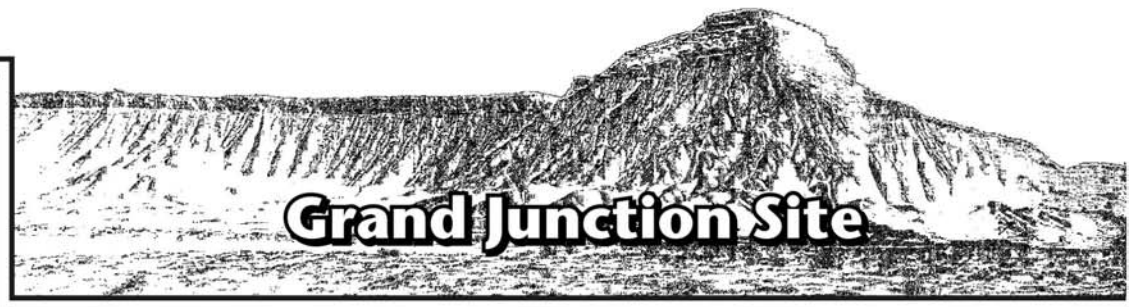
GJO–2004–554–TAC

Hanford Tank Farms Vadose Zone Monitoring Project

Annual Monitoring Report for Fiscal Year 2003

January 2004



U.S. Department of Energy

Work Performed Under DOE Contract No. DE–AC01–02GJ79491 for the U.S. Department of Energy Grand Junction Site.
Approved for public release; distribution is unlimited.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed in this report, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

GJO-2004-554-TAC

Hanford Tank Farms Vadose Zone Monitoring Project

Annual Monitoring Report for Fiscal Year 2003

January 2004

Prepared for
U.S. Department of Energy
Idaho Operations Office
Grand Junction Site
Grand Junction, Colorado

Prepared by
S.M. Stoller Corp.
Grand Junction Site
Grand Junction, Colorado

Approved for public release; distribution is unlimited.
Work performed under DOE Contract No. DE-AC01-02GJ79491.

Contents

Page

Signature Page iv

1.0 Introduction 1

2.0 Monitoring Results 2
- 2.1 A Tank Farm 3
- 2.2 AX Tank Farm 4
- 2.3 B Tank Farm 4
- 2.4 BX Tank Farm 4
- 2.5 BY Tank Farm 4
- 2.6 C Tank Farm 4
- 2.7 S Tank Farm 5
- 2.8 SX Tank Farm 5
- 2.9 T Tank Farm 5
- 2.10 TX Tank Farm 6
- 2.11 TY Tank Farm 6
- 2.12 U Tank Farm 6

3.0 Retrieval Monitoring 7
- 3.1 Tank U-107 Retrieval Monitoring 7
- 3.2 Tank C-106 Retrieval Monitoring 8
- 3.3 Tank S-112 Retrieval Monitoring 8
- 3.4 Tank S-102 Retrieval Monitoring 9

4.0 Special Projects 9
- 4.1 Tank T-106 Characterization Drilling 9
- 4.2 Tank C-105 Characterization Drilling 9

5.0 Operational Issues 9

6.0 Summary 11

7.0 Future Monitoring Operations 12

8.0 Recommendations 12

List of Tables

Table 2-1. Summary of Monitoring Operations for 4th Quarter of FY 2003 2
2-2. Summary of Monitoring Operations for FY 2003 and Project-to-Date 3

Contents (continued)

Page

2-3. Summary of Monitored Boreholes Indicating Radionuclide Contaminant Profile Changes....7
5-1. Summary of Monitoring Production (Project-to-Date) 10
5-2. Summary of Operational Down Time 11

References....15

Appendix A. Boreholes Monitored During FY 2003 .... A-1
B. Comparison of RAS and SGLS Baseline Measurements of Boreholes Identified in the Fourth Quarter of FY 2003 that Suggest Contaminant Movement B-1
C. Retrieval Monitoring Log Plots C-1
D. Special Projects Log Plots D-1
E. Boreholes Projected for Monitoring During the First Quarter of FY 2004 ....E-1

Hanford Tank Farms Vadose Zone Monitoring Project
Annual Monitoring Report for Fiscal Year 2003

Prepared by:

Paul D. Henwood — 2-9-04

P.D. Henwood — Date
S.M. Stoller, Hanford

Alan Pearson — 2/10/04

A.W. Pearson — Date
S.M. Stoller, Hanford

Concurrence:

2-9-04

R.G. McCain, Hanford Technical Lead — Date
S.M. Stoller, Hanford

Approved by:

2-10-04

Brian Mathis, Project Manager — Date
S.M. Stoller, Hanford

2/12/04

Robert Yasek, Project Manager — Date
U.S. Department of Energy
Office of River Protection

1.0 Introduction

The Hanford Tank Farms Vadose Zone Monitoring Project (VZMP) was established in fiscal year (FY) 2001 for comprehensive routine monitoring of existing boreholes in Hanford single-shell tank farms. The logging system used for monitoring is the Radionuclide Assessment System (RAS). A baseline record of existing contamination associated with gamma-emitting radionuclides in the vadose zone was established between 1995 and 2000 using the Spectral Gamma Logging System (SGLS). Although less precise, the RAS is a simpler, faster, and more cost-effective logging system than the SGLS. Measurements collected with the RAS can be compared to the baseline data to assess the long-term stability of the radionuclide contaminant profile. When routine monitoring identifies anomalies relative to the baseline, these anomalies may be investigated using the SGLS, the High Rate Logging System (HRLS), and/or the Neutron Moisture Logging System (NMLS). The HRLS is also used to collect data in boreholes where the contaminant activity exceeds the working range of the RAS instrumentation (greater than about 100,000 picocuries per gram [pCi/g] cesium-137 [^{137}Cs]).

During FY 2003, monitoring in boreholes associated with individual tanks undergoing retrieval operations was added to the work scope detailed in the original VZMP planning documents. Retrieval monitoring requirements for specific tanks are under development but include a pre-retrieval baseline measurement, monthly measurements during the retrieval operations, and monthly measurements for six months after retrieval operations cease. Both RAS and NMLS measurements are required for monthly monitoring, and monthly monitoring is supplemented by manual moisture measurements acquired by CH2M HILL Hanford Group, Inc. (CH2M HILL) personnel over limited depth intervals once or twice per week. During FY 2003, two retrieval projects (tanks C-106 and S-112) were initiated. Resources (i.e., RAS) diverted from the routine monitoring to retrieval monitoring negatively impact the achievement of VZMP goals as originally set forth in 2001. Deployment of the NMLS to support retrieval operations requires an additional logging engineer and reassignment of the system from support for the RI/FS work conducted by the Department of Energy, Richland Operations Office (DOE-RL).

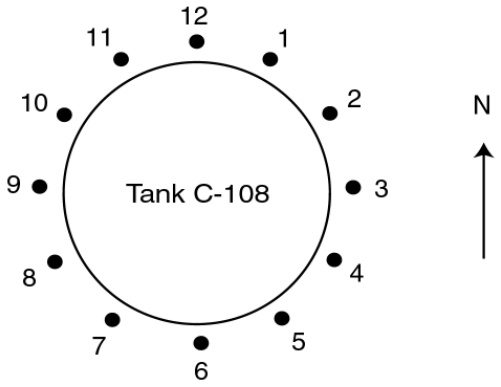
Routine quarterly reports are issued to summarize the results of monitoring activities, to provide the status of any on-going special investigations, and to provide an updated listing of borehole intervals where monitoring is planned in the coming months. This annual report summarizes routine monitoring activities for FY 2003 and includes fourth quarter and project-to-date results where appropriate. Retrieval monitoring is segregated from routine monitoring so that the impact to the latter can be considered.

For readers not familiar with the Hanford Tank Farms borehole-numbering scheme, the following illustration shows how to identify the location of a borehole from its identification number:

Tank Farm Numbering Scheme

A Farm	10
AX Farm	11
B Farm	20
BX Farm	21
BY Farm	22
C Farm	30
S Farm	40
SX Farm	41
T Farm	50
TX Farm	51
TY Farm	52
U Farm	60

Tank Farm Borehole Numbering Scheme



Boreholes are identified by numbers using the format FF-TT-PP, where "FF" = tank farm, "TT" = tank, and "PP" = the position around the tank in a time-clock numeral from 1 to 12 (12 = north). For example, borehole 30-08-02 is in the C Tank Farm, around tank C-108, and at approximately the 2 o'clock position.

2.0 Monitoring Results

Summaries of monitoring operations for the fourth quarter of FY 2003 and project-to-date are included in Tables 2-1 and 2-2, respectively.

Table 2-1. Summary of Monitoring Operations for 4th Quarter of FY 2003

Month	July	August	September	Total
Routine Monitoring Events (RAS)	24	31	18	74
Retrieval Monitoring Events (RAS)	16	6	8	29
Total RAS Events	40	37	26	103
Total NMLS Events	7	6	7	20
Total RAS & NMLS Events	47	43	33	123
Routine Main Log Footage (RAS)	1434	1768	1244	4446
Routine Rerun Log Footage (RAS)	60	70	50	180
Retrieval Main Log Footage (RAS)	1701	664	860	3225
Retrieval Rerun Log Footage (RAS)	50	0	20	70
Retrieval Main Log (NMLS)	801	662	801	2264
Retrieval Rerun Log (NMLS)	70	60	70	200
Total RAS Footage	3245	2502	2174	7921
Total NMLS Footage	871	722	871	2464
Total RAS & NMLS Footage	4116	3224	3045	10385

Table 2-2. Summary of Monitoring Operations for FY 2003 and Project-to-Date

Quarter	1	2	3	4	FY 03	Project-to-Date Total
Routine Monitoring Events (RAS)	72	83	97	74	336	827
Retrieval Monitoring Events (RAS)	0	14	8	29	51	51
Total RAS Events	72	97	105	103	377	875
Total NMLS Events	0	0	7	20	27	27
Total RAS & NMLS Events	72	97	112	123	404	902
Routine Main Log Footage (RAS)	4420	4954	5235	4446	19055	46413
Routine Rerun Log Footage (RAS)	180	210	240	180	810	2228
Retrieval Main Log Footage (RAS)	0	1523	836	3225	5584	5584
Retrieval Rerun Log Footage (RAS)	0	30	20	70	120	120
Retrieval Main Log (NMLS)	0	0	785	2264	3049	3049
Retrieval Rerun Log (NMLS)	0	0	70	200	270	270
Total RAS Footage	4600	6717	6331	7921	25569	54345
Total NMLS Footage	0	0	855	2464	3319	3319
Total RAS & NMLS Footage	4600	6717	7186	10385	28888	57664

Appendix A is a table that provides further details of boreholes monitored during FY 2003, including borehole number, tank number, logging depths and footage, total score, next projected monitoring date, dates of HRLS logging events, dates of RAS monitoring events, and a comment section. This table is derived from the project's monitoring database, which is continually updated as boreholes are monitored (DOE 2003a). Boreholes are selected by a priority score (total score) that emphasizes proximity to tanks with significant drainable liquid remaining and/or the presence of contaminant plumes or where possible contaminant movement is suspected. The most significant change that occurs in the database is the monitoring frequency. Where monitoring results suggest possible contaminant movement, the monitoring frequency may be increased and depth intervals may be changed. Monitoring frequencies have also been changed to reflect the monthly monitoring requirement for retrieval operations in C and S Farms. Some lower priority boreholes are also selected for monitoring. This re-prioritization included boreholes in the vicinity of tanks being considered for closure in the near future, such as in C and S Farms.

A total of 336 routine and 51 retrieval (377) monitoring events were performed with the RAS during FY 2003. In addition, 27 moisture monitoring events were conducted in support of retrieval operations. The following sections describe the routine monitoring performed in each tank farm. In the interest of brevity, plots for boreholes where no apparent change was observed will not be included in this report. These logs are available on request.

2.1 A Tank Farm

A total of 28 boreholes located around tanks A-101, -102, -103, -104, -105, and -106 were monitored during FY 2003. No apparent changes in the radionuclide contaminant distribution were observed.

2.2 AX Tank Farm

A total of 7 boreholes located around tanks AX-101, -102, -103, and -104 were monitored during FY 2003. No apparent changes in the radionuclide contaminant distribution were observed. Borehole 11-02-04 could not be monitored due to an obstruction, probably a broken well cap, at 37 ft.

2.3 B Tank Farm

A total of 8 boreholes located around tanks B-101, -106, -107, and -110 were monitored during FY 2003. No apparent changes in the radionuclide contaminant distribution were observed.

2.4 BX Tank Farm

A total of 33 boreholes located around tanks BX-101, -102, -103, -104, -105, -106, -108, -109, -110, -111, and -112 were monitored during FY 2003. Borehole 21-12-02 showed an abnormal decrease in total and cobalt-60 (^{60}Co) counts between 40 and 45 ft during the most recent monitoring event on 9/23/03 (Appendix B). The monitoring frequency of this borehole was changed from 1 year to 6 months. Borehole 21-27-08 showed a possible increase in uranium-238 (^{238}U) counts between 137.5 and 148.5 ft during the second monitoring event on 3/13/02. Subsequent monitoring events in this borehole during FY 2003 have not confirmed this change.

2.5 BY Tank Farm

A total of 33 boreholes located around tanks BY-101, -103, -105, -106, -107, -108, -109, -110, and -112 were monitored during FY 2003. Boreholes 22-07-02, 22-07-05, and 22-08-05 have all shown evidence of possible ^{60}Co movement during previous monitoring events. Monitoring events in these boreholes during FY 2003 failed to provide further evidence of movement.

2.6 C Tank Farm

A total of 48 boreholes located around tanks C-101, -103, -104, -105, -106, -107, -108, -109, -110, -111, and -112 were monitored during FY 2003. Boreholes associated with tank C-106 were monitored several times during FY 2003 in support of the C-106 Waste Retrieval Project. These boreholes were also logged several times with the NMLS. This work is discussed in detail in Section 3.2, "Tank C-106 Retrieval Monitoring."

A possible increase of ^{60}Co was identified in borehole 30-06-10 between 124 and 126 ft on 4/23/02. Monitoring events conducted in this borehole during FY 2003 showed no further evidence of movement. A definite change in ^{60}Co concentrations was discovered in borehole 30-08-02 on 9/11/02 between 50 and 61 ft. Subsequent monitoring events during FY 2003 have shown downward movement of ^{60}Co through this interval (Appendix B). A possible increase in ^{137}Cs was observed in borehole 30-08-03 from 42 to 47 ft on 1/21/03. Subsequent monitoring events did not confirm this change (Appendix B).

Five boreholes were logged with the NMLS at the request of CH2M HILL in support of the C-105 characterization drilling. This work is discussed in detail in Section 4.2.

2.7 S Tank Farm

A total of 28 boreholes located around tanks S-102, -103, -104, -105, -107, -109, -111, and -112 were monitored during FY 2003. Boreholes associated with tank S-112 were monitored several times during FY 2003 in support of the S-112 Waste Retrieval Project. These boreholes were also logged several times with the NMLS. This work is discussed in detail in Section 3.3, "Tank S-112 Retrieval Monitoring."

Eight boreholes located around tank S-102 were monitored in preparation for the S-102 Waste Retrieval Project. This work is discussed in detail in Section 3.4, "Tank S-102 Retrieval Monitoring."

An apparent increase in ^{137}Cs concentration was observed in borehole 40-02-03 between 44 and 47 ft on 7/8/03 (Appendix B). This borehole is associated with tank S-102 and is scheduled for monitoring in early FY 2004.

2.8 SX Tank Farm

A total of 49 boreholes located around tanks S-101, -102, -103, -105, -107, -108, -109, -110, -111, -112, -114, and -115 were monitored during FY 2003. Borehole 41-02-02 showed evidence of possible ^{137}Cs and/or ^{90}Sr concentration increases between 43 and 55 ft during the initial RAS monitoring event on 9/7/01. Subsequent monitoring events have not shown any additional increases (Appendix B). Borehole 41-10-01 has shown evidence for a possible ongoing ^{137}Cs concentration increase at 66 ft. This increase was first identified by the SGLS repeat logging in 1999 (Appendix B). Borehole 41-15-07 showed a possible ^{137}Cs increase between 57 and 60 ft. This increase was identified during the second monitoring event conducted on 2/12/03 (Appendix B).

2.9 T Tank Farm

A total of 24 boreholes located around tanks T-101, -102, -103, -104, -105, -106, -107, -108, and -109 were monitored during FY 2003. Eight of these boreholes (50-01-09, 50-04-10, 50-06-02, 50-06-03, 50-06-18, 50-09-01, 50-09-02, and 50-09-10) have shown evidence of possible concentration increases and/or contaminant movement in the past. No increases were confirmed in these boreholes during FY 2003. Borehole 50-02-05 indicated an increase during FY 2003 (Appendix B). NMLS and SGLS measurements were acquired in support of two characterization boreholes drilled in FY 2003. NMLS measurements were also collected in four existing boreholes to support this characterization effort. This work is discussed in detail in Section 4.1.

2.10 TX Tank Farm

A total of 15 boreholes located around tanks TX-101, -103, -104, -105, -107, and -118 were monitored during FY 2003. Borehole 51-03-11 showed possible increases in ^{60}Co concentrations at depths of 61 to 62 ft and from 90 to 95 ft during the initial monitoring event on 5/20/02. The subsequent monitoring event on 1/15/03 showed no additional increases at these depths.

2.11 TY Tank Farm

A total of 9 boreholes located around tanks TY-103, -104, -105, and -106 were monitored during FY 2003. Borehole 52-03-06 showed an increase in ^{137}Cs concentration between 55 and 58 ft during the initial monitoring event on 5/2/02. Subsequent monitoring events have not shown additional increases in ^{137}Cs concentrations. Borehole 52-06-05 continues to show evidence of increasing ^{60}Co concentrations between 130 and 147 ft. Borehole 52-06-07 showed evidence of possible increases between 200 to 225 ft (Appendix B).

2.12 U Tank Farm

A total of 21 boreholes located around tanks U-104, -105, -107, -108, -109, -110, -111, and -112 were monitored during FY 2003. Seven of these boreholes were monitored to support the U-107 Waste Retrieval Project. This project was completed during FY 2003 and the associated boreholes were re-assigned routine monitoring frequencies. This work is described in detail in DOE (2003b).

Table 2-3. Summary of Monitored Boreholes Indicating Radionuclide Contaminant Profile Changes

Tank Farm	Borehole Number	Radio-nuclide	Deter-mined	Number of Events	Assessment	Assigned Frequency	Qtrly/Annual Report
BX	**21-12-02**	**^{60}Co**	**9/23/03**	**3**	**Possible decrease**	**6 mos.**	**FY 2003**
BX	21-27-08	^{238}U/^{235}U	03/13/02	5	Not confirmed	6 mos.	2nd 2002
BY	22-03-04	^{60}Co	11/15/01	3	Not confirmed	6 mos.	1st 2002
BY	22-07-02	^{60}Co	11/29/01	3	Not confirmed	6 mos.	1st 2002
BY	22-07-05	^{60}Co	12/12/01	3	Not confirmed	6 mos.	1st 2002
BY	22-08-05	^{60}Co	03/30/99	4	Not confirmed	6 mos.	1st 2002
C	30-06-10	^{60}Co	03/03/97	5	Possible increase	1 mos.	3rd 2002
C	30-08-02	^{60}Co	09/11/02	5	Definite increase	3 mos.	FY 2002
C	**30-08-03**	**?**	**1/21/03**	**2**	**Not confirmed**	**3 mos.**	**FY 2003**
S	**40-02-03**	**^{137}Cs**	**7/9/03**	**1**	**Not confirmed**	**6 mos.**	**FY 2003**
SX	41-02-02	^{137}Cs/^{90}Sr	09/07/01	5	Not confirmed	6 mos.	FY 2001
SX	**41-10-01**	**^{137}Cs**	**2/11/03**	**4**	**Possible increase**	**6 mos.**	**FY 2003**
SX	**41-15-07**	**^{137}Cs**	**2/12/03**	**2**	**Not confirmed**	**6 mos.**	**FY 2003**
T	50-01-09	^{60}Co	07/30/01	5	Not confirmed	6 mos.	FY 2001
T	**50-02-05**	**^{137}Cs**	**5/19/03**	**4**	**Not confirmed**	**6 mos.**	**FY 2003**
T	50-06-02	^{60}Co/^{154}Eu	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-03	^{60}Co	07/18/01	5	Not confirmed	6 mos.	FY 2001
T	50-06-18	^{60}Co	09/03/02	5	Possible increase	3 mos.	FY 2002
T	50-04-10	^{60}Co	01/28/02	5	Possible confirmation	3 mos.	2nd 2002
T	50-09-01	^{60}Co/^{154}Eu	07/23/01	5	Not confirmed	6 mos.	FY 2001
T	50-09-02	^{60}Co	01/08/02	3	Not confirmed	12 mos.	2nd 2002
T	50-09-10	^{60}Co/^{154}Eu	07/23/01	5	Not confirmed	6 mos.	FY 2001
TX	51-03-11	^{60}Co	05/20/02	2	Possible increase	6 mos.	3rd 2002
TY	52-03-06	^{137}Cs	05/02/02	5	Definite change	3 mos.	3rd 2002
TY	52-06-05	^{60}Co	05/14/02	3	Possible increase	3 mos.	3rd 2002
TY	**52-06-07**	**^{60}Co**	**5/22/03**	**2**	**Not confirmed**	**12 mos.**	**FY 2003**
U	60-04-08	^{238}U/^{235}U	07/16/01	8	Not confirmed	6 mos.	FY 2001
U	60-05-05	^{238}U/^{235}U	08/27/02	5	Possible increase	6 mos.	FY 2002
U	60-07-01	^{238}U/^{235}U	07/12/01	8	Not confirmed	6 mos.	FY 2001

In the interest of brevity, plots for boreholes where no apparent change was observed are not included in quarterly or fiscal year reports. These logs are available on request.

