KAISER ALUMINUM
CORPORATE ENVIRONMENTAL

August 16, 2001
Project No. 5427I-01

40-2377

Mr. John T. Buckley
Project Manager
U.S. Nuclear Regulatory Commission
Decommissioning Branch, Division of Waste Management
Office of Nuclear Material Safety and Safeguards
TWFN, 7F27
Washington, DC 20555

Response to Comments
Administrative Review
Final Status Survey Report
Adjacent Land Area
Kaiser Aluminum & Chemical Corporation
Tulsa, Oklahoma

Dear Mr. Buckley:

Kaiser Aluminum & Chemical Corporation (Kaiser) has prepared this letter in response to the U.S. Nuclear Regulatory Commission (NRC) letter dated July 17, 2001 relative to the June 29, 2001 Final Status Survey Report (FSSR) for the Adjacent Land Remediation project in Tulsa, Oklahoma. It is our understanding that NRC has completed an administrative review of the FSSR. This letter has been formatted to present both NRC's comments followed immediately by Kaiser's response. Typically, the response provides a stand-alone answer. When this is not appropriate, proper reference is made to FSSR text, tables, and drawings as well as current NRC regulatory guidelines, etc., to facilitate your review of the response. Along with this response, Kaiser is submitting revisions and supplemental information to the FSSR. Where changes were made, the margin is marked to facilitate review. Instructions for the insertion of the revisions and supplemental information into the FSSR are provided below in the individual responses.

NRC Comment No. 1: Areas designated as "affected" and "unaffected" are not consistent with NRC memorandum dated January 29, 2001.

Response: *Figures 3-2 and 4-32 have been revised to include land areas that immediately surround or are located adjacent to locations of known radiological contamination as designated "affected" areas. In addition, Section 4.3.32.1 of the FSSR narrative has been revised to account for the reclassification of these "adjacent" land areas. Three copies of the revised Figures 3-2 and 4-32 and narrative Page 35 are enclosed. Please remove the original Figures 3-2 and 4-32 and Page 35 from the report narrative and substitute with the revisions provided.*

NRC Comment No. 2: The FSSR does not include surface scan survey results for all grid blocks as required by NUREG/CR-5849, Appendix D (see Table E.9).

NMSS01 Public

9141 INTERLINE AVENUE, SUITE 1A, BATON ROUGE, LA 70809-1957

Response: *Kaiser has prepared an additional data summary table (Table 4-C) and revised Section 4.3 of the report narrative (Page 18) to provide the requested surface scan information. Three copies of Table 4-C and revised Page 18 of the report narrative are enclosed with this letter. Please insert the new table in the report following Table 4-B. Also, please remove the original narrative Page 18 and replace it with the revised page provided.*

NRC Comment No. 3: The FSSR does not include a residual activity inventory estimate as required by NUREG/CR-5849, Appendix D (see Section 4.5).

Response: *Kaiser has revised the FSSR narrative to include a residual activity inventory for the site. Narrative Section 4.5 has been added to the report to provide the requested information. Three copies of revised narrative Pages 36 and 37 and new Page 38 are enclosed with this letter. Please remove original narrative Pages 36 and 37 from the report and replace with the revised pages provided including new Page 38.*

NRC Comment No. 4: The FSSR presents instrument calibration responses for instruments not used in the final status survey, and excludes calibration responses for instruments that were used in the final status survey.

Response: *Appendix C of the July 2001 FSSR contained calibration certificates and logs of daily quality control (QC) checks for the health physics instrumentation used during the final status survey for the adjacent land area remediation project. As a result of the above NRC comment, Kaiser completed a thorough review of Appendix C for completeness and accuracy. Kaiser's review of Appendix C reconfirmed the following key points:*

- *The appendix did contain appropriate calibration certificates and daily QC check logs for health physics instrumentation used during the final status survey.*
- *The appendix did not contain any calibration certificates or daily QC check logs for health physics instrumentation that was not used during the final status survey*

However, Kaiser's review of Appendix C did reveal that some copies were not collated correctly. As a result, Kaiser has reformatted Appendix C to present calibration certificates and daily QC logs by instrument in separate sub-appendices (Appendices C-1 through C-5). Kaiser has also added Table C-1 to the front of Appendix C. This table provides a summary of the health physics instruments used during the final status survey as well as the indicated instrument usage, calibration periods, and in-service periods. Please completely remove Appendix C from your current copies of the FSSR and replace it with the one enclosed.

Kaiser also reviewed the remaining sections of the FSSR relative to the mention of health physics instrumentation used during the final status survey. The result of the review reconfirmed that all instrumentation referenced in the FSSR was used during the final status survey and the corresponding QC information for such instrumentation was provided in Appendix C.

However, instrumentation utilized during the Cross Calibration Study conducted on May 11, 1999 is referenced in narrative Section 3.3 and presented in Appendix A of the FSSR. This instrumentation did not generate data that were used in the final status survey.

NRC Comment No. 5: The FSSR does not address issues regarding sample processing and data reporting as previously identified in the NRC letter dated May 18, 2001, and the NRC inspection report dated April 18, 2001 (e.g., sample blending, sample drying, and reporting concentrations as pCi/g dry, as required by Section 7.3 of NUREG/CR-5849).

Response: *In the NRC letter dated May 18, 2001, the NRC compared the results of split samples analyzed by the Kaiser contracted laboratory and the NRC contracted laboratory. A difference in the results of the split samples was identified. The difference may result in part from the difference in sample preparation between the two sets of samples; Kaiser's split soil samples were analyzed "as received" from the field, whereas the NRC's soil samples were dried and ground prior to analysis.*

Consistent with the Adjacent Land Remediation Plan (July 1999) and the Final Status Survey Plan (October 2, 2000), Kaiser did not dry and grind soil samples before gamma spectroscopy analysis. NUREG/CR-5849 (1992), Section 7.3, provides guidance for sample preparation and begins: "Various degrees of sample preparation may be necessary prior to direct measurement..." The guidance provided for soil and sediment samples includes drying and grinding of samples prior to gamma spectroscopy. More recent NRC guidance does not require special sample preparation before gamma spectroscopy and provides that a correction for the moisture content of the soil samples is the equivalent of drying soil samples prior to gamma spectroscopy analysis.

The derived acceptance criteria for net Th-232 activity concentration is 2.2 pCi/g. The average net Th-232 activity concentration calculated for each 100-square-meter grid ranges from 0.00 to 1.47 pCi/g, with an average value of 0.19 pCi/g. In terms of percent of the acceptance criteria, the grids range from 0 to 67 percent, with an average of 9 percent. Therefore, if an adjustment was made based on the assumed average soil sample moisture content, the conclusion of the final status survey would remain the same. The net Th-232 activity concentration is well below the acceptance criteria and the area is suitable for unrestricted release. This information is included in revised Section 5.0 of the FSSR.

In support of the revised summary (Section 5.0), Tables 4-1 through 4-32 were revised to include the calculation of average net Th-232 activity concentration per survey grid. In addition, Table 4-33 was created to summarize the grid average data. Finally, Appendix B has been revised to include Tables B-5, B-6, and B-7 to further document the quality control of analytical analyses.

Comment No. 6: The FSSR does not include the dates that the final status surveys were conducted. Therefore, it is not possible to determine if the surveys were performed within the instrument calibration periods (as shown in Appendix C).

Response: *As mentioned in Kaiser's response to NRC Comment No. 4, Appendix C has been revised to include an health physics instrumentation summary table. This table provides a summary of the health physics instruments used during the final status survey as well as indicated instrument usage, calibration periods, and in-service periods. Portable instruments were calibrated by approved health physics services organizations using appropriate National Institute of Standards and Technology traceable sources based on the radiation range of the Th radionuclides of concern, where appropriate. Appropriate quality assurance (QA)/QC principles were applied to field instrumentation usage as defined in Section 2.4 of the Final Status Survey Plan (October 2000). QA/QC principles typically included daily ambient background determinations, daily instrument response checks, maintained instrument calibrations, and additional instrumentation checks (voltage, efficiency, etc.).*

Field activities for the adjacent land area remediation project began on October 2, 2000 and were completed on April 13, 2001. Field survey instrumentation used during this period was maintained in calibration and checked daily during usage. Documentation supporting the QA of field instruments used during the final status survey (calibration certificates and daily QA check logs) is provided in Appendix C.

Kaiser trusts this submittal addresses the NRC's administrative review comments for the FSSR and respectfully requests NRC to proceed with the technical review of the subject document. If you should have any questions concerning this response, please contact me.

Respectfully submitted,

Bill Vinzant

J. W. (Bill) Vinzant
Manager, Corporate Environmental Affairs

JWV:bd

Enclosures

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4.2.2 Spillway (Table 4B and Figure 4-11)

4.2.2.1 Scans

Scans of the spillway surface indicated surface activity levels approaching background.

4.2.2.2 Surface Activity Measurements

Table 4-B lists results of the fixed count time surface activity measurements taken one per 1-meter-by-1-meter grid. A total of 10 fixed-point measurements (Figure 4-11) were taken in the spillway area and all were less than the acceptance criteria.

4.2.2.3 Removable Activity Measurements

Table 4-B lists results of the removable activity measurements taken one per 1-meter-by-1-meter grid. A total of 10 smears (Figure 4-11) were taken in the spillway area and all were less than the acceptance criteria.

4.2.2.4 Exposure Rates

Exposure rate measurements were taken 1 meter above the spillway surface. Due to the proximity of the retention pond area and the excavations, none of the measurement locations satisfied the acceptance criteria. The spillway area will be addressed during subsequent decommissioning of the site.

4.3 Ground Surveys

A 100 percent gross gamma scan of all affected areas (including the bottom and side walls of all excavations) was performed to identify areas of elevated residual activity. The summarized results of the gross gamma surveys are presented in Table 4-C. Background readings were taken prior to scanning the excavation. Background readings were taken in an area known to be unaffected but near the excavation.

4.3.1 Survey Unit 1 (Table 4-1 and Figure 4-1)

4.3.1.1 Scans

A 100-percent scan of the excavation bottom and sidewalls did not identify any areas of elevated contact gamma radiation, suggesting that no residual soil contamination remained. Scans of adjacent areas, not previously identified as affected areas, revealed several areas of elevated contact gamma radiation. These areas subsequently were remediated, resurveyed, and found to be absent of elevated reading. The areas in question were located in Grids 52-55 and 59 (Figure 4-1).

4.3.1.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-1. Net exposure rates averaged 1 μR/hr with a standard deviation of 2 μR/hr.

4.3.1.3 Thorium Concentrations in Soil

Table 4-1 contains analytical results of surface and core samples. Thirty-six samples were taken and all concentrations were less than the acceptance criteria (Figure 4-1). The average net concentration of Th-232 for Survey Unit 1 was 0.108 ρCi/g with a standard deviation of 0.214 ρCi/g.

4.3.2 Survey Unit 2A (Table 4-2 and Figure 4-2)

4.3.2.1 Scans

A 100-percent scan of the excavation bottom and sidewalls did not identify any areas of elevated contact gamma radiation, suggesting that no residual soil contamination remained. However, scans of adjacent areas, not previously identified as affected areas, revealed areas of elevated contact gamma radiation, suggesting soil contamination. The identified area was not contiguous, due to layers of asphalt and gravel, and, therefore, a separate subunit, 2B, was created to address the condition.

4.3.2.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-2. Net exposure rates were an average of 1 μR/hr with a standard deviation of 0 μR/hr.

4.3.2.3 Thorium Concentrations in Soil

Table 4-2 lists results of surface and core samples taken. Six samples were taken in the survey unit and all were less than the acceptance criteria (Figure 4-2). The average net concentration of Th-232 for Survey Unit 2A was 0.00 ρCi/g with a standard deviation of 0.00 ρCi/g.

4.3.27.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-27. Net exposure rates averaged 1 μR/hr with a standard deviation of 2 μR/hr. Radiation being emitted by throated material on Kaiser property did not permit accurate exposure rate readings through the survey unit. Therefore, analytical results were used to determine if remediation activities were successful.

4.3.27.3 Thorium Concentrations in Soil

Table 4-27 lists analytical results for surface samples. One-hundred-eight samples were taken in the survey unit and all but one were less than the acceptance criteria (Figure 4-27). The average net concentration of Th-232 for Survey Unit 7A was 0.268 ρCi/g with a standard deviation of 0.524 ρCi/g. For the sample that was over, a weighted average calculation was performed to ensure that the unit passed.

4.3.28 Survey Unit 7B (Table 4-28 and Figure 4-28)

4.3.28.1 Scans

A 100-percent scan of the excavation bottom and sidewalls did not identify any areas of elevated contact gamma radiation, suggesting that no residual soil contamination remained. Scans of adjacent areas, not previously identified as affected areas, identified several areas of elevated contact gamma radiation, suggesting residual soil contamination. These areas, located in Grid 87 and parts of Grids 87, 129, 130, and 132, subsequently were remediated and resurveyed.

4.3.28.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-28. Net exposure rates averaged 1 μR/hr with a standard deviation of 0 μR/hr.

4.3.28.3 Thorium Concentrations in Soil

Table 4-28 lists analytical results for surface samples taken. Thirty-eight samples were taken in the survey unit and all were less than the acceptance criteria (Figure 4-28). The average net concentration of Th-232 for Survey Unit 7B was 0.098 ρCi/g with a standard deviation of 0.267 ρCi/g.

4.3.31 Survey Unit 7E (Table 4-31 and Figure 4-31)

4.3.31.1 Scans

A 100-percent scan of the excavation bottom and sidewalls did not identify any areas of elevated contact gamma radiation, suggesting that no residual soil contamination remained. Scans of adjacent areas, not previously identified as affected areas, did not identify any areas of elevated contact gamma radiation, suggesting no residual soil contamination.

4.3.31.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-31. Net exposure rates averaged 1 μR/hr with a standard deviation of 1 μR/hr.

4.3.31.3 Thorium Concentrations in Soil

Table 4-31 lists analytical results for surface and core samples. Six samples were taken in the survey unit and all were less than the acceptance criteria (Figure 4-31). The average net concentration of Th-232 for Survey Unit 7E was 0.476 ρCi/g with a standard deviation of 0.747 ρCi/g.

4.3.32 Unaffected Areas (Table 4-32)

4.3.32.1 Scans

Scans of core samples were performed in accordance with Ref. 9, ESC/HPM 3-6 Gross Gamma Surveys of Soil Cores. Analytical results led to the reclassification of 77 areas. The areas that were reclassified are depicted in Figure 4-32

4.3.32.2 Exposure Rates

Net exposure rate measurements are presented in Table 4-32. Net exposure rates averaged 1 μR/hr with a standard deviation of 2 μR/hr.

4.3.32.3 Thorium Concentrations in Soil

Table 4-32 lists analytical results for core samples. A total of 311 samples were taken in the areas and all were less than the acceptance criteria. (Figure 4-32). The average net concentration of Th-232 for the unaffected areas was 0.167 ρCi/g with a standard deviation of 0.397 ρCi/g.

4.4 Data Evaluation

Tables 4-A through 4-32 present the average levels in the different survey units for building structures and ground surveys. Comparisons of the average with guidelines indicated the guidelines were satisfied for all survey units at the 95 percent confidence level conditions.

4.5 Residual Activity Inventory

Calculations indicate that the total residual activity above the average background in soil for affected areas of the site is approximately 3.27×10^{10} pCi (Table 4-33).

5.0 Summary

All the survey units meet the acceptance criteria for unrestricted release. The average net Th-232 activity concentration calculated for each 100-square-meter grid ranges from 0.00 to 1.47 pCi/g, with an average value of 0.19 pCi/g. (Table 4-33). The average is less than 10 percent of the net Th-232 activity concentration acceptance criteria for unrestricted release.

Consistent with the Adjacent Land Remediation Plan (July 1999) and the Final Status Survey Plan (October 2, 2000), Kaiser did not dry and grind soil samples before gamma spectroscopy analysis. NUREG/CR-5849 (1992), Section 7.3, provides guidance for sample preparation and begins: "Various degrees of sample preparation may be necessary prior to direct measurement..." The guidance provided for soil and sediment samples includes drying and grinding of samples prior to gamma spectroscopy. More recent NRC guidance does not require special sample preparation before gamma spectroscopy and provides that a correction for the moisture content of the soil samples is the equivalent of drying soil samples prior to gamma spectroscopy analysis.

The derived acceptance criteria for net Th-232 activity concentration is 2.2 pCi/g. In terms of percent of the acceptance criteria, the grids range from 0 to 67 percent, with an average of 9 percent. Therefore, if an adjustment were made based on the assumed average soil sample moisture content, the conclusion of the final status survey would remain the same. The net Th-232 activity concentration is well below the acceptance criteria and the area is suitable for unrestricted release.

6.0 References

1. NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination (June 1992).

2. B. Koh & Associates, Inc., May 1998, Characterization Survey, Kaiser Aluminum and Chemical Corporation, Tulsa, Oklahoma, Rev 0.

3. B. Koh & Associates, Inc, November 1999, Supplementary Radiological Characterization Survey, Kaiser Aluminum & Chemical Corporation, Tulsa, Oklahoma, Revision 1.

4. Scott, L. Max, Ph.D., CHP, March 1999, Adjacent Land Characterization, Kaiser Aluminum Specialty Products, Appendix A, Estimate of Volume of Off-Site Contaminated Soil, Adjacent Land Characterization Report, ADA Consultants, Inc., Baton Rouge, LA.

5. Scott, L. Max, Ph.D., CHP, Addendum to Adjacent Land Characterization, ADA Consultants, Inc. Baton Rouge, LA.

6. NRC, October 23, 1981, 46 FR 52061, Branch Technical Position, Disposal or Onsite Storage of Thorium and Uranium Waste from Past Operations.

7. Kaiser, July 1999, Adjacent Land Remediation Plan for Kaiser Aluminum & Chemical Corporation, Tulsa, Oklahoma, Tulsa, OK.

8. NUREG/CR-1575, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Rev. 1 (August 2000).

9. Kaiser Tulsa, Oklahoma Site Health Physics Manual.

10. NRC Memorandum, January 29, 2001, Meeting Report for the January 16 – 17, 2001, Meeting with Kaiser.

11. Earth Sciences, October 2000, Final Status Survey Plan, Adjacent land Area, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

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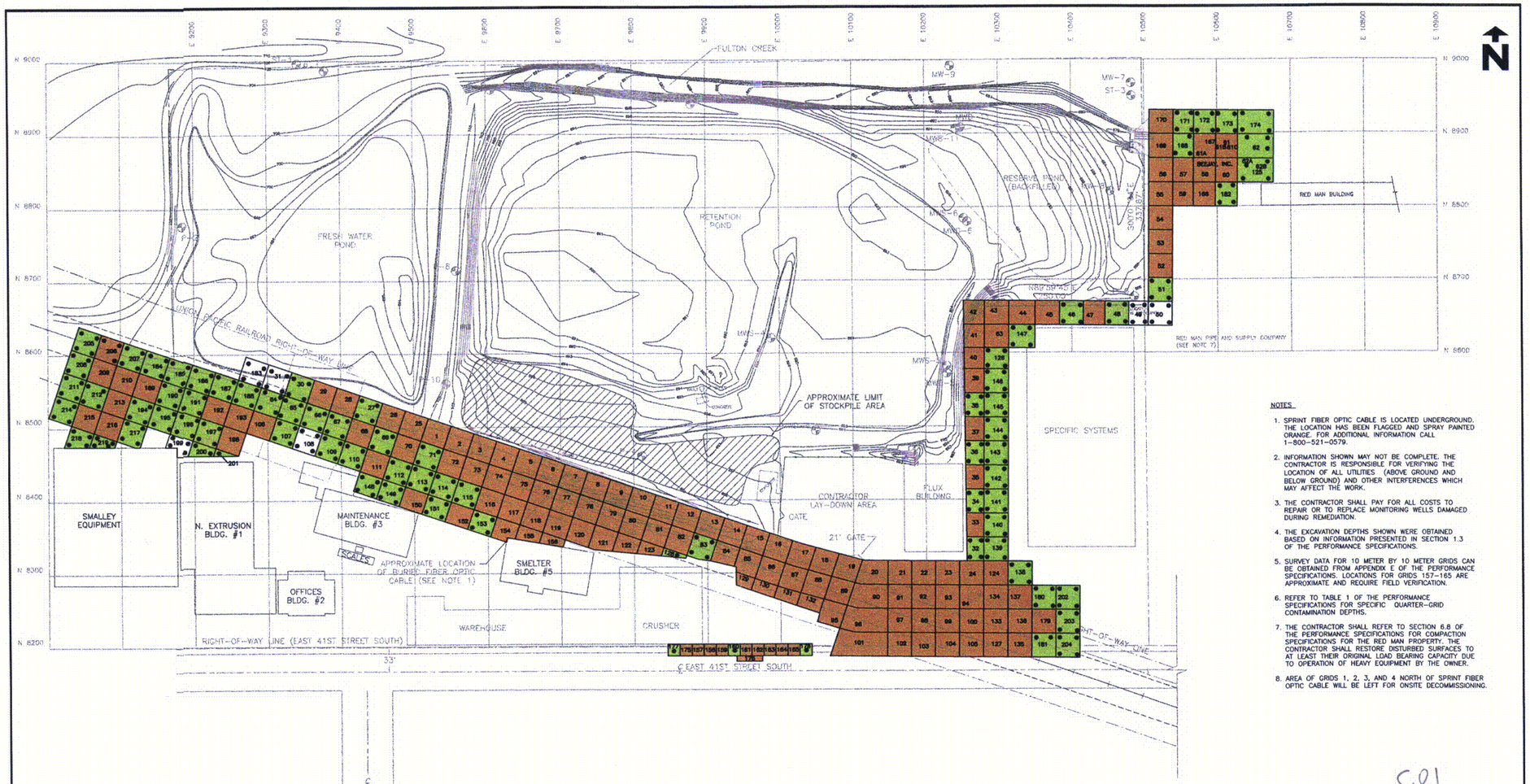


NOTES

1. SPRINT FIBER OPTIC CABLE IS LOCATED UNDERGROUND. THE LOCATION HAS BEEN FLAGGED AND SPRAY PAINTED ORANGE. FOR ADDITIONAL INFORMATION CALL 1-800-521-0579.
2. INFORMATION SHOWN MAY NOT BE COMPLETE. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES (ABOVE GROUND AND BELOW GROUND) AND OTHER INTERFERENCES WHICH MAY AFFECT THE WORK.
3. THE CONTRACTOR SHALL PAY FOR ALL COSTS TO REPAIR OR TO REPLACE MONITORING WELLS DAMAGED DURING REMEDIATION.
4. THE EXCAVATION DEPTHS SHOWN WERE OBTAINED BASED ON INFORMATION PRESENTED IN SECTION 1.3 OF THE PERFORMANCE SPECIFICATIONS.
5. SURVEY DATA FOR 10 METER BY 10 METER GRIDS CAN BE OBTAINED FROM APPENDIX E OF THE PERFORMANCE SPECIFICATIONS. LOCATIONS FOR GRIDS 157-165 ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.
6. REFER TO TABLE 1 OF THE PERFORMANCE SPECIFICATIONS FOR SPECIFIC QUARTER-GRID CONTAMINATION DEPTHS.
7. THE CONTRACTOR SHALL REFER TO SECTION 6.8 OF THE PERFORMANCE SPECIFICATIONS FOR COMPACTION SPECIFICATIONS FOR THE RED MAN PROPERTY. THE CONTRACTOR SHALL RESTORE DISTURBED SURFACES TO AT LEAST THEIR ORIGINAL LOAD BEARING CAPACITY DUE TO OPERATION OF HEAVY EQUIPMENT BY THE OWNER.
8. AREA OF GRIDS 1, 2, 3, AND 4 NORTH OF SPRINT FIBER OPTIC CABLE WILL BE LEFT FOR ONSITE DECOMMISSIONING.

C01

LEGEND

- RCP REINFORCED CONCRETE PIPE
- OVERHEAD UTILITIES
- POWER POLE
- MONITORING WELL
- FENCE LINE
- PROPERTY LINE
- RIGHT-OF-WAY
- 25' OFFSET OF RAILROAD CENTER LINE
- SURVEY UNIT BOUNDARY
- SAMPLE LOCATION
- 10 METER BY 10 METER GRID (SEE NOTE 5)
- AREAS RECLASSIFIED AS UNAFFECTED BASED ON SURVEY AND ANALYTICAL RESULTS
- AFFECTED AREA
- UNAFFECTED AREA
- APPROXIMATE LIMIT OF STOCKPILE AREA

REFERENCES

1. THE RIGHT-OF-WAY AND PROPERTY LINES WERE OBTAINED FROM PLAT OF SURVEY PREPARED BY DENTON & WHITE SURVEYING COMPANY SEALED ON FEBRUARY 14, 1984.
2. TOPOGRAPHIC INFORMATION WAS OBTAINED FROM TOPOGRAPHIC SURVEY OF PART OF THE SE/4 OF SECTION 25 TOWNSHIP 19 NORTH RANGE 13 EAST, OF THE I.& M. B.&M. TULSA COUNTY, STATE OF OKLAHOMA, ACCORDING TO THE U.S. GOVERNMENT SURVEY THEREOF, AND KNOWN AS 7311 EAST 41st STREET SOUTH. (FILE: HPSK003.DWG REV. A)

SCALE - FEET
0 60 120 180

REVISION	DATE	DESCRIPTION
1	8/1/01	ADDED AREAS CLASSIFIED AS AFFECTED DUE TO THEIR PROXIMITY TO AFFECTED AREAS

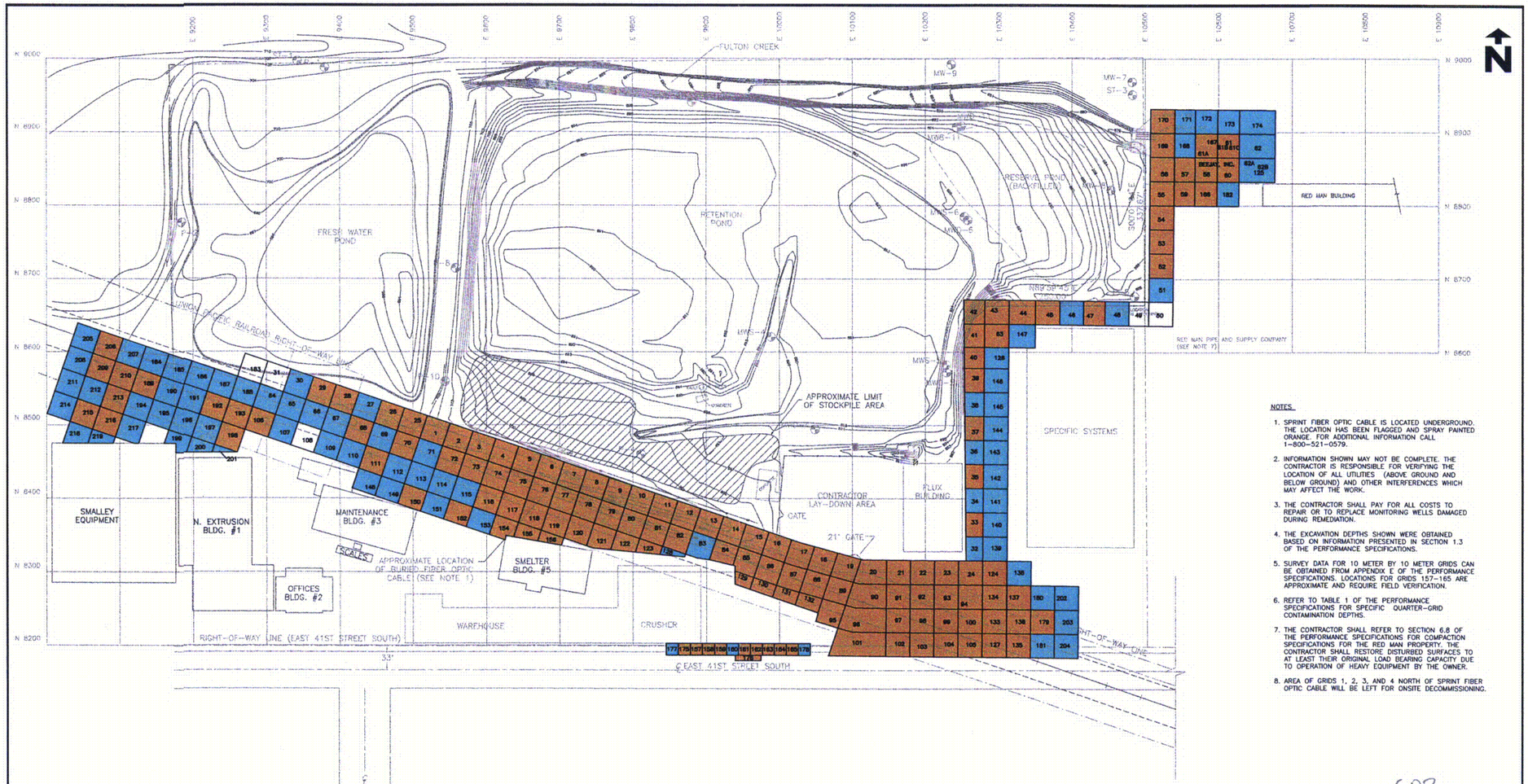
FIGURE 4-32
UNAFFECTED AREA SAMPLE LOCATIONS

ADJACENT LAND AREA REMEDIATION
KAISER ALUMINUM
TULSA, OKLAHOMA

PREPARED FOR
KAISER ALUMINUM & CHEMICAL CORPORATION
BATON ROUGE, LOUISIANA

APPROVED
CHECKED
DRAWN DEB 8/1/01
DRAWING NUMBER
5427A433

Earth Sciences Consultants, Inc.



NOTES

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2. INFORMATION SHOWN MAY NOT BE COMPLETE. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES (ABOVE GROUND AND BELOW GROUND) AND OTHER INTERFERENCES WHICH MAY AFFECT THE WORK.
3. THE CONTRACTOR SHALL PAY FOR ALL COSTS TO REPAIR OR TO REPLACE MONITORING WELLS DAMAGED DURING REMEDIATION.
4. THE EXCAVATION DEPTHS SHOWN WERE OBTAINED BASED ON INFORMATION PRESENTED IN SECTION 1.3 OF THE PERFORMANCE SPECIFICATIONS.
5. SURVEY DATA FOR 10 METER BY 10 METER GRIDS CAN BE OBTAINED FROM APPENDIX E OF THE PERFORMANCE SPECIFICATIONS. LOCATIONS FOR GRIDS 157-165 ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.
6. REFER TO TABLE 1 OF THE PERFORMANCE SPECIFICATIONS FOR SPECIFIC QUARTER-GRID CONTAMINATION DEPTHS.
7. THE CONTRACTOR SHALL REFER TO SECTION 6.8 OF THE PERFORMANCE SPECIFICATIONS FOR COMPACTION SPECIFICATIONS FOR THE RED MAN PROPERTY. THE CONTRACTOR SHALL RESTORE DISTURBED SURFACES TO AT LEAST THEIR ORIGINAL LOAD BEARING CAPACITY DUE TO OPERATION OF HEAVY EQUIPMENT BY THE OWNER.
8. AREA OF GRIDS 1, 2, 3, AND 4 NORTH OF SPRINT FIBER OPTIC CABLE WILL BE LEFT FOR ONSITE DECOMMISSIONING.

C02

LEGEND

RCP REINFORCED CONCRETE PIPE
OVERHEAD UTILITIES
POWER POLE
MONITORING WELL
FENCE LINE
PROPERTY LINE
RIGHT-OF-WAY
25' OFFSET OF RAILROAD CENTER LINE
SURVEY UNIT BOUNDARY

10 METER BY 10 METER GRID (SEE NOTE 5)
AREAS CLASSIFIED AS AFFECTED DUE TO THEIR PROXIMITY TO AFFECTED AREAS
AFFECTED AREA
UNAFFECTED AREA
APPROXIMATE LIMIT OF STOCKPILE AREA

SCALE - FEET
0 60 120 180

REFERENCES

1. THE RIGHT-OF-WAY AND PROPERTY LINES WERE OBTAINED FROM PLAT OF SURVEY PREPARED BY DENTON & WHITE SURVEYING COMPANY SEALED ON FEBRUARY 14, 1964.
2. TOPOGRAPHIC INFORMATION WAS OBTAINED FROM TOPOGRAPHIC SURVEY OF PART OF THE SE/4 OF SECTION 23 TOWNSHIP 19 NORTH RANGE 13 EAST, OF THE I.B. & M. TULSA COUNTY, STATE OF OKLAHOMA, ACCORDING TO THE U.S. GOVERNMENT SURVEY THEREOF, AND KNOWN AS 7311 EAST 41st STREET SOUTH. (FILE: MFSH003.DWG REV. A)

REVISION	DATE	DESCRIPTION
1	8/1/01	ADDED AREAS CLASSIFIED AS AFFECTED DUE TO THEIR PROXIMITY TO AFFECTED AREAS

FIGURE 3-2
AFFECTED AND UNAFFECTED AREAS

ADJACENT LAND AREA REMEDIATION
KAISER ALUMINUM
TULSA, OKLAHOMA

PREPARED FOR
KAISER ALUMINUM & CHEMICAL CORPORATION
BATON ROUGE, LOUISIANA

APPROVED
CHECKED
DRAWN DEB 8/1/01
DRAWING NUMBER
5427A432

Earth Sciences Consultants, Inc.

