

START

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JUN 03 1993

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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Station # 12

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16. KEY		
Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
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1/2	1	Cog. Eng. R.K. Price	<i>RK Price</i>	6/2/93	N6-06	J.A. Caggiano			H6-03	3	
1/2	1	Cog. Mgr. J.W. Fassett	<i>J.W. Fassett</i>		N6-06						
		QA									
		Safety									
		Env.									
3		EDMC (2)			N6-08						
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18. Signature of EDT Originator <i>RK Price</i> 6/2/93	19. Authorized Representative for Receiving Organization Date	20. Cognizant/Project Engineer's Manager <i>J.W. Fassett</i> 6-2-93	21. DOE APPROVAL (if required) Ltr. No. NA <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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SUPPORTING DOCUMENT

1. Total Pages 20

2. Title

Spectral Gamma-Ray Log Report for Tank 241-T-101 Borehole Surveys

3. Number

WHC-SD-EN-TI-163

4. Rev No.

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5. Key Words

RLS, calibration, log header, radionuclides, HPGe

6. Author

Name: R.K. Price

RK Price
Signature

Organization/Charge Code 81234/R4GD1

**APPROVED FOR
PUBLIC RELEASE**

6/2/93 N. Solis

7. Abstract

This document reports on spectral gamma-ray logs for four boreholes surrounding single-shell tank 101-T. Logs were collected with the Radionuclide Logging System high-purity germanium passive gamma-ray logging probe and showed the presence of gamma emitting manmade radionuclides in all four boreholes. The fifth borehole associated with the tank, 50-01-02, contained an obstruction that prevented access to the borehole probe.

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9. Impact Level 4

9313022.1716

OK

Date Received: 5/18/93		INFORMATION RELEASE REQUEST		Reference: WHC-CM-3-4	
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			Date Release Required 5/25/93		
Title SPECTRAL GAMMA-RAY LOG REPORT FOR TANK 241-T-101 BOREHOLE SURVEYS				Unclassified Category UC-	
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New or novel (patentable) subject matter? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has disclosure been submitted by WHC or other company? <input type="checkbox"/> No <input type="checkbox"/> Yes Disclosure No(s).			Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)		
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Author/Requestor (Printed/Signature)		Date			
R. K. Price [Signature]		14 MAY 93			
Intended Audience					
<input type="checkbox"/> Internal <input type="checkbox"/> Sponsor <input checked="" type="checkbox"/> External					
Responsible Manager (Printed/Signature)		Date			
J. W. Fassett [Signature]		5-14-93		Date Cancelled	
				Date Disapproved	

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RLS Passive Spectral Gamma-Ray Borehole Survey Report
 =====

Report Date: November 23, 1992
 Project: Single Shell Tank 101-T Initial Survey
 Boreholes: 50-01-04 (299-W10-102)
 50-01-06 (299-W10-103)
 50-01-09 (299-W10-104)
 50-01-12 (299-W10-105)
 Calibration Date: November 1991
 Logging Engineers: R. V. Cram, S. E. Kos
 Analyst: R. K. Price, J. P. Kiesler

Introduction

Logging with the high resolution, high purity germanium (HPGe) passive spectral gamma-ray system has been completed for the requested boreholes. A summary of the boreholes included in this report are presented in Table 1 and Table 2 below. Table 1 contains the survey date, maximum survey depth and maximum depth at which each manmade radionuclide was identified. Table 2 contains the maximum decay activity and corresponding depth for each manmade radionuclide.

The objective of the borehole surveys was to identify the presence and species of manmade gamma-ray emitting radionuclides, the relative activity levels and establish a baseline for evaluation of subsequent surveys. The boreholes contain multiple casings and grout which is beyond the present calibration range of the equipment. The computed activity levels will be underestimated. The graphs of the decay activities (concentrations) versus depth are presented for each survey. Decay activities are reported in pico-curies per gram (pCi/g) of sample.

The contents of the report are limited to the description of the survey results for each borehole logged. Details of the following: equipment configuration, calibration, logging procedures, casing and water correction factors, spectra analysis software, and data management have been excluded. The details of the excluded topics are described in the papers cited at the end of this report.

Tank 101-T Borehole Geophysics Project Review

Observations of the RLS borehole surveys included in this report are summarized below. This review does not necessarily include all the information that can be gleaned from the spectral gamma-ray survey data.

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Table 1: Summary of Maximum Radionuclide Depths from RLS Log Surveys of Tank 101-T

Borehole ID	Survey Date	Survey Depth ¹	Cesium-137 Depth ²	Cobalt-60 Depth ²	Europium-152 Depth ²	Europium-154 Depth ²
50-01-04	10/14/92	118'	118' ³	-	-	-
50-01-06	10/20/92	81'	25'	81' ³	-	67'
50-01-09	10/15/92	87'	26'	87' ³	-	-
50-01-12	10/13/92	85'	-	38'	-	-

¹Maximum survey depth²Maximum depth where radionuclide was identified³Maximum depth of borehole survey

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Table 2: Summary of Maximum Radioactivity from RLS Log Surveys of Tank 101-T

