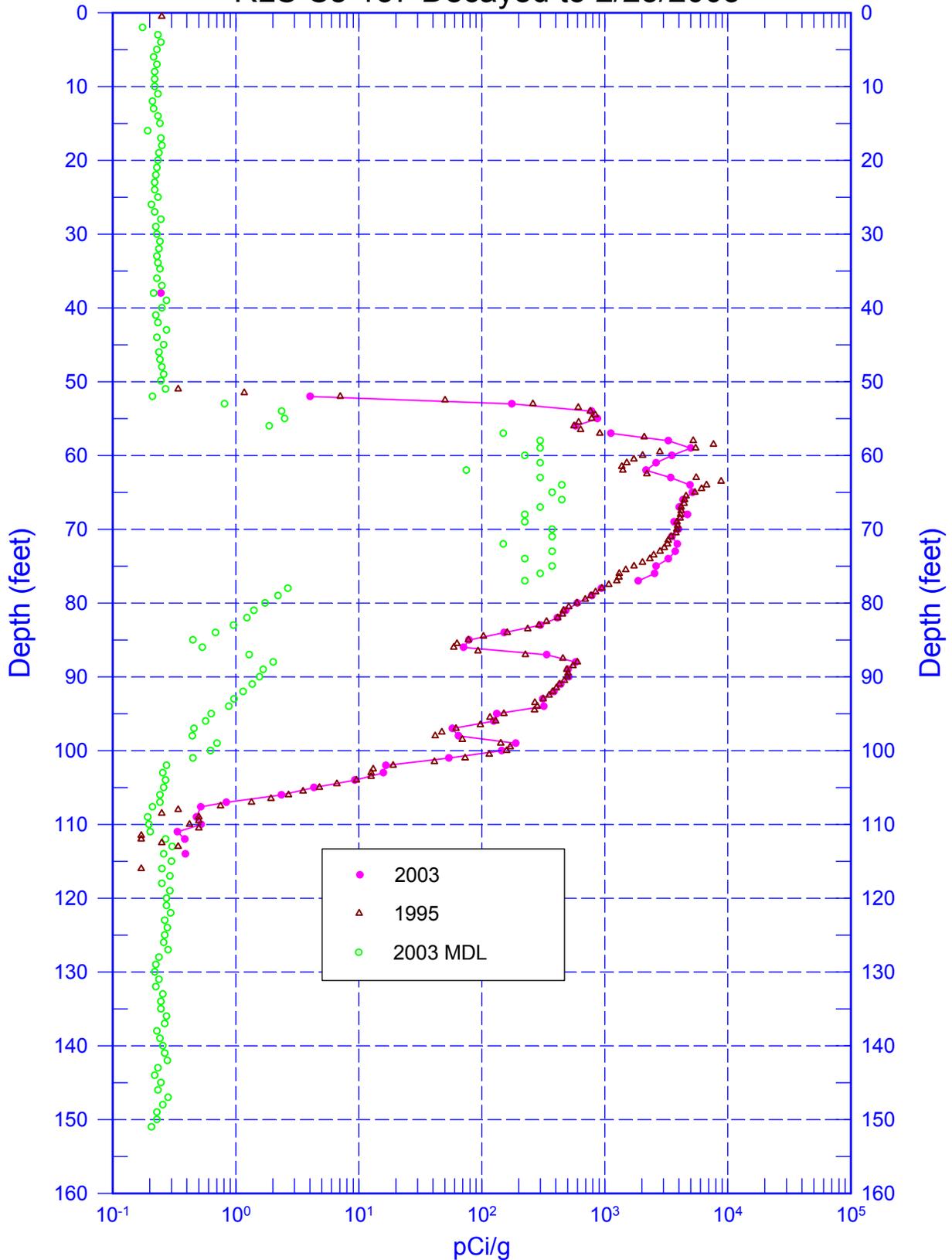
Total Gamma & Dead Time



299-E24-59 (A5916)

