Stoller
Grand Junction Office established 1959

GJO-2003-536-TAC

299-W11-79 (A7321)
Log Data Report

Borehole Information:

Borehole: 299-W11-79 (A7321)			**Site:** 241-T-361 Settling Tank		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 144.1		**GWL Date:** 10/22/2003	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
136,666.45 m	567,267.68 m	March 1983	217.573 m	150	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	3.15	6 5/8	6	5/16	+3.15	143
Welded steel	0	10 3/4	10 ?	3/8 ?	0	
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter of the 6-in. casing. The caliper and 6-in. inside casing diameter were measured using a steel tape. The 10-in. casing thickness could not be measured. 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, HWIS[3], and Chamness and Merz (1993). Zero reference is the top of the 6-in. casing. Grout is present in the casing annulus. The water that is trapped inside the borehole is not groundwater.

Logging Equipment Information:

Logging System:	Gamma 1E		**Type:** 70 % HPGe (34TP40587A)
Calibration Date:	7/2003	**Calibration Reference:**	GJO-2002-468-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C		**Type:** Planar HPGe (39-A314)
Calibration Date:	04/2003	**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	3/Repeat		
Date	10/23/03	10/27/03	10/27/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	43.0	146.0	41.0		
Finish Depth (ft)	4.0	42.0	27.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		

Log Run	1	2	3/Repeat		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[4]	N/A	N/A		
Pre-Verification	AE058CAB	AE059CAB	AE059CAB		
Start File	AE058000	AE059000	AE059105		
Finish File	AE058039	AE059104	AE059119		
Post-Verification	AE058CAA	AE059CAA	AE059CAA		
Depth Return Error (in.)	0	N/A	0		
Comments	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3/Repeat		
Date	10/27/03	10/27/03	10/27/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	110.0	24.0	21.0		
Finish Depth (ft)	105.0	17.0	19.0		
Count Time (sec)	300	300	300		
Live/Real	R	R	R		
Shield (Y/N)	None	None	None		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	AC080CAB	AC080CAB	AC080CAB		
Start File	AC080000	AC080006	AC080014		
Finish File	AC080005	AC080013	AC080016		
Post-Verification	AC080CAA	AC080CAA	AC080CAA		
Depth Return Error (in.)	N/A	N/A	-1		
Comments	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.		

Logging Operation Notes:

Zero reference was top of the 6-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 (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118. Pre- and post-survey verification measurements were acquired for the HRLS in the ^{137}Cs verifier SN 1013. During logging, fine-gain adjustments were not needed. Maximum logging depth achieved was 146 ft.

Analysis Notes:

Analyst:	Sobczyk	Date:	11/17/03	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. All of the verification spectra were within the acceptance criteria. 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 1.3 percent lower and 4.4 percent higher at the end of each day. Examinations of spectra indicate that the detector appears to have functioned normally during logging, and the spectra are accepted.

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

Log spectra for both the SGLS and HRLS 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: G1EJul03.xls [SGLS] and G1CApr03.xls [HRLS]), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 6-in. casing. On the basis of Chamness and Merz (1993) and the total gamma response, the casing configuration was assumed to be a string of 6-in. casing with a thickness of 5/16 in. to total log depth (146 ft) and a string of 10-in. surface casing with a thickness of 0.365 in. to a log depth of 20 ft. The 6-in. casing thickness was measured by the logging engineer. A casing thickness of 0.365 in. is the published value for ASTM schedule-40 steel pipe (a commonly used casing material at Hanford). Where more than one casing exists at a depth, the casing correction is additive (e.g., the correction for both an 6-in. and 10-in. casing would be 0.313 + 0.365 = 0.678). A water correction was applied below 144 ft.

Dead time corrections are applied when dead time exceeds 10 percent. Dead time exceeded 10 percent in the intervals from 17 to 23 ft and 105 to 110 ft. Maximum dead time was 100 percent in the interval from 19 to 21 ft. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. Dead time exceeded 40 percent in the intervals from 18 to 23 ft and 106 to 109 ft. These intervals were logged with the HRLS.