Borehole ID	Cesium-137		Cobalt-60		Europium-152		Europium-154	
	pCi/g ¹	Ft	pCi/g ¹	Ft	pCi/g ¹	Ft	pCi/g ¹	Ft
50-01-04	>5000	118 ²	-	-	-	-	-	-
50-01-06	10	1	12	74	-	-	33	55
50-01-09	230	21	< 3	-	-	-	-	-
50-01-12	-	-	< 1	-	-	-	-	-

¹Maximum decay activity observed for radionuclide. Maximum depth of reported activity is present.²Maximum depth of borehole survey

COUNTING SYSTEM SATURATION: Intense gamma activity in borehole 50-01-04 saturated the RLS counting system in three intervals. The intervals are 20.5 to 55 feet, 57.5 to 69.5 feet and at 110 feet. The small hole size, 4-inch inside diameter, prevent use of the high density shielding to reduce the gamma-ray flux to recordable levels. A change in the counting system configuration to optimize count rate capability will be evaluated for subsequent surveys in borehole 50-01-04. This change is already available on the RLS and will be included in the next equipment calibration plan. The design of a high resolution detector for intense gamma-ray activity is being investigated.

CESIUM MIGRATION: The extensive downward migration of cesium-137 in 50-01-04 to at least the maximum survey depth of 118 feet and possibly greater was apparently unexpected. Discussions with a nuclear chemist indicated that high salt content liquids have been demonstrated to enhance the downward movement of cesium-137 which normally does not migrate substantially from the release site. Occurrence Report 75-147 documented that high gamma activity existed in 50-01-04 prior to 9/21/73 and that the source of the radionuclides in the soil are due to a tank overflow and leakage from the inlet and cascade piping. Examination of the Tank-farms surveillance log used as the baseline, dated 3/15/82, showed that the average gamma activity at the bottom of the borehole between 109 and 122 feet is greater than the average gamma activity just above from 73 to 108 feet. Thus the presence of manmade radionuclides to 122 feet have been present at least since 1982.

COBALT and EUROPIUM at 50-01-06: The borehole survey of 50-01-06 suprisingly does not contain any cesium-137 between 26 feet and the maximum survey depth of 81 feet. The manmade radionuclides recorded in borehole 50-01-06 will probably be traced to the tank overflow and radionuclides identified in borehole 50-01-04. The explanation of the detection of three different radionuclides with their maximum activity at different depths follows.

Spectral gamma borehole surveys of manmade radionuclide species versus depth in several 200 West Area disposal sites often encountered the three nuclides of Cs-137, Eu-154 and Co-60. Field measurements frequently confirm the studies indicating that cobalt is more mobile in the subsurface than cesium. Eventhough europium was not one of the primary study nuclides the field surveys always showed its mobility to be between cobalt and cesium. The liquid discharged to the soil have been shown to spread laterally at lithologic interfaces and cobalt-60 the more mobile element will move further than cesium. The maximum peak at 74 feet in borehole 50-01-06 contains only cobalt-60 confirming its greater mobility. Occurance Report 75-147 documented the development of the peak reading at 74 feet from 70 cps on 7/18/75 to 290 cps on 1/9/76. The gamma peak at 55 feet due primarily to europium-154 and secondarily cobalt-60 had already developed prior to 9/21/73.

MAXIMUM CASING CORRECTION: The maximum calibrated casing correction factor of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated.

NO TOTAL-GAMMA CORRECTION: The Total-Gamma plot, presented as the first curve on each survey plot, is the count rate (c/s) observed for all gamma-rays

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recorded in the spectra. No correction factors for steel casing or borehole fluid have been applied to the data. The Total Gamma plot is equivalent to the PNL Gross-Gamma survey.

TOTAL GAMMA INCREASE: The Total Gamma activity for borehole 50-01-i2 increased from the average between 81 feet and the maximum survey depth of 85 feet. The change is not attributed to the presence of manmade radionuclides but is due to an increase in the natural potassium and thorium.

EQUIPMENT CALIBRATION: The borehole surveys presented in this report have all been analysed using the calibration data acquired in November 1991. Calculation of the calibration factors used in data reduction depended on the calibration data and on nuclear data (half lives, branching ratios, number of gammas per decay) for the particular nuclide. All of the nuclear data were taken from Erdtmann and Soyka, Die Gamma-Linien der Radionuklide (The Gamma Rays of the Radionuclides), Verlag Chemie GMBh Weinheim, Deutschland, 1979.

Borehole Survey Report

The report for each borehole survey by the RLS contains three types of information. The contents of each information type are described below. The borehole survey reports are presented in the same order as they are listed in Table 1.

1. A single page log header form is first. The form is titled "RLS Spectral Gamma-Ray Borehole Survey Log Header" and summarizes the borehole and survey information.

The form contains the borehole name, coordinates, and elevation.

Borehole environment information is next and includes casing parameters and water depth (if present). These are the parameters used for data reduction.

RLS survey information is presented third and includes the logging engineers name, date, file names, logging mode, and survey depths.

The survey data reduction information follows and includes calibration date and calibration report number, analyst names and analysis date. A single line is present for analysis notes and man-made radionuclides encountered.