RLS Data Compared to 2003 Data

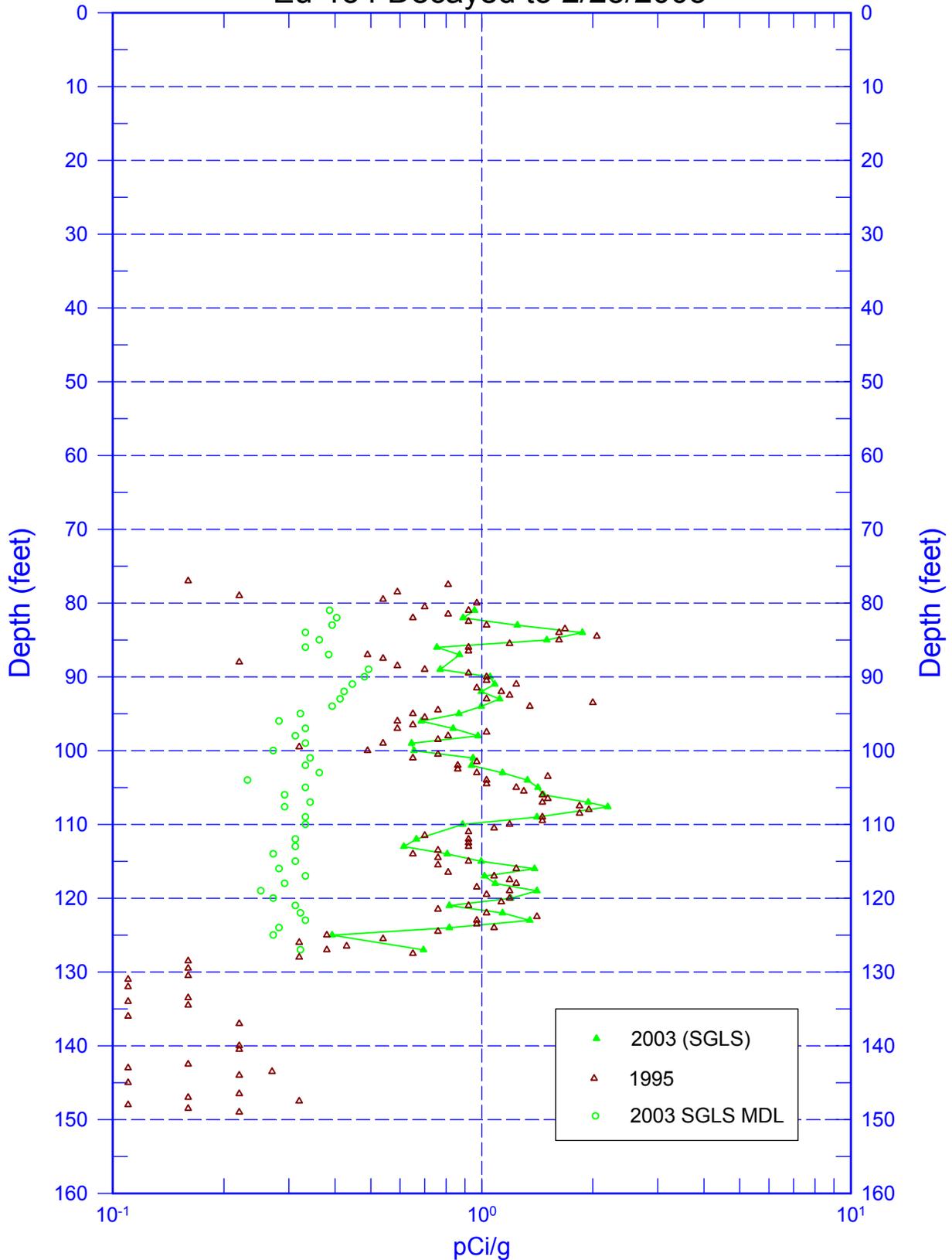
RLS Cs-137 Decayed to 2/25/2003



Zero Reference = Top of Casing (2003 SGLS & HRLS)
1995 RLS Data Shifted -1.0 ft

299-E24-59 (A5916)

