



299-E33-60 (A6868)

Log Data Report (REVISED)

Borehole Information:

Borehole: 299-E33-60 (A6868)		Site: 216-B-7A Crib			
Coordinates (WA State Plane)		GWL (ft)¹: n/a ²		GWL Date: n/a	
North (m)	East (m)	Drill Date	TOC³ Elevation	Total Depth (ft)	Type
137379.963	573802.064	05/47	653.87	156.7	Cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	1.1	8.625	8.0	0.3125	0	153

Borehole Notes:

The drilling date and casing depth are derived from *Hanford Wells* (Chamness and Merz 1993). The nominal 8-in. steel casing size was confirmed by the logging engineer's tape and caliper measurements. Casing stickup was also measured by the logging engineer. This measurement was acquired after the ground surface surrounding this location was modified when a nearby borehole (C3103) was installed on 10/01. Coordinates and TOC elevation are derived from HWIS⁴.

Logging Equipment Information:

Logging System: Gamma 1D	Type: SGLS
Calibration Date: 07/01	Calibration Reference: GJO-2001-243-TAR
	Logging Procedure: MAC-HGLP 1.6.5
Logging System: Gamma 1C	Type: HRLS
Calibration Date: 02/02	Calibration Reference: GJO-2002-309-TAR
	Logging Procedure: MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	
Date	12/05/01	12/06/01	12/10/01	12/11/01	
Logging Engineer	Musial	Musial	Musial	Musial	
Start Depth (ft)	1.5	40.0	65.0	156.5	
Finish Depth (ft)	41.0	66.0	153.0	149.5	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	n/a	n/a	n/a	n/a	
Pre-Verification	A0051CAB	A0053CAB	A0054CAB	A0055CAB	
Start File	A0052000	A0053000	A0054000	A0055000	
Finish File	A0052079	A0053052	A0054177	A0055014	
Post-Verification	A0052CAA	A0053CAA	A0054CAA	A0056CAA	

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3		
Date	02/22/01	02/26/01	02/27/01		
Logging Engineer	Kos	Kos	Kos		
Start Depth (ft)	31.0	33.0	56.5		
Finish Depth (ft)	34.0	57.5	62.0		
Count Time (sec)	300	300	300		
Live/Real	L	L	L		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	n/a	n/a	n/a		
Pre-Verification	D0011CAB	D0014CAB	D0015CAB		
Start File	D0013000	D0014000	D0015000		
Finish File	D0013006	D0014049	D0015011		
Post-Verification	D0013CAA	D0014CAA	D0016CAA		

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during December 2001 and February 2002. The reference depth for logging measurements is the top of casing. A depth error of 0.12 ft was introduced by the operator near the end of SGLS log run 3 to the data file numbers A0054175 to A0054177 that correspond to the depths of 150 to 153 ft. This depth interval was re-logged (log run 4). No repeat sections were collected in this borehole. The HRLS was utilized to perform logging in high gamma flux zones, generally where the SGLS dead time exceeded 40 percent.

Analysis Notes:

Analyst:	Henwood	Date:	03/18/02	Reference:	MAC-VZCP 1.7.9, Rev. 2
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This Log Data Report is a revision of the report originally issued 01/11/02. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report.

Pre-run and post-run verifications of the logging tools were performed for each day's log event. The efficiency (peak counts per second) of the SGLS was consistently lower each day in the post-run verification as compared to the pre-run verification. Evaluation of the spectra indicates the detector is functioning normally and the log data are provisionally accepted, subject to further review and analysis. The HRLS passed acceptance criteria. Post-run verifications were used for the energy and resolution calibration necessary to process the data except for the final SGLS log run, where the pre-run verification was used.

A casing correction for 0.322-in.-thick casing was applied to the log data. This value represents the published thickness for ASTM schedule-40 steel pipe, a common borehole casing at Hanford.

Each spectrum collected during a log run was processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing as appropriate. EXCEL templates named G1dJul01.xls and G1cFebo2.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40%) gross count rates and radionuclide concentrations become increasingly less reliable, and may be significantly higher than the reported values. The HRLS is used in zones of high SGLS dead times to quantify the ¹³⁷Cs concentrations. The ²¹⁴Bi peak at 1764 keV was used to determine the naturally occurring ²³⁸U concentrations rather than the ²¹⁴Bi peak at 609 keV. The 609-keV energy

peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs), naturally occurring radionuclides (^{40}K , ^{232}Th , ^{238}U [KUT]), and a combination of man-made, KUT, total gamma, and dead time. Data collected with the HRLS are substituted for SGLS data where appropriate to provide a continuous record of the ^{137}Cs concentrations.