3.0 Retrieval Monitoring

3.1 Tank U-107 Retrieval Monitoring

A special investigation of the boreholes around tank U-107 (U Farm) has been completed. A final report, *Evaluation of Log Data in the Vicinity of Tank U-107* (DOE 2003b), summarizing all measurements, was prepared and issued in June 2003. This investigation was initiated in June 2001 at the request of the DOE-ORP Project Manager to support waste retrieval operations. It has been concluded that the retrieval operations had no effect on the vadose zone in the vicinity of the tank. One final monitoring event was completed in boreholes around this tank in August 2003. The data from this final event supported the conclusion that there was no apparent change

in the gamma-emitting radionuclide distribution in the vicinity of this tank due to the retrieval activities. All of these boreholes have been returned to routine monitoring on an annual basis.

3.2 Tank C-106 Retrieval Monitoring

The *Process Control Plan for Tank 241-C-106 Acid Dissolution* (Reynolds 2003) specified retrieval monitoring is conducted monthly: *"The wells will be monitored monthly (or before initial acid addition, monthly during retrieval, and after retrieval) to detect any changes in the radiation or moisture profiles of the soil."* Additional manual measurements are to be performed by operations personnel within specific zones at a frequency of two times per week.

RAS retrieval monitoring started in January 2003 and four monitoring events were conducted by the end of FY 2003. Beginning in April 2003, three NMLS logs were acquired during the fiscal year. Appendix C includes a summary plot of data acquired around tank C-106. These data include SGLS baseline measurements (^{40}K, ^{137}Cs, ^{60}Co), three moisture measurements, and a RAS measurement acquired during September 2003.

Preliminary results of the moisture measurements suggest minor changes have occurred in the vadose zone between elevations of 610 and 575 ft (Appendix C); borehole 30-05-02 exhibits the best example of possible change. The moisture profile will continue to be monitored during FY 2004 to determine if the increases are due to seasonal fluctuations in moisture or a potential tank leak. RAS measurements suggest no increases in gamma activity within the areas of possible moisture increases or other high moisture zones in the vicinity of the tank. As of October 2003, it is believed that the observed moisture changes are related to seasonal fluctuations and that no tank leaks associated with the retrieval operations are occurring.

3.3 Tank S-112 Retrieval Monitoring

The *Process Control Plan for Saltcake Dissolution Retrieval Demonstration in Tank 241-S-112* (Barton 2003) specified retrieval monitoring requirements. *"A baseline profile will be taken prior to retrieval operations, and subsequent monitoring results will be compared with that baseline profile. Moisture monitoring using the truck-mounted system will be done before beginning, at the end, and whenever there is a shutdown of retrieval operations greater than 4 weeks. An initial baseline will be established by deploying calibrated gamma and neutron moisture probes over the full depth of each drywell. During waste retrieval operations, the truck-mounted systems will be supplemented by the use of manually deployed moisture gages at least once a week while actively retrieving the waste at depths corresponding to moist layers at or below the floor of the tank."*

The baseline moisture measurements were acquired during August 2003 (Appendix C). Two RAS measurements (March and August) have been acquired to support retrieval operations during FY 2003. No changes in activity were observed between the two RAS measurements or since the baseline spectral gamma data acquired in 1996.

3.4 Tank S-102 Retrieval Monitoring

No Process Control Plan has been provided to Stoller for the S-102 retrieval. In anticipation of future tank S-102 (S Farm) retrieval activities, all boreholes surrounding this tank have tentatively been assigned a monitoring frequency of 6 months (biannual). This frequency may change when the retrieval project monitoring requirements are finalized. A baseline RAS monitoring event was completed in July 2003 (Appendix C). A second pre-retrieval monitoring event is scheduled for January 2004. Currently, baseline moisture logging is planned to be performed in tank S-102 boreholes approximately one month prior to the start of retrieval. It is also suggested that one of these boreholes (40-02-03) be logged with the HRLS to assess any potential changes in a zone of high gamma flux. This borehole showed a potential increase in gamma activity (^{137}Cs) between 44 and 47 ft during the second RAS monitoring event on 7/8/03 (Appendix B).

4.0 Special Projects

4.1 Tank T-106 Characterization Drilling

Moisture logging was performed during October 2002 in four boreholes in the vicinity of tank T-106 prior to the drilling of two characterization boreholes (Appendix D). The moisture logs were used to assess and determine possible sampling intervals during the drilling of two boreholes in February 2003. SGLS and moisture measurements were acquired from the two characterization boreholes (C4104 and C4105). Plots of these boreholes are also included in Appendix D.

4.2 Tank C-105 Characterization Drilling

Five boreholes in C Farm were logged with the NMLS to provide information for sample intervals during the tank C-105 characterization that will include drilling a borehole during FY 2004. A plot showing the results of the moisture measurement plotted with the baseline SGLS (^{40}K, ^{137}Cs, ^{60}Co) and the latest RAS measurement (total gamma in cps) is included in Appendix D.

5.0 Operational Issues

During the fourth quarter of FY 2003, an average of approximately 1.6 boreholes were monitored per working day with the RAS. **Note: This analysis does not segregate routine monitoring from retrieval monitoring with the RAS or include NMLS logging**. This rate incorporates all operational aspects of monitoring, including both scheduled and unscheduled down time for maintenance, operator support, security, etc. The rate of monitoring achieved during the first three quarters of FY 2003 was between 1.3 and 1.8 boreholes per day. The project goal was to achieve an average of 3 boreholes per day.

The project experienced between 20 and 30 days of down time each quarter during FY 2003. The majority of this down time was due to the lack of dedicated operator support. The RAS project has lower priority than other Tank Farms projects; therefore, when resources are required for higher priority tasks the RAS operators are diverted to these other tasks. Another contributing factor to the low monitoring rate is the requirement for monitoring SST waste retrieval projects. The monitoring intervals selected for boreholes associated with the retrieval tanks are approximately twice that for routine monitoring. There were 385 monitoring events during FY 2002 totaling 22,349 ft, whereas in FY 2003 there were 377 monitoring events totaling 25,569 ft.

Tables 5-1 and 5-2 include summaries of production and operational issues, respectively, that affect monitoring production.

Table 5-1. Summary of Monitoring Production (Project-to-Date)

Quarter	Total Work Days	Total Days Down	Total Monitoring Events	Boreholes Monitored per Day
4th of FY01	56	29.3	84	1.5
1st of FY02	56	35.2	54	1.0
2nd of FY02	55	34.1	74	1.3
3rd of FY02	59	21.1	113	1.9
4th of FY02	66	27.6	144	2.2
1st of FY03	56	34.7	72	1.3
2nd of FY03	55	22.5	97	1.8
3rd of FY03	58	25.0	105	1.8
4th of FY03	63	22.6	103	1.6
FY03Total	232	104.8	377	1.6
Cumulative Total	524	252.1	846	1.6
Average/Quarter	58.2	28.0	94	1.6

Table 5-2. Summary of Operational Down Time

Quarter	Equipment/ Truck Problems/Calibration (hrs)	No HPT/ Operator Support (hrs)	Security Measures (hrs)	No Charge Code or Administrative (hrs)	Moving Truck (hrs)	Weather (hrs)	Misc. (hrs)	Total Down Time (hrs)
4th of FY01	64	130	20	27	20	3	0	264
1st of FY02	107	84	51	44	14	13	4	317
2nd of FY02	143	40	24	58	9	18	15	307
3rd of FY02	31	62	0	36	27	8	26	190
4th of FY02	81	122	0	0	37	0	8	248
1st of FY03	71	107	0	18	18	0	98	312
2nd of FY03	62	126	0	0	10	0	0	198
3rd of FY03	51	149	0	0	12	0	13	225
4th of FY03	45	136	0	0	16	6	0	203
FY03Total	229	518	0	18	56	6	111	938
Cumulative Total	655	956	95	183	163	48	164	2264
Average/Quarter	72.8	106.2	10.6	20.3	18.1	5.3	18.2	251.6

6.0 Summary

The RAS has proved useful since its inception in FY 2001 in providing a credible monitoring program for the tank farms vadose zone. Three hundred thirty-six routine and 51 retrieval monitoring events were performed with the RAS in FY 2003. A total of 827 routine monitoring events (51 retrieval events) have been performed since the beginning of the project in June 2001. An additional 27 events with the neutron-moisture logging system were provided, and spectral gamma measurements were collected in three boreholes. To date, the high priority boreholes in all tank farms have been monitored at least once.

Evidence of possible contaminant movement has been detected in 29 boreholes in nine tank farms; seven were identified this fiscal year. Of these 29 boreholes, data collected from two boreholes indicate movement to a degree that can be confirmed over a short time interval. Of the

remaining 27 boreholes it is likely that the elapsed time between monitoring events is not sufficient to detect subtle changes in contaminant profile, suggesting relatively slow movement of contaminants in the vadose zone. In general, intervals where discernable movement of contaminants through the vadose zone is occurring within short periods of time (e.g., < 1.5 years) appear to be very limited. This finding, corroborated with continued measurements, will be useful to select appropriate remedial actions for tank farm closure and/or removal of contaminated soil.

7.0 Future Monitoring Operations

Appendix E provides a summary by tank farm of prioritized boreholes available for monitoring through the end of the first quarter of FY 2004. This list includes all boreholes with a total score greater than 36 and a next monitoring date that is overdue or will become overdue within 90 days. However, this list is not realistic without additional resources being made available to the project. By the end of the first quarter of FY 2004, it is anticipated three retrieval operations will be ongoing. The RAS will be diverted to support these operations and it is expected the routine monitoring will be significantly reduced. Because monitoring of each tank requires approximately one week, only one week per month will be available to continue the routine monitoring. The past history of downtime coupled with the retrieval requirements suggest the routine monitoring project will be essentially non-existent during FY 2004. Therefore, the vadose zone around 146 of the 149 single-shell tanks will not be evaluated. These areas will include locations where contaminant movement has already been identified and other boreholes that have not been monitored since 1994.

Neutron moisture logging is required to support retrieval operations. To support three retrieval operations with monthly measurements, it is estimated a logging engineer and an SGLS will be required three weeks per month. This level of effort may negatively impact baseline characterization activities.

High rate logging has not been performed in the tank farms since FY 2002. Because the areas that exhibit high activity contain the greatest contaminant inventory in the farms, it is essential to monitor these areas for changes on a more frequent basis. Unfortunately, the only logging operators available to perform these measurements have been dedicated to the RI/FS program managed by DOE-RL. Approximately 25 boreholes require high rate logging, which would require a level of effort of approximately one month.

8.0 Recommendations

A credible monitoring program is essential to demonstrate long-term stability of subsurface contaminant plumes and to identify areas where contaminant migration may be continuing. Furthermore, monitoring in existing drywells before, during, and after retrieval operations is an important component of leak detection and mitigation. At present, both routine monitoring and

retrieval monitoring require the use of the same logging system, the RAS. In addition, retrieval monitoring requires neutron moisture logs. Because the RAS cannot be configured to run the neutron moisture log, an SGLS truck is required for moisture measurements. As retrieval projects are initiated in more tanks, demands for retrieval monitoring will increase. This will negatively impact routine monitoring by limiting equipment availability. To a lesser extent, the characterization program will also be impaired as an SGLS vehicle is occupied with moisture logging in tank farms. Because retrieval monitoring for a specific tank is required for six months after retrieval operations have been completed, retrieval monitoring requirements will tend to "snowball" as more operations are initiated. It is likely that retrieval monitoring requirements will quickly equal or exceed the capacity of the RAS, and the routine monitoring program will be effectively eliminated. Certainly, it will not be possible to monitor each borehole once in a five-year period, as stated in the monitoring plan (DOE 2003a). There are already monitoring boreholes that have not been logged since 1995. Although these are boreholes with a relatively low priority, the possibility exists that important data are being overlooked. More importantly, monitoring will be curtailed in approximately 30 boreholes where evidence of continuing movement has been identified.

The current emphasis on waste retrieval and single-shell tank closure creates a much greater demand for logging equipment and personnel than was originally envisioned when the monitoring plan was developed. Available logging equipment is not ideally suitable for retrieval monitoring. Specific recommendations for the single-shell tank monitoring program are discussed below.

- **Establish a Separate Project for Retrieval Monitoring**

  Current practice is to conduct retrieval monitoring as part of the routine monitoring program. Unfortunately, the demand for monitoring services for retrieval operations will likely outstrip the capability of the RAS in the near future, with the result that the routine monitoring program will be effectively eliminated. In order to more effectively manage resources, it is recommended that a separate project be established for retrieval monitoring, and that a new project management plan be written specifically for retrieval monitoring.

  High-resolution resistivity (HRR) appears to offer promise as an alternative means of leak detection. This method of leak detection will be tested on the tank S-102 retrieval. HRR has several intrinsic advantages over logging in existing boreholes. The major advantage is that it can interrogate a much larger volume of the vadose zone over more frequent time intervals. However, the usefulness of this technology must first be established. Assuming HRR is accepted as the primary means of leak detection during retrieval, geophysical logging will still be required to investigate anomalies detected by HRR, and to continue routine monitoring activities.

- **Procure a Logging System Configured Specifically for Retrieval Monitoring**

  Existing process control plans for retrieval operations list monitoring in existing boreholes as an important component of the leak detection and mitigation program. Dependence on a single logging system can lead to a scenario wherein single-shell tank retrieval schedules

can be negatively impacted by equipment failure. Retrieval monitoring also requires neutron moisture logs on a regular basis. Because the RAS is not configured to run the neutron moisture sonde, this requires that two separate log runs be made with two different logging systems. Commercially available logging systems capable of simultaneous measurement of total gamma activity and moisture content exist. In anticipation of the retrieval monitoring requirements, Stoller issued a request for proposals in early 2003. A suitable logging system was identified, and an acceptable quote was obtained from the vendor, but the procurement effort was indefinitely delayed because of DOE Headquarters (DOE-HQ) prohibitions on additional vehicles at the Hanford Site. This logging system should be procured as soon as possible. Because both neutron moisture and total gamma activity measurements are made on a single logging run, the new system will accomplish the required logging in approximately half the time, resulting in significant cost savings to the retrieval project, as well as, reducing the impact on other projects. The new system will be operated by CH2M HILL personnel, with technical oversight, calibration, logging system maintenance, and data management provided by Stoller. Eliminating the need to use the SGLS for moisture monitoring also eliminates a potential jurisdictional conflict between the union operators and Stoller's field personnel. This conflict arises because monitoring activities are assigned to the union operators. The SGLS, however, has a complex instrument system that is configured primarily for high-resolution spectral gamma measurements, and must be operated by Stoller personnel. Use of the SGLS for moisture measurements for retrieval monitoring therefore creates a situation in which non-union personnel are perceived to be performing work that has been assigned to union personnel.

- **Replace Manual Moisture Measurement with Portable Logging Units**

  Monthly RAS and NMLS logs for retrieval monitoring are supplemented by weekly manual measurements of limited depth intervals. These measurements are made by manually lowering a neutron moisture gauge to the measurement point and recording the instrument output on a datasheet. Originally, single points were identified for manual measurement in selected boreholes, but this practice has been discontinued in favor of measurements at 1-ft depth increments over a minimum interval of 5 ft. This is necessary because it is impossible to discern from a single measurement whether observed changes in response are due to changes in moisture content, or simply to slight depth errors. Manual moisture measurements are very labor-intensive. This equipment can be replaced by portable logging units that can provide a continuous profile of moisture and/or gamma activity with automatic data collection. The will result in both improved data quality and savings in labor costs.

- **Consolidate Data Evaluation Responsibilities for Retrieval Monitoring**

  At the present time, RAS and NMLS data are processed and evaluated by Stoller, and manual moisture data are reported to CH2M HILL and evaluated by CH2M HILL personnel. As the contractor responsible for geophysical logging, Stoller is best equipped to collect, evaluate, and manage borehole measurement data.

- **Improve Communication and Coordination between Stoller and CH2M HILL**

  Retrieval monitoring requirements for different tanks are under development and may not be consistent between projects. Process control plans and other documents that define monitoring requirements are prepared by CH2M HILL without input from Stoller. In many cases, Stoller is not on routine distribution for these documents and does not receive a copy until the project is well underway. Thus, long-term planning for equipment and personnel is very ineffective. The RAS is frequently unable to operate because the CH2M HILL operators have been assigned other tasks. Stoller's retrieval monitoring project management plan and CH2M HILL retrieval plans and procedures should clearly define specific organizational responsibilities, data management, and reporting requirements, and identify specific points of contact within each organization. Regular meetings should be held for each retrieval project to discuss project schedule, coordination between organizations performing work on the tank, monitoring results to date, and possible contingencies.

References

Barton, W.B., 2003. *Process Control Plan for Saltcake Dissolution Retrieval Demonstration in Tank 241-S-112*, RPP-15085, Rev. 1, CH2M HILL Hanford Group, Inc., Richland, Washington.

Reynolds, D.A., 2003. *Process Control Plan for Tank 241-C-106 Acid Dissolution*, RPP-16462, Rev. 2, CH2M HILL Hanford Group, Inc., Richland, Washington.

U.S. Department of Energy (DOE), 2003a. *Hanford Tank Farms Vadose Zone Monitoring Project, Baseline Monitoring Plan*, GJO-HGLP 1.8.1, Revision 0, Grand Junction Office, Grand Junction, Colorado.

U.S. Department of Energy (DOE), 2003b. *Hanford Tank Farms Vadose Zone Monitoring Project, Evaluation of Log Data in the Vicinity of Tank U-107*, GJO-2003-427-TAR, Grand Junction Office, Grand Junction, Colorado.