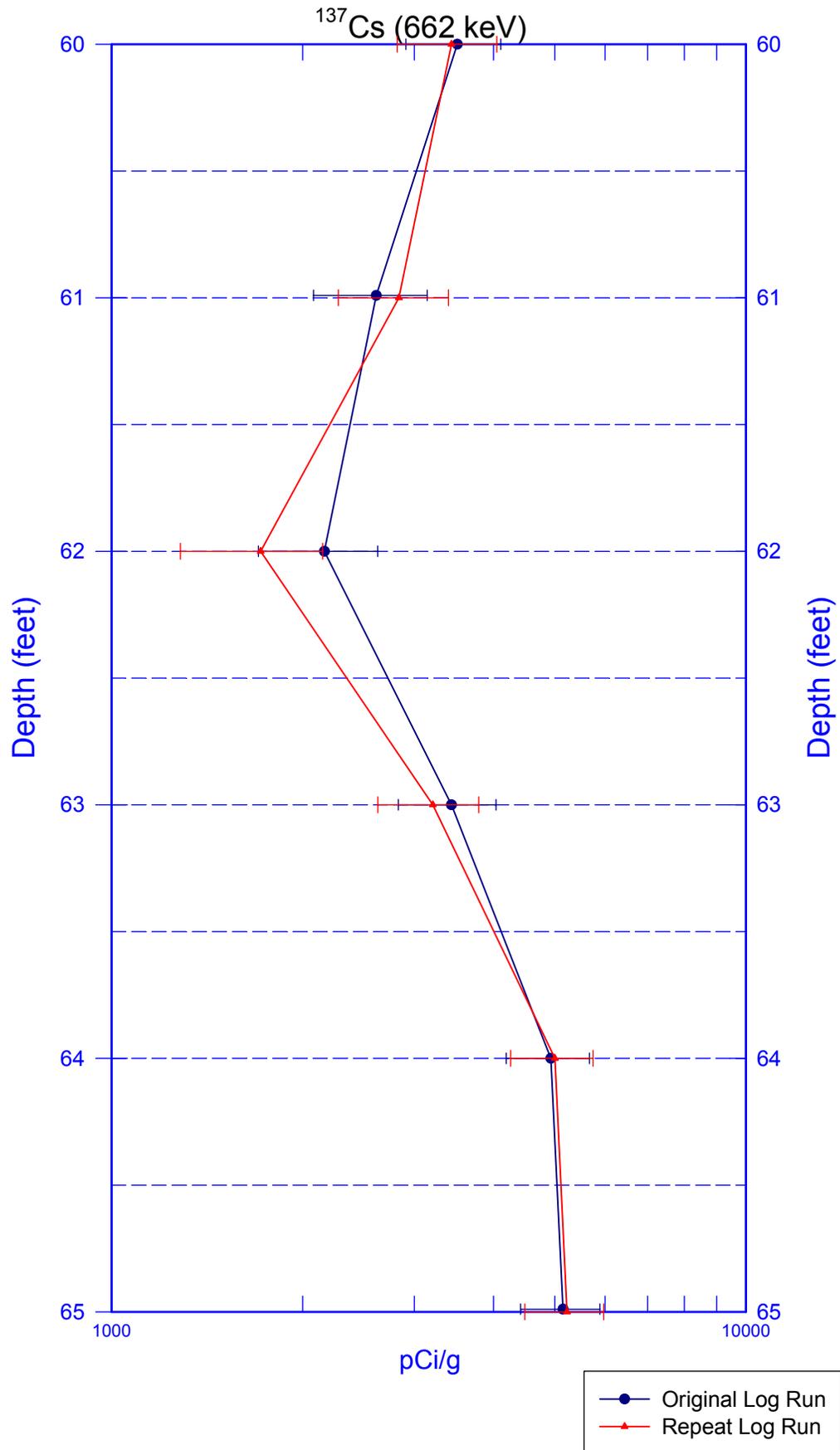
RLS Data Compared to SGLS Data
Eu-154 Decayed to 2/25/2003