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
1	52-C	4567	3302	4812	Background for unit at 3700. Quadrants B and D have no scan data due to asphalt / gravel.
1	52-A	4300	3219	4450	
1	53-C	4216	4015	4610	Quadrants B and D have no scan data due to asphalt and gravel.
1	53-A	4602	4108	4705	
1	54-C	4122	3879	4312	Quadrants B and D have no scan data due to asphalt and gravel.
1	54-A	3968	3679	4005	
1	55-C	3415	3301	3624	Quadrant D has no scan data due to asphalt and gravel.
1	55-A	3782	3578	3945	
1	55-B	3890	3688	3998	
1	57-A	3102	2998	3451	
1	57-B	3458	3301	3687	
1	57-C	3402	3215	3677	
1	57-D	3806	3710	3949	
1	59-A	3456	3356	3603	Quadrants C and D have no scan data due to asphalt and gravel.
1	59-B	3506	3412	3647	
1	58-A	3889	3618	3991	
1	58-B	3221	3110	3365	
1	58-C	3789	3601	3891	
1	58-D	3890	3749	3997	
1	60-A	3509	3321	3704	
1	60-B	3854	3715	3993	
1	60-C	3610	3413	3785	
1	60-D	3502	3404	3684	
1	166-A	3492	3359	3618	Quadrants C and D have no scan data due to asphalt and gravel.
1	166-B	3700	3617	3807	
2A	33-A	4759	4572	4809	Background for unit at 4300.
2A	33-B	4635	4622	4754	
2A	33-C	4705	4659	4720	
2A	33-D	5019	4899	5046	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
2B	35-A	4790	4582	4816	Background for unit at 4400.
2B	35-B	4788	4610	4845	
2B	35-C	4699	4512	4713	
2B	35-D	4618	4578	4786	
2C	37-C	4699	4579	4800	Background for unit at 4300.
2C	37-B	4790	4623	4871	
2C	37-A	4788	4615	4799	
2C	37-D	4678	4576	4739	
2D	124-A	4778	4658	4877	Background for unit at 4500.
2D	124-B	4987	4802	5019	
2D	124-C	5019	4934	5148	
2D	124-D	4957	4873	5021	
2D	24-B	4456	4215	4457	Quadrants A and D of grid 24 are part of Survey Unit 3.
2D	24-C	4357	4155	4336	
2D	24-E	5019	4903	5056	
2D	24-F	4875	4788	4879	
2D	24-G	5019	4978	5020	
2D	24-H	4348	4215	4378	
2D	134-A	4012	3799	4219	
2D	134-B	4516	4169	5013	
2D	134-C	4722	4222	5117	
2D	134-D	4364	4167	4655	
2D	136-B	4427	7218	4771	Quadrants A, C, and D of grid 136 are part of Survey Unit 4E.
2D	179-B	4317	4007	4663	Quadrants C and D of grid 179 are part of Survey Unit 4E.
2D	179-A	4015	3744	4612	
2D	94-B	3945	3845	4205	Quadrants C and D of grid 94 are part of Survey Unit 4E. Quadrant A is part of Survey Unit 3.
2D	137-A	4002	3849	4217	
2D	137-B	4319	4251	4457	
2D	137-C	4297	4159	4367	
2D	137-D	4267	4155	4359	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
2E	47-A	4711	4603	4852	Background for unit at 4300.
2E	47-B	4289	4123	4460	
2E	47-C	4308	4257	4467	
2E	47-D	4109	4009	4315	
2F	39-A	6211	4279	6312	Background ranged from 4000 to 20,000. Fluctuations in background varied with proximity to retention pond area as well as proximity to a "hot spot" located on Kaiser property which is the western side wall of the excavations. The "hot spot" started at middle of grid 40 and extended north to sheet pile wall. Sample density was increased in areas of high background.
2F	39-B	6015	4877	6097	
2F	39-C	5890	4976	6003	
2F	39-D	6109	5017	6215	
2F	40-A	9108	6421	10870	
2F	40-B	7509	5873	7649	
2F	40-C	7211	4976	7414	
2F	40-D	6402	5348	6891	
2F	40-E	5416	4719	6708	
2F	40-F	4321	4659	6617	
2F	40-G	4308	4287	6918	
2F	40-H	4897	4819	5481	
2F	41-A	13021	10873	15790	
2F	41-B	11798	9948	12054	
2F	41-C	9846	5679	9871	
2F	41-D	21069	9701	22799	
2F	41-E	8476	6479	9476	
2F	41-F	5670	5319	6317	
2F	41-G	5213	5107	5479	
2F	41-H	5471	5318	5547	
2F	41-I	4679	4579	4973	
2F	42-A	5610	5317	5748	
2F	42-B	4971	4679	5017	
2F	42-C	4371	4231	4673	
2F	42-D	3987	3848	4271	
2F	43-A	4646	4567	5000	
2F	43-B	5206	5001	5390	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
2F	43-C	4857	4678	5036	
2F	43-D	4799	4579	5202	
2F	44-A	5348	5012	6037	
2F	44-B	5309	5034	5508	
2F	44-C	5537	5011	6103	
2F	44-D	7544	6322	8103	
2F	44-E	6589	5972	7111	
2F	44-F	8768	7349	13129	
2F	44-G	7953	7549	9100	
2F	44-H	6030	5344	7226	
2F	44-I	6248	5218	6891	
2F	44-J	7123	6947	9907	
2F	44-K	6589	6488	8304	
2F	44-L	6300	5362	7461	
2F	44-M	6455	5559	7811	
2F	45-A	10025	9001	14370	
2F	45-B	7854	6871	8828	
2F	45-C	11540	9637	13339	
2F	45-D	9987	8947	11975	
2F	45-E	6917	6634	8023	
2F	45-F	7588	6311	8450	
2F	45-G	10891	7289	15553	
2F	45-H	9563	6875	11570	
2F	63-A	4011	3748	4379	
2F	63-C	4388	4001	4457	
2F	63-D	4215	3915	4397	
2F	63-B	3879	3748	4015	
3	24-A	4219	4018	4219	Background for Unit at 4300.
3	24-D	4251	4106	4289	
3	23-A	6048	5946	6148	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
3	23-B	6244	6107	6248	
3	23-C	4755	7654	4800	
3	23-D	5243	5016	5249	
3	23-E	4579	4315	4615	
3	23-F	4456	4215	4579	
3	94-A	4068	3912	4178	
3	93-B	3989	3897	4019	Quadrants A, C, and D of grid 93 are part of Survey Unit 4E.
3	22-A	4344	4326	4404	
3	22-B	3906	3866	4013	
3	22-C	3455	3346	3605	
3	22-D	3982	3864	4099	
3	21-A	3601	3549	6782	Quadrants C and D of grid 21 are part of Survey Unit 4E.
3	21-B	3572	3467	3649	
3	20-C	3907	3864	4016	Quadrants A, B, D, and E of grid 20 are part of Survey Unit 4E.
4A	29-A	3895	3709	4375	Background for Unit at 3900.
4A	29-B	4278	4211	4379	All C and D quadrants are part of Survey Unit 7A.
4A	28-A	3694	3548	3815	
4A	28-B	4963	4877	5097	
4B	26-A	4962	4826	5348	Background for unit at 4500. Getting closer to retention pond.
4B	26-B	4633	4578	4980	All C and D quadrants are part of Survey Unit 7A.
4B	25-A	5001	4573	5476	
4B	25-B	4769	4367	5201	
4C	3-A	6497	4215	7018	Background for unit at 6800. Elevated background due to open excavation of spillway where
4C	3-B	6489	4231	7784	elevated levels of thorium were buried onsite.
4C	4-A	6488	5019	7019	All C and D quadrants are part of Survey Unit 7A.
4C	4-B	6219	4678	7548	
4C	1-A	5019	3918	5481	
4C	1-B	5348	4016	5784	
4C	2-A	6691	4651	7515	
4C	2-B	6849	4677	7018	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
4D	6-A	4321	4279	4489	Background for unit at 4500. Getting closer to retention pond.
4D	6-B	4099	4019	4207	All C and D quadrants for grids 5-13 are part of Survey Unit 7A.
4D	5-A	5103	4987	5107	All C and D quadrants for grids 14-18 are part of Survey Unit 7B.
4D	5-B	4498	4456	4576	
4D	7-A	4301	4077	4397	
4D	7-B	4302	4015	4332	
4D	8-A	4312	4165	4388	
4D	8-B	5896	5679	5906	
4D	9-A	4872	4658	4899	
4D	9-B	5349	5100	5393	
4D	10-A	5421	5223	5430	
4D	10-B	6121	5848	6134	
4D	13-A	4016	3906	4088	
4D	13-B	5401	5248	5416	
4D	14-A	4164	4009	4186	
4D	14-B	4066	3867	4131	
4D	16-A	4215	4179	4205	
4D	16-B	4019	3967	4029	
4D	15-A	3891	3648	3915	
4D	15-B	3978	3845	3999	
4D	11-A	5050	4978	5067	
4D	11-B	4705	4613	4715	
4D	12-A	4602	4498	4613	
4D	12-B	3597	3487	3612	
4D	18-A	4201	4143	4267	
4D	18-B	4266	4167	4316	
4D	17-A	3987	3842	4019	
4D	17-B	4018	4000	4150	
4E	20-A	4359	4358	4451	Background for unit at 4200.
4E	20-B	4208	4155	4315	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
4E	20-D	3976	3899	4094	
4E	20-E	4359	4215	4478	
4E	19-B	5019	4976	5123	
4E	19-D	5468	5246	5564	
4E	91-A	4257	4199	4357	Quadrants C and D of grid 91 are part of Survey Unit 7C.
4E	91-B	4015	3948	4251	
4E	136-A	4890	4702	5439	
4E	136-C	4879	4756	5049	
4E	136-D	5012	4933	5120	
4E	94-C	3964	3866	4201	
4E	94-D	3845	3745	3978	
4E	100-A	3945	3812	4016	Quadrants C and D of grid 100 are part of Survey Unit 7C.
4E	100-B	3645	3549	3744	
4E	92-A	4109	4078	4207	
4E	92-B	4059	3927	4100	Quadrant C of grid 92 is part of Survey Unit 7C.
4E	92-D	3971	3894	4079	
4E	93-A	4109	4030	4215	
4E	93-C	4384	4256	4457	
4E	93-D	3705	3649	3846	
4E	90-C	4040	3955	4215	Quadrants A, B, D, E, F, and G of grid 90 are part of Survey Unit 7C.
4E	21-C	3920	3825	4179	
4E	21-D	3875	3766	3966	
4E	20-F	4012	3964	4218	
4E	133-A	4457	4351	4578	Quadrant C of grid 133 is part of Survey Unit 7C.
4E	133-B	4235	4097	4566	
4E	133-D	3549	3456	3649	
4E	179-C	3849	3765	3948	
4E	179-D	3799	3544	3899	
4E	19-A	4613	4378	4768	
4E	19-C	4099	3849	4336	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
4F	152-A	4026	3912	4176	Background for unit at 3400.
4F	152-B	3545	3492	3612	
4F	152-C	3408	3352	3599	
4F	152-D	3267	3148	3346	
4G	120-C	4266	4017	4279	Background for unit at 3900.
4G	120-D	4502	4299	4530	Quadrants A and B of grids 116-123 are part of Survey Unit 7A.
4G	121-C	3955	3745	3955	
4G	121-D	4166	3998	4215	
4G	122-C	4163	3800	4219	
4G	122-D	3918	3754	4211	
4G	123-C	4117	3805	4286	
4G	123-D	3966	3799	4007	
4G	116-C	3976	3746	4213	
4G	116-D	4227	4137	4567	
4G	117-C	4016	3776	4288	
4G	117-D	3766	4197	4315	
4G	118-C	4279	4013	4611	
4G	118-D	4425	4311	4876	
4G	119-C	4231	4028	4599	
4G	119-D	4367	4223	4682	
4G	154-A	4388	3871	5011	
4G	154-B	4296	3917	4768	
4G	154-C	5701	5437	6200	
4G	154-D	4308	4117	4679	
4G	155-A	4447	4223	4883	
4G	155-B	4316	4012	4572	
4G	155-C	3976	3766	4157	
4G	155-D	4211	3897	4677	
4G	156-A	4311	4122	4568	
4G	156-B	4552	4273	4873	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant average (cpm)[1]	min. (cpm)[1]	max (cpm)[1]	Comments
4G	156-C	4677	4015	4977	
4G	156-D	4576	4117	4899	
4H	130-C	4876	4657	4963	Background for unit at 4200.
4H	130-D	5102	5000	5217	Quadrants A and B of grids 129-132 are part of Survey Unit 7B.
4H	132-C	4579	4377	4679	
4H	132-D	5376	5247	5398	
4H	131-C	6109	5869	6219	
4H	131-D	5247	5018	5349	
4H	129-C	4708	4652	4793	
4H	129-D	4599	4288	4679	
4I	104-C	5543	5249	5677	Background for unit at 3800.
4I	102-A	5548	5462	5648	Quadrants A, B, and D of grid 104 are part of Survey Unit 7C.
4I	102-B	5211	5123	5312	
4I	96-E	4571	4457	4657	Quadrants A, B, C, D, and H of grid 96 are part of Survey Unit 7C.
4I	96-F	3548	3469	3654	
4I	96-G	4251	4199	4321	Quadrants A and B of grid 95 are part of Survey Unit 7C.
4I	95-C	3816	3748	3945	
4I	95-D	3645	3545	3744	
4I	101-A	3512	3456	3642	
4I	101-B	4015	3945	4195	
4I	101-C	3548	3464	3649	
4I	101-D	4579	4456	4689	
4I	101-E	3754	3654	3846	
4I	103-C	4630	4572	4766	
4I	103-D	4013	3868	4218	
4I	101-F	5016	4862	5219	
4I	101-G	4336	4019	4425	
4I	101-H	4094	3978	4157	
4I	101-I	3940	3879	3999	
4I	101-J	4978	4578	4989	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant average (cpm)[1]	min. (cpm)[1]	max (cpm)[1]	Comments
4I	102-C	5032	4726	5067	
4I	102-D	5016	4866	5124	
4J	150-A	4019	3809	4311	Background for unit at 3800.
4J	150-B	4122	3947	4511	
4J	150-C	4067	3755	4365	
4J	150-D	4219	3944	4487	
4K	111-C	4117	3879	4411	Background for unit at 3900.
4K	111-A	4218	3457	4572	
4K	111-B	4167	3648	4319	
4K	111-D	4029	3758	4331	
4L	106-D	4278	4018	5708	Background for unit at 3900.
4L	106-E	4219	3978	4999	Quadrants A and B of grid 106 are part of Survey Unit 7D. There is no quadrant C for grid 106.
4L	106-F	3799	3702	3997	
4L	193-C	4279	4017	4587	
4L	193-D	4587	4378	4789	Quadrants A and B of grid 193 are part of Survey Unit 7D.
4L	193-E	4273	4019	4677	
4L	193-F	4018	3749	4267	
4L	193-G	4266	4015	4421	
4L	193-H	4067	3899	4378	Quadrants A and B of grid 192 are part of Survey Unit 7D.
4L	192-C	3878	3499	4215	
4L	192-D	4287	4011	4657	
4L	198-A	4257	4033	4657	
4L	198-B	4988	4572	5094	
4L	198-C	7548	4579	7599	
4L	198-D	7048	5217	7248	
4M	209-D	4977	4716	5184	Background for unit at 3900.
4M	209-C	5001	4616	5318	Quadrants A and B of grid 209 are part of Survey Unit 7E.
4M	213-C	3702	3500	4108	
4M	213-D	3890	3420	4316	
4M	210-C	3699	3297	3977	
4M	210-D	6487	5177	6548	
4M	210-E	4201	3756	4278	
4M	215-A	5476	5247	5677	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
4M	215-B	4977	4257	5188	
4M	215-C	3768	3467	3987	
4M	215-D	3821	3713	4162	
4M	215-E	3907	3554	4015	
4M	216-A	3819	3661	4155	
4M	216-B	4168	3948	4218	
4M	216-C	3968	3561	4169	
4M	216-D	4278	4018	4333	
4M	216-E	4002	3791	4209	
4M	216-F	3849	3488	4173	
4M	213-A	4009	3679	4391	
4M	213-B	3497	3348	3988	
4M	189-C	4011	3748	4215	Quadrants A and B for grid 189 are part of Survey Unit 7E.
4M	189-D	3988	3497	4257	
5A	170-D	4019	3946	4217	Background for unit at 4000.
5A	169-A	5511	5429	5619	
5A	169-B	5349	5218	5487	
5A	169-C	5648	5548	5649	
5A	169-D	5301	5234	5317	
5A	170-C	4973	4861	5019	
5A	170-A	4200	4154	4298	
5A	56-A	5322	5310	5484	
5A	170-B	4807	4302	5000	
5A	56-B	5200	4906	5360	
5A	56-C	5219	4987	5320	
5A	56-D	5099	4700	5211	
5B	167-D	4279	3945	5126	Background for unit at 3800.
5B	61B1	3756	3648	3845	
5B	61B2	3849	3764	3961	
5B	61A1	3864	3716	3948	
5B	61A2	3805	3728	3899	
5B	61C1	3905	3824	4025	
5B	61C2	3864	3742	3924	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
5B	167-A	4311	4002	4560	
5B	167-B	4605	4209	4802	
5B	167-C	4498	4111	4715	
6A	175-A	4012	3921	4215	Background for unit at 3600.
6A	175-B	4066	3964	4157	
6A	175-C	3542	3419	3647	
6A	175-D	3300	3216	3456	
6A	157-A	5126	4967	5246	
6A	157-B	3546	3402	3627	
6A	157-C	3899	3745	3976	
6A	157-D	3125	3016	3246	
6A	158-A	3945	3843	4015	
6A	158-B	3745	3645	3865	
6A	158-C	3159	3062	3249	
6A	158-D	2945	2819	3014	
6B	162-A	5214	5120	5341	Background for unit at 3800.
6B	162-B	5421	5349	5567	
6B	162-C	3102	3011	3246	
6B	162-D	3006	2954	3194	
6B	161-A	4251	4157	4298	
6B	161-B	5018	4972	5187	
6B	161-C	4521	4421	4587	
6B	161-D	3166	3029	3199	
6B	165-A	5132	4878	5315	
6B	165-B	5018	4988	5244	
6B	165-C	5248	5018	5366	
6B	165-D	5099	4876	5248	
6B	164-A	5133	4925	5248	
6B	164-B	4761	4659	4987	
6B	164-C	4158	4015	4265	
6B	164-D	4059	3897	4255	
6B	163-A	4313	4105	4369	
6B	163-B	5478	5348	5847	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
6B	163-C	4274	4018	4325	
6B	163-D	5556	5218	5687	
6C	176-A	3759	3642	3816	Background for unit at 3800.
6C	176-B	4265	4135	4370	
6C	176-C	4215	4105	4355	
6C	176-D	3754	3613	3849	
7A	29-C	4388	4215	4404	Background for unit at 4100.
7A	29-D	3978	3915	4017	
7A	28-C	3641	3245	4210	
7A	28-D	4827	4731	5049	
7A	26-C	6811	6487	7106	
7A	26-D	6982	6849	7189	
7A	25-C	4097	4120	4475	
7A	25-D	4197	4097	4379	
7A	6-C	4198	4277	4417	
7A	6-D	4677	4512	4716	
7A	5-C	5476	5347	5679	
7A	5-D	4287	4217	4571	
7A	26-C	4208	4016	4508	
7A	26-D	5019	4879	5201	
7A	77-C	6399	5412	6418	
7A	77-D	4876	4678	5011	
7A	77-A	4987	4200	5610	
7A	77-B	4678	4235	4878	
7A	72-D	5200	4571	5311	
7A	73-C	5879	5402	5978	
7A	72-C	4655	4208	4887	
7A	72-B	5902	4819	6079	
7A	72-A	5648	5423	5890	
7A	73-B	3976	3679	4019	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7A	73-A	3879	3549	3976	
7A	73-D	5346	5003	5794	
7A	74-D	5221	4678	5431	
7A	74-C	5547	5237	5855	
7A	74-B	3679	3125	3845	
7A	74-A	3897	3421	3964	
7A	78-C	4579	4097	4785	
7A	78-D	4379	4279	4574	
7A	78-B	6154	5863	6219	
7A	78-A	6018	5735	6244	
7A	75-C	5437	5097	5679	
7A	75-D	6254	5873	6349	
7A	75-B	3967	3594	4019	
7A	75-A	4015	3467	4279	
7A	76-D	5478	4879	5499	
7A	76-C	6594	6011	6604	
7A	76-A	3794	3401	3879	
7A	76-B	3996	3564	3999	
7A	79-A	5210	4879	5297	
7A	79-B	5012	4873	5122	
7A	79-C	3978	3756	4018	
7A	79-D	4301	4166	4445	
7A	7-C	4306	4123	4389	
7A	7-D	4678	4456	4706	
7A	8-C	5655	5501	5678	
7A	8-D	6015	5786	6040	
7A	9-C	4539	4266	4566	
7A	9-D	4312	4019	4350	
7A	10-C	5089	4769	5097	
7A	10-D	5109	4829	5193	
7A	80-A	5312	5123	5346	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7A	80-B	5019	4877	5046	
7A	80-C	5004	4758	5012	
7A	80-D	4164	3985	4155	
7A	81-A	5107	4986	5200	
7A	81-B	5248	5196	5288	
7A	81-C	4987	4755	5019	
7A	81-D	5012	4789	5023	
7A	82-A	4450	4211	4579	
7A	82-B	4526	4297	4587	
7A	82-C	5102	4933	5199	
7A	82-D	5216	5087	5279	
7A	118-A	4132	4020	4356	
7A	118-B	4279	4101	4403	
7A	119-A	3998	3789	4221	
7A	119-B	4238	3949	4301	
7A	120-A	4230	4100	4307	
7A	120-B	3789	3548	3815	
7A	121-A	4210	4019	4257	
7A	121-B	3985	3755	4018	
7A	13-C	3800	3648	3845	
7A	13-D	4201	4018	4220	
7A	11-C	5148	5019	5193	
7A	11-D	5801	5698	5845	
7A	12-C	3697	3502	3718	
7A	12-D	3907	3846	3920	
7A	77-A	4875	4800	4899	
7A	77-B	4961	4873	5012	
7A	77-C	5164	5103	5197	
7A	77-D	4916	4879	4967	
7A	3-C	5318	4351	4451	
7A	3-D	5487	4415	4679	
7A	116-A	3908	3702	4362	
7A	116-B	4011	3711	4501	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7A	117-A	4016	3698	4520	
7A	117-B	4170	3802	4616	
7A	4-C	5487	5011	5648	
7A	4-D	5146	4357	5316	
7A	1-C	4988	4188	5019	
7A	1-D	5019	4218	5849	
7A	2-C	5648	4319	5735	
7A	2-D	5413	4677	548	
7A	123-A	5016	4759	5501	
7A	123-B	3149	3064	3249	
7A	122-A	3978	3859	3999	
7A	122-B	2948	2833	2970	
7A	122-A	4012	3715	4215	
7A	122-B	4009	3749	4379	
7A	123-B	3987	3749	4157	
7A	123-A	3842	3689	4319	
7A	70-B	3986	3845	4215	
7A	74-D	3745	3475	4018	
7A	68-B	3843	3456	3997	
7A	70-A	3975	3519	4028	
7A	73-B	3999	3502	4218	
7A	73-B	5247	4917	5317	
7A	73-B	4831	4555	5011	
7A	73-B	4938	4533	5109	
7B	130-A	4467	4287	4579	Background for unit at 4200.
7B	130-B	4501	4396	4609	
7B	132-A	5016	4831	5148	
7B	132-B	5246	5048	5333	
7B	131-A	5312	5164	5197	
7B	131-B	5049	4896	5093	
7B	129-A	4512	4387	4578	
7B	129-B	4679	4215	4692	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7B	14-C	4578	4478	4657	
7B	14-D	5223	5200	5319	
7B	16-C	4356	4279	4405	
7B	16-D	5119	4976	5179	
7B	15-C	4197	4015	4207	
7B	15-D	5386	5246	5402	
7B	84-A	3977	3789	4012	
7B	84-B	4599	4412	4607	
7B	84-C	4108	4019	4123	
7B	84-D	5166	5007	5187	
7B	85-A	4012	3948	4035	
7B	85-B	4108	4011	4121	
7B	85-C	4012	3879	4033	
7B	85-D	4109	4000	4212	
7B	86-A	4379	4266	4401	
7B	86-B	4978	4873	5013	
7B	86-C	4500	4469	4579	
7B	86-D	5000	4913	5016	
7B	87-A	5211	5143	5249	
7B	87-B	4466	4219	4497	
7B	87-C	4879	4761	4912	
7B	87-D	5243	5146	5303	
7B	88-A	4277	4019	4319	
7B	88-B	4501	4279	4516	
7B	88-C	5267	5036	5316	
7B	88-D	5413	5244	5499	
7B	18-C	4861	4678	4987	
7B	18-D	4447	4312	4521	
7B	17-C	4548	4457	4678	
7B	17-D	4793	4701	4875	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7C	98-C	4356	4011	5103	Background for unit at 4000.
7C	98-D	4423	3800	4769	
7C	135-C	3015	2115	3215	
7C	104-A	4764	4579	4873	
7C	104-B	5279	5018	5349	
7C	104-D	4427	4266	4579	
7C	105-A	4578	4359	4679	
7C	105-B	4210	4035	4266	
7C	105-C	5021	4853	5064	
7C	105-D	4469	4107	4579	
7C	90-A	4478	4322	4579	
7C	90-B	4102	4005	4256	
7C	99-D	5012	4878	5039	
7C	98-B	4658	4579	4697	
7C	92-C	4021	3912	4120	
7C	97-A	4679	4579	4699	
7C	97-B	4251	4157	4301	
7C	97-C	4876	4785	4907	
7C	97-D	4578	4570	4608	
7C	96-A	3645	3545	3679	
7C	96-B	4657	4580	4684	
7C	96-C	4210	4157	4315	
7C	96-D	4099	3915	4201	
7C	96-H	4978	4865	5018	
7C	95-A	3845	3769	3945	
7C	95-B	4016	3945	4105	
7C	89-B	4978	4856	5123	
7C	89-D	4582	4457	4679	
7C	89-C	4265	4200	4315	
7C	100-C	4571	4456	4687	
7C	100-D	3845	3756	3966	

1. Gross counts per minute readings

Table 4-C
Scan Surveys of Open Excavations
Kaiser Adjacent Land Remediation Project
Survey Units 1 - 7E

Survey Unit	Quadrant ID	Scan of quadrant			Comments
		average	min.	max	
		(cpm)[1]			
7C	99-A	4159	4056	4299	
7C	99-B	4278	4137	4358	
7C	99-C	3845	3794	4018	
7C	90-D	4125	4056	4279	
7C	90-E	4215	4165	4322	
7C	90-F	4135	4057	4211	
7C	90-G	3981	3835	4019	
7C	91-C	4091	3899	4143	
7C	91-D	4123	3912	4567	
7C	133-C	3648	3145	3848	
7C	103-A	4157	3982	4258	
7C	103-B	4752	4577	4899	
7C	135-B	4210	4032	4355	
7C	135-A	4679	4675	4788	
7C	89-A	4315	4167	4535	
7C	127-A	3899	3748	3945	
7C	127-C	2546	2457	2578	
7C	135-D	3364	3247	3366	
7D	106-A	4815	3784	5549	Background for unit at 4100.
7D	106-B	3987	3766	4579	
7D	193-A	4827	4487	5017	
7D	193-B	3907	3548	4218	
7D	192-A	4967	4573	5022	
7D	192-B	4199	3876	4297	
7E	209-B	4257	4018	4577	Background for unit at 3900.
7E	209-A	4311	4009	4616	
7E	189-A	4176	3987	4573	
7E	189-B	4938	4573	5127	
7E	210-A	3918	3748	4372	
7E	210-B	3879	3648	4138	
7E	210-F	3846	3491	4019	

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1. Gross counts per minute readings