Appendix A
Boreholes Monitored During FY 2003

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
10-00-07	A-101	88.5	45	85	40	10	88.5	10/05/03		06/20/01	10/10/02							No apparent change
10-00-08	A-101	88.5	45	85	40		88.5	10/05/03		06/25/01	10/10/02							No apparent change
10-01-01	A-101	88.5	45	85	40		88.5	06/04/04		06/27/01	06/21/02	06/10/03						No apparent change
10-01-03	A-101	88.5	45	78	33		88.5	06/04/04		06/27/01	06/21/02	06/10/03						No apparent change
10-01-04	A-101	88.5	35	85	50	10	114	06/05/04		06/27/01	06/21/02	06/11/03						No apparent change
10-01-05	A-101	88.5	45	85	40		88.5	10/04/03		06/20/01	10/09/02							No apparent change
10-01-06	A-101	88.5	45	85	40		88.5	10/02/03		06/27/01	10/07/02							No apparent change
10-01-08	A-101	88.5	45	85	40	10	88.5	10/02/03		06/27/01	10/07/02							No apparent change
10-01-09	A-101	88.5	45	63	18		88.5	10/02/03		06/26/01	10/07/02							No apparent change
10-01-10	A-101	88.5	45	85	40		88.5	10/02/03		06/27/01	10/07/02							No apparent change
10-01-11	A-101	88.5	45	85	40		88.5	10/02/03		06/27/01	10/07/02							No apparent change
10-01-16	A-101	88.5	20	52	32		114	06/06/04		06/19/01	06/17/02	06/12/03						Decreasing counts
10-01-28	A-101	88.5	20	43	23		114	06/06/04		06/19/01	06/18/02	06/12/03						Decreasing counts
10-01-39	A-101	88.5	20	44	24		114	06/06/04		06/20/01	06/18/02	06/12/03						Decreasing counts
10-02-01	A-102	6.6	45	90	45	10	31.6	10/02/03		10/07/02								No apparent change
10-02-03	A-102	6.6	45	123	78		31.6	10/03/03		10/08/02								No apparent change
10-02-08	A-102	6.6	45	100	55		31.6	10/04/03		10/09/02								No apparent change
10-03-02	A-103	18.1	45	85	40		18.1	09/13/07		10/09/02								No apparent change
10-03-07	A-103	18.1	45	123	78	10	43.1	10/03/03		10/08/02								No apparent change
10-04-10	A-104	2.4	45	85	40	10	2.4	05/13/08		06/09/03								No apparent change
10-05-02	A-105	115	45	119	74		115	06/06/04		06/25/01	06/18/02	06/12/03						No apparent change
10-05-05	A-105	115	45	74	29		115	06/04/04		06/25/01	06/20/02	06/10/03						No apparent change
10-05-07	A-105	115	45	75	30		115	06/04/04		06/26/01	06/20/02	06/10/03						No apparent change
10-05-08	A-105	115	45	55	10	10	115	06/04/04		06/26/01	06/20/02	06/10/03						No apparent change
10-05-09	A-105	115	45	76	31		115	06/04/04		06/26/01	07/01/02	06/10/03						No apparent change
10-05-10	A-105	115	25	100	75		140	06/03/04		06/26/01	06/20/02	06/09/03						No apparent change
10-05-12	A-105	115	45	75	30		115	06/04/04		06/26/01	06/20/02	06/10/03						No apparent change
10-06-02	A-106	2.7	45	85	40	10	2.7	05/14/08		06/10/03								No apparent change
11-01-02	AX-101	65.7	40	85	45		65.7	06/05/04		06/17/02	06/11/03							No apparent change
11-01-05	AX-101	65.7	45	85	40		65.7	10/04/03		10/09/02								No apparent change
11-01-07	AX-101	65.7	45	85	40	10	65.7	09/13/07		10/09/02								No apparent change
11-02-12	AX-102	2.4	20	50	30		27.4	06/05/04		06/14/02	06/11/03							No apparent change
11-03-02	AX-103	6.6	20	90	70	10	31.6	06/05/04		06/13/02	06/11/03							No apparent change
11-03-09	AX-103	6.6	40	85	45		6.6	05/15/08		06/11/03								No apparent change
11-04-08	AX-104	6.4	40	85	45		6.4	05/15/08		06/11/03								No apparent change
20-00-05	B-101	12.4	35	110	75		37.4	04/08/04		05/29/02	04/14/03							No apparent change
20-01-01	B-101	12.4	35	75	40		37.4	04/08/04		05/28/02	04/14/03							No apparent change
20-01-06	B-101	12.4	25	59	34	10	37.4	04/02/04		05/29/02	04/08/03							No apparent change
20-06-03	B-106	2.7	35	75	40		27.7	05/27/03		05/28/02	04/21/03							No apparent change
20-07-02	B-107	13.3	35	100	70		38.3	04/15/04		05/22/02	04/21/03							No apparent change
20-07-11	B-107	13.3	35	90	55		38.3	04/15/04		05/23/02	04/21/03							No apparent change; possible Sr-90 at 72 ft
20-10-02	B-110	12.2	20	97	77	10	37.2	04/02/04		05/30/02	04/08/03							No apparent change; possible Sr-90 at 75 ft
20-10-07	B-110	12.2	35	75	40		37.2	04/02/04		05/29/02	04/08/03							No apparent change
21-00-02	BX-102	56	35	97	62	10	81	09/24/04		08/13/01	09/04/02	09/30/03						No apparent change
21-00-05	BX-101	7.6	35	130	95		32.6	03/20/04		03/14/02	03/26/03							No apparent change
21-00-07	BX-110	17.2	35	86	51		17.2	08/27/08		09/23/03								No apparent change
21-00-09	BX-111	7.3	35	73	38		32.3	03/07/04		03/19/02	03/13/03							No apparent change
21-00-21	BX-111	7.3	35	100	65		32.3	03/07/04		03/20/02	03/13/03							No apparent change
21-00-22	BX-111	7.3	20	72	52		32.3	03/07/04		03/20/02	03/13/03							No apparent change
21-01-01	BX-101	7.6	15	99	89	10	32.6	03/25/04		03/25/02	03/31/03							No apparent change

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
21-01-02	BX-101	7.6	35	98	63		32.6	03/14/04		03/13/02	03/20/03							No apparent change
21-02-03	BX-102	56	35	98	63		106	03/21/04		08/14/01	03/13/02	09/04/02	03/20/03	09/23/03				No apparent change
21-02-06	BX-102	56	35	99	64		93.5	09/19/04		08/15/01	09/04/02	09/25/03						No apparent change
21-03-03	BX-103	4.5	35	90	55		54.5	09/17/03		08/28/01	02/25/02	09/04/02	03/21/03					No apparent change
21-03-05	BX-103	4.5	35	80	45		29.5	03/14/04		02/25/02	03/20/03							No apparent change
21-04-11	BX-104	2.1	35	97	62	10	27.1	03/21/04		03/18/02	03/27/03							No apparent change
21-05-05	BX-105	2.7	35	99	64		27.7	03/15/04		03/18/02	03/21/03							No apparent change
21-05-06	BX-105	2.7	35	99	64		27.7	03/21/04		03/19/02	03/27/03							No apparent change
21-06-05	BX-106	1.2	25	80	60		26.2	03/26/04		03/25/02	04/01/03							No apparent change
21-08-07	BX-108	3.2	30	99	69	10	28.2	03/21/04		03/19/02	03/27/03							No apparent change
21-08-12	BX-109	7.5	35	80	45		32.5	09/17/04		08/29/01	09/05/02	09/23/03						No apparent change, decrease 50-70 ft Co-60 decay
21-10-01	BX-110	17.2	35	95	60	10	42.2	09/16/04		08/30/01	09/05/02	09/22/03						No apparent change
21-10-07	BX-110	17.2	35	75	40		17.2	08/23/08		09/19/03								No apparent change
21-10-11	BX-110	17.2	35	75	40	10	17.2	08/23/08		09/19/03								No apparent change
21-11-03	BX-111	7.3	35	98	68	10	32.3	03/27/04		03/25/02	04/02/03							No apparent change
21-11-04	BX-111	7.3	35	90	60		32.3	03/27/04		03/21/02	04/02/03							No apparent change
21-11-05	BX-111	7.3	35	75	40		32.3	03/07/04		03/20/02	03/13/03							No apparent change
21-11-07	BX-111	7.3	35	75	40		32.3	03/07/04		03/20/02	03/13/03							No apparent change
21-12-02	BX-109	7.5	35	75	40		32.5	03/21/04		08/29/01	09/04/02	09/23/03						Abnormal decrease 40-45 ft
21-27-01	BX-102	56	35	98	63		106	03/27/04		08/28/01	03/13/02	09/04/02	03/20/03	09/29/03				No apparent change
21-27-02	BX-102	56	35	96	61		93.5	09/24/04		08/20/01	09/04/02	09/30/03						No apparent change
21-27-07	BX-102	56	35	138	103	10	93.5	09/23/04		08/15/01	09/04/02	09/29/03						No apparent change
21-27-08	BX-102	56	35	148	113	10	106	03/22/04		08/14/01	03/13/02	09/04/02	03/26/03	09/24/03				Apparent change 137.5-148.5 ft not confirmed
21-27-09	BX-102	56	35	148	113		93.5	09/18/04		08/16/01	09/04/02	09/24/03						No apparent change
21-27-10	BX-102	56	30	148	118	10	93.5	09/24/04		08/13/01	09/04/02	09/30/03						No apparent change
21-27-11	BX-102	56	30	136	106		106	03/23/04		08/20/01	03/14/02	09/04/02	03/21/03	09/25/03				No apparent change
22-00-02	BY-103	12.7	40	98	58	10	62.7	10/04/03		11/15/01	07/25/02	04/07/03						No apparent change
22-00-03	BY-103	12.7	50	146	96		50.2	11/20/03		11/19/01	11/25/02							No apparent change
22-01-07	BY-101	4.2	40	80	40		29.2	11/20/03		11/25/02								No apparent change
22-03-04	BY-103	12.7	40	100	60		62.7	10/04/03		11/15/01	07/23/02	04/07/03						Possible change 77-82 ft not confirmed
22-03-06	BY-103	12.7	40	99	59		37.7	11/10/03		11/16/01	11/15/02							No apparent change
22-03-07	BY-103	12.7	40	98	58	10	37.7	11/16/03		11/26/01	11/21/02							No apparent change
22-03-08	BY-103	12.7	40	99	59		37.7	11/16/03		11/19/01	11/21/02							No apparent change
22-03-09	BY-103	12.7	30	97	67		37.7	11/16/03		11/26/01	11/21/02							No apparent change
22-05-01	BY-105	24.6	40	98	58		62.1	11/16/03		11/14/01	11/21/02							No apparent change
22-05-09	BY-105	24.6	40	98	58	10	62.1	11/20/03		11/14/01	11/25/02							No apparent change
22-06-01	BY-106	26.2	40	80	40		51.2	11/22/03		11/27/01	11/27/02							No apparent change
22-06-05	BY-106	26.2	20	97	77		76.2	10/04/03		11/27/01	07/26/02	04/07/03						No apparent change
22-06-07	BY-106	26.2	35	131	96		63.7	11/22/03		11/28/01	11/27/02							No apparent change
22-07-01	BY-107	17.9	40	98	58		42.9	11/15/03		12/06/01	11/20/02							No apparent change
22-07-02	BY-107	17.9	30	100	70		67.9	09/30/03		11/29/01	07/29/02	04/03/03						Apparent change 98-100 ft not confirmed
22-07-05	BY-107	17.9	30	97	67	10	67.9	09/30/03		12/12/01	07/29/02	04/03/03						Apparent change 75-81 ft not confirmed
22-07-07	BY-107	17.9	40	99	59		67.9	09/30/03		12/12/01	08/20/02	04/03/03						No apparent change
22-07-09	BY-107	17.9	20	99	84	10	55.4	11/28/03		12/19/01	12/03/02							No apparent change
22-07-10	BY-107	17.9	20	80	60		17.9	10/30/07		11/25/02								No apparent change
22-08-01	BY-108	23.8	25	99	74		61.3	11/15/03		12/14/01	11/20/02							No apparent change
22-08-02	BY-108	23.8	25	102	77		73.8	10/01/03		12/13/01	07/30/02	04/04/03						No apparent change
22-08-05	BY-108	23.8	35	98	63		73.8	10/01/03		12/17/01	07/30/02	11/20/02	04/04/03					Apparent change 75-82 ft not confirmed
22-08-06	BY-108	23.8	40	98	58	10	61.3	11/14/03		12/14/01	11/19/02							No apparent change
22-08-07	BY-108	23.8	40	110	70		48.8	11/15/03		12/17/01	11/20/02							No apparent change

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
22-08-12	BY-108	23.8	30	100	70	10	73.8	10/01/03		12/13/01	08/19/02	04/04/03						No apparent change
22-09-01	BY-109	4.65	40	80	40		29.7	11/14/03		11/19/02								No apparent change
22-09-02	BY-109	4.65	40	99	59		17.2	10/24/07		11/19/02								No apparent change
22-09-05	BY-109	4.65	40	80	40	10	17.2	10/24/07		11/19/02								No apparent change
22-10-05	BY-110	3.15	40	98	58		40.7	11/14/03		12/11/01	11/19/02							No apparent change
22-10-07	BY-110	3.15	40	90	50		53.2	09/30/03		12/11/01	07/18/02	04/03/03						No apparent change
22-12-03	BY-112	3.6	40	99	59		16.1	10/23/07		11/18/02								No apparent change
22-12-05	BY-112	3.6	40	80	40		16.1	10/23/07		11/18/02								No apparent change
22-12-06	BY-112	3.6	40	80	40	10	16.1	10/23/07		11/18/02								No apparent change
30-00-01	C-106	6	0	65	65	20	31	10/21/03		04/24/02	01/16/03	04/28/03	07/22/03	09/15/03				No apparent change, C-106 Retrieval
30-00-06	C-101	18.4	30	110	80	10	18.4	12/25/07		01/20/03								No apparent change
30-00-09	C-110	18.7	30	57	27		18.7	01/02/08		01/28/03								No apparent change
30-00-12	C-112	1.8	30	96	66		1.8	08/19/08		09/15/03								No apparent change
30-01-06	C-101	18.4	30	70	40		43.4	04/30/04		04/18/02	05/06/03							No apparent change
30-01-09	C-101	18.4	20	70	55		43.4	05/01/04		04/25/02	05/07/03							No apparent change
30-01-12	C-101	18.4	30	70	40		18.4	12/26/07		01/21/03								No apparent change
30-03-09	C-103	25.5	30	98	68		50.5	04/30/04		04/19/02	05/06/03							No apparent change
30-04-02	C-104	8.7	30	134	104		33.7	01/23/04		01/28/03								No apparent change
30-04-03	C-104	8.7	20	49	32		33.7	01/10/04		01/15/03								No apparent change
30-04-08	C-104	8.7	30	80	50	10	8.7	04/08/08		05/05/03								No apparent change
30-04-12	C-104	8.7	30	80	50		21.2	06/26/08		07/23/03								No apparent change
30-05-02	C-105	3	0	127	127		28	10/23/03		04/22/02	01/29/03	04/29/03	07/23/03	09/17/03				No apparent change, C-106 Retrieval
30-05-03	C-105	3	30	90	60		28	04/25/04		04/19/02	05/01/03							No apparent change
30-05-04	C-105	3	30	117	87		28	04/25/04		04/22/02	05/01/03							No apparent change
30-05-05	C-105	3	30	98	68	10	28	04/25/04		04/17/02	05/01/03							No apparent change
30-05-07	C-105	3	30	48	11		28	05/01/04		04/25/02	05/07/03							No apparent change; requires HRLS
30-05-08	C-105	3	25	48	23		28	04/25/04		04/22/02	05/01/03							No apparent change
30-05-10	C-105	3	10	70	60		28	07/17/04		09/11/02	07/23/03							No apparent change
30-06-02	C-106	6	0	122	122	20	6	10/22/03		01/27/03	04/28/03	07/21/03	09/16/03					No apparent change, C-106 Retrieval
30-06-03	C-106	6	0	98	98	20	6	10/22/03		01/23/03	04/28/03	07/21/03	09/16/03					No apparent change, C-106 Retrieval
30-06-04	C-106	6	0	129	129		31	10/23/03		09/11/02	01/27/03	04/29/03	07/23/03	09/17/03				No apparent change, C-106 Retrieval
30-06-09	C-106	6	5	98	93	10	43.5	10/16/03		04/22/02	01/22/03	04/22/03	07/22/03	09/10/03				No apparent change, C-106 Retrieval
30-06-10	C-106	6	0	128	128	10	56	10/14/03		04/23/02	01/23/03	04/22/03	07/22/03	09/08/03				Pos change 124-126 ft Co-60, 5 ft Cs-137, C-106 Ret
30-06-12	C-106	6	0	98	98	20	43.5	10/17/03		04/24/02	01/24/03	04/29/03	07/22/03	09/11/03				No apparent change, C-106 Retrieval
30-07-01	C-107	9	30	80	50		9	04/03/08		04/30/03								No apparent change
30-07-02	C-107	9	30	70	40		9	04/03/08		04/30/03								No apparent change
30-07-05	C-107	9	30	80	50		9	04/03/08		04/30/03								No apparent change
30-07-08	C-107	9	30	70	40	10	9	04/03/08		04/30/03								No apparent change
30-08-02	C-108	2.4	30	99	69	10	27.4	10/28/03		09/11/02	09/12/02	01/21/03	05/05/03	07/30/03				Definite change in Co-60 49-75 ft, down move
30-08-03	C-108	2.4	30	50	20		2.4	08/03/03		01/21/03	05/05/03							No apparent change
30-08-12	C-108	2.4	30	98	68		2.4	01/17/04		01/22/03								No apparent change
30-09-01	C-109	2.4	30	98	68		27.4	07/19/04		09/11/02	07/25/03							No apparent change
30-09-02	C-109	2.4	30	99	69	10	27.4	07/19/04		09/11/02	07/25/03							No apparent change
30-09-06	C-109	2.4	30	98	68		39.9	10/28/03		04/23/02	01/29/03	05/05/03	07/30/03					No apparent change
30-09-07	C-109	2.4	30	121	91	20	27.4	10/28/03		09/11/02	01/16/03	05/02/03	07/30/03					No apparent change
30-09-10	C-109	2.4	25	98	73		27.4	07/23/04		09/11/02	07/29/03							No apparent change
30-09-11	C-109	2.4	30	98	68	10	27.4	07/24/04		09/11/02	07/30/03							No apparent change
30-10-01	C-110	18.7	30	70	40		18.7	01/03/08		01/29/03								No apparent change
30-10-02	C-110	18.7	30	70	40		18.7	01/02/08		01/28/03								No apparent change
30-10-09	C-110	18.7	30	70	40	10	18.7	01/02/08		01/28/03								No apparent change

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
30-10-11	C-110	18.7	30	70	40		18.7	12/29/07		01/24/03								No apparent change
30-11-01	C-111	6.8	30	70	40		6.8	04/05/08		05/02/03								No apparent change
30-11-05	C-111	6.8	30	70	40		6.8	04/05/08		05/02/03								No apparent change
30-11-11	C-111	6.8	30	70	40		6.8	04/05/08		05/02/03								No apparent change
30-12-01	C-112	1.8	30	70	40		26.8	07/19/04		09/10/02	07/25/03							No apparent change
30-12-03	C-112	1.8	30	70	40		1.8	08/14/08		09/10/03								No apparent change
30-12-13	C-112	1.8	25	70	45		26.8	07/25/04		09/10/02	07/31/03							No apparent change
40-02-01	S-102	14	0	129	129		14	06/05/08		09/17/02	07/02/03							No apparent change, S-102 Retrieval
40-02-03	S-102	14	0	98	98	10	39	07/02/04	04/25/02	07/08/03								App Cs-137 incr at 44-47 ft., S-102 Retrieval
40-02-04	S-102	14	0	144	144		14	06/12/08		09/19/02	07/09/03							No apparent change, S-102 Retrieval
40-02-05	S-102	14	0	97	97		14	06/10/08		09/17/02	07/07/03							No apparent change, S-102 Retrieval
40-02-07	S-102	14	0	95	95		39	07/01/04		09/17/02	07/07/03							No apparent change, S-102 Retrieval
40-02-08	S-102	14	0	99	99	10	39	07/01/04		09/17/02	07/07/03							No apparent change, S-102 Retrieval
40-02-10	S-102	14	0	100	100		14	06/04/08		09/17/02	07/01/03							No apparent change, S-102 Retrieval
40-02-11	S-102	14	0	100	100		14	06/05/08		09/19/02	07/02/03							No apparent change, S-102 Retrieval
40-03-01	S-103	13.8	40	80	40		13.8	06/04/08		07/01/03								No apparent change
40-03-05	S-103	13.8	40	90	50		38.8	08/20/04		09/17/02	08/26/03							No apparent change
40-03-06	S-103	13.8	40	80	40	10	13.8	06/04/08		07/01/03								No apparent change
40-03-08	S-103	13.8	40	80	40		13.8	06/04/08		07/01/03								No apparent change
40-03-11	S-103	13.8	40	80	40		13.8	06/03/08		06/30/03								No apparent change
40-04-05	S-104	26.6	25	100	82	10	51.6	07/03/04	04/24/02	06/11/02	07/09/03							No apparent change
40-04-07	S-104	26.6	35	80	45		51.6	06/13/04		05/31/02	06/19/03							No apparent change
40-05-07	S-105	6.3	40	80	40	10	6.3	07/31/08		08/27/03								No apparent change
40-07-01	S-107	22.5	35	80	45		47.5	06/12/04		05/31/02	06/18/03							No apparent change
40-07-04	S-107	22.5	40	80	40	10	22.5	03/06/04		03/12/03								No apparent change
40-07-06	S-107	22.5	40	80	40		22.5	02/12/08		03/10/03								No apparent change
40-07-11	S-107	22.5	35	80	45		22.5	02/14/08		03/12/03								No apparent change
40-09-06	S-109	2.4	0	98	98		2.4	09/26/03		06/05/02	03/11/03	08/27/03						No apparent change; S-112 Retrieval
40-09-08	S-109	2.4	40	97	57		2.4	08/20/04		09/17/02	08/26/03							No apparent change
40-11-09	S-111	39	40	80	40		39	06/12/04		06/05/02	06/18/03							No apparent change
40-12-02	S-112	12.2	0	99	99		12.2	09/26/03		06/05/02	03/12/03	08/27/03						No apparent change; S-112 Retrieval
40-12-04	S-112	12.2	0	126	126		12.2	09/21/03		06/04/02	03/10/03	08/22/03						No apparent change; S-112 Retrieval
40-12-06	S-112	12.2	0	144	144	10	12.2	09/20/03		06/04/02	03/10/03	08/21/03						No apparent change; S-112 Retrieval
40-12-07	S-112	12.2	0	98	98		12.2	09/25/03		06/04/02	03/11/03	08/26/03						No apparent change; S-112 Retrieval
40-12-09	S-112	12.2	0	99	99		12.2	09/26/03		06/05/02	03/11/03	08/27/03						No apparent change; S-112 Retrieval
41-00-02	SX-101	14	30	80	50	10	14	06/13/08		07/10/03								No apparent change
41-00-08	SX-109	8	40	90	50	10	58	01/07/04		08/20/01	03/28/02	09/06/02	02/10/03	07/11/03				No apparent change
41-01-01	SX-101	14	35	80	45		14	01/29/04		02/03/03								No apparent change
41-01-04	SX-101	14	40	80	40		14	01/30/04		02/04/03								No apparent change
41-01-06	SX-101	14	25	80	55		39	07/04/04		09/06/01	09/09/02	07/10/03						No apparent change
41-01-07	SX-101	14	40	80	40		14	01/29/04		02/03/03								No apparent change
41-01-08	SX-101	14	40	80	40	10	14	01/29/04		02/03/03								No apparent change
41-01-10	SX-101	14	40	80	40		51.5	07/04/04		09/07/01	09/06/02	07/10/03						No apparent change
41-01-11	SX-101	14	40	80	40		14	01/30/04		02/04/03								No apparent change
41-02-02	SX-102	32.4	25	139	114	10	82.4	01/12/04		09/07/01	03/26/02	09/06/02	02/04/03	07/16/03				Possible change not confirmed; pos Sr-90
41-02-08	SX-102	32.4	40	80	40		69.9	07/04/04		09/10/01	09/09/02	07/10/03						No apparent change; possible Sr-90
41-02-11	SX-102	32.4	20	80	60		69.9	07/10/04		09/07/01	09/09/02	07/16/03						No apparent change
41-03-02	SX-103	19.8	30	80	50		44.8	01/31/04		03/26/02	02/05/03							No apparent change
41-03-05	SX-103	19.8	40	80	40		44.8	02/01/04		03/26/02	02/06/03							No apparent change
41-03-06	SX-103	19.8	40	80	40		19.8	01/11/08		02/06/03								No apparent change, Salt Well Pumping