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. 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 was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected over the entire length of the borehole at concentrations ranging from 0.4 pCi/g to 54,100 pCi/g. The maximum concentration of ^{137}Cs was measured at 19 ft. Elevated ^{137}Cs was encountered at 63 ft with a concentration of 50 pCi/g and in the interval from 106 to 109 ft at concentrations above 1,000 pCi/g.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and natural radionuclides (662, 609, 1461, 1764, and 2614 keV). ^{137}Cs concentrations determined by the HRLS were repeatable.

References:

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

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[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable

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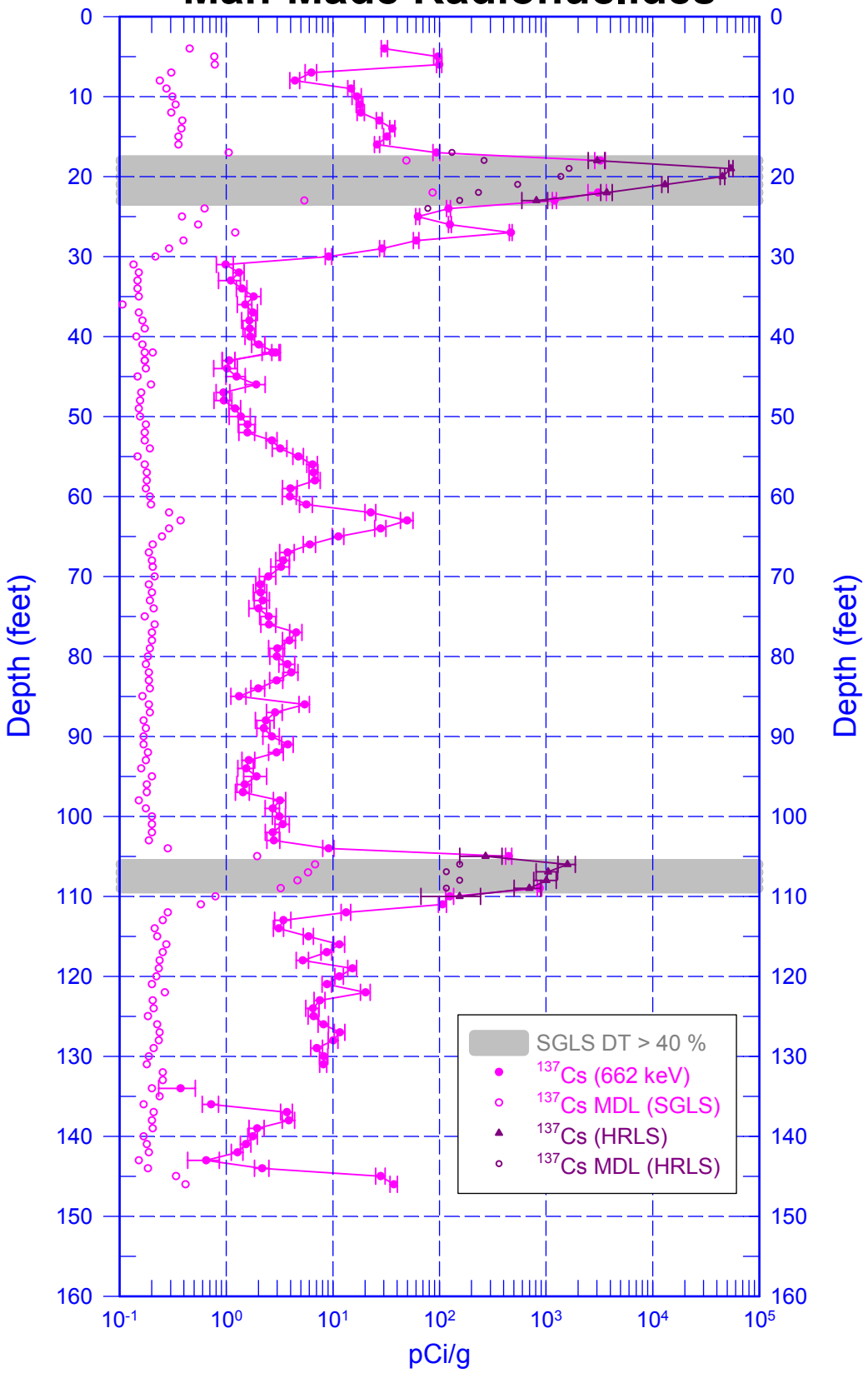
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
10/27/2003