Table 4-1
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 1

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
52A	FS	5.32E-01	0.00E+00	1.10E-01	3.88E-01	0.00	2	
52B	CS	1.02E+00	0.00E+00	1.58E-01	4.53E-01	0.00	1	1.15E-01
52C	FS	1.56E+00	4.60E-01	1.31E-01	2.34E-01	0.21	1	0.05
52D	CS	6.19E-01	0.00E+00	9.80E-02	3.33E-01	0.00	-2	1
53A	FS	1.16E+00	6.00E-02	1.33E-01	5.21E-01	0.03	4	
53B	CS	5.60E-01	0.00E+00	5.60E-01	5.19E-01	0.00	-1	1.50E-02
53C	FS	6.05E-01	0.00E+00	9.20E-02	2.77E-01	0.00	4	0.01
53D	CS	6.41E-01	0.00E+00	7.20E-02	2.80E-01	0.00	-1	2
54A	FS	8.35E-01	0.00E+00	1.00E-01	2.32E-01	0.00	4	
54B	CS	1.18E+00	8.00E-02	1.61E-01	3.61E-01	0.04	-1	2.00E-02
54C	FS	8.17E-01	0.00E+00	9.40E-02	2.24E-01	0.00	4	0.01
54D	CS	9.63E-01	0.00E+00	1.35E-01	3.94E-01	0.00	-1	2
55A	FS	7.96E-01	0.00E+00	9.30E-02	1.77E-01	0.00	4	
55B	FS	6.63E-01	0.00E+00	1.08E-01	2.98E-01	0.00	-1	5.25E-02
55C	FS	1.31E+00	2.10E-01	1.54E-01	3.53E-01	0.09	5	0.02
55D	CS	9.30E-01	0.00E+00	8.20E-02	3.25E-01	0.00	1	2
57A	FS	1.17E+00	7.00E-02	1.57E-01	4.39E-01	0.03	3	
57B	FS	1.27E+00	1.70E-01	1.38E-01	2.39E-01	0.08	1	1.30E-01
57C	FS	1.38E+00	2.80E-01	1.29E-01	4.01E-01	0.13	1	0.06
57D	FS	9.51E-01	0.00E+00	9.90E-02	1.96E-01	0.00	1	2
58A	FS	9.95E-01	0.00E+00	1.37E-01	4.13E-01	0.00	1	
58B	FS	1.28E+00	1.80E-01	8.40E-02	2.39E-01	0.08	1	2.65E-01
58C	FS	1.66E+00	5.60E-01	8.00E-02	1.83E-01	0.25	1	0.12
58D	FS	1.42E+00	3.20E-01	7.00E-02	3.03E-01	0.14	1	1
59A	FS	7.26E-01	0.00E+00	1.12E-01	2.44E-01	0.00	1	
59B	FS	6.99E-01	0.00E+00	7.70E-02	3.45E-01	0.00	-1	0.00E+00
59C	CS	6.75E-01	0.00E+00	1.78E-01	3.36E-01	0.00	-2	0.00
59D	CS	8.04E-01	0.00E+00	1.24E-01	3.79E-01	0.00	-2	-1
60A	FS	9.34E-01	0.00E+00	1.18E-01	3.92E-01	0.00	-2	
60B	FS	8.21E-01	0.00E+00	1.13E-01	4.47E-01	0.00	-2	0.00E+00
60C	FS	5.63E-01	0.00E+00	1.04E-01	3.81E-01	0.00	1	0.00
60D	FS	7.66E-01	0.00E+00	7.00E-02	3.57E-01	0.00	1	-1
166A	FS	2.03E+00	9.30E-01	6.40E-02	1.40E-01	0.42	1	
166B	FS	1.67E+00	5.70E-01	6.10E-02	1.08E-01	0.26	-2	3.75E-01
166C	CS	9.05E-01	0.00E+00	1.24E-01	3.79E-01	0.00	-2	0.17
166D	CS	7.08E-01	0.00E+00	7.60E-02	2.34E-01	0.00	-2	-1
Degrees of Freedom:	35	9.89E-01	1.08E-01			0.05	1	Average
		3.65E-01	2.14E-01			0.10	2	Std Deviation
		5.32E-01	0.00E+00			0.00	-2	Minimum
		2.03E+00	9.30E-01			0.42	5	Maximum
t value*		9.18E-01	0.00E+00			0.00	1	Median
1.690		1.09E+00	1.68E-01			0.08	1	μ_α 95%CL
2.031		1.11E+00	1.80E-01			0.08	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-2
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
33A-1	FS	7.62E-01	0.00E+00	1.17E-01	2.94E-01	0.00	1	
33A-2	FS	3.92E-01	0.00E+00	8.70E-02	3.84E-01	0.00	1	
33B	CS	1.02E+00	0.00E+00	1.19E-01	3.93E-01	0.00	1	0.00E+00
33C-1	FS	8.26E-01	0.00E+00	1.32E-01	2.00E-01	0.00	1	0.00
33C-2	FS	6.21E-01	0.00E+00	1.14E-01	4.10E-01	0.00	1	1
33D	CS	8.17E-01	0.00E+00	1.20E-01	3.99E-01	0.00	1	
Degrees of Freedom:	5	7.40E-01	0.00E+00			0.00	1	Average
		2.13E-01	0.00E+00			0.00	0	Std Deviation
		3.92E-01	0.00E+00			0.00	1	Minimum
		1.02E+00	0.00E+00			0.00	1	Maximum
t value*		7.90E-01	0.00E+00			0.00	1	Median
2.015		9.15E-01	0.00E+00			0.00	1	μ_α 95%CL
2.571		9.64E-01	0.00E+00			0.00	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-3
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
35A-1	FS	7.13E-01	0.00E+00	1.00E-01	3.46E-01	0.00	6	
35A-2	FS	6.79E-01	0.00E+00	1.12E-01	2.28E-01	0.00	4	0.00E+00
35B	CS	9.13E-01	0.00E+00	1.94E-01	3.84E-01	0.00	6	0.00
35C-1	FS	7.44E-01	0.00E+00	6.90E-02	2.03E-01	0.00	4	5
35C-2	FS	5.08E-01	0.00E+00	6.30E-02	2.24E-01	0.00	4	
35D	CS	1.07E+00	0.00E+00	1.85E-01	3.58E-01	0.00	6	
Degrees of Freedom:	5	7.71E-01	0.00E+00			0.00	5	Average
		1.96E-01	0.00E+00			0.00	1	Std Deviation
		5.08E-01	0.00E+00			0.00	4	Minimum
		1.07E+00	0.00E+00			0.00	6	Maximum
t value*		7.29E-01	0.00E+00			0.00	5	Median
2.015		9.32E-01	0.00E+00			0.00	6	μ_α 95%CL
2.571		9.76E-01	0.00E+00			0.00	6	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-4
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
37A	FS	8.07E-01	0.00E+00	7.20E-02	2.59E-01	0.00	6	
37B	CS	8.45E-01	0.00E+00	1.26E-01	4.00E-01	0.00	8	0.00E+00
37C-1	FS	4.18E-01	0.00E+00	1.03E-01	3.44E-01	0.00	9	0.00
37C-2	FS	7.67E-01	0.00E+00	8.90E-02	3.98E-01	0.00	9	8
37C-3	FS	5.73E-01	0.00E+00	8.50E-02	2.17E-01	0.00	9	
37D	CS	8.56E-01	0.00E+00	1.29E-01	3.00E-01	0.00	8	
Degrees of Freedom:	5	7.11E-01	0.00E+00			0.00	8	Average
		1.77E-01	0.00E+00			0.00	1	Std Deviation
		4.18E-01	0.00E+00			0.00	6	Minimum
		8.56E-01	0.00E+00			0.00	9	Maximum
t value*		7.87E-01	0.00E+00			0.00	9	Median
2.015		8.56E-01	0.00E+00			0.00	9	μ_α 95%CL
2.571		8.97E-01	0.00E+00			0.00	9	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-5
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2D

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
24B	FS	1.05E+00	0.00E+00	1.49E-01	5.61E-01	0.00	2	
24C	FS	1.40E+00	3.00E-01	1.72E-01	4.66E-01	0.14	2	1.92E-01
24E	FS	1.56E+00	4.60E-01	1.93E-01	5.19E-01	0.21	3	0.09
24F	FS	1.40E+00	3.00E-01	2.29E-01	5.69E-01	0.14	1	2
24G	FS	1.19E+00	9.00E-02	1.51E-01	5.59E-01	0.04	2	
24H	FS	9.59E-01	0.00E+00	1.92E-01	4.50E-01	0.00	2	
94B	FS	1.10E+00	0.00E+00	1.55E-01	5.04E-01	0.00	1	NA
124A	FS	1.03E+00	0.00E+00	1.42E-01	4.72E-01	0.00	1	
124B	FS	1.11E+00	1.00E-02	1.87E-01	4.00E-01	0.00	1	2.50E-03
124C	FS	7.75E-01	0.00E+00	1.17E-01	4.89E-01	0.00	1	0.00
124D	FS	1.06E+00	0.00E+00	1.46E-01	4.50E-01	0.00	1	1
134A	CS	1.57E+00	4.70E-01	2.25E-01	3.76E-01	0.21	0	
134B	CS	2.48E+00	1.38E+00	2.28E-01	4.06E-01	0.62	0	6.98E-01
134C	CS	8.75E-01	0.00E+00	1.21E-01	4.68E-01	0.00	0	0.31
134D	CS	2.04E+00	9.40E-01	1.85E-01	5.34E-01	0.42	1	0
136B	FS	8.64E-01	0.00E+00	1.46E-01	5.64E-01	0.00	2	NA
179A	FS	6.87E-01	0.00E+00	1.02E-01	4.73E-01	0.00	1	5.00E-02
179B	FS	1.20E+00	1.00E-01	2.17E-01	4.33E-01	0.04	1	0.02
								1
137A	FS	1.11E+00	1.00E-02	1.87E-01	3.65E-01	0.00	1	
137B	FS	1.22E+00	1.20E-01	2.12E-01	3.76E-01	0.05	1	3.25E-02
137C	FS	1.09E+00	0.00E+00	1.62E-01	4.28E-01	0.00	1	0.01
137D	FS	7.35E-01	0.00E+00	9.50E-02	3.98E-01	0.00	1	1
Degrees of Freedom:	21	1.20E+00	1.90E-01			0.09	1	Average
		4.22E-01	3.54E-01			0.16	1	Std Deviation
		6.87E-01	0.00E+00			0.00	0	Minimum
		2.48E+00	1.38E+00			0.62	3	Maximum
t value*		1.11E+00	5.00E-03			0.00	1	Median
1.721		1.36E+00	3.20E-01			0.14	1	μ_α 95%CL
2.080		1.39E+00	3.47E-01			0.16	2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-6
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2E

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
47A	CS	7.59E-01	0.00E+00	1.39E-01	4.24E-01	0.00	3	
47B	CS	7.16E-01	0.00E+00	1.30E-01	4.87E-01	0.00	1	
47C-1	FS	4.30E-01	0.00E+00	1.15E-01	3.30E-01	0.00	0	5.00E-02
47C-2	FS	BDL	0.00E+00	BDL	4.83E-01	0.00	0	0.02
47C-3	FS	5.45E-01	0.00E+00	9.30E-02	3.61E-01	0.00	1	1
47C-4	FS	4.91E-01	0.00E+00	8.20E-02	2.41E-01	0.00	0	
47D	CS	1.45E+00	3.50E-01	1.51E-01	4.15E-01	0.16	1	
Degrees of Freedom:	6	7.32E-01	5.00E-02			0.02	1	Average
		3.74E-01	1.32E-01			0.06	1	Std Deviation
		4.30E-01	0.00E+00			0.00	0	Minimum
		1.45E+00	3.50E-01			0.16	3	Maximum
t value*		6.31E-01	0.00E+00			0.00	1	Median
1.943		1.01E+00	1.47E-01			0.07	2	μ_α 95%CL
2.447		1.08E+00	1.72E-01			0.08	2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-7
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2F

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
39A	FS	9.47E-01	0.00E+00	1.24E-01	3.70E-01	0.00	8	
39B	FS	1.19E+00	9.00E-02	1.61E-01	3.91E-01	0.04	8	4.50E-02
39C	FS	1.06E+00	0.00E+00	1.44E-01	3.97E-01	0.00	6	0.02
39D	FS	1.19E+00	9.00E-02	1.40E-01	4.77E-01	0.04	9	8
40A	FS	7.41E-01	0.00E+00	1.05E-01	4.57E-01	0.00	8	
40B	FS	8.27E-01	0.00E+00	9.20E-02	2.77E-01	0.00	8	6.50E-02
40C	FS	7.94E-01	0.00E+00	1.21E+00	4.23E+00	0.00	8	0.03
40D	FS	9.28E-01	0.00E+00	1.54E-01	5.28E-01	0.00	7	8
40E	FS	8.23E-01	0.00E+00	1.00E-01	3.78E-01	0.00	7	
40F	FS	1.37E+00	2.70E-01	1.47E-01	3.78E-01	0.12	8	
40G	FS	1.35E+00	2.50E-01	1.90E-01	5.30E-01	0.11	6	
40H	FS	9.98E-01	0.00E+00	1.08E-01	4.57E-01	0.00	10	
41A	FS	3.04E+00	1.94E+00	1.49E-01	3.99E-01	0.87	6	
41B	FS	7.10E-01	0.00E+00	1.15E-01	4.55E-01	0.00	6	4.30E-01
41C	FS	7.91E-01	0.00E+00	1.28E-01	5.14E-01	0.00	8	0.19
41D	FS	9.86E-01	0.00E+00	8.60E-02	3.11E-01	0.00	6	7
41E	FS	1.37E+00	2.70E-01	1.34E-01	4.11E-01	0.12	7	
41F	FS	2.76E+00	1.66E+00	2.03E-01	4.74E-01	0.75	7	
41G	FS	7.78E-01	0.00E+00	1.01E-01	3.73E-01	0.00	6	
41H	FS	8.85E-01	0.00E+00	1.54E-01	5.06E-01	0.00	6	
41I	FS	6.89E-01	0.00E+00	1.35E-01	4.54E-01	0.00	7	
42A	FS	8.58E-01	0.00E+00	1.20E-01	4.83E-01	0.00	6	
42B	FS	7.76E-01	0.00E+00	1.65E-01	4.51E-01	0.00	8	0.00E+00
42C	FS	1.01E+00	0.00E+00	1.42E-01	4.72E-01	0.00	8	0.00
42D	FS	1.09E+00	0.00E+00	1.33E-01	4.47E-01	0.00	9	8
43A	FS	1.02E+00	0.00E+00	1.30E-01	2.91E-01	0.00	7	
43B	CS	8.98E-01	0.00E+00	1.25E-01	3.51E-01	0.00	6	5.00E-03
43C	FS	1.12E+00	2.00E-02	1.31E-01	4.22E-01	0.01	6	0.00
43D	FS	9.83E-01	0.00E+00	2.08E-01	3.98E-01	0.00	6	6
63A	FS	9.22E-01	0.00E+00	1.25E-01	5.06E-01	0.00	7	
63B	FS	9.18E-01	0.00E+00	1.59E-01	3.40E-01	0.00	7	0.00E+00
63C	CS	9.42E-01	0.00E+00	9.50E-02	3.04E-01	0.00	7	0.00
63D	CS	1.08E+00	0.00E+00	1.15E-01	4.09E-01	0.00	7	7
44A	FS	1.87E+00	7.70E-01	1.75E-01	4.42E-01	0.35	6	
44B	FS	1.18E+00	8.00E-02	9.80E-02	2.90E-01	0.04	6	1.90E-01
44C	FS	2.30E+00	1.20E+00	1.82E-01	3.56E-01	0.54	4	0.09
44D	FS	9.76E-01	0.00E+00	1.20E-01	4.72E-01	0.00	5	5
44E	FS	8.96E-01	0.00E+00	9.20E-02	3.09E-01	0.00	5	
44F	FS	1.18E+00	8.00E-02	1.28E-01	3.68E-01	0.04	4	
44M	FS	1.31E+00	2.10E-01	1.43E-01	4.46E-01	0.09	6	
44G	FS	8.03E-01	0.00E+00	1.44E-01	4.58E-01	0.00	6	
44H	FS	9.44E-01	0.00E+00	1.18E-01	3.95E-01	0.00	6	
44I	FS	1.14E+00	4.00E-02	1.29E-01	3.49E-01	0.02	5	
44J	FS	1.11E+00	1.00E-02	1.68E-01	4.46E-01	0.00	5	
44K	FS	8.91E-01	0.00E+00	9.70E-02	3.03E-01	0.00	5	
44L	FS	1.18E+00	8.00E-02	1.33E-01	3.80E-01	0.04	5	

Table 4-7
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 2F

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
45A	FS	1.03E+00	0.00E+00	1.58E-01	5.69E-01	0.00	4	3.00E-01
45B	FS	1.06E+00	0.00E+00	1.99E-01	5.06E-01	0.00	4	0.14
45C	FS	2.00E+00	9.00E-01	1.84E-01	4.60E-01	0.41	4	4
45D	FS	1.32E+00	2.20E-01	1.62E-01	5.54E-01	0.10	3	
45E	FS	1.00E+00	0.00E+00	1.85E-01	3.88E-01	0.00	3	1.40E+00
45F	FS	2.19E+00	1.09E+00	1.50E-01	4.86E-01	0.49	3	0.63
45G	FS	1.06E+00	0.00E+00	8.30E-02	2.58E-01	0.00	2	3
45H	FS	6.27E+00	5.17E+00	2.73E-01	3.37E-01	2.33	2	
46A-1	CS	5.56E+00	4.46E+00	2.82E-01	3.99E-01	2.01	4	
46A-2	CS	1.25E+00	1.50E-01	1.62E-01	3.64E-01	0.07	4	
46C	CS	1.23E+00	1.30E-01	1.14E-01	4.16E-01	0.06	2	
Wgt. Avg. Final Survey Grid 45/46:		2.26E+00	1.18E+00			0.53		
Degrees of Freedom:	57	1.34E+00	3.51E-01			0.16	6	Average
		1.00E+00	9.53E-01			0.43	2	Std Deviation
		6.89E-01	0.00E+00			0.00	2	Minimum
		6.27E+00	5.17E+00			2.33	10	Maximum
t value*		1.05E+00	0.00E+00			0.00	6	Median
1.673		1.56E+00	5.60E-01			0.25	6	μ_α 95%CL
2.003		1.61E+00	6.02E-01			0.27	6	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average net Th-232, unity and exposure rate is calculated for each final survey grid.

Finally, the average, standard deviation, median, minimum, maximum, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for Grid 45/45.

Weighted Average = ($20m^2/100m^2$) x elevated measurement + ($80m^2/100m^2$) x average of unelevated measurements

Grid 45/46 contained an elevated area of 20m2 with Th-232 activity concentration = 5.92 pCi/g.

Table 4-8
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 3

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
20C	FS	1.45E+00	3.50E-01	1.37E-01	0.43	0.16	2	NA
21A	FS	1.23E+00	1.30E-01	1.15E-01	0.40	0.06	2	6.50E-02
21B	FS	1.05E+00	0.00E+00	9.00E-02	0.34	0.00	2	0.03
								2
22A	FS	1.23E+00	1.30E-01	1.50E-01	0.60	0.06	1	
22B	FS	1.06E+00	0.00E+00	1.90E-01	0.45	0.00	2	4.75E-02
22C	FS	1.16E+00	6.00E-02	2.06E-01	0.32	0.03	1	0.02
22D	FS	8.86E-01	0.00E+00	1.17E-01	0.41	0.00	2	2
23A	FS	8.22E-01	0.00E+00	1.24E-01	0.34	0.00	1	
23B	FS	9.19E-01	0.00E+00	1.75E-01	0.64	0.00	1	
23C	FS	8.15E-01	0.00E+00	1.34E-01	0.52	0.00	1	1.83E-02
23D	FS	8.97E-01	0.00E+00	1.15E-01	0.29	0.00	2	0.01
23E	FS	1.21E+00	1.10E-01	1.89E-01	0.48	0.05	1	1
23F	FS	7.51E-01	0.00E+00	2.01E-01	0.52	0.00	1	
24A	FS	9.45E-01	0.00E+00	1.63E-01	0.43	0.00	2	0.00E+00
24D	FS	8.33E-01	0.00E+00	1.72E-01	0.45	0.00	1	0.00
								2
93B	FS	8.18E-01	0.00E+00	1.26E-01	0.52	0.00	1	NA
94A	FS	1.39E+00	2.90E-01	2.18E-01	0.46	0.13	2	NA
Degrees of Freedom:	16	1.03E+00	6.29E-02			0.03	1	Average
		2.16E-01	1.09E-01			0.05	1	Std Deviation
		7.51E-01	0.00E+00			0.00	1	Minimum
		1.45E+00	3.50E-01			0.16	2	Maximum
t value*		9.45E-01	0.00E+00			0.00	1	Median
1.746		1.12E+00	1.09E-01			0.05	2	μ_α 95%CL
2.120		1.14E+00	1.19E-01			0.05	2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-9
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
29A	FS	9.87E-01	0.00E+00	1.38E-01	3.35E-01	0.00	1	0.00E+00
29B	FS	1.06E+00	0.00E+00	6.50E-02	2.36E-01	0.00	1	0.00
								1
28A	FS	9.58E-01	0.00E+00	1.09E-01	2.98E-01	0.00	1	1.15E-01
28B	FS	1.33E+00	2.30E-01	9.10E-02	2.41E-01	0.10	1	0.05
								1
Degrees of Freedom:	3	1.08E+00	5.75E-02			0.03	1	Average
		1.70E-01	1.15E-01			0.05	0	Std Deviation
		9.58E-01	0.00E+00			0.00	1	Minimum
		1.33E+00	2.30E-01			0.10	1	Maximum
t value*		1.02E+00	0.00E+00			0.00	1	Median
2.353		1.28E+00	1.93E-01			0.09	1	μ_α 95%CL
3.182		1.35E+00	2.40E-01			0.11	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-10
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
26A	FS	1.29E+00	1.90E-01	8.50E-02	2.79E-01	0.09	1	1.35E-01
26B	FS	1.18E+00	8.00E-02	1.52E-01	3.76E-01	0.04	1	0.06
								1
25A	FS	1.05E+00	0.00E+00	1.12E-01	4.53E-01	0.00	1	9.00E-02
25B	FS	1.28E+00	1.80E-01	1.95E-01	3.61E-01	0.08	1	0.04
								1
Degrees of Freedom:	3	1.20E+00	1.13E-01			0.05	1	Average
		1.12E-01	9.00E-02			0.04	0	Std Deviation
		1.05E+00	0.00E+00			0.00	1	Minimum
		1.29E+00	1.90E-01			0.09	1	Maximum
t value*		1.23E+00	1.30E-01			0.06	1	Median
2.353		1.33E+00	2.18E-01			0.10	1	μ_α 95%CL
3.182		1.38E+00	2.56E-01			0.12	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.

Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-11
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
1A	FS	1.43E+00	3.30E-01	2.12E-01	4.76E-01	0.15	1	1.75E-01
1B	FS	1.12E+00	2.00E-02	1.58E-01	4.95E-01	0.01	1	0.08
								1
2A	FS	1.10E+00	0.00E+00	1.43E-01	2.64E-01	0.00	1	0.00E+00
2B	FS	9.41E-01	0.00E+00	1.16E-01	3.73E-01	0.00	1	0.00
								1
3A	FS	1.31E+00	2.10E-01	1.76E-01	3.50E-01	0.09	1	1.05E-01
3B	FS	8.71E-01	0.00E+00	1.39E-01	3.12E-01	0.00	1	0.05
								1
4A	FS	1.04E+00	0.00E+00	1.41E-01	4.08E-01	0.00	1	1.50E-02
4B	FS	1.13E+00	3.00E-02	1.73E-01	3.91E-01	0.01	1	0.01
								1
Degrees of Freedom:	7	1.12E+00	7.38E-02			0.03	1	Average
		1.82E-01	1.26E-01			0.06	0	Std Deviation
		8.71E-01	0.00E+00			0.00	1	Minimum
		1.43E+00	3.30E-01			0.15	1	Maximum
t value*		1.11E+00	1.00E-02			0.00	1	Median
1.895		1.24E+00	1.58E-01			0.07	1	μ_α 95%CL
2.365		1.27E+00	1.79E-01			0.08	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-12
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4D

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
5A	FS	8.37E-01	0.00E+00	1.28E-01	5.24E-01	0.00	21	0.00E+00
5B	FS	8.33E-01	0.00E+00	1.35E-01	5.04E-01	0.00	21	0.00
								21
6A	FS	9.58E-01	0.00E+00	1.98E-01	3.56E-01	0.00	21	0.00E+00
6B	FS	9.94E-01	0.00E+00	1.20E-01	3.20E-01	0.00	17	0.00
								19
7A	FS	9.36E-01	0.00E+00	1.66E-01	5.55E-01	0.00	11	5.50E-02
7B	FS	1.21E+00	1.10E-01	1.65E-01	2.98E-01	0.05	11	0.02
								11
8A	FS	1.06E+00	0.00E+00	3.28E-01	3.28E-01	0.00	11	9.30E-01
8B	FS	2.96E+00	1.86E+00	5.57E-01	5.57E-01	0.84	11	0.42
								11
9A	FS	1.45E+00	3.50E-01	1.44E-01	4.79E-01	0.16	11	3.15E-01
9B	FS	1.38E+00	2.80E-01	1.88E-01	4.04E-01	0.13	11	0.14
								11
10A	FS	1.42E+00	3.20E-01	1.38E-01	4.47E-01	0.14	15	4.45E-01
10B	FS	1.67E+00	5.70E-01	1.58E-01	4.93E-01	0.26	15	0.20
								15
11A	FS	9.65E-01	0.00E+00	1.03E-01	2.68E-01	0.00	15	0.00E+00
11B	FS	1.04E+00	0.00E+00	2.14E-01	4.10E-01	0.00	15	0.00
								15
12A	FS	1.12E+00	2.00E-02	2.11E-01	3.51E-01	0.01	15	1.00E-02
12B	FS	1.04E+00	0.00E+00	1.82E-01	3.76E-01	0.00	15	0.00
								15
13A	FS	9.87E-01	0.00E+00	1.74E-01	3.72E-01	0.00	15	8.50E-02
13B	FS	1.27E+00	1.70E-01	1.27E-01	4.55E-01	0.08	15	0.04
								15
14A	FS	1.75E+00	6.50E-01	1.50E-01	3.68E-01	0.29	15	3.25E-01
14B	FS	8.43E-01	0.00E+00	1.10E-01	4.33E-01	0.00	11	0.15
								13
15A	FS	7.72E-01	0.00E+00	7.60E-02	2.45E-01	0.00	11	0.00E+00
15B	FS	8.53E-01	0.00E+00	9.80E-02	3.46E-01	0.00	11	0.00
								11
16A	FS	6.14E-01	0.00E+00	1.10E-01	5.03E-01	0.00	11	0.00E+00
16B	FS	8.50E-01	0.00E+00	1.10E-01	4.18E-01	0.00	11	0.00
								11
17A	FS	1.29E+00	1.90E-01	1.89E-01	3.85E-01	0.09	9	9.50E-02
17B	FS	1.09E+00	0.00E+00	1.86E-01	3.75E-01	0.00	7	0.04
								8
18A	FS	7.31E-01	0.00E+00	1.87E-01	4.79E-01	0.00	4	0.00E+00
18B	FS	7.12E-01	0.00E+00	1.02E-01	3.83E-01	0.00	1	0.00
								3
Degrees of Freedom:	27	1.13E+00	1.61E-01			0.07	13	Average
		4.56E-01	3.78E-01			0.17	5	Std Deviation
		6.14E-01	0.00E+00			0.00	1	Minimum
		2.96E+00	1.86E+00			0.84	21	Maximum
t value*		1.02E+00	0.00E+00			0.00	11	Median
1.703		1.28E+00	2.83E-01			0.13	14	m_a 95%CL
2.052		1.31E+00	3.08E-01			0.14	15	m_a 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

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Table 4-13
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4E

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
19A	FS	1.21E+00	1.10E-01	2.25E-01	4.94E-01	0.05	2	
19B	FS	1.15E+00	5.00E-02	1.44E-01	4.64E-01	0.02	2	4.00E-02
19C	FS	6.16E-01	0.00E+00	1.42E-01	4.66E-01	0.00	2	0.02
19D	FS	1.02E+00	0.00E+00	1.68E-01	4.07E-01	0.00	3	2
20A	FS	9.93E-01	0.00E+00	1.47E-01	3.85E-01	0.00	2	
20B	FS	7.51E-01	0.00E+00	1.07E-01	4.04E-01	0.00	1	0.00E+00
20E	FS	9.40E-01	0.00E+00	1.84E-01	5.74E-01	0.00	2	0.00
20D	FS	9.40E-01	0.00E+00	1.28E-01	4.36E-01	0.00	1	1
20F	FS	8.98E-01	0.00E+00	1.79E-01	4.68E-01	0.00	1	
21C	FS	9.33E-01	0.00E+00	9.40E-02	2.80E-01	0.00	2	2.10E-01
21D	FS	1.52E+00	4.20E-01	2.27E-01	4.64E-01	0.19	2	0.09
								2
90C	CS	8.80E-01	0.00E+00	1.39E-01	5.18E-01	0.00	2	NA
91A	FS	1.08E+00	0.00E+00	1.52E-01	5.03E-01	0.00	2	0.00E+00
91B	FS	7.51E-01	0.00E+00	1.31E-01	4.21E-01	0.00	1	0.00
								2
92A	FS	9.23E-01	0.00E+00	1.52E-01	3.19E-01	0.00	1	0.00E+00
92B	FS	6.65E-01	0.00E+00	1.11E-01	4.41E-01	0.00	1	0.00
92D	FS	8.15E-01	0.00E+00	1.18E-01	4.09E-01	0.00	1	1
93A	FS	7.47E-01	0.00E+00	7.40E-02	3.22E-01	0.00	1	0.00E+00
93C	FS	8.99E-01	0.00E+00	1.93E-01	5.00E-01	0.00	2	0.00
93D	FS	7.76E-01	0.00E+00	1.08E-01	3.24E-01	0.00	1	1
94C	FS	1.16E+00	6.00E-02	1.94E-01	4.31E-01	0.03	1	8.50E-02
94D	FS	1.21E+00	1.10E-01	1.62E-01	4.79E-01	0.05	0	0.04
								1
100A	FS	9.90E-01	0.00E+00	1.12E-01	3.09E-01	0.00	1	2.50E-02
100B	FS	1.15E+00	5.00E-02	1.89E-01	3.36E-01	0.02	1	0.01
								1
133A	FS	1.30E+00	2.00E-01	1.90E-01	3.60E-01	0.09	1	6.67E-02
133B	FS	1.03E+00	0.00E+00	1.23E-01	4.15E-01	0.00	1	0.03
133D	FS	8.63E-01	0.00E+00	1.35E-01	3.00E-01	0.00	1	1
136A	FS	9.16E-01	0.00E+00	1.56E-01	4.47E-01	0.00	1	0.00E+00
136C	FS	8.91E-01	0.00E+00	1.27E-01	4.54E-01	0.00	1	0.00
136D	FS	9.06E-01	0.00E+00	1.37E-01	4.69E-01	0.00	2	1
179C	CS	2.51E+00	1.41E+00	1.87E-01	5.10E-01	0.63	1	1.36E+00
179D	CS	2.40E+00	1.30E+00	2.10E-01	3.59E-01	0.59	0	0.61
								1
Degrees of Freedom:	31	1.06E+00	1.16E-01			0.05	1	Average
		4.13E-01	3.36E-01			0.15	1	Std Deviation
		6.16E-01	0.00E+00			0.00	0	Minimum
		2.51E+00	1.41E+00			0.63	3	Maximum
t value*		9.37E-01	0.00E+00			0.00	1	Median
1.70		1.18E+00	2.17E-01			0.10	2	μ_α 95%CL
2.04		1.21E+00	2.37E-01			0.11	2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

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Table 4-14
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4F

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
152A	FS	2.22E+00	1.12E+00	1.71E-01	4.88E-01	0.50	0	
152B	FS	8.88E-01	0.00E+00	1.33E-01	4.69E-01	0.00	-1	3.35E-01
152C	FS	1.32E+00	2.20E-01	2.00E-01	5.08E-01	0.10	-1	0.15
152D	FS	1.01E+00	0.00E+00	1.00E-01	4.51E-01	0.00	0	-1
Degrees of Freedom:	3	1.36E+00	3.35E-01			0.15	-1	Average
		6.02E-01	5.34E-01			0.24	1	Std Deviation
		8.88E-01	0.00E+00			0.00	-1	Minimum
		2.22E+00	1.12E+00			0.50	0	Maximum
t value*		1.17E+00	1.10E-01			0.05	-1	Median
2.353		2.07E+00	9.63E-01			0.43	0	μ_α 95%CL
3.182		2.32E+00	1.18E+00			0.53	0	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-15
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4G

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
120C	FS	1.41E+00	3.10E-01	1.72E-01	4.54E-01	0.14	-1	1.60E-01
120D	FS	1.11E+00	1.00E-02	1.70E-01	4.14E-01	0.00	-2	0.07
								-2
121C	FS	1.02E+00	0.00E+00	1.18E-01	4.42E-01	0.00	-1	0.00E+00
121D	FS	1.00E+00	0.00E+00	9.10E-02	2.39E-01	0.00	-1	0.00
								-1
116C	FS	1.06E+00	0.00E+00	1.37E-01	3.96E-01	0.00	0	9.50E-02
116D	FS	1.29E+00	1.90E-01	1.44E-01	3.97E-01	0.09	0	0.04
								0
117C	FS	1.23E+00	1.30E-01	1.58E-01	5.22E-01	0.06	-1	1.35E-01
117D	FS	1.24E+00	1.40E-01	1.42E-01	5.21E-01	0.06	-1	0.06
								-1
118C	FS	8.94E-01	0.00E+00	1.16E-01	3.58E-01	0.00	0	0.00E+00
118D	FS	9.76E-01	0.00E+00	1.47E-01	5.28E-01	0.00	-1	0.00
								-1
119C	FS	1.12E+00	2.00E-02	1.51E-01	4.68E-01	0.01	-2	1.00E-02
119D	FS	9.95E-01	0.00E+00	1.18E-01	3.53E-01	0.00	-1	0.00
								-2
154A	FS	9.36E-01	0.00E+00	1.13E-01	3.76E-01	0.00	0	
154B	FS	1.12E+00	2.00E-02	1.48E-01	3.99E-01	0.01	-1	7.00E-02
154C	FS	1.36E+00	2.60E-01	3.00E-01	6.70E-01	0.12	-1	0.03
154D	FS	7.00E-01	0.00E+00	1.32E-01	4.96E-01	0.00	0	-1
155A	FS	9.03E-01	0.00E+00	2.21E-01	5.78E-01	0.00	0	
155B	FS	9.31E-01	0.00E+00	1.23E-01	2.95E-01	0.00	0	0.00E+00
155C	FS	6.68E-01	0.00E+00	1.03E-01	4.05E-01	0.00	0	0.00
155D	FS	1.01E+00	0.00E+00	1.35E-01	3.71E-01	0.00	-1	0
156A	FS	1.15E+00	5.00E-02	1.53E-01	6.58E-01	0.02	-2	
156B	FS	1.17E+00	7.00E-02	1.92E-01	4.17E-01	0.03	-1	3.00E-02
156C	FS	7.88E-01	0.00E+00	1.46E-01	5.60E-01	0.00	0	0.01
156D	FS	9.68E-01	0.00E+00	1.50E-01	4.46E-01	0.00	0	-1
122C	FS	1.13E+00	3.00E-02	1.50E-01	5.63E-01	0.01	-1	6.00E-02
122D	FS	1.19E+00	9.00E-02	2.18E-01	5.49E-01	0.04	-1	0.03
								-1
123C	FS	1.06E+00	0.00E+00	1.27E-01	4.40E-01	0.00	-1	0.00E+00
123D	FS	9.96E-01	0.00E+00	1.23E-01	3.89E-01	0.00	-1	0.00
								-1
Degrees of Freedom:	27	1.05E+00	4.71E-02			0.02	-1	Average
		1.77E-01	8.42E-02			0.04	1	Std Deviation
		6.68E-01	0.00E+00			0.00	-2	Minimum
		1.41E+00	3.10E-01			0.14	0	Maximum
t value*		1.04E+00	0.00E+00			0.00	-1	Median
1.703		1.11E+00	7.42E-02			0.03	-1	μ_α 95%CL
2.052		1.12E+00	7.98E-02			0.04	0	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 µR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

