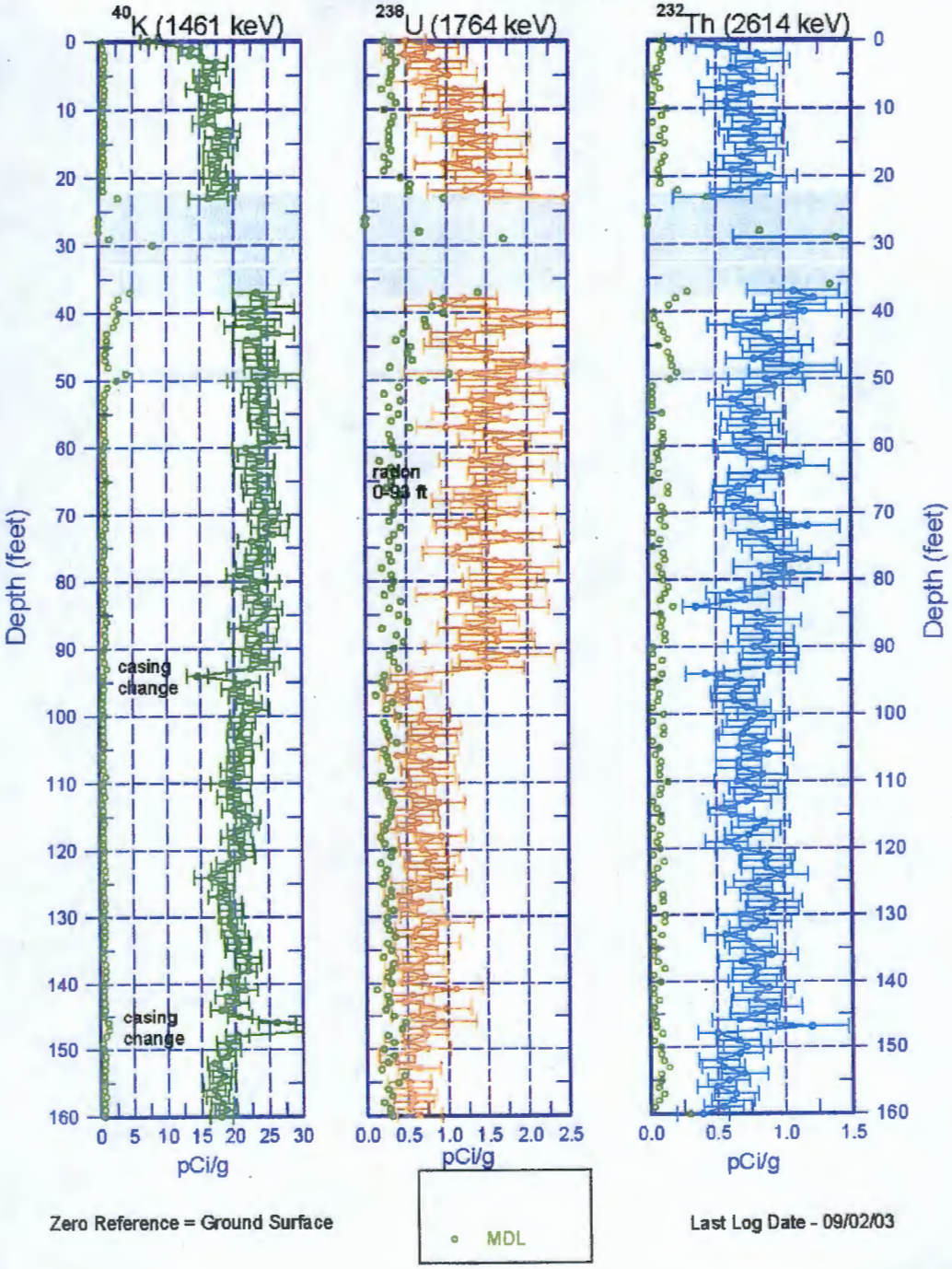
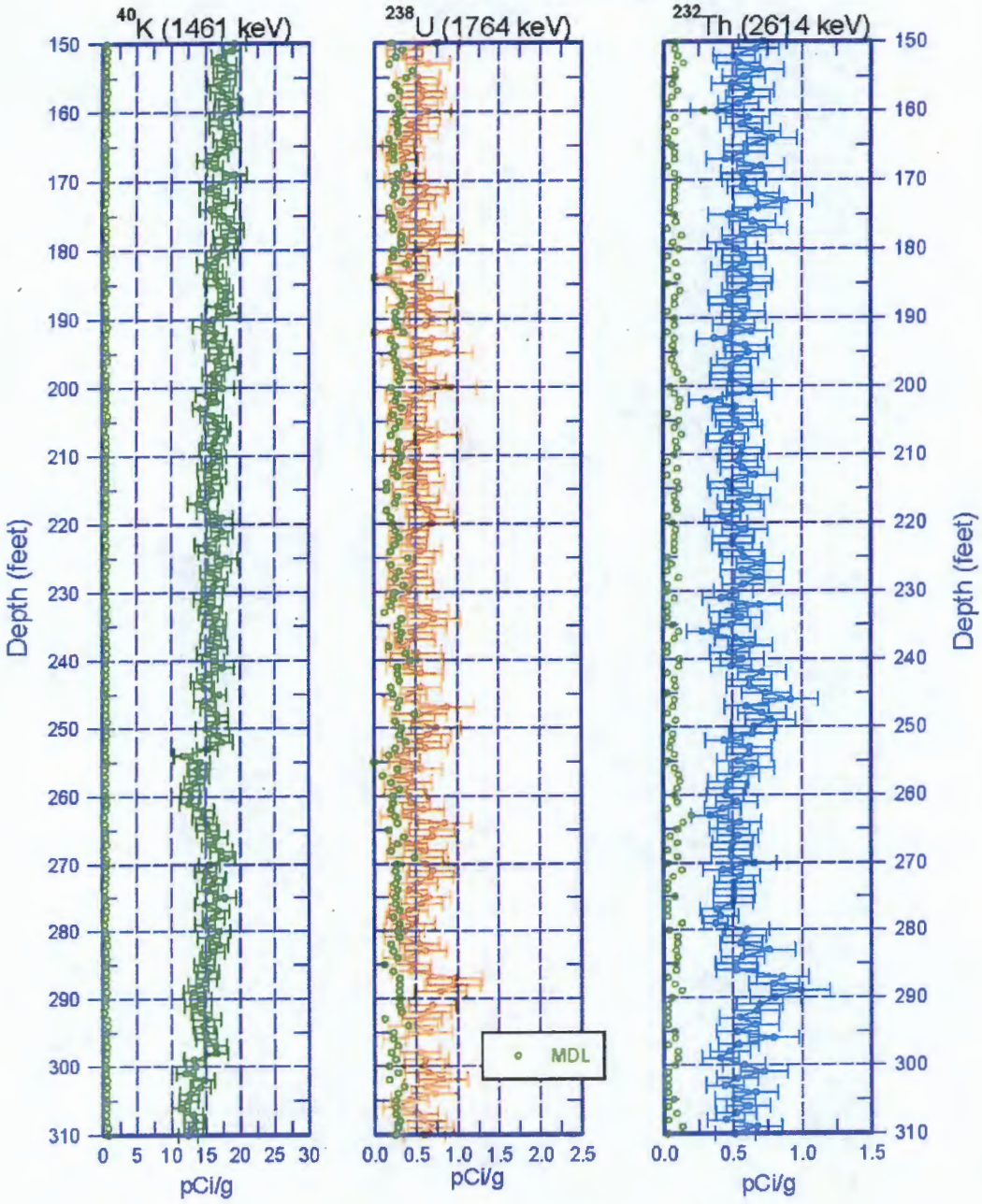
C-4160
Natural Gamma Logs