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 corrections.

Results and Interpretations:

The man-made radionuclide detected in this borehole was ^{137}Cs . ^{137}Cs is detected in a depth interval from 5 to 8 ft and continuously from about 24 to 80 ft. The highest concentrations exist between 33 and 61 ft with the maximum concentration of about 4,000 pCi/g measured at 36.5 ft in depth. SGLS dead time exceeded 40 % between 33 and 61 ft, where concentrations recorded by the SGLS are not reliable and probably underestimate the true radionuclide concentration. HRLS data have been collected and substituted at these depths.

The KUT logs do not delineate any definitive lithologic units. Changes in the ^{40}K concentrations from near 12 pCi/g at 30 ft to 18 pCi/g at about 62 ft suggest a lithologic change occurs in the high rate interval. This concentration change suggests a transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediment of the Hanford H2.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

¹ GWL – groundwater level

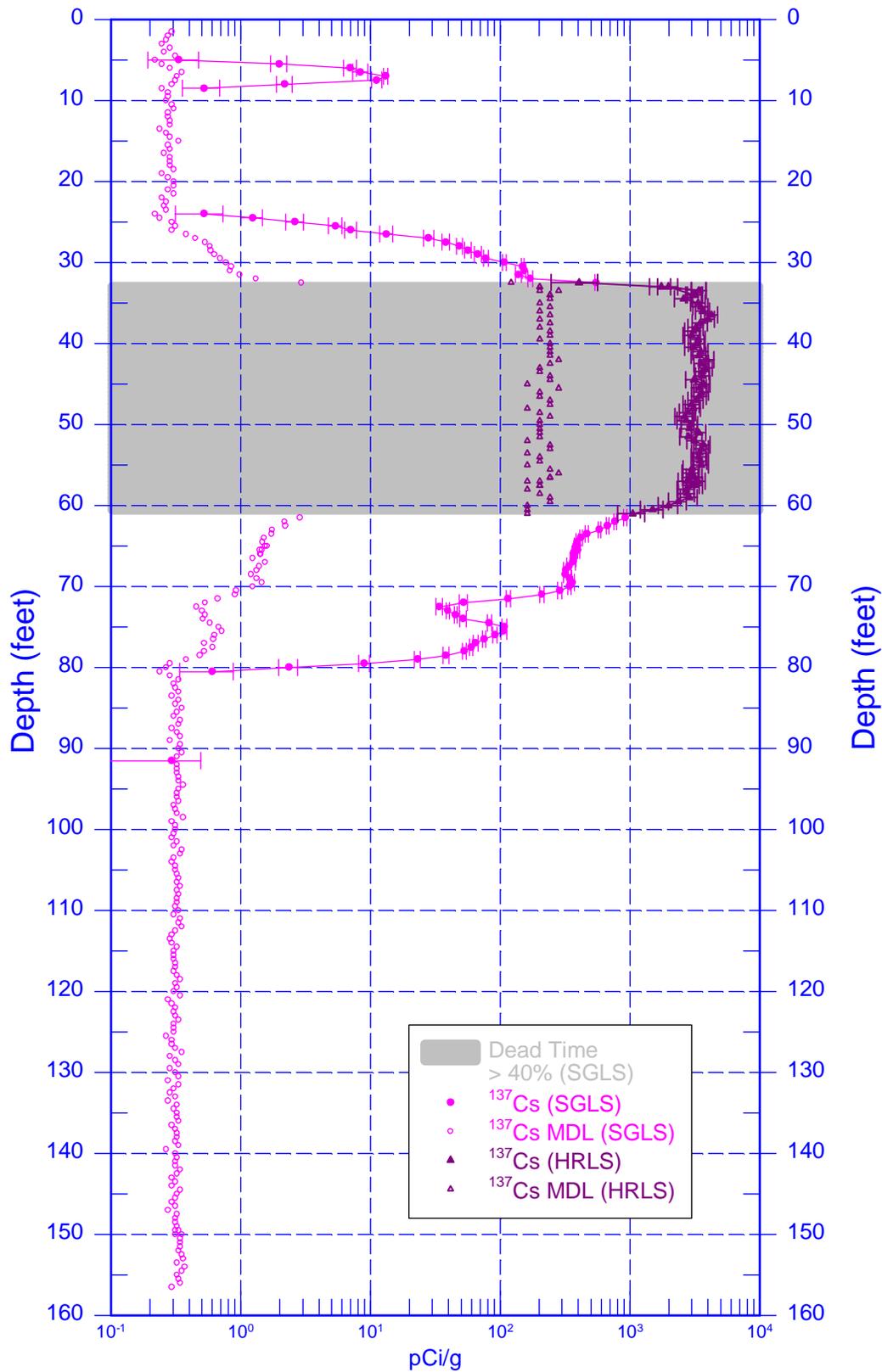
² n/a – not applicable

³ TOC – top of casing

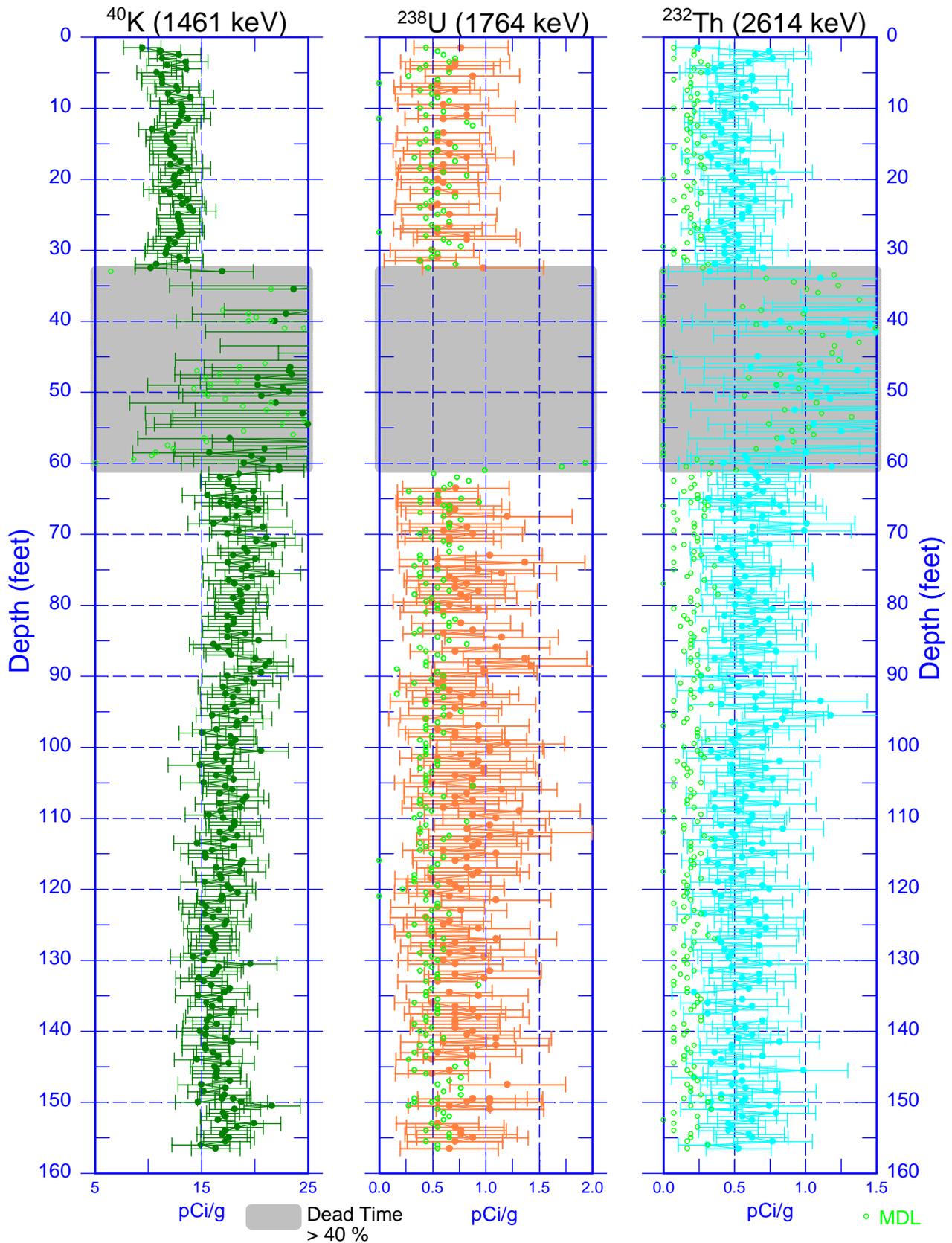
⁴ HWIS – Hanford Well Information System