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Table 4-16
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4H

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
129C	FS	9.59E-01	0.00E+00	1.39E-01	2.97E-01	0.00	2	0.00E+00
129D	FS	9.51E-01	0.00E+00	1.30E-01	4.13E-01	0.00	6	0.00
								4
130C	FS	1.09E+00	0.00E+00	1.48E-01	4.64E-01	0.00	6	0.00E+00
130D	FS	1.05E+00	0.00E+00	1.03E-01	3.53E-01	0.00	2	0.00
								4
131C	FS	9.53E-01	0.00E+00	1.53E-01	2.88E-01	0.00	1	0.00E+00
131D	FS	9.31E-01	0.00E+00	9.90E-02	2.78E-01	0.00	1	0.00
								1
132C	FS	9.53E-01	0.00E+00	6.20E-02	2.80E-01	0.00	1	0.00E+00
132D	FS	6.68E-01	0.00E+00	1.15E-01	3.81E-01	0.00	1	0.00
								1
Degrees of Freedom:	7	9.44E-01	0.00E+00			0.00	3	Average
		1.25E-01	0.00E+00			0.00	2	Std Deviation
		6.68E-01	0.00E+00			0.00	1	Minimum
		1.09E+00	0.00E+00			0.00	6	Maximum
t value*		9.53E-01	0.00E+00			0.00	2	Median
1.895		1.03E+00	0.00E+00			0.00	4	μ_α 95%CL
2.365		1.05E+00	0.00E+00			0.00	4	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-17
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4I

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
95C	FS	8.30E-01	0.00E+00	9.30E-02	3.47E-01	0.00	1	2.00E-02
95D	FS	1.14E+00	4.00E-02	1.22E-01	2.38E-01	0.02	1	0.01
								1
96E	FS	1.20E+00	1.00E-01	1.32E-01	5.11E-01	0.04	2	1.40E-01
96F	FS	1.42E+00	3.20E-01	2.11E-01	4.47E-01	0.14	1	0.06
96G	FS	9.32E-01	0.00E+00	1.34E-01	4.50E-01	0.00	1	1
101A	FS	1.30E+00	2.00E-01	1.84E-01	2.68E-01	0.09	1	
101B	FS	8.29E-01	0.00E+00	1.22E-01	1.88E-01	0.00	1	
101C	FS	1.07E+00	0.00E+00	1.31E-01	4.09E-01	0.00	2	
101D	FS	1.06E+00	0.00E+00	1.76E-01	4.60E-01	0.00	1	1.46E-01
101E	FS	9.41E-01	0.00E+00	1.37E-01	4.32E-01	0.00	1	0.07
101F	FS	1.60E+00	5.00E-01	1.56E-01	3.93E-01	0.23	1	1
101G	FS	1.50E+00	4.00E-01	1.95E-01	4.23E-01	0.18	0	
101H	FS	1.05E+00	0.00E+00	1.79E-01	5.01E-01	0.00	1	
101I	FS	8.40E-01	0.00E+00	1.47E-01	5.16E-01	0.00	2	
101J	FS	1.46E+00	3.60E-01	2.08E-01	4.70E-01	0.16	1	
102A	FS	1.02E+00	0.00E+00	1.54E-01	4.37E-01	0.00	1	
102B	FS	7.46E-01	0.00E+00	2.33E-01	4.83E-01	0.00	2	8.00E-02
102C	FS	1.21E+00	1.10E-01	1.20E-01	2.95E-01	0.05	1	0.04
102D	FS	1.31E+00	2.10E-01	1.55E-01	4.13E-01	0.09	1	1
103C	FS	1.12E+00	2.00E-02	2.81E-01	3.33E-01	0.01	2	1.00E-02
103D	FS	4.42E-01	0.00E+00	1.36E-01	5.56E-01	0.00	1	0.00
								2
104C	FS	1.83E+00	7.30E-01	1.97E-01	2.75E-01	0.33	2	NA
Degrees of Freedom:	21	1.13E+00	1.36E-01			0.06	1	Average
		3.16E-01	2.04E-01			0.09	1	Std Deviation
		4.42E-01	0.00E+00			0.00	0	Minimum
		1.83E+00	7.30E-01			0.33	2	Maximum
t value*		1.10E+00	1.00E-02			0.00	1	Median
1.721		1.25E+00	2.11E-01			0.09	1	μ_α 95%CL
2.08		1.27E+00	2.27E-01			0.10	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Table 4-18
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4J

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
150A	FS	8.29E-01	0.00E+00	2.73E-01	5.35E-01	0.00	-2	
150B	FS	9.48E-01	0.00E+00	1.29E-01	3.89E-01	0.00	-2	0.00E+00
150C	FS	1.02E+00	0.00E+00	2.42E-01	5.18E-01	0.00	-2	0.00
150D	FS	3.73E-01	0.00E+00	1.00E-01	3.02E-01	0.00	-2	-2
Degrees of Freedom:	3	7.93E-01	0.00E+00			0.00	-2	Average
		2.91E-01	0.00E+00			0.00	0	Std Deviation
		3.73E-01	0.00E+00			0.00	-2	Minimum
		1.02E+00	0.00E+00			0.00	-2	Maximum
t value*		8.89E-01	0.00E+00			0.00	-2	Median
2.353		1.13E+00	0.00E+00			0.00	-2	μ_α 95%CL
3.182		1.25E+00	0.00E+00			0.00	-2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-19
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4K

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
111C	FS	8.62E-01	0.00E+00	9.40E-02	3.67E-01	0.00	-1	1.85E-01
111D	FS	1.47E+00	3.70E-01	2.66E-01	5.36E-01	0.17	-2	0.08
								-2
Degrees of Freedom:	1	1.17E+00	1.85E-01			0.08	-2	Average
		4.30E-01	2.62E-01			0.12	1	Std Deviation
		8.62E-01	0.00E+00			0.00	-2	Minimum
		1.47E+00	3.70E-01			0.17	-1	Maximum
t value*		1.17E+00	1.85E-01			0.08	-2	Median
6.314		3.09E+00	1.35E+00			0.61	2	μ_α 95%CL
12.706		5.03E+00	2.54E+00			1.14	5	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-20
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4L

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
192C	FS	6.64E-01	0.00E+00	1.03E-01	3.85E-01	0.00	-1	
192D	FS	1.56E+00	4.59E-01	2.20E-01	5.18E-01	0.21	1	2.94E-01
193C	FS	1.44E+00	3.40E-01	2.39E-01	4.82E-01	0.15	1	0.19
193D	FS	1.73E+00	6.30E-01	1.83E-01	6.06E-01	0.28	1	0
193E	FS	1.45E+00	3.47E-01	1.24E-01	3.64E-01	0.27	0	
193F	FS	1.20E+00	1.02E-01	2.11E-01	4.60E-01	0.16	1	
193G	FS	1.46E+00	3.56E-01	1.42E-01	4.26E-01	0.27	0	
193H	FS	1.22E+00	1.21E-01	1.24E-01	2.96E-01	0.16	-1	
106D	FS	1.18E+00	8.10E-02	2.54E-01	5.55E-01	0.04	1	8.73E-02
106E	FS	1.28E+00	1.81E-01	1.58E-01	5.80E-01	0.08	0	0.04
106F	FS	7.90E-01	0.00E+00	1.18E-01	3.21E-01	0.00	0	0
198A	FS	1.53E+00	4.30E-01	1.64E-01	5.50E-01	0.19	1	
198B	FS	1.84E+00	7.40E-01	1.39E-01	4.20E-01	0.33	2	1.46E+00
198C	FS	3.76E+00	2.66E+00	2.38E-01	3.41E-01	1.20	3	0.65
198D	FS	3.09E+00	1.99E+00	1.87E-01	3.85E-01	0.90	4	3
Wgt. Avg of Grid 198:		2.48E+00	1.38E+00			0.62		
Degrees of Freedom:	15	1.67E+00	6.13E-01			0.30	1	Average
		8.10E-01	7.61E-01			0.33	1	Std Deviation
		6.64E-01	0.00E+00			0.00	-1	Minimum
		3.76E+00	2.66E+00			1.20	4	Maximum
t value*		1.45E+00	3.52E-01			0.20	1	Median
1.753		2.02E+00	9.47E-01			0.45	1	μ_α 95%CL
2.131		2.10E+00	1.02E+00			0.48	2	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average net Th-232, unity and exposure rate is calculated for each final survey grid.

Finally, the average, standard deviation, median, minimum, maximum, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for Grid 198.

Weighted Average = ($20m^2/100m^2$) x elevated measurement + ($80m^2/100m^2$) x average of unelevated measurements

Grid 198 contained an elevated area of 20m2 with Th-232 activity concentration = 3.76 pCi/g.

Table 4-21
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 4M

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
209C	CS	1.16E+00	6.00E-02	2.14E+00	4.56E-01	0.03	1	4.64E-01
209D	FS	1.97E+00	8.67E-01	2.56E-01	5.42E-01	0.39	1	0.21
								1
210C	FS	7.79E-01	0.00E+00	1.24E-01	5.01E-01	0.00	0	4.14E-01
210D	FS	2.34E+00	1.24E+00	2.72E-01	6.62E-01	0.56	2	0.19
210E	FS	9.51E-01	0.00E+00	1.37E-01	4.64E-01	0.00	1	1
189C	FS	7.76E-01	0.00E+00	1.21E-01	2.93E-01	0.00	1	0.00E+00
189D	FS	9.88E-01	0.00E+00	1.43E-01	4.47E-01	0.00	1	0.00
								1
216A	FS	8.48E-01	0.00E+00	1.29E-01	4.36E-01	0.00	-1	
216B	FS	8.11E-01	0.00E+00	9.80E-02	2.22E-01	0.00	-1	2.33E-03
216C	FS	9.55E-01	0.00E+00	1.44E-01	5.38E-01	0.00	-1	0.00
216D	FS	1.11E+00	1.40E-02	1.25E-01	4.68E-01	0.01	-1	-1
216E	FS	7.14E-01	0.00E+00	1.19E-01	4.32E-01	0.00	-1	
216F	FS	4.84E-01	0.00E+00	1.07E-01	3.97E-01	0.00	-1	
215A	FS	1.21E+00	1.10E-01	1.28E-01	4.94E-01	0.05	0	
215B	FS	1.04E+00	0.00E+00	1.48E-01	4.41E-01	0.00	-1	1.91E-01
215C	FS	1.38E+00	2.83E-01	1.32E-01	4.20E-01	0.13	0	0.09
215D	FS	1.05E+00	0.00E+00	1.40E-01	3.54E-01	0.00	-1	0
215E	FS	1.66E+00	5.63E-01	1.84E-01	5.60E-01	0.25	0	
213A	FS	1.08E+00	0.00E+00	1.28E-01	4.51E-01	0.00	-1	
213B	FS	5.13E-01	0.00E+00	9.40E-02	3.09E-01	0.00	0	1.00E-02
213C	CS	1.14E+00	4.00E-02	1.37E-01	3.92E-01	0.02	1	0.00
213D	CS	7.52E-01	0.00E+00	1.76E-01	4.24E-01	0.00	1	0
Degrees of Freedom:	21	1.08E+00	1.44E-01			0.07	0	Average
		4.42E-01	3.27E-01			0.15	1	Std Deviation
		4.84E-01	0.00E+00			0.00	-1	Minimum
		2.34E+00	1.24E+00			0.56	2	Maximum
t value*		1.01E+00	0.00E+00			0.00	0	Median
1.721		1.24E+00	2.64E-01			0.12	0	μ_α 95%CL
2.080		1.27E+00	2.90E-01			0.13	0	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-22
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 5A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
56A	FS	2.14E+00	1.04E+00	1.88E-01	4.67E-01	0.47	2	
56B	CS	1.30E+00	2.00E-01	1.46E-01	3.07E-01	0.09	2	4.40E-01
56C	CS	1.62E+00	5.20E-01	1.76E-01	3.90E-01	0.23	2	0.20
56D	CS	1.04E+00	0.00E+00	1.05E-01	3.46E-01	0.00	1	2
169A	FS	2.05E+00	9.50E-01	1.03E-01	3.91E-01	0.43	1	
169B	FS	1.77E+00	6.70E-01	1.64E-01	4.81E-01	0.30	2	9.75E-01
169C	FS	2.36E+00	1.26E+00	2.37E-01	4.55E-01	0.57	1	0.44
169D	FS	2.12E+00	1.02E+00	1.86E-01	4.17E-01	0.46	2	2
170A	FS	6.94E-01	0.00E+00	1.16E-01	3.18E-01	0.00	0	
170B	CS	5.74E-01	0.00E+00	1.01E-01	3.55E-01	0.00	1	5.00E-02
170C	FS	1.30E+00	2.00E-01	1.29E-01	3.52E-01	0.09	1	0.02
170D	FS	8.10E-01	0.00E+00	1.18E-01	3.62E-01	0.00	1	1
Degrees of Freedom:	11	1.48E+00	4.88E-01			0.22	1	Average
		6.17E-01	4.81E-01			0.22	1	Std Deviation
		5.74E-01	0.00E+00			0.00	0	Minimum
		2.36E+00	1.26E+00			0.57	2	Maximum
t value*		1.46E+00	3.60E-01			0.16	1	Median
1.796		1.80E+00	7.38E-01			0.33	2	m_a 95%CL
2.201		1.87E+00	7.94E-01			0.36	2	m_a 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-23
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 5B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
61A1	FS	7.42E-01	0.00E+00	1.93E-01	4.26E-01	0.00	1	
61A2	FS	9.14E-01	0.00E+00	1.32E-01	4.36E-01	0.00	1	0.00E+00
61B1	FS	9.24E-01	0.00E+00	1.43E-01	2.94E-01	0.00	1	0.00
61B2	FS	6.95E-01	0.00E+00	1.09E-01	4.34E-01	0.00	1	1
61C1	FS	8.32E-01	0.00E+00	9.80E-02	3.14E-01	0.00	1	
61C2	FS	4.83E-01	0.00E+00	2.10E-01	4.80E-01	0.00	1	
167A	CS	1.07E+00	0.00E+00	1.53E-01	6.69E-01	0.00	1	
167B	CS	1.02E+00	0.00E+00	2.06E-01	5.06E-01	0.00	1	1.90E-01
167C	CS	1.35E+00	2.50E-01	1.44E-01	3.83E-01	0.11	1	0.09
167D	FS	1.61E+00	5.10E-01	1.40E-01	3.74E-01	0.23	1	1
Degrees of Freedom:	9	9.64E-01	7.60E-02			0.03	1	Average
		3.26E-01	1.72E-01			0.08	0	Std Deviation
		4.83E-01	0.00E+00			0.00	1	Minimum
		1.61E+00	5.10E-01			0.23	1	Maximum
t value*		9.19E-01	0.00E+00			0.00	1	Median
1.833		1.15E+00	1.75E-01			0.08	1	μ_α 95%CL
2.262		1.20E+00	1.99E-01			0.09	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-24
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 6A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
157A	FS	2.66E+00	1.56E+00	1.80E-01	3.59E-01	0.70	0	
157B	FS	8.21E-01	0.00E+00	2.18E-01	5.22E-01	0.00	0	5.08E-01
157C	FS	1.57E+00	4.70E-01	1.46E-01	5.15E-01	0.21	0	0.23
157D	FS	1.02E+00	0.00E+00	1.46E-01	3.80E-01	0.00	1	0
158A	FS	1.46E+00	3.60E-01	1.28E-01	3.53E-01	0.16	0	
158B	FS	7.33E-01	0.00E+00	1.08E-01	3.72E-01	0.00	0	9.00E-02
158C	FS	7.71E-01	0.00E+00	1.18E-01	3.83E-01	0.00	0	0.04
158D	FS	1.01E+00	0.00E+00	1.63E-01	3.68E-01	0.00	0	0
175A	FS	8.70E-01	0.00E+00	2.56E-01	5.61E-01	0.00	0	
175B	FS	1.36E+00	2.60E-01	1.55E-01	4.85E-01	0.12	0	1.98E-01
175C	FS	1.49E+00	3.90E-01	1.51E-01	5.18E-01	0.18	0	0.09
175D	FS	1.24E+00	1.40E-01	1.46E-01	4.10E-01	0.06	0	0
Degrees of Freedom:	11	1.25E+00	2.65E-01			0.12	0	Average
		5.34E-01	4.45E-01			0.20	0	Std Deviation
		7.33E-01	0.00E+00			0.00	0	Minimum
		2.66E+00	1.56E+00			0.70	1	Maximum
t value*		1.13E+00	7.00E-02			0.03	0	Median
1.796		1.53E+00	4.96E-01			0.22	0	μ_α 95%CL
2.201		1.59E+00	5.48E-01			0.25	0	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-25
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 6B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (mR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
161A	FS	8.59E-01	0.00E+00	1.08E-01	3.06E-01	0.00	1	
161B	FS	1.10E+00	0.00E+00	1.16E-01	4.13E-01	0.00	1	1.00E-02
161C	FS	1.14E+00	4.00E-02	1.92E-01	4.42E-01	0.02	1	0.00
161D	FS	9.50E-01	0.00E+00	1.33E-01	4.25E-01	0.00	1	1
162A	FS	1.14E+00	4.00E-02	1.29E-01	3.05E-01	0.02	2	
162B	FS	8.37E-01	0.00E+00	1.17E-01	4.56E-01	0.00	2	4.25E-02
162C	FS	8.54E-01	0.00E+00	1.27E-01	3.95E-01	0.00	2	0.02
162D	FS	1.23E+00	1.30E-01	1.63E-01	3.14E-01	0.06	1	2
163A	FS	8.78E-01	0.00E+00	1.35E-01	4.43E-01	0.00	1	
163B	FS	4.06E+00	2.96E+00	3.39E-01	4.37E-01	1.33	1	9.60E-01
163C	FS	9.74E-01	0.00E+00	1.58E-01	3.56E-01	0.00	1	0.43
163D	FS	1.98E+00	8.80E-01	2.25E-01	4.41E-01	0.40	0	1
164A	FS	2.46E+00	1.36E+00	1.78E-01	4.36E-01	0.61	1	
164B	FS	1.24E+00	1.40E-01	1.61E-01	3.94E-01	0.06	1	3.75E-01
164C	FS	9.35E-01	0.00E+00	1.65E-01	3.26E-01	0.00	0	0.17
164D	FS	8.17E-01	0.00E+00	1.27E-01	4.12E-01	0.00	0	1
165A	FS	2.30E+00	1.20E+00	2.52E-01	5.07E-01	0.54	1	
165B	FS	1.15E+00	5.00E-02	1.27E-01	4.70E-01	0.02	0	5.98E-01
165C	FS	1.81E+00	7.10E-01	1.68E-01	4.14E-01	0.32	0	0.27
165D	FS	1.53E+00	4.30E-01	1.21E-01	3.64E-01	0.19	0	0
Weighted Avg. of Grid 163:		1.50E+00	5.07E-01			2.28E-01		
Degrees of Freedom:	20	1.42E+00	4.02E-01			0.18	1	Average
		7.75E-01	7.22E-01			0.32	1	Std Deviation
		8.17E-01	0.00E+00			0.00	0	Minimum
		4.06E+00	2.96E+00			1.33	2	Maximum
t value*		1.14E+00	4.00E-02			0.02	1	Median
1.725		1.71E+00	6.74E-01			0.30	1	μ_α 95%CL
2.086		1.77E+00	7.31E-01			0.33	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average net Th-232, unity and exposure rate is calculated for each final survey grid.

Finally, the average, standard deviation, median, minimum, maximum, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for Grid 163.

Weighted Average = ($4m^2/50m^2$) x elevated measurement + ($46m^2/50m^2$) x average of unelevated measurements

Grid 163 contained an elevated area of 4m2 with Th-232 activity concentration = 4.06 pCi/g.

Table 4-26
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 6C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
176A	FS	9.75E-01	0.00E+00	1.46E-01	4.53E-01	0.00	0	
176B	FS	1.27E+00	1.70E-01	1.99E-01	3.96E-01	0.08	0	6.50E-02
176C	FS	1.19E+00	9.00E-02	1.45E-01	4.16E-01	0.04	0	0.03
176D	FS	9.25E-01	0.00E+00	1.50E-01	5.79E-01	0.00	0	0
Degrees of Freedom:	3	1.09E+00	6.50E-02			0.03	0	Average
		1.66E-01	8.19E-02			0.04	0	Std Deviation
		9.25E-01	0.00E+00			0.00	0	Minimum
		1.27E+00	1.70E-01			0.08	0	Maximum
t value*		1.08E+00	4.50E-02			0.02	0	Median
2.353		1.29E+00	1.61E-01			0.07	0	μ_α 95%CL
3.182		1.35E+00	1.95E-01			0.09	0	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-27
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
26C	FS	7.97E-01	0.00E+00	1.33E-01	4.04E-01	0.00	0	8.15E-01
26D	FS	2.73E+00	1.63E+00	1.70E-01	3.52E-01	0.73	0	0.37
								0
25C	FS	2.19E+00	1.09E+00	1.94E-01	6.92E-01	0.49	1	5.45E-01
25D	FS	8.02E-01	0.00E+00	1.47E-01	4.93E-01	0.00	1	0.25
								1
28C	FS	7.44E-01	0.00E+00	7.80E-02	2.81E-01	0.00	1	0.00E+00
28D	FS	9.53E-01	0.00E+00	1.11E-01	2.55E-01	0.00	1	0.00
								1
29C	FS	9.76E-01	0.00E+00	1.34E-01	3.50E-01	0.00	1	0.00E+00
29D	FS	1.08E+00	0.00E+00	1.00E-01	3.50E-01	0.00	2	0.00
								2
1C	FS	1.80E+00	7.00E-01	1.56E-01	4.47E-01	0.32	1	5.15E-01
1D	FS	1.43E+00	3.30E-01	1.95E-01	4.45E-01	0.15	1	0.23
								1
2C	FS	2.16E+00	1.06E+00	2.02E-01	3.97E-01	0.48	1	5.30E-01
2D	FS	8.14E-01	0.00E+00	7.20E-02	3.76E-01	0.00	1	0.24
								1
3C	FS	1.03E+00	0.00E+00	9.90E-02	3.27E-01	0.00	1	1.15E-01
3D	FS	1.33E+00	2.30E-01	2.22E-01	4.71E-01	0.10	1	0.05
								1
4C	FS	1.16E+00	6.00E-02	1.35E-01	4.41E-01	0.03	1	3.00E-02
4D	FS	7.16E-01	0.00E+00	1.03E-01	4.51E-01	0.00	1	0.01
								1
5C	FS	2.46E+00	1.36E+00	2.24E-01	3.31E-01	0.61	1	6.80E-01
5D	FS	1.04E+00	0.00E+00	1.24E-01	4.30E-01	0.00	2	0.31
								2
6C	FS	9.03E-01	0.00E+00	1.22E-01	2.28E-01	0.00	1	0.00E+00
6D	FS	1.04E+00	0.00E+00	1.79E-01	4.67E-01	0.00	0	0.00
								1
7C	FS	8.65E-01	0.00E+00	9.20E-02	3.29E-01	0.00	1	4.50E-02
7D	FS	1.19E+00	9.00E-02	1.70E-01	3.69E-01	0.04	1	0.02
								1
8C	FS	1.07E+00	0.00E+00	1.60E-01	3.99E-01	0.00	0	1.00E+00
8D	FS	3.10E+00	2.00E+00	2.22E-01	4.35E-01	0.90	0	0.45
								0
9C	FS	6.77E-01	0.00E+00	1.36E-01	5.48E-01	0.00	1	2.60E-01
9D	FS	1.62E+00	5.20E-01	2.26E-01	4.15E-01	0.23	1	0.12
								1
10C	FS	3.48E+00	2.38E+00	2.13E-01	5.57E-01	1.07	1	1.19E+00
10D	FS	9.90E-01	0.00E+00	1.61E-01	3.48E-01	0.00	1	0.54
								1
11C	FS	1.95E+00	8.50E-01	2.46E-01	5.18E-01	0.38	1	8.20E-01
11D	FS	1.89E+00	7.90E-01	1.63E-01	4.82E-01	0.36	0	0.37
								1

Table 4-27
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
12C	FS	5.41E-01	0.00E+00	9.20E-02	3.67E-01	0.00	0	0.00E+00
12D	FS	5.23E-01	0.00E+00	1.22E-01	4.62E-01	0.00	1	0.00
								1
13C	FS	9.19E-01	0.00E+00	1.20E-01	3.20E-01	0.00	1	0.00E+00
13D	FS	9.35E-01	0.00E+00	8.90E-02	3.33E-01	0.00	1	0.00
								1
111A	FS	1.38E+00	2.80E-01	2.09E-01	4.08E-01	0.13	0	1.40E-01
111B	FS	1.06E+00	0.00E+00	1.17E-01	2.92E-01	0.00	0	0.06
								0
116A	FS	1.06E+00	0.00E+00	1.34E-01	4.84E-01	0.00	1	0.00E+00
116B	FS	9.94E-01	0.00E+00	2.33E-01	5.89E-01	0.00	0	0.00
								1
117A	FS	1.15E+00	5.00E-02	1.00E-01	4.51E-01	0.02	0	2.50E-02
117B	FS	1.05E+00	0.00E+00	2.19E-01	6.69E-01	0.00	0	0.01
								0
118A	FS	1.74E+00	6.40E-01	2.48E-01	5.29E-01	0.29	0	3.20E-01
118B	FS	9.96E-01	0.00E+00	1.35E-01	2.85E-01	0.00	0	0.14
								0
119A	FS	1.06E+00	0.00E+00	1.94E-01	5.84E-01	0.00	0	5.50E-02
119B	FS	1.21E+00	1.10E-01	1.39E-01	3.75E-01	0.05	0	0.02
								0
120A	FS	9.61E-01	0.00E+00	1.59E-01	4.09E-01	0.00	0	0.00E+00
120B	FS	6.21E-01	0.00E+00	1.10E-01	3.98E-01	0.00	0	0.00
								0
121A	FS	9.68E-01	0.00E+00	2.08E-01	4.18E-01	0.00	0	0.00E+00
121B	FS	7.86E-01	0.00E+00	9.70E-02	3.43E-01	0.00	0	0.00
								0
122A	FS	9.85E-01	0.00E+00	1.63E-01	5.42E-01	0.00	0	0.00E+00
122B	FS	1.09E+00	0.00E+00	1.22E-01	5.18E-01	0.00	-1	0.00
								-1
123A	FS	8.16E-01	0.00E+00	1.20E-01	3.92E-01	0.00	0	0.00E+00
123B	FS	8.65E-01	0.00E+00	1.70E-01	3.90E-01	0.00	0	0.00
								0
68A	CS	1.33E+00	2.30E-01	1.63E-01	4.42E-01	0.10	0	
68B	FS	1.72E+00	6.20E-01	1.54E-01	5.26E-01	0.28	0	2.15E-01
68C	CS	1.11E+00	1.00E-02	1.48E-01	3.95E-01	0.00	-1	0.10
68D	CS	7.89E-01	0.00E+00	1.42E-01	4.83E-01	0.00	-1	-1
72A	FS	*2.46E-01*	0.00E+00	6.00E-02	2.46E-01	0.00	1	
72B	FS	5.10E-01	0.00E+00	1.11E-01	2.34E-01	0.00	1	1.68E-01
72C	FS	1.77E+00	6.70E-01	1.35E-01	3.42E-01	0.30	-1	0.08
72D	FS	7.75E-01	0.00E+00	1.25E-01	4.99E-01	0.00	-1	0
70A	FS	2.09E+00	9.89E-01	1.53E-01	3.79E-01	0.15	1	
70B	FS	1.14E+00	3.80E-02	1.73E-01	6.41E-01	0.06	1	2.57E-01
70C	CS	8.91E-01	0.00E+00	1.48E-01	5.07E-01	0.05	-1	0.08
70D	CS	9.78E-01	0.00E+00	1.27E-01	3.37E-01	0.04	-1	0

Table 4-27
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
73A	FS	*2.69E-01*	0.00E+00	7.30E-02	2.69E-01	0.00	1	
73B	FS	5.71E-01	0.00E+00	1.09E-01	3.02E-01	0.00	1	5.49E-01
73B-1	FS	3.09E+00	1.99E+00	2.33E-01	3.59E-01	0.90	1	0.25
73B-2	FS	1.82E+00	7.20E-01	1.32E-01	3.41E-01	0.32	1	1
73B-3	FS	5.72E-01	0.00E+00	1.19E-01	2.91E-01	0.00	1	
73B-4	FS	4.43E-01	0.00E+00	9.50E-02	2.14E-01	0.00	1	
73C	FS	2.78E+00	1.68E+00	1.39E-01	3.35E-01	0.76	-1	
73D	FS	6.34E-01	0.00E+00	1.32E-01	4.18E-01	0.00	-1	
74A	FS	3.95E-01	0.00E+00	9.50E-02	3.11E-01	0.00	1	
74B	FS	5.83E-01	0.00E+00	9.50E-02	2.92E-01	0.00	1	1.53E-01
74C	FS	1.71E+00	6.10E-01	1.69E-01	5.74E-01	0.27	-1	0.07
74D	FS	8.83E-01	0.00E+00	1.29E-01	3.57E-01	0.00	-1	0
75A	FS	2.31E+00	1.21E+00	1.46E-01	3.71E-01	0.54	1	
75B	FS	1.73E+00	6.30E-01	1.31E-01	3.46E-01	0.28	1	4.85E-01
75C	FS	1.12E+00	2.00E-02	1.10E-01	3.27E-01	0.01	-1	0.22
75D	FS	1.18E+00	8.00E-02	1.78E-01	3.18E-01	0.04	-1	0
76A	FS	6.34E-01	0.00E+00	2.50E-02	2.11E-01	0.00	1	
76B	FS	1.92E+00	8.20E-01	1.27E-01	3.45E-01	0.37	1	2.88E-01
76C	FS	1.21E+00	1.10E-01	1.52E-01	3.19E-01	0.05	-1	0.13
76D	FS	1.32E+00	2.20E-01	1.08E-01	4.13E-01	0.10	-1	0
77A	FS	2.97E-01	0.00E+00	8.30E-02	3.18E-01	0.00	1	
77B	FS	1.43E+00	3.30E-01	1.26E-01	2.33E-01	0.15	1	1.20E-01
77C	FS	1.25E+00	1.50E-01	1.49E-01	3.21E-01	0.07	-1	0.05
77D	FS	7.53E-01	0.00E+00	1.14E-01	5.61E-01	0.00	-1	0
78A	FS	3.19E+00	2.09E+00	3.03E-01	4.44E-01	0.94	1	
78B	FS	1.16E+00	6.00E-02	1.27E-01	3.93E-01	0.03	1	5.80E-01
78C	FS	1.27E+00	1.70E-01	2.29E-01	4.63E-01	0.08	-1	0.26
78D	FS	1.02E+00	0.00E+00	1.46E-01	5.62E-01	0.00	-1	0
79A	FS	6.52E-01	0.00E+00	8.90E-02	3.06E-01	0.00	1	
79B	FS	1.11E+00	1.00E-02	1.82E-01	4.16E-01	0.00	1	2.50E-03
79C	FS	8.30E-01	0.00E+00	1.60E-01	3.94E-01	0.00	-1	0.00
79D	FS	1.02E+00	0.00E+00	1.22E-01	4.79E-01	0.00	-1	0
80A	FS	7.01E-01	0.00E+00	4.00E-02	3.10E-01	0.00	1	
80B	FS	7.13E-01	0.00E+00	1.04E-01	3.91E-01	0.00	1	0.00E+00
80C	FS	7.70E-01	0.00E+00	1.19E-01	3.52E-01	0.00	-1	0.00
80D	FS	9.99E-01	0.00E+00	1.96E-01	4.93E-01	0.00	-1	0
81A	FS	9.77E-01	0.00E+00	8.20E-02	5.47E-01	0.00	0	
81B	FS	1.47E+00	3.70E-01	1.51E-01	3.16E-01	0.17	0	9.25E-02
81C	FS	7.28E-01	0.00E+00	9.80E-02	3.48E-01	0.00	6	0.04
81D	FS	7.14E-01	0.00E+00	1.05E-01	3.37E-01	0.00	7	3
82A	FS	1.15E+00	5.00E-02	1.50E-01	5.17E-01	0.02	7	
82B	FS	9.80E-01	0.00E+00	1.04E-01	3.27E-01	0.00	7	1.25E-02
82C	FS	9.41E-01	0.00E+00	1.15E-01	3.76E-01	0.00	7	0.01
82D	FS	6.74E-01	0.00E+00	9.60E-02	3.78E-01	0.00	7	7

Table 4-27
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7A

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
Weighted Avg. of Grid 10		2.24E+00	1.19E+00				1	
Degrees of Freedom:	108	1.19E+00	2.68E-01			0.12	1	Average
		6.44E-01	5.24E-01			0.23	2	Std Deviation
		2.46E-01	0.00E+00			0.00	-1	Minimum
		3.48E+00	2.38E+00			1.07	7	Maximum
t value*		1.02E+00	0.00E+00			0.00	1	Median
1.661		1.30E+00	3.52E-01			0.15	1	μ_α 95%CL
1.984		1.32E+00	3.68E-01			0.16	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average net Th-232, unity and exposure rate is calculated for each final survey grid.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for Grid 10.