C-4160
Natural Gamma Logs

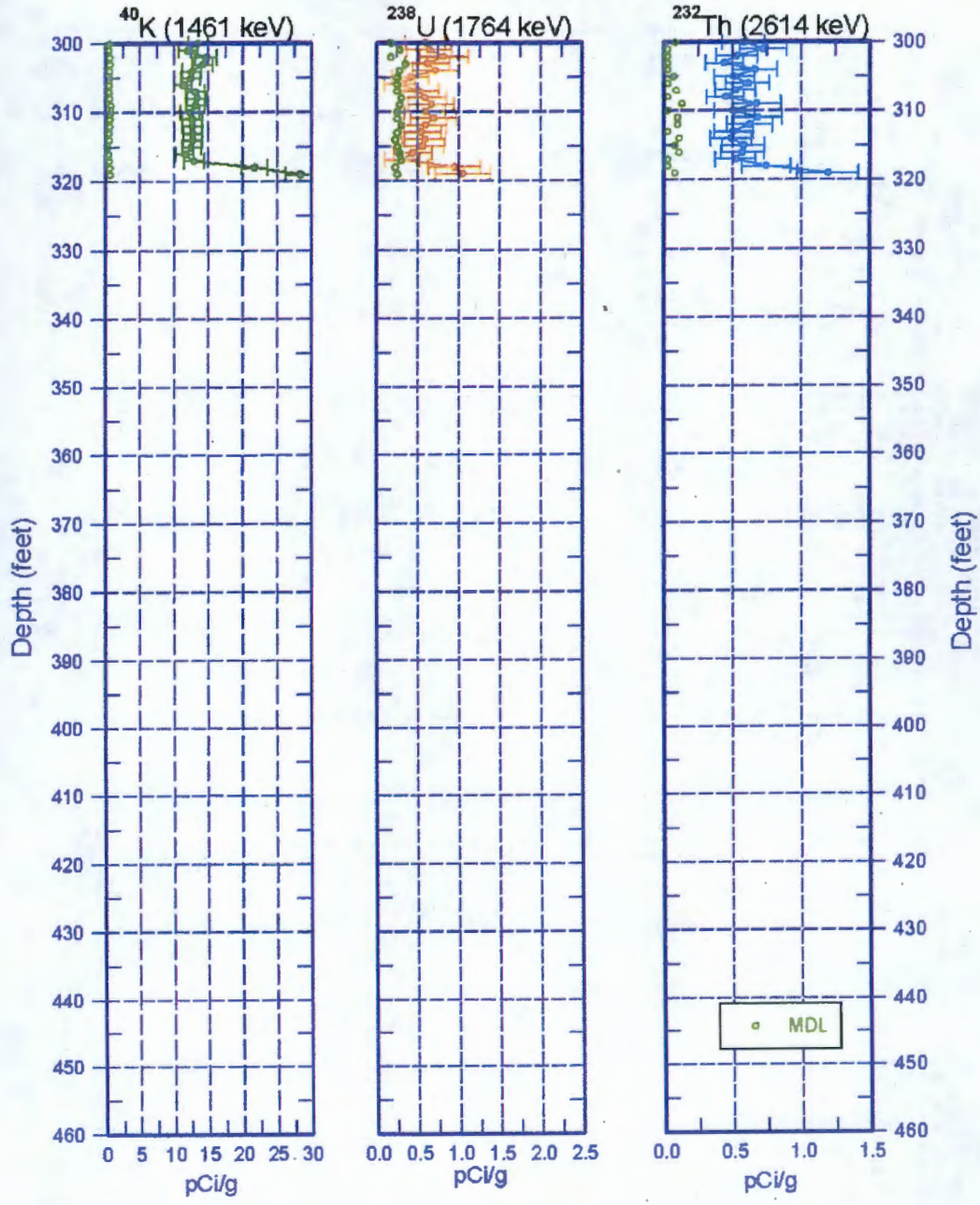


Zero Reference = Ground Surface

Depth scale: 1"=20 ft

Last Log Date - 09/02/03

C-4160
Natural Gamma Logs

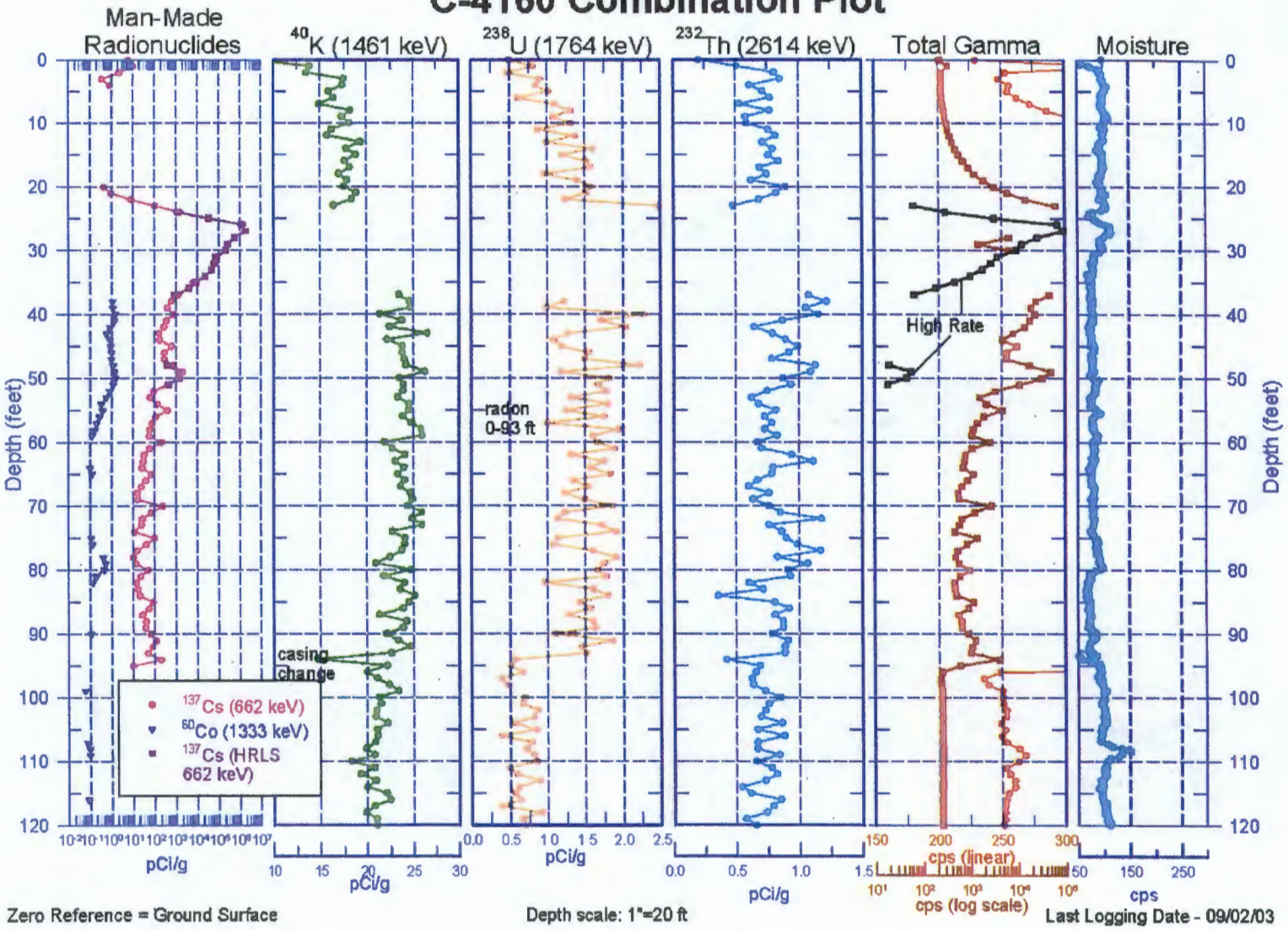


Zero Reference = Ground Surface

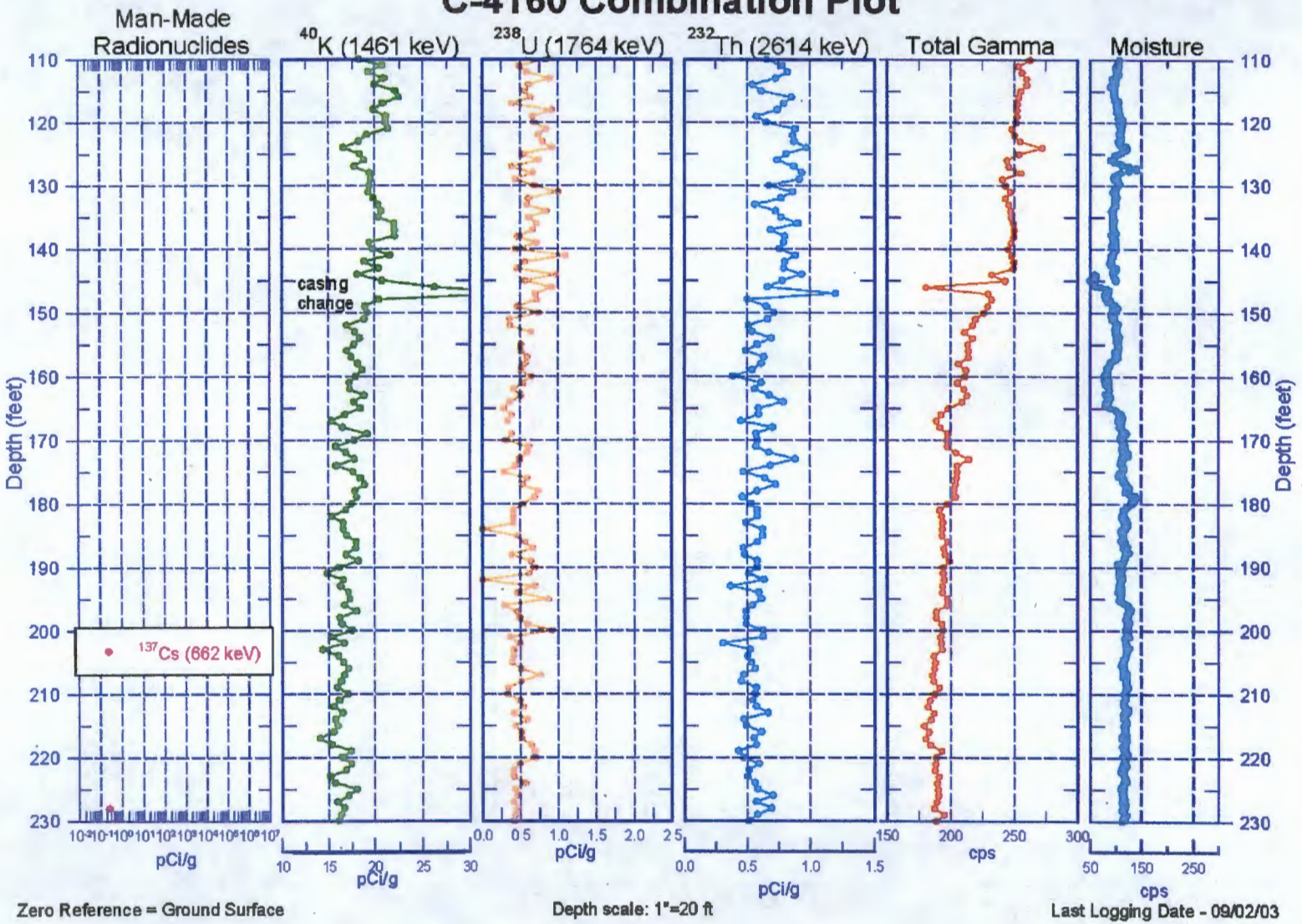
Depth scale: 1"=20 ft

Last Log Date - 09/02/03

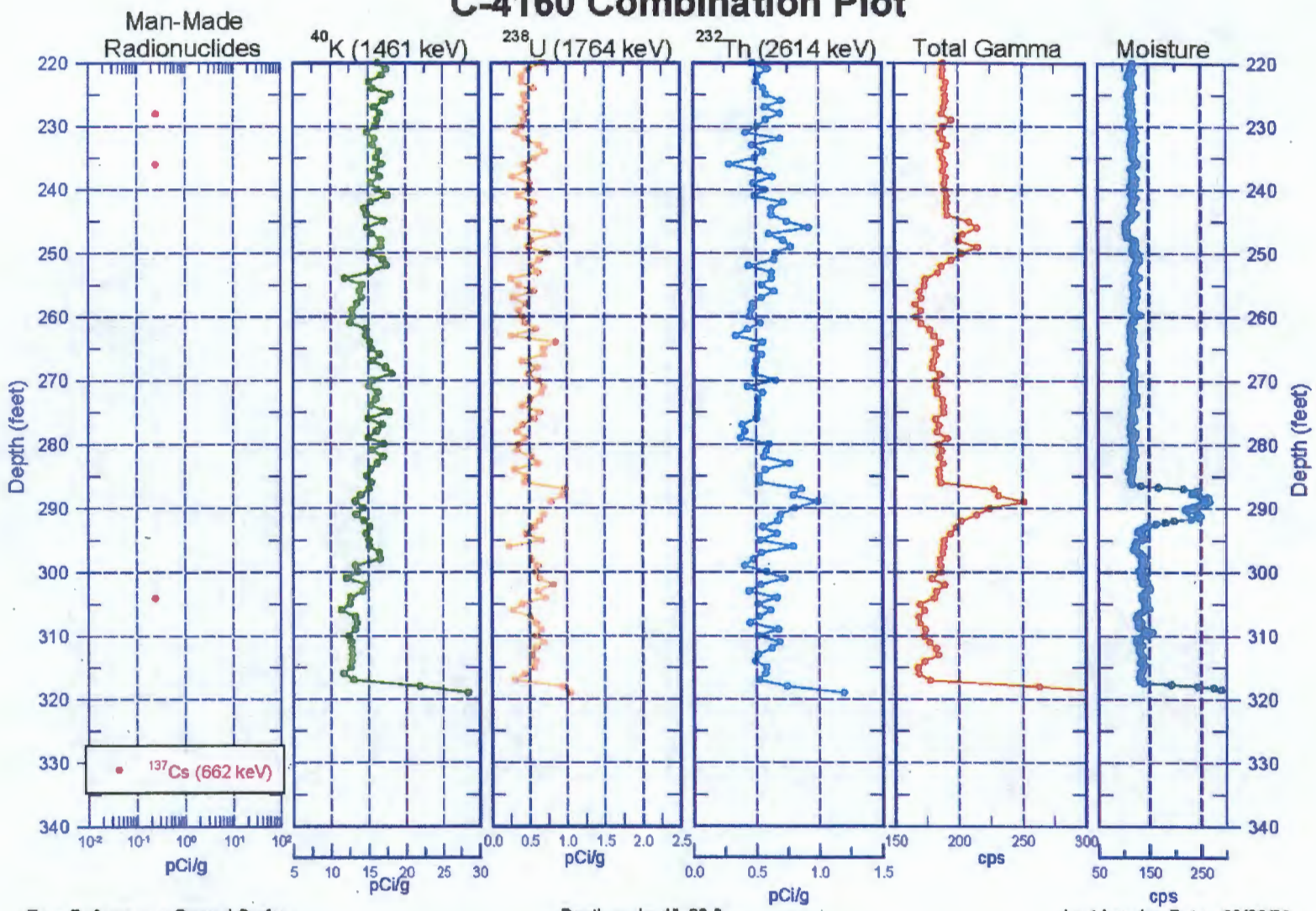
C-4160 Combination Plot



C-4160 Combination Plot



C-4160 Combination Plot

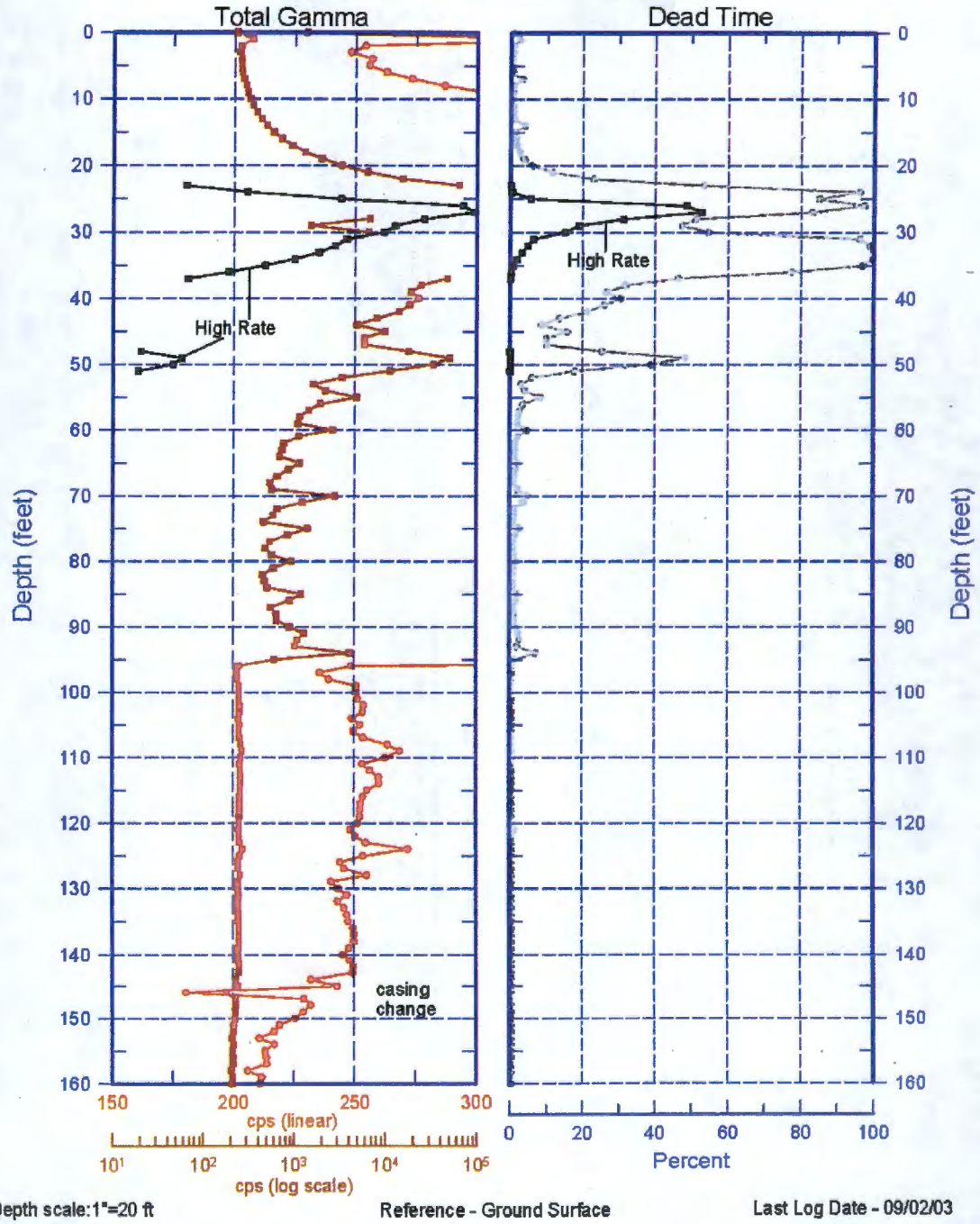


Zero Reference = Ground Surface

Depth scale: 1"=20 ft

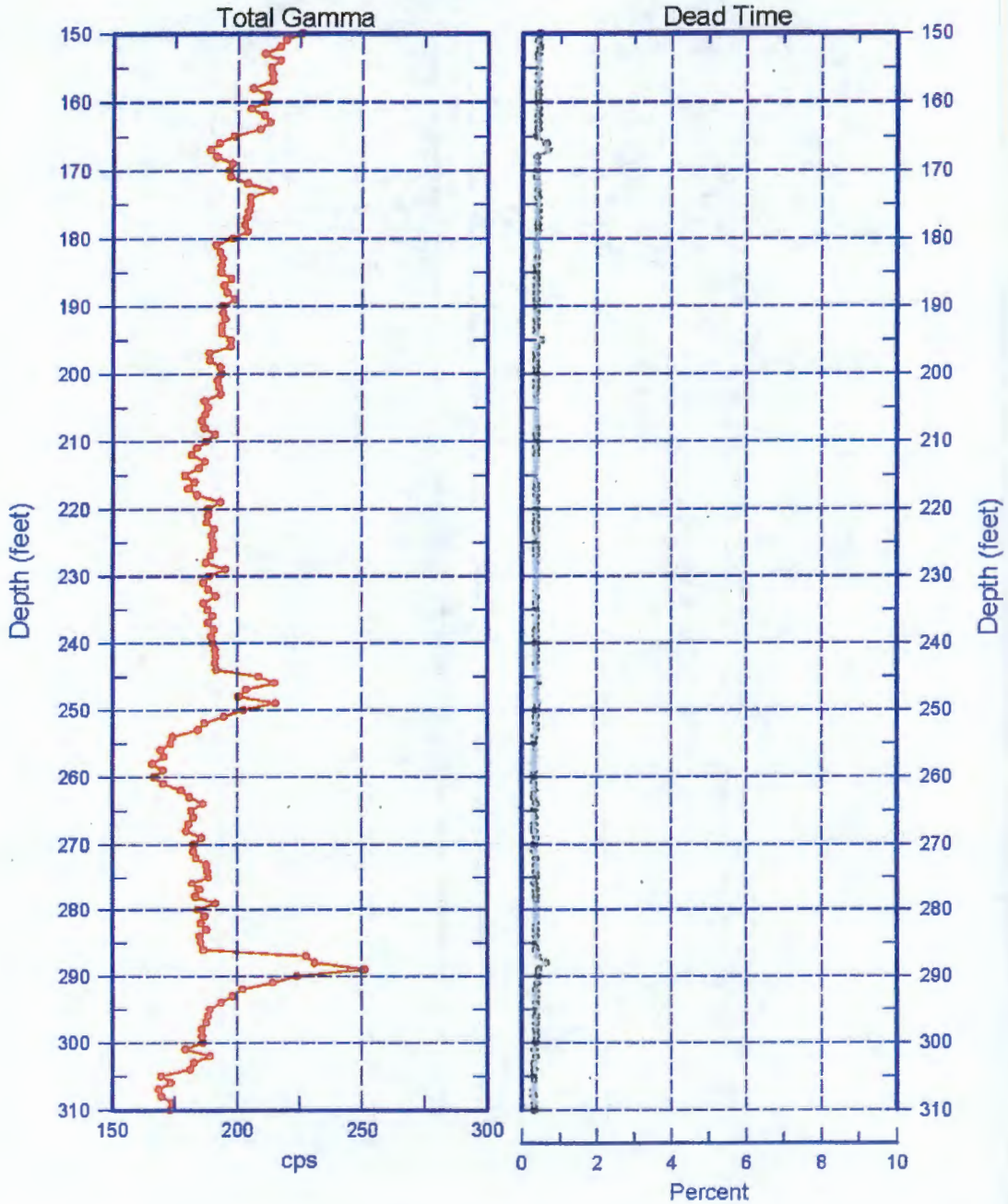
Last Logging Date - 09/02/03

C-4160
Total Gamma & Dead Time



Depth scale:1"=20 ft Reference - Ground Surface Last Log Date - 09/02/03

C-4160
Total Gamma & Dead Time

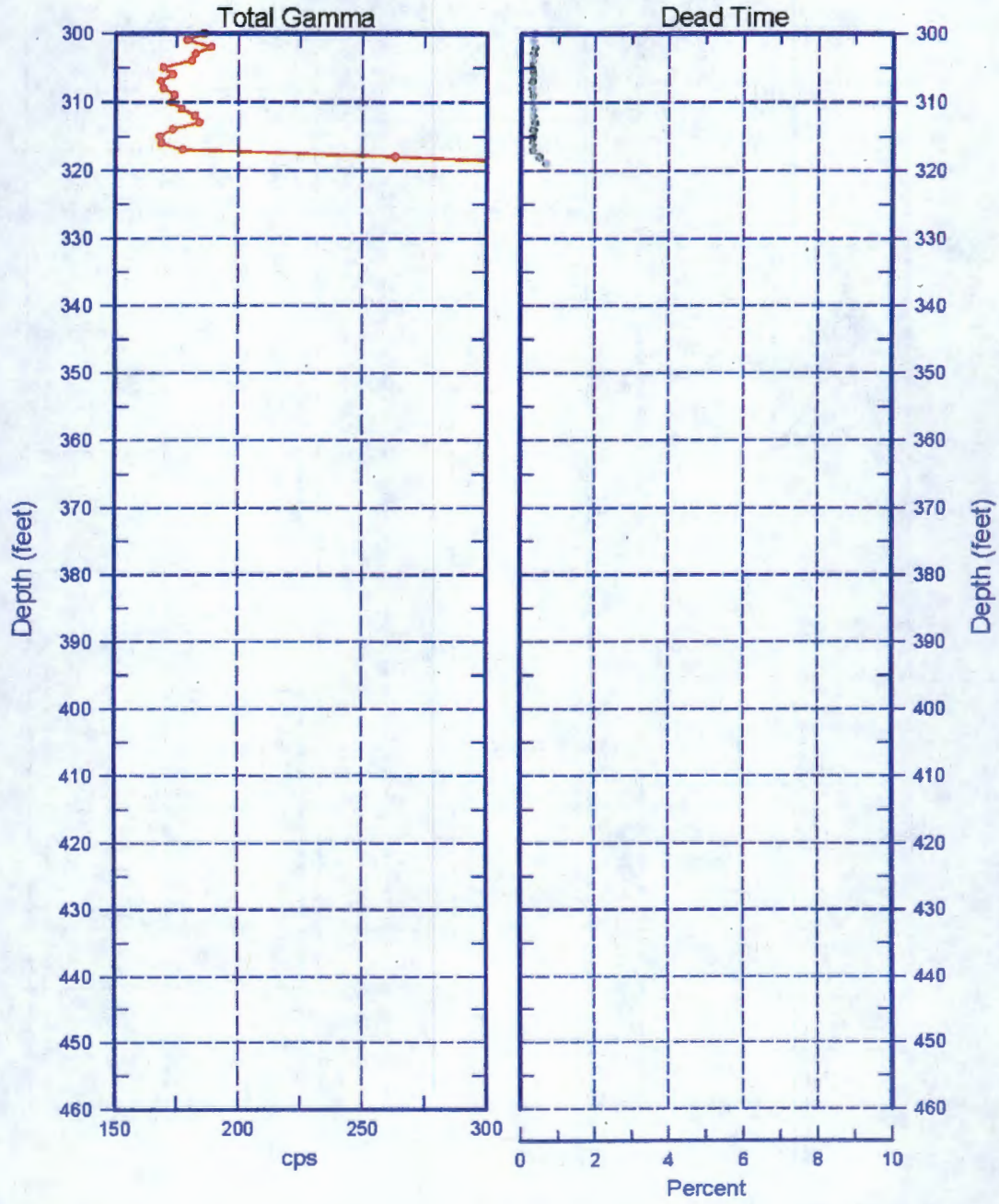


Reference - Ground Surface

Depth scale: 1"=20 ft

Last Log Date - 09/02/03

C-4160
Total Gamma & Dead Time



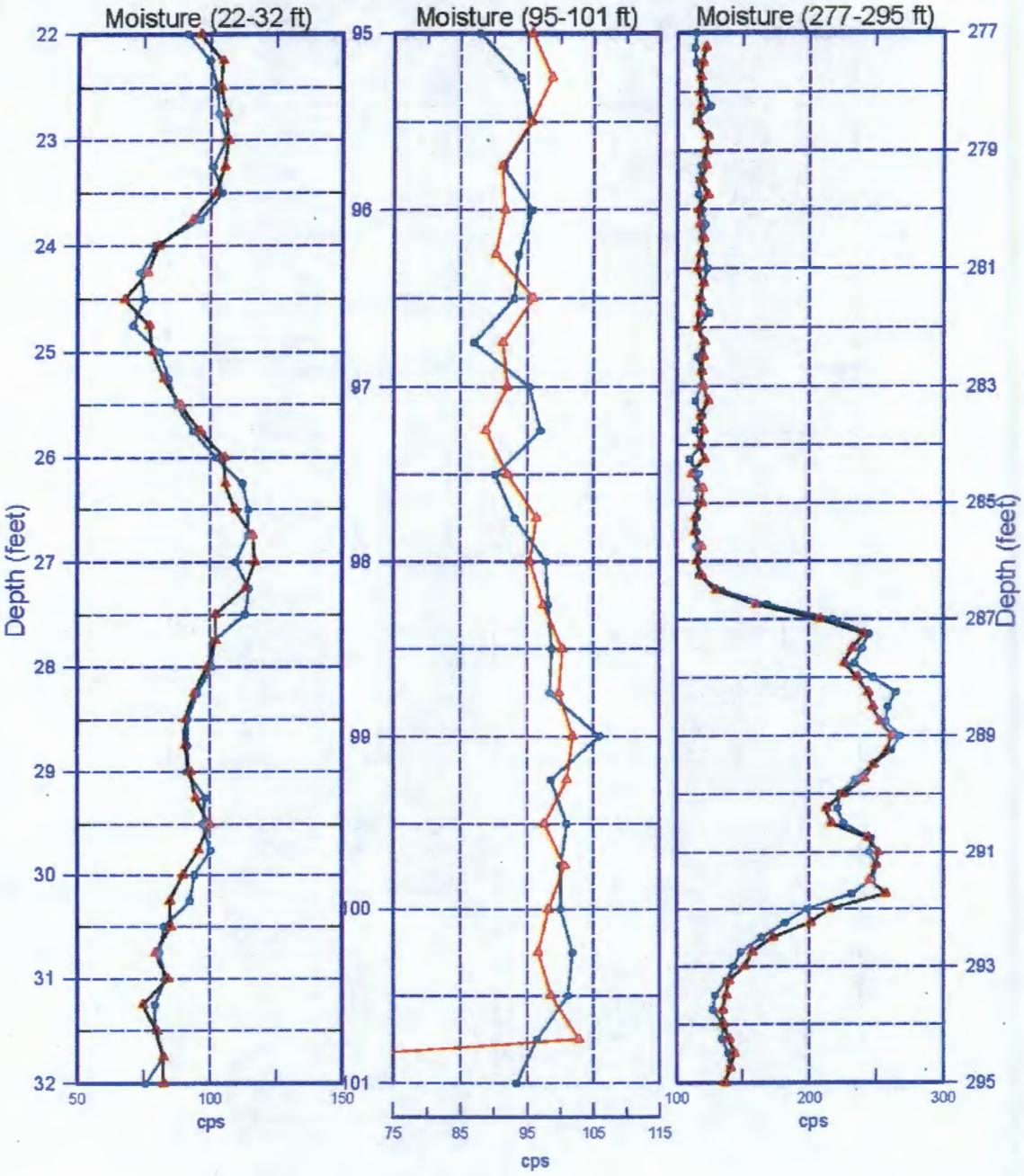
Reference - Ground Surface

Depth scale: 1"=20 ft

Last Log Date - 09/02/03

C-4160

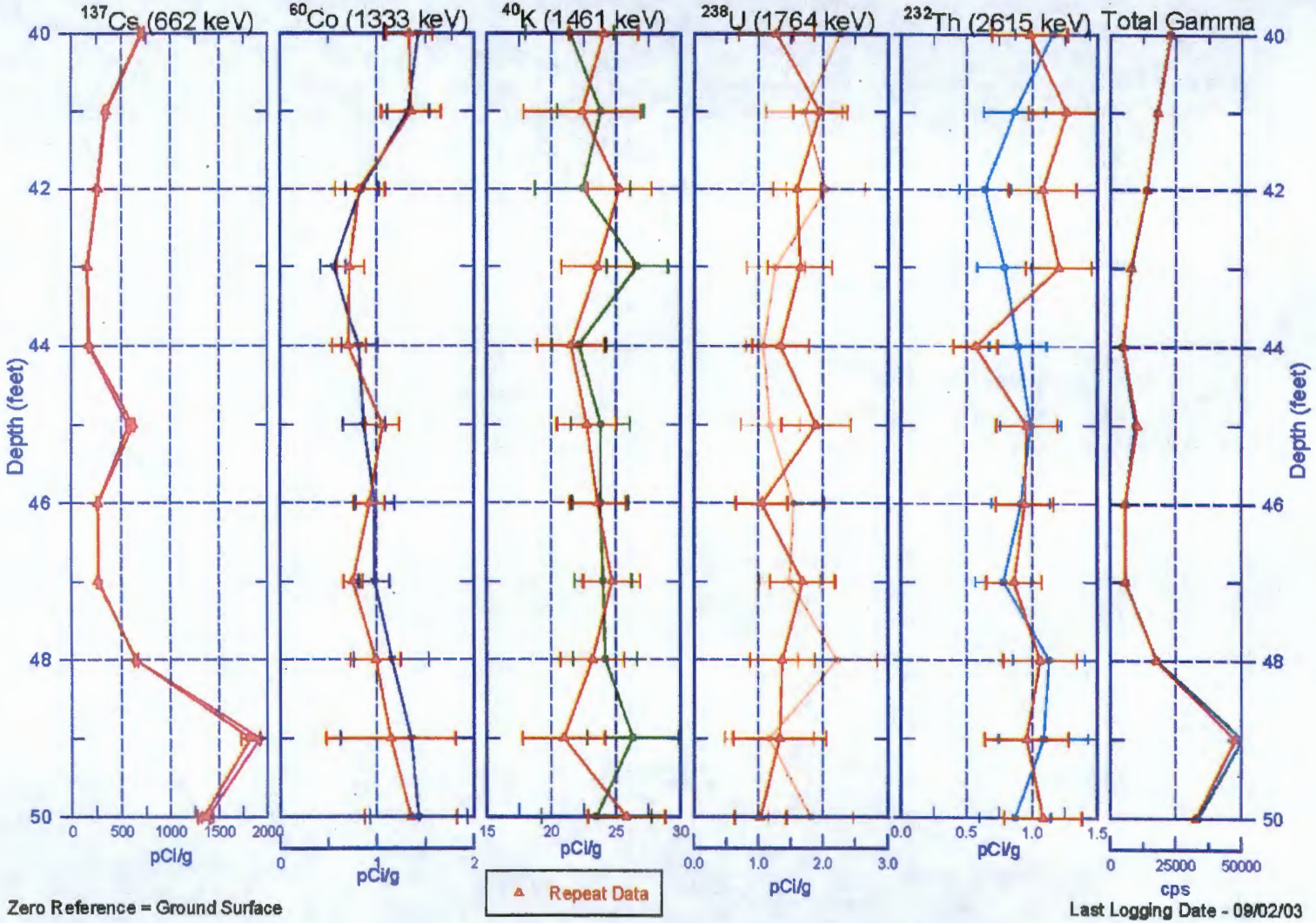
Repeat Sections of Moisture



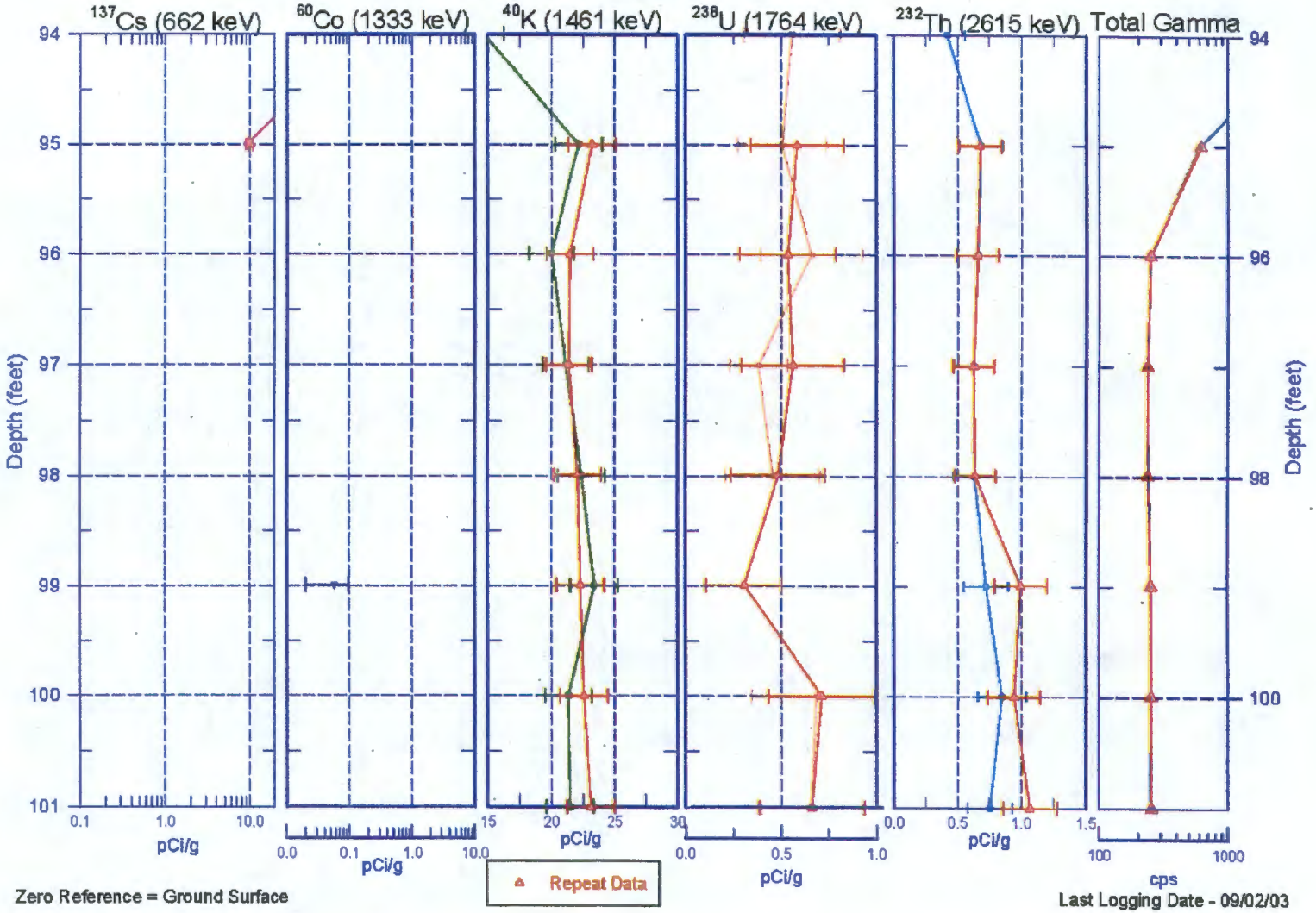
Zero Reference = Ground Surface

Last Log Date - 09/02/03

C-4160 Repeat Section

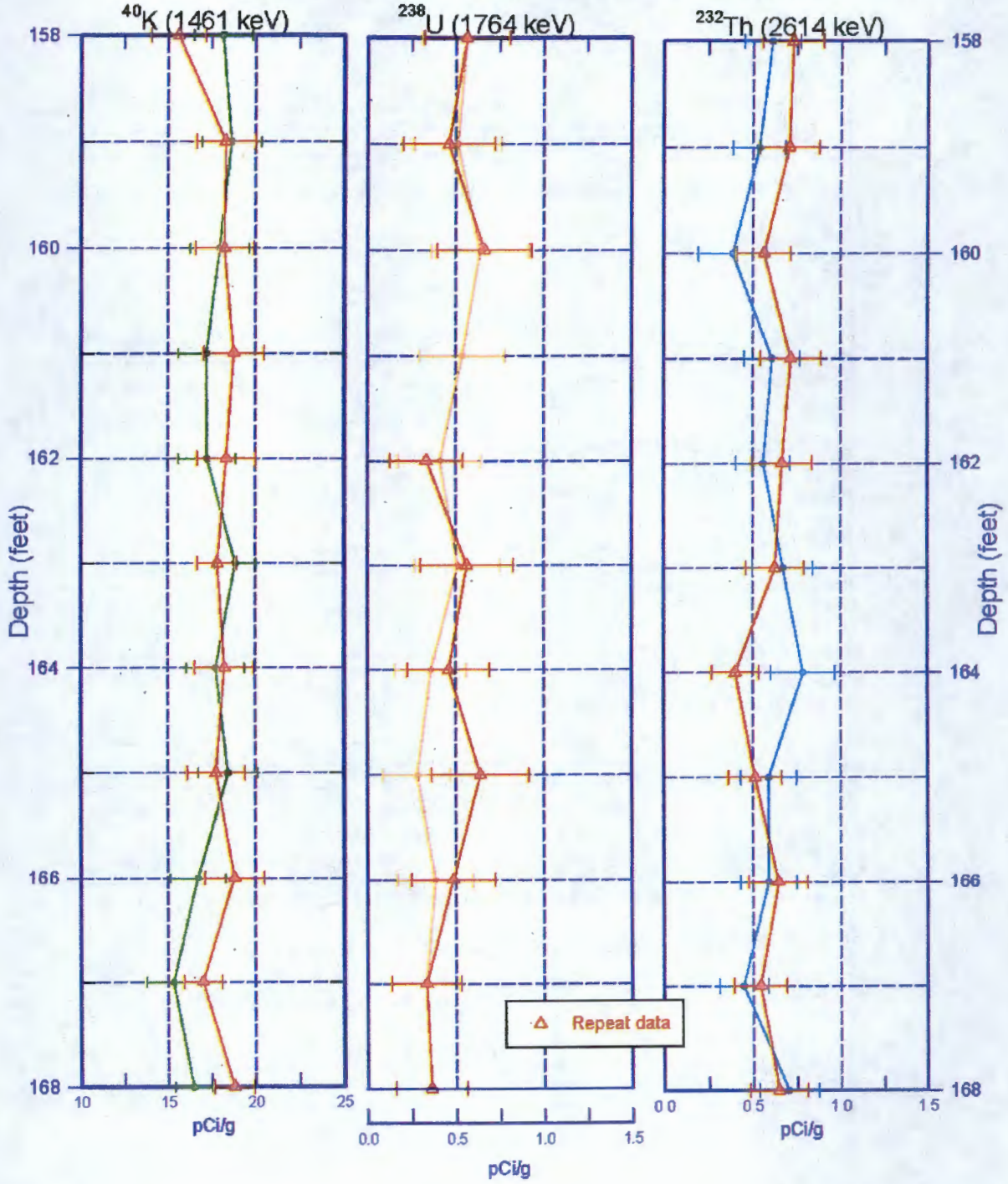


C-4160 Repeat Section



C-4160

Repeat Section of Natural Gamma Logs



Zero Reference = Ground Surface

Last Log Date - 09/02/03

Stoller
Grand Junction Office established 1959

C4106
Log Data Report

Borehole Information:

Borehole:	C4106		Site:	216-A-37-1 Crib	
Coordinates (WA State Plane)		GWL (ft)[1]:	~ 276	GWL Date:	5/08/2003
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
135,640.2 m	575,917.32 m	March 2003	206.76 m	275	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Steel	0.3	10 3/4	9 3/8	0.5	+0.3	69.0
Threaded Steel	1.25	9	8	0.5	+1.25	142.0
Threaded Steel	4.24	6 5/8	5 1/2	0.5625	+4.24	275

The driller provided the casing diameters and depths. The logging engineer measured the stickups using a steel tape. Casing thickness was calculated.

Borehole Notes:

Zero reference is the ground surface. Depth to bottom and depth to water were supplied by the driller. Borehole coordinates and elevation were provided by the project lead. Depth-to-bottom is the total depth that the sonde reached measured from the ground surface. Depth-to-water was reported by the driller and is approximated because the e-tape was not working. The driller also reported they stopped advancing after the bit showed only a couple inches of moisture. This borehole was logged through the drill pipe. The pad on ground surface is a layer of coarse crushed rock that is approximately 0.5 ft thick.

Logging Equipment Information:

Logging System:	Gamma 2E		Type:	70% HPGe
Calibration Date:	03/2003	Calibration Reference:	GJO-2003-430-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 2F		Type:	Moisture (H380932510)
Calibration Date:	09/2002	Calibration Reference:	GJO-2002-387-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2/Repeat	3	4/Repeat	5
Date	4/30/03	4/30/03	5/02/03	5/02/03	5/08/03
Logging Engineer	Pearson	Pearson	Kos	Kos	Kos
Start Depth (ft)	68.0	14.0	141.0	81.0	275.0
Finish Depth (ft)	0.0	7.0	65.0	71.0	140.0
Count Time (sec)	100	100	100	100	100

Log Run	1	2/Repeat	3	4/Repeat	5
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	N/A	N/A	N/A	N/A
Pre-Verification	BE028CAB	BE028CAB	BE029CAB	BE029CAB	BE030CAB
Start File	BE028000	BE028069	BE029000	BE029077	BE030000
Finish File	BE028068	BE028076	BE029076	BE029087	BE030135
Post-Verification	BE028CAA	BE028CAA	BE029CAA	BE029CAA	BE030CAA
Depth Return Error (in.)	1 low	1 low	N/A	0	N/A
Comments	No fine-gain adjustments.	No fine-gain adjustments.	Fine-gain adjustment after file -066.	No fine-gain adjustment.	Fine-gain adjustment after files -055, -132.

Log Run	6/Repeat				
Date	5/08/03				
Logging Engineer	Kos				
Start Depth (ft)	159.0				
Finish Depth (ft)	145.0				
Count Time (sec)	100 s				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	N/A				
Pre-Verification	BE030CAB				
Start File	BE030136				
Finish File	BE030150				
Post-Verification	BE030CAA				
Depth Return Error (in.)	+1				
Comments	Repeat section.				

Neutron-Moisture Logging System (NMLS) Log Run Information:

Log Run	1	2/Repeat	3	4/Repeat
Date	4/30/03	4/30/03	5/02/03	5/02/03
Logging Engineer	Pearson	Pearson	Kos	Kos
Start Depth (ft)	0.0	60.0	65.0	71.0
Finish Depth (ft)	68.0	67.0	141.0	81.0
Count Time (sec)	N/A	N/A	N/A	N/A
Live/Real	N/A	N/A	NA	N/A
Shield (Y/N)	N/A	N/A	N/A	N/A
MSA Interval (ft)	N/A	N/A	N/A	N/A
ft/min	1.0	1.0	1.0	1.0
Pre-Verification	BF054CAB	BF054CAB	BF058CAB	BF058CAB
Start File	BF054000	BF054273	BF058000	BF058305
Finish File	BF054272	BF054301	BF058304	BF058345
Post-Verification	BF054CAA	BF054CAA	BF058CAA	BF058CAA
Depth Return Error (in.)	N/A	1.0 high	N/A	0
Comments	No fine-gain adjustment.		No fine-gain adjustment.	

Log Run	5	6/Repeat		
Date	5/12/03	5/12/03		
Logging Engineer	Kos	Kos		
Start Depth (ft)	140.0	200.0		
Finish Depth (ft)	275.0	215.0		
Count Time (sec)	N/A	N/A		
Live/Real	N/A	N/A		
Shield (Y/N)	N/A	N/A		
MSA Interval (ft)	N/A	N/A		
ft/min	1.0	1.0		
Pre-Verification	BF059CAB	BF059CAB		
Start File	BF059000	BF059541		
Finish File	BF059540	BF059601		
Post-Verification	BF059CAA	BF059CAA		
Depth Return Error (in.)	N/A	0.5 high		
Comments	No fine-gain adjustment.	Repeat section.		

Logging Operation Notes:

Zero reference was the ground surface, and the borehole was logged through drill pipe. Logging operations were conducted in three separate events as the borehole was advanced. Each time the casing was "telescoped", the borehole was logged such that each interval was logged through a single casing string. Logging was performed with a centralizer installed on the sonde. SGLS data were collected using Gamma 2E. Pre- and post-survey verification measurements employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 082.

Analysis Notes:

Analyst:	Sobczyk	Date:	5/27/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits. The verification spectra were all within the control limits. 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 the day were between 4 percent lower and 1 percent higher at the end of the day.

NMLS pre-run and post-run verification measurements were made at the beginning and end of the day and compared to the control limits established on 12/05/2002. The verification spectra were all within the control limits except for BF058CAA and BF059CAB. Verification spectrum BF058CAA registered 736 cps, which was slightly above the upper control limit of 735 cps. Verification spectrum BF059CAB registered 18 cps, which was considerably below the lower control limit of 681 cps.

SGLS log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. 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: G2EMar03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the ground surface. On the basis of measurements supplied by the driller, the casing configuration was assumed to be one string of 10-in. casing to 69 ft, one string of 8-in. casing to 142 ft and one string of 6-in. casing to 275 ft. The casing correction factor was calculated using a 10-in. casing thickness of 0.5 in., an 8-in. casing thickness of 0.5 in., and a 6-in. casing thickness of 0.5625 in. Because the borehole was logged in stages, the casing correction is not additive; the borehole was logged through one string of casing during each logging run. However, the end of logging runs 3 and 5 (i.e., final

4 ft) were run in a dual string of pipe and the casing correction is additive (0.5 in. + 0.5 in = 1.0 in.). Water and dead time corrections were not needed or applied.

NMLS log spectra were processed in batch mode using APTEC SUPERVISOR to determine count rates. Zero reference was the ground surface. Calibration data are available only for 8-in. casing. The volume fraction of water was not calculated because only a portion of the borehole was logged through 8-in. casing.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, gross gamma and neutron total counts, 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 is less affected by the presence of radon in the borehole.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected near the ground surface (0 to 2 ft) with a concentration of 0.3 pCi/g. ^{137}Cs was detected in the interval from 9 ft through 36 ft at concentrations ranging from 0.2 pCi/g to 30 pCi/g. The maximum concentration of ^{137}Cs was measured at 10 ft. In addition, ^{137}Cs was detected at 62, 65, and 167 ft with concentrations near the MDL of approximately 0.2 pCi/g. After examination of the spectra at these depths, it was determined that there is no evidence of a photopeak at 662 keV. These reported peaks are probably the result of statistical fluctuation.

The behavior of the ^{238}U log suggests that radon may be present inside the borehole casing. Determination of ^{238}U is based on measurement of gamma activity at 609 and/or 1764 keV associated with ^{214}Bi, under the assumption of secular equilibrium in the decay chain. However, ^{214}Bi is also a short-term daughter of ^{222}Rn. When radon is present, ^{214}Bi will tend to "plate" onto the casing wall and will quickly reach equilibrium with ^{222}Rn. Because the additional ^{214}Bi resulting from radon is on the inside of the casing, the effect of the casing correction is to amplify the 609 photopeak relative to the 1764 photopeak. (The magnitude of the casing correction factor decreases with increasing energy, but gamma rays originating inside the casing are not attenuated.) This effect is observed in the upper portion of the hole (log runs 1 and 2). The effects of radon appear to be minimal in the middle portion of the hole (log runs 3 and 4). The reason for variations in radon content between log runs on successive days is not known. Variations in radon content in boreholes are probably related to variations in surface weather conditions. Radon daughters such as ^{214}Bi may also "plate" onto the sonde itself. When this occurs, there is a gradual increase in total counts as well as photopeak counts associated with ^{214}Bi and ^{214}Pb. This phenomenon appears to best explain the observed discrepancy in ^{238}U values based on 609 keV versus those based on 1764 keV during log runs 3 and 4 (65 ft to 141 ft).

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS and NMLS data. ^{137}Cs and the natural radionuclides at energy levels of 662, 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs. The neutron-moisture and its repeat are within the acceptance criteria.

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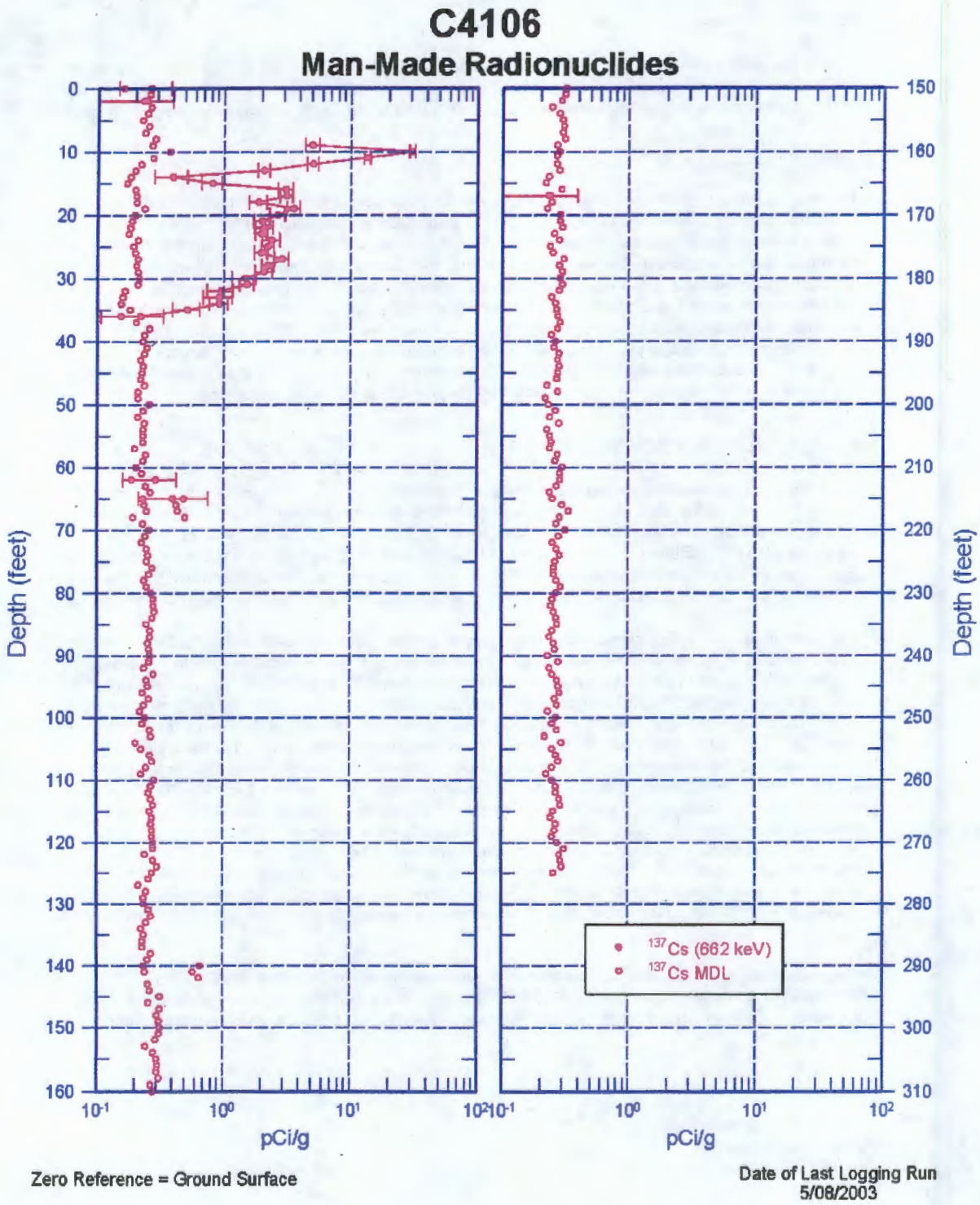
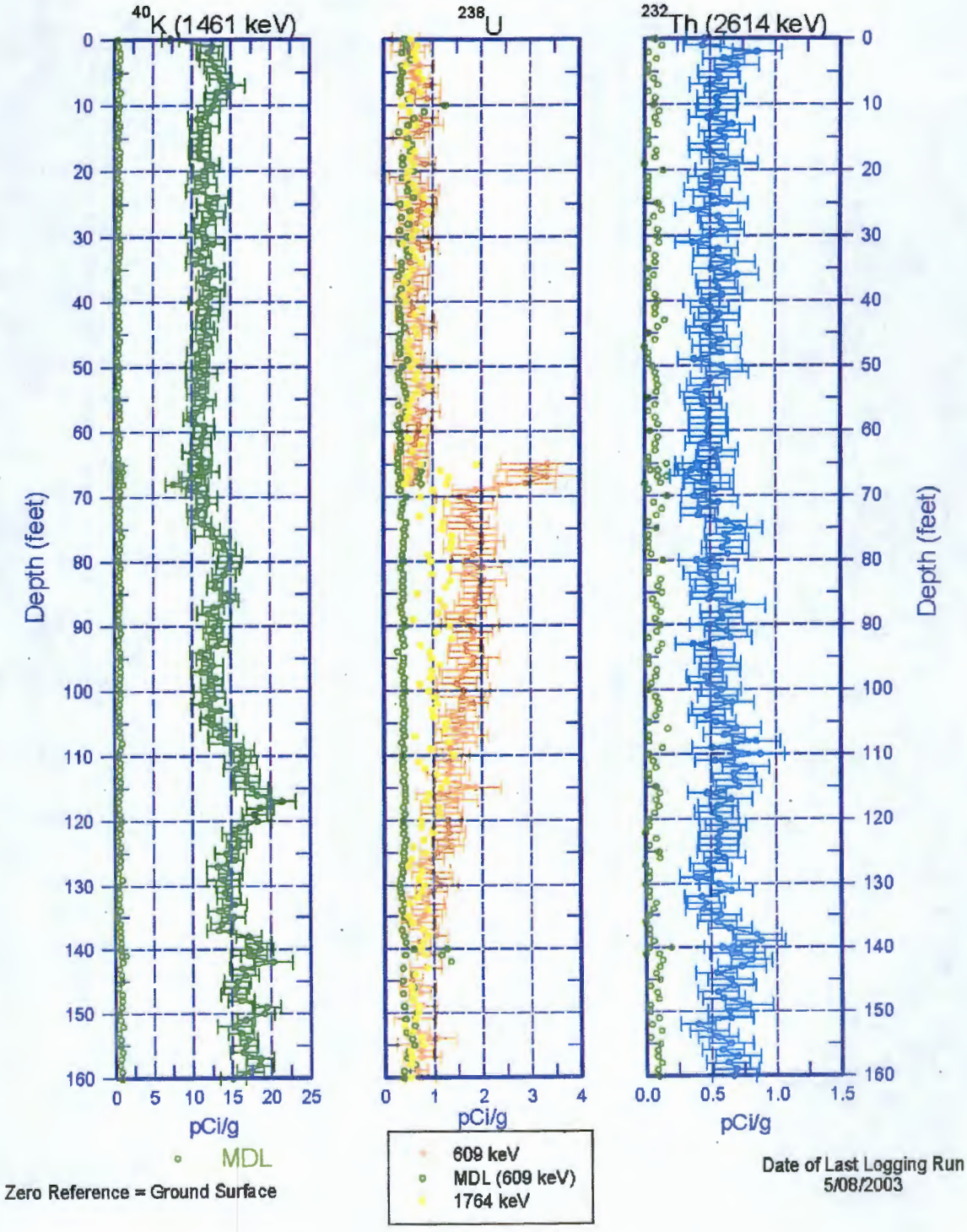
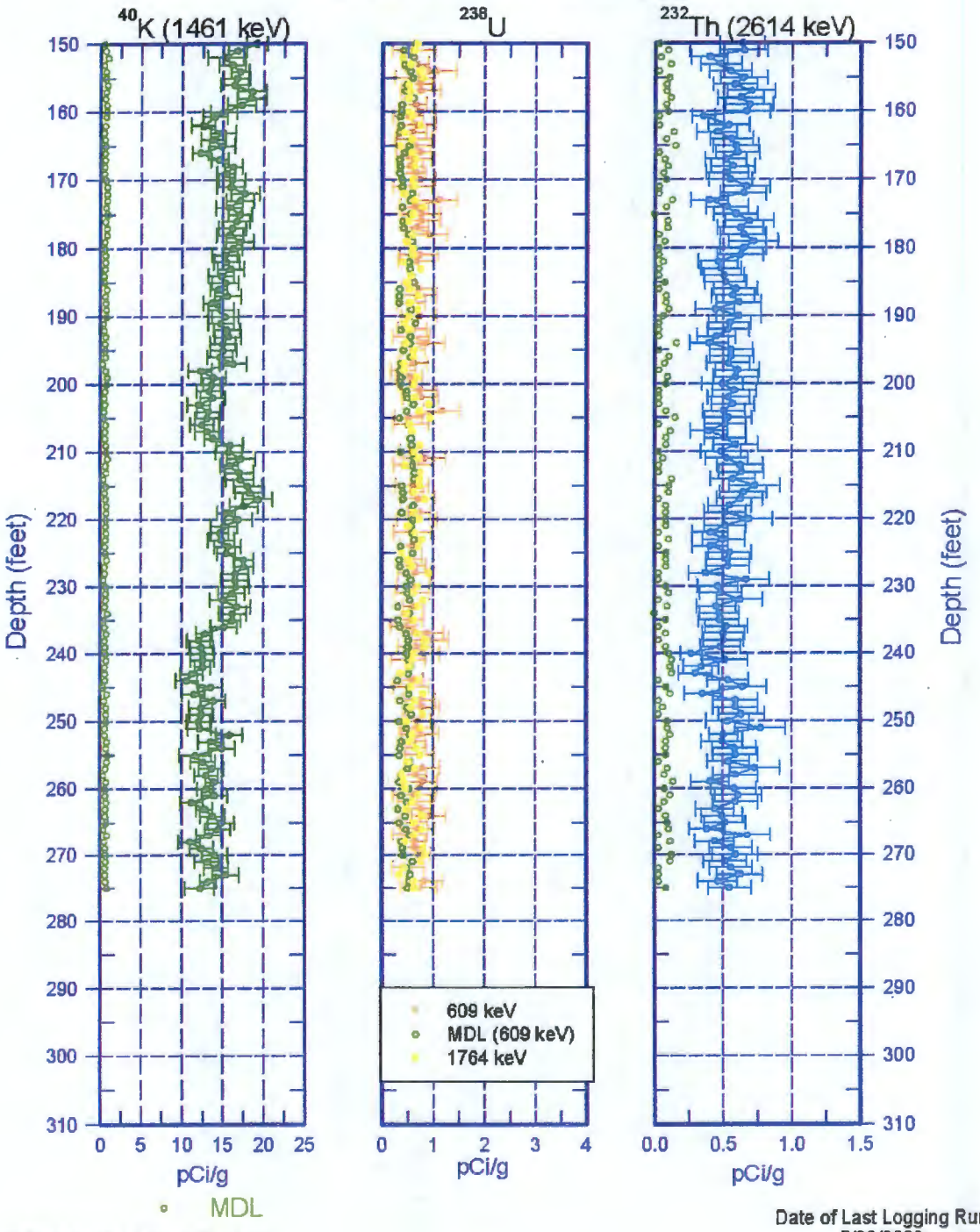
[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable


C4106
Man-Made Radionuclides
Depth (feet)
pCi/g
137Cs (662 keV)
137Cs MDL
Zero Reference = Ground Surface
Date of Last Logging Run
5/08/2003

C4106
Natural Gamma Logs



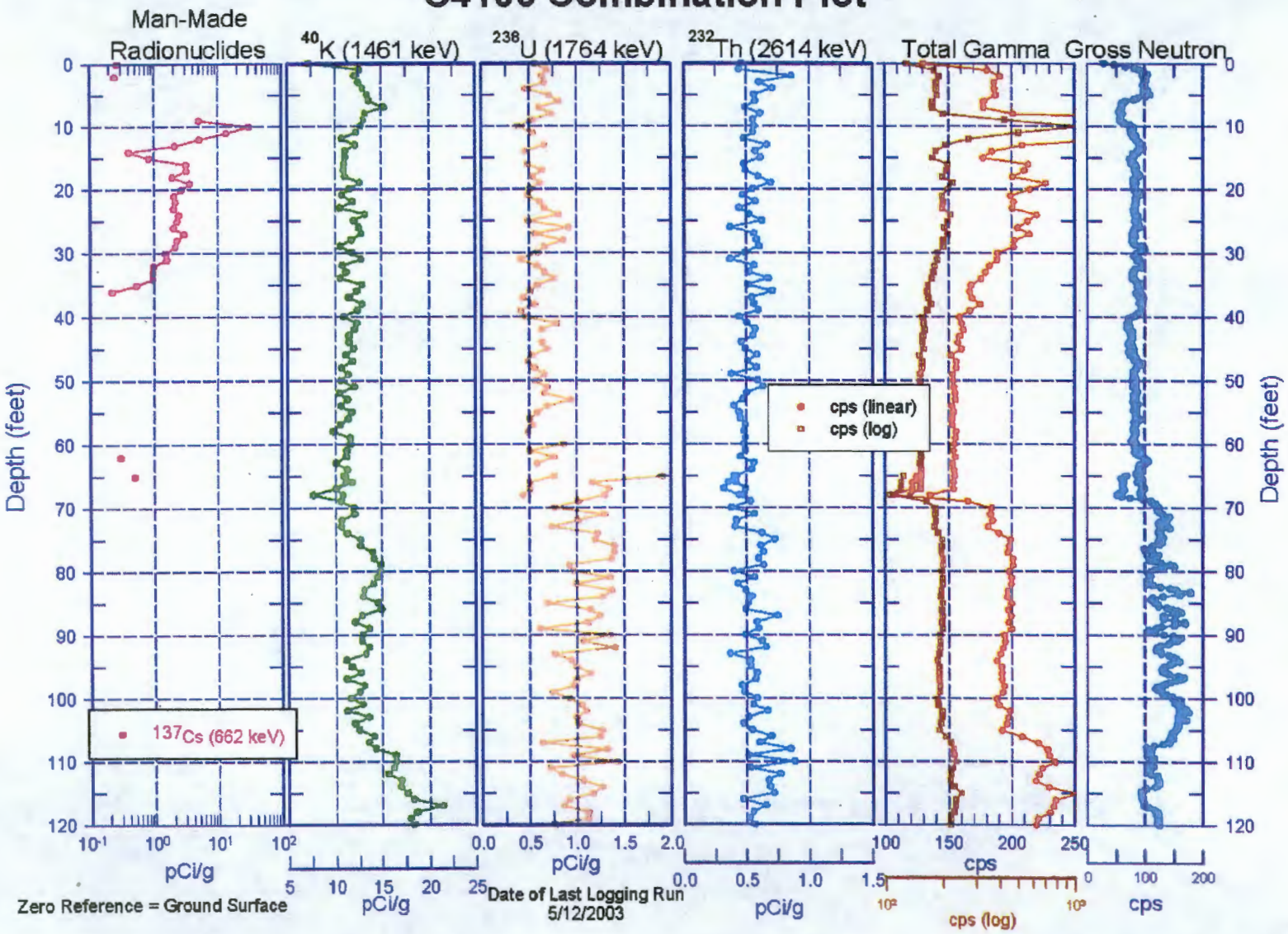
C4106
Natural Gamma Logs



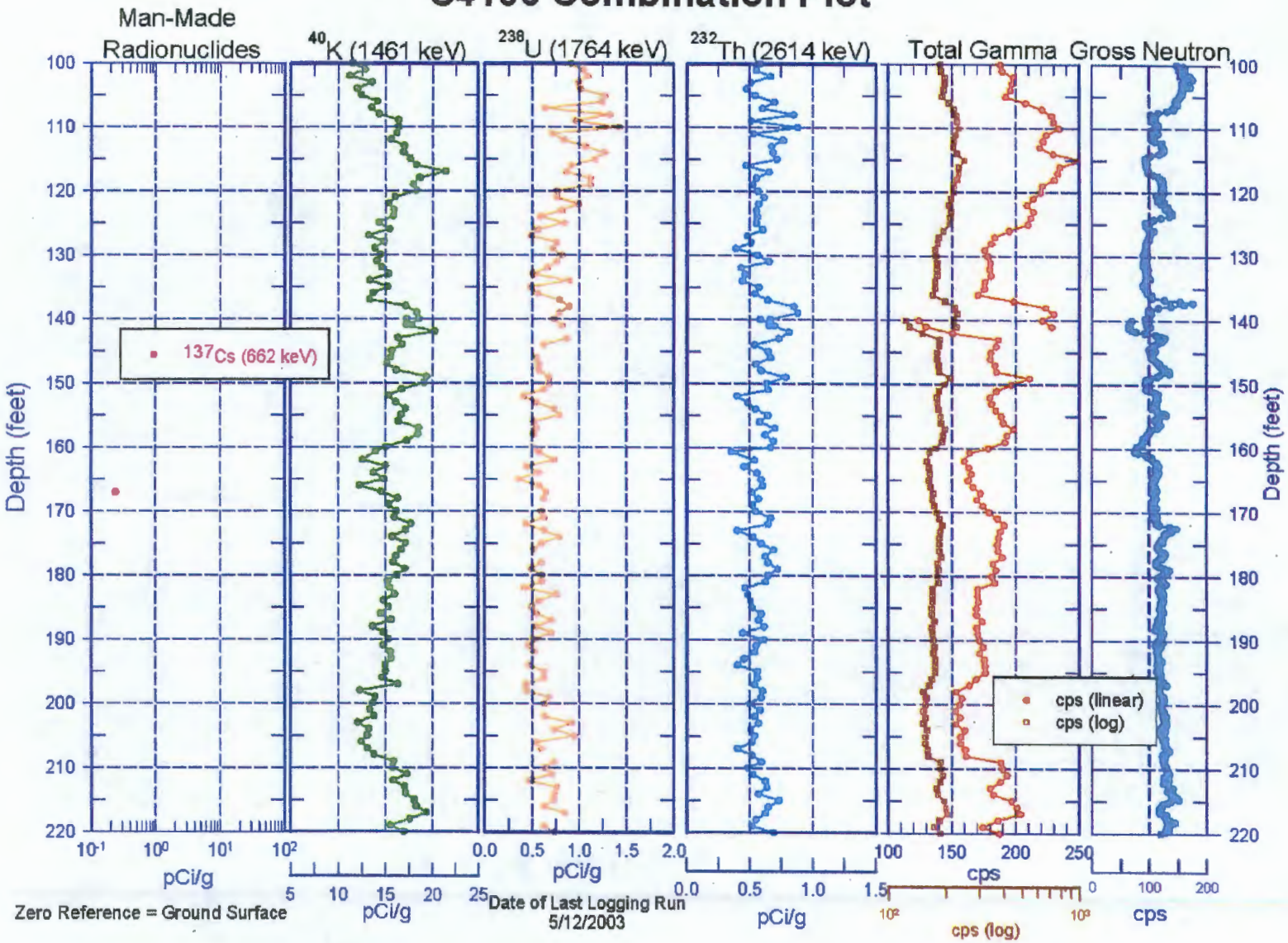
Zero Reference = Ground Surface

Date of Last Logging Run
5/08/2003

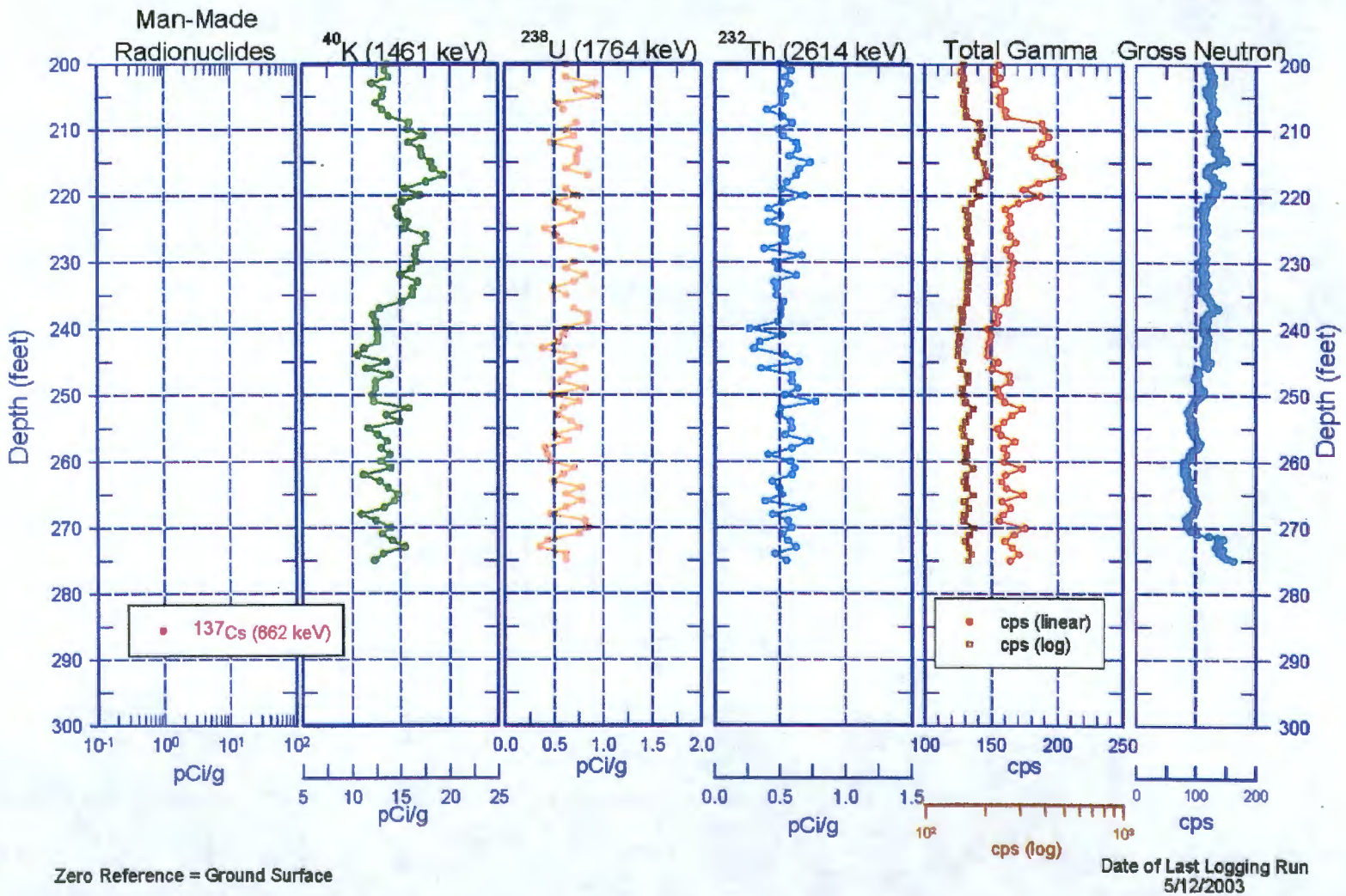
C4106 Combination Plot



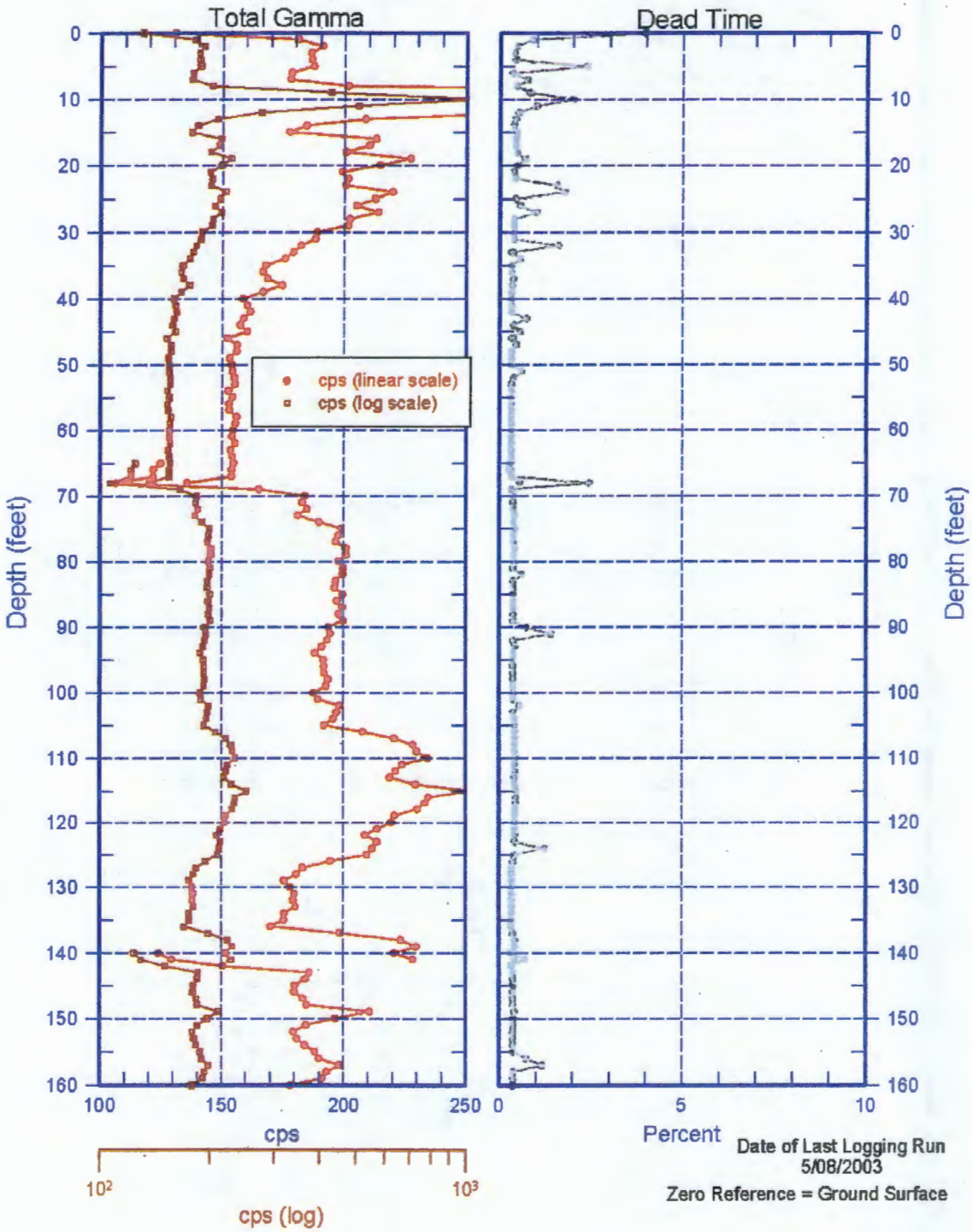
C4106 Combination Plot



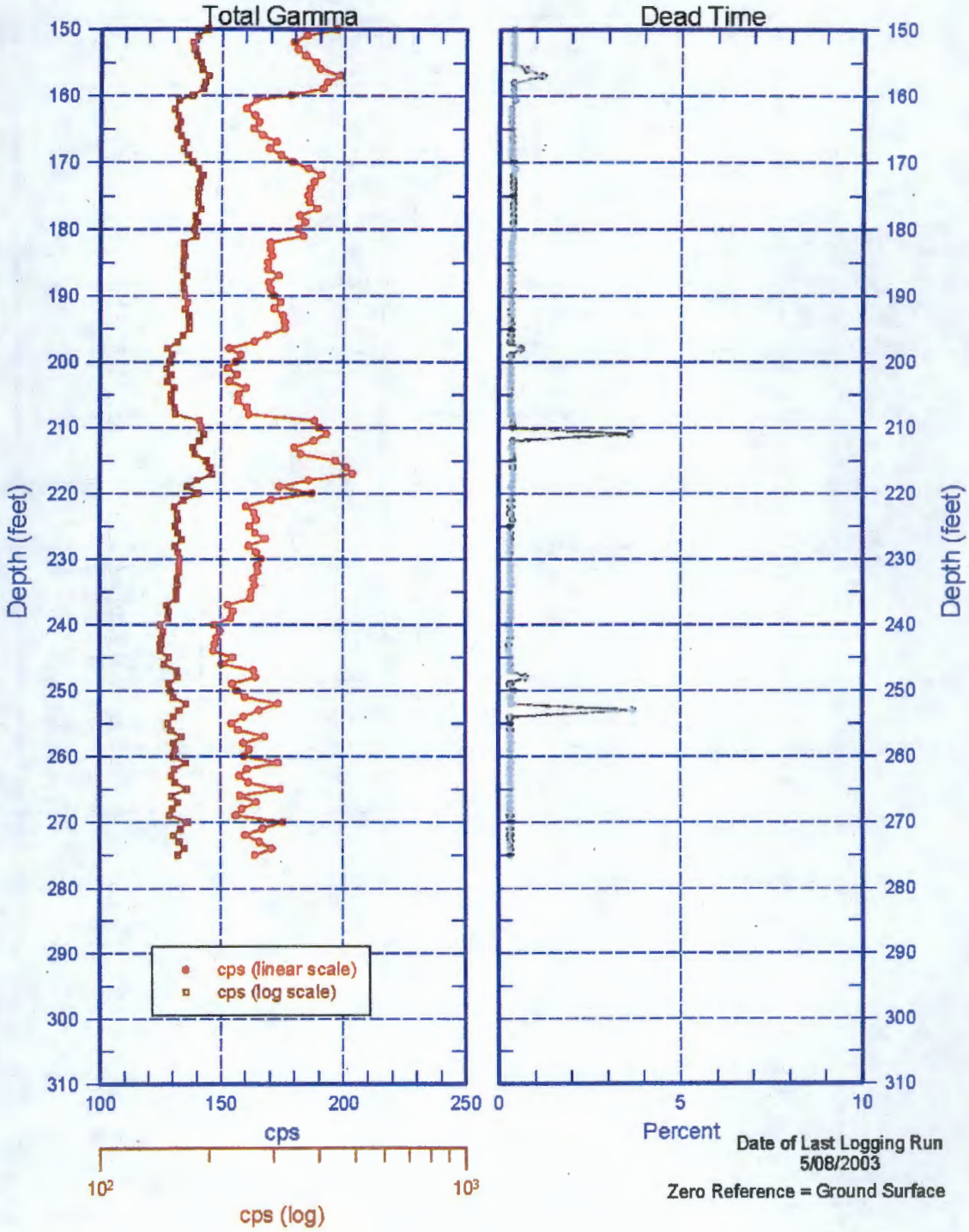
C4106 Combination Plot



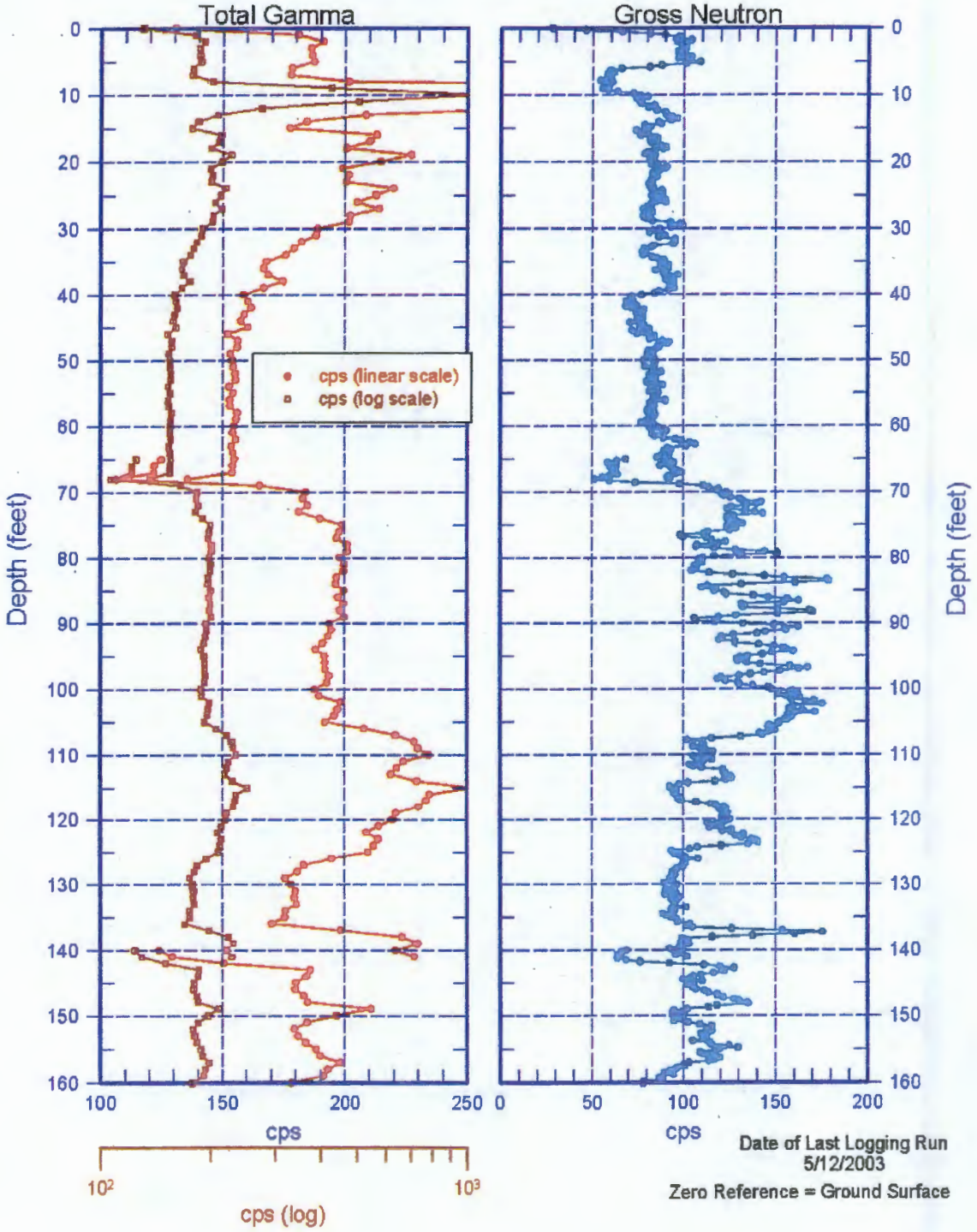
C4106
Total Gamma & Dead Time



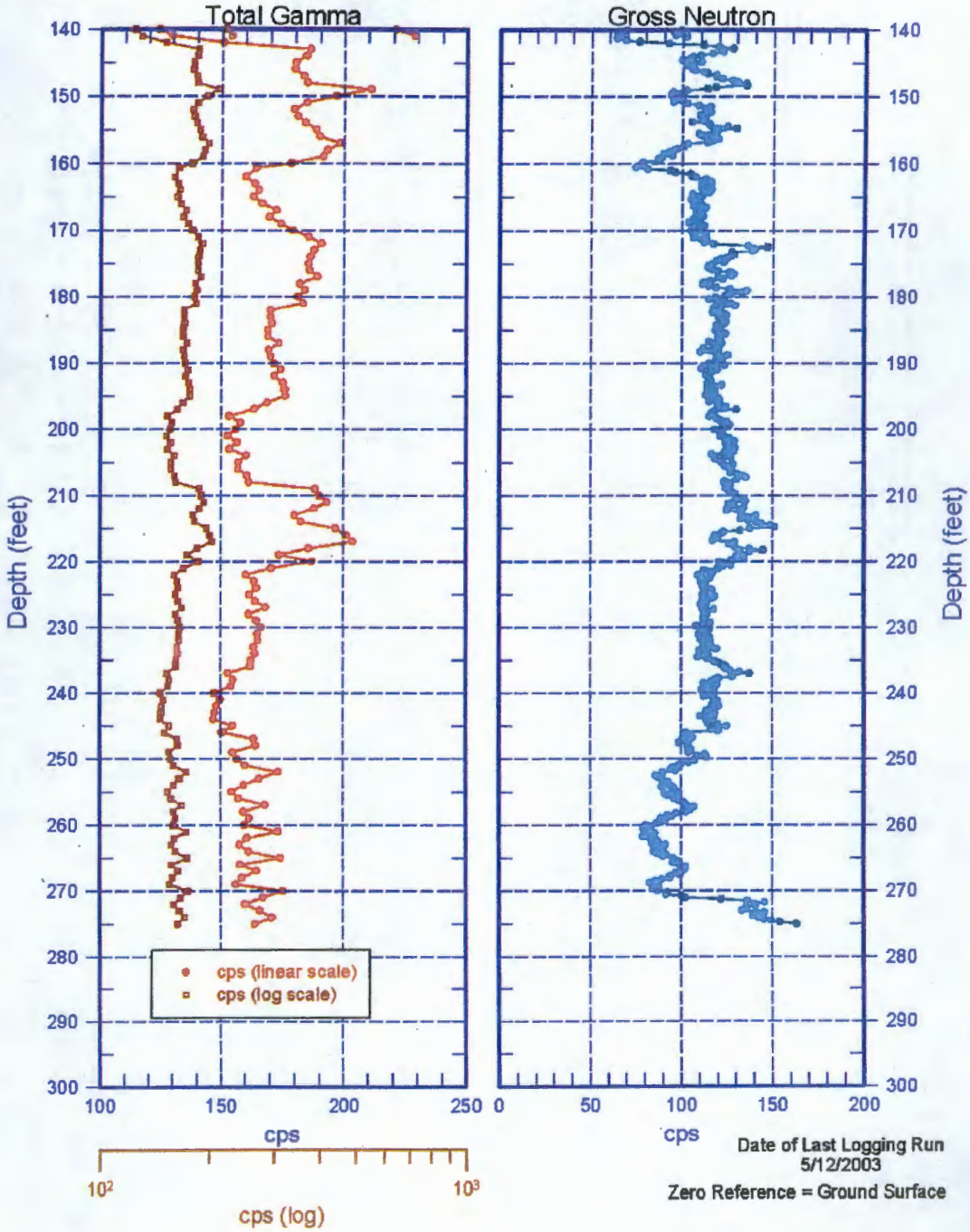
C4106
Total Gamma & Dead Time



C4106
Total Gamma & Neutron

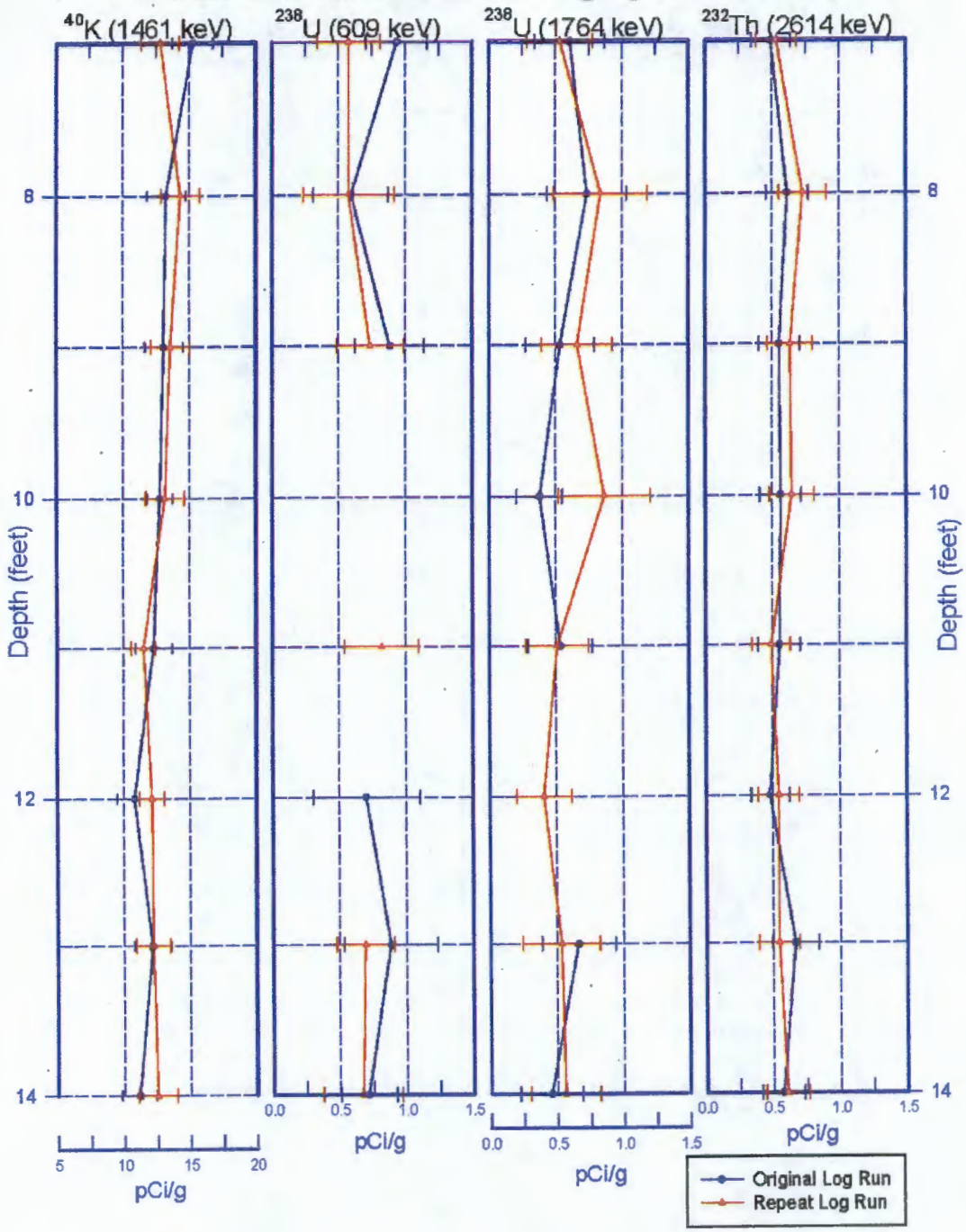


C4106
Total Gamma & Neutron



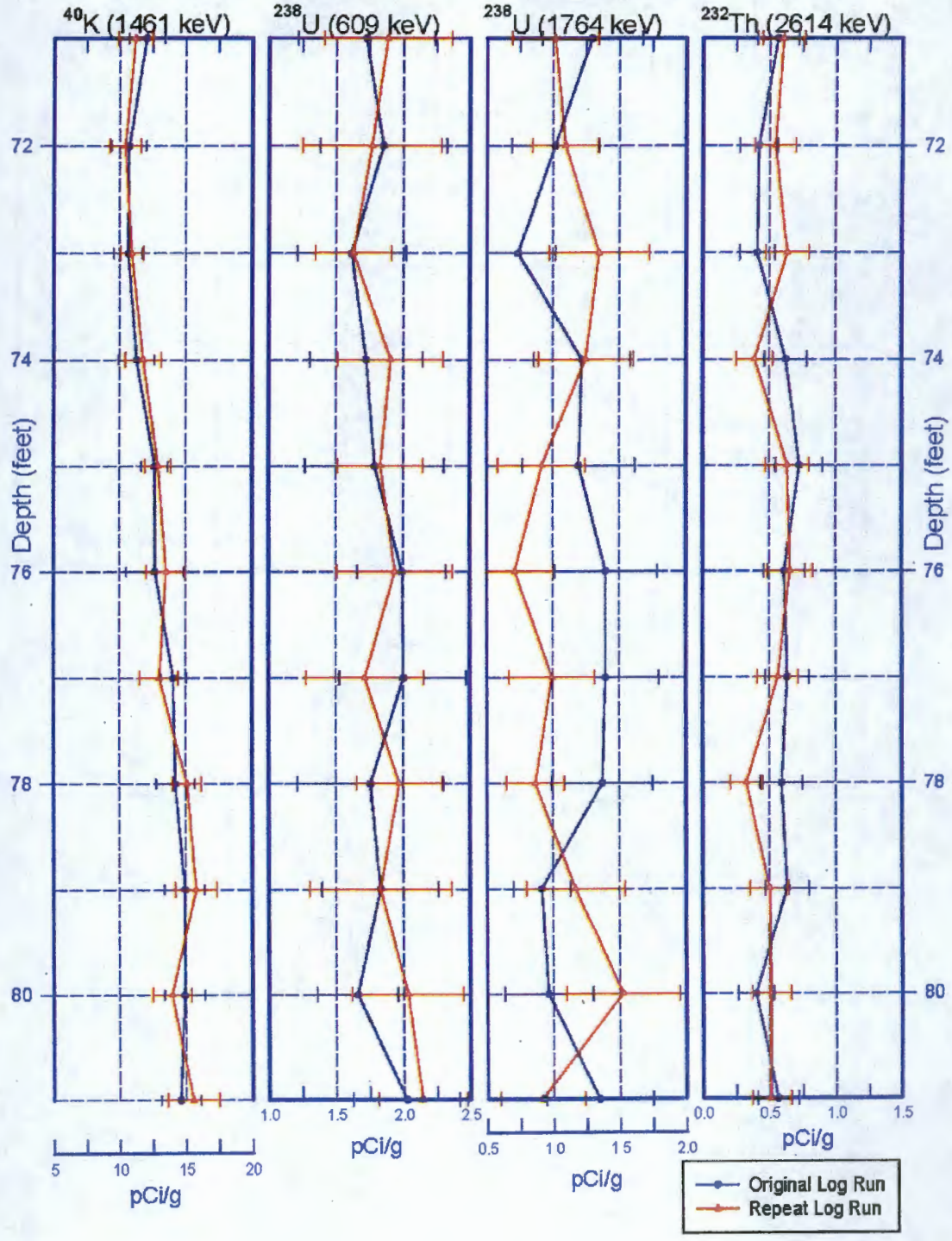
C4106

Rerun of Natural Gamma Logs (7.0 to 14.0 ft)



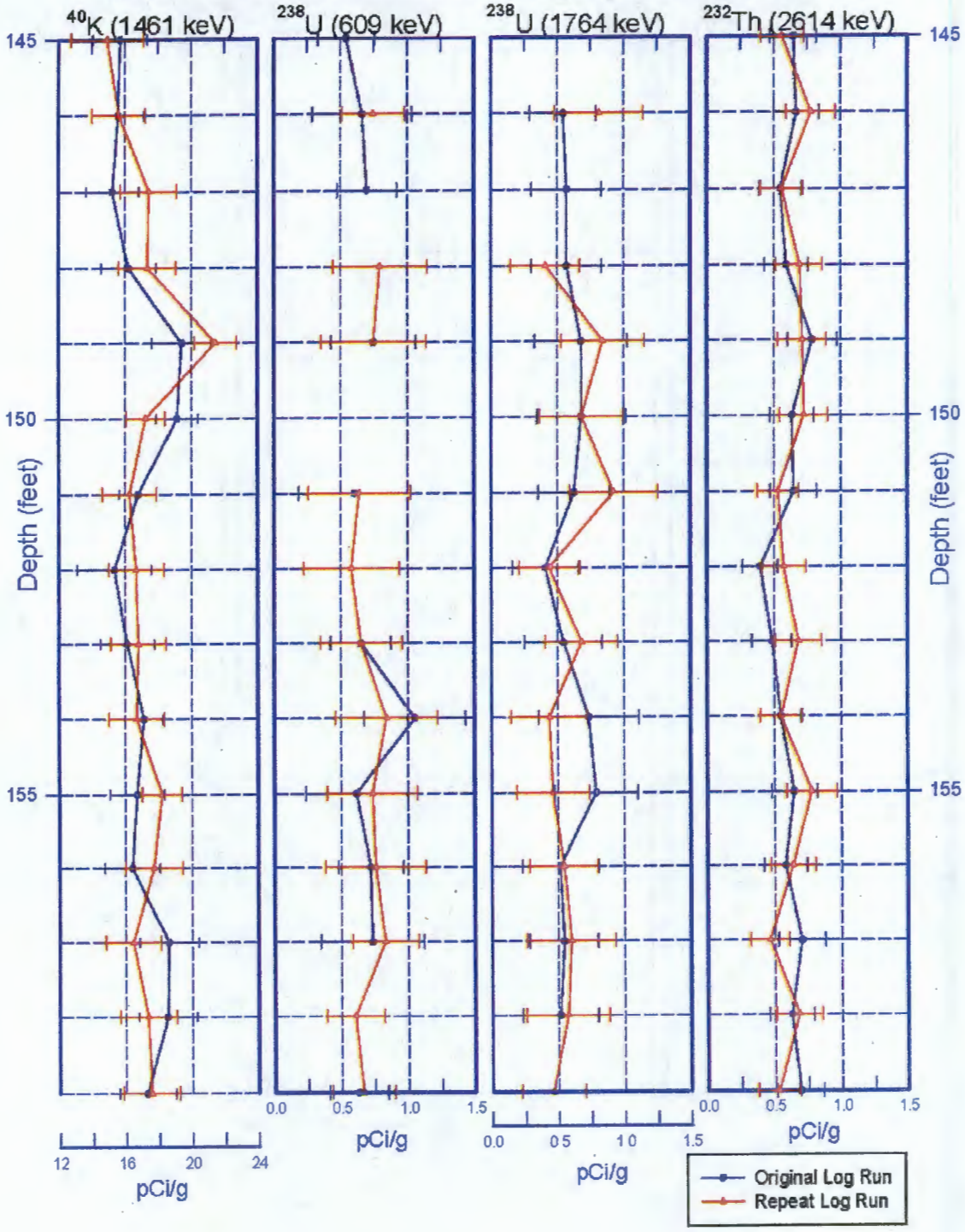
C4106

Rerun of Natural Gamma Logs (81.0 to 68.0 ft)



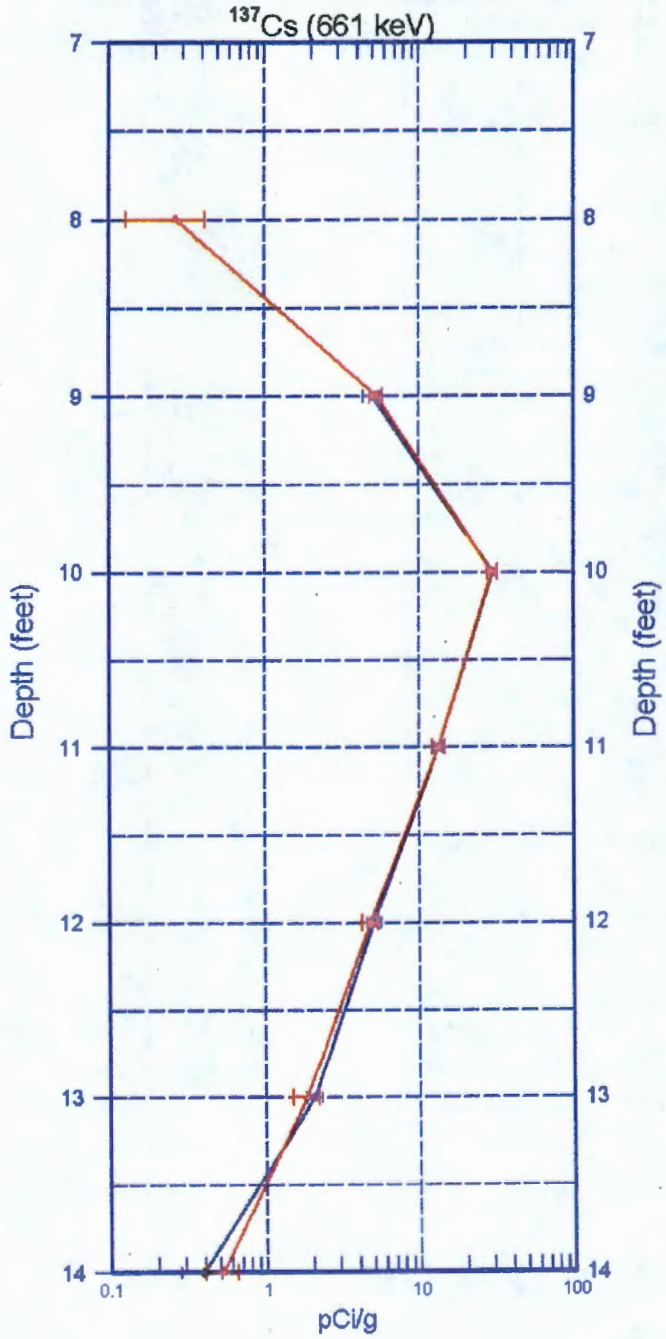
C4106

Rerun of Natural Gamma Logs (145.0 to 159.0 ft)



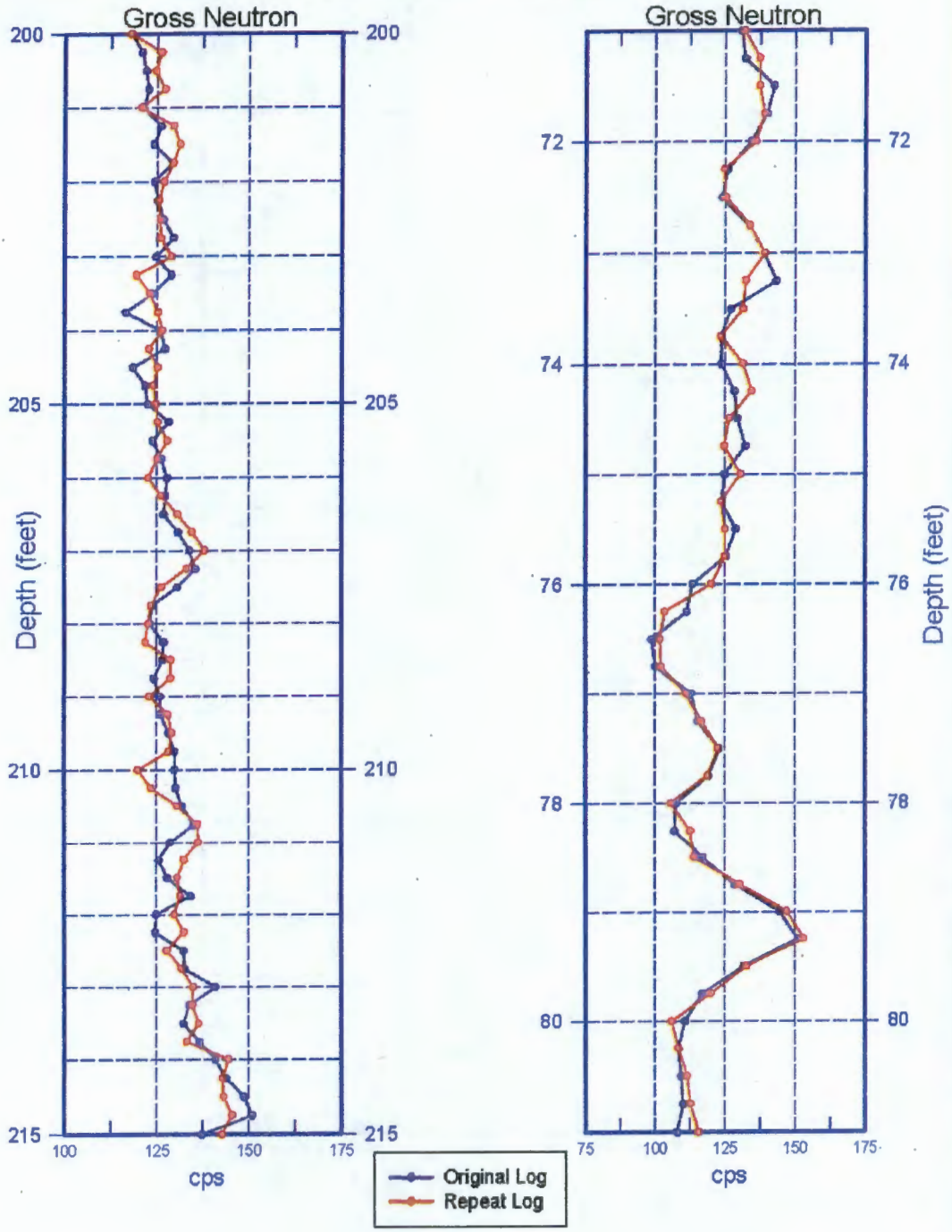
C4106

Rerun of Man-Made Radionuclides



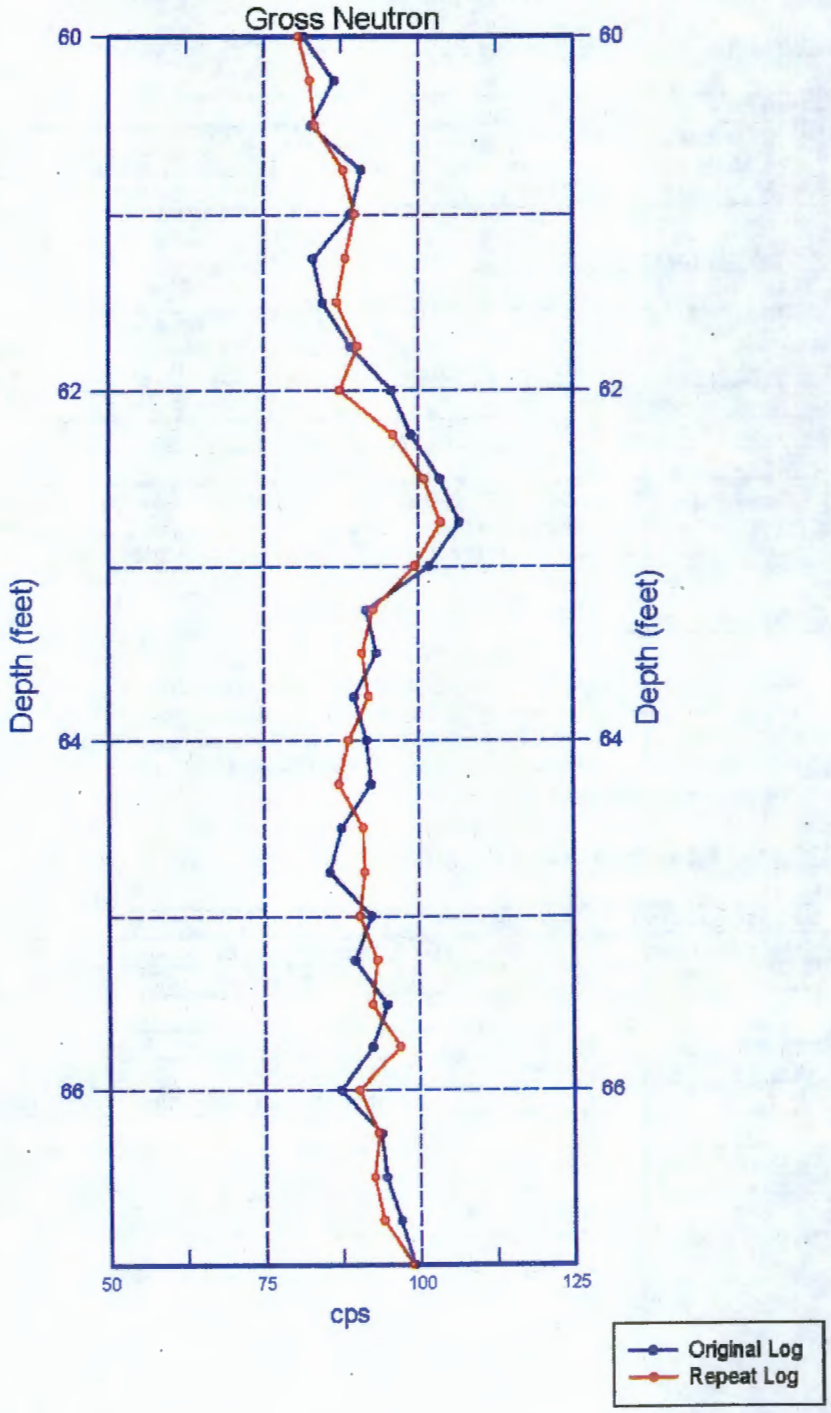
C4106

Reruns of Neutron-Moisture Log



C4106

Rerun of Neutron-Moisture Log (60.0 to 67.0 ft)



Stoller
Grand Junction Office
established 1949

C3246
Log Data Report

Borehole Information:

Borehole:	C3246		Site:	216-B-12 Crib	
Coordinates (WA State Plane)		GWL (ft)[1]:	305.08	GWL Date:	6/19/2003
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
136,589.69 m	573,128.61 m	June 2003	215.01	308	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Steel (06/04/03)	0.5	10 11/16	9 3/4	15/32	-0.5	111
Threaded steel (06/09/03)	1.1	9.0	8.0	1/2	+1.1	149
Threaded steel (06/18/03)	1.1	6 5/8	5 1/2	9/16	+1.1	303

The logging engineer measured the outside casing diameter with a caliper. Inside casing diameter and the caliper were measured using a steel tape; measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. The driller supplied casing depth. The stickup was measured using a steel tape.

Borehole Notes:

Zero reference is the ground surface. This borehole was logged through the drill pipe in stages through single strings of casing. There is approximately 6 in. of crushed gravel at the surface. Borehole coordinates and elevation were provided by the project lead. The driller reported that drilling stopped when the groundwater's capillary fringe was reached. Wet mud was sticking to the e-tape's sonde when the groundwater level was measured.

Logging Equipment Information:

Logging System:	Gamma 2E		Type:	70% HPGe (34TP40587A)
Calibration Date:	03/2003	Calibration Reference:	GJO-2003-430-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 1C		Type:	High Rate Detector (39-A314)
Calibration Date:	02/2002	Calibration Reference:	GJO-2002-309-TAR	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 2F		Type:	Moisture (H380932510)
Calibration Date:	10/2002	Calibration Reference:	GJO-2002-387-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	5
Date	6/5/03	6/5/03	6/5/03	6/5/03	6/9/03
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	0.0	31.0	70.0	30.0	147.0
Finish Depth (ft)	32.0	70.0	110.0	19.0	109.0
Count Time (sec)	100	15	100	100	100
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	BE036CAB	BE036CAB	BE036CAB	BE036CAB	BE037CAB
Start File	BE036000	BE036033	BE036073	BE036114	BE037000
Finish File	BE036032	BE036072	BE036113	BE036125	BE037038
Post-Verification	BE036CAA	BE036CAA	BE036CAA	BE036CAA	BE037CAA
Depth Return Error (in.)	N/A	N/A	N/A	0	N/A
Comments	File -028 was repeated see file -116. No fine-gain adjustment.	High-rate zone delineation. No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.	Fine-gain adjustment made after file -018.

Log Run	6/Repeat	7	8/Repeat		
Date	6/9/03	6/19/03	6/19/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	115.0	305.0	166.0		
Finish Depth (ft)	109.0	146.0	150.0		
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		
ft/min	N/A	N/A	N/A		
Pre-Verification	BE037CAB	BE044CAB	BE044CAB		
Start File	BE037039	BE044000	BE044160		
Finish File	BE037045	BE044159	BE044176		
Post-Verification	BE037CAA	BE044CAA	BE044CAA		
Depth Return Error (in.)	0	N/A	+1		
Comments	Fine-gain adjustment made after file -041.	No fine-gain adjustment.	Repeat section. No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3	4	5/Repeat
Date	6/5/03	6/5/03	6/5/03	6/5/03	6/5/03
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	86.0	69.0	67.0	32.0	39.0
Finish Depth (ft)	72.0	66.0	31.0	31.0	34.0
Count Time (sec)	300	300	100	300	100
Live/Real	R	R	R	R	R

Log Run	1	2	3	4	5/Repeat
Shield (Y/N)	None	None	None	None	None
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	AC073CAB	AC073CAB	AC073CAB	AC073CAB	AC073CAB
Start File	AC073000	AC073015	AC073019	AC073056	AC073058
Finish File	AC073014	AC0730018	AC073055	AC073057	AC073063
Post-Verification	AC073CAA	AC073CAA	AC073CAA	AC073CAA	AC073CAA
Depth Return Error (in.)	N/A	N/A	N/A	N/A	-1.5
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.

Neutron-Moisture Logging System (NMLS) Log Run Information:

Log Run	1	2/Repeat	3	4/Repeat
Date	6/4/03	6/4/03	6/9/03	6/9/03
Logging Engineer	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	0	30.0	109.0	116.0
Finish Depth (ft)	110.25	42.0	147.0	122.0
Count Time (sec)	N/A	N/A	N/A	N/A
Live/Real	N/A	N/A	N/A	N/A
Shield (Y/N)	N	N	N	N
MSA Interval (ft)	N/A	N/A	N/A	N/A
ft/min	1.0	1.0	1.0	1.0
Pre-Verification	BF061CAB	BF061CAB	BF062CAB	BF062CAB
Start File	BF061000	BF061442	BF062000	BF062153
Finish File	BF061441	BF061490	BF062152	BF062177
Post-Verification	BF061CAA	BF061CAA	BF062CAA	BF062CAA
Depth Return Error (in.)	N/A	0	N/A	-0.5
Comments	None	Repeat section.	None	Repeat section.

Log Run	5	6/Repeat		
Date	6/18/03	6/18/03		
Logging Engineer	Kos	Kos		
Start Depth (ft)	146.0	290.0		
Finish Depth (ft)	304.75	275.0		
Count Time (sec)	N/A	N/A		
Live/Real	N/A	N/A		
Shield (Y/N)	N	N		
MSA Interval (ft)	N/A	N/A		
ft/min	1.0	1.0		
Pre-Verification	BF063CAB	BF063CAB		
Start File	BF063000	BF063638		
Finish File	BF063637	BF063697		
Post-Verification	BF063CAA	BF063CAA		
Depth Return Error (in.)	N/A	0.0		
Comments	None	Repeat section.		

Logging Operation Notes:

Zero reference was the ground surface, and the borehole was logged through drill pipe. Logging was performed with a centralizer installed on the sonde.

SGLS data were collected using Gamma 2E. Pre- and post-survey verification measurements employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 082.

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

Analysis Notes:

Analyst:	Sobczyk	Date:	7/2/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits. All of the verification spectra were within the control limits except for spectra BE036CAA and BE037CAA. The peak counts per second (cps) at the 2615-keV photopeak was below the control limit in spectrum BE036CAA. The peak counts per second at the 1461-keV photopeak was below the control limit in spectrum BE037CAA. 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 2 percent higher and 5 percent lower 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 each day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

NMLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits established on 12/05/2002. All of the verification spectra were within the control limits.

SGLS and HRLS log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. 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: G2EMar03.xls and G1CApr03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the ground surface. The casing configuration was assumed to be one string of 10-in. casing to 111 ft, one string of 8-in. casing to 149 ft, and one string of 6-in. casing to 303 ft. Below 303 ft, open hole was logged to a depth of 305 ft. The casing correction factor was calculated using casing thicknesses of 15/32 in., 1/2 in., and 9/16 in. for the 10-in., 8-in., and 6-in. casings, respectively. Because the borehole was logged in stages, the casing correction is not additive; the borehole was logged through one string of casing during each logging run. A water correction was not needed or applied to the data.

Using the SGLS, dead time greater than 40 percent was encountered in the intervals from 32 to 69 ft, 73 to 78 ft, and 80 to 86 ft. Data from these regions 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 were applied when dead time surpassed 10.5 percent. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent.

NMLS log spectra were processed in batch mode using APTEC SUPERVISOR to determine count rates. Zero reference was the ground surface. The volume fraction of water was calculated (for the portion of the borehole with 6 in. and 8 in. casing) in EXCEL, using parameters determined from analysis of recent calibration data. Calibration data are not available for the 10-in. casing.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, gross gamma and neutron total counts, gross gamma and volume fraction of water, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. The neutron-moisture data are displayed in a counts per second format on the combination plot so the data can be compared over the entire length of the borehole. 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, ^{238}U, and ^{154}Eu were the man-made radionuclides detected in this borehole. ^{137}Cs was detected near the ground surface (0 through 7 ft) at concentrations ranging from 0.3 to 14 pCi/g. ^{137}Cs was detected in the interval from 30 through 111 ft at concentrations ranging from 0.6 to 121,000 pCi/g. The maximum concentration of ^{137}Cs was measured at 35 ft. ^{137}Cs was also detected at 25 ft, 119 ft, 120 ft, and 268 ft with concentrations of 0.3, 0.3, 0.9, and 0.2 pCi/g, respectively. Processed ^{238}U was detected at 118 ft with a concentration of 13 pCi/g. ^{154}Eu was detected at 31 ft with a concentration of approximately 9 pCi/g. It is likely that ^{154}Eu also occurs within the high rate zone from 32 to 69 ft.

Recognizable changes in the KUT logs occurred in this borehole. At 23 ft, there is a 4-pCi/g decrease in ^{40}K concentration and a 0.3-pCi/g decrease in ^{232}Th concentration. Between 109 and 112 ft, there is an apparent 10-pCi/g increase in ^{40}K concentration. Between 146 and 150 ft, there is an apparent 15-pCi/g increase in ^{40}K concentration and a 1.0-pCi/g increase in ^{238}U concentration. These increases are associated with the different geometry near the base of the borehole as it was logged in stages. Below 185 ft, there is a 4-pCi/g decrease in ^{40}K concentration, which represents a transition to coarser grained sediments.

The plots of the repeat logs demonstrate reasonable repeatability of the HRLS, SGLS, and NMLS data. The man-made and natural radionuclides at energy levels of 662, 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs. The ^{137}Cs detected at 25 and 111 ft did not repeat. The man-made radionuclide at the energy level of 662 keV (^{137}Cs) is comparable between the repeat and original HRLS log runs.

