Stoller
Grand Junction Office established 1959

299-W11-62 (A7304)
Log Data Report

Borehole Information:

Borehole: 299-W11-62 (A7304)			**Site:** 216-T-6 Crib		
Coordinates (WA State Plane)		**GWL (ft)[1]:** Not deep enough		**GWL Date:** 2/19/2003	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
136,660.52 m	567,205.31 m	August 1947	218.058 m	101.9	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	4.5	8 5/8	7 15/16	0.344	+4.5	102
The logging engineer measured the casing stick up 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, HWIS[3], 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 2A		**Type:** SGLS (35%)
Calibration Date:	9/2002	**Calibration Reference:**	GJO-2002-383-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C		**Type:** High Rate Detector
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/Repeat**	**3**		
Date	2/19/03	2/20/03	2/20/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	101.0	56.0	35.0		
Finish Depth (ft)	34.0	46.0	5.0		
Count Time (sec)	200	200	200		
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	BA205CAB	BA206CAB	BA206CAB		
Start File	BA205000	BA206000	BA206011		
Finish File	BA205067	BA206010	BA206041		
Post-Verification	BA205CAA	BA207CAA	BA207CAA		
Depth Return Error (in.)	-0.5	N/A	0		
Comments	Fine-gain adjustments made after files -001, -017, and -054.	No fine-gain adjustment.	No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2/Repeat			
Date	06/10/03	06/10/03			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	36.0	31.0			
Finish Depth (ft)	24.0	28.0			
Count Time (sec)	300	300			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	AC074CAB	AC074CAB			
Start File	AC074000	AC074013			
Finish File	AC074012	AC074016			
Post-Verification	AC075CAA	AC075CAA			
Depth Return Error (in.)	N/A	0			
Comments	No fine-gain adjustment.				

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 (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 082. Pre- and post-survey verification measurements were acquired for the HRLS in the Cs-137 verifier SN 1013. During SGLS logging, fine-gain adjustments were needed.

Analysis Notes:

Analyst:	Sobczyk	Date:	06/16/03	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 control limits established on 12/05/2002. 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 5 percent lower and 4 percent higher at the end of each day.

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: G2AFeb03.xls and G1CApr03.xls), using parameters determined from analysis of recent calibration data. 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 (101 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.

Dead time corrections are required when dead time exceeds 10.5 percent. Dead time exceeded 10.5 percent in the interval from 24 to 39 ft. Maximum dead time was 93 percent at 29 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 interval from 25 to 35 ft. This interval was 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. 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 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 the MDL (0.2 pCi/g) to 8,600 pCi/g. The maximum concentration of ^{137}Cs was measured at 30 ft.

Recognizable changes in the KUT logs occurred in this borehole. A change of 5 pCi/g or more in apparent ^{40}K concentrations occurs between 24 and 42 ft. This increase in ^{40}K concentrations may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. A decrease of approximately 5 pCi/g in apparent ^{40}K concentrations occurs at 86 ft.

The plots of the repeat logs demonstrate good repeatability of the SGLS data for both the man-made and natural radionuclides (661, 609, 1461, 1764, and 2614 keV).

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of gamma-emitting contamination as early as 1963 and through at least 1976. The log from 4/26/63 detected gamma activity above background over the entire length of the borehole.

The log from 5/6/76 detected significant amounts of gamma activity in the interval from 16 ft (5 m) to 43 ft (13 m). The SGLS detected ^{137}Cs at concentrations greater than 10 pCi/g between 21 and 43 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 ^{137}Cs are decayed to the date of the SGLS logging event in February 2003. Comparison of the ^{137}Cs concentrations indicates differences in apparent concentrations occur in the intervals from 33 to 34 ft and from 97 to 98 ft. RLS data appear to overestimate ^{137}Cs concentrations in the interval between 33 and 34 ft, and RLS data appear to underestimate the ^{137}Cs concentrations in the interval between 97 and 98 ft. Since 1995, ^{137}Cs activities in the intervals between 33 and 34 ft and between 97 and 98 ft may have changed more rapidly than is predicted by radioactive decay alone.

Because of the possibility that movement of ^{137}Cs has occurred in the vadose zone, it is recommended that this borehole is logged periodically to verify that the change observed in the contaminant profile over the last 8 years has occurred. The interval from ground surface to total depth should be logged again in 10 years.

References:

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

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

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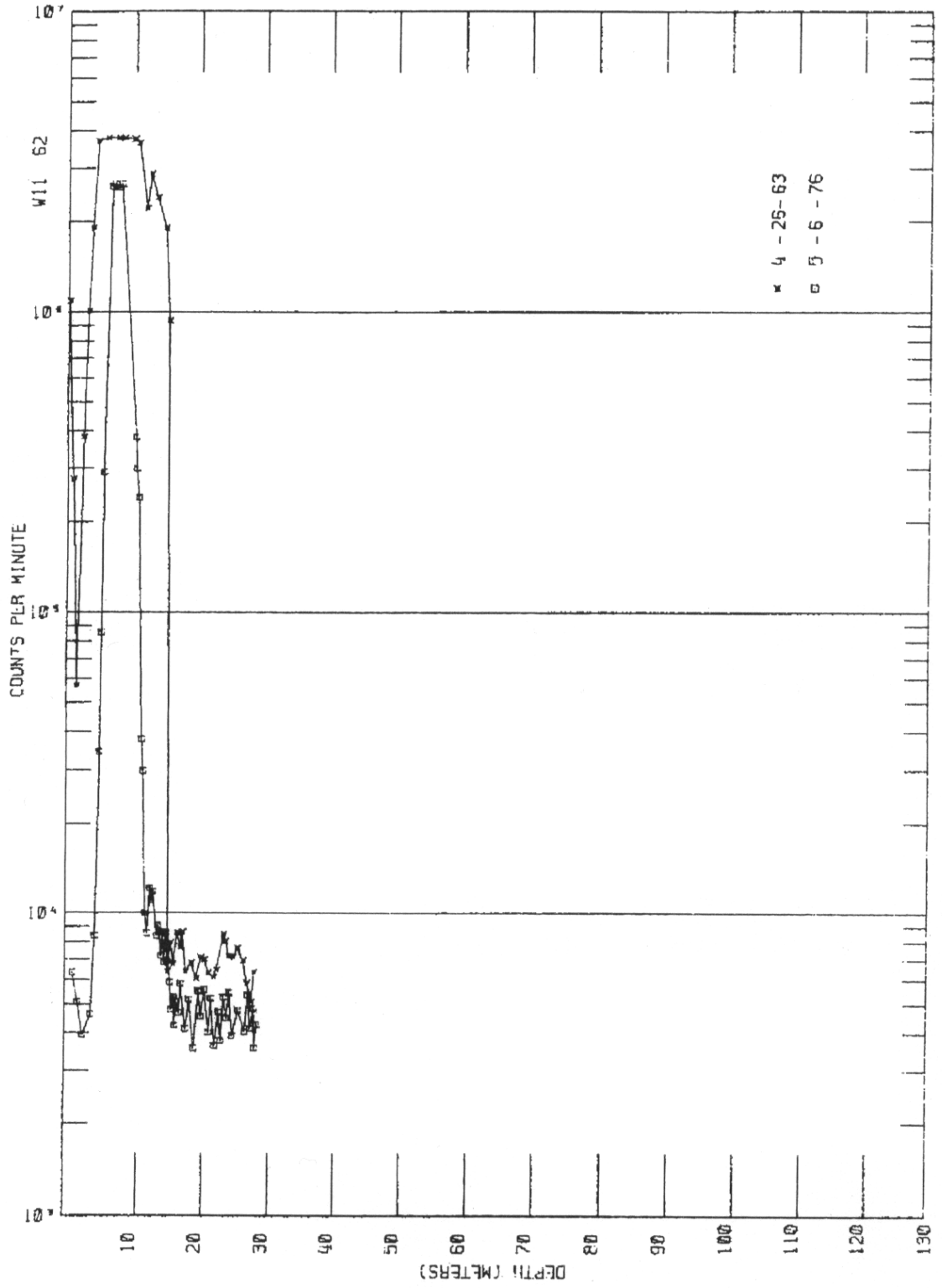
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable

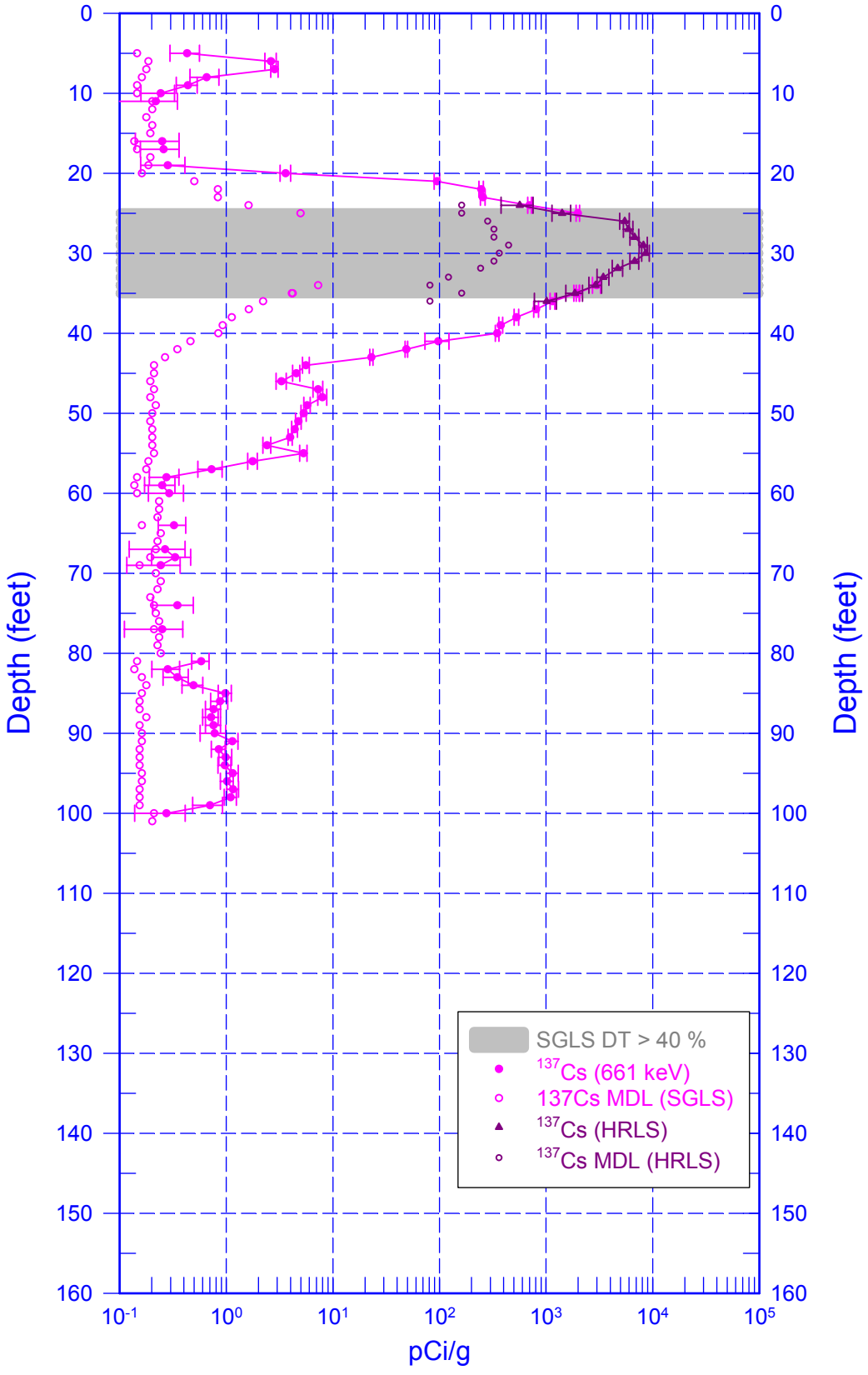


from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-62, Logged on 4/26/63 and 5/6/76

299-W11-62 (A7304)