Weighted Average = ($10m^2/20m^2$) x elevated measurement + ($10m^2/20m^2$) x average of unelevated measurements

Grid 10 contained an elevated area of $4m^2$ with Th-232 activity concentration = 3.48 pCi/g.

Table 4-28
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
84A	FS	7.41E-01	0.00E+00	6.00E-02	2.25E-01	0.00	1	
84B	FS	9.26E-01	0.00E+00	1.17E-01	3.92E-01	0.00	2	0.00E+00
84C	FS	1.06E+00	0.00E+00	1.78E-01	4.28E-01	0.00	1	0.00
84D	FS	9.99E-01	0.00E+00	1.21E-01	3.91E-01	0.00	1	1
85A	FS	6.41E-01	0.00E+00	1.09E-01	4.33E-01	0.00	2	
85B	FS	7.81E-01	0.00E+00	1.36E-01	3.46E-01	0.00	2	0.00E+00
85C	FS	9.02E-01	0.00E+00	1.36E-01	4.34E-01	0.00	1	0.00
85D	FS	8.63E-01	0.00E+00	1.25E-01	4.92E-01	0.00	1	2
86A	FS	2.62E+00	1.52E+00	1.93E-01	4.30E-01	0.68	2	
86B	FS	1.28E+00	1.80E-01	1.28E-01	4.03E-01	0.08	2	4.25E-01
86C	FS	7.68E-01	0.00E+00	1.82E-01	3.57E-01	0.00	2	0.19
86D	FS	1.04E+00	0.00E+00	1.24E-01	4.02E-01	0.00	1	2
87A	FS	9.16E-01	0.00E+00	1.07E-01	3.58E-01	0.00	2	
87B	FS	1.12E+00	2.00E-02	1.81E-01	3.82E-01	0.01	1	5.00E-03
87C	FS	8.52E-01	0.00E+00	1.12E-01	4.20E-01	0.00	1	0.00
87D	FS	1.03E+00	0.00E+00	1.46E-01	6.20E-01	0.00	1	1
88A	FS	1.18E+00	8.00E-02	1.82E-01	3.35E-01	0.04	1	
88B	FS	8.81E-01	0.00E+00	1.51E-01	6.44E-01	0.00	1	1.58E-01
88C	FS	1.19E+00	9.00E-02	1.58E-01	6.01E-01	0.04	1	0.07
88D	FS	1.56E+00	4.60E-01	2.78E-01	5.14E-01	0.21	1	1
14C	FS	9.65E-01	0.00E+00	2.22E-01	3.72E-01	0.00	1	2.35E-01
14D	FS	1.57E+00	4.70E-01	1.60E-01	4.75E-01	0.21	1	0.11
								1
15C	FS	1.23E+00	1.30E-01	1.99E-01	4.30E-01	0.06	2	2.30E-01
15D	FS	1.43E+00	3.30E-01	1.62E-01	5.26E-01	0.15	2	0.10
								2
16C	FS	7.80E-01	0.00E+00	1.35E-01	5.15E-01	0.00	2	7.50E-02
16D	FS	1.25E+00	1.50E-01	1.29E-01	4.38E-01	0.07	2	0.03
								2
17C	FS	8.93E-01	0.00E+00	1.06E-01	3.35E-01	0.00	1	0.00E+00
17D	FS	9.91E-01	0.00E+00	1.72E-01	3.12E-01	0.00	1	0.00
								1
18C	FS	9.96E-01	0.00E+00	1.66E-01	6.26E-01	0.00	1	0.00E+00
18D	FS	8.08E-01	0.00E+00	1.08E-01	4.06E-01	0.00	1	0.00
								1
129A	FS	1.02E+00	0.00E+00	1.15E-01	1.89E-01	0.00	1	0.00E+00
129B	FS	8.72E-01	0.00E+00	1.44E-01	5.11E-01	0.00	1	0.00
								1
130A	FS	8.71E-01	0.00E+00	1.36E-01	4.61E-01	0.00	1	0.00E+00
130B	FS	8.69E-01	0.00E+00	1.32E-01	4.01E-01	0.00	1	0.00
								1
131A	FS	9.71E-01	0.00E+00	9.30E-02	3.36E-01	0.00	1	1.15E-01
131B	FS	1.33E+00	2.30E-01	1.68E-01	3.98E-01	0.10	1	0.05
								1
132A	FS	1.15E+00	5.00E-02	1.57E-01	2.72E-01	0.02	1	2.50E-02
132B	FS	9.11E-01	0.00E+00	8.40E-02	2.87E-01	0.00	1	0.01
								1

Table 4-28
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7B

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
Degrees of Freedom:	37	1.06E+00	9.76E-02			4.39E-02	1	Average
		3.39E-01	2.67E-01			1.20E-01	0	Std Deviation
		6.41E-01	0.00E+00			0.00E+00	1	Minimum
		2.62E+00	1.52E+00			6.84E-01	2	Maximum
t value*		9.81E-01	0.00E+00			0.00E+00	1	Median
1.688		1.15E+00	1.71E-01			7.68E-02	1	μ_α 95%CL
2.027		1.17E+00	1.85E-01			8.34E-02	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-29
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
89A	FS	1.01E+00	0.00E+00	1.12E-01	3.33E-01	0.00	1	
89B	FS	1.29E+00	1.90E-01	2.03E-01	4.12E-01	0.09	1	4.75E-02
89C	FS	1.01E+00	0.00E+00	1.48E-01	4.07E-01	0.00	0	0.02
89D	FS	1.03E+00	0.00E+00	1.26E-01	5.58E-01	0.00	0	1
90A	FS	1.86E+00	7.60E-01	1.68E-01	4.70E-01	0.34	1	
90B	FS	1.17E+00	7.00E-02	1.43E-01	3.04E-01	0.03	0	1.38E-01
90D	FS	9.75E-01	0.00E+00	1.28E-01	3.02E-01	0.00	0	0.06
90E	FS	9.64E-01	0.00E+00	1.14E-01	3.94E-01	0.00	0	0
90F	FS	9.74E-01	0.00E+00	1.41E-01	3.84E-01	0.00	0	
90G	FS	7.40E-01	0.00E+00	9.70E-02	3.99E-01	0.00	1	
91C	FS	7.56E-01	0.00E+00	1.22E-01	3.97E-01	0.00	1	0.00E+00
91D	FS	7.31E-01	0.00E+00	1.42E-01	5.18E-01	0.00	1	0.00
								1
92C	FS	8.17E-01	0.00E+00	1.44E-01	4.88E-01	0.00	0	NA
95A	FS	8.68E-01	0.00E+00	1.57E-01	4.12E-01	0.00	1	0.00E+00
95B	FS	1.01E+00	0.00E+00	8.90E-02	2.60E-01	0.00	1	0.00
								1
96A	FS	9.72E-01	0.00E+00	1.47E-01	4.54E-01	0.00	1	
96B	FS	1.33E+00	2.30E-01	1.98E-01	3.67E-01	0.10	0	4.60E-02
96C	FS	1.01E+00	0.00E+00	1.52E-01	4.53E-01	0.00	0	0.02
96D	FS	1.04E+00	0.00E+00	1.27E-01	5.15E-01	0.00	0	0
96H	FS	7.91E-01	0.00E+00	7.60E-02	4.06E-01	0.00	1	
97A	FS	1.17E+00	7.00E-02	1.39E-01	3.93E-01	0.03	1	
97B	FS	1.30E+00	2.00E-01	1.55E-01	5.32E-01	0.09	1	7.25E-02
97C	FS	9.58E-01	0.00E+00	1.77E-01	4.44E-01	0.00	1	0.03
97D	FS	1.12E+00	2.00E-02	1.46E-01	4.87E-01	0.01	0	1
98A	CS	9.44E-01	0.00E+00	1.31E-01	4.56E-01	0.00	1	
98B	FS	9.37E-01	0.00E+00	1.63E-01	4.05E-01	0.00	1	3.25E-02
98C	FS	1.15E+00	5.00E-02	1.84E-01	3.99E-01	0.02	0	0.01
98D	FS	1.18E+00	8.00E-02	1.41E-01	4.66E-01	0.04	1	1
99A	FS	1.45E+00	3.50E-01	1.65E-01	6.00E-01	0.16	1	
99B	FS	1.55E+00	4.50E-01	1.97E-01	4.43E-01	0.20	1	2.00E-01
99C	FS	1.02E+00	0.00E+00	1.23E-01	4.68E-01	0.00	0	0.09
99D	FS	8.79E-01	0.00E+00	1.43E-01	5.24E-01	0.00	1	1
100C	FS	1.25E+00	1.50E-01	1.51E-01	4.21E-01	0.07	0	7.50E-02
100D	FS	7.44E-01	0.00E+00	1.02E-01	4.55E-01	0.00	1	0.03
								1
103A	FS	8.91E-01	0.00E+00	1.40E-01	3.24E-01	0.00	0	1.20E-01
103B	FS	1.34E+00	2.40E-01	1.48E-01	4.06E-01	0.11	1	0.05
								1
104A	FS	9.71E-01	0.00E+00	1.30E-01	4.97E-01	0.00	1	7.43E-01
104B	FS	3.22E+00	2.12E+00	2.02E-01	3.99E-01	0.95	1	0.33
104D	FS	1.21E+00	1.10E-01	1.35E-01	3.29E-01	0.05	0	1
105A	FS	9.61E-01	0.00E+00	1.48E-01	6.20E-01	0.00	1	
105B	FS	8.71E-01	0.00E+00	9.80E-02	4.11E-01	0.00	1	3.63E-01
105C	FS	1.14E+00	4.00E-02	1.69E-01	5.31E-01	0.02	1	0.16
105D	FS	2.51E+00	1.41E+00	2.08E-01	3.29E-01	0.63	1	1

Table 4-29
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
127A	FS	6.17E-01	0.00E+00	1.05E-01	3.12E-01	0.00	0	
127B	CS	1.12E+00	2.00E-02	1.03E-01	3.92E-01	0.01	0	2.63E-01
127C	FS	2.13E+00	1.03E+00	2.42E-01	4.09E-01	0.46	0	0.12
127D	CS	6.99E-01	0.00E+00	1.04E-01	3.34E-01	0.00	0	0
133C	FS	7.54E-01	0.00E+00	1.19E-01	3.37E-01	0.00	0	NA
135A	FS	1.05E+00	0.00E+00	1.79E-01	4.05E-01	0.00	1	
135B	FS	1.08E+00	0.00E+00	1.45E-01	6.21E-01	0.00	1	2.65E-01
135C	FS	6.34E-01	0.00E+00	1.25E-01	3.12E-01	0.00	0	0.12
135D	FS	2.16E+00	1.06E+00	2.12E-01	3.37E-01	0.48	1	1
Degrees of Freedom:	51	1.14E+00	1.66E-01			0.07	1	Average
		4.76E-01	4.05E-01			0.18	0	Std Deviation
		6.17E-01	0.00E+00			0.00	0	Minimum
		3.22E+00	2.12E+00			0.95	1	Maximum
t value*		1.01E+00	0.00E+00			0.00	1	Median
1.677		1.25E+00	2.61E-01			0.12	1	μ_α 95%CL
2.009		1.27E+00	2.79E-01			0.13	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-30
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7D

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
192A	FS	1.79E+00	6.94E-01	2.82E-01	5.15E-01	0.31	0	4.68E-01
192B	FS	1.34E+00	2.41E-01	1.86E-01	6.52E-01	0.11	1	0.21
								1
193A	FS	1.78E+00	6.75E-01	1.82E-01	4.45E-01	0.30	1	3.38E-01
193B	FS	6.76E-01	0.00E+00	7.90E-02	2.28E-01	0.00	1	0.15
								1
106A	FS	1.76E+00	6.63E-01	1.99E-01	6.23E-01	0.30	1	3.37E-01
106B	FS	1.11E+00	1.10E-02	1.22E-01	3.26E-01	0.00	0	0.15
								1
Degrees of Freedom:	5	1.41E+00	3.81E-01			0.17	1	Average
		4.56E-01	3.36E-01			0.15	1	Std Deviation
		6.76E-01	0.00E+00			0.00	0	Minimum
		1.79E+00	6.94E-01			0.31	1	Maximum
t value*		1.55E+00	4.52E-01			0.20	1	Median
2.015		1.78E+00	6.57E-01			0.30	1	μ_α 95%CL
2.571		1.89E+00	7.34E-01			0.33	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 µR/hr subtracted from Gross Exposure Rate measurements.
FS = Final soil sample.
CS = Core sample.
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.

Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-31
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Survey Unit 7E

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
209A	CS	4.94E-01	0.00E+00	1.19E+00		0.00	0	1.44E-01
209B	FS	1.39E+00	2.88E-01	1.59E-01	5.06E-01	0.13	1	0.06
								1
210A	FS	1.13E+00	3.10E-02	1.90E-01	3.29E-01	0.13	1	1.55E-02
210B	FS	7.51E-01	0.00E+00	1.77E-01	5.17E-01	0.12	0	0.13
								1
189A	FS	1.31E+00	2.05E-01	1.51E-01	5.89E-01	0.09	1	5.25E-01
189B	FS	1.94E+00	8.44E-01	1.98E-01	5.35E-01	0.38	1	0.24
								1
206D	CS	1.58E+00	4.80E-01	4.80E-01	3.49E-01	0.22	3	1.47E+00
206A	CS	3.55E+00	2.45E+00	2.45E+00	3.94E-01	1.10	3	0.66
206B	CS	7.61E-01	0.00E+00	0.00E+00	5.83E-01	0.00	3	3
Wgt. Avg. Final Survey Grid 206:		1.41E+00	4.61E-01			0.21		
Degrees of Freedom:	9	1.43E+00	4.76E-01			0.24	1	Average
		8.61E-01	7.47E-01			0.32	1	Std Deviation
		4.94E-01	0.00E+00			0.00	0	Minimum
		3.55E+00	2.45E+00			1.10	1	Maximum
t value*		1.31E+00	2.05E-01			0.13	1	Median
1.833		1.93E+00	9.09E-01			0.43	1	μ_α 95%CL
.262		2.05E+00	1.01E+00			0.47	1	μ_α 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.

FS = Final soil sample.

CS = Core sample.

Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).

The average net Th-232, unity and exposure rate is calculated for each final survey grid.

Finally, the average, standard deviation, median, minimum, maximum, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for Grid 206.

Weighted Average = ($10m^2/100m^2$) x elevated measurement + ($90m^2/100m^2$) x average of unelevated measurements

Grid 206 contained an elevated area of 10m2 with Th-232 activity concentration = 3.55 pCi/g.

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
27 D	CS	6.60E-01	0.00E+00	1.20E-01	3.66E-01	0.00	1	
27 C	CS	1.06E+00	0.00E+00	1.15E-01	3.05E-01	0.00	1	6.00E-02
27 A	CS	8.28E-01	0.00E+00	1.15E-01	4.26E-01	0.00	1	0.03
27 B	CS	1.34E+00	2.40E-01	1.86E-01	4.22E-01	0.11	1	1
30 C	CS	7.34E-01	0.00E+00	1.10E-01	3.65E-01	0.00	0	
30 D	CS	1.08E+00	0.00E+00	1.93E-01	5.02E-01	0.00	0	5.80E-02
30 B	CS	8.14E-01	0.00E+00	1.43E+00	3.90E-01	0.00	0	0.03
30 A	CS	1.33E+00	2.32E-01	2.15E-01	4.31E-01	0.10	0	0
31 C	CS	1.15E+00	5.10E-02	2.29E-01	5.28E-01	0.02	0	
31 D	CS	1.04E+00	0.00E+00	1.35E-01	3.56E-01	0.00	0	1.28E-02
31 B	CS	7.12E-01	0.00E+00	1.18E-01	4.22E-01	0.00	0	0.01
31 A	CS	7.51E-01	0.00E+00	1.48E-01	2.67E-01	0.00	0	0
32 A	CS	6.74E-01	0.00E+00	1.16E-01	3.92E-01	0.00	1	
32 B	CS	7.27E-01	0.00E+00	1.51E-01	3.76E-01	0.00	1	5.01E-01
32 C	CS	3.10E+00	2.00E+00	2.86E-01	5.03E-01	0.90	1	0.23
32 D	CS	1.02E+00	0.00E+00	1.47E-01	5.33E-01	0.00	1	1
34 A	CS	7.94E-01	0.00E+00	1.33E-01	4.93E-01	0.00	2	
34 B	CS	1.43E+00	3.30E-01	1.48E-01	3.11E-01	0.15	2	8.25E-02
34 C	CS	9.97E-01	0.00E+00	9.40E-02	3.33E-01	0.00	1	0.04
34 D	CS	8.76E-01	0.00E+00	1.23E-01	3.44E-01	0.00	1	2
36 B	CS	6.54E-01	0.00E+00	1.20E-01	3.44E-01	0.00	6	
36 D	CS	7.17E-01	0.00E+00	1.25E-01	4.24E-01	0.00	4	0.00E+00
36 C	CS	1.07E+00	0.00E+00	1.31E-01	3.73E-01	0.00	4	0.00
36 A	CS	8.74E-01	0.00E+00	1.49E-01	2.99E-01	0.00	6	5
38 A	CS	8.21E-01	0.00E+00	1.77E-01	5.24E-01	0.00	6	
38 B	CS	9.13E-01	0.00E+00	1.15E-01	3.89E-01	0.00	8	0.00E+00
38 C	CS	8.42E-01	0.00E+00	1.79E-01	3.51E-01	0.00	6	0.00
38 D	CS	7.15E-01	0.00E+00	1.14E-01	4.15E-01	0.00	6	7
46 A	CS	1.25E+00	1.50E-01	1.62E-01	3.64E-01	0.07	4	
46 B	CS	1.82E+00	7.16E-01	1.70E-01	6.48E-01	0.32	3	2.48E-01
46 C	CS	1.23E+00	1.27E-01	1.14E-01	4.16E-01	0.06	0	0.11
46 D	CS	8.17E-01	0.00E+00	1.36E-01	4.87E-01	0.00	-1	2
48 B	CS	2.56E+00	1.46E+00	1.79E-01	4.93E-01	0.66	0	
48 A	CS	7.33E-01	0.00E+00	1.67E-01	5.07E-01	0.00	1	4.10E-01
48 C	CS	8.80E-01	0.00E+00	1.12E-01	4.02E-01	0.00	-1	0.18
48 D	CS	1.28E+00	1.79E-01	1.33E-01	4.00E-01	0.08	-1	-0.3
49 A	CS	1.57E+00	4.65E-01	1.68E-01	2.83E-01	0.21	0	
49 B	CS	2.29E-01	0.00E+00	7.30E-02	2.19E-01	0.00	0	4.26E-01
49 C	CS	1.91E+00	8.12E-01	1.82E-01	5.51E-01	0.37	-1	0.19
49 D	CS	BDL	BDL	BDL	2.01E-01	BDL	-1	-1
50 A	CS	7.36E-01	0.00E+00	9.70E-02	3.49E-01	0.00	1	
50 B	CS	4.00E-01	0.00E+00	9.20E-02	2.90E-01	0.00	0	0.00E+00
50 D	CS	6.59E-01	0.00E+00	1.00E-01	3.19E-01	0.00	-1	0.00
50 C	CS	6.96E-01	0.00E+00	1.12E-01	4.01E-01	0.00	-1	0

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
51 C	CS	8.03E-01	0.00E+00	1.08E-01	4.09E-01	0.00	1	
51 B	CS	1.10E+00	0.00E+00	1.36E-01	3.05E-01	0.00	-1	0.00E+00
51 A	CS	9.86E-01	0.00E+00	1.73E-01	3.27E-01	0.00	1	0.00
51 D	CS	5.15E-01	0.00E+00	1.06E-01	4.04E-01	0.00	-1	0
62 A	CS	1.37E+00	2.72E-01	1.83E-01	3.76E-01	0.12	1	6.47E-01
62 B97	CS	2.77E+00	1.67E+00	2.25E-01	5.25E-01	0.75	1	0.29
62 B99	CS	7.46E-01	0.00E+00	8.40E-02	4.38E-01	0.00	1	1
64 C	CS	8.64E-01	0.00E+00	1.60E-01	4.61E-01	0.00	0	
64 A	CS	1.74E+00	6.35E-01	1.66E-01	2.50E-01	0.29	-1	1.59E-01
64 B	CS	9.07E-01	0.00E+00	1.48E-01	3.61E-01	0.00	0	0.07
64 D	CS	8.49E-01	0.00E+00	1.03E-01	1.90E-01	0.00	0	0
65 C	CS	9.89E-01	0.00E+00	1.45E-01	4.92E-01	0.00	-1	
65 D	CS	1.78E+00	6.82E-01	1.68E-01	3.93E-01	0.31	-1	1.71E-01
65 A	CS	8.15E-01	0.00E+00	1.55E-01	5.45E-01	0.00	-1	0.08
65 B	CS	6.79E-01	0.00E+00	1.33E-01	4.53E-01	0.00	-1	-1
66 B	CS	6.19E-01	0.00E+00	1.04E-01	4.98E-01	0.00	-1	
66 A	CS	8.01E-01	0.00E+00	1.44E-01	3.43E-01	0.00	-1	0.00E+00
66 D	CS	1.02E+00	0.00E+00	1.71E-01	3.17E-01	0.00	-1	0.00
66 C	CS	8.76E-01	0.00E+00	1.09E-01	3.58E-01	0.00	-1	-1
67 A	CS	8.89E-01	0.00E+00	1.26E-01	3.69E-01	0.00	-1	0.00E+00
67 B	CS	1.01E+00	0.00E+00	1.41E-01	4.25E-01	0.00	-1	0.00
67 C	CS	7.23E-01	0.00E+00	1.34E-01	4.14E-01	0.00	-1	-1
69 D	CS	1.12E+00	1.80E-02	1.64E-01	3.98E-01	0.01	0	
69 C	CS	1.32E+00	2.19E-01	7.60E-02	3.23E-01	0.10	0	3.98E-01
69 B	CS	1.07E+00	0.00E+00	2.08E-01	4.54E-01	0.00	-1	0.18
69 A	CS	2.46E+00	1.36E+00	1.64E-01	4.23E-01	0.61	-1	-1
71 D	CS	2.75E+00	1.65E+00	2.71E-01	5.44E-01	0.74	0	
71 A	CS	7.26E-01	0.00E+00	1.61E-01	2.27E-01	0.00	1	8.16E-01
71 B	CS	8.84E-01	0.00E+00	1.50E-01	3.26E-01	0.00	1	0.37
71 C	CS	2.72E+00	1.62E+00	2.62E-01	4.48E-01	0.73	0	1
83 D	CS	8.71E-01	0.00E+00	1.91E-01	5.05E-01	0.00	0	
83 B	CS	1.36E+00	2.64E-01	1.98E-01	3.62E-01	0.12	1	2.64E-01
83 C	CS	1.27E+00	1.74E-01	1.69E-01	3.68E-01	0.08	-1	0.12
83 A	CS	1.72E+00	6.17E-01	2.08E-01	4.44E-01	0.28	0	0
107 C	CS	6.97E-01	0.00E+00	1.32E-01	4.66E-01	0.00	0	
107 B	CS	9.41E-01	0.00E+00	1.49E-01	4.63E-01	0.00	-1	1.32E-02
107 A	CS	1.17E+00	6.60E-02	1.31E-01	5.13E-01	0.03	-1	0.01
107 D	CS	9.35E-01	0.00E+00	1.31E-01	4.87E-01	0.00	0	0
107 D	CS	9.07E-01	0.00E+00	2.37E-01	5.31E-01	0.00	0	
108 B	CS	7.00E-01	0.00E+00	1.10E-01	3.64E-01	0.00	0	0.00E+00
108 A	CS	9.64E-01	0.00E+00	1.53E-01	4.35E-01	0.00	-1	0.00
108 C	CS	8.71E-01	0.00E+00	1.20E-01	3.06E-01	0.00	-1	-1

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
109 B	CS	9.19E-01	0.00E+00	2.05E-01	5.33E-01	0.00	-1	
109 A	CS	9.01E-01	0.00E+00	2.01E-01	3.76E-01	0.00	-1	9.03E-02
109 C	CS	9.95E-01	0.00E+00	1.84E-01	4.70E-01	0.00	-1	0.04
109 D	CS	1.46E+00	3.61E-01	2.21E-01	3.62E-01	0.16	-1	-1
110 D	CS	1.05E+00	0.00E+00	1.48E-01	5.29E-01	0.00	0	
110 C	CS	1.01E+00	0.00E+00	1.37E-01	4.89E-01	0.00	0	1.81E-01
110 A	CS	1.77E+00	6.65E-01	2.38E-01	5.37E-01	0.30	0	0.08
110 B	CS	1.16E+00	6.00E-02	2.17E-01	5.49E-01	0.03	0	0
112 A	CS	1.00E+00	0.00E+00	1.35E-01	4.03E-01	0.00	0	
112 C	CS	1.49E+00	3.91E-01	1.53E-01	5.07E-01	0.18	0	9.78E-02
112 D	CS	1.10E+00	0.00E+00	2.20E-01	4.25E-01	0.00	0	0.04
112 B	CS	6.02E-01	0.00E+00	1.19E-01	5.44E-01	0.00	0	0
113 D	CS	8.95E-01	0.00E+00	1.25E-01	3.15E-01	0.00	0	
113 A	CS	6.19E-01	0.00E+00	1.30E-01	4.80E-01	0.00	0	0.00E+00
113 C	CS	1.09E+00	0.00E+00	2.18E-01	4.18E-01	0.00	0	0.00
113 B	CS	9.94E-01	0.00E+00	1.43E-01	4.77E-01	0.00	0	0
114 A	CS	7.44E-01	0.00E+00	8.80E-02	2.59E-01	0.00	0	
114 B	CS	7.31E-01	0.00E+00	1.37E-01	5.73E-01	0.00	1	0.00E+00
114 C	CS	9.61E-01	0.00E+00	1.42E-01	5.28E-01	0.00	-1	0.00
114 D	CS	9.30E-01	0.00E+00	1.39E-01	4.30E-01	0.00	0	0
115 A	CS	1.02E+00	0.00E+00	1.81E-01	4.76E-01	0.00	0	
115 B	CS	1.08E+00	0.00E+00	1.20E-01	3.04E-01	0.00	0	3.50E-03
115 C	CS	1.11E+00	1.40E-02	1.85E-01	3.53E-01	0.01	0	0.00
115 D	CS	8.14E-01	0.00E+00	1.30E-01	4.71E-01	0.00	0	0
125 B	CS	9.31E-01	0.00E+00	1.26E-01	2.01E-01	0.00	1	
125 C	CS	1.13E+00	3.20E-02	1.33E-01	4.13E-01	0.01	1	1.08E-01
125 D	CS	1.50E+00	3.99E-01	1.94E-01	4.44E-01	0.18	1	0.05
125 A	CS	8.10E-01	0.00E+00	1.40E-01	4.69E-01	0.00	1	1
126 A	CS	6.90E-01	0.00E+00	1.09E-01	3.88E-01	0.00	6	
126 B	CS	1.06E+00	0.00E+00	2.02E-01	4.76E-01	0.00	2	0.00E+00
126 D	CS	8.00E-01	0.00E+00	1.91E-01	4.04E-01	0.00	1	0.00
126 C	CS	7.36E-01	0.00E+00	1.39E-01	5.47E-01	0.00	7	4
128 A	CS	1.12E+00	2.10E-02	1.16E-01	2.61E-01	0.01	2	NA
138 A	CS	2.39E+00	1.29E+00	1.79E-01	4.61E-01	0.58	0	
138 C	CS	9.78E-01	0.00E+00	1.77E-01	3.84E-01	0.00	0	3.24E-01
138 D	CS	1.01E+00	0.00E+00	1.33E-01	2.25E-01	0.00	0	0.15
138 B	CS	3.36E-01	0.00E+00	9.70E-02	3.92E-01	0.00	0	0
139 D	CS	7.95E-01	0.00E+00	1.01E-01	3.78E-01	0.00	1	
139 C	CS	8.12E-01	0.00E+00	1.26E-01	4.10E-01	0.00	1	4.52E-01
139 A	CS	2.91E+00	1.81E+00	1.99E-01	4.50E-01	0.81	1	0.20
139 B	CS	9.14E-01	0.00E+00	1.26E-01	4.26E-01	0.00	1	1
140 C	CS	8.11E-01	0.00E+00	1.83E-01	4.12E-01	0.00	1	
140 A	CS	9.40E-01	0.00E+00	1.11E-01	3.22E-01	0.00	1	0.00E+00
140 B	CS	8.14E-01	0.00E+00	1.18E-01	4.80E-01	0.00	1	0.00
140 D	CS	1.01E+00	0.00E+00	1.27E-01	4.59E-01	0.00	1	1

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
141 D	CS	9.59E-01	0.00E+00	1.27E-01	4.05E-01	0.00	1	
141 B	CS	1.02E+00	0.00E+00	1.29E-01	3.93E-01	0.00	2	0.00E+00
141 C	CS	6.03E-01	0.00E+00	1.39E-01	3.01E-01	0.00	2	0.00
141 A	CS	ND	ND	ND	6.60E-01	ND	1	2
142 C	CS	6.90E-01	0.00E+00	1.25E-01	4.07E-01	0.00	2	
142 A	CS	7.94E-01	0.00E+00	1.07E-01	3.07E-01	0.00	3	1.80E-01
142 B	CS	1.65E+00	5.52E-01	1.81E-01	4.12E-01	0.25	3	0.08
142 D	CS	1.27E+00	1.69E-01	1.83E-01	4.65E-01	0.08	3	3
143 B	CS	1.17E+00	7.30E-02	1.69E-01	4.40E-01	0.03	3	
143 D	CS	9.33E-01	0.00E+00	1.98E-01	4.99E-01	0.00	2	1.83E-02
143 A	CS	9.01E-01	0.00E+00	1.23E-01	3.10E-01	0.00	6	0.01
143 C	CS	1.09E+00	0.00E+00	1.34E-01	2.92E-01	0.00	3	4
144 A	CS	2.25E+00	1.15E+00	1.80E-01	4.11E-01	0.52	6	
144 C	CS	1.13E+00	3.20E-02	1.91E-01	4.63E-01	0.01	6	3.94E-01
144 D	CS	7.89E-01	0.00E+00	1.17E-01	3.79E-01	0.00	2	0.18
144 B99	CS	ND	ND	ND	4.76E-01	ND	2	4
145 C	CS	1.81E+00	7.08E-01	1.66E-01	3.25E-01	0.32	6	
145 B	CS	1.02E+00	0.00E+00	1.40E-01	3.65E-01	0.00	1	1.77E-01
145 D	CS	5.69E-01	0.00E+00	1.60E-01	3.65E-01	0.00	2	0.08
145 A	CS	8.67E-01	0.00E+00	1.21E-01	3.23E-01	0.00	6	4
146 C	CS	1.03E+00	0.00E+00	1.46E-01	4.30E-01	0.00	6	
146 A	CS	1.12E+00	2.20E-02	1.27E-01	8.80E-02	0.01	6	5.50E-03
146 D	CS	6.52E-01	0.00E+00	1.16E-01	3.92E-01	0.00	1	0.00
146 B	CS	6.07E-01	0.00E+00	1.16E-01	3.63E-01	0.00	2	4
147 C	CS	1.67E+00	5.68E-01	1.41E-01	3.00E+00	0.26	6	
147 D	CS	1.42E+00	3.17E-01	2.13E-01	4.26E-01	0.14	6	6.35E-01
147 A	CS	2.76E+00	1.66E+00	2.22E-01	5.01E-01	0.75	6	0.29
147 B	CS	7.59E-01	0.00E+00	1.13E-01	3.75E-01	0.00	6	6
148 C	CS	1.05E+00	0.00E+00	1.55E-01	3.83E-01	0.00	0	
148 D	CS	9.92E-01	0.00E+00	1.60E-01	3.78E-01	0.00	-1	0.00E+00
148 B	CS	1.03E+00	0.00E+00	1.33E-01	5.22E-01	0.00	-1	0.00
148 A	CS	1.02E+00	0.00E+00	1.95E-01	4.09E-01	0.00	-1	-1
149 C	CS	9.66E-01	0.00E+00	1.24E-01	4.52E-01	0.00	0	
149 D	CS	8.46E-01	0.00E+00	1.42E-01	4.90E-01	0.00	0	0.00E+00
149 B	CS	6.32E-01	0.00E+00	1.14E-01	5.73E-01	0.00	0	0.00
149 A	CS	9.08E-01	0.00E+00	9.50E-02	4.01E-01	0.00	0	0
151 C	CS	1.01E+00	0.00E+00	2.14E-01	3.94E-01	0.00	0	
151 A	CS	9.96E-01	0.00E+00	1.28E-01	4.73E-01	0.00	-1	5.43E-01
151 D	CS	3.05E+00	1.95E+00	2.05E-01	3.75E-01	0.88	-1	0.24
151 F	CS	1.85E+00	7.49E-01	1.83E-01	5.65E-01	0.34	-1	-1
151 B	CS	1.11E+00	1.30E-02	1.65E-01	5.34E-01	0.01	-1	