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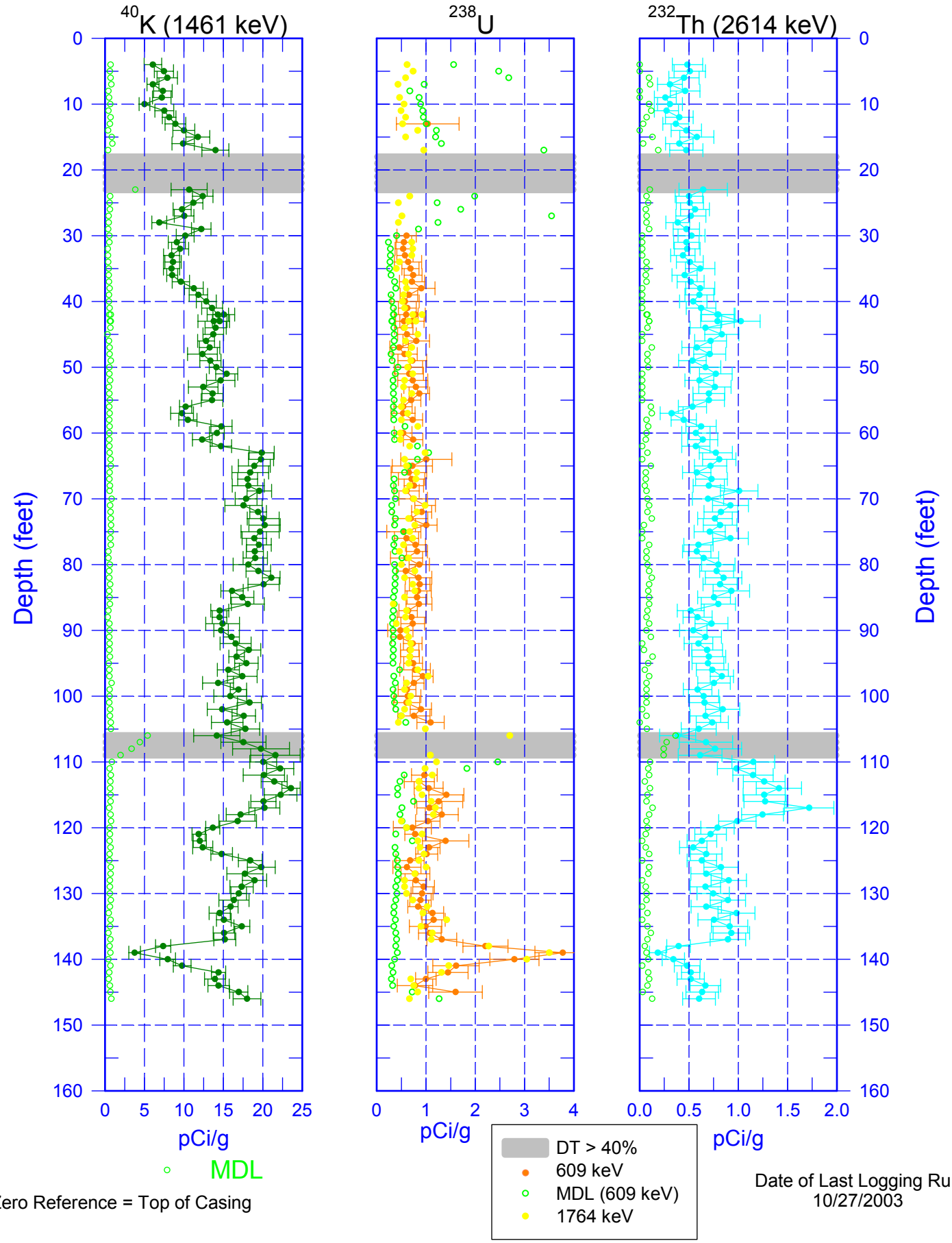
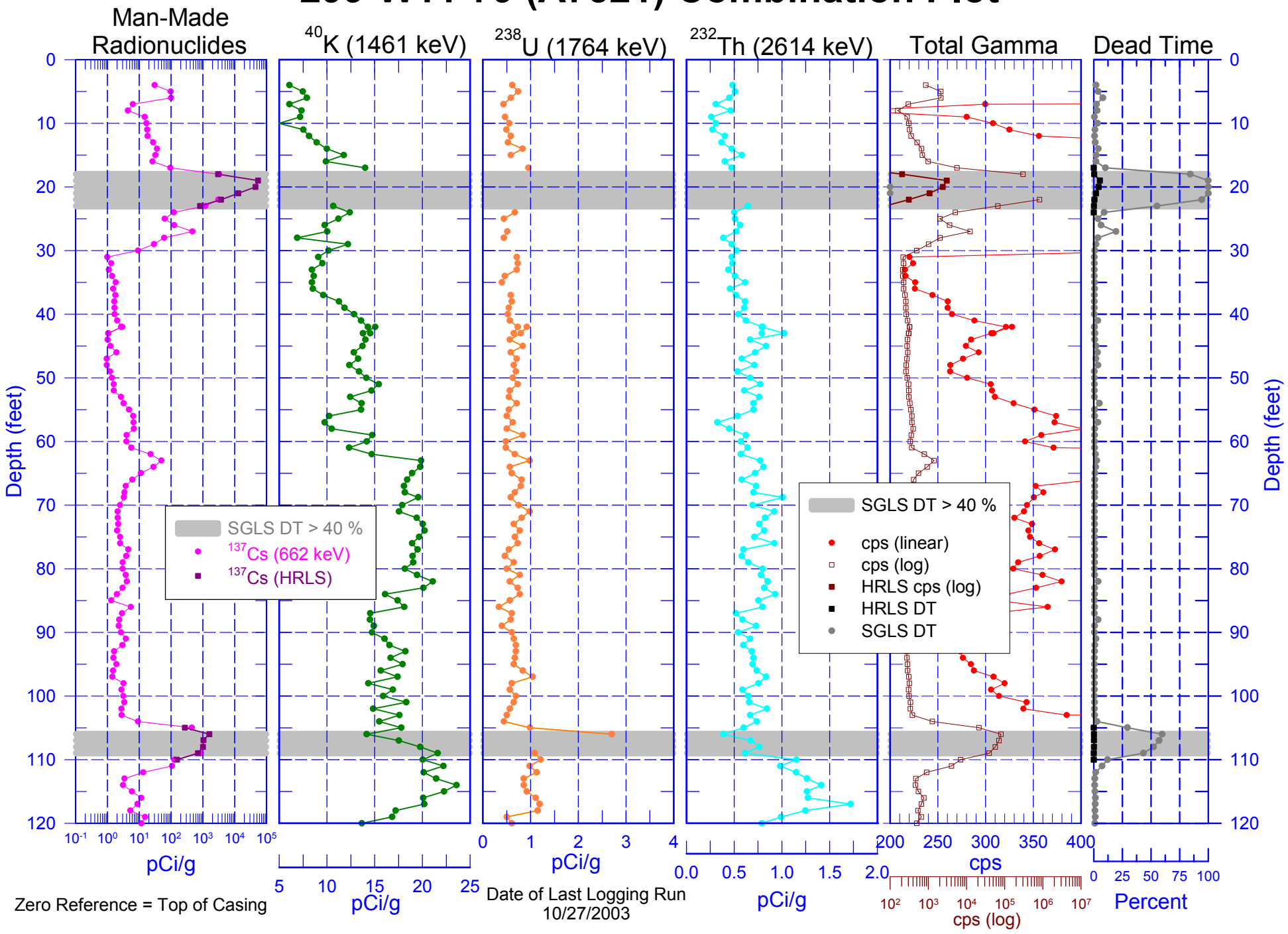