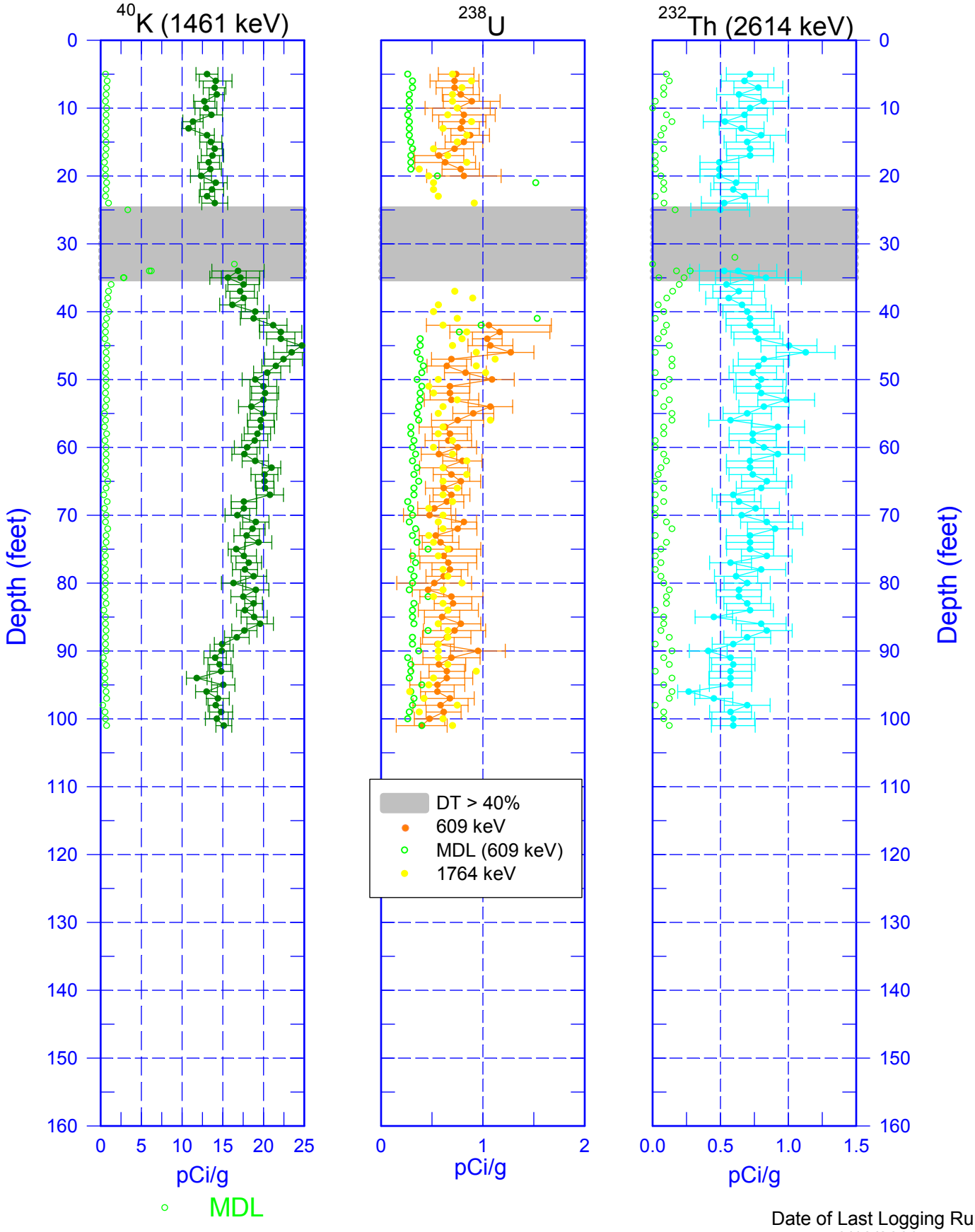
Man-Made Radionuclides



Zero Reference = Top of Casing

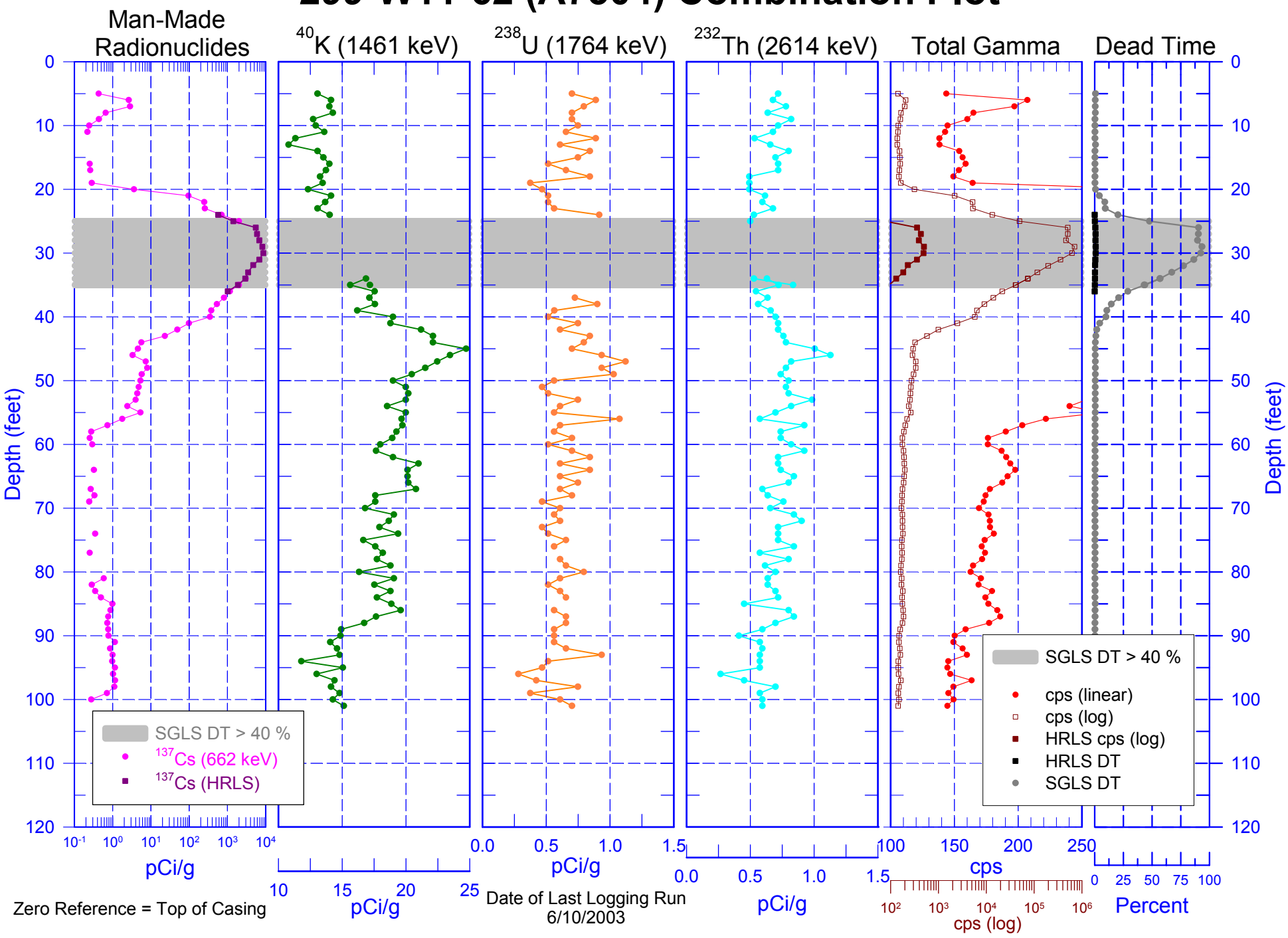
Date of Last Logging Run
6/10/2003

299-W11-62 (A7304)
Natural Gamma Logs

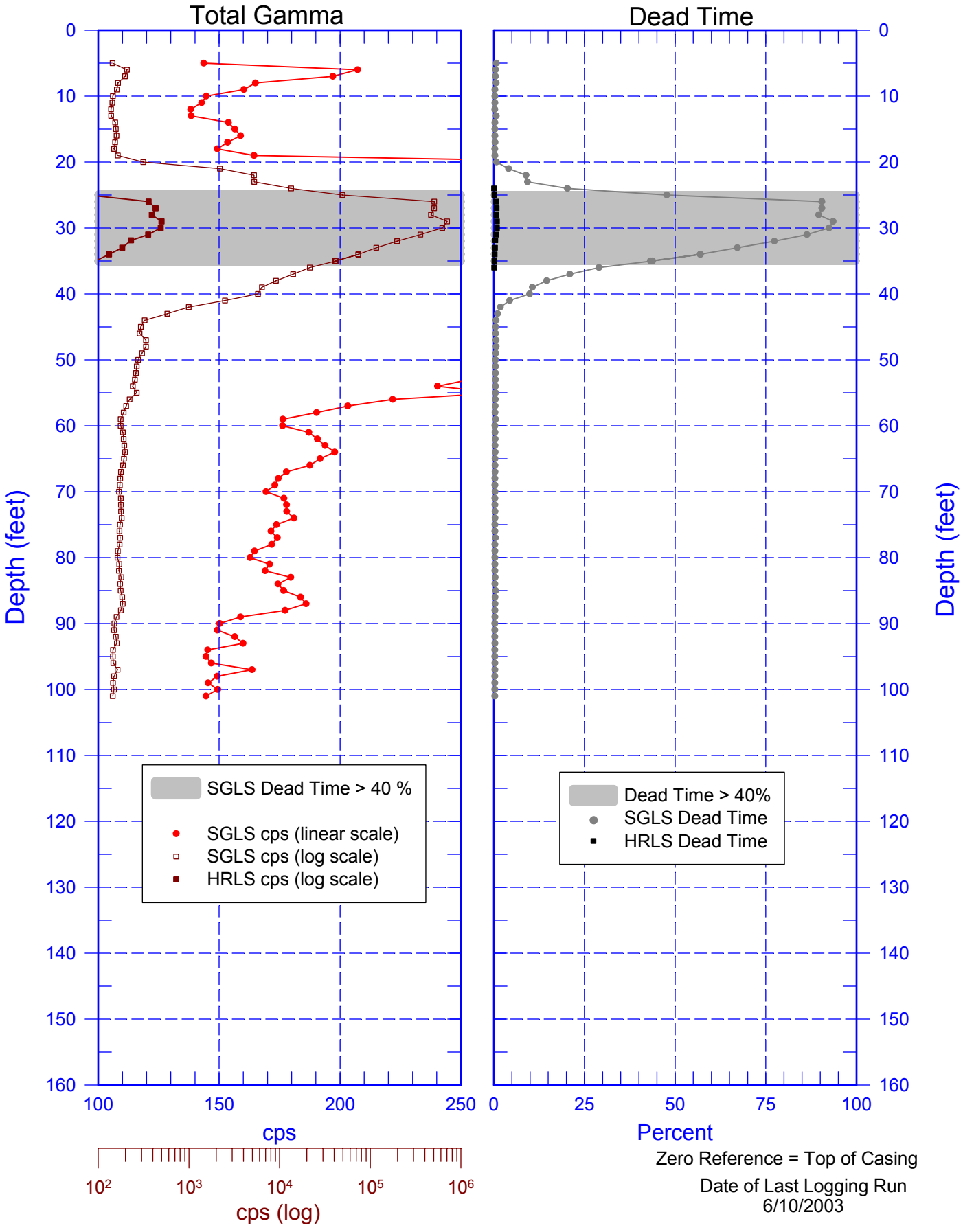


Zero Reference = Top of Casing

Date of Last Logging Run
6/10/2003


299-W11-62 (A7304) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2614 keV)
Total Gamma
Dead Time
Depth (feet)
0
10
20
30
40
50
60
70
80
90
100
110
120
SGLS DT > 40 %
137Cs (662 keV)
137Cs (HRLS)
pCi/g
10-1 100 101 102 103 104
10 15 20 25
0.0 0.5 1.0 1.5
100 150 200 250
cps
102 103 104 105 106
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
6/10/2003

