RUST GEOTECH INC.

Spectral Gamma-Ray Borehole
Log Data Report

Borehole 51-08-09

Log Event A

Borehole Information

Farm : TX	**Tank :** TX-108	**Site Number :** 299-W15-137
N-Coord : 41,748	**W-Coord :** 76,104	**TOC Elevation :** 668.02
Water Level, ft :	**Date Drilled :** 11/30/1971	

Casing Record

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

Borehole Notes:
This borehole was completed in November 1971 to a depth of 100 ft. Though not specified in the driller's notes, it is assumed that 6-in. casing was installed from the ground surface to the bottom of the borehole. There is no indication that the casing was perforated. The driller's notes do not indicate that any segment of the borehole was cemented or grouted.

The casing thickness is presumed to be 0.280 in., on the basis of published thickness for schedule-40, 6-in. steel tubing.

The top of the casing is the starting depth for the logs. The casing collar is about even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 11/1995	**Calibration Reference :** GJPO-HAN-3	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number : 1	**Log Run Date :** 2/12/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 99.5	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 53.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Log Run Number : 2	**Log Run Date :** 2/13/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 0.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 54.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Log Run Number : 3	**Log Run Date :** 2/12/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 0.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 10.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

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Analysis Information

Analyst : H.D. Mac Lean

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

Analysis Notes :

Three logging runs were conducted with the SGLS in this borehole. The log of the borehole was completed in two logging runs. A third logging run repeated the segment between the ground surface and 10 ft as an additional quality assurance measure.

The pre-survey field verification spectra from all logging runs failed to meet the acceptance criteria established for the peak shape and system efficiency. A nonconformance report issued in August 1996 (N-96-05) identified the cause of this failure as a power supply malfunction that resulted in a low detector bias voltage being supplied to the logging tool. This malfunction occurred in the mornings because of inadequate system warm-up time. The nonconformance report also documents that radionuclide concentrations calculated from data collected in the first 2 hours of logging operation could be systematically understated by about 10 percent. Data from the second run between 0 to 20 ft may show a repeatability problem if the borehole is re-logged in the future. It should be noted that data collected between the ground surface and 10 ft (collected early in the morning) produced calculated radionuclide concentrations that were almost identical to those collected by the repeat log (data acquired in the afternoon) indicating that only a few, if any, log spectra were affected.

The post-survey field verification spectra for all logging runs passed the acceptance criteria for the peak shape and system efficiency, indicating that the logging system was operating within specification after an initial warm-up period. The energy calibration and peak-shape calibration from the post-survey field verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during logging. Slight gain drift was experienced during brief intervals during the first and second log runs. It was necessary to adjust the energy calibration to compensate for this drift while processing data from a few of the logging spectra in order to maintain proper peak identification.

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

Depth overlaps, where data were collected at common borehole locations by separate logging runs, occurred between 53 and 54 ft. The KUT concentrations using the separate data sets at the overlapping points were within the uncertainty of the measurements, indicating acceptable repeatability of the measurements. In addition, the log segment between the ground surface and 10 ft was repeated to confirm the repeatability of the calculated radionuclide concentrations. The calculated concentrations of Cs-137 and KUT using data sets from the original and repeated logging runs were within the uncertainty of the measurements, indicating very good repeatability of the measurements and the concentration determinations.

The only man-made radionuclide encountered was Cs-137. Detectable Cs-137 concentrations were measured almost continuously from the ground surface to about 19 ft. A peak of elevated Cs-137 concentrations was detected at approximately 1 ft. The maximum measured Cs-137 concentration of about 7 pCi/g was detected at 1 ft. Below 6 ft the Cs-137 concentrations were less than 1 pCi/g.

A step-like increase in the K-40 concentration and in the total gamma-ray count rate was detected at 49 ft. Measured concentrations are about 12 pCi/g above 49 ft and about 18 pCi/g below this depth. A subtle increase in the Th-232 concentrations also occurs below this depth.

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A decrease in the K-40 concentrations was detected at 98 ft. The U-238 and Th-232 concentrations increase at this depth, along with the total gamma-ray count rate.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank TX-108.

Log Plot Notes:

Separate log plots show the man-made (Cs-137) and the naturally occurring 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. 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, 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. The MDL and the uncertainty bars have been removed from these plots.

A plot of the measured concentration of Cs-137 and KUT for the original log run and repeated log run interval is included. The radionuclide concentrations shown were calculated using the separate data sets provided by the original logging run and the repeated segment.