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
41-03-09	SX-103	19.8	40	80	40		19.8	01/10/08		02/05/03								No apparent change
41-03-10	SX-103	19.8	40	80	40	10	19.8	01/10/08		02/05/03								No apparent change
41-03-12	SX-103	19.8	40	80	40		19.8	01/10/08		02/05/03								No apparent change
41-05-02	SX-105	5.85	40	80	40		5.85	01/12/08		02/07/03								No apparent change
41-05-05	SX-105	5.85	45	132	87		5.85	01/11/08		02/06/03								No apparent change, Salt Well Pumping
41-05-07	SX-105	5.85	45	123	78	10	5.85	01/12/08		02/07/03								No apparent change
41-05-10	SX-105	5.85	40	95	55		5.85	01/12/08		02/07/03								No apparent change
41-05-12	SX-105	5.85	35	80	45		5.85	01/12/08		02/07/03								No apparent change
41-07-05	SX-107	6.1	40	75	27		43.6	07/29/04	04/19/02	09/25/01	08/04/03							No apparent change; HRLS 04/19/02
41-07-07	SX-107	6.1	40	74	25	10	56.1	02/08/04	04/19/02	09/26/01	04/09/02	02/24/03	08/12/03					No apparent change; HRLS 04/19/02
41-07-10	SX-107	6.1	40	72	32	10	24.9	01/15/08		02/10/03								No apparent change
41-08-02	SX-108	15	40	74	39		40	07/31/04		09/24/01	09/16/02	08/06/03						No apparent change
41-08-04	SX-108	15	35	76	41		52.5	07/30/04		09/17/01	09/09/02	08/05/03						No apparent change
41-08-07	SX-108	15	40	63	23		52.5	07/31/04	04/18/02	09/25/01	08/06/03							No apparent change; HRLS 04/18/02
41-08-11	SX-108	15	40	75	25	10	40	08/06/04	04/18/02	09/26/01	08/12/03							No apparent change; HRLS 04/18/02
41-09-02	SX-109	8	40	74	34		33	02/05/04		03/27/02	02/10/03							No apparent change
41-09-03	SX-109	8	40	74	31		45.5	02/04/04	04/22/02	09/26/01	08/08/03							No apparent change; HRLS 04/22/02
41-09-07	SX-109	8	40	73	35		58	02/03/04	04/22/02	10/03/01	04/05/02	02/13/03	08/07/03					No apparent change; HRLS 04/22/02
41-09-09	SX-109	8	40	95	66		58	02/04/04		10/03/01	04/05/02	02/13/03	08/08/03					No apparent change
41-10-01	SX-110	4.4	40	80	40	10	54.4	02/01/04		09/13/01	04/01/02	02/11/03	08/05/03					Possible ongoing Cs-137 increase at 66 ft
41-10-02	SX-110	4.4	40	80	40	10	23.2	01/16/08		02/11/03								No apparent change
41-11-08	SX-111	4.3	40	85	45		23.1	01/17/08		02/12/03								No apparent change
41-11-09	SX-111	4.3	40	75	35		41.8	07/30/04		09/17/01	09/09/02	08/05/03						No apparent change
41-11-10	SX-111	4.3	40	95	69		54.3	08/23/03	04/18/02	09/25/01	04/09/02	02/24/03						No apparent change; HRLS 04/18/02
41-12-02	SX-112	25.8	40	121	65		63.3	08/06/04	04/23/02	10/03/01	08/12/03							No apparent change; HRLS 04/23/02
41-12-03	SX-112	25.8	40	75	40		63.3	02/08/04		10/03/01	02/13/03							No apparent change
41-14-02	SX-114	15.4	40	76	36	10	15.4	07/08/08		08/04/03								No apparent change
41-14-03	SX-114	15.4	40	74	34		15.4	06/20/08		07/17/03								No apparent change
41-14-04	SX-114	15.4	40	85	45		15.4	06/20/08		07/17/03								No apparent change
41-14-06	SX-114	15.4	30	76	46		40.4	02/06/04		04/02/02	02/11/03							No apparent change
41-14-08	SX-114	15.4	40	73	33		15.4	07/08/08		08/04/03								No apparent change
41-14-09	SX-114	15.4	40	75	35		40.4	02/06/04		04/02/02	02/11/03							No apparent change
41-14-11	SX-114	15.4	40	75	35	10	40.4	02/06/04		04/02/02	02/11/03							No apparent change
41-15-07	SX-115	40	40	90	50	10	65	02/07/04		09/25/01	02/12/03							Apparent Cs-137 increase (57-60ft)
50-00-09	T-106	92	30	120	90		142	11/17/03		07/18/01	01/09/02	08/28/02	05/21/03					No apparent change
50-01-09	T-101	10.8	30	90	60		60.8	11/11/03		07/30/01	11/08/01	01/22/02	08/28/02	05/15/03				Apparent change at 86-90 ft not confirmed
50-02-02	T-102	4.8	30	70	40		23.6	12/18/03		01/22/02	12/23/02							No apparent change
50-02-05	T-102	4.8	30	83	53	10	54.8	11/15/03		07/25/01	01/22/02	08/28/02	05/19/03					Apparent Cs-137 increase (39-41ft)
50-02-08	T-103	2.9	30	85	55		27.9	12/18/03		01/14/02	12/23/02							No apparent change
50-02-09	T-102	4.8	30	85	55		29.8	12/18/03		01/16/02	12/23/02							No apparent change
50-03-04	T-103	2.9	20	120	100	10	27.9	12/21/03		01/14/02	12/26/02							No apparent change
50-03-05	T-103	2.9	30	120	90		27.9	12/21/03		01/14/02	12/26/02							No apparent change
50-04-07	T-104	4.65	20	70	50		23.4	12/21/03		01/21/02	12/26/02							No apparent change
50-04-08	T-104	4.65	30	95	65		54.7	11/11/03		07/31/01	01/24/02	08/28/02	05/15/03					No apparent change
50-04-10	T-104	4.65	30	87	57		54.7	08/13/03		07/31/01	01/22/02	08/29/02	12/16/02	05/15/03				Apparent change 67-68 ft
50-05-07	T-105	1.5	30	87	57		26.5	06/10/04		01/08/02	06/16/03							No apparent change
50-06-02	T-106	92	30	122	92	10	142	12/14/03		07/19/01	11/07/01	01/15/02	08/29/02	06/17/03				Apparent change at 110 ft not confirmed
50-06-03	T-106	92	30	118	88		142	12/14/03		07/18/01	11/12/01	01/15/02	08/28/02	06/17/03				Apparent change at 115 ft not confirmed
50-06-18	T-106	92	25	130	110		142	09/16/03		08/01/01	01/29/02	09/03/02	12/31/02	06/18/03				Poss. Incr. 117-119 ft (Co-60), poss. ongoing 6/18/03
50-07-08	T-107	16.6	35	88	53		16.6	11/20/07		12/16/02								No apparent change

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
50-08-07	T-108	2	30	119	89		27	05/14/04		01/10/02	05/20/03							No apparent change
50-08-08	T-108	2	30	95	65	10	27	05/08/04		01/08/02	05/14/03							No apparent change
50-08-09	T-108	2	30	100	70		27	12/25/03		01/16/02	12/30/02							No apparent change
50-08-19	T-108	2	30	86	56		27	05/08/04		01/08/02	05/14/03							No apparent change
50-09-01	T-109	4.1	30	86	56		54.1	12/13/03		07/23/01	11/08/01	01/28/02	08/27/02	06/16/03				Apparent change at 85 ft result of water level
50-09-02	T-109	4.1	30	86	56		54.1	12/13/03		01/08/02	08/27/02	06/16/03						App change 81-86 ft caused by diff. water levels
50-09-05	T-109	4.1	30	90	60	10	29.1	12/25/03		01/10/02	12/30/02							No apparent change
50-09-10	T-109	4.1	30	119	89	10	54.1	11/16/03		07/23/01	11/07/01	01/16/02	08/28/02	05/20/03				Apparent change at 76 and 94 ft not confirmed
51-01-02	TX-101	2.1	40	80	40		39.6	05/28/04		05/13/02	06/03/03							No apparent change
51-03-01	TX-103	5.4	40	80	40		30.4	05/28/04		05/13/02	06/03/03							No apparent change
51-03-09	TX-103	5.4	40	97	57		55.4	07/13/03		05/13/02	01/14/03							No apparent change
51-03-11	TX-103	5.4	40	99	59	10	30.4	07/14/03		05/20/02	01/15/03							Pos change 61-62 & 90-95 ft; No add changes
51-03-12	TX-103	5.4	40	99	59		30.4	05/24/04		05/14/02	05/30/03							No apparent change
51-04-02	TX-104	3.6	40	90	50	10	41.1	05/24/04		05/17/02	05/30/03							No apparent change
51-04-05	TX-104	3.6	40	97	57		53.6	07/13/03		05/16/02	01/14/03							No apparent change
51-04-06	TX-104	3.6	40	90	50		41.1	05/24/04		05/16/02	05/30/03							No apparent change
51-05-01	TX-105	13.9	40	80	40		38.9	05/28/04		05/15/02	06/03/03							No apparent change
51-05-03	TX-105	13.9	25	90	65		51.4	05/28/04		05/13/02	06/03/03							No apparent change
51-05-05	TX-105	13.9	40	98	58		63.9	07/12/03		05/17/02	01/13/03							No apparent change
51-05-07	TX-105	13.9	40	106	66		63.9	07/13/03		05/17/02	01/14/03							No apparent change
51-07-07	TX-107	4.1	40	90	60	10	29.1	05/29/04		05/20/02	06/04/03							No apparent change
51-07-18	TX-107	4.1	40	80	50		29.1	05/29/04		05/16/02	06/04/03							No apparent change
51-18-03	TX-118	4.65	10	79	69	10	29.7	01/08/04		01/13/03								No apparent change
52-03-03	TY-103	5.85	40	80	41		30.9	05/23/04	05/13/02	05/14/02	05/29/03							No apparent change; HRLS 05/13/02
52-03-06	TY-103	5.85	40	100	60		55.9	08/20/03		05/02/02	05/21/02	08/22/02	12/04/02	05/22/03				Definite change 55-60 ft; report issued 5/14/02
52-03-12	TY-103	5.85	40	99	59		30.9	05/21/04		05/02/02	05/27/03							No apparent change
52-04-06	TY-104	2.62	40	98	58	10	2.62	11/29/03		12/04/02								No apparent change
52-05-07	TY-105	31.6	40	96	56	10	81.6	11/24/03		05/02/02	12/04/02	05/28/03						No apparent change
52-06-04	TY-106	16.3	40	97	57		53.8	05/22/04		05/07/02	05/28/03							No apparent change
52-06-05	TY-106	16.3	40	147	107		66.3	08/25/03		05/08/02	12/04/02	05/27/03						Pos change 130-148 ft, ongoing 12/04/03, 5/27/03
52-06-06	TY-106	16.3	40	99	59	10	53.8	05/22/04		05/07/02	05/28/03							No apparent change
52-06-07	TY-106	16.3	200	238	38		41.3	05/16/04		05/07/02	05/22/03							No app change; Co-60? in GW, Radon on 5/22/03
60-04-08	U-104	44	40	118	78		94	11/12/03		07/16/01	10/22/01	01/03/02	04/10/02	08/27/02	11/14/02	02/26/03	08/14/03	App change (74-78 and 84-89 ft) not confirmed
60-04-10	U-104	44	35	117	82	10	69	08/08/04		07/16/01	08/27/02	08/14/03						No apparent change
60-05-04	U-105	6.6	35	72	37		44.1	11/11/03		07/16/01	10/24/01	08/27/02	11/14/02	03/03/03	08/13/03			No apparent change
60-05-05	U-105	6.6	35	123	88		44.1	11/13/03		07/16/01	08/27/02	11/13/02	02/26/03	08/15/03				Possible increase 75-80 ft
60-05-07	U-105	6.6	35	123	88	10	6.6	11/08/03		11/13/02								No apparent change
60-07-01	U-107	34.5	0	98	98		84.5	11/11/03		07/12/01	10/04/01	12/26/01	04/10/02	08/23/02	11/05/02	03/05/03	08/13/03	Apparent change 83-88 ft not confirmed
60-07-02	U-107	34.5	0	125	125	10	53.3	11/18/03		07/12/01	10/04/01	12/26/01	04/15/02	08/23/02	11/04/02	03/05/03	08/20/03	Apparent decrease 90-100 ft not confirmed
60-07-10	U-107	34.5	0	98	98	10	84.5	11/16/03		07/09/01	10/24/01	12/27/01	04/15/02	08/26/02	11/05/02	03/06/03	08/18/03	App change (SGLS); 53-65 ft not confirmed
60-07-11	U-107	34.5	0	124	124	10	84.5	11/13/03		07/12/01	10/24/01	12/27/01	04/15/02	08/26/02	11/05/02	03/05/03	08/15/03	App change (SGLS); 73-95 ft not confirmed
60-08-04	U-108	18.6	0	127	127		56.1	11/16/03		07/09/01	10/25/01	12/28/01	04/15/02	08/27/02	11/05/02	03/06/03	08/18/03	No apparent change
60-09-01	U-109	7.05	35	75	40		7.05	10/16/07		11/11/02								No apparent change
60-09-07	U-109	7.05	35	75	40		7.05	10/16/07		11/11/02								No apparent change
60-09-08	U-109	7.05	35	75	40	10	7.05	10/17/07		11/12/02								No apparent change
60-09-10	U-109	7.05	35	124	89		7.05	10/16/07		11/11/02								No apparent change
60-10-01	U-110	10	0	125	125	10	10	11/17/03		07/17/01	10/04/01	12/27/01	04/11/02	08/26/02	11/06/02	03/03/03	08/19/03	No apparent change
60-10-07	U-110	10	35	75	30		35	08/14/04	07/18/02	07/17/01	08/26/02	08/20/03						No apparent change
60-10-11	U-110	10	0	98	98	10	10	11/17/03		07/17/01	10/04/01	01/02/02	04/11/02	08/26/02	11/06/02	03/03/03	08/19/03	No apparent change
60-11-07	U-111	12	35	123	88	10	37	11/07/03		10/25/01	11/12/02							No apparent change

Appendix A. Boreholes Monitored During FY 2003

Borehole Number	Tank	Tank Score	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	RAS Event G	RAS Event H	Comment
60-11-12	U-111	12	35	124	89		37	11/07/03		11/05/01	11/12/02							No apparent change
60-12-01	U-112	9.2	35	125	60		34.2	08/14/04	07/17/02	11/06/01	08/20/03							No apparent change; requires HRLS
60-12-03	U-112	9.2	35	124	89		9.2	11/08/03		11/13/02								No apparent change

Appendix B
Comparison of RAS and SGLS Baseline Measurements of Boreholes Identified in the Fourth Quarter of FY 2003 that Suggest Contaminant Movement

Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 21-12-02 (299-E33-153) (A6961)

Borehole Information

Site: BX Farm, Tank BX-112			
Coordinates (HAN Plant):	**North: 45616**	**West: 53503**	**Elevation (ft): 653.82**
Coordinates (WA Plane):	**North: 137382.792**	**East: 573580.2**	**Elevation (m): 200.392**
Drill Date: 12/31/1971	**Type: Cable Tool**	**Depth (ft): 99**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 9/19/03**	**D/W Reference: Stoller**	
Comments: None.			

