mactec-ers
MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole 11-03-12

Borehole Information

Farm : AX	**Tank :** AX-103	**Site Number :** 299-E25-118
N-Coord : 41,776	**W-Coord :** 47,569	**TOC Elevation :** 681.54
Water Level, ft :	**Date Drilled :** 12/31/1974	

Casing Record

Type : Steel-welded	Thickness : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:
This borehole was drilled in December 1974. It was driven to 100 ft with 6-in. casing. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness of schedule-40, carbon-steel pipe. The zero reference is the top of the borehole pipe, which is even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 04/1996	**Calibration Reference :** GJPO-HAN-5	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number : 1	**Log Run Date :** 09/12/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 99.5	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 50.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Log Run Number : 2	**Log Run Date :** 09/13/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 51.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 0.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Log Run Number : 3	**Log Run Date :** 09/13/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 15.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 0.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Borehole 11-03-12

Log Event A

Analysis Information

Analyst : E. Larsen

Data Processing Reference : P-GJPO-1787 Analysis Date : 11/27/1996

Analysis Notes :

This borehole was logged in three log runs; log run three repeated the log of a segment of the borehole for the specific purpose of demonstrating the system repeatability. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and system efficiency, confirming the SGLS was operating within specifications. The energy calibration and peak-shape calibration from these verification 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 log segment between 0 and 15 ft of this borehole was repeated and the concentrations of the Cs-137 and naturally occurring radionuclides were calculated using the separate data sets. The calculated radionuclide concentrations using the separate data sets were generally within two standard deviations of the measured gamma-ray energy count-rate used in the calculations (the two-sigma or 95% confidence interval), indicating very good repeatability of the logging system measurements.

The man-made radionuclides Cs-137, Co-60, and Sb-125 were identified in this borehole. The presence of Cs-137 was noted continuously from the ground surface to 18 ft and 37.5 to 43.5 ft. Detectable quantities (less than 1 pCi/g) were also noted from 27 to 27.5 ft and 53 to 54 ft. The zone of continuous Cs-137 contamination was detected within back-fill material (consisting of coarse sand, silt, and some gravel) that overlies and surrounds the tank. The maximum Cs-137 concentration of about 40 pCi/g was detected within the upper 5 ft of the borehole.

Detectable concentrations of Co-60 were encountered at 5 ft and between 10.5 and 11.5 ft. The highest measured concentration of Co-60 within this borehole was 0.14 pCi/g between 11 and 11.5 ft. Concentrations of Sb-125 were detected between 9 and 13 ft. The highest measured concentration was 1.8 pCi/g at 12.5 ft.

The presence of Co-60 was indicated by the 1173- and 1333-keV spectral peaks. Log data obtained from both Co-60 peaks were combined and plotted on the concentration plot. The presence of Sb-125 was indicated by the 427- and 600-keV spectral peaks. The log data obtained from both Sb-125 peaks were also combined and plotted on the concentration plot.

Between 1 ft and 6 ft, it was not possible to identify most of the 609-keV peaks used to determine the U-238 concentrations. This occurred because high gamma-ray activity associated with the nearby Cs-137 peak (661 keV) created an elevated Compton continuum extending to the 609-keV region, causing the MDL to exceed the measured U-238 concentration.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank AX-103.

Log Plot Notes:

Separate log plots show the man-made radionuclides (Cs-137, Co-60, and Sb-125) and the naturally occurring

Borehole 11-03-12

Log Event A

radionuclides (KUT). 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 of a radionuclide, which 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, in addition to 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.

Separate plots are included that compare the measured concentration of the man-made radionuclides (Cs-137, Co-60, and Sb-125) and the naturally occurring radionuclides (KUT) over the repeated log interval. The radionuclide concentrations shown were calculated using the separate data sets provided by the original and rerun logging runs.