2. Radionuclide activity responses versus depth, i.e., data plots, are plotted on one or more pages. A uniform depth scale of 20 feet/inch is used for all plots. Four plot tracks are presented for uniformity. The experimental uncertainties in the computed radionuclide activities are not presented on the data plots at this time.

The "Total Gamma" is the count rate for all gamma-rays detected by the RLS detector with no discrimination of gamma-ray energy. The "Total

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Gamma" is equivalent to the gross gamma log commonly used by some organizations at Hanford. The count rate data values are plotted on two linear scales. The scale of the narrow line is 0 to 1000 c/s. The scale of the wide line is 0 to 100,000 c/s.

The remaining plot tracks contain the results of the spectra gamma-ray analysis. The computed data values are generally plotted on two linear scales. The scale of the narrow line is given at the top of the plot and is 0 to 50 pCi/g. The scale of the wide line is given at the bottom of the plot and is 0 to 5000 pCi/g.

3. The analysis notes follow as the third type of information reported for each spectral gamma-ray survey. The notes contain descriptions of the borehole conditions and possible limitations of the plotted results. The depth ranges where each radionuclide was encountered and the maximum activities are reported.

Limitations to the Radioelement Analyses

Several limitations of the borehole survey equipment, calibration, and data acquisition objectives follow.

The logging cable supporting the borehole detector, supplying electrical power, receiving voltage signals for each detected gamma-ray, and permitting the liquid-nitrogen cooled detector to be submerged in water was specially fabricated for the RLS system. The recorded depth of the detector is estimated to be accurate to 98.5 percent, with a precision (repeatability) of 99 percent. Comparisons with drilling measurements, other logging equipment, and secondary measuring systems have verified the accuracy. An upgrade in the logging cable and measuring system is being investigated.

The standard logging configuration optimizes the counting system for detecting low decay activities of radioelements. The RLS has frequently detected man-made radioelement activities of 0.3 pCi/g for nuclides with gamma-rays having energies greater than 500 keV and number of gammas per decay at greater than 50 percent. The maximum decay activity the RLS has detected is about 10,000 pCi/g in this standard configuration.

The alternate logging configuration employs a lead shield and changes the counting system to maximize the count rate. Configuring the counting system to maximize the count rate compromises its ability to detect radioelements at low decay activities (concentrations). The RLS has frequently detected man-made radioelement activities exceeding 33,000 pCi/g in this shielded configuration. The alternate logging configuration was not employed for the surveys included in this report due to hole size restrictions.

Borehole environment correction factors have been determined for steel casing and water in the borehole. Correction factors for other borehole configurations have not been investigated. Borehole configurations for which no correction is available include: (1) grout between multiple casing strings,

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(2) formation seals containing bentonite, sand, or grout behind the casing, and (3) drilling mud remaining inside the borehole during logging. The calculated decay activity for manmade radionuclides will be underestimated for boreholes with these configurations.

Energy dependent casing corrections have been established for steel casing thicknesses up to 0.40 inches. Corrections for casings of different materials and/or cumulative thicknesses greater than 0.40 inches have not been calculated and therefore cannot be used in the data reduction.

The calibration data were recorded with the detector centered in calibration zones that are uniform in density, water content, and gamma-ray source material. The dimensions of each zone are large enough that the detector always responded as though surrounded by a medium of infinite extent. Therefore, the use of the calibration results to calculate nuclide activity carries the assumption that the nuclides in the logged formation are also distributed in thick uniform layers.

Gamma-ray sources are not normally distributed in the earth in thick uniform layers. Source inhomogeneities are reflected to some degree by the fluctuations in the amplitudes of the log traces. A factor called the vertical spacial resolution quantifies the correlation between (1) the intensity of the log fluctuation and the depth interval over which it extends, and (2) the intensity of the corresponding gamma-ray source and the thickness of the zone in which the source is embedded. The vertical spatial resolution of the RLS HPGc logging system is scheduled for investigation.

Radionuclide decay activities are determined from the net area of the gamma-ray peaks. Radioelements such as strontium-90 which do not emit a gamma-ray when they decay will not be identified or quantified by the spectra analysis performed for this report. The decay of strontium-90 results in a high energy beta particle that can excite surrounding elements to emit photon radiation that can be identified by the HPGc detector. This type of radiation is called bremsstrahlung radiation. A method to obtain estimates of the concentrations of strontium-90 is under consideration.

Conclusion

The RLS has completed surveys for four boreholes associated with single shell tank 101-T. Four boreholes with detectable and often significant amounts of manmade radionuclides were identified.

At this time with only one spectral gamma survey of the boreholes surrounding the tank it can not be confirmed that the tank is leaking. Two items contribute to the nonconclusive statement. First, the significant magnitude of the radionuclides present in the tank overflow prior to 1976 will severely impact the possibility of detecting a leak in borehole 50-01-04 unless the gamma activity generated from the leaking fluid significantly exceeds the present gamma activity from the historic event. Second, the radionuclide

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contents of the tank have not been disclosed.