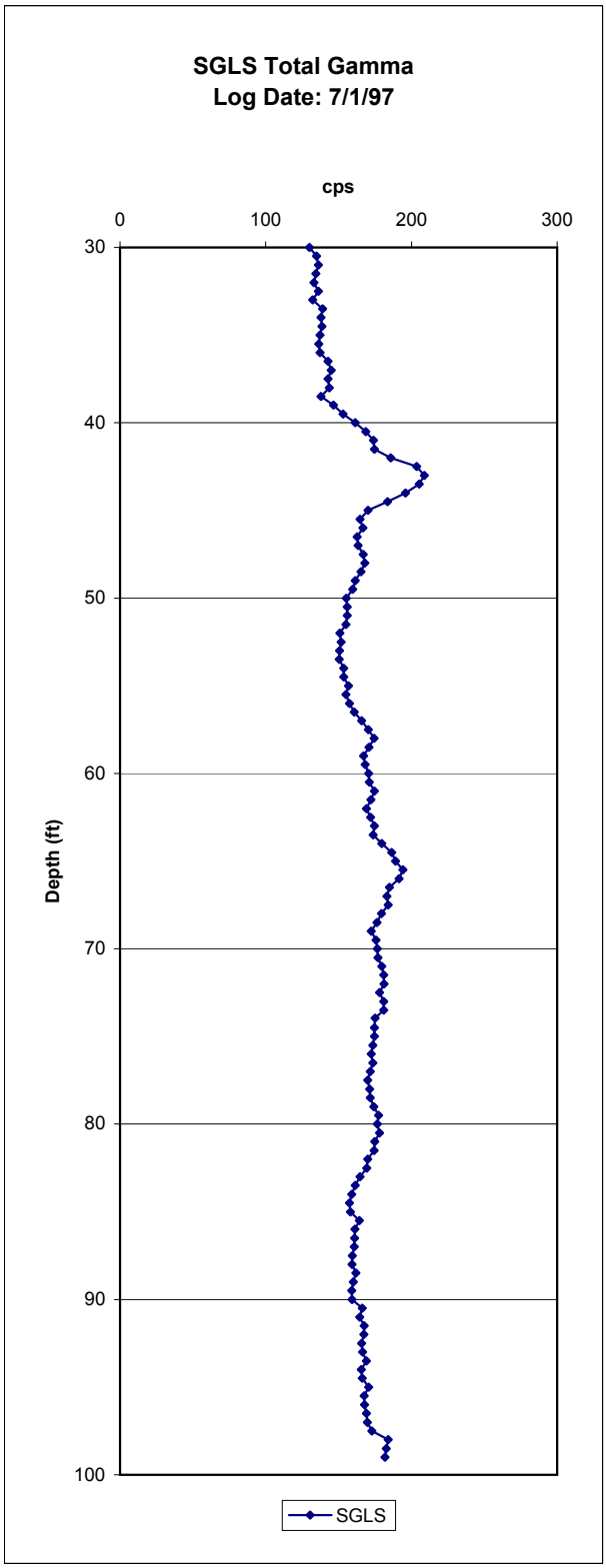
Casing Information

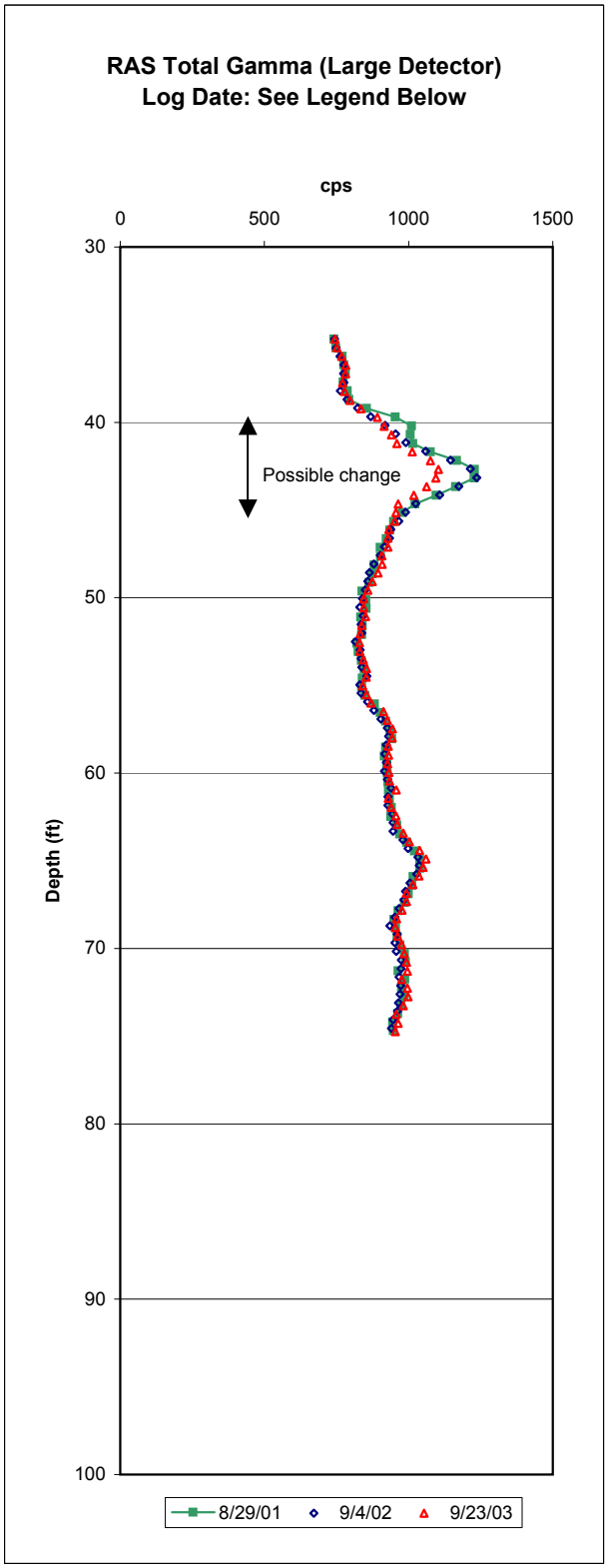
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
7/1/1997	SGLS	G2A	NA	0-99	MACTEC-ERS	Baseline
8/29/2001	RAS	Large	A	35-75	MACTEC-ERS	No Change
9/4/2002	RAS	Large	B	35-75	Stoller	No Change
9/23/2003	RAS	Large-New	C	35-75	Stoller	Decrease 40-45 ft

Borehole 21-12-02





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 30-08-02 (299-E27-94) (A6719)

Borehole Information

Site: C Farm, Tank C-108			
Coordinates (HAN Plant):	**North: 42965**	**West: 48363**	**Elevation (ft): 647.00**
Coordinates (WA Plane):	**North: 136578.828**	**East: 575150.01**	**Elevation (m): 197.951**
Drill Date: 9/30/1974	**Type: Cable Tool**	**Depth (ft): 99**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 12/9/03**	**D/W Reference: Stoller**	
Comments: None.			

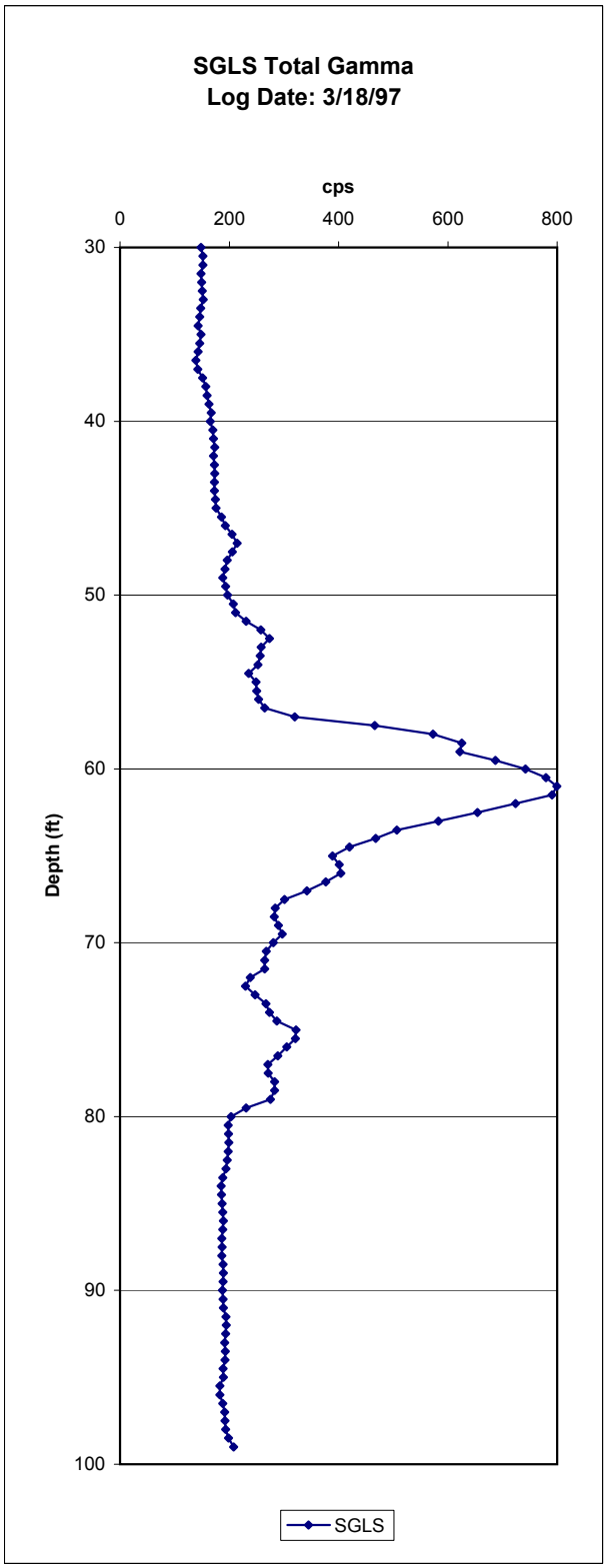
Casing Information

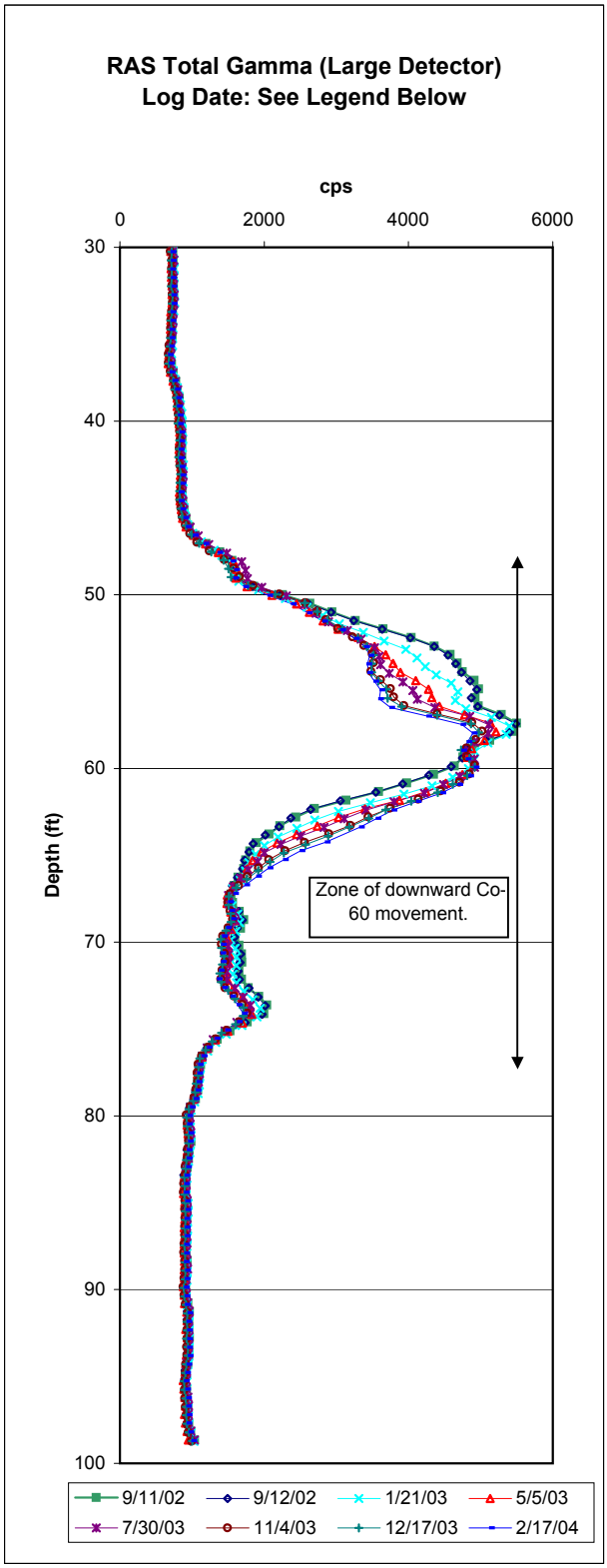
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
3/18/1997	SGLS	G1B	NA	0-99	MACTEC-ERS	Baseline
9/11/2002	RAS	Large	A	30-99	Stoller	Co-60 increase 49-75 ft
9/12/2002	RAS	Large	B	30-99	Stoller	No change from above.
1/21/2003	RAS	Large-New	C	30-99	Stoller	Downward Movement
5/5/2003	RAS	Large-New	D	30-99	Stoller	Downward Movement
7/30/2003	RAS	Large-New	E	30-98	Stoller	Downward Movement
11/4/2003	RAS	Large-New	F	30-98	Stoller	Downward Movement
12/8/2003	NMLS	Moisture	1	0-99	Stoller	Moisture baseline
12/17/2003	RAS	Large-New	G	30-99	Stoller	No change from above.
2/17/2004	RAS	Large-New	H	30-99	Stoller	Downward Movement

Borehole 30-08-02





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 30-08-03 (299-E27-51) (A6676)

Borehole Information

Site: C Farm, Tank C-108			
Coordinates (HAN Plant):	**North: 42932**	**West: 48345**	**Elevation (ft): 646.96**
Coordinates (WA Plane):	**North: 136568.869**	**East: 575155.576**	**Elevation (m): 197.954**
Drill Date: 12/31/1944	**Type: Cable Tool**	**Depth (ft): 50**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 10/28/03**	**D/W Reference: Stoller**	
Comments: This borehole was drilled to a depth of 150 ft. The 8" casing was perforated from 48 to 148 ft. The total depth now is only 50 ft.			

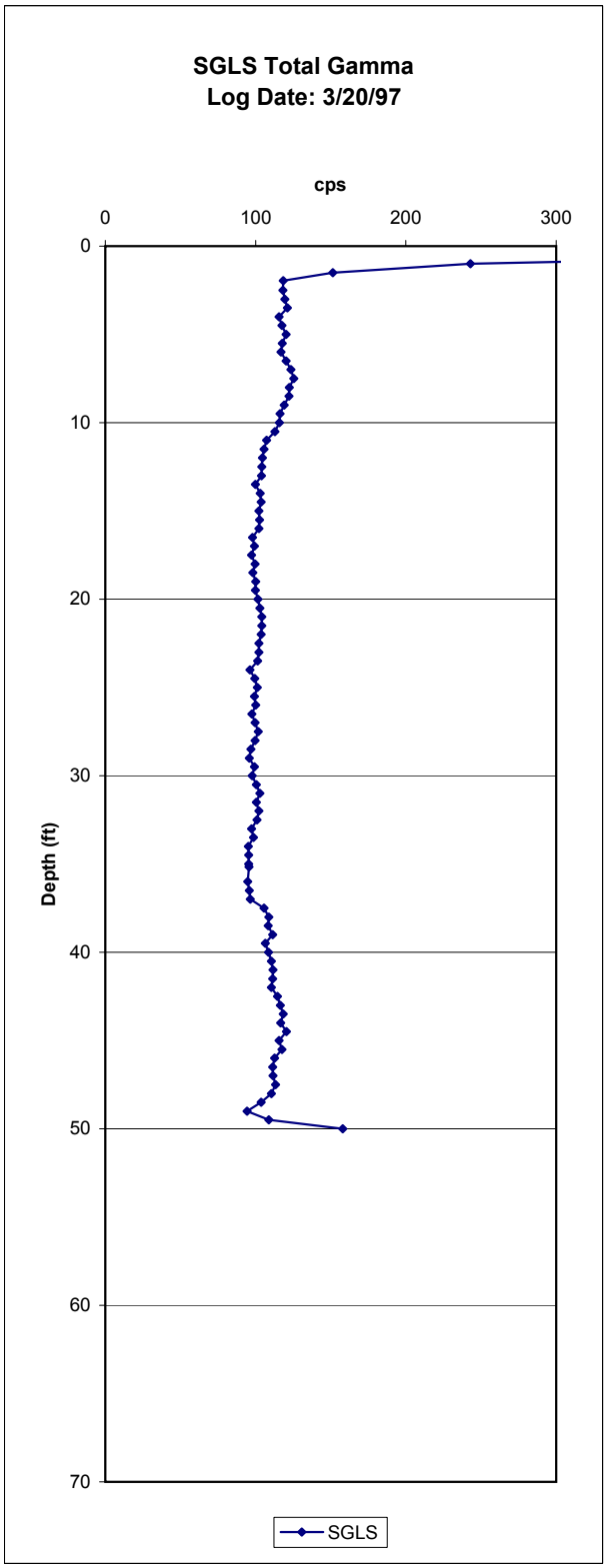
Casing Information

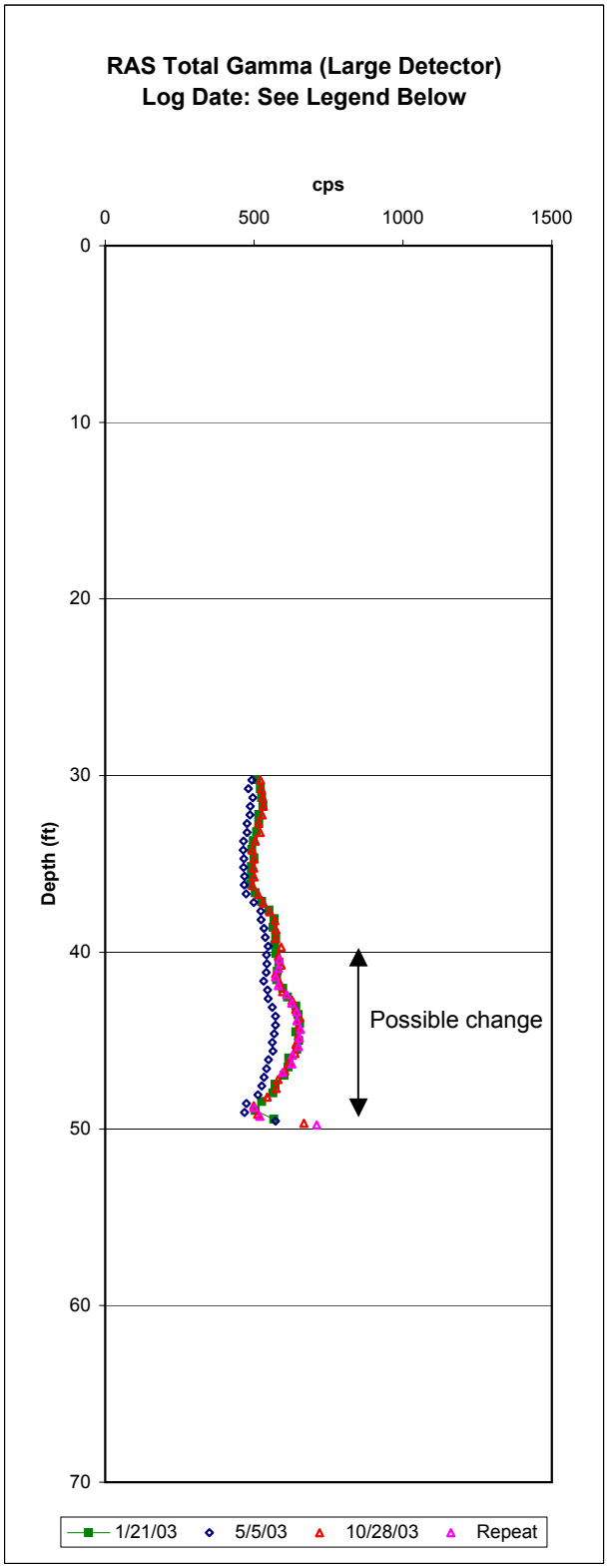
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	150	8	0.322	0	Stoller
Steel	0	50	12	0.406	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
5/27/1963	Nat. Gamma	Unk	NA	0-78	PNL	Copy at Sigma 5
11/5/1964	Nat. Gamma	Unk	NA	0-78	PNL	Copy at Sigma 5
3/20/1997	SGLS	G1B	NA	0-50	MACTEC-ERS	Baseline
1/21/2003	RAS	Large-New	A	30-50	Stoller	Possible increase 42-47 ft
5/5/2003	RAS	Large-New	B	30-50	Stoller	No change from baseline
10/28/2003	RAS	Large-New	C	30-50	Stoller	No change from baseline

Borehole 30-08-03





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 40-02-03 (299-W23-188) (Unk)

Borehole Information

Site: S Farm, Tank S-102			
Coordinates (HAN Plant):	**North: 36249**	**West: 75726**	**Elevation (ft): 663.00**
Coordinates (WA Plane):	**North: Unk**	**East: Unk**	**Elevation (m): Unk**
Drill Date: 2/27/1974	**Type: Cable Tool**	**Depth (ft): 98.5**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 6/18/03**	**D/W Reference: Stoller**	
Comments: None.			