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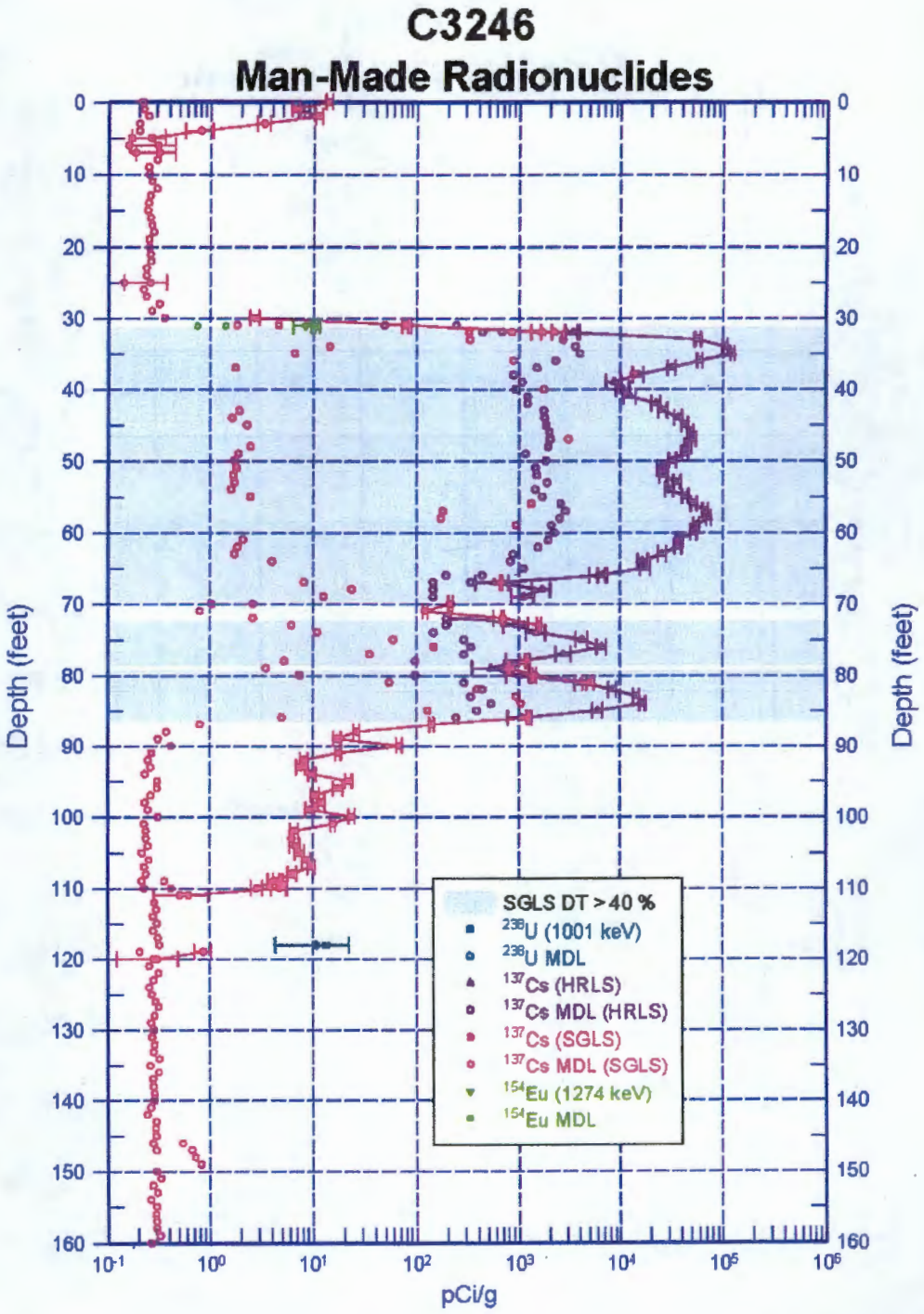
[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable

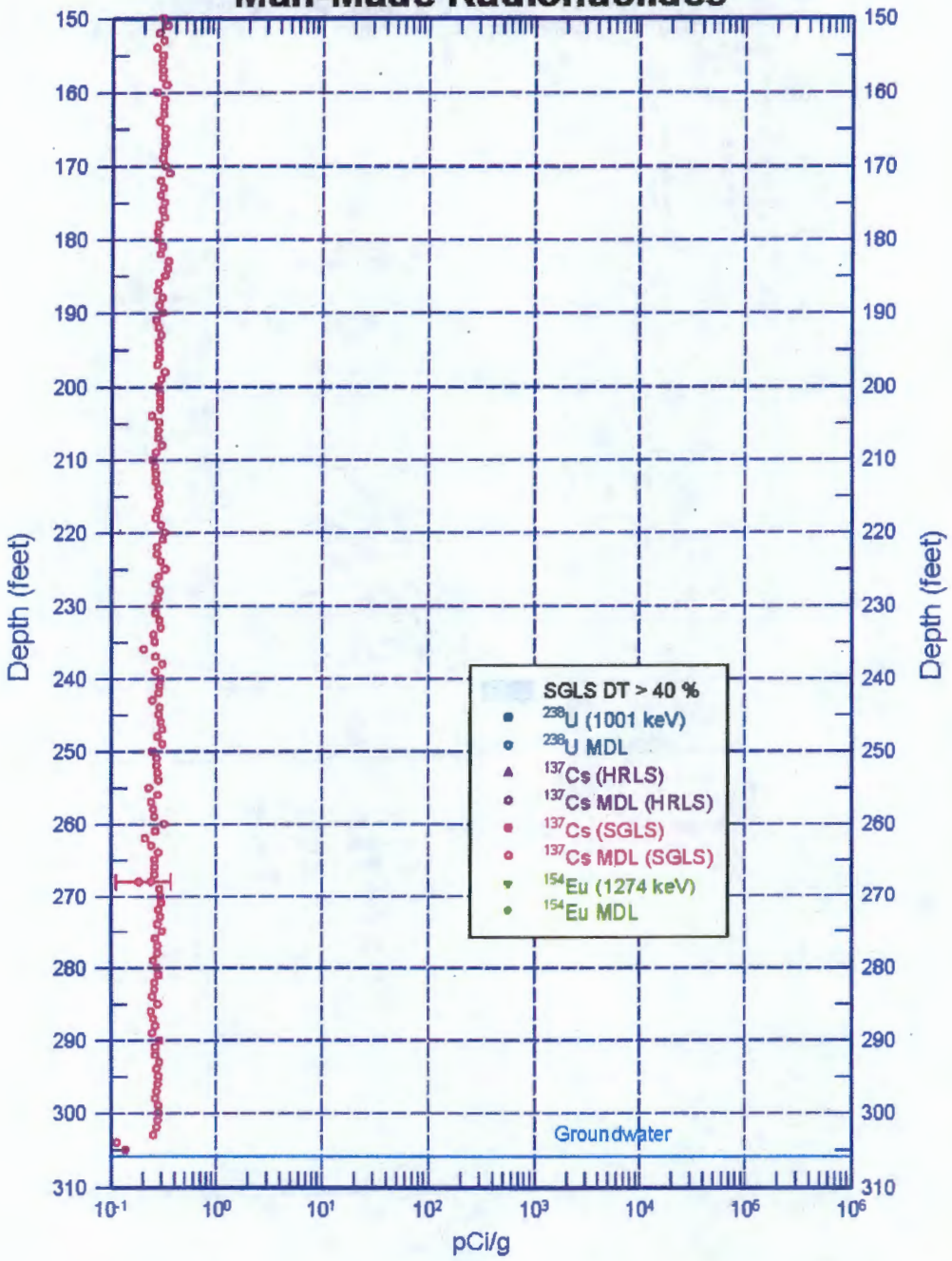


Zero Reference = Ground Surface

Date of Last Logging Run
6/19/2003

C3246

Man-Made Radionuclides



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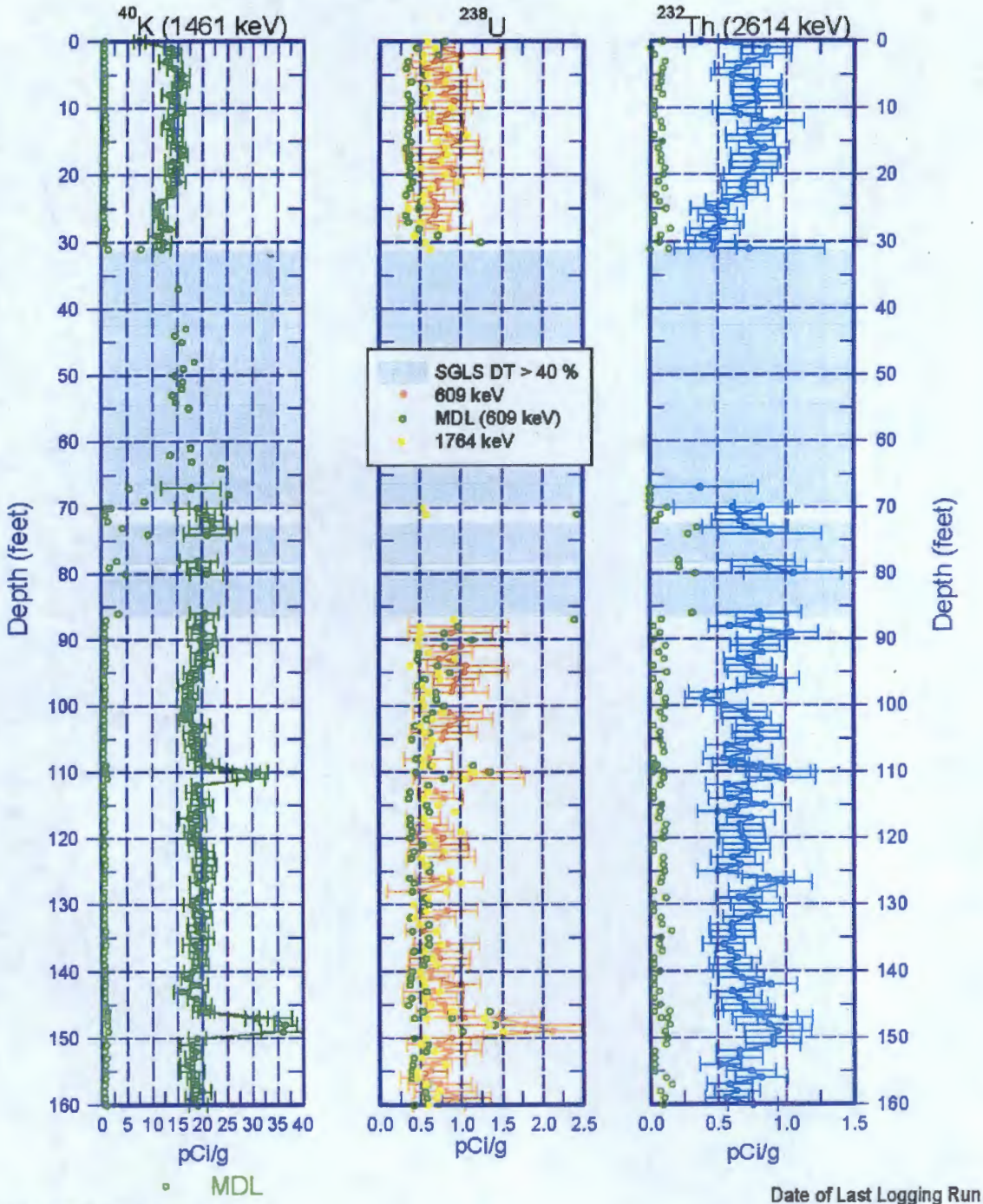
Date of Last Logging Run
6/19/2003

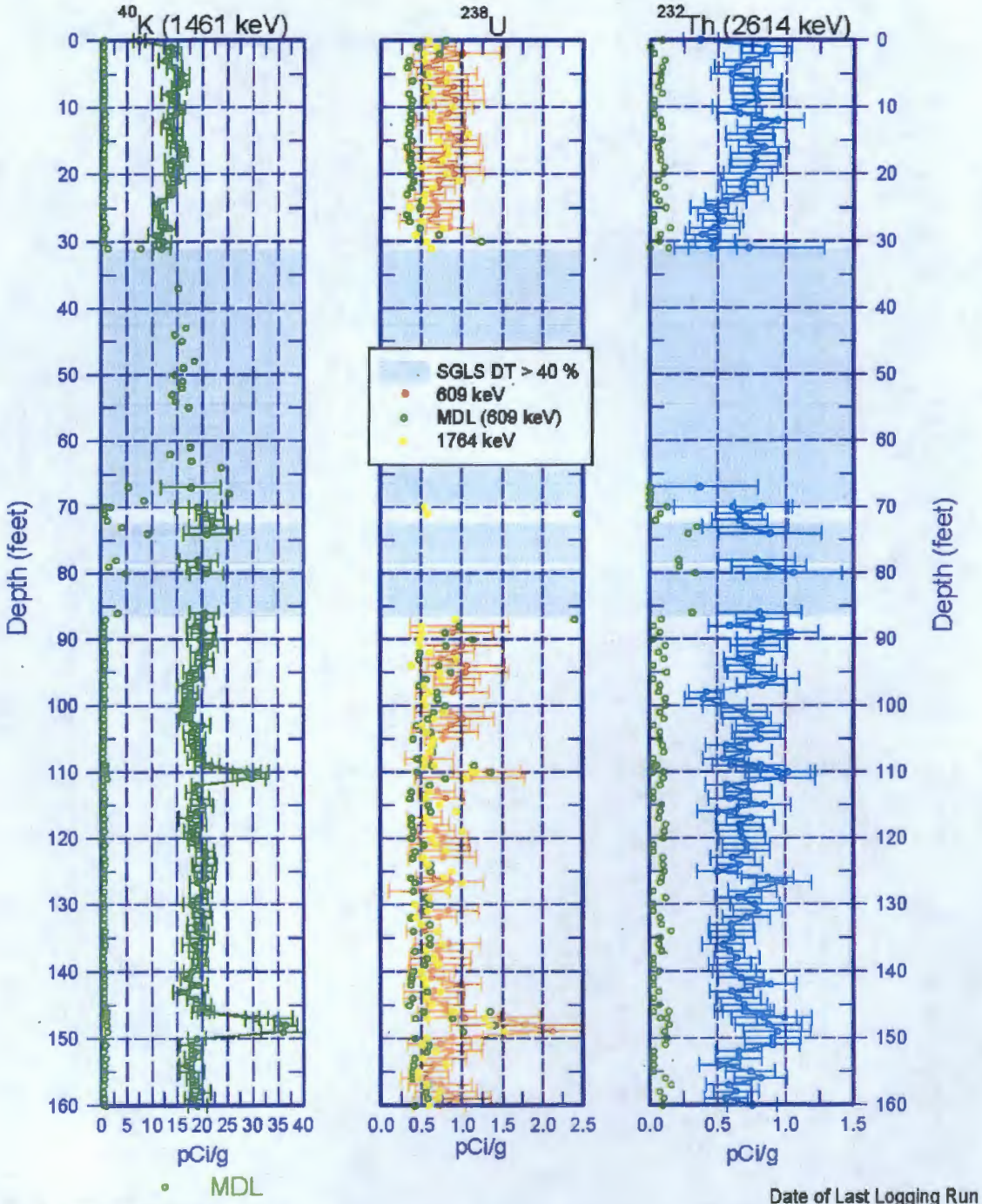
C3246
Natural Gamma Logs



Zero Reference = Ground Surface

Date of Last Logging Run
6/19/2003

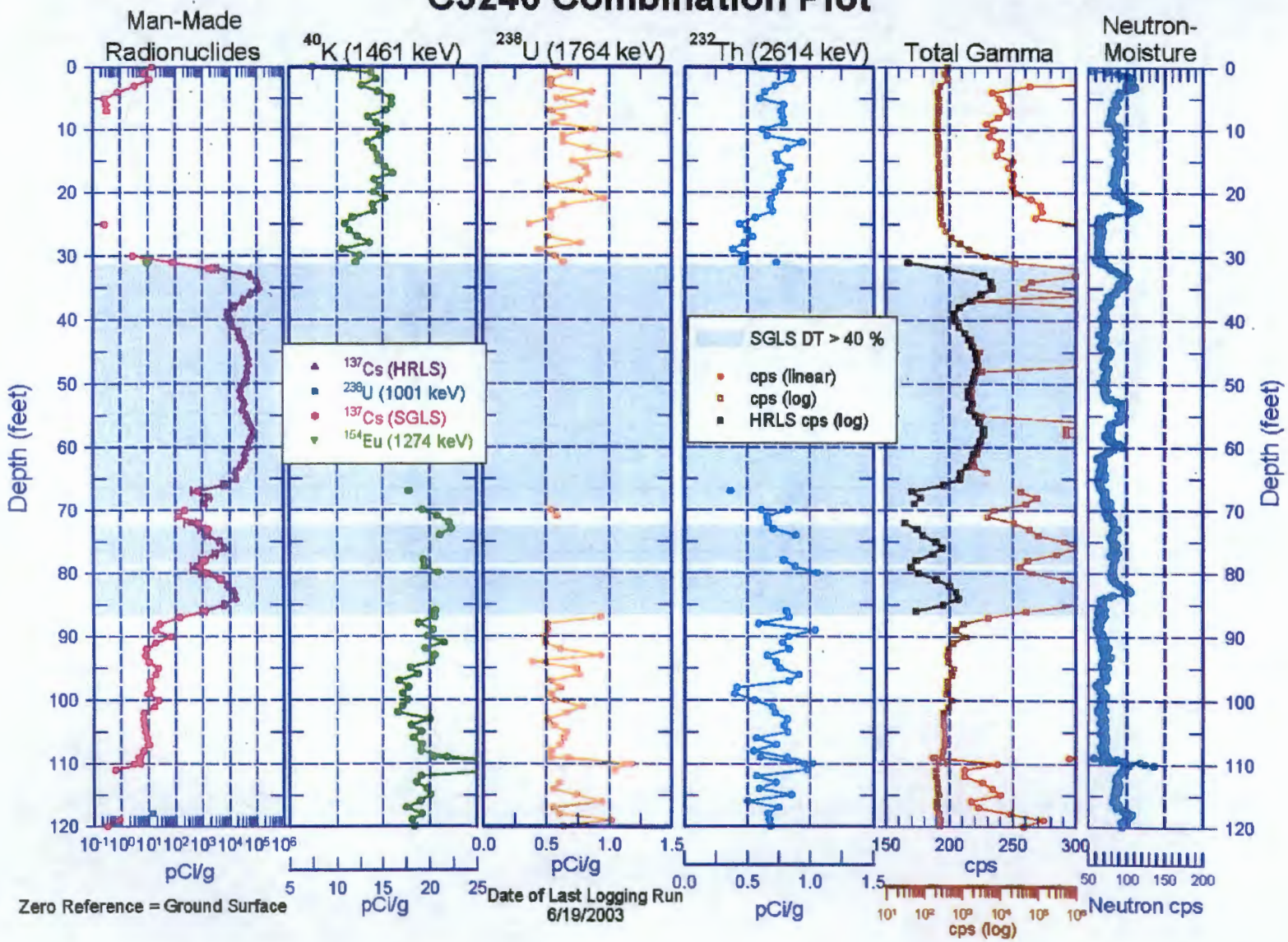
C3246
Natural Gamma Logs



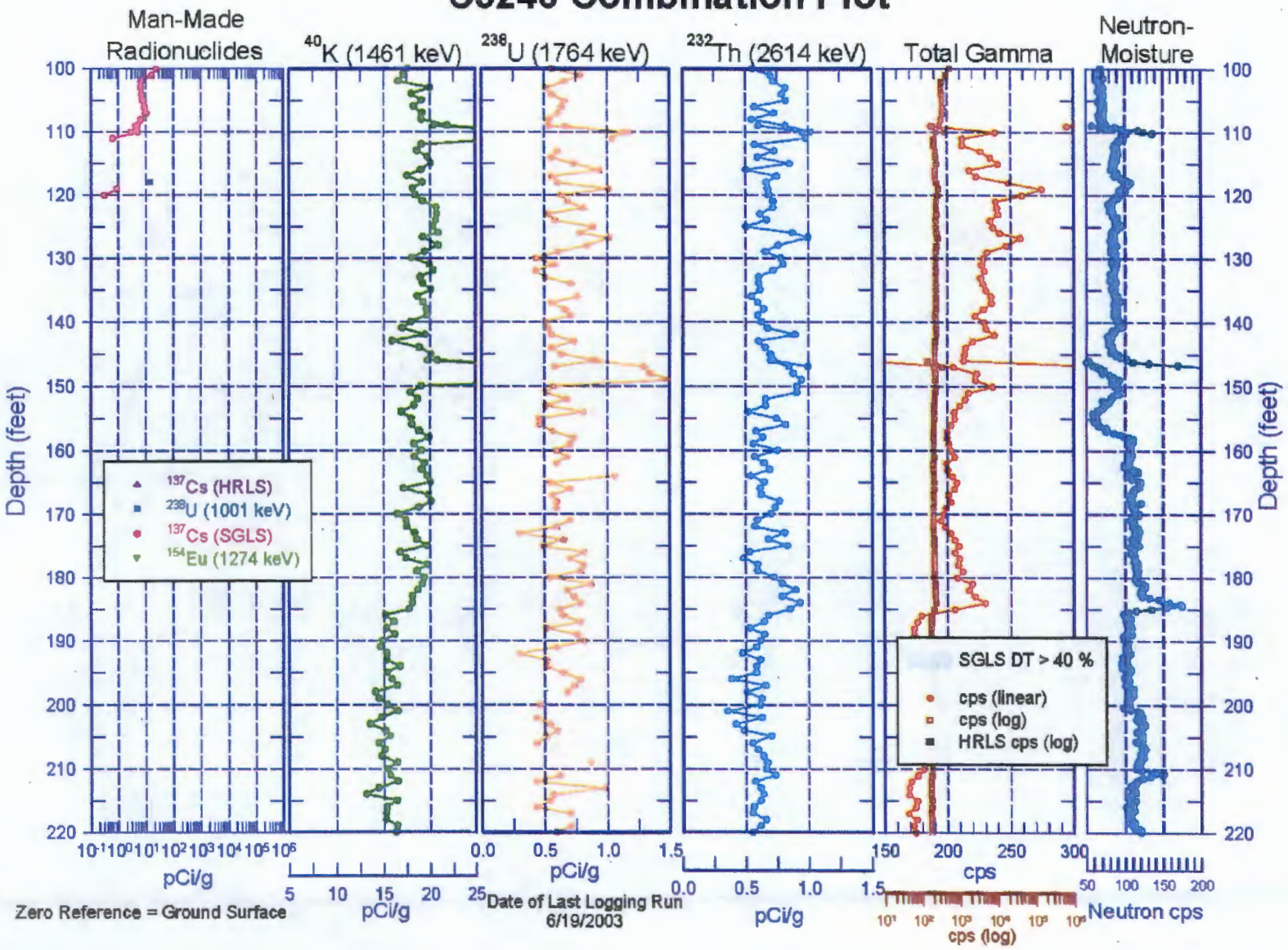
Zero Reference = Ground Surface

Date of Last Logging Run
6/19/2003

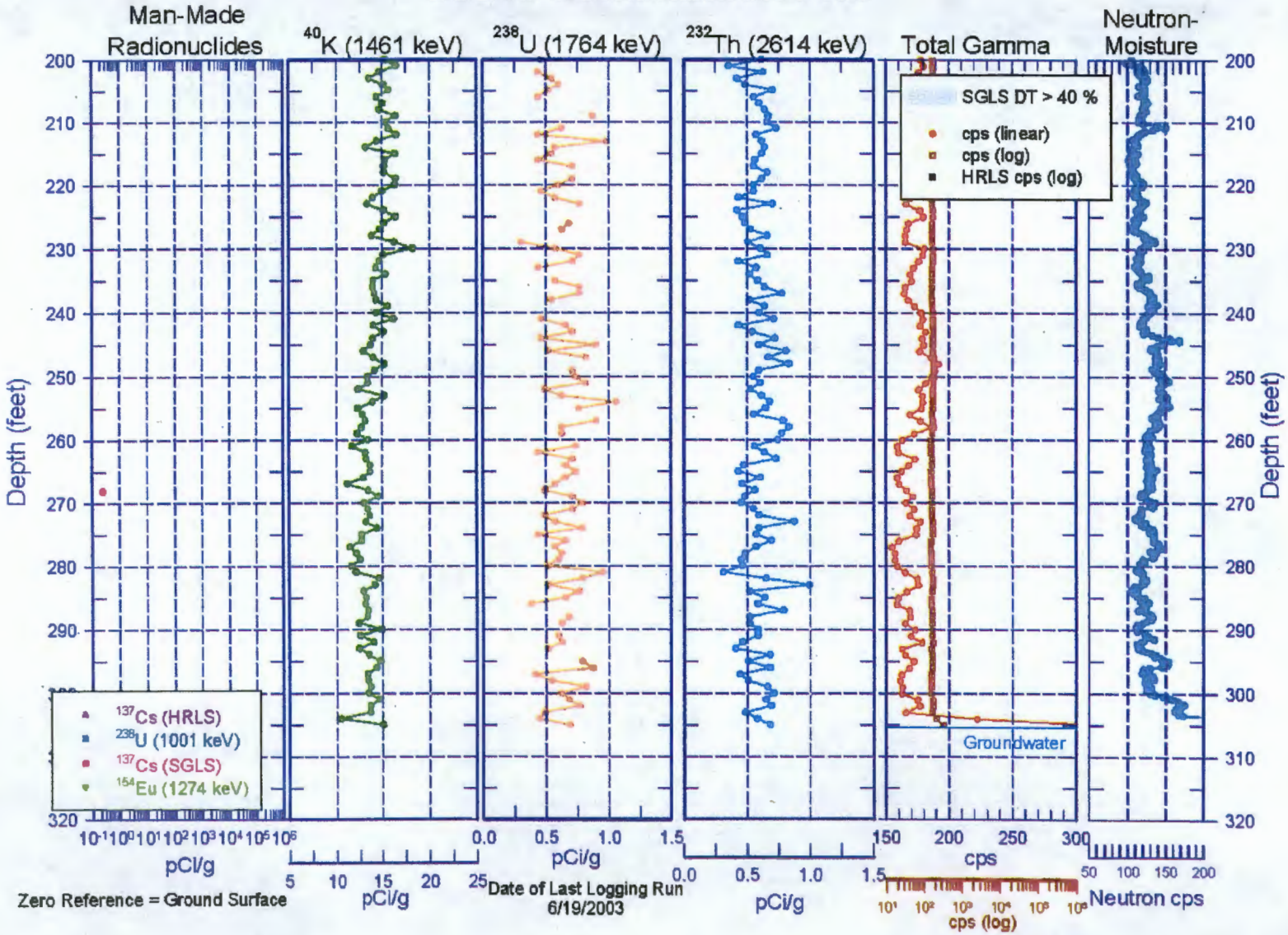
C3246 Combination Plot



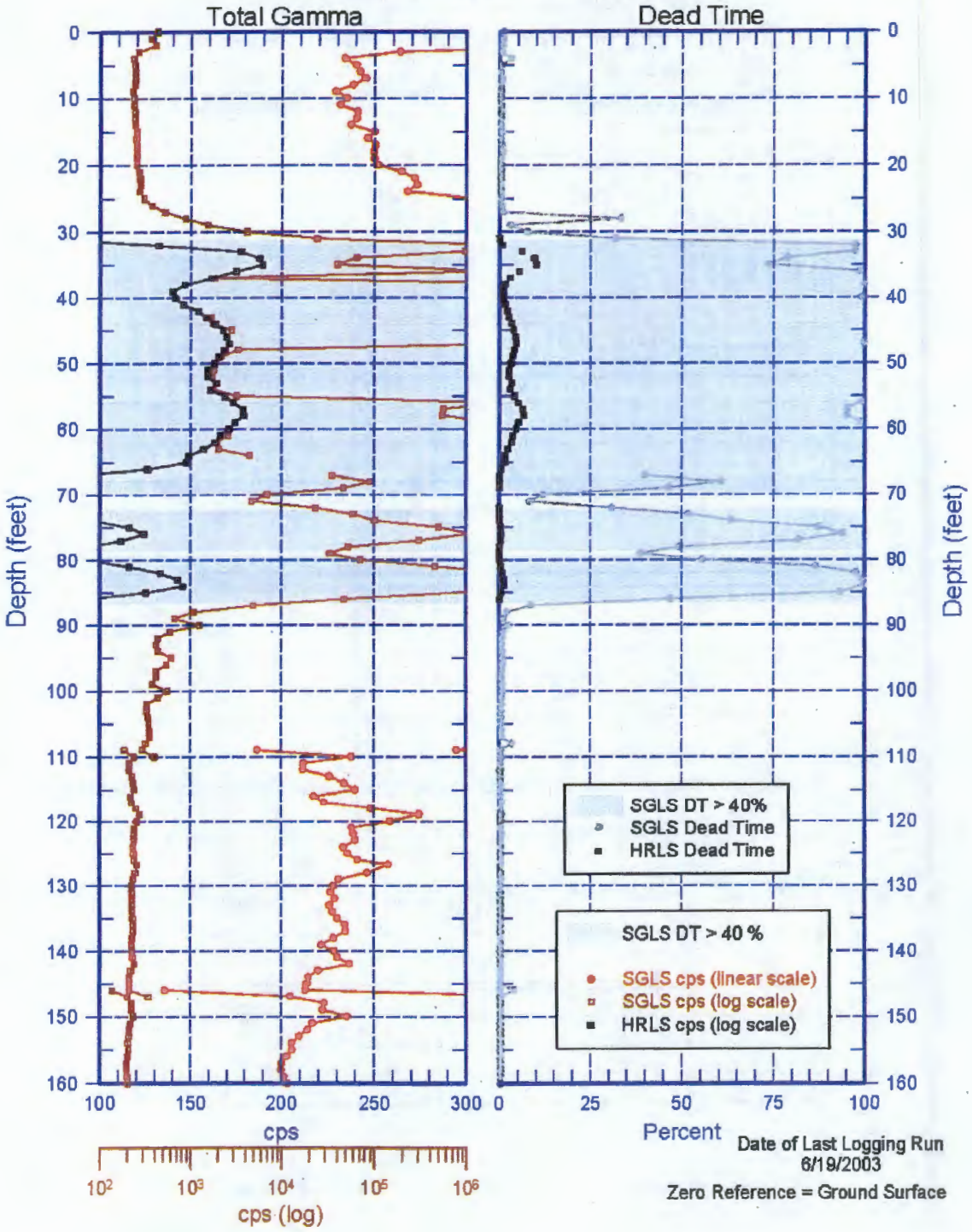
C3246 Combination Plot



C3246 Combination Plot



C3246
Total Gamma & Dead Time



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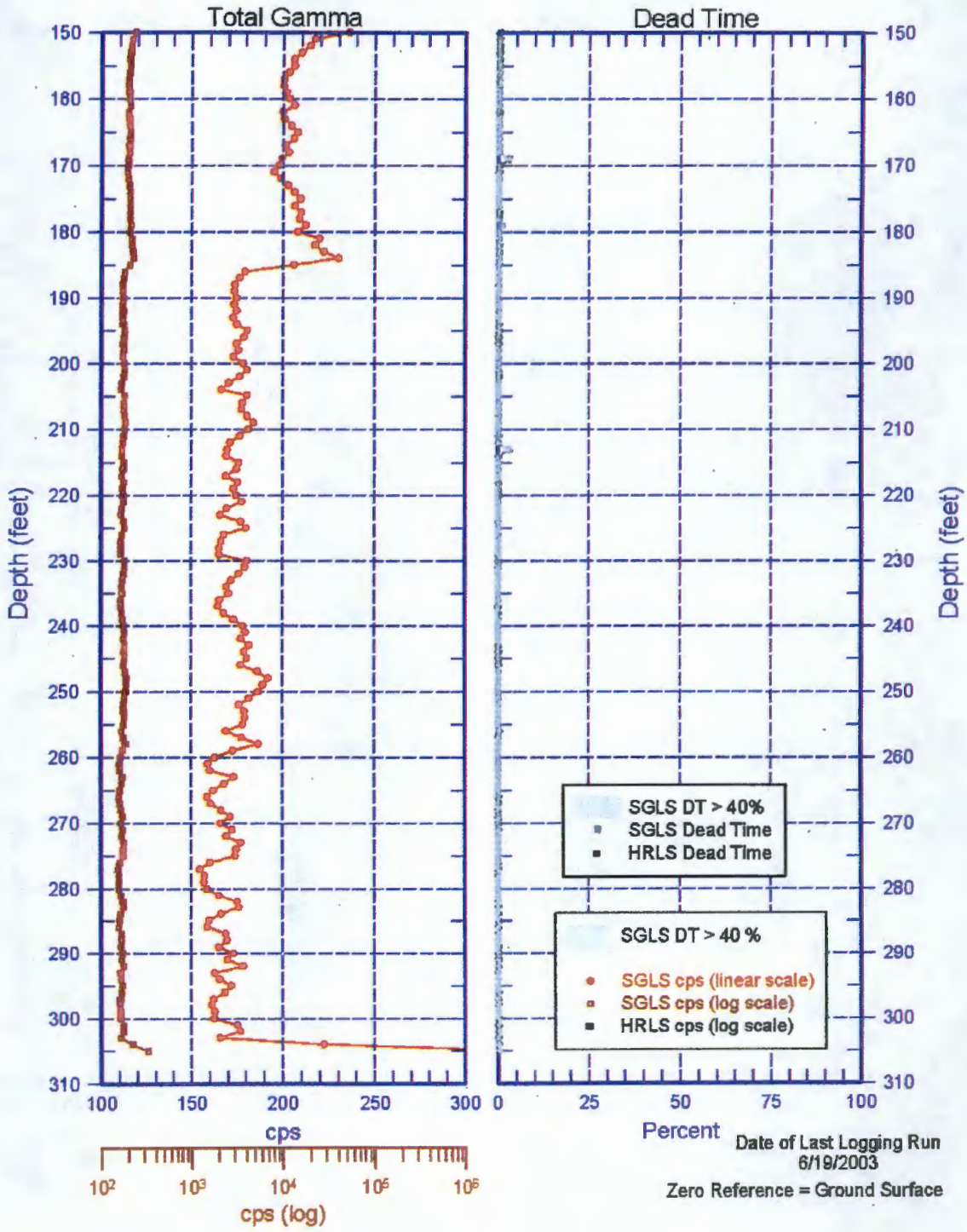
Total Gamma & Dead Time



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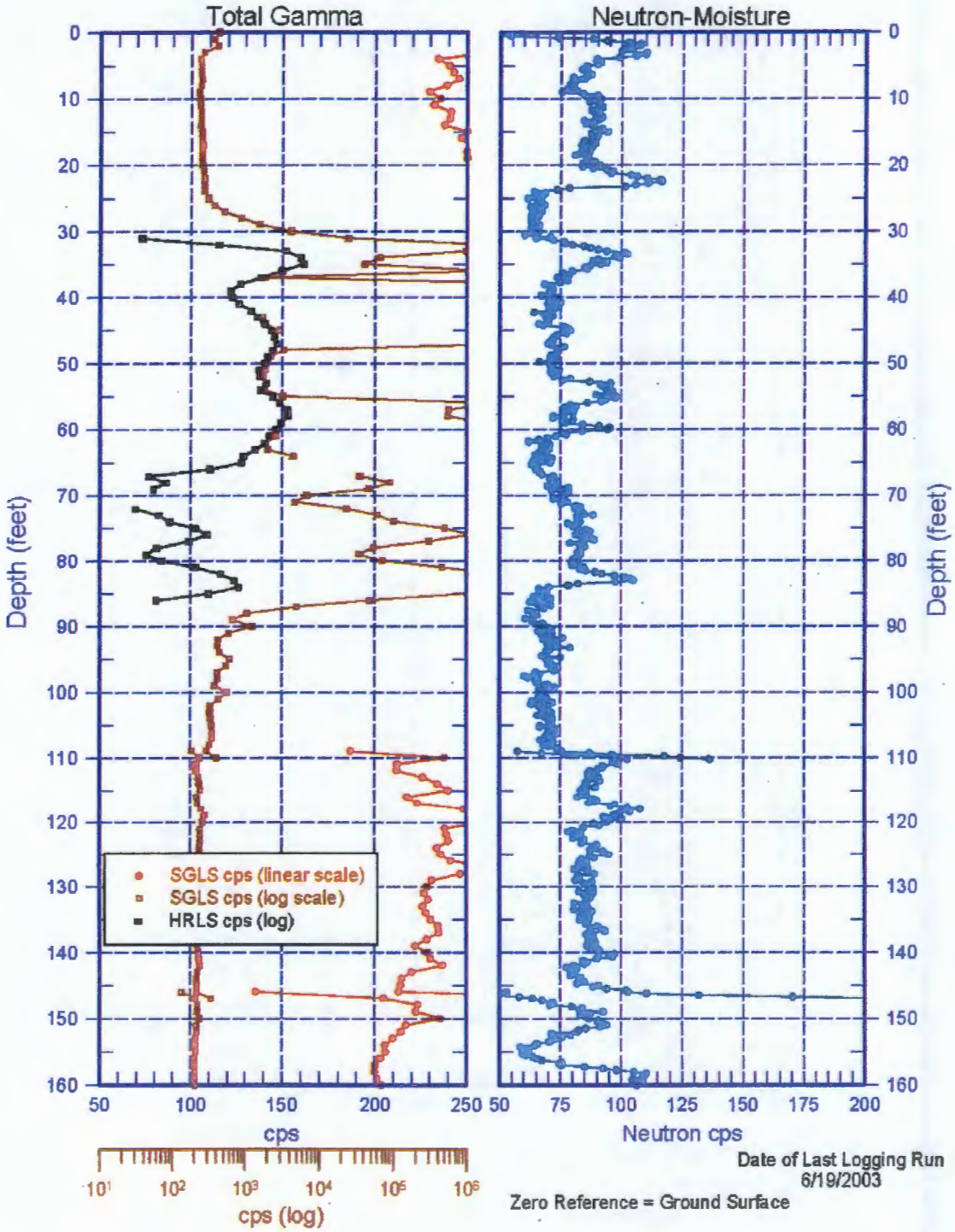
Total Gamma & Neutron