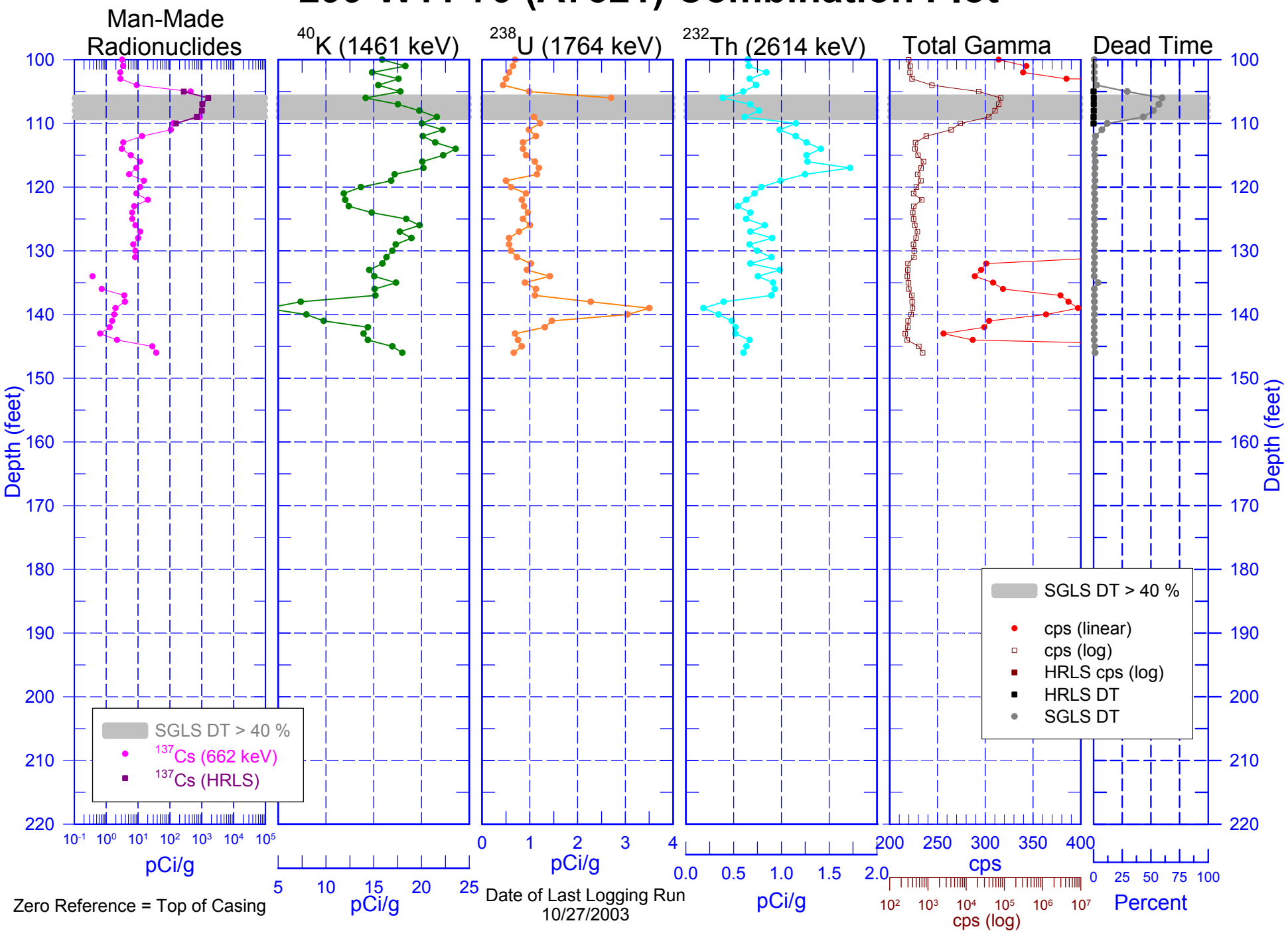
Natural Gamma Logs