Subsequent spectral gamma surveys will be compared to this base line survey and changes will be strong indications of the leak location.

The decay activity for the natural radionuclides, KUT, have been computed by the data reduction program. The decay activity of KUT have not been presented in this report. Plots of the KUT activity levels can be prepared if necessary.

Cited Reports

Koizumi, C. J., J. R. Brodeur, W. H. Ulbricht, and R. K. Price, 1991, "Calibration of the RLS HPGe Spectral Gamma-Ray Logging System," WHC external publication WHC-EP-0464

Brodeur, J. R., C. J. Koizumi, W. H. Ulbricht, and R. K. Price, 1991, "Calibration of a High-Resolution Passive Gamma-Ray Logging System for Nuclear Waste Assessment," WHC Speech Article Report WHC-SA-1175-FP

Koizumi, C. J., R. K. Price, and R. D. Wilson, 1992, "Calibration of the RLS System for 200 Aggregate Area Management Study Screening Measurements," WHC supporting document WHC-SD-EN-TRP-001

Koizumi, C. J., R. K. Price, and R. D. Wilson, 1992, "Gamma-Ray Logging results for the 200 Aggregate Area Management Study," WHC supporting document WHC-SD-EN-TI-021

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Westinghouse Hanford Company
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: Single Shell Tank T-101

Borehole	<u>T50-01-04 299-W10-102</u>		
Coordinates	<u>43.632 N</u>	<u>75.595 W</u>	ft (Plant 200 W)
Elevation	<u>674.18</u>	ft	Top of Casing (Plant 200 W)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (ft) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (in)	Casing Thickness (in)	Top Depth (ft)	Base Depth (ft)
6	0.28	0.	125.
4	0.19	0.	125.

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (ft)		
			Top	Base	Incr
Oct 14, 92	H2W10102\A262	MSA 80sec RT	0	118.	0.5

MSA: Move-Stop-Acquire Rt: Real Time

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>J. P. Kiesler</u>
Analysis Date: <u>Oct 19, 1992</u>
Analysis Notes: <u>No Eu-152, Eu-154 or Co-60 detected.</u>
Radionuclides identified: <u>Cs-137</u>

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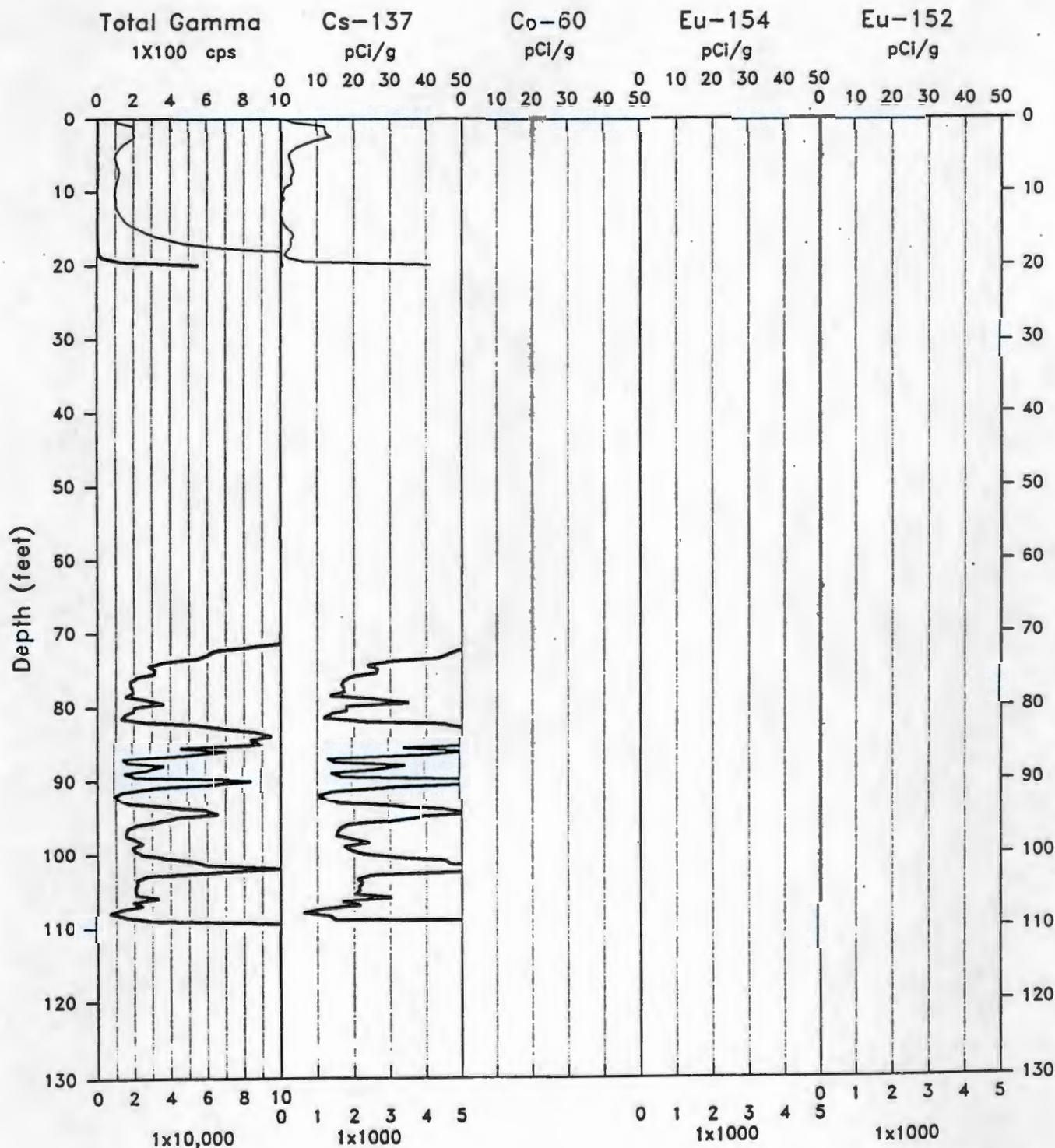
RLS Spectral Gamma-Ray Borehole Survey