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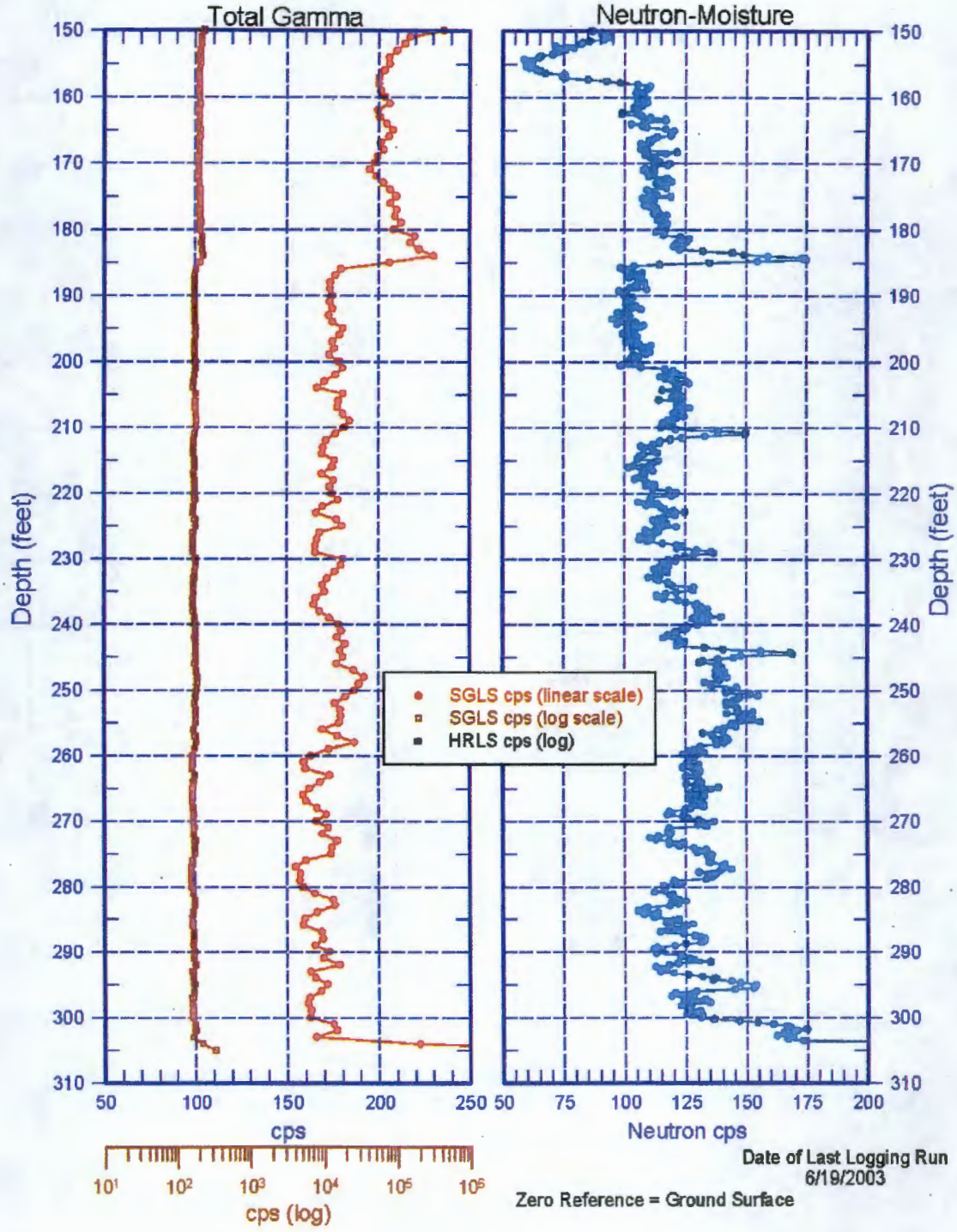
Total Gamma & Neutron



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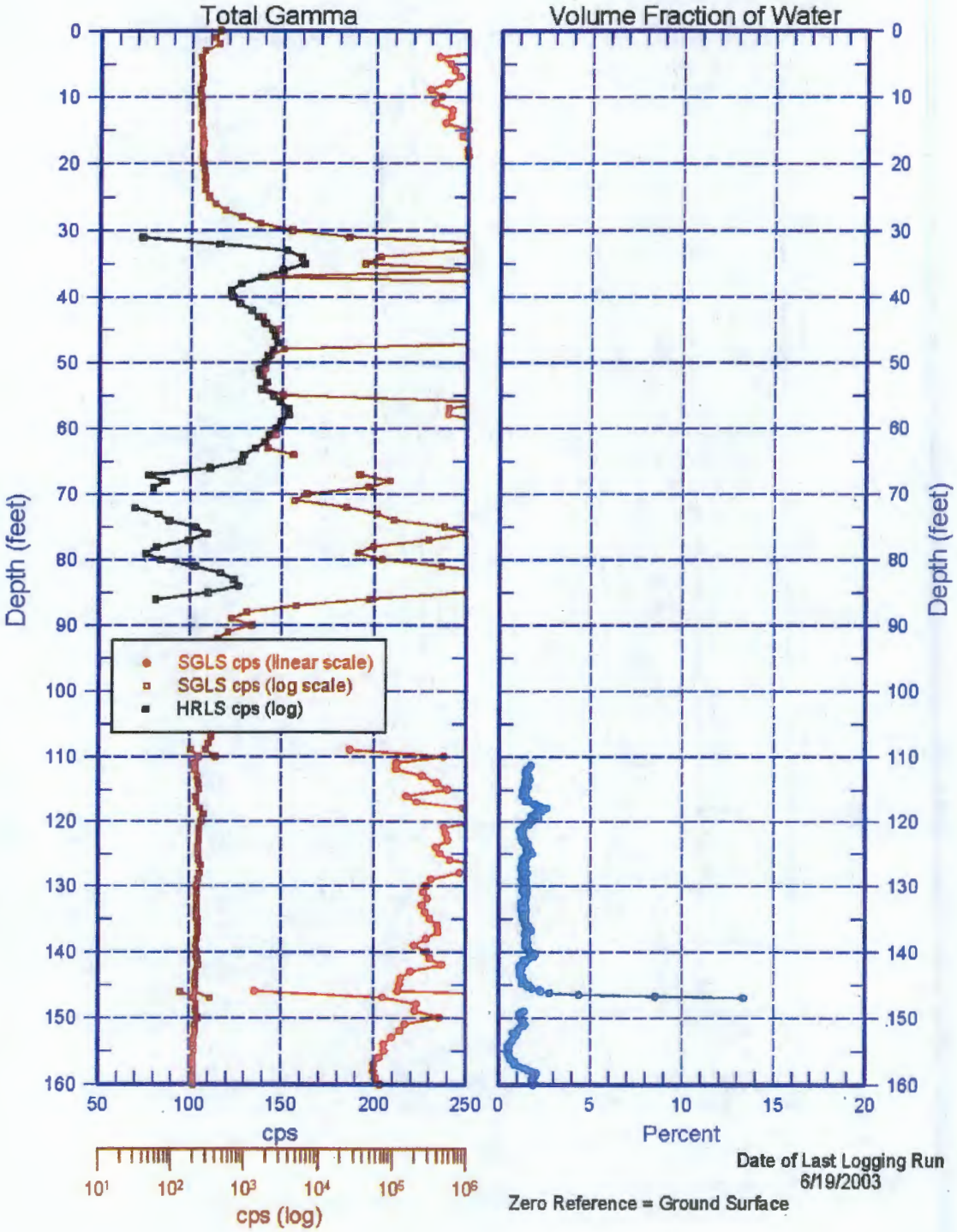
Total Gamma & Moisture



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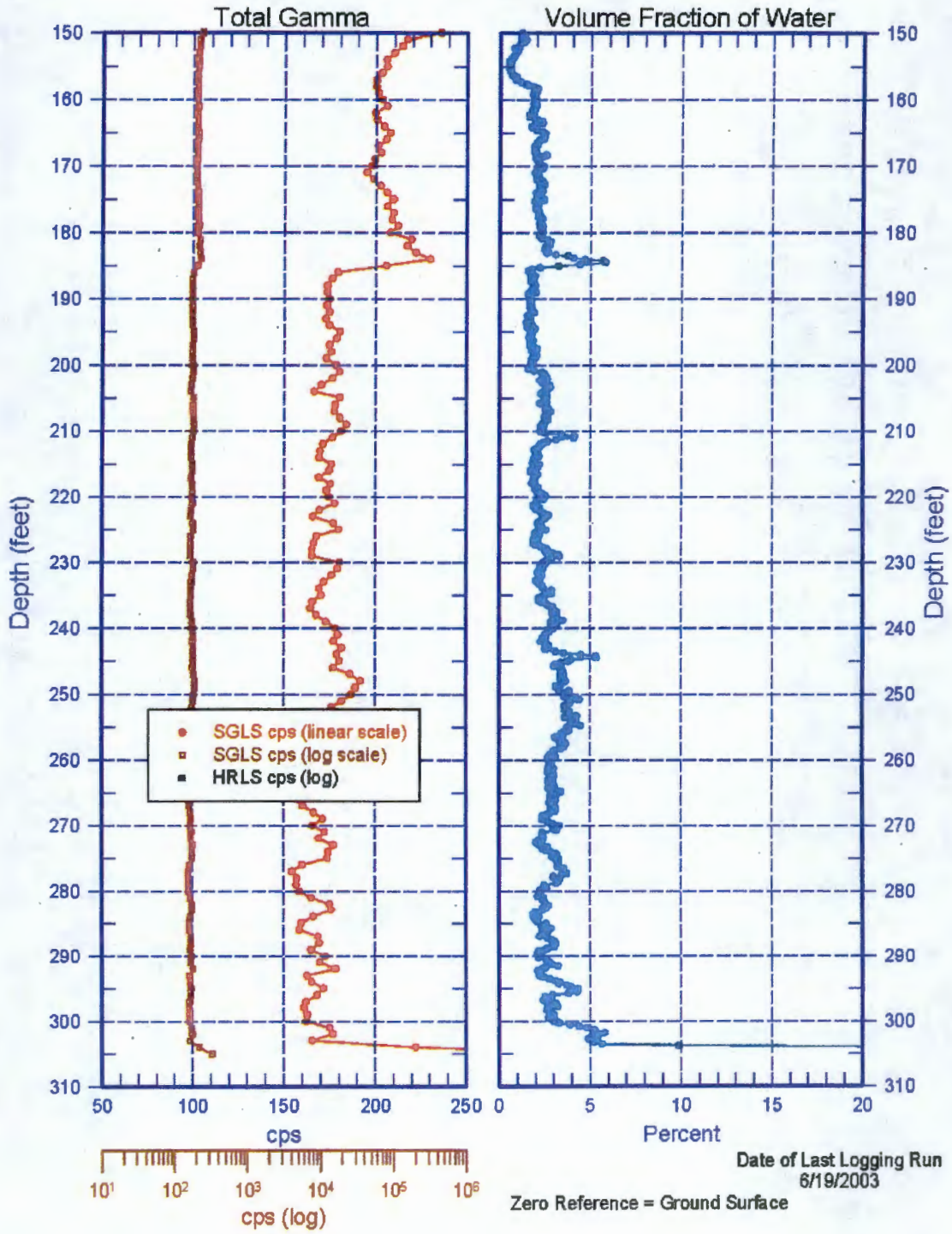
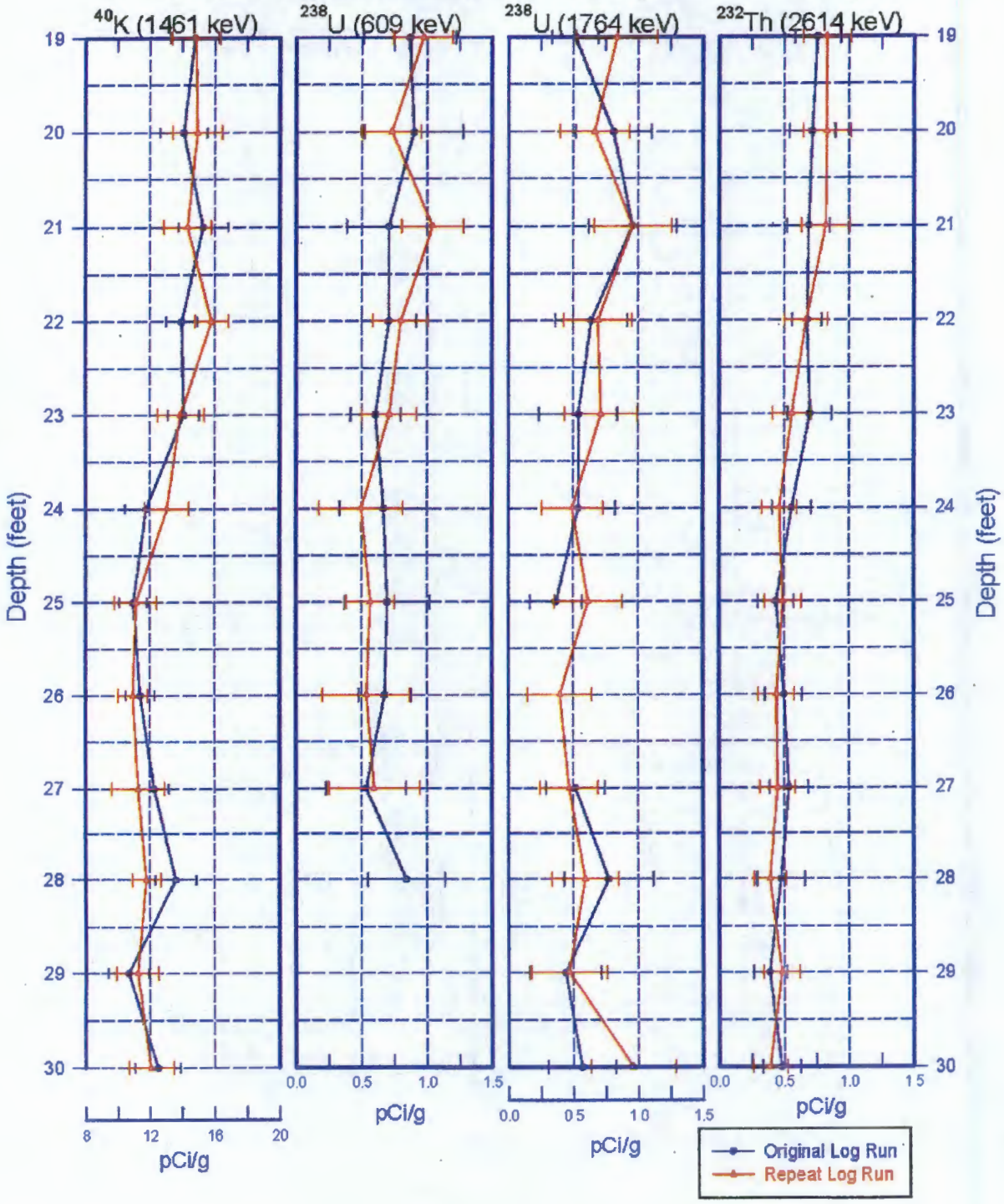


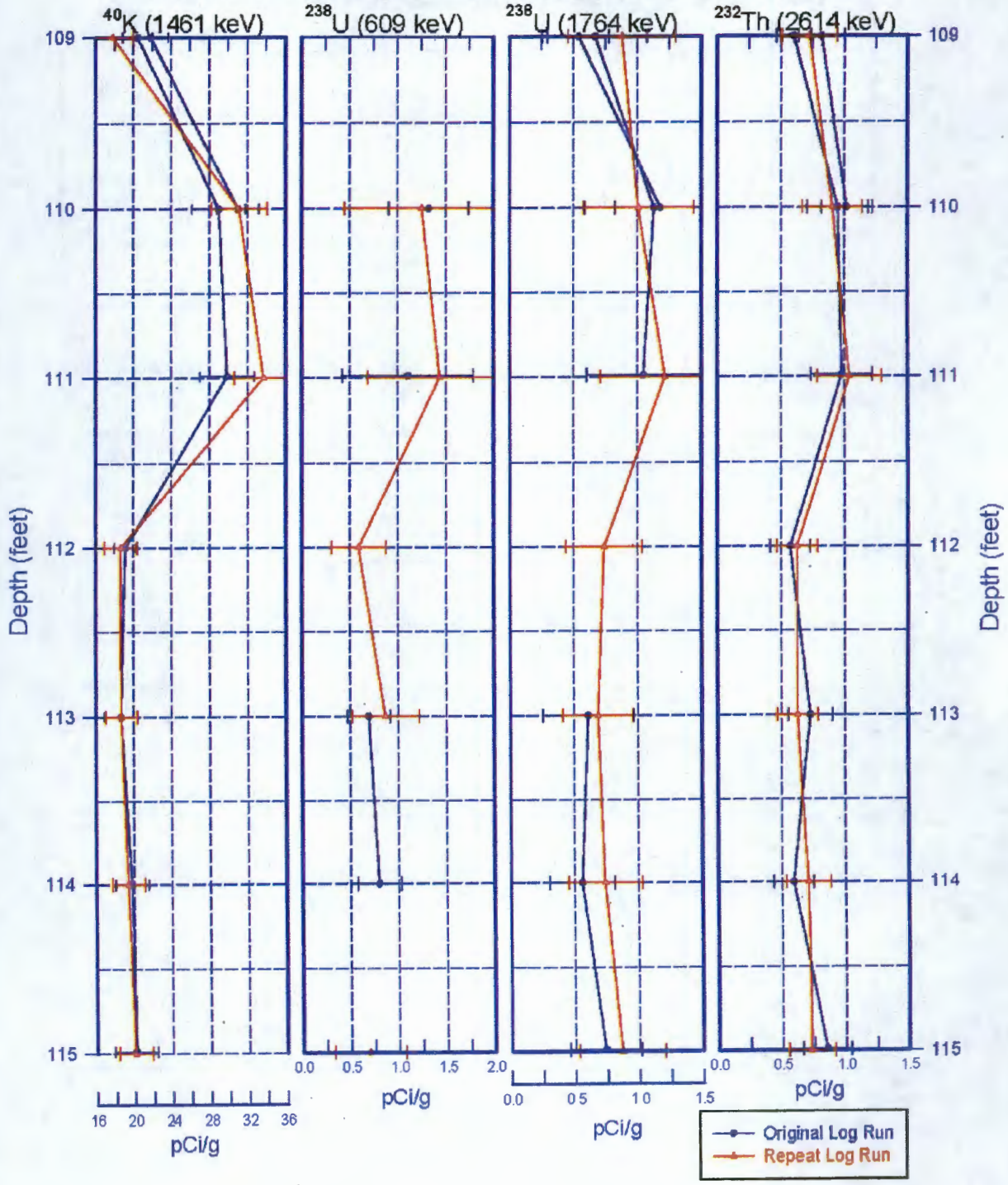
C3246

Rerun of Natural Gamma Logs (30.0 to 19.0 ft)



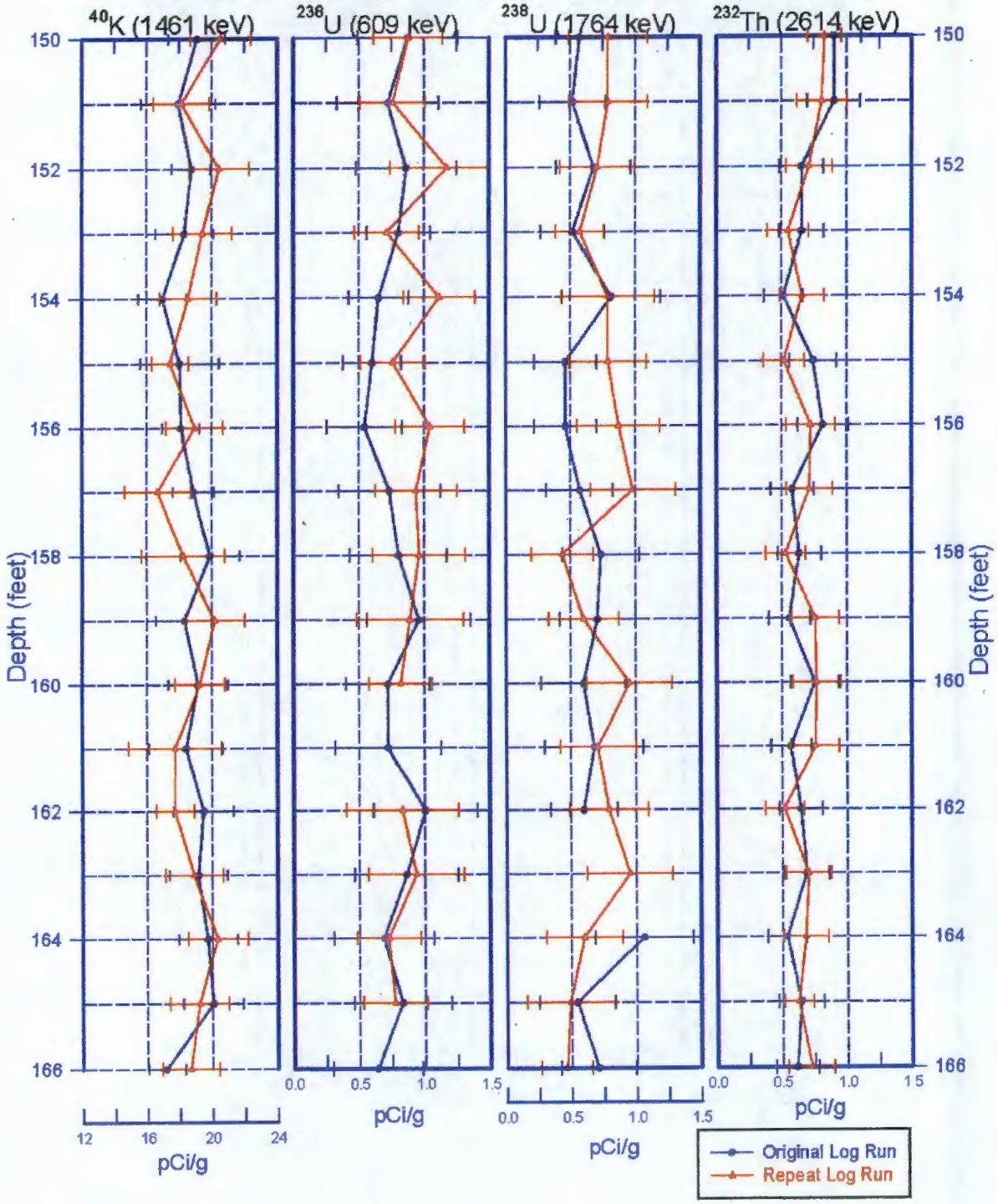
C3246

Rerun of Natural Gamma Logs (115.0 to 109.0 ft)



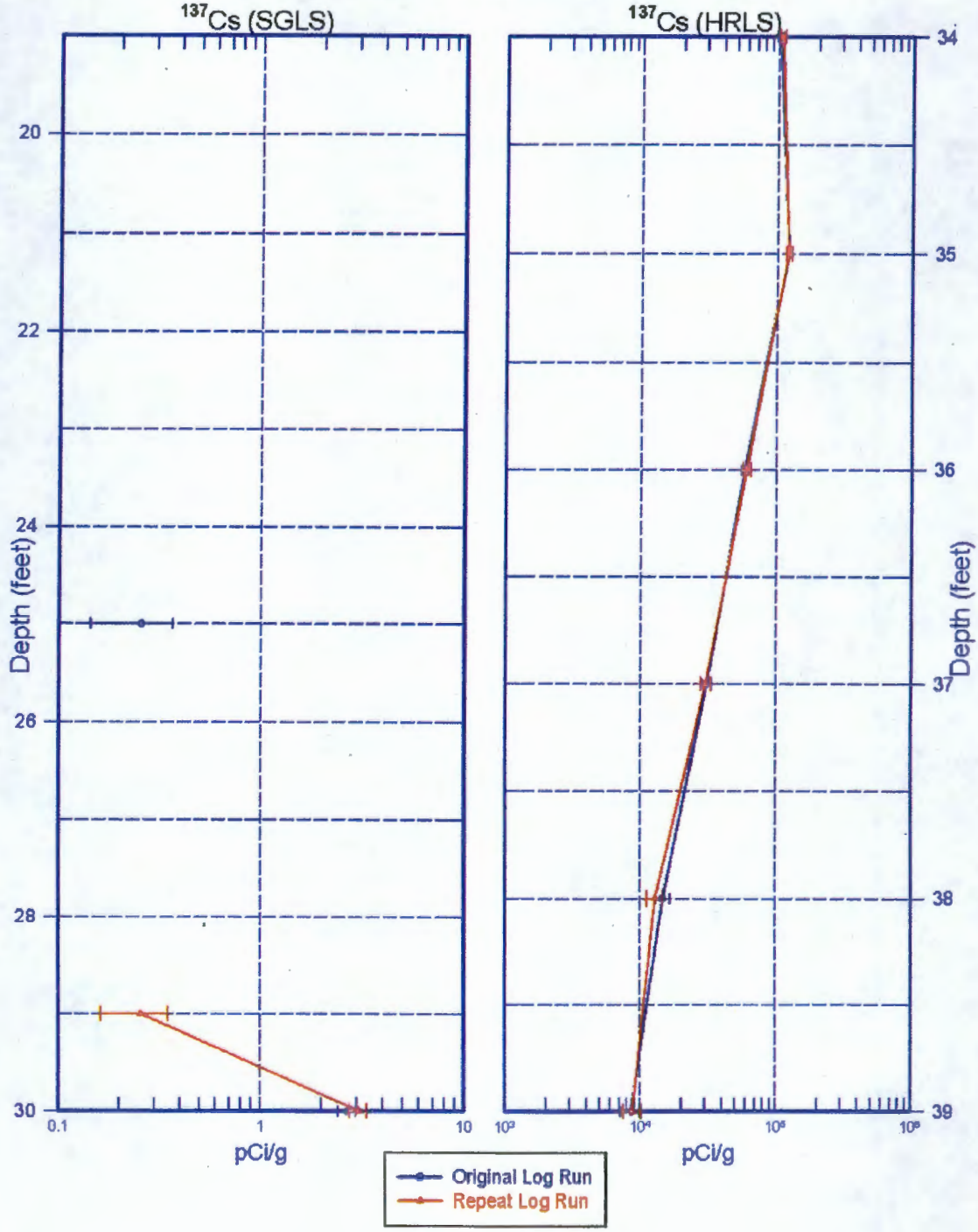
C3246

Rerun of Natural Gamma Logs (166.0 to 150.0 ft)