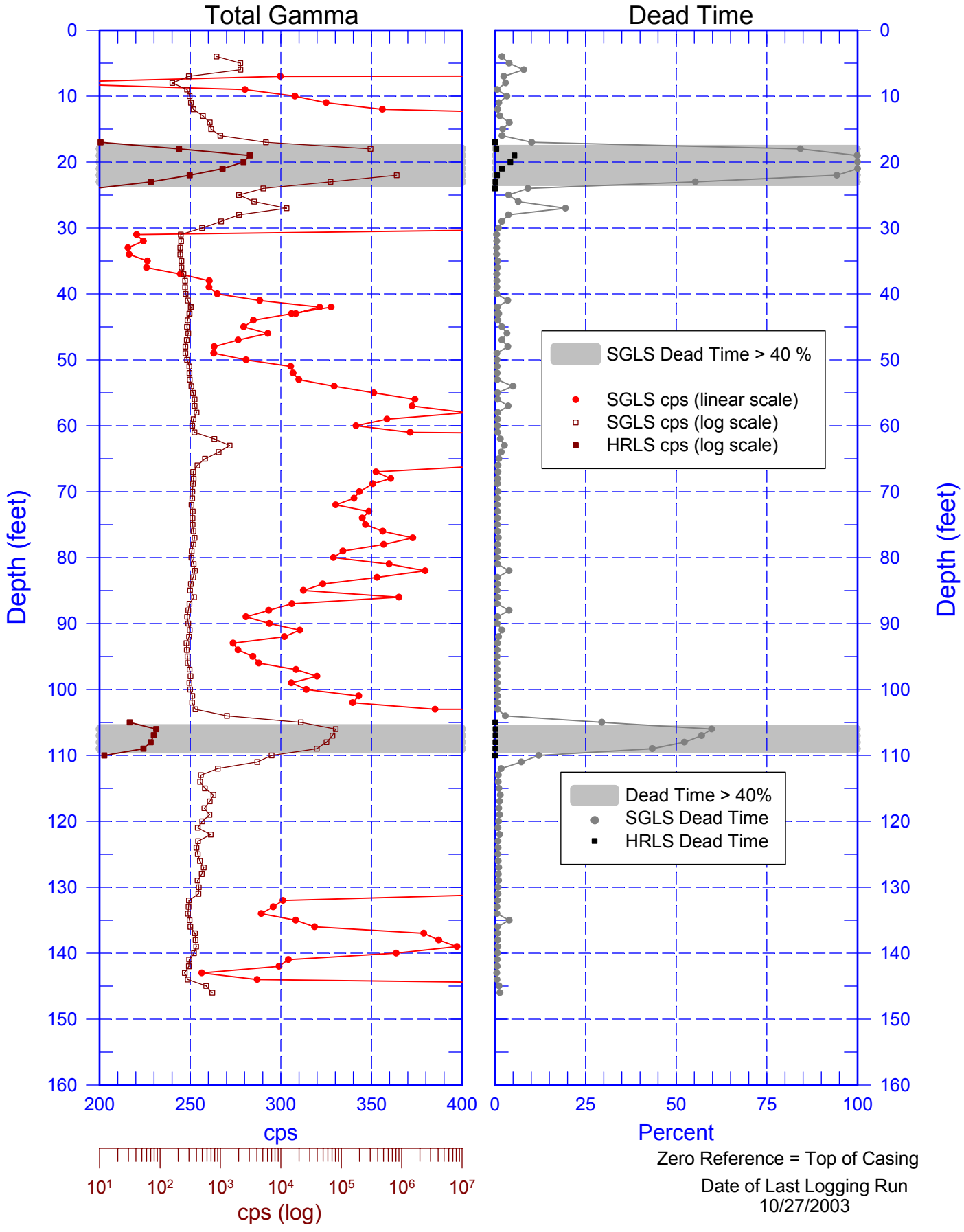
Zero Reference = Top of Casing

Date of Last Logging Run
10/27/2003


299-W11-79 (A7321) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2614 keV)
Total Gamma
Dead Time
Depth (feet)
SGLS DT > 40 %
137Cs (662 keV)
137Cs (HRLS)
cps (linear)
cps (log)
HRLS cps (log)
HRLS DT
SGLS DT
pCi/g
cps
cps (log)
Percent
Zero Reference = Top of Casing
Date of Last Logging Run
10/27/2003


299-W11-79 (A7321) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2614 keV)
Total Gamma
Dead Time
Depth (feet)
100
110
120
130
140
150
160
170
180
190
200
210
220
SGLS DT > 40 %
137Cs (662 keV)
137Cs (HRLS)
10-1 100 101 102 103 104 105
pCi/g
5 10 15 20 25
pCi/g
0 1 2 3 4
pCi/g
0.0 0.5 1.0 1.5 2.0
pCi/g
200 250 300 350 400
cps
102 103 104 105 106 107
cps (log)
0 25 50 75 100
Percent
SGLS DT > 40 %
cps (linear)
cps (log)
HRLS cps (log)
HRLS DT
SGLS DT
Zero Reference = Top of Casing
Date of Last Logging Run
10/27/2003