Project: T Tank Farm

Log Date: Oct 14, 92

Borehole: T50-01-04

Anal. Date: Oct 19, 92



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299-W10-102 T-101 Tank Borehole 50-01-04

Casing	Depth: 125 Ft	Size: 6 in	Thickness: 0.28 in
	Depth: 125 Ft	Size: 4 in	Thickness: 0.188 in
Water	Depth: none		
Survey	Depth: 0 - 118 Ft	Mode: MSA 80s	Date: 10/14/92

General Notes:

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated.

The borehole diameter of 4 inches prevented use of the detector shielding. Saturation of the counting system occurred in three zones during the borehole survey. The depths of saturation are: 20.5 to 55.0 feet, 57.5 to 69.5 feet and at 110 feet.

The maximum cesium decay activity represented on the survey plot is 5000 pCi/g. The maximum decay activity the program computed before saturation occurred was 33,000 pCi/g.

Cesium activity reached 40 pCi/g at 20 feet before the counting system saturated at 20.5 feet. The unusually high total gamma activity below 18 feet with no associated gamma-ray photo peaks may be attributed to bremsstrahlung radiation from the high energy beta decay of strontium-90.

Man-made Radionuclides:

Cesium (Cs-137) was encountered from the surface to the maximum survey depth of 118 feet. The cesium decay activity exceeded 200 pCi/g from probably just below 20 feet to the maximum survey depth of 118 feet. The cesium activity exceeded 5000 pCi/g from some where above 55 feet to 73 feet, at several thin zones between 83 feet and 103 feet and from 109 to the maximum survey depth of 118 feet.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

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Westinghouse Hanford Company
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: Single Shell Tank T-101

Borehole	<u>T50-01-06</u>	<u>299-W10-103</u>	
Coordinates	<u>43.593 N</u>	<u>75.637 W</u>	ft (Plant 200 W)
Elevation	<u>673.04</u>	ft	Top of Casing (Plant 200 W)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (ft) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (in)	Casing Thickness (in)	Top Depth (ft)	Base Depth (ft)
6	0.28	0.	100.
4	0.19	0.	84.

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (ft)		
			Top	Base	Incr
Oct 16, 92	T500106\A264	MSA 80sec RT	0	81	0.5