299-W11-62 (A7304)
Total Gamma & Dead Time

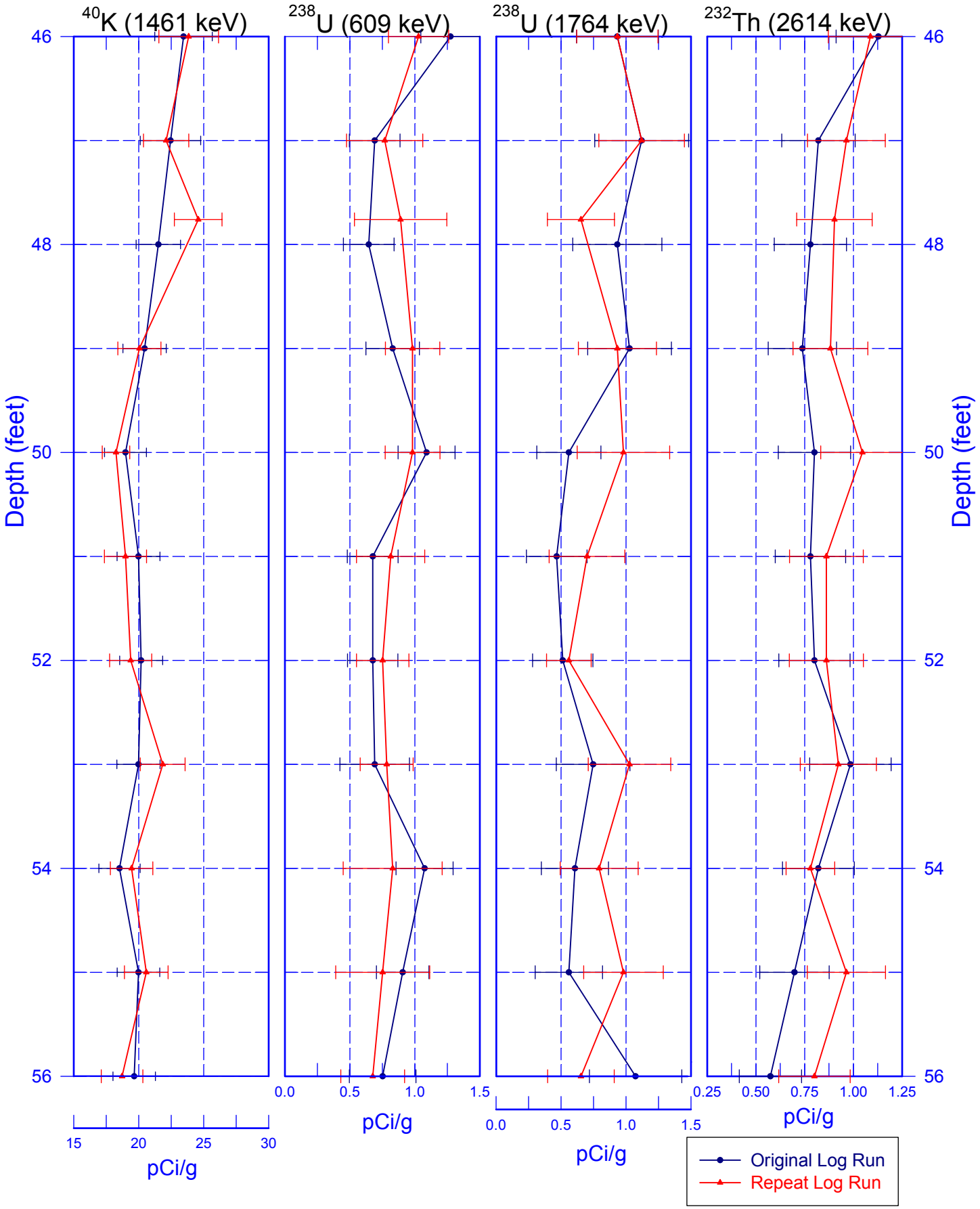


Zero Reference = Top of Casing

Date of Last Logging Run
6/10/2003

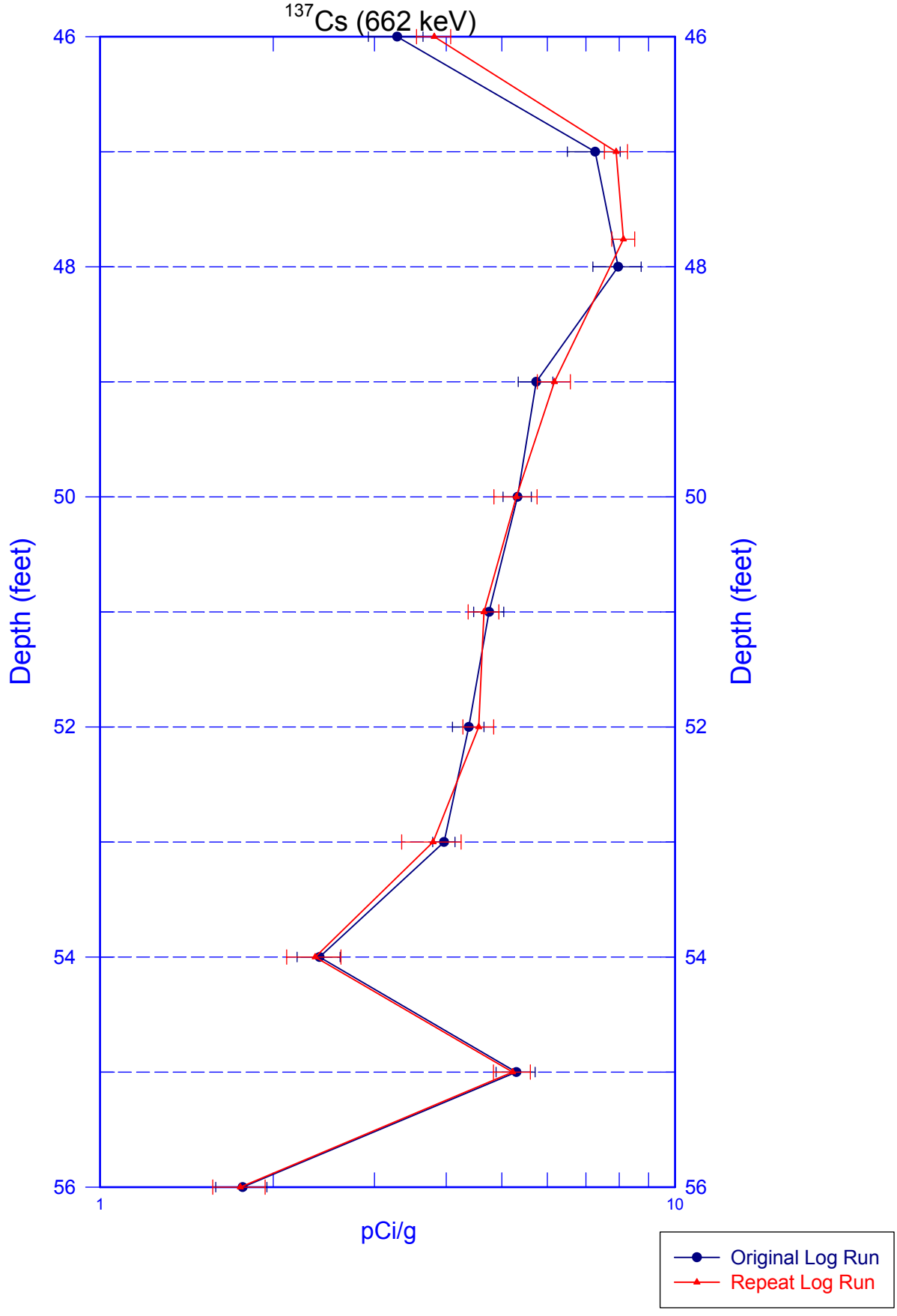
299-W11-62 (A7304)