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
153 D	CS	1.53E+00	4.31E-01	1.53E-01	5.44E-01	0.19	-1	
153 C	CS	5.32E-01	0.00E+00	1.20E-01	3.91E-01	0.00	0	2.84E-01
153 B	CS	1.71E+00	6.11E-01	2.09E-01	3.97E-01	0.27	0	0.13
153 A	CS	1.19E+00	9.20E-02	1.50E-01	4.05E-01	0.04	0	0
160 A	CS	2.38E+00	1.28E+00	1.89E-01	5.86E-01	0.58	1	NA
168 C	CS	1.14E+00	3.80E-02	1.85E-01	3.17E-01	0.02	2	4.23E-02
168 D	CS	1.19E+00	8.90E-02	1.47E-01	4.96E-01	0.04	2	0.02
168 B	CS	8.72E-01	0.00E+00	8.80E-02	2.75E-01	0.00	1	2
171 C	SS	1.70E+00	6.00E-01	1.32E-01	4.55E-01	0.27	1	
171 D	SS	8.87E-01	0.00E+00	1.03E-01	3.70E-01	0.00	1	6.60E-01
171 A	SS	3.62E-01	0.00E+00	8.70E-02	3.40E-01	0.00	1	0.30
171 B	SS	3.14E+00	2.04E+00	2.47E-01	6.34E-01	0.92	1	1
172 C	CS	9.62E-01	0.00E+00	1.94E-01	3.45E-01	0.00	0	
172 B	CS	7.89E-01	0.00E+00	1.17E-01	3.42E-01	0.00	1	0.00E+00
172 D	CS	9.75E-01	0.00E+00	1.84E-01	5.03E-01	0.00	-1	0.00
172 A	CS	4.36E-01	0.00E+00	1.12E-01	3.90E-01	0.00	-1	0
173 D	CS	1.03E+00	0.00E+00	1.36E-01	4.22E-01	0.00	-1	
173 A	CS	7.77E-01	0.00E+00	1.89E-01	4.15E-01	0.00	0	0.00E+00
173 B	CS	7.25E-01	0.00E+00	1.28E-01	4.42E-01	0.00	-2	0.00
173 C	CS	7.68E-01	0.00E+00	1.01E-01	3.59E-01	0.00	-2	-1
174 A	CS	1.09E+00	0.00E+00	2.12E-01	3.78E-01	0.00	-2	
174 B	CS	8.13E-01	0.00E+00	1.25E-01	4.18E-01	0.00	-1	0.00E+00
174 C	CS	1.02E+00	0.00E+00	1.97E-01	3.05E-01	0.00	0	0.00
174 D	CS	8.84E-01	0.00E+00	1.30E-01	3.51E-01	0.00	-2	-1
177	CS	9.61E-01	0.00E+00	1.59E-01	3.66E-01	0.00	1	NA
178	CS	8.05E-01	0.00E+00	1.51E-01	3.83E-01	0.00	1	NA
180 A	CS	9.77E-01	0.00E+00	2.03E-01	4.44E-01	0.00	0	
180 B	CS	2.90E-01	0.00E+00	1.02E-01	3.14E-01	0.00	0	4.25E-03
180 C	CS	7.60E-01	0.00E+00	1.08E-01	3.81E-01	0.00	0	0.00
180 D	CS	1.12E+00	1.70E-02	1.82E-01	3.94E-01	0.01	0	0
181 A	CS	4.13E-01	0.00E+00	8.10E-02	2.52E-01	0.00	0	0.00E+00
181 B	CS	3.94E-01	0.00E+00	7.50E-02	1.60E-01	0.00	0	0.00
								0
182 A	CS	7.55E-01	0.00E+00	1.16E-01	3.75E-01	0.00	0	
182 B	CS	8.61E-01	0.00E+00	1.01E-01	3.80E-01	0.00	0	0.00E+00
182 C	CS	2.57E-01	0.00E+00	6.10E-02	3.14E-01	0.00	0	0.00
182 D	CS	6.07E-01	0.00E+00	1.07E-01	3.55E-01	0.00	0	0
183 A	CS	8.34E-01	0.00E+00	1.64E-01	2.96E-01	0.00	0	
183 B	CS	6.66E-01	0.00E+00	8.90E-02	2.66E-01	0.00	0	2.72E-01
183 C	CS	7.33E-01	0.00E+00	1.22E-01	3.97E-01	0.00	0	0.12
183 D	CS	2.19E+00	1.09E+00	1.83E-01	5.10E-01	0.49	0	0
184 A	CS	1.14E+00	3.70E-02	1.26E-01	4.47E-01	0.02	0	
184 B	CS	9.27E-01	0.00E+00	1.11E-01	3.42E-01	0.00	0	2.02E-02
184 C	CS	1.10E+00	3.00E-03	1.20E-01	4.03E-01	0.00	0	0.01
184 D	CS	1.14E+00	4.10E-02	1.76E-01	4.03E-01	0.02	0	0

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
185 A	CS	8.33E-01	0.00E+00	1.07E-01	4.13E-01	0.00	1	
185 B	CS	7.32E-01	0.00E+00	1.29E-01	4.96E-01	0.00	1	0.00E+00
185 C	CS	8.32E-01	0.00E+00	1.96E-01	4.94E-01	0.00	0	0.00
185 D	CS	6.84E-01	0.00E+00	9.10E-02	2.45E-01	0.00	0	1
186 A	CS	8.25E-01	0.00E+00	1.06E-01	3.49E-01	0.00	0	
186 B	CS	1.07E+00	0.00E+00	2.14E-01	3.93E-01	0.00	1	0.00E+00
186 C	CS	5.48E-01	0.00E+00	1.32E-01	4.96E-01	0.00	1	0.00
186 D	CS	5.91E-01	0.00E+00	1.34E-01	4.17E-01	0.00	1	1
187 A	CS	9.23E-01	0.00E+00	1.87E-01	3.64E-01	0.00	1	
187 B	CS	8.64E-01	0.00E+00	1.22E-01	3.91E-01	0.00	1	0.00E+00
187 C	CS	8.53E-01	0.00E+00	1.70E-01	4.48E-01	0.00	1	0.00
187 D	CS	6.94E-01	0.00E+00	1.30E-01	2.34E-01	0.00	1	1
188 A	CS	8.43E-01	0.00E+00	1.20E-01	3.78E-01	0.00	0	
188 B	CS	1.16E+00	5.70E-02	1.91E-01	4.99E-01	0.03	0	1.43E-02
188 C	CS	8.42E-01	0.00E+00	1.39E-01	5.06E-01	0.00	0	0.01
188 D	CS	5.61E-01	0.00E+00	1.05E-01	3.58E-01	0.00	1	0
190 A	CS	8.24E-01	0.00E+00	1.67E-01	4.22E-01	0.00	1	
190 B	CS	1.38E+00	2.76E-01	1.54E-01	4.69E-01	0.12	1	1.83E-01
190 C	CS	1.01E+00	0.00E+00	1.41E-01	3.64E-01	0.00	1	0.08
190 D	CS	1.56E+00	4.55E-01	1.59E-01	4.98E-01	0.20	1	1
191 A	CS	8.55E-01	0.00E+00	1.34E-01	4.78E-01	0.00	1	
191 B	CS	9.41E-01	0.00E+00	1.17E-01	3.46E-01	0.00	0	1.68E-01
191 C	CS	1.38E+00	2.84E-01	1.67E-01	3.52E-01	0.13	0	0.08
191 D	CS	1.49E+00	3.89E-01	1.46E-01	4.93E-01	0.18	-1	0
194 C	CS	9.01E-01	0.00E+00	1.45E-01	3.19E-01	0.00	-1	
194 B	CS	8.86E-01	0.00E+00	1.15E-01	3.40E-01	0.00	-1	4.40E-02
194 D	CS	1.28E+00	1.76E-01	2.06E-01	3.95E-01	0.08	-1	0.02
194 C	CS	7.88E-01	0.00E+00	1.77E-01	4.56E-01	0.00	-1	-1
195 D	CS	1.04E+00	0.00E+00	1.45E-01	3.28E-01	0.00	-1	
195 C	CS	8.70E-01	0.00E+00	8.30E-02	3.54E-01	0.00	-1	0.00E+00
195 B	CS	5.47E-01	0.00E+00	1.50E-01	5.19E-01	0.00	-1	0.00
195 A	CS	6.47E-01	0.00E+00	1.24E-01	4.17E-01	0.00	-1	-1
196 A	CS	2.00E+00	8.96E-01	2.32E-01	4.54E-01	0.40	-1	
196 C	CS	1.58E+00	4.81E-01	2.46E-01	5.34E-01	0.22	-1	4.62E-01
196 B	CS	1.14E+00	4.20E-02	1.60E-01	4.65E-01	0.02	-1	0.21
196 D	CS	1.53E+00	4.29E-01	1.61E-01	4.36E-01	0.19	-1	-1
197 A	CS	2.13E+00	1.03E+00	1.68E-01	5.07E-01	0.46	0	
197 B	CS	2.29E+00	1.19E+00	1.89E-01	3.96E-01	0.53	-1	9.89E-01
197 C	CS	2.09E+00	9.86E-01	2.10E-01	3.56E-01	0.44	-1	0.44
197 D	CS	1.85E+00	7.54E-01	1.41E-01	4.00E-01	0.34	-1	-1
199 A	CS	1.36E+00	2.57E-01	2.15E-01	5.04E-01	0.12	0	
199 C	CS	1.91E+00	8.10E-01	1.68E-01	5.30E-01	0.36	0	4.62E-01
199 D	CS	1.88E+00	7.80E-01	1.75E-01	7.47E-01	0.35	0	0.21
199 B	CS	1.01E+00	0.00E+00	1.41E-01	4.62E-01	0.00	0	0
200 A	CS	8.17E-01	0.00E+00	1.29E-01	4.59E-01	0.00	0	9.22E-01
200 B	CS	2.94E+00	1.84E+00	2.06E-01	5.48E-01	0.83	0	0.41
								0

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (µR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
201	CS	2.37E+00	1.27E+00	2.06E-01	6.35E-01	0.57	0	NA
202 A	CS	9.19E-01	0.00E+00	1.12E-01	3.52E-01	0.00	0	
202 B	CS	7.54E-01	0.00E+00	1.10E-01	3.36E-01	0.00	0	0.00E+00
202 C	CS	7.59E-01	0.00E+00	1.75E-01	5.11E-01	0.00	0	0.00
202 D	CS	1.02E+00	0.00E+00	1.49E-01	4.00E-01	0.00	1	0
203 B	CS	1.19E+00	8.70E-02	1.55E-01	4.18E-01	0.04	1	
203 C	CS	9.86E-01	0.00E+00	1.37E-01	4.05E-01	0.00	1	2.18E-02
203 D	CS	8.95E-01	0.00E+00	1.67E-01	4.13E-01	0.00	1	0.01
203 A	CS	9.88E-01	0.00E+00	1.67E-01	4.18E-01	0.00	1	1
204 A	CS	9.42E-01	0.00E+00	1.22E-01	4.68E-01	0.00	2	
204 B	CS	7.64E-01	0.00E+00	1.61E-01	3.99E-01	0.00	2	0.00E+00
204 C	CS	8.04E-01	0.00E+00	8.90E-02	3.17E-01	0.00	2	0.00
204 D	CS	6.25E-01	0.00E+00	1.25E-01	4.67E-01	0.00	3	2
205 A	CS	8.57E-01	0.00E+00	1.37E-01	6.10E-01	0.00	3	
205 C	CS	1.04E+00	0.00E+00	2.04E-01	4.90E-01	0.00	2	0.00E+00
205 B	CS	9.69E-01	0.00E+00	1.43E-01	5.33E-01	0.00	3	0.00
205 D	CS	8.90E-01	0.00E+00	1.46E-01	5.45E-01	0.00	3	3
207 A	CS	8.11E-01	0.00E+00	1.30E-01	4.69E-01	0.00	2	
207 B	CS	1.04E+00	0.00E+00	1.04E-01	3.25E-01	0.00	3	3.53E-01
207 C	CS	1.44E+00	3.40E-01	1.50E-01	3.74E-01	0.15	2	0.16
207 D	CS	2.17E+00	1.07E+00	4.02E-01	4.75E-01	0.48	3	3
208 A	CS	1.31E+00	2.13E-01	1.47E-01	3.98E-01	0.10	1	
208 B	CS	1.09E+00	0.00E+00	1.36E-01	4.34E-01	0.00	1	1.16E-01
208 D	CS	1.19E+00	8.80E-02	1.20E-01	4.16E-01	0.04	1	0.05
208 C	CS	1.26E+00	1.62E-01	1.43E-01	4.99E-01	0.07	1	1
211 A	CS	1.46E-01	0.00E+00	1.53E-01	4.65E-01	0.00	0	
211 B	CS	8.42E-01	0.00E+00	1.21E-01	2.91E-01	0.00	0	2.45E-01
211 C	CS	7.37E-01	0.00E+00	1.19E-01	4.15E-01	0.00	0	0.11
211 D	CS	2.08E+00	9.81E-01	1.82E-01	4.15E-01	0.44	0	0
212 A	CS	1.54E+00	4.44E-01	2.16E-01	5.04E-01	0.20	0	
212 B	CS	5.81E-01	0.00E+00	1.21E-01	3.15E-01	0.00	0	1.49E-01
212 C	CS	1.25E+00	1.52E-01	1.52E-01	4.56E-01	0.07	0	0.07
212 D	CS	6.12E-01	0.00E+00	9.30E-02	2.36E-01	0.00	0	0
214 A	CS	9.52E-01	0.00E+00	1.56E-01	4.24E-01	0.00	0	
214 B	CS	6.69E-01	0.00E+00	9.90E-02	2.84E-01	0.00	0	0.00E+00
214 C	CS	6.39E-01	0.00E+00	1.32E-01	3.38E-01	0.00	0	0.00
214 D	CS	4.86E-01	0.00E+00	1.10E-01	3.36E-01	0.00	0	0
218 A	SS	6.18E-01	0.00E+00	1.69E-01	3.60E-01	0.00	0	
218 B	SS	6.25E-01	0.00E+00	1.24E-01	3.27E-01	0.00	0	0.00E+00
218 C	SS	6.83E-01	0.00E+00	1.19E-01	2.84E-01	0.00	0	0.00
218 D	SS	6.34E-01	0.00E+00	1.37E-01	4.33E-01	0.00	1	0

Table 4-32
Exposure Rates and Soil Concentrations
Kaiser Adjacent Land Remediation Unaffected Areas

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)	Unity (-)	Net Exposure Rate (μR/hr)	Grid Block Average Net Th-232 / Unity / Exp. Rate
219 A	SS	6.97E-01	0.00E+00	1.17E-01	3.38E-01	0.00	1	
219 B	SS	5.56E-01	0.00E+00	1.04E-01	3.71E-01	0.00	1	0.00E+00
219 C	SS	4.41E-01	0.00E+00	1.03E-01	4.59E-01	0.00	1	0.00
219 D	SS	6.11E-01	0.00E+00	1.26E-01	4.17E-01	0.00	1	1
217 A	CS	1.61E+00	5.13E-01	1.60E-01	4.36E-01	0.23	0	
217 B	CS	5.75E-01	0.00E+00	1.29E-01	3.96E-01	0.00	0	1.28E-01
217 C	CS	5.89E-01	0.00E+00	1.42E-01	4.64E-01	0.00	1	0.06
217 D	CS	8.00E-01	0.00E+00	3.20E-02	3.32E-01	0.00	1	1
Degrees of Freedom:	310	1.06E+00	1.67E-01			0.07	1	Average
		5.16E-01	3.97E-01			0.18	2	Std Deviation
		1.46E-01	0.00E+00			0.00	-2	Minimum
		3.14E+00	2.04E+00			0.92	8	Maximum
t value*		9.31E-01	0.00E+00			0.00	0	Median
1.658		1.11E+00	2.04E-01			0.09	1	m_a 95%CL
1.98		1.12E+00	2.11E-01			0.10	1	m_a 97.5%CL

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 9 μR/hr subtracted from Gross Exposure Rate measurements.
CS = Core sample.
SS = Soil sample.
BDL = Below Detection Limit
Uncertainty represents the 95 percent confidence level, 2σ.

Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.
Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., ((Th-232 + Th-228) / 10 pCi/g) + (Th-230 / 14 pCi/g).
The average of Net Th-232, Unity and Exposure Rate are calculated for each final survey grid.
Finally, the average, standard deviation, minimum, maximum, median and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.

Table 4-33
Soil Activity Concentration and Exposure Rate Summary Table
and Residual Activity Inventory
Kaiser Adjacent Land Remediation

Survey Unit	Grid Number	Average Net Conc. Th-232 (pCi/g)	Average Unity	Average Net Exposure Rate (μR/hr)	Residual Soil Mass (g)	Residual Th-232 Activity (pCi)
1	52	1.15E-01	0.05	1	9.12E+08	1.05E+08
1	53	1.50E-02	0.01	2	9.12E+08	1.37E+07
1	54	2.00E-02	0.01	2	9.12E+08	1.82E+07
1	55	5.25E-02	0.02	2	8.64E+08	4.54E+07
1	57	1.30E-01	0.06	2	8.64E+08	1.12E+08
1	58	2.65E-01	0.12	1	9.12E+08	2.42E+08
1	59	0.00E+00	0.00	-1	9.12E+08	0.00E+00
1	60	0.00E+00	0.00	-1	9.12E+08	0.00E+00
1	166	3.75E-01	0.17	-1	9.12E+08	3.42E+08
2A	33	0.00E+00	0.00	1	8.64E+08	0.00E+00
2B	35	0.00E+00	0.00	5	9.12E+08	0.00E+00
2C	37	0.00E+00	0.00	8	9.12E+08	0.00E+00
2D	24	1.92E-01	0.09	2	6.72E+08	1.29E+08
2D	94*	0.00E+00	0.00	1	9.12E+08	0.00E+00
2D	124	2.50E-03	0.00	1	9.12E+08	2.28E+06
2D	134	6.98E-01	0.31	0	9.60E+08	6.70E+08
2D	136*	0.00E+00	0.00	2	8.64E+08	0.00E+00
2D	179	5.00E-02	0.02	1	9.12E+08	4.56E+07
2D	137	3.25E-02	0.01	1	8.64E+08	2.81E+07
2E	47	5.00E-02	0.02	1	9.12E+08	4.56E+07
2F	39	4.50E-02	0.02	8	9.12E+08	4.10E+07
2F	40	6.50E-02	0.03	8	8.64E+08	5.62E+07
2F	41	4.30E-01	0.19	7	6.72E+08	2.89E+08
2F	42	0.00E+00	0.00	8	4.80E+08	0.00E+00
2F	43	5.00E-03	0.00	6	8.64E+08	4.32E+06
2F	63	0.00E+00	0.00	7	8.64E+08	0.00E+00
2F	44	1.90E-01	0.09	5	6.72E+08	1.28E+08
2F	45	3.00E-01	0.14	4	6.72E+08	2.02E+08
2F	46	1.40E+00	0.63	3	9.60E+08	1.34E+09
3	20*	3.50E-01	0.16	2	9.12E+08	3.19E+08
3	21	6.50E-02	0.03	2	9.12E+08	5.93E+07
3	22	4.75E-02	0.02	2	8.64E+08	4.10E+07
3	23	1.83E-02	0.01	1	8.64E+08	1.58E+07
3	24	0.00E+00	0.00	2	6.72E+08	0.00E+00
3	93*	0.00E+00	0.00	1	9.12E+08	0.00E+00
3	94*	2.90E-01	0.13	2	9.12E+08	2.64E+08
4A	29	0.00E+00	0.00	1	9.12E+08	0.00E+00
4A	28	1.15E-01	0.05	1	9.12E+08	1.05E+08
4B	26	1.35E-01	0.06	1	9.12E+08	1.23E+08
4B	25	9.00E-02	0.04	1	9.12E+08	8.21E+07
4C	1	1.75E-01	0.08	1	9.12E+08	1.60E+08
4C	2	0.00E+00	0.00	1	8.16E+08	0.00E+00
4C	3	1.50E-01	0.05	1	7.68E+08	1.15E+08
4C	4	1.50E-02	0.01	1	8.64E+08	1.30E+07

Table 4-33
Soil Activity Concentration and Exposure Rate Summary Table
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Survey Unit	Grid Number	Average			Residual Soil Mass (g)	Residual Th-232 Activity (pCi)
		Net Conc. Th-232 (pCi/g)	Unity	Net Exposure Rate (µR/hr)		
4D	5	0.00E+00	0.00	21	9.12E+08	0.00E+00
4D	6	0.00E+00	0.00	19	9.12E+08	0.00E+00
4D	7	5.50E-02	0.02	11	9.12E+08	5.02E+07
4D	8	9.30E-01	0.42	11	9.12E+08	8.48E+08
4D	9	3.15E-01	0.14	11	8.64E+08	2.72E+08
4D	10	4.45E-01	0.20	15	9.12E+08	4.06E+08
4D	11	0.00E+00	0.00	15	9.12E+08	0.00E+00
4D	12	1.00E-02	0.00	15	9.12E+08	9.12E+06
4D	13	8.50E-02	0.04	15	9.12E+08	7.75E+07
4D	14	3.25E-01	0.15	13	9.12E+08	2.96E+08
4D	15	0.00E+00	0.00	11	9.12E+08	0.00E+00
4D	16	0.00E+00	0.00	11	8.64E+08	0.00E+00
4D	17	9.50E-02	0.04	8	9.12E+08	8.66E+07
4D	18	0.00E+00	0.00	3	9.12E+08	0.00E+00
4E	19	4.00E-02	0.02	2	7.68E+08	3.07E+07
4E	20	0.00E+00	0.00	1	9.12E+08	0.00E+00
4E	21	2.10E-01	0.09	2	9.12E+08	1.92E+08
4E	90*	0.00E+00	0.00	2	9.12E+08	0.00E+00
4E	91	0.00E+00	0.00	2	9.12E+08	0.00E+00
4E	92	0.00E+00	0.00	1	9.12E+08	0.00E+00
4E	93	0.00E+00	0.00	1	9.12E+08	0.00E+00
4E	94	8.50E-02	0.04	1	9.12E+08	7.75E+07
4E	100	2.50E-02	0.01	1	9.12E+08	2.28E+07
4E	133	6.67E-02	0.03	1	9.12E+08	6.08E+07
4E	136	0.00E+00	0.00	1	8.64E+08	0.00E+00
4E	179	1.36E+00	0.61	1	9.12E+08	1.24E+09
4F	152	3.35E-01	0.15	-1	9.12E+08	3.06E+08
4G	120	1.60E-01	0.07	-2	8.64E+08	1.38E+08
4G	121	0.00E+00	0.00	-1	7.68E+08	0.00E+00
4G	116	9.50E-02	0.04	0	9.12E+08	8.66E+07
4G	117	1.35E-01	0.06	-1	9.12E+08	1.23E+08
4G	118	0.00E+00	0.00	-1	9.12E+08	0.00E+00
4G	119	1.00E-02	0.00	-2	9.12E+08	9.12E+06
4G	154	7.00E-02	0.03	-1	9.12E+08	6.38E+07
4G	155	0.00E+00	0.00	0	9.12E+08	0.00E+00
4G	156	3.00E-02	0.01	-1	9.12E+08	2.74E+07
4G	122	6.00E-02	0.03	-1	8.64E+08	5.18E+07
4G	123	0.00E+00	0.00	-1	8.64E+08	0.00E+00
4H	129	0.00E+00	0.00	4	8.64E+08	0.00E+00
4H	130	0.00E+00	0.00	4	8.64E+08	0.00E+00
4H	131	0.00E+00	0.00	1	8.64E+08	0.00E+00
4H	132	0.00E+00	0.00	1	8.64E+08	0.00E+00

Table 4-33
Soil Activity Concentration and Exposure Rate Summary Table
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Survey Unit	Grid Number	Average Net Conc. Th-232 (pCi/g)	Average Unity	Average Net Exposure Rate (μR/hr)	Residual Soil Mass (g)	Residual Th-232 Activity (pCi)
4I	95	2.00E-02	0.01	1	9.12E+08	1.82E+07
4I	96	1.40E-01	0.06	1	8.64E+08	1.21E+08
4I	101	1.46E-01	0.07	1	8.64E+08	1.26E+08
4I	102	8.00E-02	0.04	1	7.68E+08	6.14E+07
4I	103	1.00E-02	0.00	2	8.64E+08	8.64E+06
4I	104*	7.30E-01	0.33	2	8.64E+08	6.31E+08
4J	150	0.00E+00	0.00	-2	9.12E+08	0.00E+00
4K	111	1.85E-01	0.08	-2	9.12E+08	1.69E+08
4L	192/193	2.94E-01	0.19	0	8.88E+08	2.61E+08
4L	106	8.73E-02	0.04	0	8.64E+08	7.54E+07
4L	198	1.46E+00	0.65	3	9.12E+08	1.33E+09
4M	209	4.64E-01	0.21	1	9.60E+08	4.45E+08
4M	210	4.14E-01	0.19	1	8.64E+08	3.58E+08
4M	189	0.00E+00	0.00	1	8.64E+08	0.00E+00
4M	216	2.33E-03	0.00	-1	8.64E+08	2.01E+06
4M	215	1.91E-01	0.09	0	7.68E+08	1.47E+08
4M	213	1.00E-02	0.00	0	9.12E+08	9.12E+06
5A	56	4.40E-01	0.20	2	9.12E+08	4.01E+08
5A	169	9.75E-01	0.44	2	9.12E+08	8.89E+08
5A	170	5.00E-02	0.02	1	9.60E+08	4.80E+07
5B	61	0.00E+00	0.00	1	7.68E+08	0.00E+00
5B	167	1.90E-01	0.09	1	7.68E+08	1.46E+08
6A	157	5.08E-01	0.23	0	9.12E+08	4.63E+08
6A	158	9.00E-02	0.04	0	9.12E+08	8.21E+07
6A	175	1.98E-01	0.09	0	9.12E+08	1.81E+08
6B	161	1.00E-02	0.00	1	8.64E+08	8.64E+06
6B	162	4.25E-02	0.02	2	8.64E+08	3.67E+07
6B	163	9.60E-01	0.43	1	8.64E+08	8.29E+08
6B	164	3.75E-01	0.17	1	8.64E+08	3.24E+08
6B	165	5.98E-01	0.27	0	9.12E+08	5.45E+08
6C	176	6.50E-02	0.03	0	7.68E+08	4.99E+07
7A	26	8.15E-01	0.37	0	9.12E+08	7.43E+08
7A	25	5.45E-01	0.25	1	9.12E+08	4.97E+08
7A	28	0.00E+00	0.00	1	9.12E+08	0.00E+00
7A	29	0.00E+00	0.00	2	9.12E+08	0.00E+00
7A	1	5.15E-01	0.23	1	9.12E+08	4.70E+08
7A	2	5.30E-01	0.24	1	8.16E+08	4.32E+08
7A	3	1.15E-01	0.05	1	7.68E+08	8.83E+07
7A	4	3.00E-02	0.01	1	8.64E+08	2.59E+07
7A	5	6.80E-01	0.31	2	9.12E+08	6.20E+08
7A	6	0.00E+00	0.00	1	9.12E+08	0.00E+00
7A	7	4.50E-02	0.02	1	9.12E+08	4.10E+07
7A	8	1.00E+00	0.45	0	9.12E+08	9.12E+08
7A	9	2.60E-01	0.12	1	8.64E+08	2.25E+08
7A	10	1.19E+00	0.54	1	9.12E+08	1.09E+09

Table 4-33
Soil Activity Concentration and Exposure Rate Summary Table
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Survey Unit	Grid Number	Average			Residual Soil Mass (g)	Residual Th-232 Activity (pCi)
		Net Conc. Th-232 (pCi/g)	Unity	Net Exposure Rate (μR/hr)		
7A	11	8.20E-01	0.37	1	9.12E+08	7.48E+08
7A	12	0.00E+00	0.00	1	9.12E+08	0.00E+00
7A	13	0.00E+00	0.00	1	9.12E+08	0.00E+00
7A	111	1.40E-01	0.06	0	9.12E+08	1.28E+08
7A	116	0.00E+00	0.00	1	9.12E+08	0.00E+00
7A	117	2.50E-02	0.01	0	9.12E+08	2.28E+07
7A	118	3.20E-01	0.14	0	9.12E+08	2.92E+08
7A	119	5.50E-02	0.02	0	9.12E+08	5.02E+07
7A	120	0.00E+00	0.00	0	8.64E+08	0.00E+00
7A	121	0.00E+00	0.00	0	7.68E+08	0.00E+00
7A	122	0.00E+00	0.00	-1	8.64E+08	0.00E+00
7A	123	0.00E+00	0.00	0	8.64E+08	0.00E+00
7A	68	2.15E-01	0.10	-1	9.12E+08	1.96E+08
7A	72	1.68E-01	0.08	0	9.12E+08	1.53E+08
7A	70	2.57E-01	0.08	0	9.12E+08	2.34E+08
7A	73	5.49E-01	0.25	1	9.12E+08	5.01E+08
7A	74	1.53E-01	0.07	0	9.12E+08	1.40E+08
7A	75	4.85E-01	0.22	0	9.12E+08	4.42E+08
7A	76	2.88E-01	0.13	0	9.12E+08	2.63E+08
7A	77	1.20E-01	0.05	0	9.12E+08	1.09E+08
7A	78	5.80E-01	0.26	0	9.12E+08	5.29E+08
7A	79	2.50E-03	0.00	0	8.64E+08	2.16E+06
7A	80	0.00E+00	0.00	0	9.12E+08	0.00E+00
7A	81	9.25E-02	0.04	3	9.12E+08	8.44E+07
7A	82	1.25E-02	0.01	7	9.12E+08	1.14E+07
7B	84	0.00E+00	0.00	1	9.12E+08	0.00E+00
7B	85	0.00E+00	0.00	2	9.12E+08	0.00E+00
7B	86	4.25E-01	0.19	2	9.12E+08	3.88E+08
7B	87	5.00E-03	0.00	1	9.12E+08	4.56E+06
7B	88	1.58E-01	0.07	1	9.12E+08	1.44E+08
7B	14	2.35E-01	0.11	1	9.12E+08	2.14E+08
7B	15	2.30E-01	0.10	2	9.12E+08	2.10E+08
7B	16	7.50E-02	0.03	2	8.64E+08	6.48E+07
7B	17	0.00E+00	0.00	1	9.12E+08	0.00E+00
7B	18	0.00E+00	0.00	1	9.12E+08	0.00E+00
7B	129	0.00E+00	0.00	1	8.64E+08	0.00E+00
7B	130	0.00E+00	0.00	1	8.64E+08	0.00E+00
7B	131	1.15E-01	0.05	1	8.64E+08	9.94E+07
7B	132	2.50E-02	0.01	1	8.64E+08	2.16E+07
7C	89	4.75E-02	0.02	1	9.12E+08	4.33E+07
7C	90	1.38E-01	0.06	0	9.12E+08	1.26E+08
7C	91	0.00E+00	0.00	1	9.12E+08	0.00E+00
7C	92*	0.00E+00	0.00	0	9.12E+08	0.00E+00
7C	95	0.00E+00	0.00	1	9.12E+08	0.00E+00
7C	96	4.60E-02	0.02	0	8.64E+08	3.97E+07

Table 4-33
Soil Activity Concentration and Exposure Rate Summary Table
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Survey Unit	Grid Number	Average Net Conc. Th-232 (pCi/g)	Average Unity	Average Net Exposure Rate (μR/hr)	Residual Soil Mass (g)	Residual Th-232 Activity (pCi)
7C	97	7.25E-02	0.03	1	7.68E+08	5.57E+07
7C	98	3.25E-02	0.01	1	9.12E+08	2.96E+07
7C	99	2.00E-01	0.09	1	9.12E+08	1.82E+08
7C	100	7.50E-02	0.03	1	9.12E+08	6.84E+07
7C	103	1.20E-01	0.05	1	8.64E+08	1.04E+08
7C	104	7.43E-01	0.33	1	8.64E+08	6.42E+08
7C	105	3.63E-01	0.16	1	9.12E+08	3.31E+08
7C	127	2.63E-01	0.12	0	8.64E+08	2.27E+08
7C	133*	0.00E+00	0.00	0	9.12E+08	0.00E+00
7C	135	2.65E-01	0.12	1	8.64E+08	2.29E+08
7D	192	4.68E-01	0.21	1	9.12E+08	4.27E+08
7D	193	3.38E-01	0.15	1	8.64E+08	2.92E+08
7D	106	3.37E-01	0.15	1	8.64E+08	2.91E+08
7E	209	1.44E-01	0.06	1	9.60E+08	1.38E+08
7E	210	1.55E-02	0.13	1	8.64E+08	1.34E+07
7E	189	5.25E-01	0.24	1	8.64E+08	4.54E+08
7E	206	1.47E+00	0.66	3	9.60E+08	1.41E+09
					Sum:	3.27E+10

Minimum Value:	0.00E+00	0.00	-2	4.80E+08	0.00E+00
Maximum Value	1.47E+00	0.66	21	9.60E+08	1.41E+09
Average Value	1.89E-01	0.09	2	8.83E+08	1.69E+08
Standard Deviation:	2.94E-01	0.13	4	5.99E+07	2.69E+08

Notes:
* Only one sample was collected in a grid, therefore, an average could not be calculated and the sample result is shown.