MSA: Move-Stop-Acquire Rt: Real Time

Calibration and Analysis Information

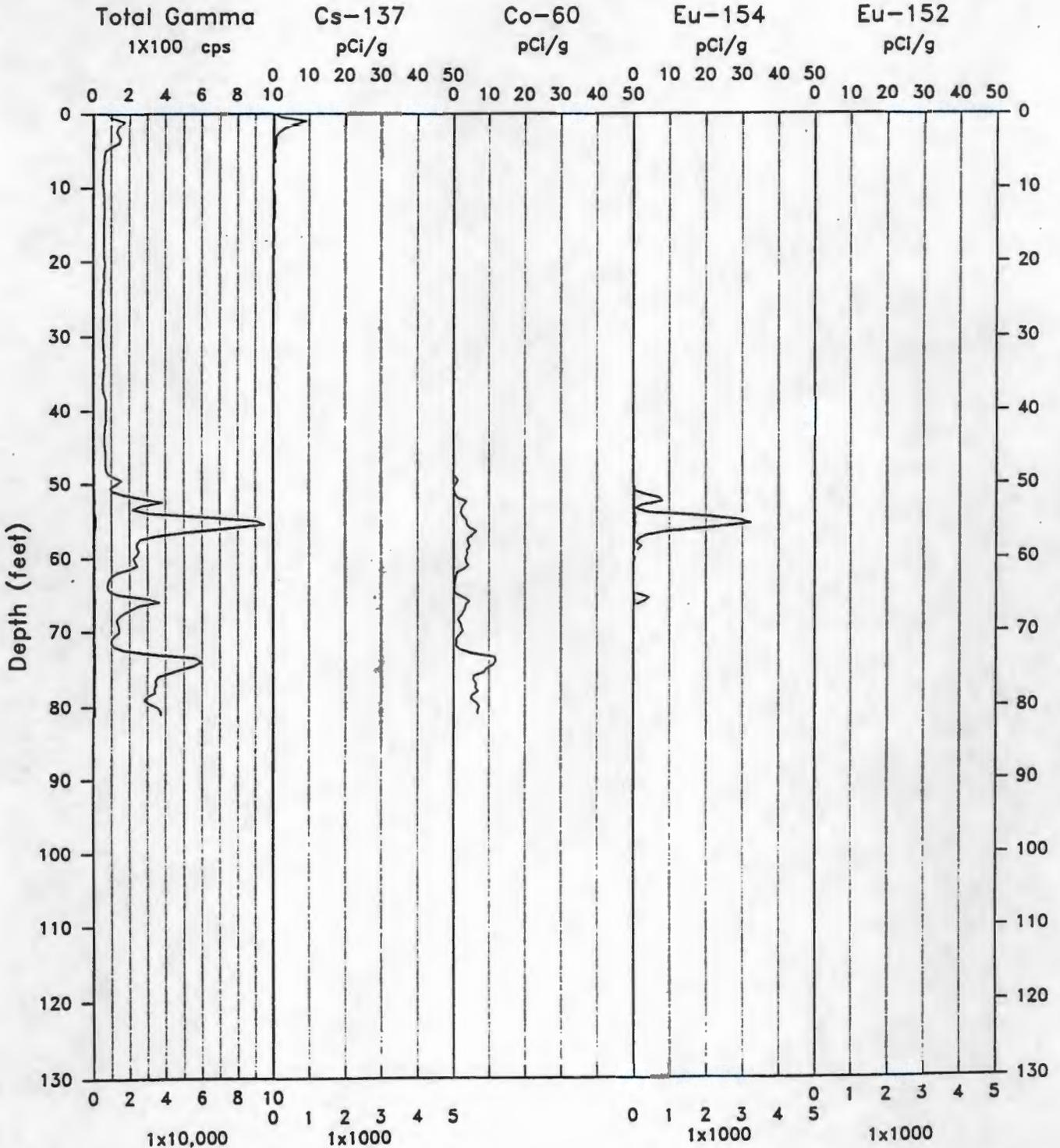
RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>J. P. Kiesler</u> _____
Analysis Date: <u>Oct 20, 1992</u>
Analysis Notes: <u>No Eu-152 detected. presented only for plot consistency</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-154</u>

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RLS Spectral Gamma-Ray Borehole Survey

Project: T Tank Farm
Borehole: T50-01-06

Log Date: Oct 16, 92
Anal. Date: Oct 20, 92



9313022.1729

299-W10-103 T-101 Tank Borehole 50-01-06

Casing	Depth: 100 Ft	Size: 6 in	Thickness: 0.28 in
	Depth: 84 Ft	Size: 4 in	Thickness: 0.188 in
Water	Depth: none		
Survey	Depth: 0 - 81 Ft	Mode: MSA 80s	Date: 10/16/92

General Notes:

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated.

Man-made Radionuclides:

Cesium (Cs-137) was encountered from the surface to 25 feet. The maximum cesium decay activity detected was 10 pCi/g at 1 foot.

Cobalt (Co-60) was encountered in the borehole survey from 49 feet to the maximum survey depth of 81 feet. The maximum cobalt decay activity detected was 12 pCi/g at 74 feet.

Europium-154 (Eu-154) was encountered in the borehole survey from 49 feet to 67 feet. The maximum Eu-154 activity detected was 33 pCi/g at 55 feet.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

9313022-1730

Westinghouse Hanford Company
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: Single Shell Tank T-101

Borehole	<u>T50-01-09</u>	<u>299-W10-104</u>	
Coordinates	<u>43,685 N</u>	<u>75,680 W</u>	ft (Plant 200 W)
Elevation	<u>673.17</u>		ft Top of Casing (Plant 200 W)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (ft) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (in)	Casing Thickness (in)	Top Depth (ft)	Base Depth (ft)
6	0.28	0.	100.
4	0.19	0.	87.

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (ft)		
			Top	Base	Incr
Oct 15, 92	T500109\A263	MSA 80sec RT	0	87	0.5