Rerun of Natural Gamma Logs (56.0 to 46.0 ft)



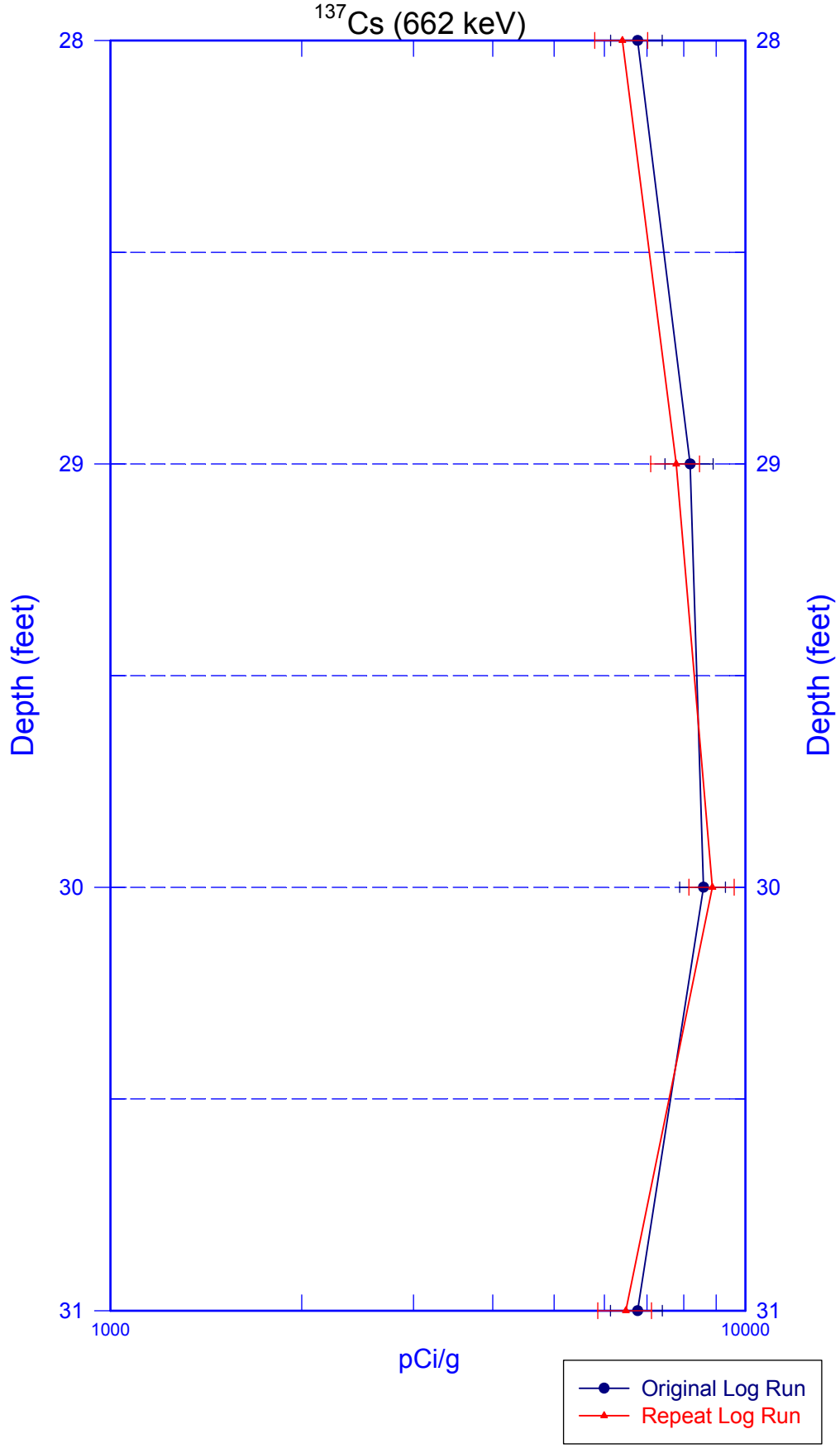
299-W11-62 (A7304)