Appendix B

Analytical QA/QC
(Rev. 8/01)

Appendix B
Analytical QA/QC

In accordance with the Final Status Survey Plan (Reference 11), a number of samples, equal to a minimum of 10 percent of samples submitted for laboratory analysis as part of the survey, were submitted as part of the QA/QC program. Also in accordance with Reference 11, approximately one third of these samples were to be blank samples, one third spiked samples, and one third split samples. These QA/QC samples are defined as follows:

1. Blank Samples – A blank sample consisted of soil or soil-like material known to be unaffected by site processes. The blank sample material used was off-site backfill and soil samples taken from an off-site location approximately one-half mile from the site.

2. Spike Samples – A spike sample consisted of dross material taken from one of three uniformly mixed stock samples.

3. Split Samples – During final sampling, an aliquot of soil was mixed and used to fill a bag sent to the lab for analysis and a bag used to archive some of the sample. A split sample consisted of soil taken from the archive bag and submitted for analytical analysis.

Ten percent of the 921 samples submitted for gamma spectroscopy analysis as part of this report is equal to 92 samples. A total of 131 samples were submitted as QA/QC samples, exceeding the minimum requirement of 92 samples. One third of the minimum of 92 (31) samples was required for each QA/QC category. A total of 42 blank samples, 37 spike samples, and 52 split samples were submitted for gamma spectroscopy analysis, exceeding the minimum required for each type.

Table B-1 lists the results of the 42 blank samples. The average activity concentration of the 42 blanks (Th-232 = 0.783 $\pm$ 0.48 picocurie per gram [pCi/g] [2 sigma error]) compare favorably with site established background of 1.1 $\pm$ 0.30 pCi/g Th-232.

Table B-2 lists results of the 37 spike samples. The spike samples were taken from three separate stocks: PD#1, PD#2, and PD#3. The precision within the stocks was excellent. Refer to Table B-2 for the average, standard deviation, median, minimum, and maximum for each group.

Table B-3 lists results of the 52 split samples. The samples are compared to the result of the first sample analyzed. The percent change listed in Table B-3 is the percent relative bias of the split sample analytical

result to the original sample analytical result. The average percent relative bias for the 52 sets of samples is 15 percent. This difference includes the inherent difference between two aliquots of the same sample.

In addition to the split samples taken in accordance with the survey plan, 44 additional split samples were taken with the Nuclear Regulatory Commission (NRC). The results of the project's analytical analyses and the NRC's analytical analyses are presented in Table B-4. The percent relative bias statistic of the project's analyses to that of the NRC was calculated. The average percent relative bias for the 44 sets of samples is 33 percent. This difference includes the inherent difference in the two analytical laboratory's (the project's and the NRC's), as well as the difference between two aliquots of the same sample.

Finally, Tables B-5, B-6, and B-7 include Outreach Lab internal QA/QC data for Detectors 2, 3, and 4 respectively. The data cover the time period the detectors were used in the analysis of soil samples in support of the Kaiser Adjacent Land Remediation Project. QA/QC data were generated by Outreach through the counting of Laboratory Control Standard (LCS) MAPEP-98-S5, an independent soil sample standard provided by the Department of Energy (DOE). Resultant Co-60 and Cs-137 data were used for the project since the gamma energies of these radionuclides cover the gamma energies used in the identification of Th-232. Also included in the tables are the Th-232 results of counting a blank sample and the results of duplicate analyses. The data verify excellent performance of all three detectors over the time period of the project. The average relative biases for Cs-137 and Co-60 range from 0 to a negative 8 percent for the three detectors.

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Table B-1
Quality Control Samples - Blanks
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)
1	CF	4.84E-01	2.90E-02	1.20E-01	0.00E+00	0.00
2	CF	1.71E-01	1.60E-02	8.90E-02	0.00E+00	0.00
3	CF	7.47E-01	3.60E-02	1.45E-01	0.00E+00	0.00
4	BKHS	4.43E-01	7.50E-02	2.00E-01	0.00E+00	0.00
5	BKHS	5.79E-01	6.70E-02	2.40E-01	0.00E+00	0.00
6	CF	1.18E+00	1.53E-01	5.84E-01	8.00E-02	0.04
7	BKHS	1.05E+00	1.25E-01	4.74E-01	0.00E+00	0.00
8	CF	7.65E-01	9.50E-02	3.98E-01	0.00E+00	0.00
9	BKHS	5.19E-01	1.64E-01	3.83E-01	0.00E+00	0.00
10	BKHS	8.50E-01	1.19E-01	4.10E-01	0.00E+00	0.00
11	CF	9.90E-01	1.69E-01	5.22E-01	0.00E+00	0.00
12	CF	1.36E-01	2.41E-01	4.78E-01	0.00E+00	0.00
13	CF	9.40E-01	1.81E-01	4.39E-01	0.00E+00	0.00
14	CF	7.31E-01	1.00E-01	4.06E-01	0.00E+00	0.00
15	CF	4.62E-01	1.04E-01	3.79E-01	0.00E+00	0.00
16	CF	8.24E-01	7.20E-02	1.40E-01	0.00E+00	0.00
17	CF	9.16E-01	2.18E-01	5.12E-01	0.00E+00	0.00
18	CF	9.69E-01	1.51E-01	5.92E-01	0.00E+00	0.00
19	CF	8.56E-01	1.30E-01	4.44E-01	0.00E+00	0.00
20	CF	9.97E-01	1.95E-01	5.99E-01	0.00E+00	0.00
21	CF	1.11E+00	1.68E-01	6.50E-01	1.00E-02	0.00
22	CF	1.20E+00	1.45E-01	4.30E-01	1.00E-01	0.04
23	CF	7.24E-01	8.20E-02	3.34E-01	0.00E+00	0.00
24	CF	9.22E-01	9.50E-02	3.28E-01	0.00E+00	0.00
25	CF	4.10E-01	1.73E-01	4.80E-01	0.00E+00	0.00
26	CF	7.63E-01	1.20E-01	4.49E-01	0.00E+00	0.00
27	CF	8.89E-01	1.35E-01	4.63E-01	0.00E+00	0.00
28	CF	1.17E+00	1.48E-01	4.02E-01	7.00E-02	0.03
29	CF	7.44E-01	1.03E-01	3.97E-01	0.00E+00	0.00
30	CF	8.96E-01	1.15E-01	4.14E-01	0.00E+00	0.00
31	CF	7.37E-01	2.11E-01	7.25E-01	0.00E+00	0.00
32	CF	5.47E-01	9.40E-02	3.91E-01	0.00E+00	0.00
33	CF	6.31E-01	1.16E-01	4.07E-01	0.00E+00	0.00
34	CF	7.15E-01	1.17E-01	3.49E-01	0.00E+00	0.00
35	CF	8.79E-01	1.99E-01	4.23E-01	0.00E+00	0.00

Table B-1
Quality Control Samples - Blanks
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	
36	CF	9.98E-01	1.27E-01	4.92E-01	0.00E+00	0.00	
37	CF	8.47E-01	1.20E-01	4.25E-01	0.00E+00	0.00	
38	CF	7.99E-01	1.16E-01	4.87E-01	0.00E+00	0.00	
39	CF	8.18E-01	1.89E-01	4.69E-01	0.00E+00	0.00	
40	CF	8.89E-01	1.13E-01	3.68E-01	0.00E+00	0.00	
41	CF	8.64E-01	1.87E-01	3.74E-01	0.00E+00	0.00	
42	CF	7.35E-01	9.80E-02	2.91E-01	0.00E+00	0.00	
Degrees of Freedom:	41	7.83E-01			6.19E-03	0.00	Average
		2.42E-01			2.20E-02	0.01	Std Deviation
		1.36E-01			0.00E+00	0.00	Minimum
		1.20E+00			1.00E-01	0.04	Maximum
t value*		8.21E-01			0.00E+00	0.00	Median
1.68		8.46E-01			1.19E-02	0.01	m_a 95%CL
2.02		8.59E-01			1.30E-02	0.01	m_a 97.5%C

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.

Background value of 10 mR/hr subtracted from Gross Exposure Rate measurements.

CF = Clean fill.

BKHS = Bishop Kelly High School soil.

Calculations:

(1). Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

(2). Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., Th-232 + Th-228 / 10 pCi/g + Th-230 / 14 pCi/g.

(3). The average and standard deviation of unity is calculated for each final survey grid.

Finally, the average, standard deviation, median, and m_a (95 and 97.5% confidence level) are calculated for the entire survey unit.

The average and standard deviation calculation for the entire survey unit include the weighted average calculated for any grids that contain e

Table B-2
Quality Control Samples - Spikes
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	
1	PD#1	5.41E+01	1.15E+00	1.06E+00	5.30E+01	23.85	
2	PD#1	6.45E+01	1.48E+00	1.08E+00	6.34E+01	28.53	
3	PD#1	5.82E+01	1.45E+00	9.88E-01	5.71E+01	25.70	
4	PD#1	5.46E+01	1.47E+00	1.06E+00	5.35E+01	24.08	
5	PD#1	5.92E+01	1.66E+00	1.14E+00	5.81E+01	26.15	
6	PD#1	5.49E+01	1.49E+00	1.53E+00	5.38E+01	24.21	
7	PD#1	5.37E+01	1.28E+00	9.05E-01	5.26E+01	23.67	
8	PD#1	5.53E+01	1.32E+00	3.17E-01	5.42E+01	24.39	
9	PD#1	5.23E+01	1.18E+00	2.81E-01	5.12E+01	23.04	
10	PD#1	5.49E+01	1.57E+00	1.57E+00	5.38E+01	24.21	
11	PD#1	5.25E+01	1.41E+00	9.42E-01	5.14E+01	23.13	
Degrees of Freedom:	10	5.58E+01			5.47E+01	24.63	Average
		3.56E+00			3.56E+00	1.60	Std Deviation
		5.23E+01			5.12E+01	23.04	Minimum
		6.45E+01			6.34E+01	28.53	Maximum
t value*		5.49E+01			5.38E+01	24.21	Median
1.81		5.72E+01			5.61E+01	25.25	μ_α 95%CL
2.23		5.75E+01			5.64E+01	25.38	μ_α 97.5%C

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	
12	PD#2	4.74E+01	1.58E+00	1.06E+00	4.63E+01	20.84	
13	PD#2	4.25E+01	1.26E+00	8.76E-01	4.14E+01	18.63	
14	PD#2	4.18E+01	1.24E+00	8.34E-01	4.07E+01	18.32	
15	PD#2	4.70E+01	1.69E+00	1.08E+00	4.59E+01	20.66	
16	PD#2	4.36E+01	1.48E+00	1.24E+00	4.25E+01	19.13	
17	PD#2	4.64E+01	1.42E+00	1.41E+00	4.53E+01	20.39	
Degrees of Freedom:	5	4.48E+01			4.37E+01	19.66	Average
		2.44E+00			2.44E+00	1.10	Std Deviation
		4.18E+01			4.07E+01	18.32	Minimum
		4.74E+01			4.63E+01	20.84	Maximum
t value*		4.50E+01			4.39E+01	19.76	Median
2.02		4.57E+01			4.46E+01	20.08	μ_α 95%CL
2.57		4.59E+01			4.48E+01	20.17	μ_α 97.5%C

Table B-2
Quality Control Samples - Spikes
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	
18	PD#3	3.43E+01	1.06E+00	7.87E-01	3.32E+01	14.94	
19	PD#3	3.76E+01	1.42E+00	1.24E+00	3.65E+01	16.43	
20	PD#3	3.35E+01	1.19E+00	1.29E+00	3.24E+01	14.58	
21	PD#3	3.72E+01	1.42E+00	1.26E+00	3.61E+01	16.25	
22	PD#3	3.79E+01	1.31E+00	1.08E+00	3.68E+01	16.56	
23	PD#3	4.57E+01	1.64E+00	9.28E-01	4.46E+01	20.07	
24	PD#3	3.59E+01	1.26E+00	1.30E+00	3.48E+01	15.66	
25	PD#3	3.73E+01	1.38E+00	7.26E-01	3.62E+01	16.29	
26	PD#3	3.98E+01	1.16E+00	7.01E-01	3.87E+01	17.42	
27	PD#3	3.66E+01	1.23E+00	8.48E-01	3.55E+01	15.98	
28	PD#3	3.96E+01	1.28E+00	7.07E-01	3.85E+01	17.33	
29	PD#3	3.66E+01	1.30E+00	9.39E-01	3.55E+01	15.98	
30	PD#3	3.32E+01	1.23E+00	1.15E+00	3.21E+01	14.45	
31	PD#3	3.29E+01	9.58E-01	6.09E-01	3.18E+01	14.31	
32	PD#3	3.08E+01	8.96E-01	5.84E-01	2.97E+01	13.37	
33	PD#3	3.45E+01	9.96E-01	6.48E-01	3.34E+01	15.03	
34	PD#3	2.71E+01	1.01E+00	6.81E-01	2.60E+01	11.70	
35	PD#3	3.94E+01	1.28E+00	7.55E-01	3.83E+01	17.24	
36	PD#3	3.29E+01	9.55E-01	6.40E-01	3.18E+01	14.31	
37	PD#3	3.36E+01	1.23E+00	2.01E+00	3.25E+01	14.63	
Degrees of Freedom:	19	3.58E+01			3.47E+01	15.62	Average
		3.93E+00			3.93E+00	1.77	Std Deviation
		2.71E+01			2.60E+01	11.70	Minimum
		4.57E+01			4.46E+01	20.07	Maximum
t value*		3.63E+01			3.52E+01	15.82	Median
1.73		3.73E+01			3.62E+01	16.31	μ_α 95%CL
2.09		3.77E+01			3.66E+01	16.45	μ_α 97.5%C

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 10 μR/hr subtracted from Gross Exposure Rate measurements.
PD = Pond dross.

Calculations:

(1). Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

(2). Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., Th-232 + Th-228 / 10 pCi/g + Th-230 / 14 pCi/g.

(3). The average and standard deviation of unity is calculated for each final survey grid.
Finally, the average, standard deviation, median, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.
The average and standard deviation calculation for the entire survey unit include the weighted average calculated for any grids that contain e

Table B-3
Quality Control Samples - Duplicates
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	% Change
166B	DFS	1.16E+00	1.18E-01	3.62E-01	6.00E-02	0.03	30.54
166B	FS	1.67E+00	6.10E-02	1.08E-01	5.70E-01	0.26	
54C	DFS	7.31E-01	8.30E-02	2.13E-01	0.00E+00	0.00	10.53
54C	FS	8.17E-01	9.40E-02	2.24E-01	0.00E+00	0.00	
59B	DFS	6.02E-01	9.90E-02	2.43E-01	0.00E+00	0.00	17.08
59B	FS	7.26E-01	1.12E-01	2.44E-01	0.00E+00	0.00	
60C	DFS	5.38E-01	8.20E-02	4.50E-02	0.00E+00	0.00	4.44
60C	FS	5.63E-01	1.04E-01	3.81E-01	0.00E+00	0.00	
37C	DFS	1.01E+00	1.57E-01	4.31E-01	0.00E+00	0.00	76.27
37C	FS	5.73E-01	8.50E-02	2.17E-01	0.00E+00	0.00	
60C	DFS	9.02E-01	1.27E-01	3.64E-01	0.00E+00	0.00	67.66
60C	FS	5.38E-01	8.20E-02	4.50E-02	0.00E+00	0.00	
42D	DFS	8.41E-01	9.10E-02	3.07E-01	0.00E+00	0.00	22.84
42D	FS	1.09E+00	1.33E-01	4.47E-01	0.00E+00	0.00	
40A	DFS	6.55E-01	8.30E-02	2.43E-01	0.00E+00	0.00	11.61
40A	FS	7.41E-01	1.05E-01	4.57E-01	0.00E+00	0.00	
124B	DFS	1.36E+00	1.64E-01	3.20E-01	2.60E-01	0.12	32.04
124B	FS	1.03E+00	1.42E-01	4.72E-01	0.00E+00	0.00	
41D	DFS	4.73E-01	8.40E-02	2.48E-01	0.00E+00	0.00	52.03
41D	FS	9.86E-01	8.60E-02	3.11E-01	0.00E+00	0.00	
41B	DFS	8.41E-01	8.10E-02	2.70E-01	0.00E+00	0.00	18.45
41B	FS	7.10E-01	1.15E-01	4.55E-01	0.00E+00	0.00	
37A	DFS	6.84E-01	1.17E-01	3.40E-01	0.00E+00	0.00	15.24
37A	FS	8.07E-01	7.20E-02	2.59E-01	0.00E+00	0.00	
22C	DFS	2.01E+00	2.50E-01	5.55E-01	9.10E-01	0.41	17.54
22C	FS	1.71E+00	1.32E-01	3.14E-01	6.10E-01	0.27	
77C	DFS	3.91E+00	3.04E-01	4.48E-01	2.81E+00	1.26	2.89
77C	FS	3.80E+00	3.05E-01	5.07E-01	2.70E+00	1.22	
77B	DFS	1.11E+00	1.46E-01	4.35E-01	1.00E-02	0.00	68.10
77B	FS	3.48E+00	2.38E-01	5.73E-01	2.38E+00	1.07	

Table B-3
Quality Control Samples - Duplicates
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	% Change
22B	DFS	2.69E+00	2.97E-01	5.62E-01	1.59E+00	0.72	39.55
22B	FS	4.45E+00	2.35E-01	5.57E-01	3.35E+00	1.51	
10B	DFS	1.88E+00	2.01E-01	5.11E-01	7.80E-01	0.35	12.57
10B	FS	1.67E+00	1.58E-01	4.93E-01	5.70E-01	0.26	
22A	DFS	3.02E+00	2.35E+00	4.50E-01	1.92E+00	0.86	35.05
22A	FS	4.65E+00	2.68E-01	4.80E-01	3.55E+00	1.60	
23A	DFS	8.00E-01	1.39E-01	5.12E-01	0.00E+00	0.00	2.68
23A	FS	8.22E-01	1.24E-01	3.99E-01	0.00E+00	0.00	
74A	DFS	1.79E-01	7.20E-02	3.11E-01	0.00E+00	0.00	54.68
74A	FS	3.95E-01	9.50E-02	3.11E-01	0.00E+00	0.00	
17C	DFS	8.73E-01	1.22E-01	3.02E-01	0.00E+00	0.00	2.24
17C	FS	8.93E-01	1.06E-01	3.35E-01	0.00E+00	0.00	
73A	DFS	ND	ND	3.90E-01	ND	0.00	N/A
73A	FS	BDL	7.30E-02	2.69E-01	BDL	0.00	
162B	DFS	6.66E-01	8.40E-02	2.84E-01	0.00E+00	0.00	20.43
162B	FS	8.37E-01	1.17E-01	4.56E-01	0.00E+00	0.00	
10C	DFS	2.28E+00	2.59E-01	5.00E-01	1.18E+00	0.53	34.48
10C	FS	3.48E+00	2.13E-01	5.57E-01	2.38E+00	1.07	
80B	DFS	6.72E-01	1.52E-01	5.67E-01	0.00E+00	0.00	5.75
80B	FS	7.13E-01	1.04E-01	3.91E-01	0.00E+00	0.00	
164D	FS	1.15E+00	1.24E-01	2.86E-01	5.00E-02	0.02	40.76
164D	FS	8.17E-01	1.27E-01	4.12E-01	0.00E+00	0.00	
121A	DFS	8.40E-01	1.99E-01	4.23E-01	0.00E+00	0.00	13.22
121A	FS	9.68E-01	2.08E-01	4.18E-01	0.00E+00	0.00	
78D	DFS	9.89E-01	1.42E-01	3.31E-01	0.00E+00	0.00	3.04
78D	FS	1.02E+00	1.22E-01	4.79E-01	0.00E+00	0.00	
162D	DFS	9.75E-01	1.24E-01	4.23E-01	0.00E+00	0.00	20.73
162D	FS	1.23E+00	1.63E-01	3.14E-01	1.30E-01	0.06	
157B	DFS	8.43E-01	1.73E-01	4.46E-01	0.00E+00	0.00	2.68
157B	FS	8.21E-01	2.18E-01	5.22E-01	0.00E+00	0.00	

Table B-3
Quality Control Samples - Duplicates
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	% Change
73B	DNRC	3.64E+00	2.30E-01	5.67E-01	2.54E+00	1.14	6.91
73B	NRC	3.91E+00	3.28E-01	5.60E-01	2.81E+00	1.26	
74D	DNRC	7.19E+00	4.89E-01	7.98E-01	6.09E+00	2.74	725.49
74D	NRC	8.71E-01	3.74E-01	6.56E-01	0.00E+00	0.00	
123A	DNRC	5.41E+00	3.13E-01	5.06E-01	4.31E+00	1.94	3.91
123A	NRC	5.63E+00	3.01E+00	6.74E+00	4.53E+00	2.04	
45D	DFS	1.16E+00	1.40E-01	3.91E-01	6.00E-02	0.03	12.12
45D	FS	1.32E+00	1.62E-01	5.54E-01	2.20E-01	0.10	
45C	DFS	1.27E+00	2.16E-01	5.11E-01	1.70E-01	0.08	19.81
45B	FS	1.06E+00	1.99E-01	5.06E-01	0.00E+00	0.00	
44L	DFS	9.18E-01	1.31E-01	3.99E-01	0.00E+00	0.00	22.20
44L	FS	1.18E+00	1.33E-01	3.80E-01	8.00E-02	0.04	
44C	DFS	2.01E+00	1.84E-01	4.95E-01	9.10E-01	0.41	12.61
44C	FS	2.30E+00	1.82E-01	3.56E-01	1.20E+00	0.54	
44A	DFS	1.92E+00	1.65E-01	4.08E-01	8.20E-01	0.37	2.67
44A	FS	1.87E+00	1.75E-01	4.42E-01	7.70E-01	0.35	
23D	DFS	9.33E-01	2.25E-01	5.88E-01	0.00E+00	0.00	21.60
23D	FS	1.19E+00	1.69E-01	3.36E-01	9.00E-02	0.04	
61C2	DFS	6.70E-01	1.25E-01	4.77E-01	0.00E+00	0.00	38.72
61C2	FS	4.83E-01	2.10E-01	4.80E-01	0.00E+00	0.00	
7A	DFS	1.33E+00	2.06E-01	4.34E-01	2.30E-01	0.10	42.09
7A	FS	9.36E-01	1.66E-01	5.55E-01	0.00E+00	0.00	
40D	DFS	7.99E-01	1.48E-01	5.21E-01	0.00E+00	0.00	13.90
40D	FS	9.28E-01	1.54E-01	5.28E-01	0.00E+00	0.00	
89D	DFS	1.04E+00	2.13E-01	4.73E-01	0.00E+00	0.00	11.86
89D	FS	1.18E+00	1.41E-01	4.66E-01	8.00E-02	0.04	
102D	DFS	1.10E+00	1.53E-01	5.06E-01	0.00E+00	0.00	16.03
102D	FS	1.31E+00	1.55E-01	4.13E-01	2.10E-01	0.09	
111C	DFS	7.07E-01	8.00E-02	4.52E-01	0.00E+00	0.00	17.98
111C	FS	8.62E-01	9.40E-02	3.67E-01	0.00E+00	0.00	

Table B-3
Quality Control Samples - Duplicates
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	% Change	
166A	DFS	3.01E+00	2.33E-01	3.29E-01	1.91E+00	0.86	48.28	
166A	FS	2.03E+00	6.40E-02	1.40E-01	9.30E-01	0.42		
3D	DFS	1.39E+00	1.28E-01	3.80E-01	2.90E-01	0.13	4.51	
3D	FS	1.33E+00	2.20E-02	4.71E-01	2.30E-01	0.10		
37B	DFS	1.38E+00	2.90E-01	5.26E-01	2.80E-01	0.13	230.14	
37B	FS	4.18E-01	1.03E-01	3.44E-01	0.00E+00	0.00		
61B2	DFS	8.45E-01	9.10E-02	2.88E-01	0.00E+00	0.00	21.58	
61B2	FS	6.95E-01	1.09E-01	4.34E-01	0.00E+00	0.00		
78A	DFS	3.43E+00	2.17E-01	3.82E-01	2.33E+00	1.05	7.52	
78A	FS	3.19E+00	3.03E-01	4.44E-01	2.09E+00	0.94		
101F	DFS	1.12E+00	1.94E-01	4.46E-01	2.00E-02	0.01	30.00	
101F	FS	1.60E+00	1.56E-01	3.93E-01	5.00E-01	0.23		
26B	DFS	1.02E+00	1.33E-01	3.67E-01	0.00E+00	0.00	13.56	
26B	FS	1.18E+00	1.52E-01	3.76E-01	8.00E-02	0.04		
24F	DFS	1.37E+00	1.48E-01	4.47E-01	2.70E-01	0.12	2.84	
24F	FS	1.41E+00	1.10E-01	2.30E-01	3.10E-01	0.14		
Degrees of Freedom:	103	1.51E+00			5.79E-01	0.26	14.65	Average
		1.24E+00			1.14E+00	0.51	109.33	Std Deviation
		1.79E-01			0.00E+00	0.00	-68.10	Minimum
		7.19E+00			6.09E+00	2.74	725.49	Maximum
t value*		1.04E+00			0.00E+00	0.00	-6.33	Median
1.67		1.72E+00			7.66E-01	0.34	32.57	μ_α 95%CL
2.00		1.76E+00			8.03E-01	0.36	36.09	μ_α 97.5%C

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 10 μR/hr subtracted from Gross Exposure Rate measurements.
DFS = Duplicate final sample.
FS = Final sample.
DNRC = Duplicate counts of thr NRC samples.
NRC = Samples taken with the NRC.

Calculations:

(1). Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

(2). Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., Th-232 + Th-228 / 10 pCi/g + Th-230 / 14 pCi/g.

(3). The average and standard deviation of unity is calculated for each final survey grid.
Finally, the average, standard deviation, median, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.
The average and standard deviation calculation for the entire survey unit include the weighted average calculated for any grids that contain elevated areas

Table B-4
Quality Control Samples - NRC
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)
47A	FSS	6.78E-01	7.60E-02	3.29E-01	0.00E+00	0.00
47D	FSS	4.29E-01	1.08E-01	4.63E-01	0.00E+00	0.00
42D	ASS	8.41E-01	9.10E-02	3.07E-01	0.00E+00	0.00
40A	ASS	6.55E-01	8.30E-02	2.43E-01	0.00E+00	0.00
124B	ASS	1.36E+00	1.64E-01	3.20E-01	2.60E-01	0.12
41B	ASS	8.41E-01	8.10E-02	2.70E-01	0.00E+00	0.00
41D	ASS	4.73E-01	8.40E-02	2.48E-01	0.00E+00	0.00
37C	ASS	6.84E-01	1.17E-01	3.40E-01	0.00E+00	0.00
25D	FSS	2.67E+00	1.77E-01	5.71E-01	1.57E+00	0.71
26C	FSS	1.84E+00	2.34E-01	5.38E-01	7.40E-01	0.33
27A	FSS	7.16E-01	1.21E-01	3.79E-01	0.00E+00	0.00
28C	FSS	1.02E+00	1.22E-01	4.13E-01	0.00E+00	0.00
29B	FSS	1.33E+00	2.19E-01	3.45E-01	2.30E-01	0.10
71C	FSS	1.05E+00	1.52E-01	5.22E-01	0.00E+00	0.00
72D	FSS	8.83E-01	1.10E-01	3.84E-01	0.00E+00	0.00
73B	FSS	3.91E+00	3.28E-01	5.60E-01	2.81E+00	1.26
74D	FSS	8.71E+00	3.74E-01	6.56E-01	7.61E+00	3.42
75A	FSS	1.45E+00	1.29E-01	4.52E-01	3.50E-01	0.16
76A	FSS	1.80E+00	2.15E-01	4.71E-01	7.00E-01	0.32
77B	FSS	1.10E+00	1.58E-01	5.51E-01	0.00E+00	0.00
78C	FSS	1.26E+00	1.42E-01	4.89E-01	1.60E-01	0.07
78D	FSS	1.22E+00	1.68E-01	4.01E-01	1.20E-01	0.05
79B	FSS	7.94E-01	1.53E-01	5.80E-01	0.00E+00	0.00
80A	FSS	1.05E+00	1.46E-01	5.29E-01	0.00E+00	0.00
81A	FSS	9.98E-01	2.18E-01	5.10E-01	0.00E+00	0.00
82B	FSS	6.49E-01	1.17E-01	3.39E-01	0.00E+00	0.00
83C	FSS	1.25E+00	1.61E-01	4.83E-01	1.50E-01	0.07
84D	FSS	9.00E-01	1.49E-01	4.12E-01	0.00E+00	0.00
119A	FSS	1.28E+00	1.42E-01	4.36E-01	1.80E-01	0.08
120A	FSS	1.01E+00	1.38E-01	5.23E-01	0.00E+00	0.00
121A	FSS	8.85E-01	1.30E-01	3.07E-01	0.00E+00	0.00
122C	FSS	9.45E-01	1.47E-01	5.11E-01	0.00E+00	0.00
123A	FSS	5.63E+00	3.01E-01	6.74E-01	4.53E+00	2.04
142	FSS	1.32E+00	2.04E-01	3.27E-01	2.20E-01	0.10
143	FSS	8.13E-01	1.30E-01	3.71E-01	0.00E+00	0.00
144	FSS	1.00E+00	1.42E-01	4.58E-01	0.00E+00	0.00
152C	FSS	5.25E-01	1.35E-01	2.35E-01	0.00E+00	0.00
161A	FSS	1.02E+00	1.56E-01	3.17E-01	0.00E+00	0.00
162D	FSS	8.45E-01	1.22E-01	3.85E-01	0.00E+00	0.00
179A	FSS	1.28E+00	1.40E-01	4.02E-01	1.80E-01	0.08

Table B-4
Quality Control Samples - NRC
Soil Concentrations
Kaiser Adjacent Land Remediation

Sample Location	Sample Type	Analytical Results Gross Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit	(1) Conc. Th-232 (pCi/g)	(2)(3) Unity (-)	
181B	FSS	6.19E-01	8.10E-02	2.29E-01	0.00E+00	0.00	
190D	FSS	7.11E-01	1.08E-01	3.56E-01	0.00E+00	0.00	
191D	FSS	1.04E+00	1.05E-01	3.13E-01	0.00E+00	0.00	
200A	FSS	2.11E+00	2.14E-01	6.18E-01	1.01E+00	0.45	
199B	FSS	1.07E+00	1.33E-01	4.91E-01	0.00E+00	0.00	
209C	FSS	4.64E-01	1.18E-01	3.03E-01	0.00E+00	0.00	
194C	FSS	2.16E-01	8.50E-02	3.64E-01	0.00E+00	0.00	
217D	FSS	8.68E-01	1.30E-01	4.02E-01	0.00E+00	0.00	
107C	FSS	1.38E+00	1.14E-01	3.65E-01	2.80E-01	0.13	
111C	FSS	1.05E+00	1.39E-01	4.92E-01	0.00E+00	0.00	
108A	FSS	9.11E-01	1.47E-01	5.61E-01	0.00E+00	0.00	
110C	FSS	1.15E+00	4.90E-02	2.18E-01	5.00E-02	0.02	
67B	FSS	2.09E+00	8.80E-02	2.65E-01	9.90E-01	0.45	
64B	FSS	1.13E+00	1.09E-01	4.44E-01	3.00E-02	0.01	
Degrees of Freedom:	54	1.33E+00	1.46E-01	4.16E-01	4.11E-01	0.18	Average
		1.33E+00	6.10E-02	1.15E-01	1.25E+00	0.56	Std Deviation
		2.16E-01	4.90E-02	2.18E-01	0.00E+00	0.00	Minimum
		8.71E+00	3.74E-01	6.74E-01	7.61E+00	3.42	Maximum
t value*		1.02E+00	1.37E-01	4.02E-01	0.00E+00	0.00	Median
1.67		1.63E+00	1.60E-01	4.42E-01	6.94E-01	0.31	μ_α 95%CL
2.01		1.69E+00	1.63E-01	4.47E-01	7.50E-01	0.34	μ_α 97.5%C

*Look up value from Table 1 in Appendix B of NUREG/CR-5849.