MSA: Move-Stop-Acquire Rt: Real Time

Calibration and Analysis Information

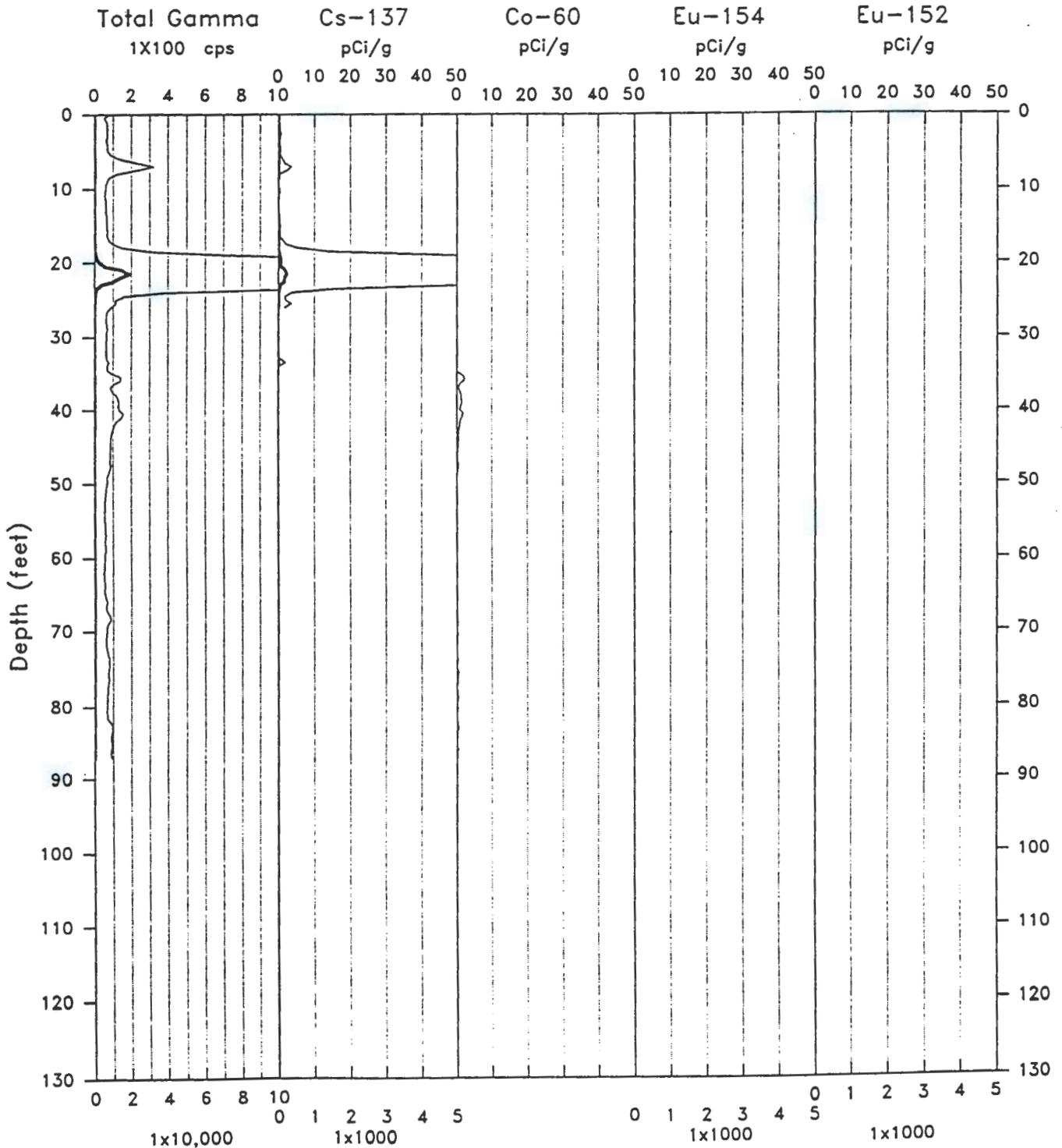
RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>J. P. Kiesler</u>
Analysis Date: <u>Oct 20, 1992</u>
Analysis Notes: <u>No Eu-152 or Eu-154 detected</u>
Radionuclides identified: <u>Cs-137, Co-60</u>

9313022-1731

RLS Spectral Gamma-Ray Borehole Survey

Project: T Tank Farm
Borehole: T50-01-09

Log Date: Oct 15, 92
Anal. Date: Oct 20, 92



9313022.1732

299-W10-104 T-101 Tank Borehole 50-01-09

Casing	Depth: 100 Ft	Size: 6 in	Thickness: 0.28 in
	Depth: 90 Ft	Size: 4 in	Thickness: 0.188 in
Water	Depth: none		
Survey	Depth: 0 - 87 Ft	Mode: MSA 80s	Date: 10/15/92

General Notes:

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated.

Man-made Radionuclides:

Cesium (Cs-137) was encountered from the surface to 26 feet. The maximum cesium decay activity detected was 230 pCi/g at 21 feet.

Cobalt (Co-60) was encountered in the borehole survey from 35 feet to 53 feet and from 67 feet to the maximum survey depth of 87 feet. The cobalt decay activity detected was less than 3 pCi/g.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

9313022.1733

Westinghouse Hanford Company
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: Single Shell Tank T-101

Borehole	<u>T50-01-12</u>	<u>299-W10-105</u>		
Coordinates	<u>43,692 N</u>	<u>75,637 W</u>	ft	(Plant 200 W)
Elevation	<u>673.46</u>		ft	Top of Casing (Plant 200 W)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (ft) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (in)	Casing Thickness (in)	Top Depth (ft)	Base Depth (ft)
6	0.28	0.	100.
4	0.19	0.	86.

