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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 21-02-04

Borehole Information

Farm : BX	**Tank :** BX-102	**Site Number :** 299-E33-27
N-Coord : 45,469	**W-Coord :** 53,219	**TOC Elevation :** 655.50
Water Level, ft :	**Date Drilled :** 7/31/1970	

Casing Record

Type : Steel-welded	Thickness, in. : 0.250	ID, in. : 4
Top Depth, ft. : 0	Bottom Depth, ft. : 240	
Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 255	

Borehole Notes:

According to the driller's log, this borehole was drilled in July 1970 to a depth of 255 ft using 6-in. casing. In 1976, the borehole was perforated from a depth of 236 to 90 ft and from 20 ft to the ground surface. A packer was set at a depth of 240 ft and a 4-in. casing was installed to the same depth. Grout was added from the surface to the depth of the packer. The top of the casing, which is the zero reference for the SGLS, is approximately 0.5 ft below the ground surface.

Equipment Information

Logging System : 2	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 04/1997	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number : 1	**Log Run Date :** 05/21/1997	**Logging Engineer:** Bob Spatz
Start Depth, ft.: 231.0	**Counting Time, sec.:** 100	**L/R :** R **Shield :** N
Finish Depth, ft. : 188.5	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a
Log Run Number : 2	**Log Run Date :** 05/22/1997	**Logging Engineer:** Bob Spatz
Start Depth, ft.: 189.5	**Counting Time, sec.:** 100	**L/R :** R **Shield :** N
Finish Depth, ft. : 127.5	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a
Log Run Number : 3	**Log Run Date :** 05/23/1997	**Logging Engineer:** Gary Lekvold
Start Depth, ft.: 128.5	**Counting Time, sec.:** 100	**L/R :** R **Shield :** N
Finish Depth, ft. : 58.5	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

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Log Run Number :	4	**Log Run Date :**	05/27/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	59.5	**Counting Time, sec.:**	100	**L/R :** R	**Shield :** N
Finish Depth, ft. :	27.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	5	**Log Run Date :**	05/27/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	28.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	15.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	6	**Log Run Date :**	05/27/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	16.5	**Counting Time, sec.:**	100	**L/R :** R	**Shield :** N
Finish Depth, ft. :	12.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	7	**Log Run Date :**	05/28/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	2.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	8	**Log Run Date :**	05/28/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	2.0	**Counting Time, sec.:**	100	**L/R :** R	**Shield :** N
Finish Depth, ft. :	13.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 07/08/1997

Analysis Notes :

This borehole was logged by the SGLS in eight log runs. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from these spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The only man-made radionuclide detected around this borehole was Cs-137. However, throughout most of the borehole, the total count rate exceeded the SGLS capacity to produce a usable spectrum. Cs-137 contamination was positively identified from the ground surface to about 5 ft, 12 to 27 ft, and 102 to 125.5 ft. The detector was saturated due to very high gamma activity along the remaining intervals of the borehole.

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Meaningful intervals of KUT log data were not acquired because of the high dead time throughout most of the borehole.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank BX-102.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of the historical gross gamma log data from 1975 to 1992 is included with the SGLS plots.