299-W11-79 (A7321)
Total Gamma & Dead Time



Zero Reference = Top of Casing

Date of Last Logging Run
10/27/2003

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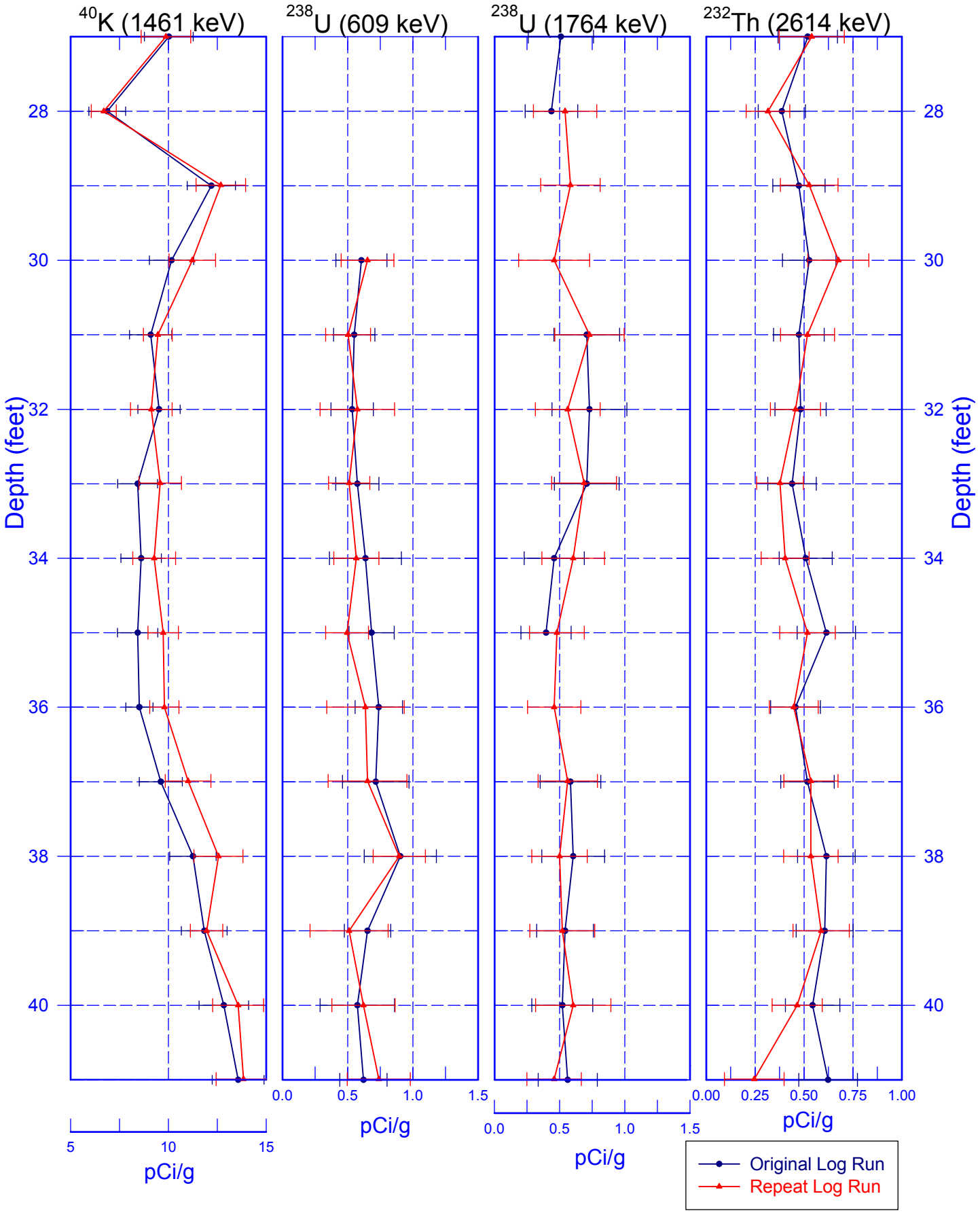
Rerun of Natural Gamma Logs (41.0 to 27.0 ft)