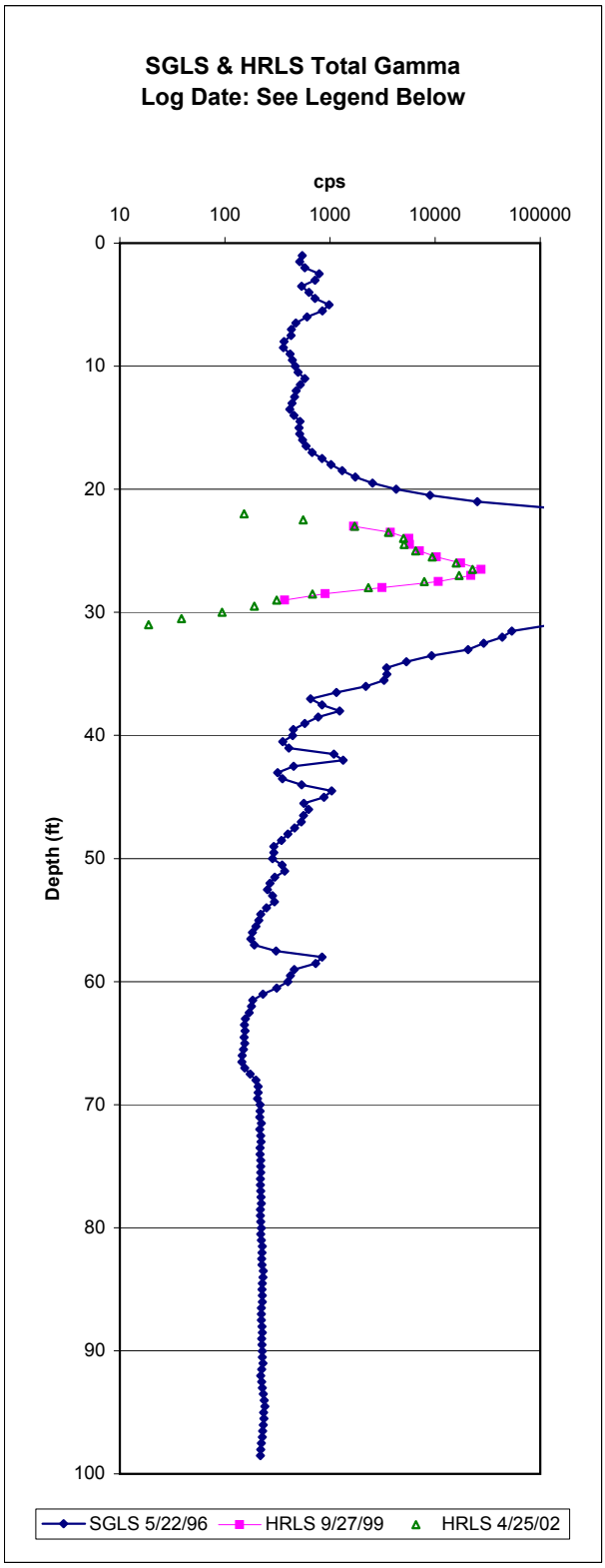
Casing Information

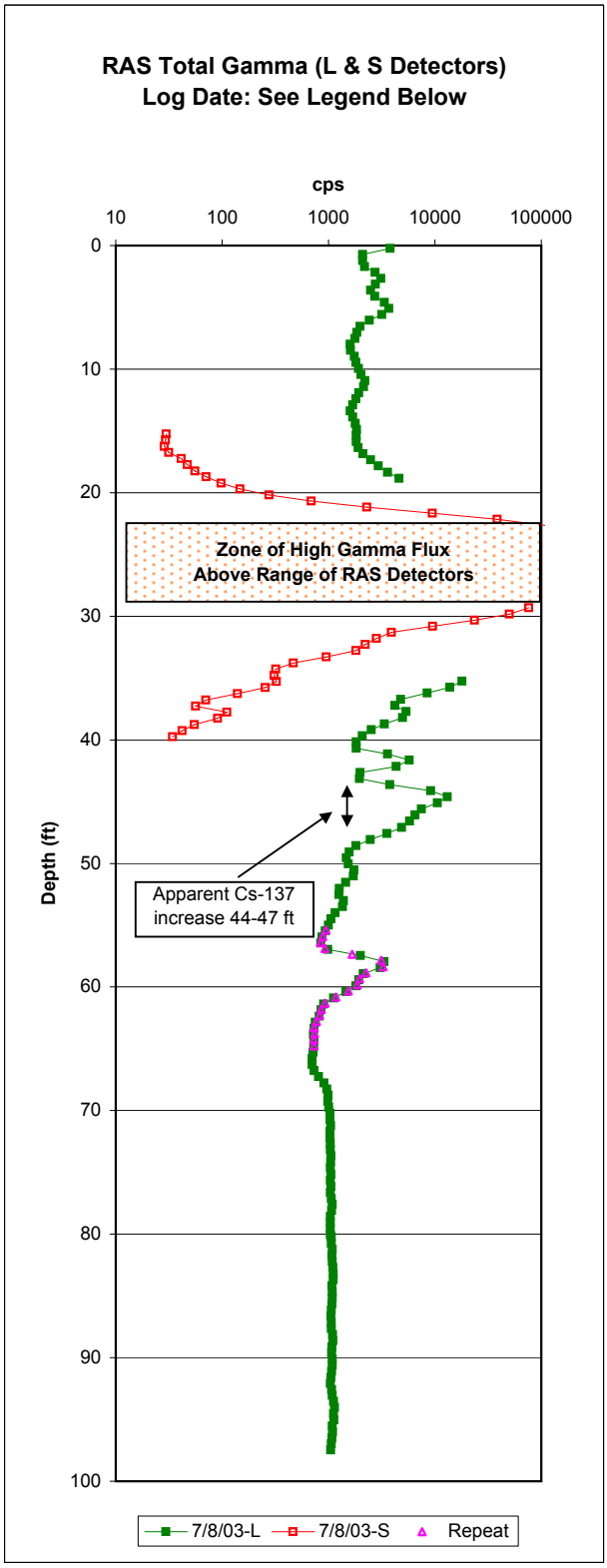
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	100	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
5/22/1996	SGLS	G1A	NA	1-98.5	MACTEC-ERS	Baseline
9/27/1999	HRLS	Highrate	NA	20-35	MACTEC-ERS	Baseline-Highrate
4/25/2002	HRLS	Highrate	NA	22-31	MACTEC-ERS	Highrate-Repeat
7/8/2003	RAS	Large-New	A	0-19&35-98	Stoller	Cs-137 inc. 44-47 ft.
7/8/2003	RAS	Small	A	15-23&29-40	Stoller	No Change

Borehole 40-02-03





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 41-10-01 (299-W23-80) (A7916)

Borehole Information

Site: SX Farm, Tank SX-110			
Coordinates (HAN Plant):	**North: 35290**	**West: 75645**	**Elevation (ft): 663.31**
Coordinates (WA Plane):	**North: 134217.453**	**East: 566841.599**	**Elevation (m): 203.22**
Drill Date: 2/22/1962	**Type: Cable Tool**	**Depth (ft): 134**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 2/3/03**	**D/W Reference: Stoller**	
Comments: This borehole was deepened from 75 to 135 ft in 1973.			

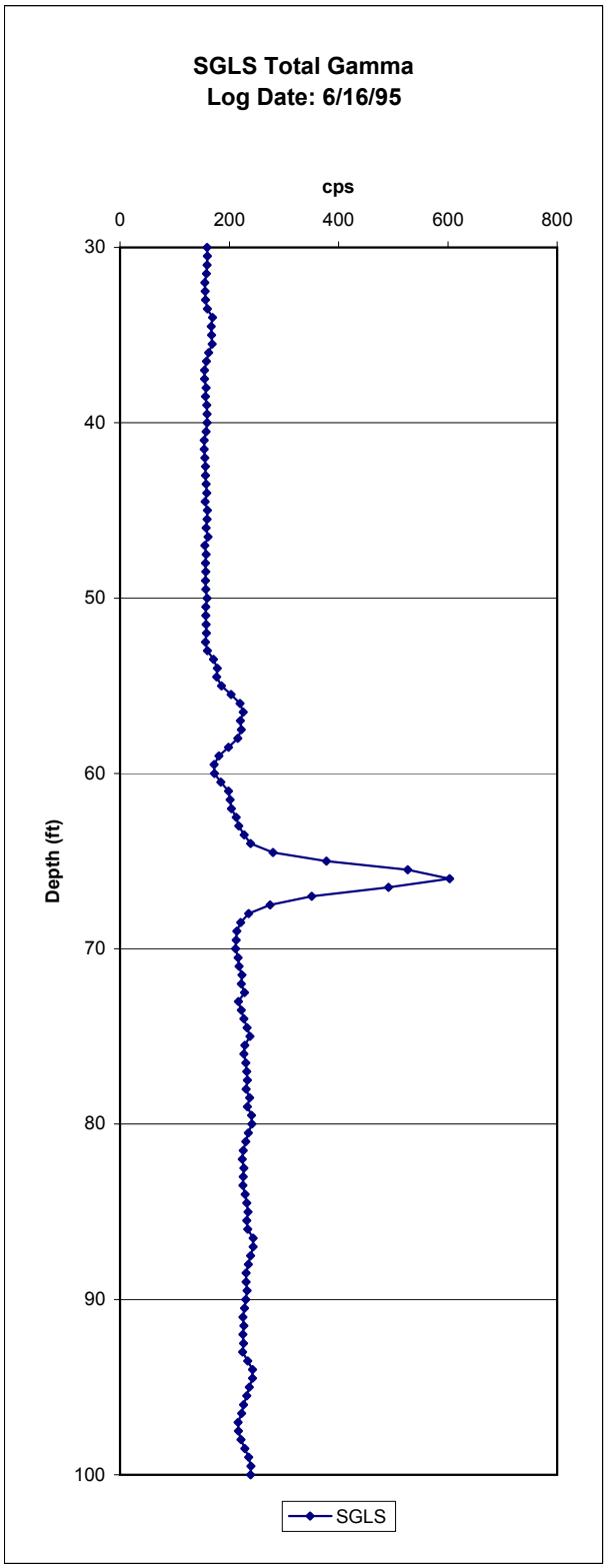
Casing Information

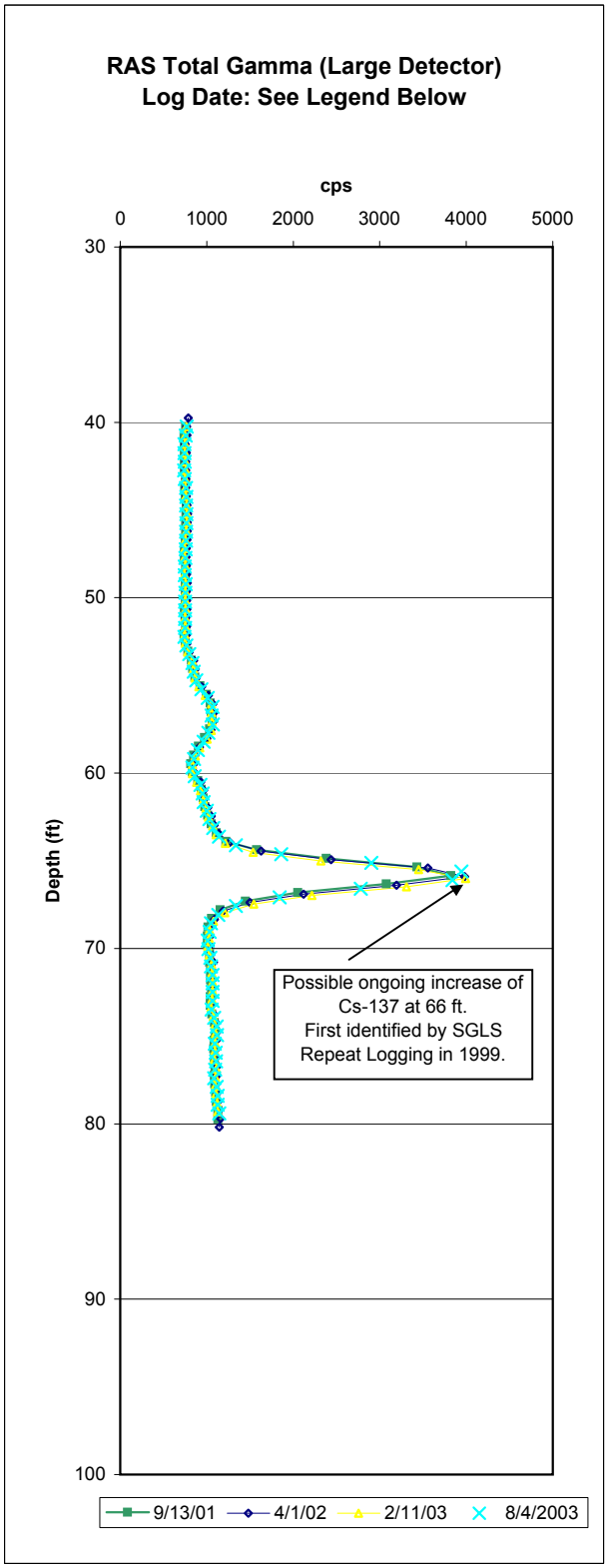
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	135	6	0.28	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
12/13/62	Nat. Gamma	Unk	NA	0-74	PNL	On File at Sigma 5
03/14/64	Nat. Gamma	Unk	NA	0-74	PNL	On File at Sigma 5
11/02/64	Nat. Gamma	Unk	NA	0-74	PNL	On File at Sigma 5
06/16/95	SGLS	G1A	NA	0-134	RUST	Baseline
11/19/99	SGLS	G2B	NA	60-70	MACTEC-ERS	Cs-137 increase @ 66ft
09/13/01	RAS	Large	A	40-80	MACTEC-ERS	Cs-137 increase ?
04/01/02	RAS	Large	B	40-80	MACTEC-ERS	Cs-137 increase ?
02/11/03	RAS	Large-New	C	40-80	Stoller	Cs-137 increase ongoing?
08/05/03	RAS	Large-New	D	40-80	Stoller	Cs-137 increase ongoing?
08/05/03	RAS	Large-New	D-repeat	60-70	Stoller	Repeats well

Borehole 41-10-01





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 41-15-07 (299-W23-70) (A7906)

Borehole Information

Site: SX Farm, Tank SX-115			
Coordinates (HAN Plant):	**North: 35099**	**West: 75894**	**Elevation (ft): 662.99**
Coordinates (WA Plane):	**North: 134159.816**	**East: 566765.965**	**Elevation (m): 202.443**
Drill Date: 3/27/1956	**Type: Cable Tool**	**Depth (ft): 112**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 2/12/03**	**D/W Reference: Stoller**	
Comments: None.			

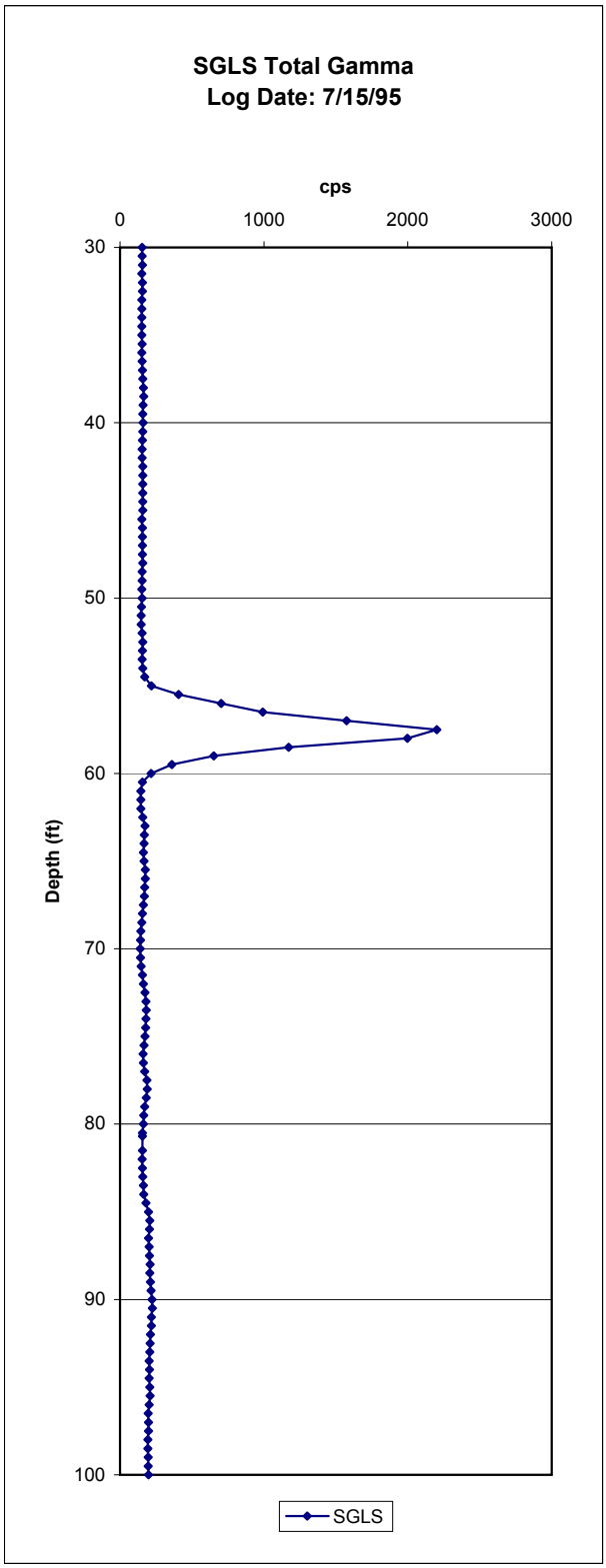
Casing Information

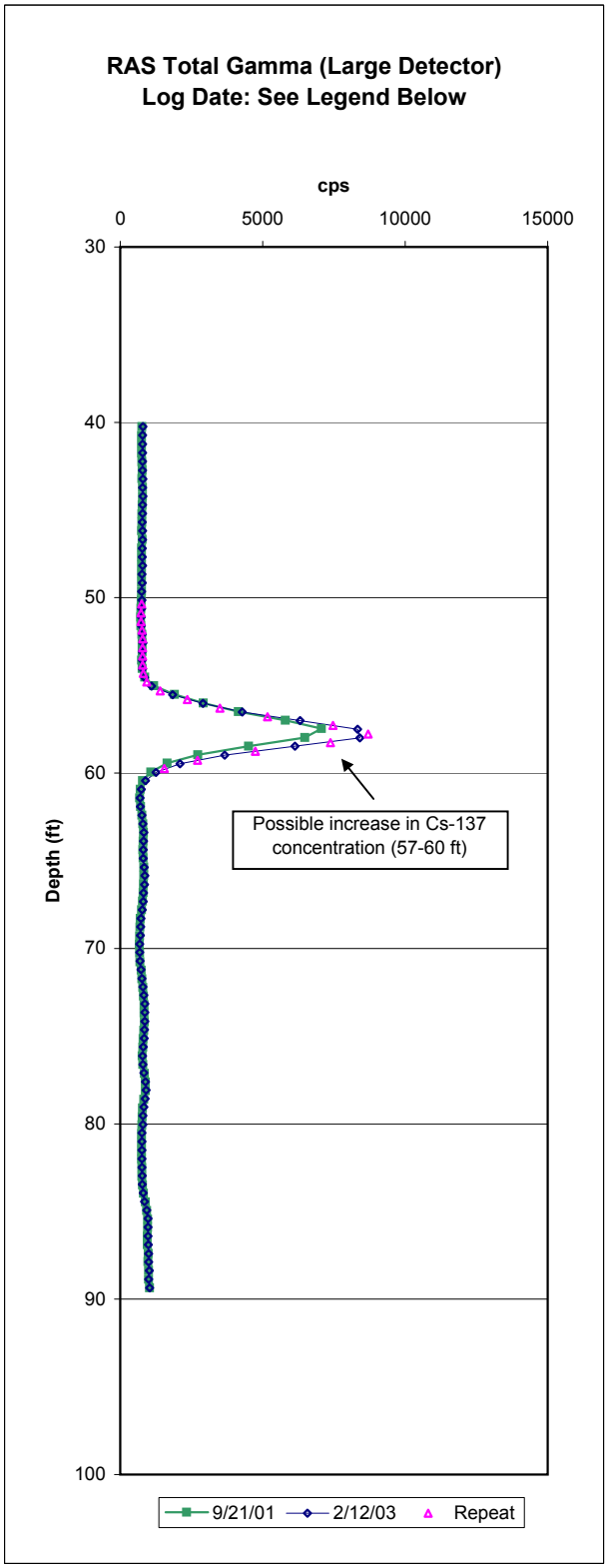
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	125	8	0.313	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
6/17/58	Nat. Gamma	Unk	NA	0-116	PNL	On File at Sigma 5
6/25/1958	Nat. Gamma	Unk	NA	0-125	PNL	On File at Sigma 5
12/12/1962	Nat. Gamma	Unk	NA	0-125	PNL	On File at Sigma 5
11/5/1964	Nat. Gamma	Unk	NA	0-125	PNL	On File at Sigma 5
10/13/1965	Nat. Gamma	Unk	NA	0-125	PNL	On File at Sigma 5
7/11/1968	Nat. Gamma	Unk	NA	0-125	PNL	On File at Sigma 5
7/15/1995	SGLS	G1A	NA	0-124	RUST	Baseline
9/21/2001	RAS	Large	A	40-90	MACTEC-ERS	No Change
2/12/2003	RAS	Large-New	B	40-90	Stoller	Cs-137 increase (57-60ft)

Borehole 41-15-07





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 50-02-05 (299-W10-123) (A7213)

Borehole Information

Site: T Farm, Tank T-102			
Coordinates (HAN Plant):	**North: 43596**	**West: 75723**	**Elevation (ft): 672.34**
Coordinates (WA Plane):	**North: 136749.494**	**East: 566811.727**	**Elevation (m): 205.963**
Drill Date: 3/31/1974	**Type: Cable Tool**	**Depth (ft): 85.5**	**Depth Datum: TOC**
Depth/Water (ft): Dry	**D/W Date: 5/14/03**	**D/W Reference: Stoller**	
Comments: There is grout between the 6" and 4" casings.			