Zero Reference = Top of Casing (2003 SGLS)
1995 RLS Data Shifted -1.0 ft

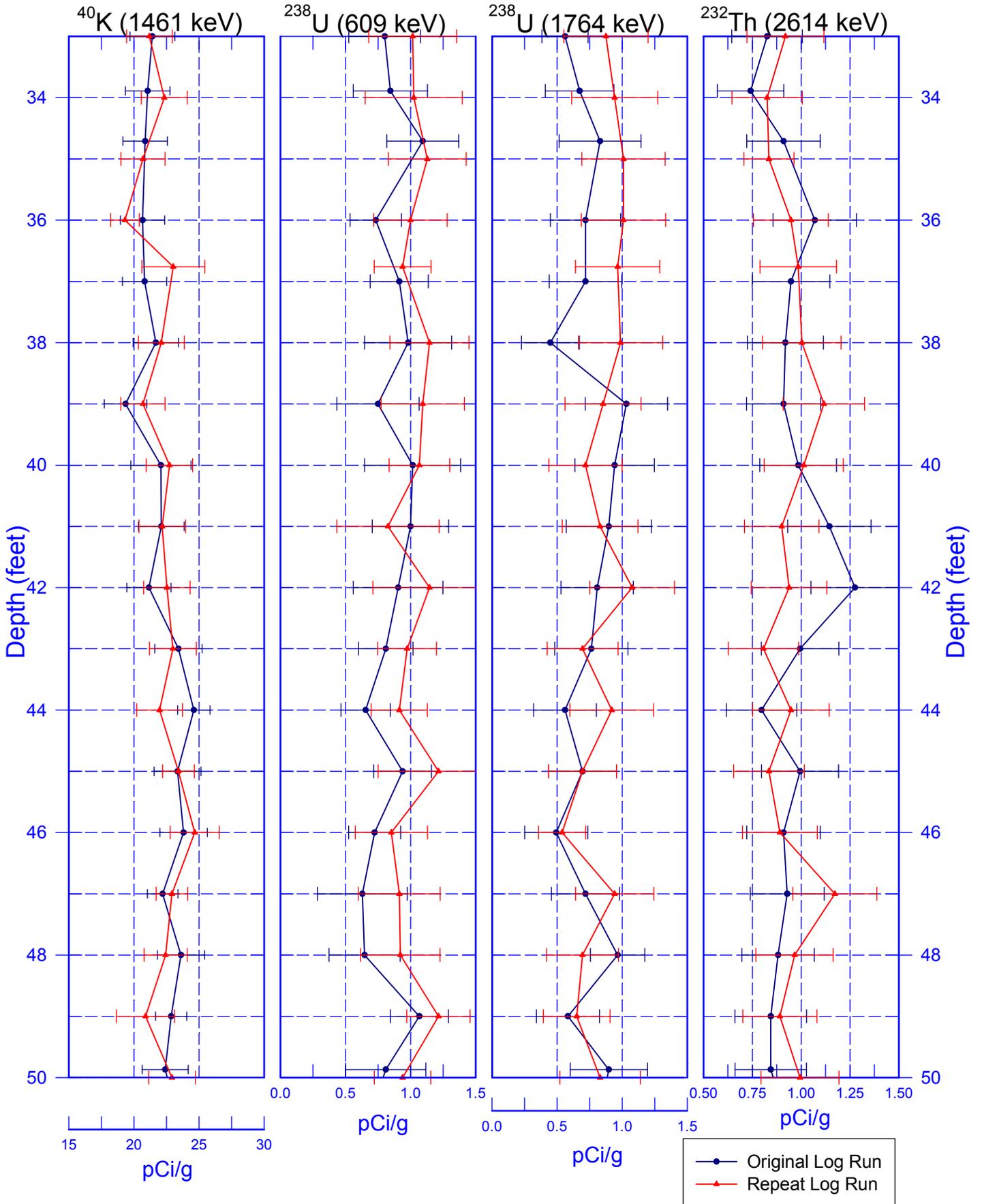
299-E24-59 (A5916)

Rerun of High Rate Logging (65.0 to 60.0 ft)



299-E24-59 (A5916)

Rerun of Natural Gamma Logs (50.0 to 33.0 ft)



299-E24-59 (A5916)

Rerun of Man-Made Radionuclides (50.0 to 33.0 ft)