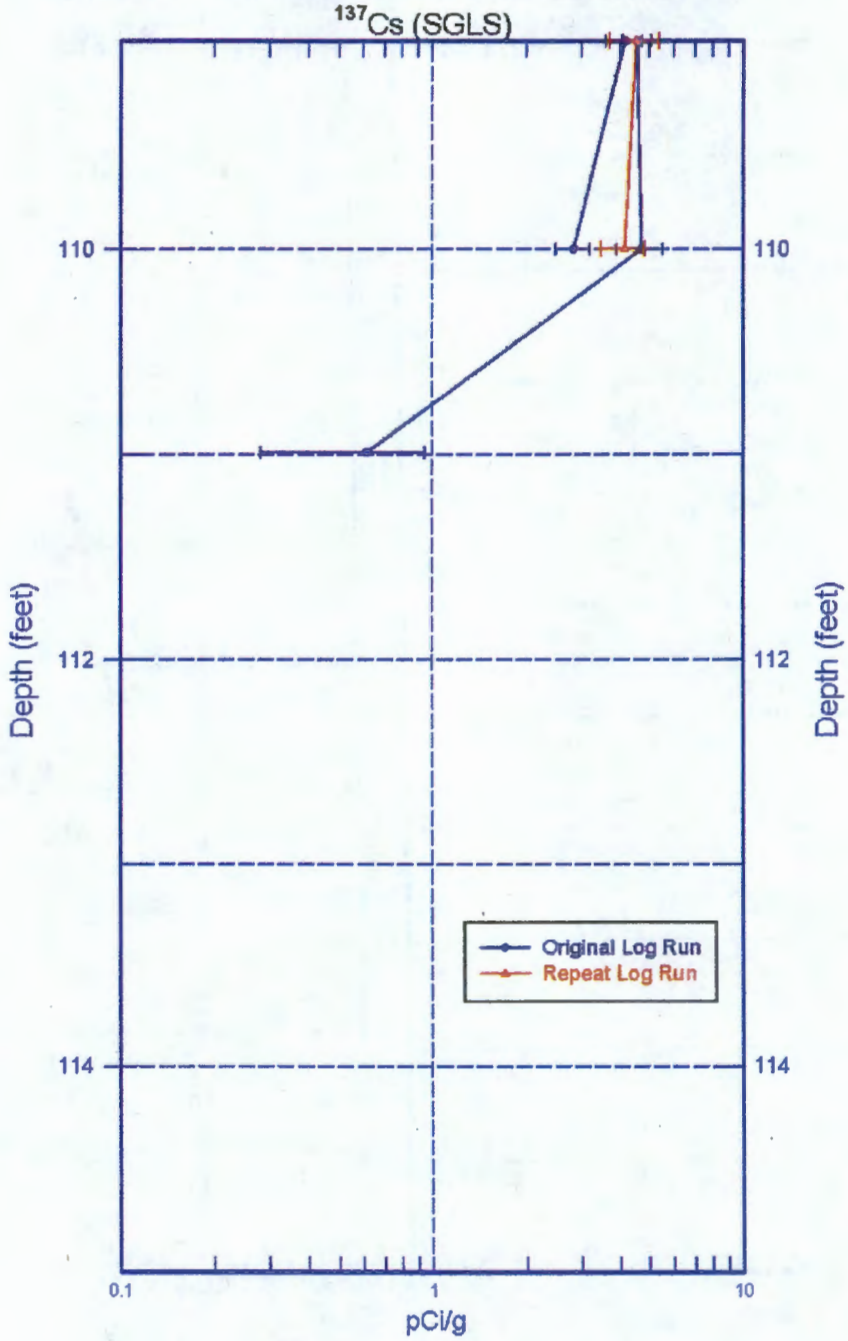
C3246

Rerun of Man-Made Radionuclides



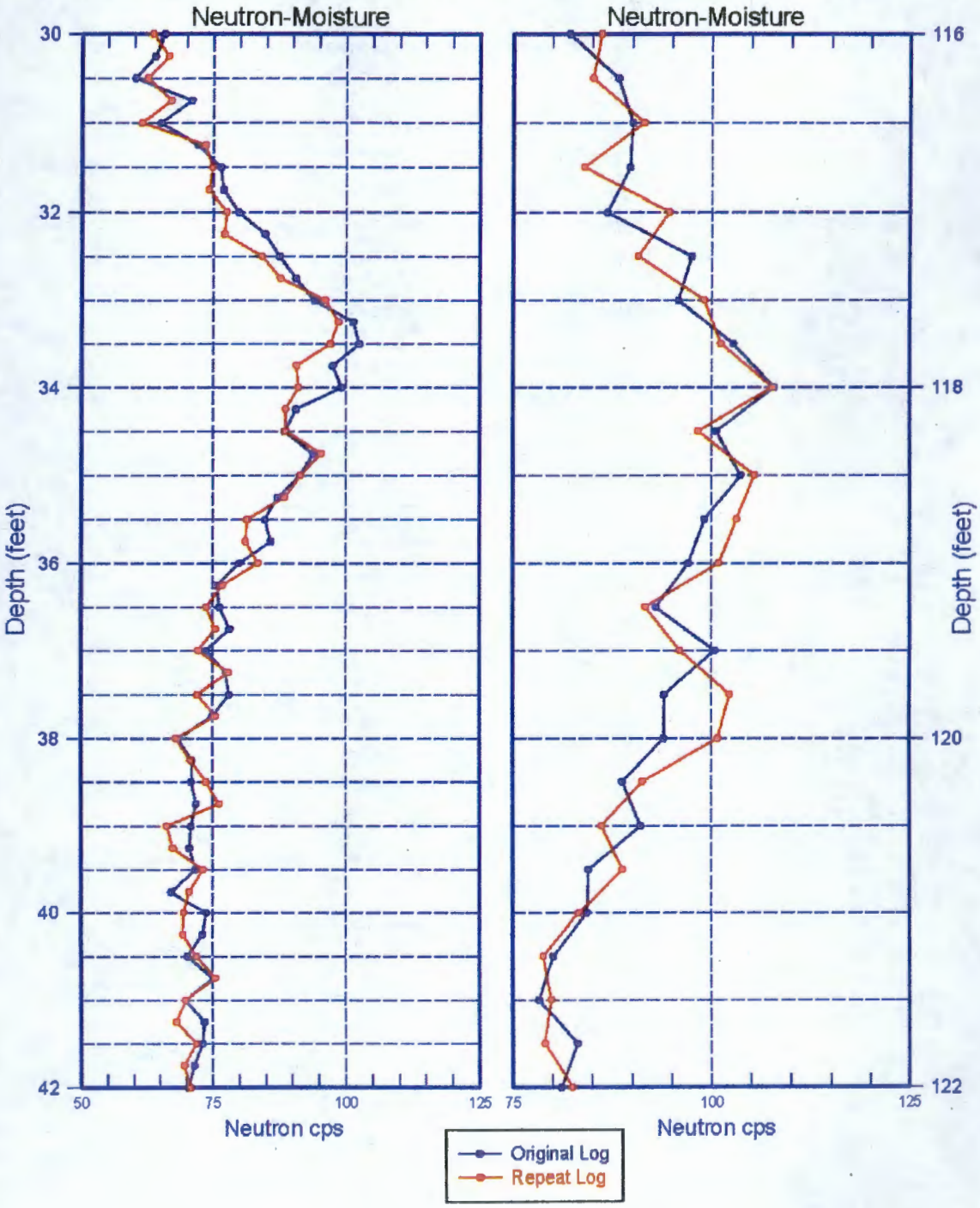
C3246

Rerun of Man-Made Radionuclides



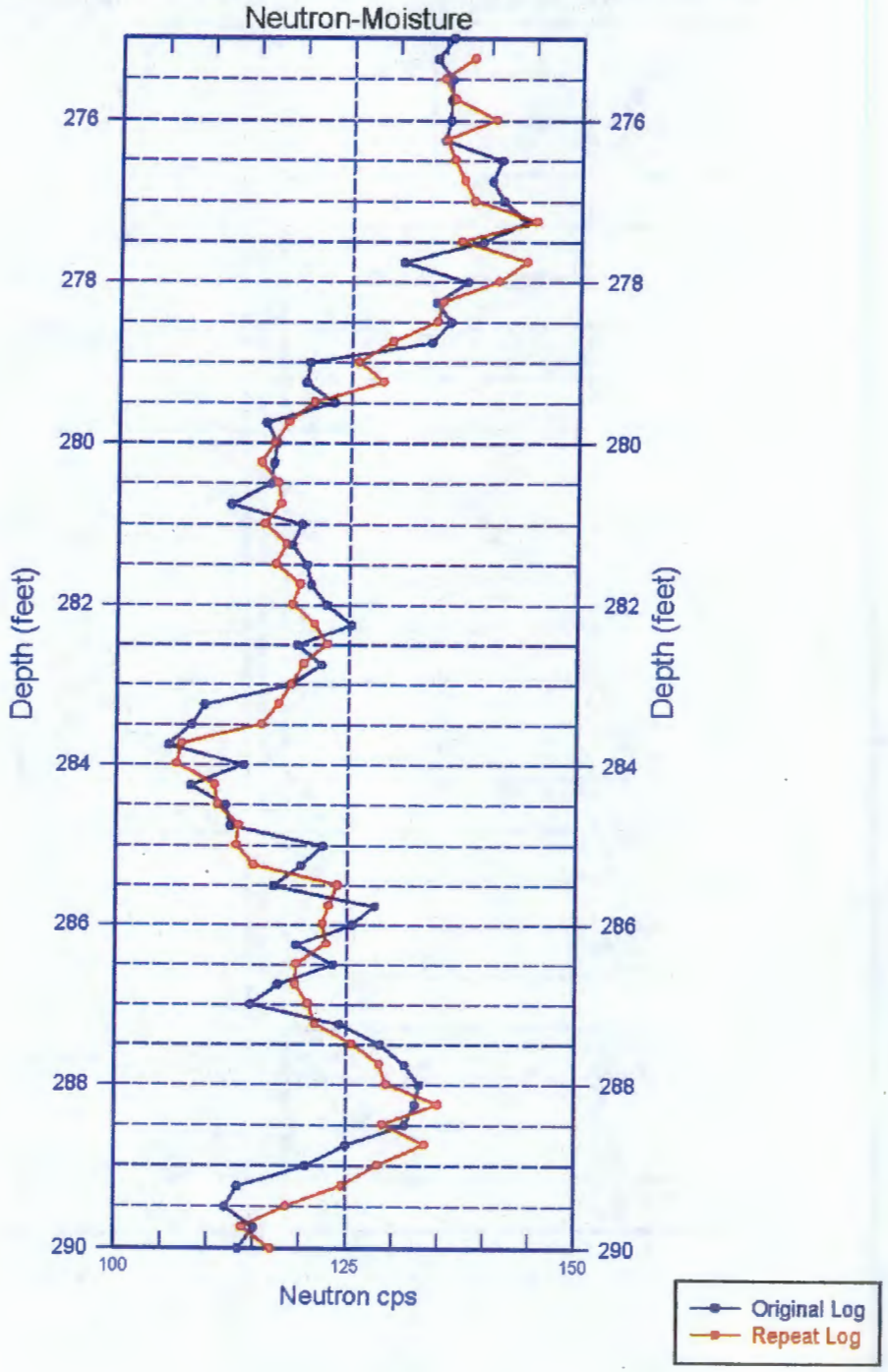
C3246

Rerun of Neutron-Moisture (30.0 to 42.0 ft & 116.0 to 122.0 ft)



C3246

Rerun of Neutron-Moisture (275.0 to 290.0 ft)



APPENDIX G

PHYSICAL PROPERTY DATA

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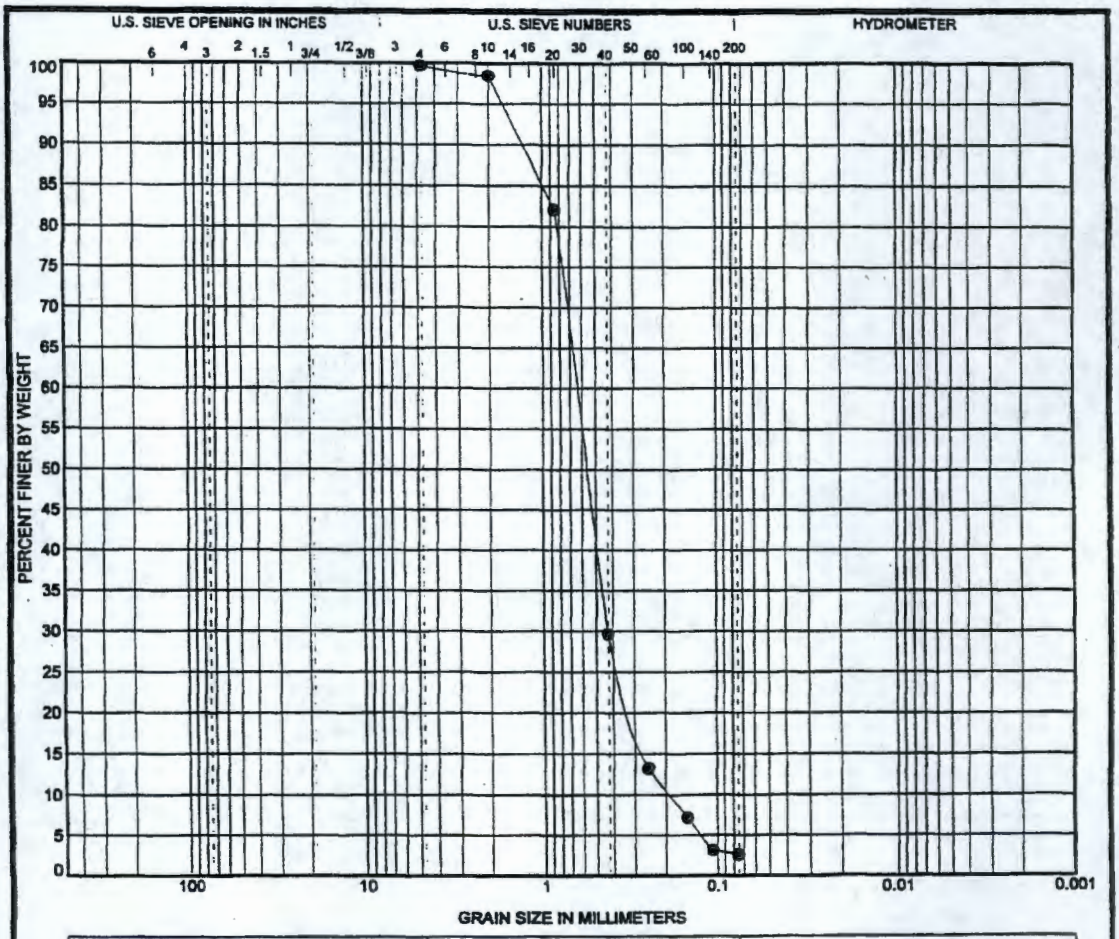
APPENDIX G

PHYSICAL PROPERTY DATA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 030523001-005	0.0	Soil				1.51	3.33
B16RY8							

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 030523001-005	0.0	4.75	0.635	0.427	0.191	0.0	97.1	2.6	

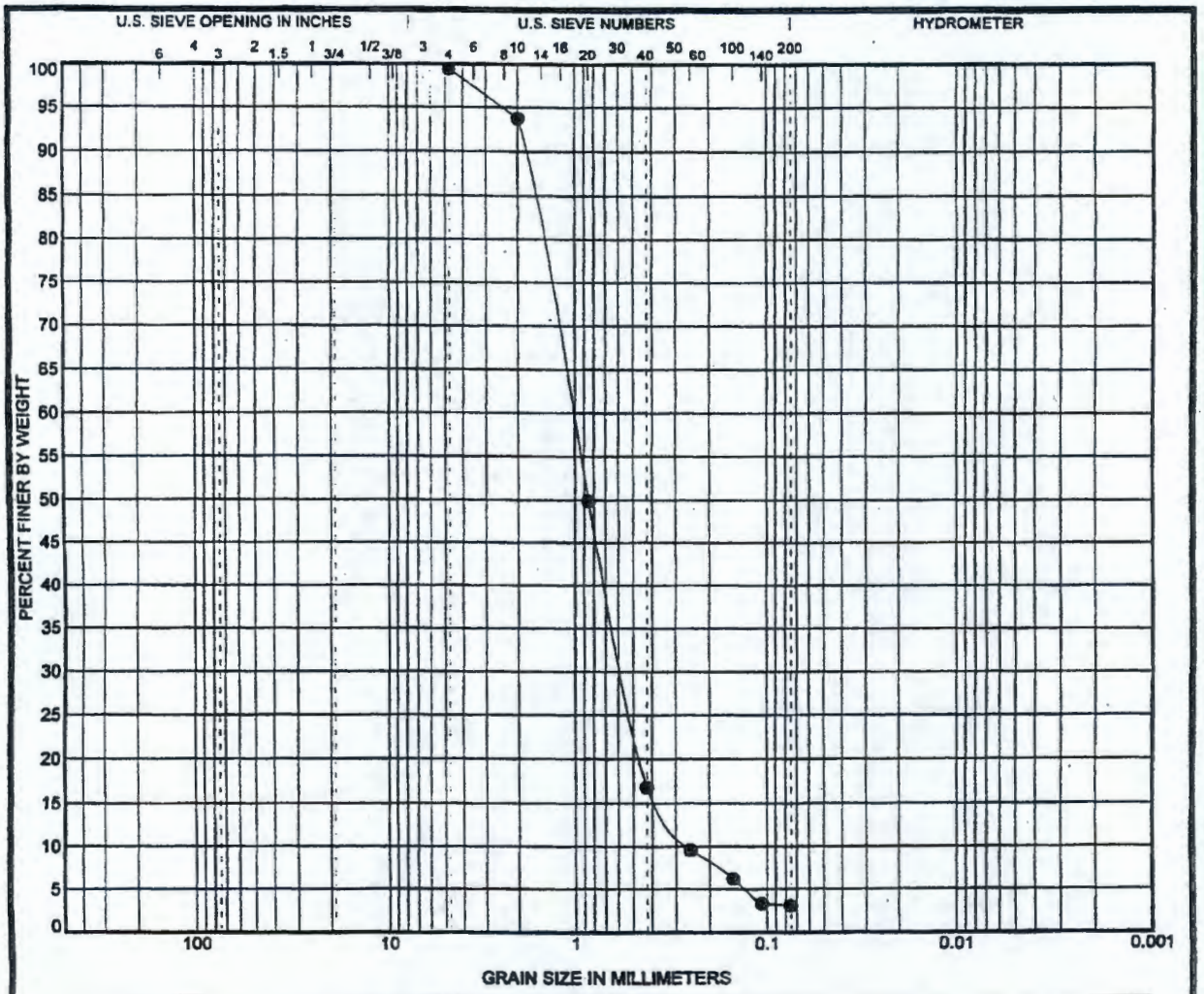
US GRAIN SIZE EBERLINE.GPJ US LAB.GDT 6/5/03

MAXIM

Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline
Location: St. Louis
Number: 9905093



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	030523001-006	0.0	Soil				1.18	4.02
	B16RY9							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	030523001-006	0.0	4.75	1.036	0.56	0.258	0.0	96.3	3.1	

US_GRAIN_SIZE_EBERLINE.GPJ US_LAB.GDT 6/5/03

MAXIM

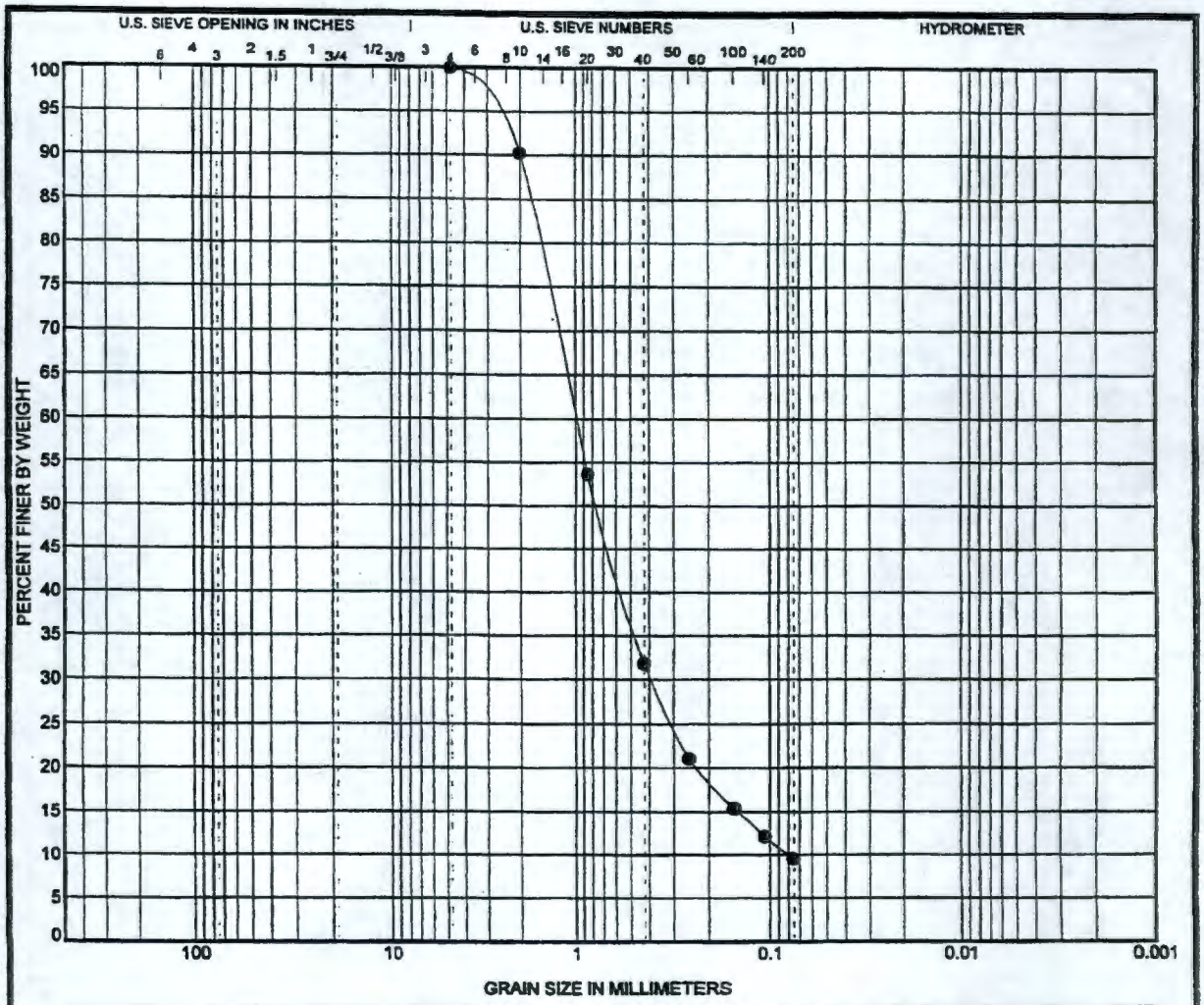
Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline

Location: St. Louis

Number: 9905093



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	030523001-007	0.0	Soil				1.92	12.38
	B16T00							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	030523001-007	0.0	4.75	0.986	0.388	0.08	0.0	90.4	9.5	

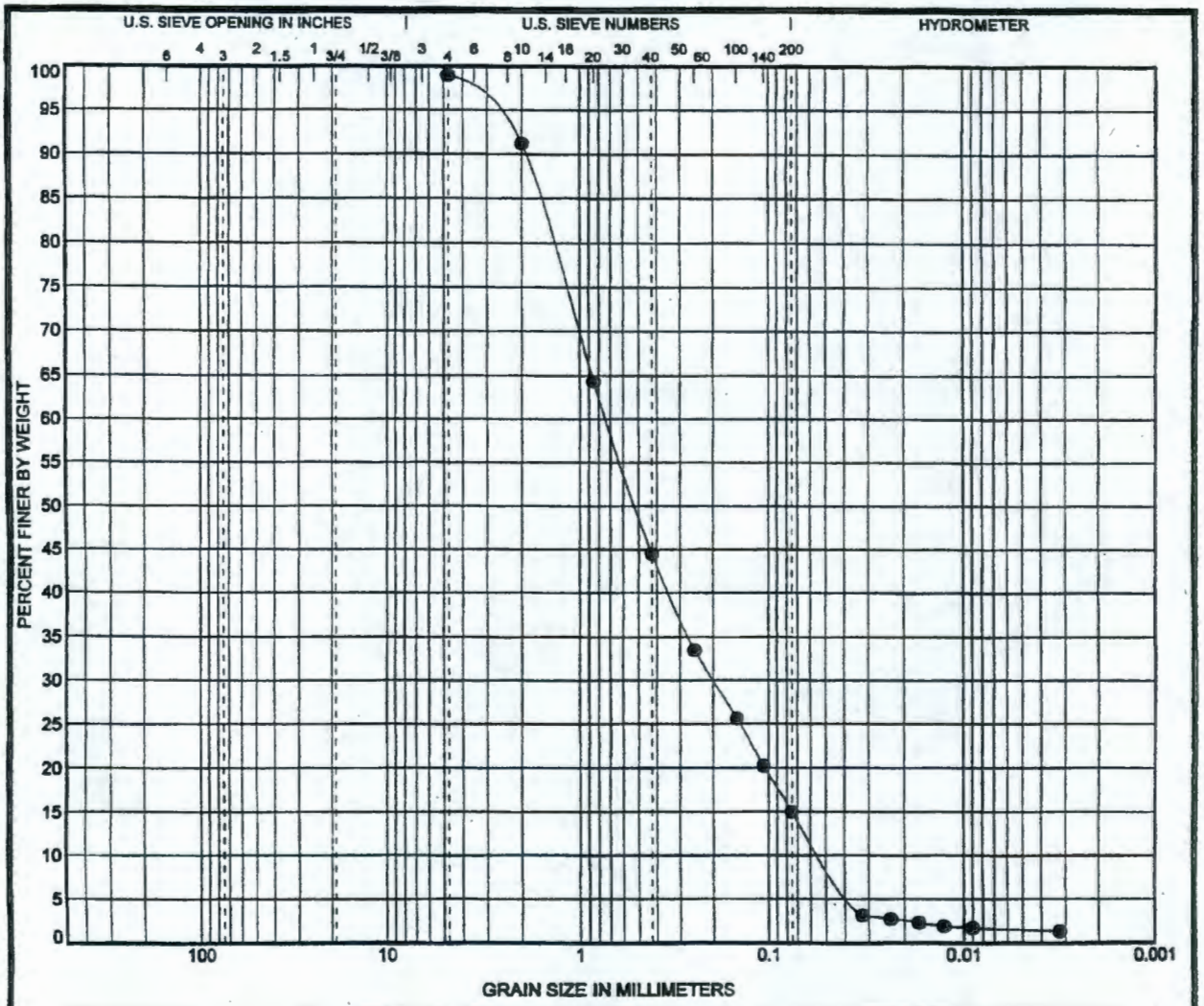
US GRAIN SIZE EBERLINE.GPJ US LAB.GDT 6/5/03

MAXIM

Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline
Location: St. Louis
Number: 9905093



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	030523001-008 0.0	Soil				1.03	13.86
	B16T01						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	030523001-008 0.0	4.75	0.73	0.199	0.053	0.0	84.0	13.5	1.5

US GRAIN SIZE EBERLINE.GPJ US LAB.GDT 6/19/03

MAXIM

Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline

Location: St. Louis

Number: 9905093

Moisture Content, ASTM D2216

MAXIM Technolgies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, MO 63114-5700
314-426-0880

Client: ThermoNutech/Eberline

Date: 5/6/2003

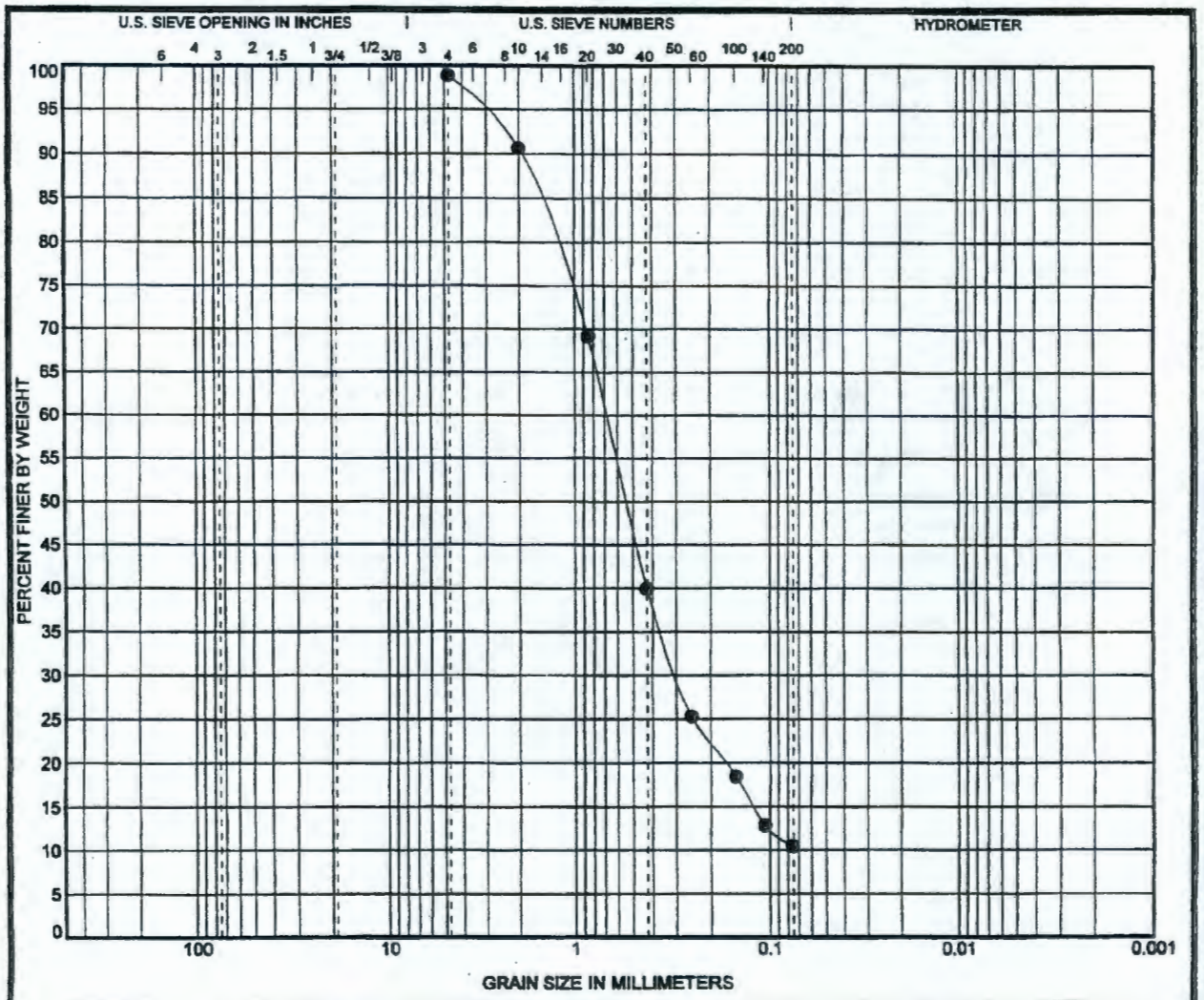
Project Number: 9905093-100

File: Eberline-Moisture-5-6-03

Performed By: Ron Swaller

Maxim Sample Number	Client Sample Name	Container Number	Container Weight	Wet Sample + Container	Dry Sample + Container	Moisture Content (%)
030523001-002	B16T01	55	11.84	36.59	35.98	2.5
030523001-007	B16T00	5X	11.88	39.08	38.35	2.8
030523001-003	B16HB9	Q102	11.55	37.05	36	4.3
030523001-005	B16RY8	25	11.82	36.48	35.54	4.0
030523001-006	B16RY9	36	12.08	37.26	36.85	1.7
030523001-004	B16HCO	43	12.06	35.55	34.59	4.3
030523001-004	B16HCO-dup	X-18	11.55	37.74	36.71	4.1

Remarks: All weights in grams



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 030527001-002	0.0	Soil				1.83	9.73
B16WB5							

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 030527001-002	0.0	4.75	0.684	0.296		0.0	88.4	10.5	

US GRAIN SIZE EBERLINE.GPJ US LAB.GDT 6/19/03

MAXIM

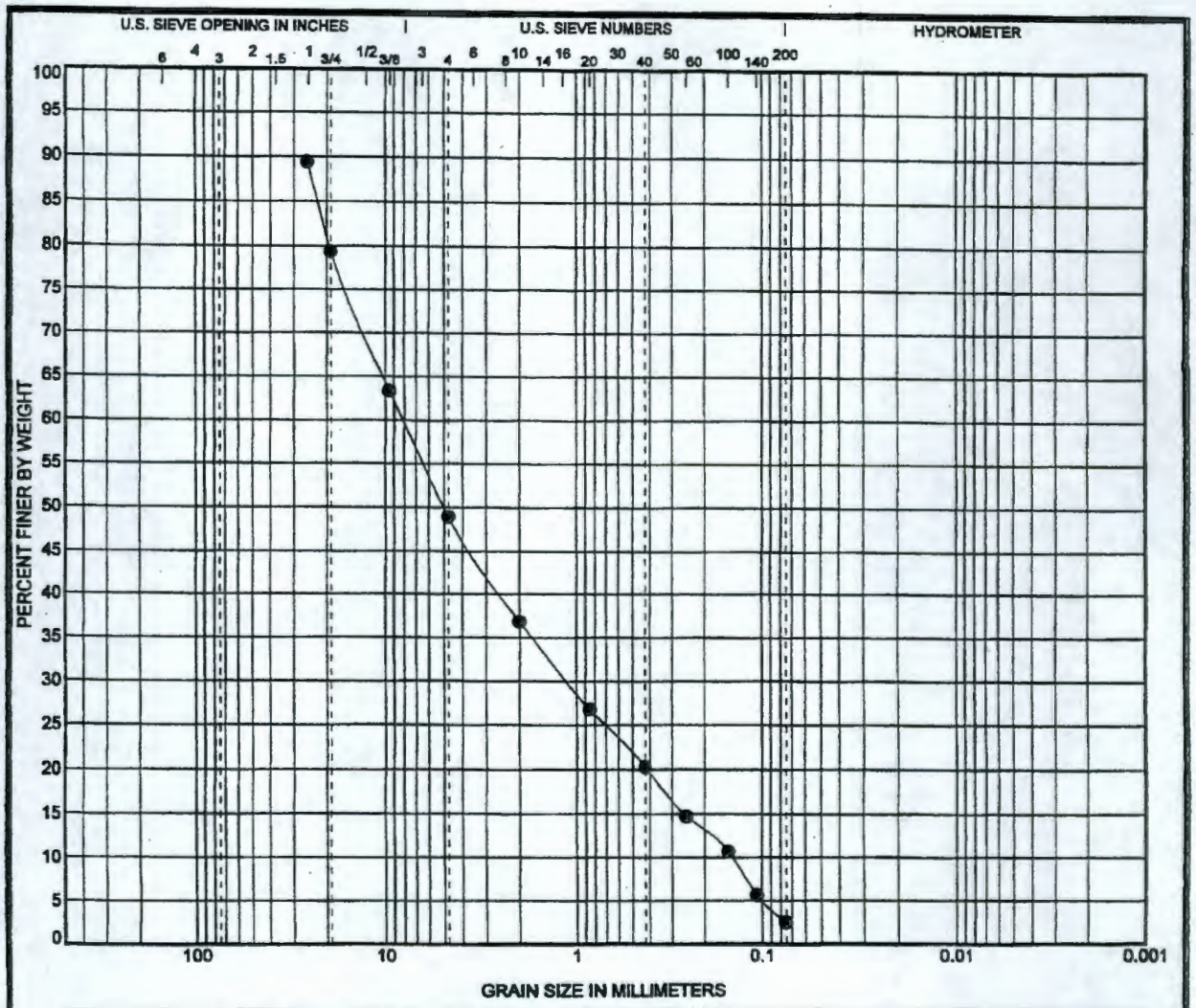
Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline

Location: St. Louis

Number: 9905093



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	030527001-003	0.0	Soil				1.08	56.67
	B16WB6							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	030527001-003	0.0	25.4	8.09	1.119	0.143	40.5	46.4	2.5	