Rerun of Man-Made Radionuclides (56.0 to 46.0 ft)



299-W11-62 (A7304)

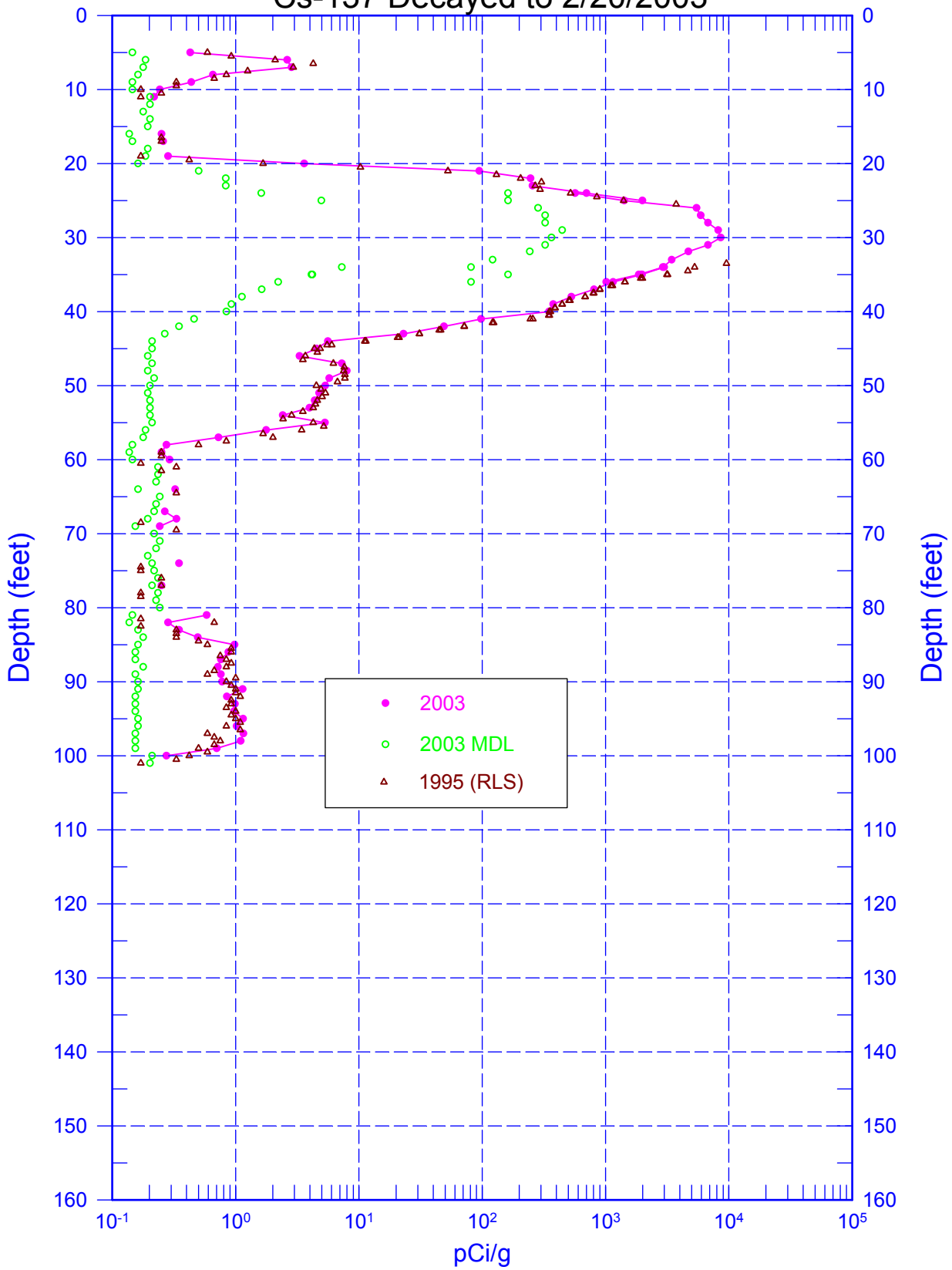
Rerun of High-Rate Man-Made Radionuclides (31.0 to 28.0 ft)



299-W11-62 (A7304)

RLS Data Compared to SGLS Data

Cs-137 Decayed to 2/20/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)