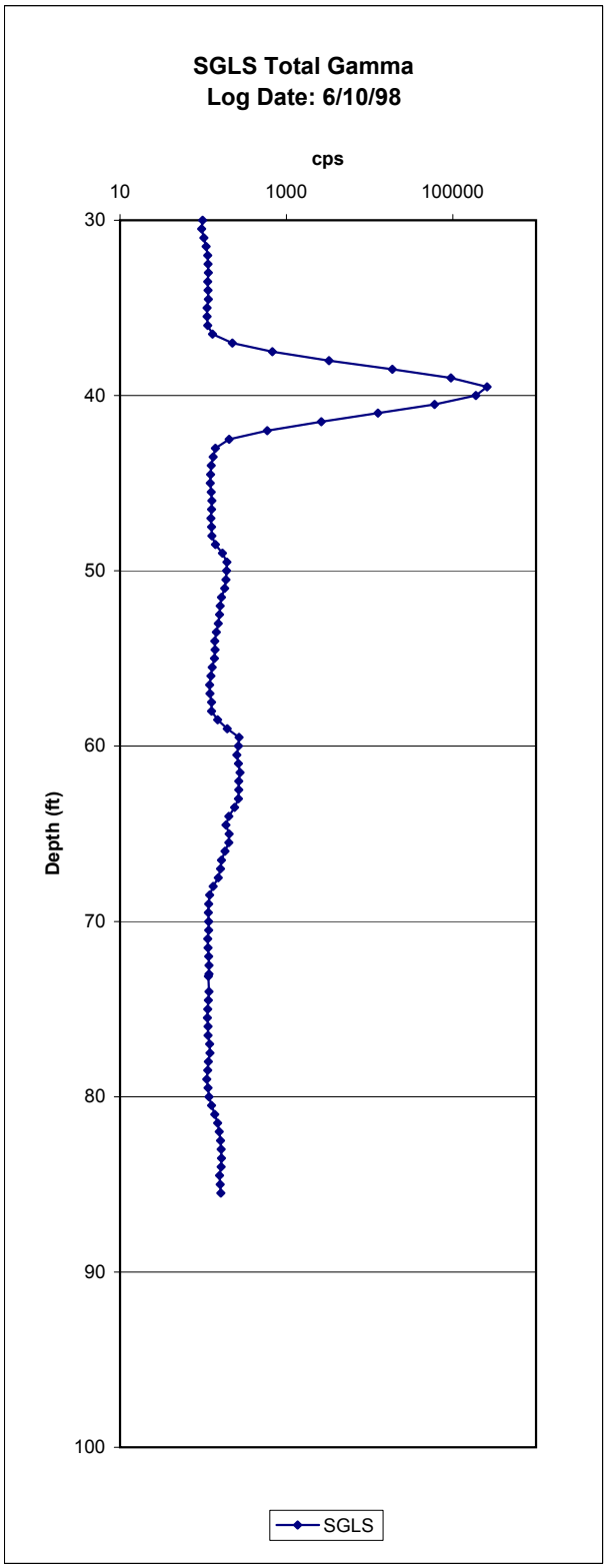
Casing Information

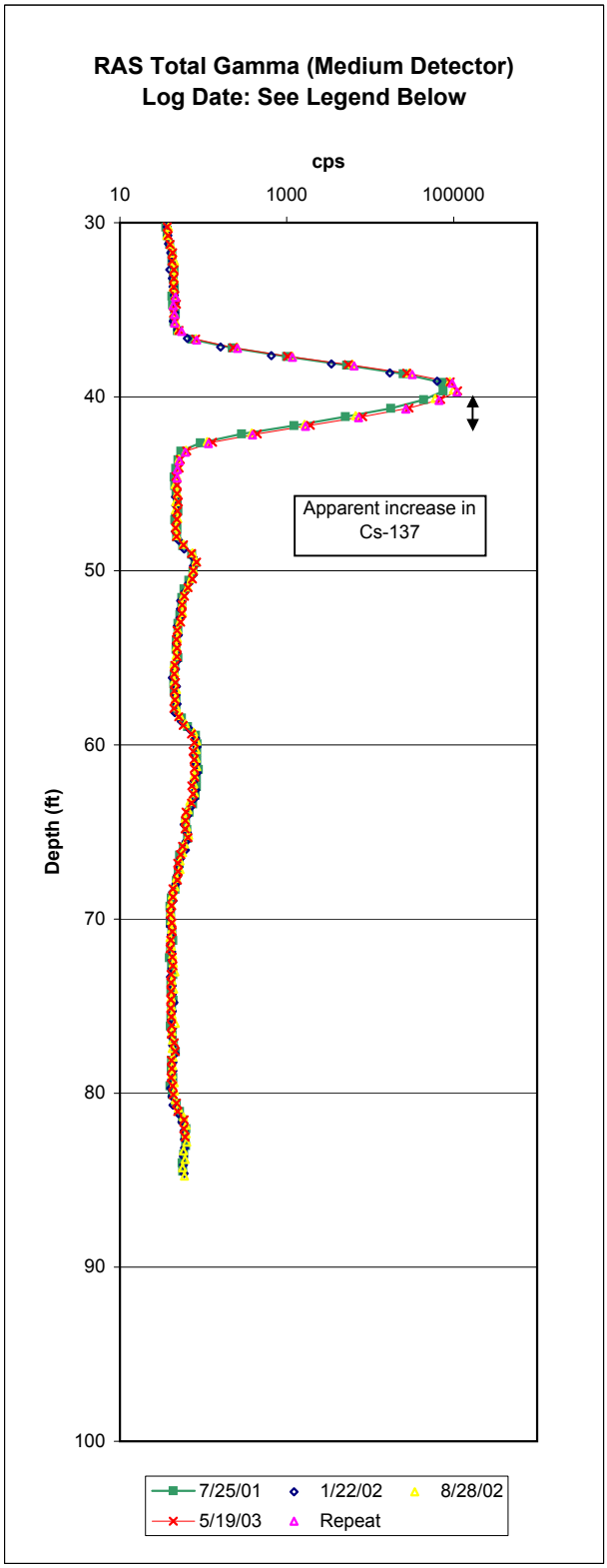
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	91	6	0.28	0	Stoller
Steel	0	91	4	0.237	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
6/10/1998	SGLS	G2B	NA	0-85.5	MACTEC-ERS	Baseline
4/13/1999	SGLS	G2B	NA	45-75	MACTEC-ERS	Baseline-Repeat
7/25/2001	RAS	Medium	A	30-85	MACTEC-ERS	No Change
1/22/2002	RAS	Medium	B	30-85	MACTEC-ERS	No Change
8/28/2002	RAS	Medium	C	30-85	Stoller	No Change
5/19/2003	RAS	Medium	D	30-83	Stoller	Cs-137 increase 39-41 ft

Borehole 50-02-05





Stoller
Grand Junction Office established 1959

Hanford Single Shell Tank Farms
Borehole Geophysics Summary Sheet

Borehole Number (Alias): 52-06-07 (299-W15-13) (A4928)

Borehole Information

Site: TY Farm, Tank TY-106			
Coordinates (HAN Plant):	**North: 42355**	**West: 75996**	**Elevation (ft): 670.50**
Coordinates (WA Plane):	**North: 136726.082**	**East: 566755.441**	**Elevation (m): 205.653**
Drill Date: 9/30/1952	**Type: Cable Tool**	**Depth (ft): 245**	**Depth Datum: TOC**
Depth/Water (ft): 220.4	**D/W Date: 2/1/99**	**D/W Reference: Stoller**	
Comments: This borehole is double cased and grouted.			

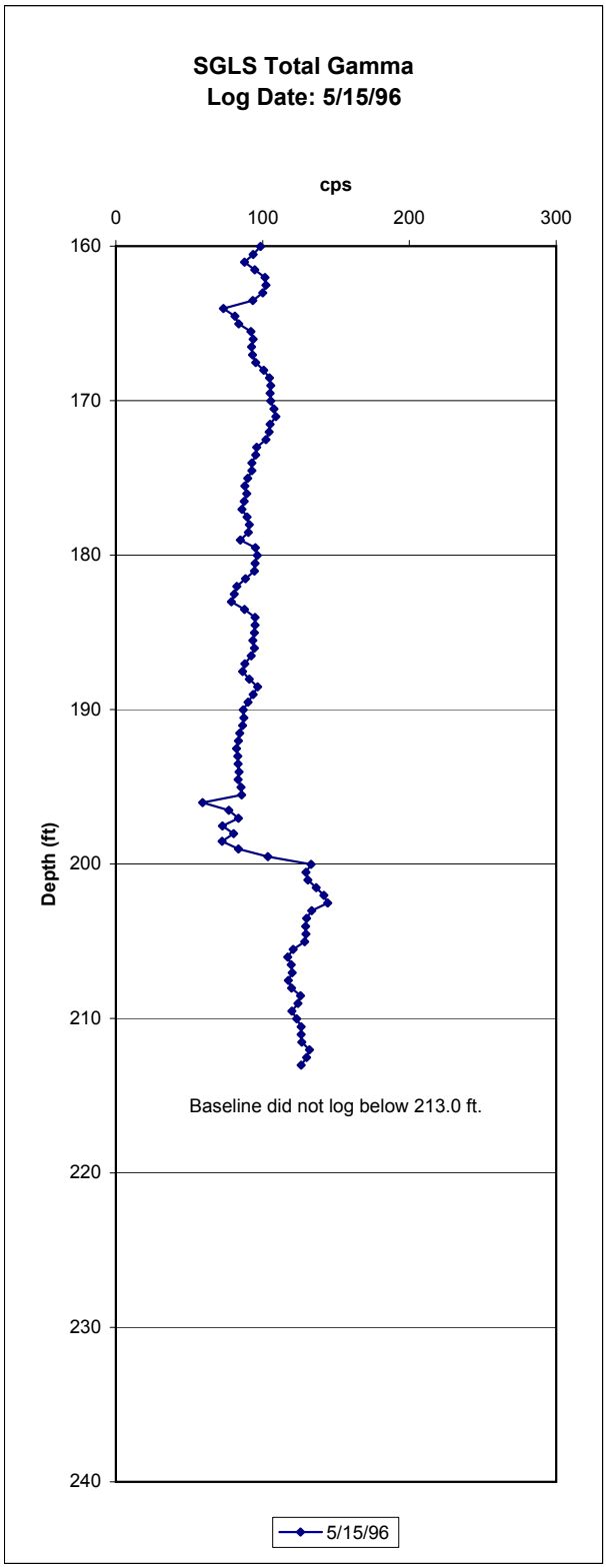
Casing Information

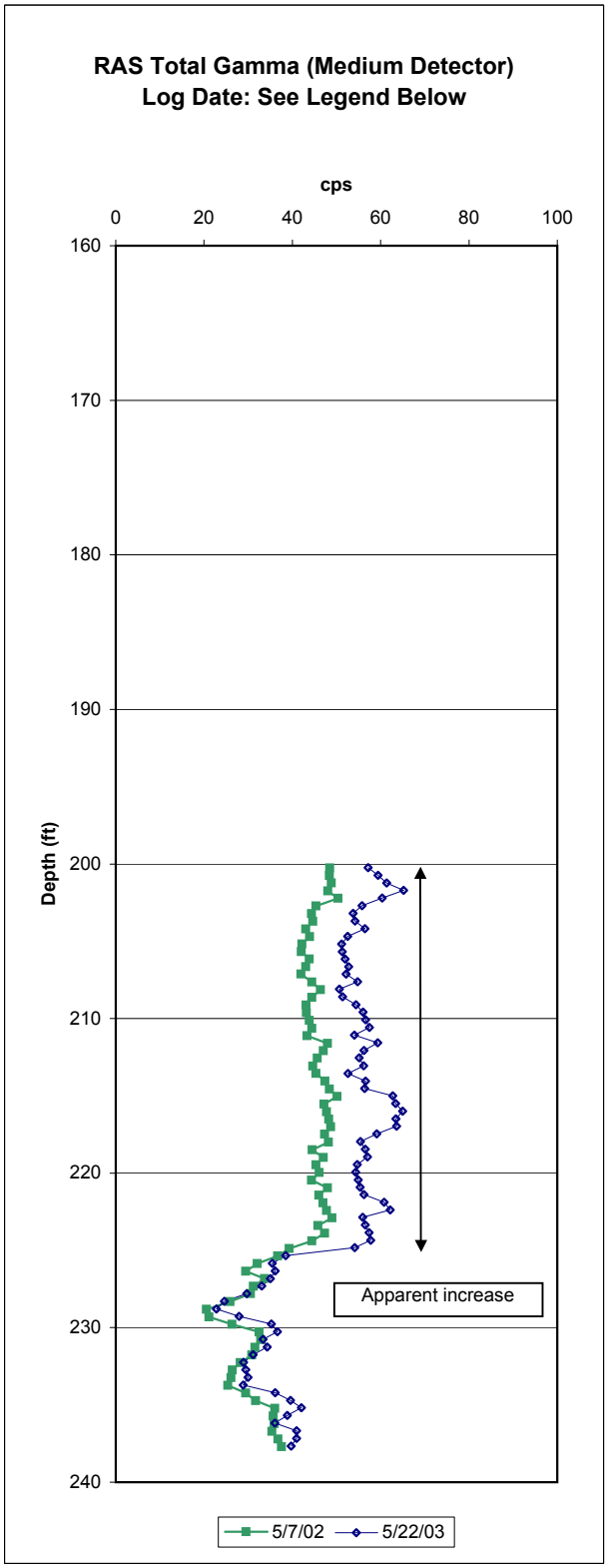
Type	Top(ft)	Bottom (ft)	ID (in)	Thick. (in)	Stickup (ft)	Reference
Steel	0	245	8	0.322	0	Stoller
Steel	0	192	4	0.237	0	Stoller

Log Run Information

Log Date	System	Detector	Event	Log int. (ft)	Contractor	Comments
5/15/1996	SGLS	G1A	NA	0-213	MACTEC-ERS	Baseline
2/1/1999	SGLS	G2B	NA	190-237	MACTEC-ERS	Baseline Repeat
5/7/2002	RAS	Medium	A	200-238	MACTEC-ERS	No Change
5/22/2003	RAS	Medium	B	200-238	Stoller	App. increase 200-225 ft

Borehole 52-06-07





Appendix C
Retrieval Monitoring Log Plots

Tank C-106 Retrieval Monitoring Measurements

30-06-02 | 30-06-03 | 30-06-04 | 30-05-02 | 30-06-09 | 30-06-10 | 30-06-12

Elevation (feet)

650 640 630 620 610 600 590 580 570 560 550 540 530 520 510 500 490

^{137}Cs (SGLS)
NMLS 04/03
^{40}K
^{60}Co
NMLS 07/03
NMLS 09/03
RAS 09/03

total gamma (cps)
600 700 800 900 1000 1100 1200

pCi/g
10^{-1} 10^{0} 10^{1} 10^{2}

Volume Fraction %
0 5 10 15 20

^{40}K (pCi/g)
0 5 10 15 20 25

Tank S-112 Retrieval Monitoring Measurements

40-11-08 | 40-12-04 | 40-12-06 | 40-12-07 | 40-12-09 | 40-09-06 | 40-12-02 | 40-11-09

Elevation (feet)

670 660 650 640 630 620 610 600 590 580 570 560 550 540 530 520 510

cps: 100 150 200 250 300

pCi/g: 10^{-1} 10^{0} 10^{1} 10^{2}

Volume Fraction %: 0 5 10 15 20 25 30

^{40}K (pCi/g): 5 10 15 20 25

Appendix D
Special Projects – Log Plots

C Farm Data Acquired to Support Drilling of Exploration Borehole

30-00-06 | 30-04-08 | 30-04-02 | 30-05-05 | 30-05-10

Elevation (feet)

660 650 640 630 620 610 600 590 580 570 560 550 540 530 520 510 500

^{137}Cs (1997)
^{40}K
NMLS (09/03)
RAS (2003)
^{60}Co (1997)

cps

30-00-06: 500 600 700 800 900 1000
30-04-08: 600 800 1000 1200 1400 1600
30-04-02: 500 600 700 800 900 1000
30-05-05: 600 800 1000 1200 1400 1600 1800 2000
30-05-10: 700 750 800 850 900 950 1000

pCi/g

10^{-1} 10^{0} 10^{1} 10^{2}

Volume Fraction %

0 5 10 15 20 (30-00-06)
0 5 10 15 (30-04-08, 30-04-02, 30-05-10)
0 5 10 15 (30-05-05)

^{40}K (pCi/g)

0 5 10 15 20 25

Data Acquired to Support Drilling of Exploration Borehole Near Tank T-106

50-06-04

50-06-18

50-09-01

50-08-08

Elevation (feet) NAVD88

675 665 655 645 635 625 615 605 595 585 575 565 555 545 535 525 515 505 495

Bottom of Tank Farm Excavation

Multiple casings and possible grout

Cement Grout

Hydrated Bentonite Seal

Note: The ground surface elevation (TOC) for borehole 50-06-18 was estimated from other nearby boreholes as 675.0 ft.

K-40
Cs-137
Co-60
Eu-154
Eu-152
Sn-126
Moisture (cps)

10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5}

pCi/g

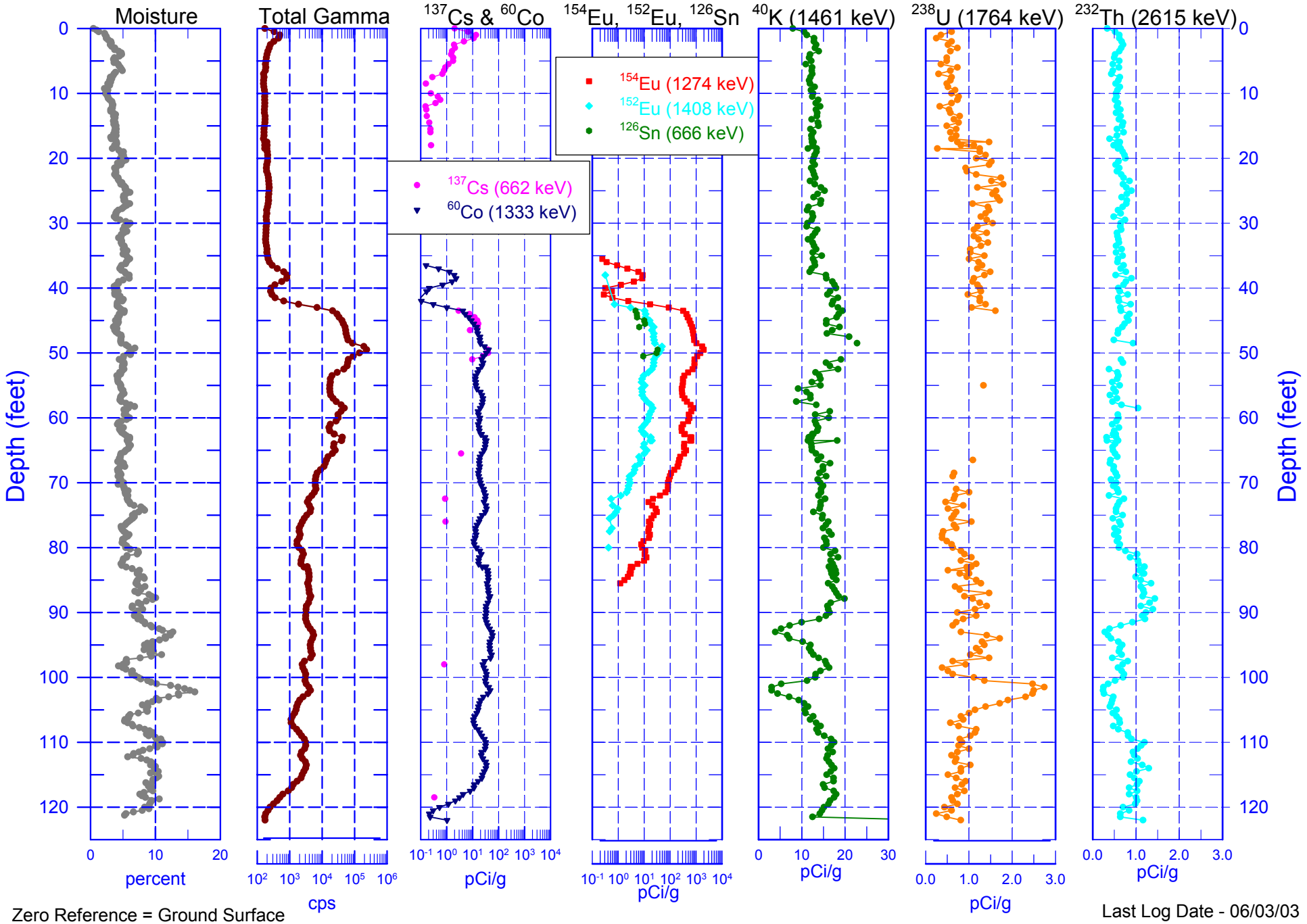
0 100 200 300 400 500

Moisture (cps)