US GRAIN SIZE EBERLINE.GPJ US LAB.GDT 6/19/03

MAXIM

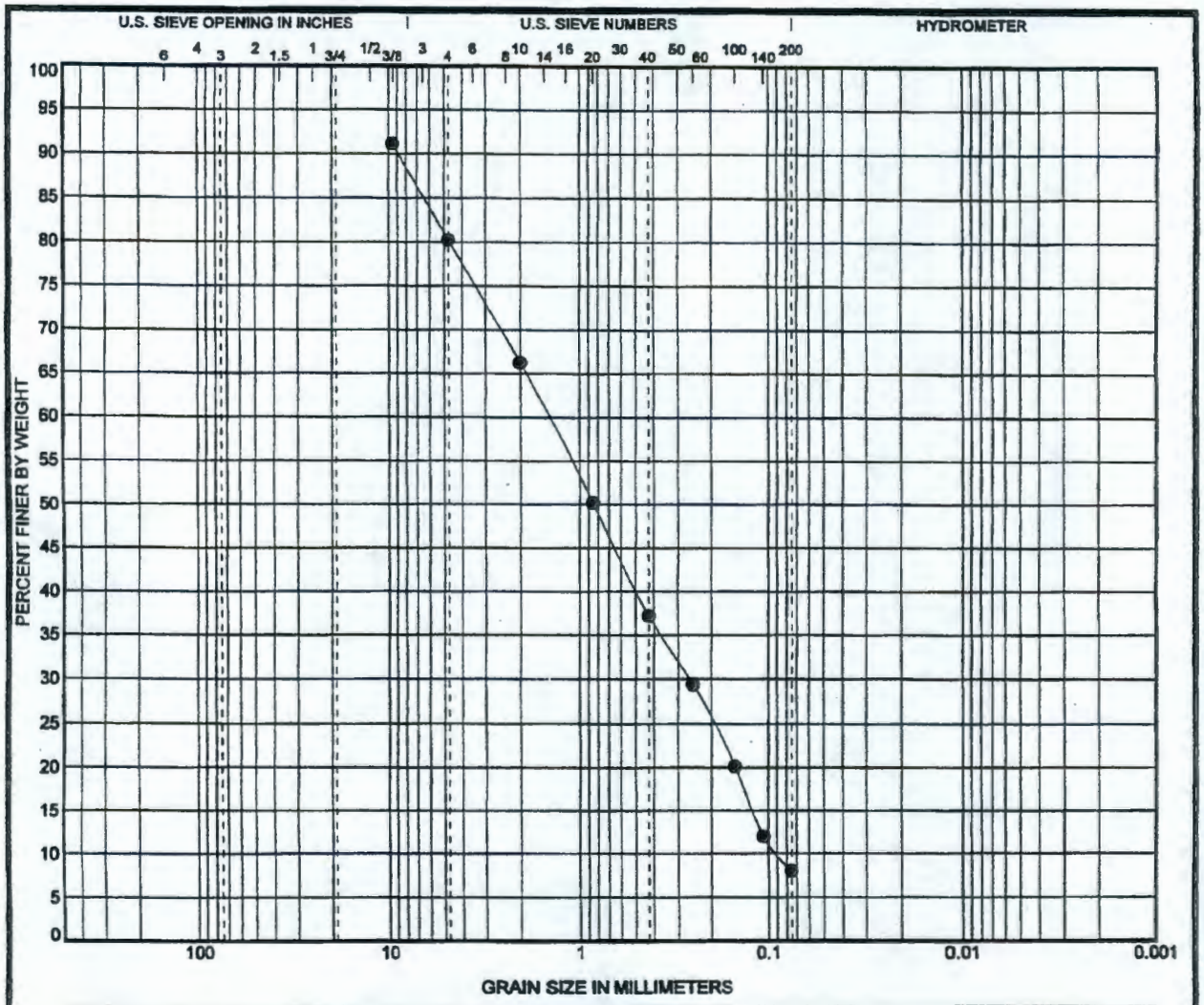
Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline

Location: St. Louis

Number: 9905093



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	030527001-004	0.0	Soil				0.53	16.12
	B16WB7							

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	030527001-004	0.0	9.52	1.433	0.261	0.089	10.9	72.2	8.1	

US_GRAIN_SIZE_EBERLINE.GPJ US_LAB.GDT 8/19/03

MAXIM

Maxim Technologies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, Missouri 63114
Telephone: 314-426-0880
Fax: 314-426-4212

GRAIN SIZE DISTRIBUTION

Project: Eberline

Location: St. Louis

Number: 9905093

Moisture Content, ASTM D2216

MAXIM Technolgies, Inc.
1908 Innerbelt Business Center Drive
St. Louis, MO 63114-5700
314-426-0880

Client: Thermo Nutech-Eberline

Date: 5/22-23/03

Project Number: 9905093-100

File: Eberline-Moisture-5-22-03

Performed By: Ron Swaller

Maxim Sample Number	Client Sample Name	Container Number	Container Weight	Wet Sample + Container	Dry Sample + Container	Moisture Content (%)
	B16WB7	62	11.8	38.66	37.59	4.1
	B16WB6	35-B	11.98	40.95	40.06	3.2
	B16WB5	40	12.05	38.91	38	3.5

Remarks: All weights in grams

November 13, 2003
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Eberline Services
Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

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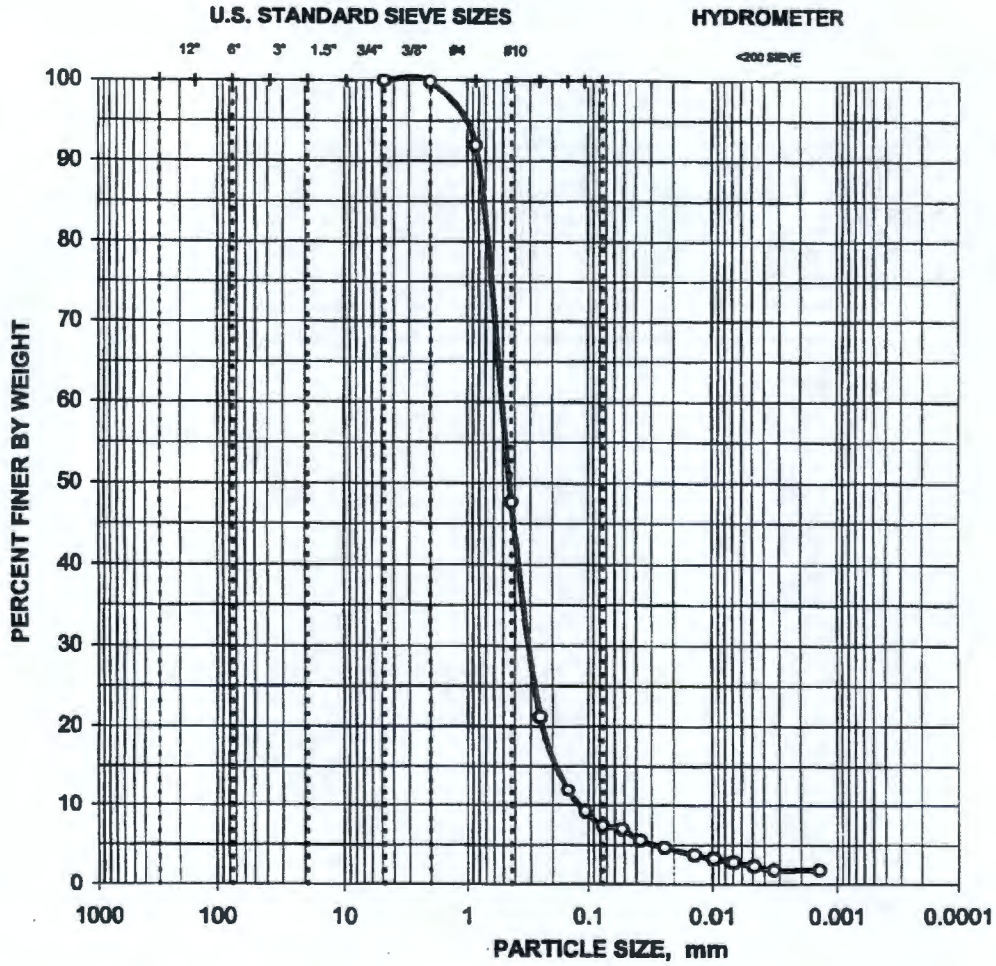
Eberline Hanford



CLIENT SAMPLE NO.: B171M8 **LAB SAMPLE NO.:** BC0224

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000011

November 13, 2003
Steven Trent
Eberline Services
Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
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865/482-6497

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B171M8
Project No.	100846.01000000	Lab Sample No.	BC0224

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 2.6%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.8%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	91.9%
	#40	0.425	47.6%
	#60	0.250	21.1%
	#100	0.149	12.0%
	#140	0.106	9.3%
	#200	0.075	7.4%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05189	7.0%
	0.03695	5.6%
	0.02353	4.7%
	0.01368	3.7%
	0.00989	3.3%
	0.00686	2.8%
	0.00481	2.3%
	0.00330	1.9%
	0.00139	1.9%

0.0% Gravel 92.6% Sand 7.4% Silt/Clay

0000010

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Steven Trent
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SAF No. F03-006
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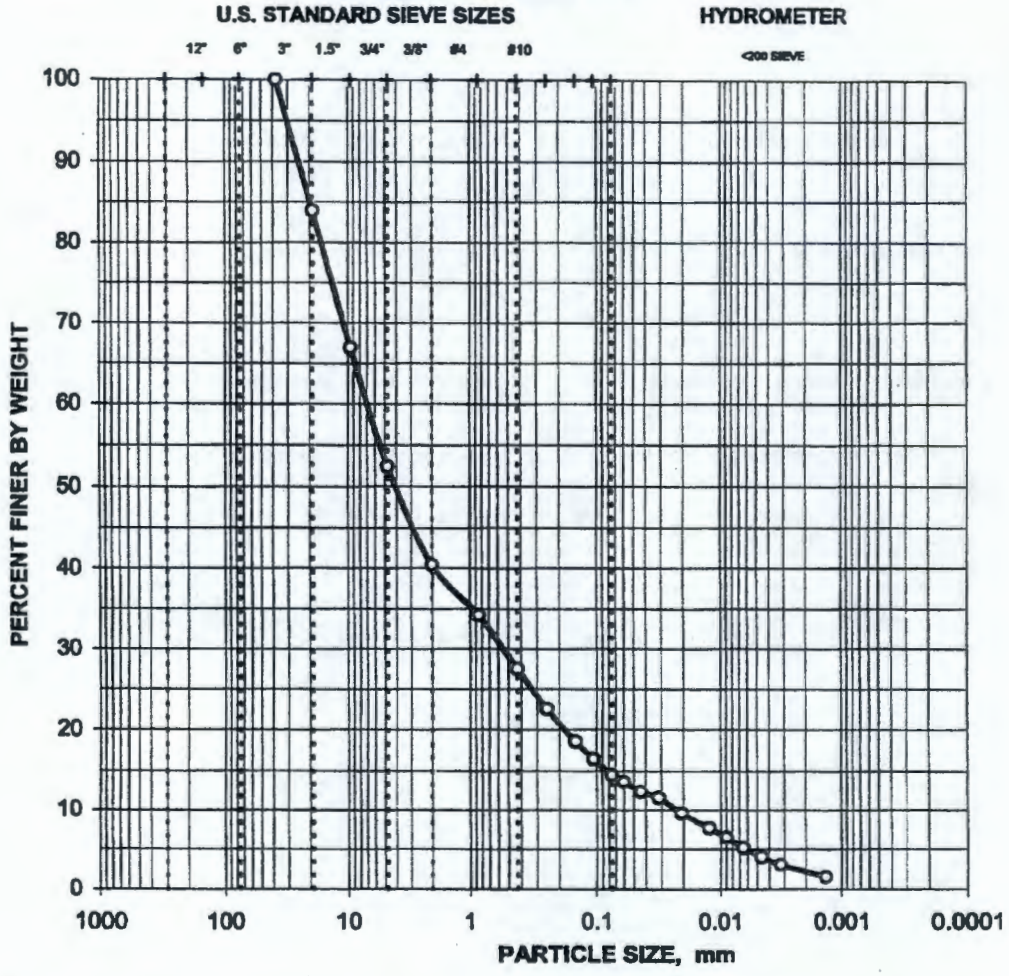
865/482-6497

Eberline Hanford



CLIENT SAMPLE NO.: B171M9

LAB SAMPLE NO.: BC0229

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000019

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SAF No. F03-006
SDG No. H2380

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B171M9
Project No.	100846.01000000	Lab Sample No.	BC0229

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 2.9%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	83.9%
	0.375"	9.500	66.9%
	#4	4.750	52.4%
	#10	2.000	40.4%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	34.2%
	#40	0.425	27.5%
	#60	0.250	22.6%
	#100	0.149	18.6%
	#140	0.106	16.4%
	#200	0.075	14.5%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER	0.06024	13.6%
	0.04392	12.3%
	0.03151	11.5%
	0.02068	9.6%
	0.01236	7.7%
	0.00892	6.5%
	0.00646	5.2%
	0.00460	4.0%
	0.00319	3.1%
	0.00136	1.5%

47.6% Gravel 37.9% Sand 14.5% Silt/Clay

0000018

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November 13, 2003
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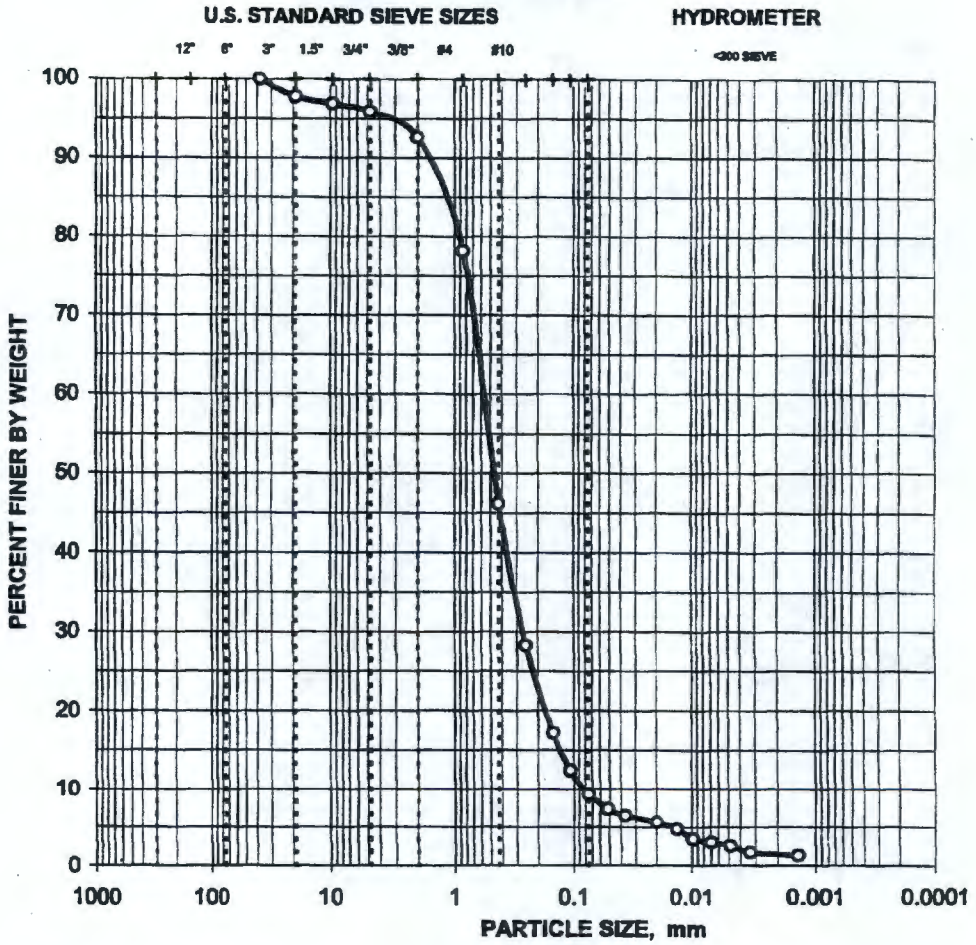
Eberline Hanford



CLIENT SAMPLE NO.: B174B1 **LAB SAMPLE NO.:** BC0227

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000017

November 13, 2003
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SAF No. F03-006
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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B174B1
Project No.	100846.01000000	Lab Sample No.	BC0227

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 3.0%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	97.8%
	0.375"	9.500	96.9%
	#4	4.750	95.9%
	#10	2.000	92.7%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	78.1%
	#40	0.425	46.2%
	#60	0.250	28.3%
	#100	0.149	17.2%
	#140	0.106	12.4%
	#200	0.075	9.3%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05152	7.3%
	0.03669	6.5%
	0.01961	5.6%
	0.01311	4.7%
	0.00967	3.4%
	0.00685	3.0%
	0.00479	2.6%
	0.00330	1.7%
	0.00138	1.3%

4.1% Gravel 86.6% Sand 9.3% Silt/Clay

0000016

Page 7 of 44
November 13, 2003
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Project No. 100846.01000000
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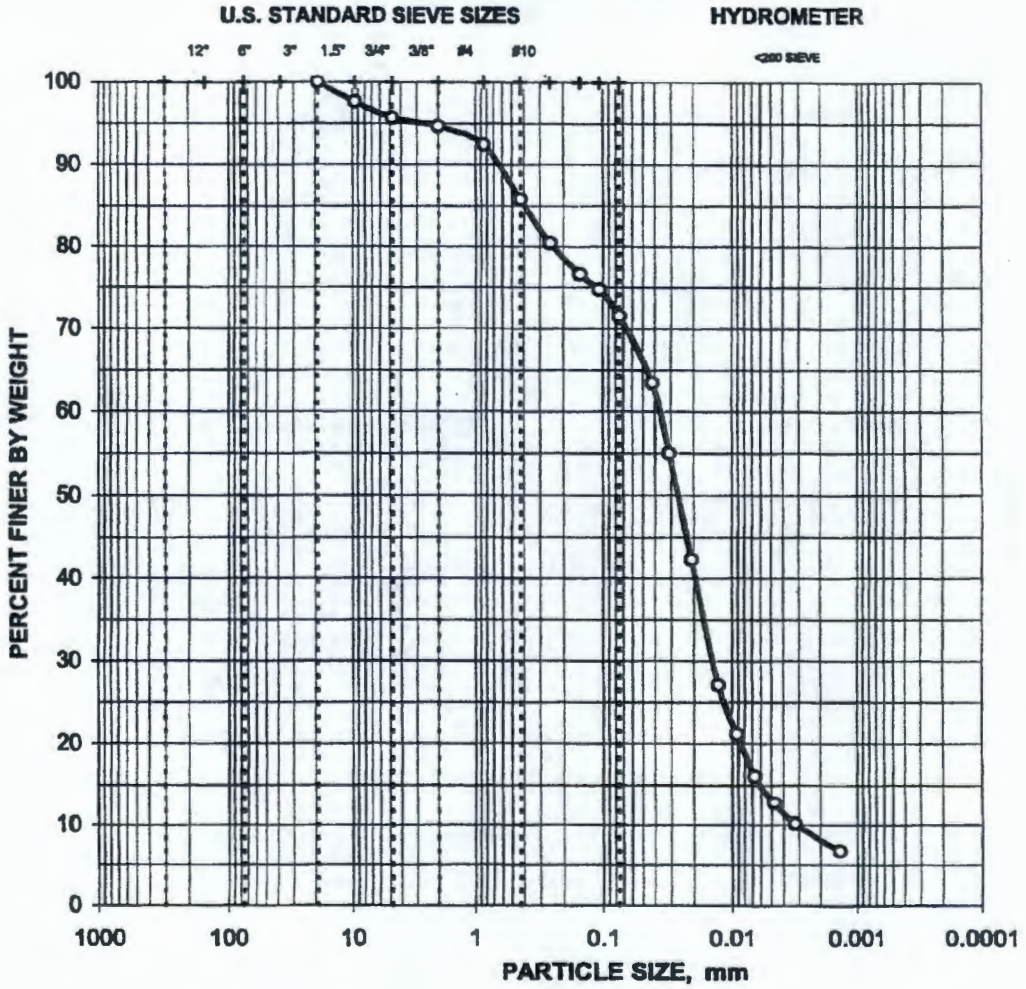
Eberline Hanford



CLIENT SAMPLE NO.: B174B2 **LAB SAMPLE NO.:** BC0223

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000009

November 13, 2003
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SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
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865/482-6497

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Eberline Hanford
Client Sample No.: B174B2
Project No.: 100846.01000000
Lab Sample No.: BC0223

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 17.2%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	97.6%
	#4	4.750	95.7%
	#10	2.000	94.7%

FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	92.4%
	#40	0.425	85.8%
	#60	0.250	80.4%
	#100	0.149	76.6%
	#140	0.106	74.7%
	#200	0.075	71.5%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04180	63.5%
	0.03090	55.0%
	0.02068	42.3%
	0.01272	27.1%
	0.00918	21.2%
	0.00662	16.1%
	0.00468	12.7%
	0.00322	10.2%
	0.00138	6.8%

4.3% Gravel 24.2% Sand 71.5% Silt/Clay

0000008

November 13, 2003
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SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
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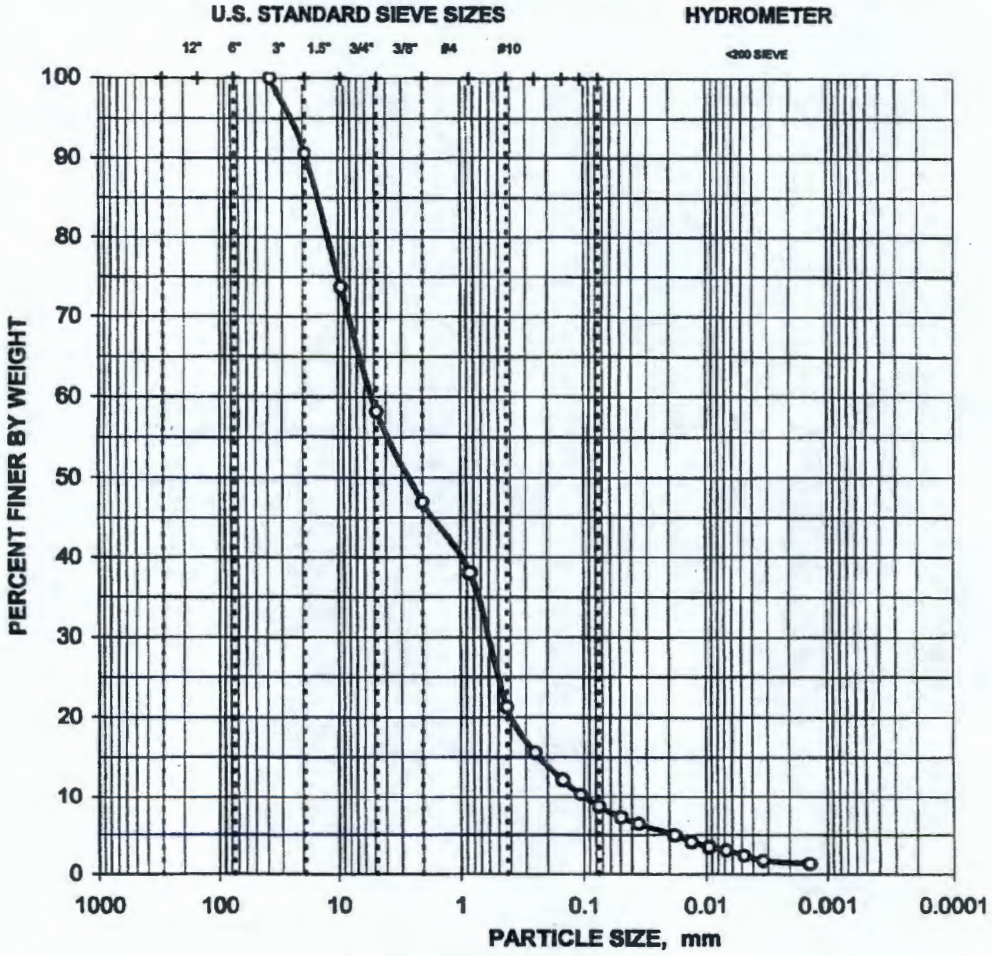
Eberline Hanford



CLIENT SAMPLE NO.: B174B3 **LAB SAMPLE NO.:** BC0225

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000013

November 13, 2003
Steven Trent
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Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
Oak Ridge TN
865/482-6497

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B174B3
Project No.	100846.01000000	Lab Sample No.	BC0225

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 3.9%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	90.6%
	0.375"	9.500	73.7%
	#4	4.750	58.2%
	#10	2.000	46.9%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	38.1%
	#40	0.425	21.3%
	#60	0.250	15.6%
	#100	0.149	12.2%
	#140	0.106	10.3%
	#200	0.075	8.7%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04886	7.3%
	0.03510	6.4%
	0.01789	4.9%
	0.01323	4.1%
	0.00944	3.4%
	0.00672	3.0%
	0.00473	2.4%
	0.00327	1.7%
	0.00138	1.3%

41.8% Gravel 49.5% Sand 8.7% Silt/Clay

0000012

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November 13, 2003
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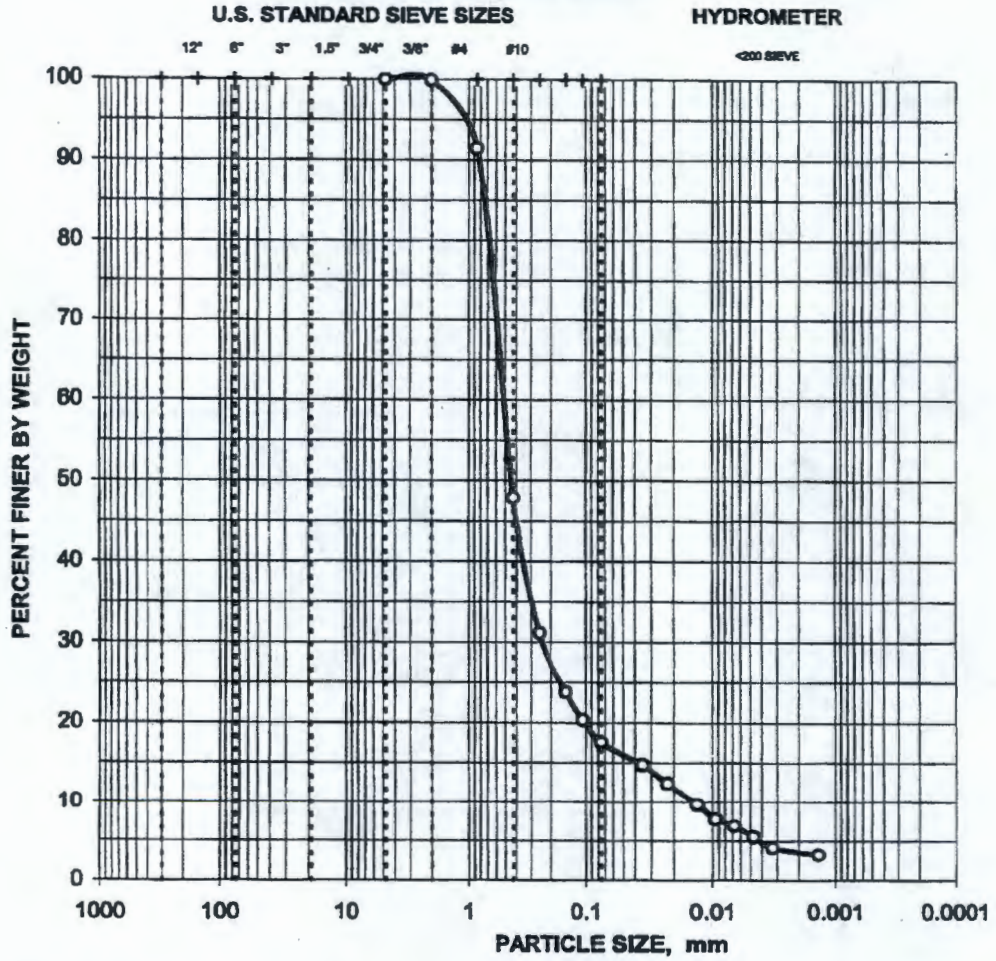
Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
Oak Ridge TN
865/482-6497

Eberline Hanford



CLIENT SAMPLE NO.: B17125 **LAB SAMPLE NO.:** BC0226

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

0000015

November 13, 2003
Steven Trent
Eberline Services
Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
Oak Ridge TN
865/482-6497

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B17125
Project No.	100846.01000000	Lab Sample No.	BC0226

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 4.0%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.9%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	91.4%
	#40	0.425	47.9%
	#60	0.250	31.1%
	#100	0.149	23.8%
	#140	0.106	20.4%
	#200	0.075	17.6%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.03483	14.7%
	0.02237	12.4%
	0.01316	9.7%
	0.00941	7.8%
	0.00670	6.9%
	0.00465	5.5%
	0.00326	4.1%
	0.00138	3.2%

0.0% Gravel 82.4% Sand 17.6% Silt/Clay

0000014

November 13, 2003
Steven Trent
Eberline Services
Project No. 100846.01000000
SAF No. F03-006
SDG No. H2380

Shaw Geotechnical Laboratory
Oak Ridge TN
865/482-6497

MOISTURE CONTENT

PROJECT NAME
Eberline Hanford

PROJECT NUMBER
100846.01000000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
BC0221	B17J01	9.8	8.9	91.1
BC0222	B17J07	14.2	12.5	87.5
BC0223	B174B2	17.2	14.7	85.3
BC0224	B171M8	2.6	2.5	97.5
BC0225	B174B3	3.9	3.8	96.2
BC0226	B17125	4.0	3.8	96.2
BC0227	B174B1	3.0	2.9	97.1
BC0228	B17JM0	3.3	3.2	96.8
BC0229	B171M9	2.9	2.8	97.2

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

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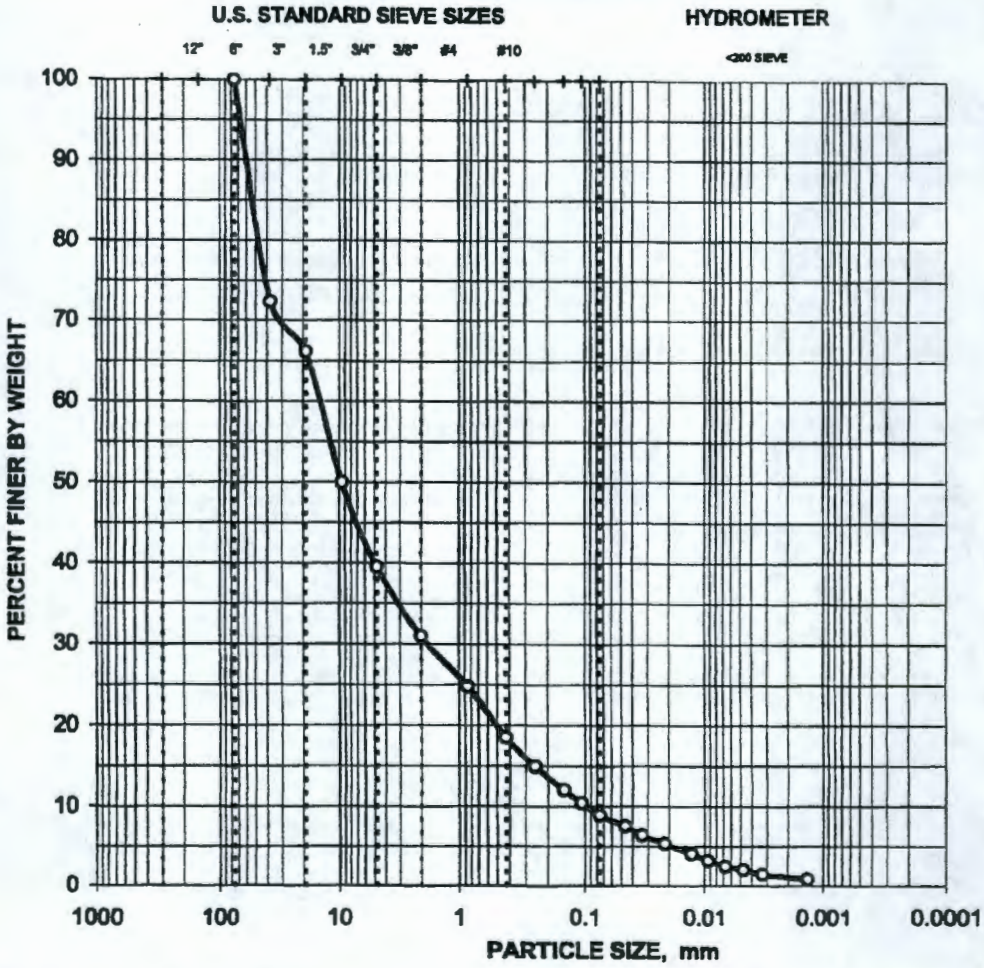
November 18, 2003
Steven Trent
Fluor Hanford, Inc.
Shaw Project Name: Eberline Hanford
Shaw Project No. 100846.01000000
SAF No. F03-006
SDG No. H2394

Shaw Geotechnical Laboratory
Oak Ridge TN
865/482-6497

Eberline Hanford



CLIENT SAMPLE NO.: B17127 **LAB SAMPLE NO.:** BC0230

BOULDERS	COBBLES	GRAVEL					Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

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Oak Ridge TN
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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name	Eberline Hanford	Client Sample No.	B17127
Project No.	100846.01000000	Lab Sample No.	BC0230

Specific Gravity = 2.65
assumed for calculations

Moisture Content = 3.3%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	72.3%
	0.75"	19.000	66.2%
	0.375"	9.500	50.0%
	#4	4.750	39.5%
	#10	2.000	31.0%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	24.8%
	#40	0.425	18.5%
	#60	0.250	15.0%
	#100	0.149	12.0%
	#140	0.106	10.4%
	#200	0.075	8.9%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04604	7.5%
	0.03343	6.4%
	0.02168	5.4%
	0.01287	4.1%
	0.00927	3.2%
	0.00665	2.5%
	0.00470	2.0%
	0.00325	1.4%
	0.00137	0.9%

60.5% Gravel 30.7% Sand 8.9% Silt/Clay

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Shaw Geotechnical Laboratory
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865/482-6497

MOISTURE CONTENT

PROJECT NAME
Eberline Hanford

PROJECT NUMBER
100846.01000000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
BC0230	B17127	3.3	3.2	96.8

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

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