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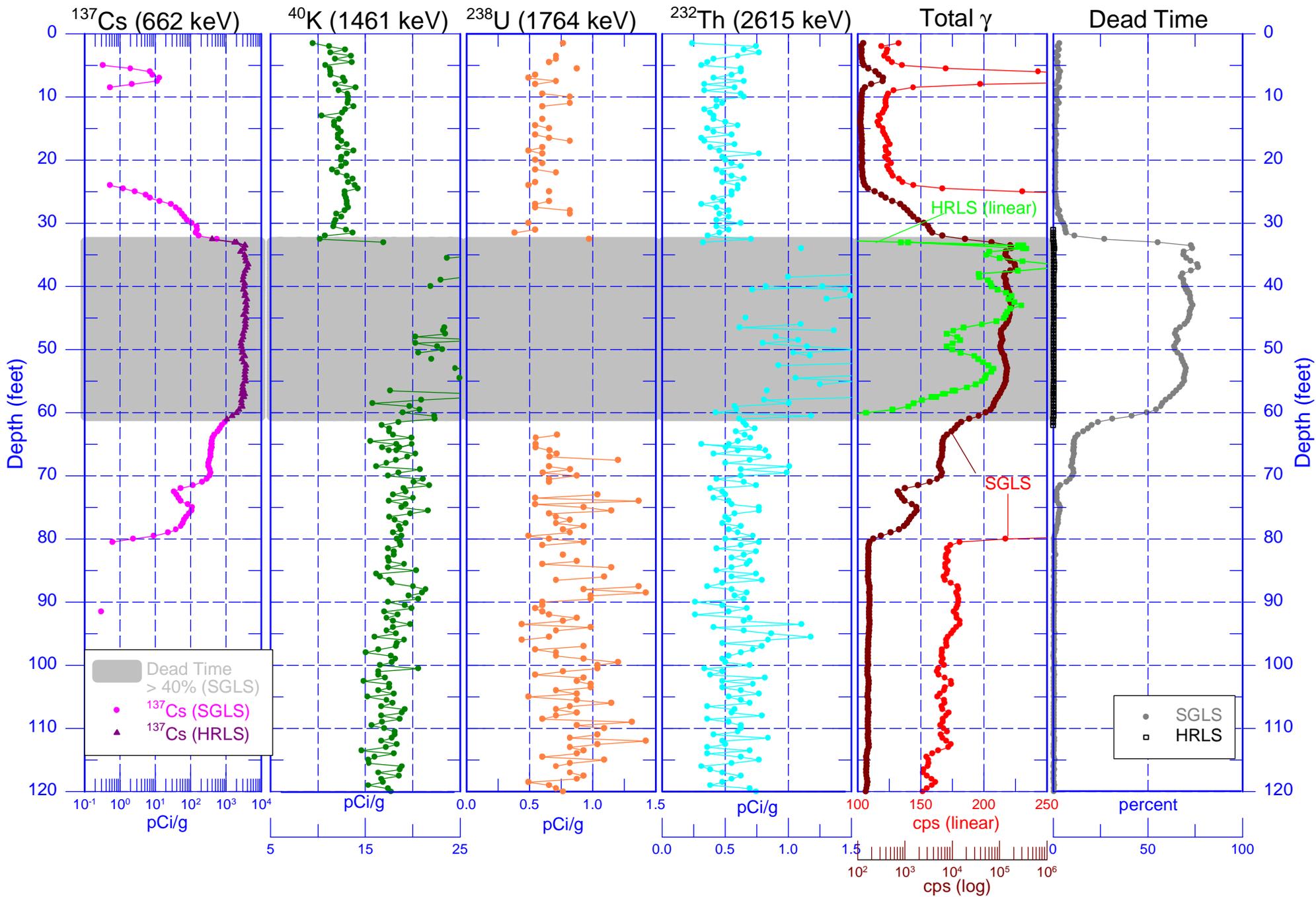
Man-Made Radionuclide Concentrations



299-E33-60 (A6868) Natural Gamma Logs



299-E33-60 (A6868) Combination Plot



299-E33-60 (A6868) Combination Plot (continued)