0 5 10 15 20 25 30

^{40}K (pCi/g)

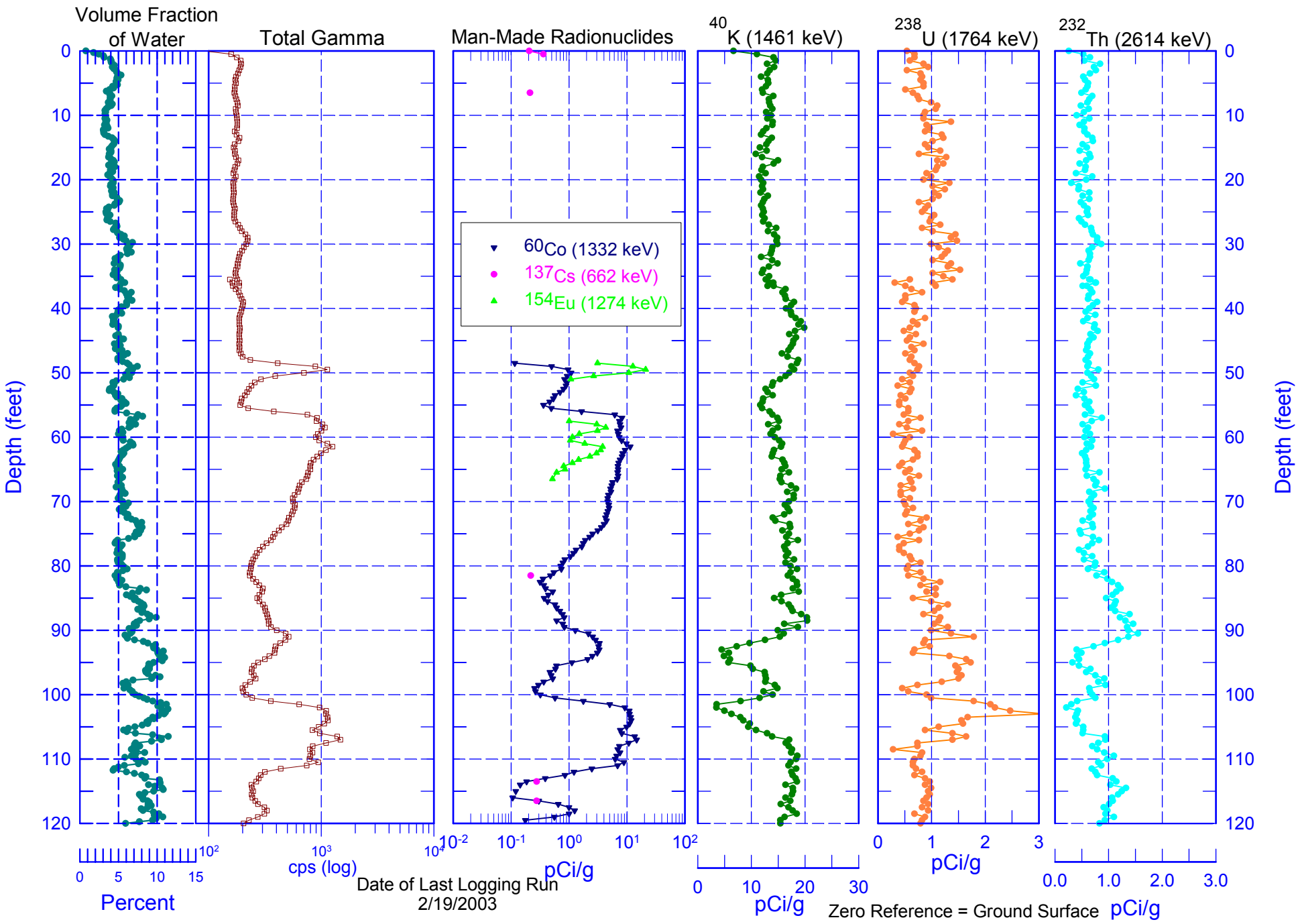
C4104 Spectral Gamma Ray and Moisture Log



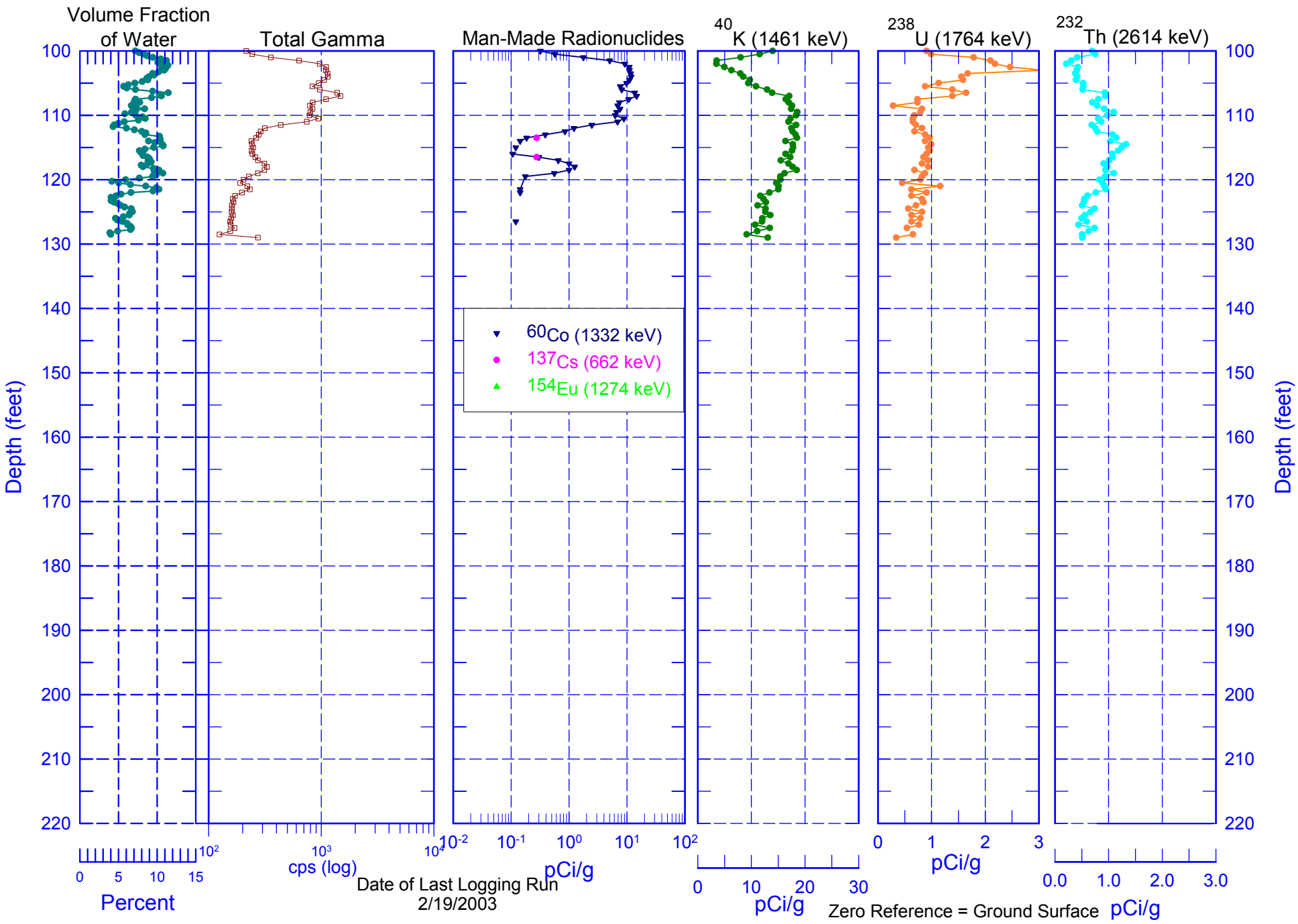
Zero Reference = Ground Surface

Last Log Date - 06/03/03

299-W10-XX (C4105) Spectral Gamma Ray and Moisture Log Survey



299-W10-XX (C4105) Spectral Gamma Ray and Moisture Log Survey



Appendix E
Boreholes Projected for Monitoring During the First Quarter of FY 2004

Appendix E. Boreholes Projected for Monitoring During the 1st Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	Ras Event G	Ras Event H	Comment
10-00-07	A-101	45	85	40	89	10/05/03		06/20/01	10/10/02							No apparent change
10-00-08	A-101	45	85	40	89	10/05/03		06/25/01	10/10/02							No apparent change
10-01-05	A-101	45	85	40	89	10/04/03		06/20/01	10/09/02							No apparent change
10-01-06	A-101	45	85	40	89	10/02/03		06/27/01	10/07/02							No apparent change
10-01-08	A-101	45	85	40	89	10/02/03		06/27/01	10/07/02							No apparent change
10-01-09	A-101	45	63	18	89	10/02/03		06/26/01	10/07/02							No apparent change
10-01-10	A-101	45	85	40	89	10/02/03		06/27/01	10/07/02							No apparent change
10-01-11	A-101	45	85	40	89	10/02/03		06/27/01	10/07/02							No apparent change
10-03-07	A-103	45	123	78	43	10/03/03		10/08/02								No apparent change
11-01-05	AX-101	45	85	40	66	10/04/03		10/09/02								No apparent change
11-01-09	AX-101	45	85	40	66	09/21/03		09/26/02								No apparent change
20-10-12	B-110	102	120	18	37	09/14/03	07/03/02	09/19/02								No apparent change
21-02-04	BX-102	0	230	0	94	06/22/03	06/27/02	09/04/01								No apparent change; HRLS 6/27/02
21-03-03	BX-103	35	90	55	55	09/17/03		08/28/01	02/25/02	09/04/02	03/21/03					No apparent change
21-04-08	BX-107	35	100	65	36	08/31/03		08/29/01	09/05/02							No apparent change
21-07-03	BX-107	35	100	65	36	08/31/03		08/29/01	09/05/02							No apparent change
21-07-06	BX-107	20	102	0	36	05/15/03	05/20/02	09/05/01								No apparent change
21-10-03	BX-110	0	100	0	42	05/16/03	05/21/02	08/30/01								No apparent change
21-10-05	BX-110	46.5	98	57	42	09/03/03		09/06/01	09/08/02							No apparent change; requires HRLS
22-00-02	BY-103	40	98	58	63	10/04/03		11/15/01	07/25/02	04/07/03						No apparent change
22-00-03	BY-103	50	146	96	50	11/20/03		11/19/01	11/25/02							No apparent change
22-03-04	BY-103	40	100	60	63	10/04/03		11/15/01	07/23/02	04/07/03						Possible change 77-82 ft not confirmed
22-03-05	BY-103	20	99	83	50	07/11/03	07/16/02	12/20/01								No apparent change
22-03-06	BY-103	40	99	59	38	11/10/03		11/16/01	11/15/02							No apparent change
22-03-07	BY-103	40	98	58	38	11/16/03		11/26/01	11/21/02							No apparent change
22-03-08	BY-103	40	99	59	38	11/16/03		11/19/01	11/21/02							No apparent change
22-03-09	BY-103	30	97	67	38	11/16/03		11/26/01	11/21/02							No apparent change
22-05-01	BY-105	40	98	58	62	11/16/03		11/14/01	11/21/02							No apparent change
22-05-09	BY-105	40	98	58	62	11/20/03		11/14/01	11/25/02							No apparent change
22-06-01	BY-106	40	80	40	51	11/22/03		11/27/01	11/27/02							No apparent change
22-06-05	BY-106	20	97	77	76	10/04/03		11/27/01	07/26/02	04/07/03						No apparent change
22-06-07	BY-106	35	131	96	64	11/22/03		11/28/01	11/27/02							No apparent change
22-07-01	BY-107	40	98	58	43	11/15/03		12/06/01	11/20/02							No apparent change
22-07-02	BY-107	30	100	70	68	09/30/03		11/29/01	07/29/02	04/03/03						Apparent change 98-100 ft not confirmed
22-07-05	BY-107	30	97	67	68	09/30/03		12/12/01	07/29/02	04/03/03						Apparent change 75-81 ft not confirmed
22-07-07	BY-107	40	99	59	68	09/30/03		12/12/01	08/20/02	04/03/03						No apparent change
22-07-09	BY-107	20	99	84	55	11/28/03		12/19/01	12/03/02							No apparent change
22-08-01	BY-108	25	99	74	61	11/15/03		12/14/01	11/20/02							No apparent change
22-08-02	BY-108	25	102	77	74	10/01/03		12/13/01	07/30/02	04/04/03						No apparent change
22-08-05	BY-108	35	98	63	74	10/01/03		12/17/01	07/30/02	11/20/02	04/04/03					Apparent change 75-82 ft not confirmed
22-08-06	BY-108	40	98	58	61	11/14/03		12/14/01	11/19/02							No apparent change
22-08-07	BY-108	40	110	70	49	11/15/03		12/17/01	11/20/02							No apparent change
22-08-12	BY-108	30	100	70	74	10/01/03		12/13/01	08/19/02	04/04/03						No apparent change
22-10-05	BY-110	40	98	58	41	11/14/03		12/11/01	11/19/02							No apparent change
22-10-07	BY-110	40	90	50	53	09/30/03		12/11/01	07/18/02	04/03/03						No apparent change
30-00-01	C-106	0	65	65	31	10/21/03		04/24/02	01/16/03	04/28/03	07/22/03	09/15/03				No apparent change, C-106 Retrieval
30-05-02	C-105	0	127	127	28	10/23/03		04/22/02	01/29/03	04/29/03	07/23/03	09/17/03				No apparent change, C-106 Retrieval
30-06-02	C-106	0	122	122	6	10/22/03		01/27/03	04/28/03	07/21/03	09/16/03					No apparent change, C-106 Retrieval
30-06-03	C-106	0	98	98	6	10/22/03		01/23/03	04/28/03	07/21/03	09/16/03					No apparent change, C-106 Retrieval

Appendix E. Boreholes Projected for Monitoring During the 1st Quarter of FY 2004

Borehole Number	Tank	Top	Bottom	Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	RAS Event E	RAS Event F	Ras Event G	Ras Event H	Comment
30-06-04	C-106	0	129	129	31	10/23/03		09/11/02	01/27/03	04/29/03	07/23/03	09/17/03				No apparent change, C-106 Retrieval
30-06-09	C-106	5	98	93	44	10/16/03		04/22/02	01/22/03	04/22/03	07/22/03	09/10/03				No apparent change, C-106 Retrieval
30-06-10	C-106	0	128	128	56	10/14/03		04/23/02	01/23/03	04/22/03	07/22/03	09/08/03				Pos. change 124'-126' Co-60, 5' Cs-137, C-106 Retr.
30-06-12	C-106	0	98	98	44	10/17/03		04/24/02	01/24/03	04/29/03	07/22/03	09/11/03				No apparent change, C-106 Retrieval
40-09-06	S-109	0	98	98	2	10/02/03		06/05/02	03/11/03	08/27/03						No apparent change; S-112 Retrieval
40-11-08	S-111	40	80	40	39	05/08/07		06/03/02								No apparent change, S-112 Retrieval
40-11-09	S-111	40	80	40	39	06/12/04		06/05/02	06/18/03							No apparent change, S-112 Retrieval
40-12-02	S-112	0	99	99	12	10/02/03		06/05/02	03/12/03	08/27/03						No apparent change; S-112 Retrieval
40-12-04	S-112	0	126	126	12	09/27/03		06/04/02	03/10/03	08/22/03						No apparent change; S-112 Retrieval
40-12-06	S-112	0	144	144	12	09/26/03		06/04/02	03/10/03	08/21/03						No apparent change; S-112 Retrieval
40-12-07	S-112	0	98	98	12	10/01/03		06/04/02	03/11/03	08/26/03						No apparent change; S-112 Retrieval
40-12-09	S-112	0	99	99	12	10/02/03		06/05/02	03/11/03	08/27/03						No apparent change; S-112 Retrieval
41-11-10	SX-111	40	95	69	54	08/23/03	04/18/02	09/25/01	04/09/02	02/24/03						No apparent change; HRLS 04/18/02
50-00-09	T-106	30	120	90	142	11/17/03		07/18/01	01/09/02	08/28/02	05/21/03					No apparent change
50-00-10	T-106	30	70	40	92	08/24/03		07/18/01	08/29/02							No apparent change
50-01-04	T-101	20	123	103	36	07/19/03	07/24/02	08/07/01								No apparent change; requires HRLS
50-01-06	T-101	30	87	57	48	08/23/03		07/30/01	08/28/02							No apparent change
50-01-09	T-101	30	90	60	61	11/11/03		07/30/01	11/08/01	01/22/02	08/28/02	05/15/03				Apparent change at 86-90 ft not confirmed
50-01-12	T-101	30	70	40	36	08/23/03		07/30/01	08/28/02							No apparent change
50-02-05	T-102	30	83	53	55	11/15/03		07/25/01	01/22/02	08/28/02	05/19/03					Apparent Cs-137 increase (39-41ft)
50-04-08	T-104	30	95	65	55	11/11/03		07/31/01	01/24/02	08/28/02	05/15/03					No apparent change
50-04-10	T-104	30	87	57	55	11/11/03		07/31/01	01/22/02	08/29/02	12/16/02	05/15/03				Apparent change 67-68 ft
50-05-11	T-105	30	120	90	39	08/23/03		07/25/01	08/28/02							No apparent change
50-06-02	T-106	30	122	92	142	12/14/03		07/19/01	11/07/01	01/15/02	08/29/02	06/17/03				Apparent change at 110 ft not confirmed
50-06-03	T-106	30	118	88	142	12/14/03		07/18/01	11/12/01	01/15/02	08/28/02	06/17/03				Apparent change at 115 ft not confirmed
50-06-04	T-106	55	93	68	117	07/24/03	07/29/02	07/23/01								No apparent change
50-06-05	T-106	30	116	86	130	07/21/03	07/26/02	08/06/01								No apparent change; requires HRLS
50-06-06	T-106	65	120	95	130	07/24/03	07/29/02	07/24/01								No apparent change
50-06-08	T-106	46	120	109	130	07/24/03	07/29/02	07/25/01								No apparent change
50-06-11	T-106	30	83	53	117	08/22/03		07/19/01	08/27/02							No apparent change
50-06-16	T-106	30	86	61	130	08/29/03		07/24/01	09/03/02							No apparent change
50-06-17	T-106	30	87	57	117	07/25/03	07/30/02	08/07/01								No apparent change; requires HRLS
50-06-18	T-106	25	130	110	142	12/15/03		08/01/01	01/29/02	09/03/02	12/31/02	06/18/03				Pos. Incr. 117-119 ft (Co-60), ongoing 6/18/03
50-09-01	T-109	30	86	56	54	12/13/03		07/23/01	11/08/01	01/28/02	08/27/02	06/16/03				Apparent change at 85 ft result of water level
50-09-02	T-109	30	86	56	54	12/13/03		01/08/02	08/27/02	06/16/03						Apparent change 81-86 ft caused by dif. water levels
50-09-10	T-109	30	119	89	54	11/16/03		07/23/01	11/07/01	01/16/02	08/28/02	05/20/03				Apparent change at 76 and 94 ft not confirmed
51-03-09	TX-103	40	97	57	55	07/13/03		05/13/02	01/14/03							No apparent change
51-04-05	TX-104	40	97	57	54	07/13/03		05/16/02	01/14/03							No apparent change
51-05-05	TX-105	40	98	58	64	07/12/03		05/17/02	01/13/03							No apparent change
51-05-07	TX-105	40	106	66	64	07/13/03		05/17/02	01/14/03							No apparent change
51-16-04	TX-116	35	80	45	38	09/07/03		09/12/02								No apparent change
52-03-06	TY-103	40	100	60	56	11/18/03		05/02/02	05/21/02	08/22/02	12/04/02	05/22/03				Definite change 55-60 ft; report issued 5/14/02
52-05-07	TY-105	40	96	56	82	11/24/03		05/02/02	12/04/02	05/28/03						No apparent change
52-06-05	TY-106	40	147	107	66	11/23/03		05/08/02	12/04/02	05/27/03						Pos. change 130-148 ft, ongoing 12/04/03, 5/27/03
60-11-07	U-111	35	123	88	37	11/07/03		10/25/01	11/12/02							No apparent change
60-11-12	U-111	35	124	89	37	11/07/03		11/05/01	11/12/02							No apparent change