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>						
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>						
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (ft)			
			Top	Base	Incr	
Oct 13, 92	H2W10105\A261	MSA 80sec RT	0	75.	0.5	
		MSA 180sec RT	75.5	85.	0.5	

MSA: Move-Stop-Acquire Rt: Real Time

Calibration and Analysis Information

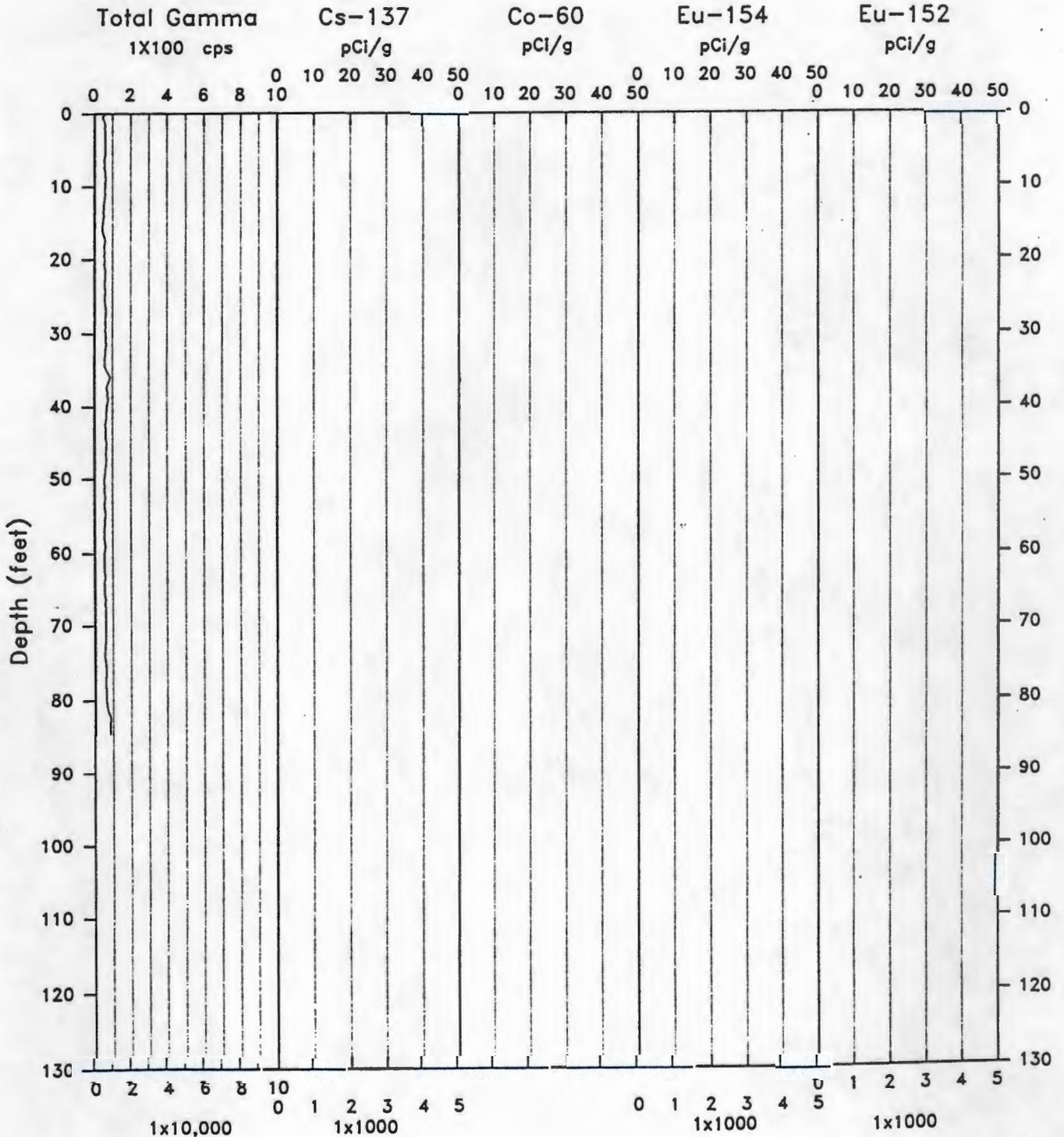
RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>J. P. Kiesler</u>
Analysis Date: <u>Oct 29, 1992</u>
Analysis Notes: <u>No Eu-152, Eu-154 or Cs-137 detected</u>
Radionuclides identified: <u>Co-60</u>

9313022.1734

RLS Spectral Gamma-Ray Borehole Survey

Project: T Tank Farm
Borehole: T50-01-12

Log Date: Oct 13, 92
Anal. Date: Oct 19, 92



9313022.1735

299-W10-105 T-101 Tank Borehole 50-01-12

Casing	Depth: 100 Ft	Size: 6 in	Thickness: 0.288 in
	Depth: 86 Ft	Size: 4 in	Thickness: 0.188 in
Water	Depth: none		
Survey	Depth: 0 - 75 Ft	Mode: MSA 80s	Date: 10/13/92
	Depth: 75 - 85 Ft	Mode: MSA 180s	

General Notes:

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated.

The increase in "Total Gamma" activity below 81 feet is due to an increase in the natural potassium and thorium.

Man-made Radionuclides:

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in the borehole survey from 35 feet to 38 feet. The cobalt decay activity detected was less than 1 pCi/g.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

9313022.1735