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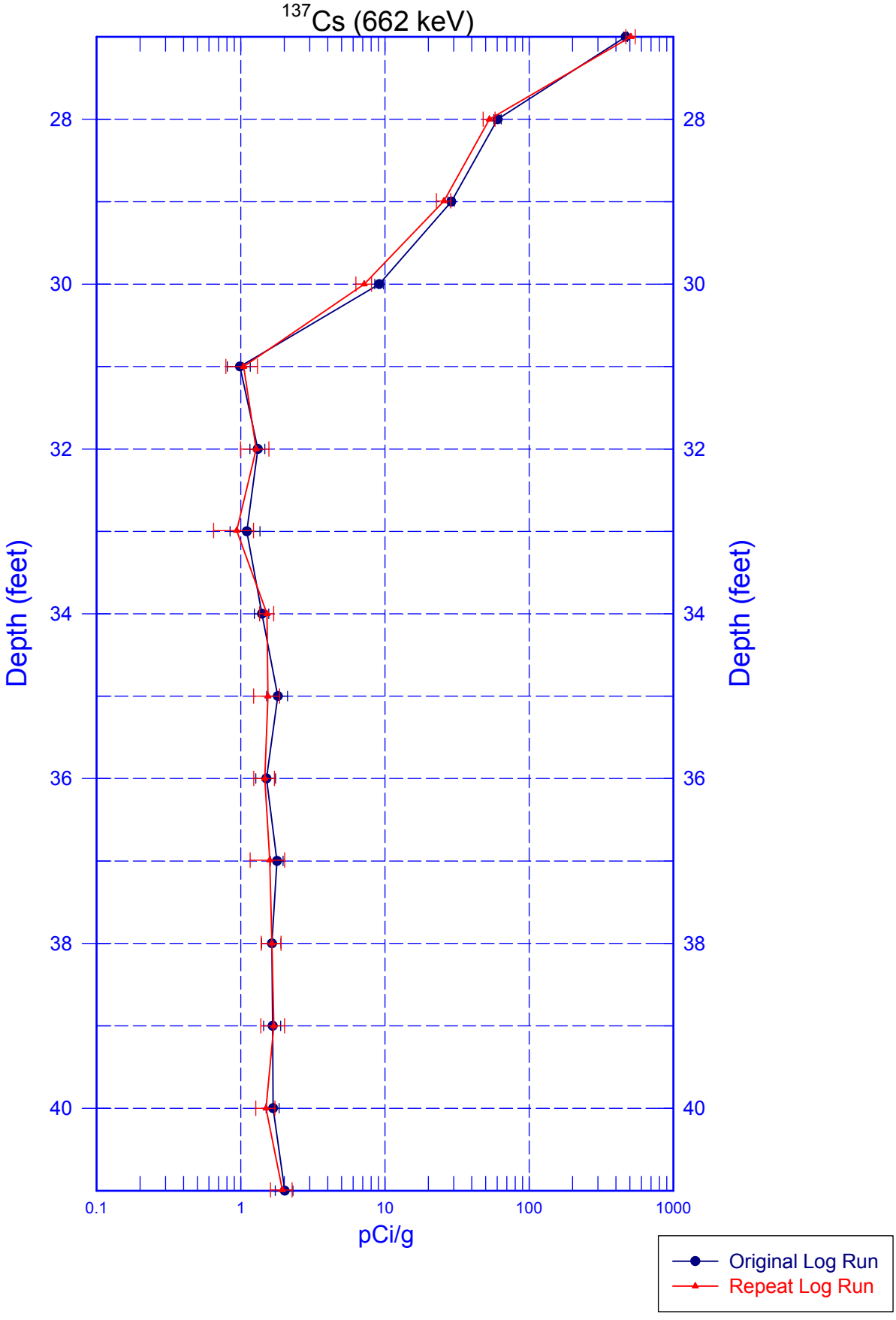
Rerun of Man-Made Radionuclides (41.0 to 27.0 ft)



299-W11-79 (A7321)

Rerun of High-Rate Man-Made Radionuclides (21.0 to 19.0 ft)