Notes: Background value of 1.1 pCi/g Th-232 subtracted from Gross Th-232 result.
Background value of 10 μR/hr subtracted from Gross Exposure Rate measurements.
FSS = Field split sample.
ASS = Archived split sample.

Calculations:

(1). Th-232 is calculated using the analytical data and correcting for background. The measured background value is 1.1 pCi/g Th-232.

(2). Unity is calculated by summing the fractions of Th-232, Th-228, and Th-230 activity concentrations divided by their respective acceptance criteria, i.e., Th-232 + Th-228 / 10 pCi/g + Th-230 / 14 pCi/g.

(3). The average and standard deviation of unity is calculated for each final survey grid.
Finally, the average, standard deviation, median, and μ_α (95 and 97.5% confidence level) are calculated for the entire survey unit.
The average and standard deviation calculation for the entire survey unit include the weighted average calculated for any grids that contain e

Table B-5
Outreach Labs Detector 2 QA/QC Data

Date Counted	Det.	Density Corrected Result Co-60	LCS Result Co-60	Density Corrected Result Cs-137	LCS Result Cs-137	Blank Th-232	Duplicate Analyses 1	Duplicate Analyses DUP	Percent Relative Bias Co-60	Percent Relative Bias Cs-137	Percent Relative Bias DUP
13-Oct-00	2	1020	1110	514	552	0.044	0.747	0.621	-8	-7	-17
20-Oct-00	2	1047	1110	490	552	BDL	54.1	56.4	-6	-11	4
13-Nov-00	2	1057	1110	477	552				-5	-14	
16-Nov-00	2	1057	1110	510	552				-5	-8	
21-Nov-00	2	1080	1110	517	552				-3	-6	
21-Nov-00	2	1080	1110	517	552	BDL	1.19	0.76	-3	-6	-36
29-Nov-00	2	1057	1110	510	552				-5	-8	
6-Dec-00	2	1039	1110	496	552				-6	-10	
15-Dec-00	2	1021	1110	482	552				-8	-13	
22-Dec-00	2	1068	1110	478	552				-4	-13	
27-Dec-00	2	1370	1110	691	552				23	25	
4-Jan-01	2	1030	1110	505	552				-7	-9	
12-Jan-01	2	1038	1110	495	552				-6	-10	
19-Jan-01	2	1111	1110	516	552				0	-7	
24-Jan-01	2	1070	1110	504	552	BDL	3.48	3.1	-4	-9	-11
25-Jan-01	2	1030	1110	527	552	BDL	59.2	59	-7	-5	0
25-Jan-01	2	1030	1110	527	552	BDL	59.2	59	-7	-5	0
28-Jan-01	2	1040	1110	499	552	BDL	1.4	0.919	-6	-10	-34
6-Feb-01	2	1074	1110	487	552	BDL	1.64	1.813	-3	-12	11
7-Feb-01	2	1090	1110	487	552	BDL	63.3	65.9	-2	-12	4
13-Feb-01	2	1019	1110	507	552	BDL	1.09	0.685	-8	-8	-37
14-Feb-01	2	1046	1110	496	552	BDL	1.296	1.097	-6	-10	-15
15-Feb-01	2	1045	1110	460	552	BDL	1.314	1.28	-6	-17	-3
15-Feb-01	2	1081	1110	545	552	0.158	13.75	13.95	-3	-1	1
19-Feb-01	2	1037	1110	494	552	BDL	1.331	1.471	-7	-11	11
20-Feb-01	2	1041	1110	495	552	BDL	1.722	1.284	-6	-10	-25
21-Feb-01	2	1031	1110	502	552	BDL	17.242	17.394	-7	-9	1
23-Feb-01	2	1081	1110	526	552	BDL	43.6	46.8	-3	-5	7
23-Feb-01	2	1042	1110	518	552	BDL	2.72	2.73	-6	-6	0
28-Feb-01	2	1033	1110	529	552	BDL	4.756	5.102	-7	-4	7
2-Mar-01	2	1032	1110	486	552	BDL	3.229	2.634	-7	-12	-18
5-Mar-01	2	1054	1110	509	552	BDL	4.021	4.275	-5	-8	6
7-Mar-01	2	1018	1110	492	552	BDL	1.117	0.981	-8	-11	-12
8-Mar-01	2	1035	1110	498	552	BDL	3.688	3.659	-7	-10	-1
16-Mar-01	2	1055	1110	448	552	BDL	1.996	1.123	-5	-19	-44
5-Apr-01	2	1028	1110	493	552	BDL	2.081	2.038	-7	-11	-2
								Minimum:	-8	-19	-44
								Maximum:	23	25	11
								Average:	-5	-8	-8
								Stdev.:	5	7	16

Notes: All QA/QC analytical results are in Bq/kg.
LCS = Lab Control Standard MAPEP-98-S5.
BDL = Below Detection Limit.

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Table B-6
Outreach Labs Detector 3 QA/QC Data

Date Counted	Det.	Density Corrected Result Co-60	LCS Result Co-60	Density Corrected Result Cs-137	LCS Result Cs-137	Blank Th-232	Duplicate Analyses 1	Duplicate Analyses DUP	Percent Relative Bias Co-60	Percent Relative Bias Cs-137	Percent Relative Bias DUP
14-Nov-00	3	1065	1110	528	552				-4	-4	
4-Dec-00	3	1108	1110	538	552				0	-3	
18-Dec-00	3	1115	1110	518	552	BDL	1.28	1.13	0	-6	-12
27-Dec-00	3	1143	1110	583	552	BDL	2.55	3.03	3	6	19
23-Jan-01	3	1078	1110	502	552				-3	-9	
25-Jan-01	3	1090	1110	528	552	BDL	1.95	1.7	-2	-4	-13
28-Jan-01	3	1070	1110	550	552	BDL	1.21	1.08	-4	0	-11
19-Feb-01	3	1092	1110	533	552	BDL	3.433	2.826	-2	-3	-18
20-Feb-01	3	1092	1110	524	552	BDL	2.444	2.628	-2	-5	8
21-Feb-01	3	1100	1110	552	552	BDL	2.77	2.35	-1	0	-15
21-Feb-01	3					BDL	2.19	1.86			-15
22-Feb-01	3	1116	1110	521	552	BDL	1.724	1.85	1	-6	7
22-Feb-01	3	1107	1110	551	552	BDL	1.24	1.154	0	0	-7
23-Feb-01	3	1172	1110	555	552	BDL	41.8	46.8	6	1	12
28-Feb-01	3	1096	1110	567	552	BDL	27.944	28.999	-1	3	4
5-Mar-01	3	1112	1110	507	552	BDL	5.165	4.636	0	-8	-10
6-Mar-01	3	1141	1110	515	552	BDL	5.557	5.453	3	-7	-2
2-Apr-01	3	1111	1110	531	552	BDL	3.472	3.505	0	-4	1
3-Apr-01	3	1110	1110	533	552	BDL	2.341	2.062	0	-3	-12
3-Apr-01	3	1122	1110	537	552	BDL	2.506	2.071	1	-3	-17
								Minimum:	-4	-9	-18
								Maximum:	6	6	19
								Average:	0	-3	-5
								Stdev.:	2	4	11

Notes: All QA/QC analytical results are in Bq/kg.
LCS = Lab Control Standard MAPEP-98-S5.
BDL = Below Detection Limit.

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Table B-7
Outreach Labs Detector 4 QA/QC Data

Date Counted	Det.	Density Corrected Result Co-60	LCS Result Co-60	Density Corrected Result Cs-137	LCS Result Cs-137	Blank Th-232	Duplicate Analyses 1	Duplicate Analyses DUP	Percent Relative Bias Co-60	Percent Relative Bias Cs-137	Percent Relative Bias DUP
16-Oct-00	4	1020	1110	508	552	ND	1.28	1.18	-8	-8	-8
13-Nov-00	4	1032	1110	521	552	BDL	0.573	0.55	-7	-6	-4
16-Nov-00	4	1076	1110	527	552	BDL	1.03	1.02	-3	-5	-1
21-Nov-00	4	1080	1110	506	552				-3	-8	
21-Nov-00	4	1080	1110	506	552				-3	-8	
29-Nov-00	4	1119	1110	503	552	BDL	64.5	66.6	1	-9	3
4-Dec-00	4	1057	1110	524	552	BDL	1.25	1.21	-5	-5	-3
7-Dec-00	4	1095	1110	528	552	BDL	1.41	1.36	-1	-4	-4
22-Dec-00	4	1100	1110	520	552	BDL	0.746	0.65	-1	-6	-13
11-Jan-01	4	1039	1110	518	552	BDL	0.744	0.83	-6	-6	12
11-Jan-01	4					BDL	67.3	64.2			-5
18-Jan-01	4	1070	1110	503	552	BDL	1.7	1.41	-4	-9	-17
18-Jan-01	4					BDL	0.732	0.86			17
24-Jan-01	4	1076	1110	509	552	BDL	0.501	0.59	-3	-8	18
25-Jan-01	4	1028	1110	514	552	BDL	1.43	1.7	-7	-7	19
26-Jan-01	4	1050	1110	510	552	BDL	2.62	2.42	-5	-8	-8
6-Feb-01	4	1090	1110	522	552	BDL	0.719	0.708	-2	-5	-2
6-Feb-01	4	1090	1110	522	552	BDL	0.566	0.835	-2	-5	48
12-Feb-01	4	1065	1110	527	552	BDL	0.726	0.89	-4	-5	23
13-Feb-01	4	1069	1110	519	552	BDL	0.754	0.519	-4	-6	-31
16-Feb-01	4	1056	1110	514	552	BDL	2.479	2.797	-5	-7	13
20-Feb-01	4	1094	1110	543	552	BDL	1.913	1.946	-1	-2	2
21-Feb-01	4	1100	1110	525	552	BDL	0.717	0.639	-1	-5	-11
30-Mar-01	4	1074	1110	505	552	BDL	2.285	2.129	-3	-9	-7
2-Apr-01	4	1052	1110	519	552	BDL	3.758	3.776	-5	-6	0
4-Apr-01	4	1079	1110	520	552	BDL	1.313	1.721	-3	-6	31
10-Apr-01	4	1127	1110	547	552	BDL	1.663	1.661	2	-1	0
								Minimum:	-8	-9	-31
								Maximum:	2	-1	48
								Average:	-3	-6	3
								Stdev.:	2	2	17

Notes: All QA/QC analytical results are in Bq/kg.
LCS = Lab Control Standard MAPEP-98-S5.
BDL = Below Detection Limit.

w:\5427f\rpt\tables\tb5-tb7.xls

Appendix C

Final Status Survey Instrumentation QA/QC
(Rev. 8/01)

Table C-1

Health Physics Instrument Summary

Table C-1
Health Physics Instrument Summary
Final Status Survey
Adjacent Land Area Remediation
Kaiser Aluminum & Chemical Corporation
Tulsa, Oklahoma

Instrument Model and Detector Model/Type	Instrument Serial Number	Detector Serial Number	Calibration Period	In-Service Period	Usage
Ludlum 19 (Internal NaI Scintillator)	104630	N/A	8/31/00 to 2/28/01 1/29/01 to 7/29/01 3/12/01 to 9/12/01	10/2/00 to 1/23/01 1/30/01 to 3/8/01 3/13/01 to 5/30/01	Low-level (microR) gamma survey - Instrument was used to collect exposure rates for the Final Status Survey.
Ludlum 2221 with 44-10 NaI Scintillator	75448	112016	9/5/00 to 3/5/01 1/29/01 to 7/29/01	10/2/00 to 1/26/01 1/30/01 to 5/30/01	Field analysis, high-energy gamma detection - Instrument was used to evaluate remediation progress and scan land areas for the Final Status Survey.
Ludlum 2221 with 44-10 NaI Scintillator	75473	081084	1/29/01 to 7/29/01	2/12/01 to 2/19/01	Field analysis, high-energy gamma detection - Instrument was used to scan archived core samples for the purposes of delineating affected and unaffected areas.
Ludlum 2224 with 43-68 Gas Proportional	116240	507	4/18/00 to 4/18/01	2/20/01 to 2/21/01	Simultaneous alpha-beta counting and discrimination - Instrument was used to survey building structures (concrete spillway, railroad ties, and train rails) for the Final Status Survey.
Ludlum 2929 with 43-10-1 ZnS (Ag) Scintillator	95574	094383	9/5/00 to 9/5/01	10/2/00 to 5/5/01	Alpha-beta sample counting - Instrument was used to evaluate building structures, shipping containers, and equipment for removable alpha and beta/gamma contamination.

Appendix C-1

Ludlum Model 19 MicroR Meter with
Internal NaI Scintillation Gamma Detector
Serial No. 104630
Calibration Certificates and Source/Background Logs

Applied Health Physics, Inc.

2986 Industrial Blvd., Bethel Park, Pa 15102 Phone: (412) 835-9555 Fax: (412) 835-9559

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Applied Health Physics, Inc.		**Contact**	Todd Mobley	**PO #**	
2986 Industrial Blvd.		**Contact Phone:**	(412) 835-9555	**Calibration Date**	8/31/00
		Contact	Celia Rajkovich		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	104630	**Probe SN**	N/A
Manufacturer	Ludlum	**Probe Manufacturer**	Ludlum
Model	19	**Probe Model**	Internal Scintillator

Scale 1 25		**Scale 2** 50		**Scale 3** 250	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
Background	Background	Background	Background	Background	Background
				200	200

Scale 4 500		**Scale 5** 5000		**Scale 6**	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
200	200	2000	2200		
400	370	4000	3600		

Units for above readings: uR/hr

Battery Check: 46 uR/h **Check Source:** N/A **Technician:** C. Barto

Cynthia Barto

Quality Assurance: T. Mobley

Exposure/Dose Rate	**Electronic Calibration**	**Efficiency Check**
Cs-137 ☐ **Ra-226** ☑	**MP-500** ☐ **S#94932**	**Alpha %** N/A
		Beta % N/A
Geometry to Source: Perpendicular		**Gamma %** N/A

Receiving comments: OK

Maintenance comments and scale adjustments: Calibrated for lease to Earth, Inc.

Temperature: 80.8

Humidity % 58 *Note: If no scale adjustments are listed, readings are as found.*

Calibration Due Date: 2/28/01

Notice: Applied Health Physics, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology under Nuclear Regulatory Commission License # 37-09135-01 and PA State License # PA-0228. This Calibration system conforms to the requirements of NRC regulation 10-CFR-34, 10-CFR-35, ANSI/NCSL Z540-1-1994, ANSI-STD N323A-1997 and N323-1978. This certificate is an essential record and should be maintained for inspection by the regulatory agency.

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	2/28/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	349

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
10/2/00	10	330	320	D.Baker	None
10/3/00	13	335	322	D.Baker	None
10/4/00	12	320	308	D.Baker	None
10/5/00	12	335	323	D.Baker	None
10/6/00	11	330	319	D.Baker	None
10/7/00	11.5	300	288.5	D.Baker	None
10/9/00	13.5	300	286.5	D.Baker	None
10/10/00	13.5	310	296.5	D.Baker	None
10/11/00	13	300	287	D.Baker	None
10/12/00	13	300	287	D.Baker	None
10/13/00	13.5	310	296.5	D.Baker	None
10/14/00	13	300	287	D.Baker	None
10/16/00	12.5	310	297.5	D.Baker	None
10/17/00	13	310	297	D.Baker	None
10/18/00	13	300	287	D.Baker	None
10/19/00	12.5	310	297.5	D.Baker	None
10/20/00	13	320	307	D.Baker	None
10/23/00	13	300	287	D.Baker	None

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	2/28/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	349

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
11/2/00	12	300	288	D.Baker	None
11/3/00	12	310	298	D.Baker	None
11/6/00	12.5	300	287.5	D.Baker	None
11/7/00	12.5	310	297.5	D.Baker	None
11/8/00	13	300	287	D.Baker	None
11/9/00	13	310	297	D.Baker	None
11/10/00	13	300	287	D.Baker	None
11/13/00	12.5	310	297.5	D.Baker	None
11/14/00	12.5	300	287.5	D.Baker	None
11/15/00	13	300	287	D.Baker	None
11/16/00	13.5	300	286.5	D.Baker	None
11/17/00	13	310	297	D.Baker	None
11/18/00	13	310	297	D.Baker	None
11/20/00	13.5	300	286.5	D.Baker	None
11/21/00	13	310	297	D.Baker	None

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	19		Source S/N:	99.2193
Instrument S/N:	104630		Source DPM:	n/a
Detector Model:	n/a		Radiation Detected:	gamma
Detector S/N:	n/a		Acceptable Range:	285
Calibration Due:	2/28/01		(Refer to ESC/HPM-2-1)	349

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
12/1/00	10	300	290	Todd Brautigam	None
12/4/00	9	310	301	Todd Brautigam	None
12/5/00	9	300	291	Todd Brautigam	None
12/6/00	9	300	291	Todd Brautigam	None
12/7/00	9	315	306	Todd Brautigam	None
12/8/00	9	315	306	Todd Brautigam	None
12/9/00	10	315	305	Todd Brautigam	None
12/11/00	10	310	300	Todd Brautigam	None
12/12/00	10	310	300	Todd Brautigam	None
12/13/00	10	310	300	Todd Brautigam	None
12/14/00	10	315	305	Todd Brautigam	None
12/15/00	11	320	309	Todd Brautigam	None
12/16/00	11	300	289	Todd Brautigam	None
12/17/00	11	310	299	Todd Brautigam	None
12/18/00	10	310	300	Todd Brautigam	None
12/19/00	10	320	310	Todd Brautigam	None
12/20/00	10	315	305	Todd Brautigam	None
12/21/00	10	310	300	Todd Brautigam	None
12/22/00	9	310	301	Todd Brautigam	None

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	2/28/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	349

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
1/3/01	12	300	288	D.Baker	None
1/4/01	12	310	298	D.Baker	None
1/5/01	12.5	310	297.5	D.Baker	None
1/8/01	13	310	297	D.Baker	None
1/9/01	13.5	310	296.5	D.Baker	None
1/10/01	13	310	297	D.Baker	None
1/11/01	13	310	297	D.Baker	None
1/12/01	12.5	310	297.5	D.Baker	None
1/15/01	13	320	307	D.Baker	None
1/16/01	13	310	297	D.Baker	None
1/17/01	12.5	310	297.5	D.Baker	None
1/18/01	13	310	297	D.Baker	None
1/19/01	13	310	297	D.Baker	None
1/20/01	13	300	287	D.Baker	None
1/21/01	12.5	310	297.5	D.Baker	None
1/22/01	13	310	297	D.Baker	None
1/23/01	13	310	297	D.Baker	None
1/24/01	13	310	297	D.Baker	None
1/25/01	12.5	310	297.5	D.Baker	None

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Applied Health Physics, Inc.		Contact	Todd Mobley	PO #	
2986 Industrial Blvd.		Contact Phone:	(412) 835-9555	Calibration Date	1/29/01
		Contact	Cindy Barto		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	104630	Probe SN	N/A
Manufacturer	Ludlum	Probe Manufacturer	Ludlum
Model	19	Probe Model	Internal Scintillator

Scale 1 25		Scale 2 50		Scale 3 250	
Source	Reading	Source	Reading	Source	Reading
Background]	Background	Background	Background	Background	Background
				200	220

Scale 4 500		Scale 5 5000		Scale 6	
Source	Reading	Source	Reading	Source	Reading
200	210	2000	2200		
400	380	4000	3600		

Units for above readings: uR/hr

Battery Check: 42 uR/h

Check Source: N/A

Technician: C. Barto

Cynthia Barto

Quality Assurance: T. Mobley

Exposure/Dose Rate	Electronic Calibration	Efficiency Check
Cs-137 ☐ Ra-226 ☑	MP-500 S#94932 ☐	Alpha % N/A
		Beta % N/A
Geometry to Source: Perpendicular		Gamma % N/A

Receiving comments: N/A

Maintenance comments and scale adjustments: Audio & reset OK
Calibrated for lease to Earth Sciences.

Temperature: 73.7

Humidity % 27

Note: If no scale adjustments are listed, readings are as found.

Calibration Due Date: 7/29/01

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	7/29/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	307

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
1/30/01	11	300	289	D.Baker	Re-Cal.
1/31/01	10	310	300	D.Baker	None
2/1/01	10	310	300	D.Baker	None
2/2/01	11	300	289	D.Baker	None
2/3/01	10	310	300	D.Baker	None
2/4/01	10	310	300	D.Baker	None
2/5/01	10	310	300	D.Baker	None
2/6/01	10	310	300	D.Baker	None
2/7/01	11	300	289	D.Baker	None
2/8/01	11	310	299	D.Baker	None
2/9/01	11	310	299	D.Baker	None
2/10/01	11	300	289	D.Baker	None
2/11/01	10	310	300	D.Baker	None
2/12/01	11	300	289	D.Baker	None
2/13/01	10	310	300	D.Baker	None
2/14/01	11	310	299	D.Baker	None
2/15/01	10	300	290	D.Baker	None
2/16/01	10	310	300	D.Baker	None
2/17/01	10	300	290	D.Baker	None
2/18/01	11	310	299	D.Baker	None
2/19/01	10	310	300	D.Baker	None
2/21/01	10	300	290	D.Baker	None
2/22/01	10	310	300	D.Baker	None

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	7/29/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	307

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
2/27/01	10	300	290	D.Baker	None
2/28/01	10	310	300	D.Baker	None
3/1/01	9	300	291	D.Baker	None
3/2/01	10	310	300	D.Baker	None
3/3/01	10	300	290	D.Baker	None
3/4/01	10	300	290	D.Baker	None
3/5/01	9	310	301	D.Baker	None
3/6/01	9	310	301	D.Baker	None
3/7/01	10	310	300	D.Baker	None
3/8/01	10	300	290	D.Baker	None
					Elc.Calibration
					Cal Due: 9-12-01
3/13/01	10	310	300	D.Baker	None
3/14/01	10	300	290	D.Baker	None
3/15/01	9	310	301	D.Baker	None
3/16/01	9	300	291	D.Baker	None
3/19/01	10	300	290	D.Baker	None
3/20/01	9	310	301	D.Baker	None
3/26/01	9	300	291	D.Baker	None
3/27/01	9	300	291	D.Baker	None
3/28/01	10	300	290	D.Baker	None
3/29/01	9	310	301	D.Baker	None
3/30/01	9	310	301	D.Baker	None

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Applied Health Physics, Inc.		**Contact**	Todd Mobley	**PO #**	N/A
2986 Industrial Blvd.		**Contact Phone:**	(412) 835-9555	**Calibration Date**	3/12/01
		Contact	Cindy Barto		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	104630	**Probe SN**	N/A
Manufacturer	Ludlum	**Probe Manufacturer**	Ludlum
Model	19	**Probe Model**	Internal Scintillator

Scale 1 25		**Scale 2** 50		**Scale 3** 250	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
BKG	BKG	BKG	BKG	BKG	BKg
				200	200

Scale 4 500		**Scale 5** 5000		**Scale 6**	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
200	200	2000	2000		
400	400	4000	3600		

Units for above readings: uR/hr

Battery Check: 42uR/hr **Check Source:** N/A **Technician:** V. Petriano

Exposure/Dose Rate **Electronic Calibration** **Efficiency Check** **Quality Assurance:** C. Barto

Cs-137 ☐ **Ra-226** ☑ **MP-500 S#94932** ☑ **Alpha %** N/A

Beta % N/A

Geometry to Source: Perpendicular/Electronic **Gamma %** N/A

Receiving comments: None

Maintenance comments and scale adjustments: Lower scales pulsed for linearity

Temperature: 73.99

Humidity % 28% *Note: If no scale adjustments are listed, readings are as found.*

Calibration Due Date: 9/12/01

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Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument S/N:	19
Instrument S/N:	104630
Detector S/N:	n/a
Detector S/N:	n/a
Calibration Due:	9/12/01

Source S/N:	99.2193
Source DPM:	n/a
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	285
	307

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
4/2/01	9	300	291	D.Baker	None
4/3/01	9	300	291	D.Baker	None
4/4/01	10	310	300	D.Baker	None
4/5/01	10	310	300	D.Baker	None
4/6/01	10	310	300	D.Baker	None
4/7/01	9	300	291	D.Baker	None
4/9/01	9	300	291	D.Baker	None
4/20/01	9	300	291	D.Baker	None
4/21/01	9	300	291	D.Baker	None
5/7/01	9	310	301	D.Baker	None
5/8/01	10	310	300	D.Baker	None
5/9/01	10	310	300	D.Baker	None
5/10/01	10	310	300	D.Baker	None
5/11/01	10	300	290	D.Baker	None
5/29/01	9	310	301	D.Baker	None
5/30/01	9	300	291	D.Baker	None

Appendix C-2

Ludlum Model 2221 Scaler/Rate Meter with
Model 44-10 2" x 2" NaI Scintillation Gamma Detector
Serial Nos. 75448 (Meter) and 112016 (Detector)
Calibration Certificates and Source/Background Logs

Applied Health Physics, Inc.

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Applied Health Physics, Inc.		Contact	Todd Mobley	PO #	
2986 Industrial Blvd.		Contact Phone:	(412) 835-9555	Calibration Date	9/ 5/00
		Contact	Celia Rajkovich		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	75448	Probe SN	112016
Manufacturer	Ludlum	Probe Manufacturer	Ludlum
Model	2221	Probe Model	44-10

Scale 1 X1		Scale 2 X10		Scale 3 X100	
Source	Reading	Source	Reading	Source	Reading
200	200	2000	1984	20000	19864
400	401	4000	4002	40000	40038

Scale 4 X1K		Scale 5		Scale 6	
Source	Reading	Source	Reading	Source	Reading
200000	198656				
400000	400384				

Units for above readings: CPM

Battery Check: 5.0 **Check Source:** N/A **Technician:** C. Barto Cynthia Barto

Quality Assurance: T. Mobley

Exposure/Dose Rate	Electronic Calibration	Efficiency Check
Cs-137 ☐ Ra-226 ☑	MP-500 S#94932 ☑	Alpha %
		Beta %
		Gamma %

Geometry to Source: Perpendicular/Electronic

Receiving comments: OK

Maintenance comments and scale adjustments:
Count Rate Efficiency = 95000CPM/mR/h Ra-226
Probe efficiency = 19.7% Ra-226
Audio OK
High voltage set @1115
Calibrated for Earth Sciences

Temperature: 78.2

Humidity % 42

Note: If no scale adjustments are listed, readings are as found.

Calibration Due Date: 3/5/01

Notice: Applied Health Physics, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology under Nuclear Regulatory Commission License # 37-09135-01 and PA State License # PA-0228. This Calibration system conforms to the requirements of NRC regulation 10-CFR-34, 10-CFR-35, ANSI/NCSL Z540-1-1994, ANSI-STD N323A-1997 and N323-1978. This certificate is an essential record and should be maintained for inspection by the regulatory agency.

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221
Instrument S/N:	75448
Detector Model:	44-10-C
Detector S/N:	112016
Calibration Due:	3/5/01

Source S/N:	99.2193
Source DPM:	na
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	214228/238394 scaler
	203707/248975 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
10/2/00	3382	232421	229039	D.Baker	none
10/3/00	2909	228999	226090	D.Baker	none
10/4/00	3021	227773	224752	D.Baker	none
10/5/00	2989	227989	225000	D.Baker	none
10/6/00	3001	228019	225018	D.Baker	none
10/7/00	2933	232978	230045	D.Baker	none
10/9/00	2964	238035	235071	D.Baker	none
10/10/00	2928	229868	226940	D.Baker	none
10/11/00	2909	239003	236094	D.Baker	none
10/12/00	3003	239771	236768	D.Baker	none
10/13/00	2839	233467	230628	D.Baker	Change Battery
10/14/00	3333	227332	223999	D.Baker	none
10/16/00	3634	224142	220508	D.Baker	none
10/17/00	3206	224698	221492	D.Baker	none
10/18/00	3416	235986	232570	D.Baker	none
10/19/00	3394	231649	228255	D.Baker	none
10/20/00	3479	236190	232711	D.Baker	none
10/23/00	3398	231949	228551	D.Baker	none

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221
Instrument S/N:	75448
Detector Model:	44-10-C
Detector S/N:	112016
Calibration Due:	3/5/01

Source S/N:	99.2193
Source DPM:	na
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	214228/238394 scaler
	203707/248975 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
11/2/00	3334	232549	229215	D.Baker	none
11/3/00	3290	228359	225069	D.Baker	none
11/6/00	3303	218107	214804	D.Baker	none
11/7/00	3303	218367	215064	D.Baker	none
11/8/00	3504	221708	218204	D.Baker	none
11/9/00	3375	222942	219567	D.Baker	none
11/10/00	3479	221546	218067	D.Baker	none
11/13/00	3891	228676	224785	D.Baker	none
11/14/00	3294	227970	224676	D.Baker	done at 35 deg. F
11/15/00	3647	232335	228688	D.Baker	none
11/16/00	3409	238989	235580	D.Baker	none
11/17/00	3426	237482	234056	D.Baker	none
11/18/00	3367	234451	231084	D.Baker	none
11/20/00	3316	229168	225852	D.Baker	none
11/21/00	3396	234891	231495	D.Baker	none

Earth Sciences Consultants, Inc.
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(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221	Source S/N:	99.2193
Instrument S/N:	75448	Source DPM:	na
Detector Model:	44-10-C	Radiation Detected:	gamma
Detector S/N:	112016	Acceptable Range:	214228/238394 scaler
Calibration Due:	3/5/01	(Refer to ESC/HPM-2-1)	203707/248975 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
12/1/00	3299	220914	217615	Todd Brautigam	
12/4/00	3308	231429	228121	Todd Brautigam	
12/5/00	3232	227232	224000	Todd Brautigam	
12/6/00	3377	224004	220627	Todd Brautigam	
12/7/00	3473	219758	216285	Todd Brautigam	
12/8/00	3373	223562	220189	Todd Brautigam	
12/9/00	3486	226575	223089	Todd Brautigam	
12/11/00	3545	234750	231205	Todd Brautigam	
12/12/00	3345	232491	229146	Todd Brautigam	
12/13/00	3467	229948	226481	Todd Brautigam	
12/14/00	3501	225476	221975	Todd Brautigam	
12/15/00	3469	219998	216529	Todd Brautigam	
12/16/00	3356	220873	217517	Todd Brautigam	
12/17/00	3394	238477	235083	Todd Brautigam	
12/18/00	3548	226547	222999	Todd Brautigam	
12/19/00	3467	225476	222009	Todd Brautigam	
12/20/00	3399	234971	231572	Todd Brautigam	
12/21/00	3426	220154	216728	Todd Brautigam	
12/22/00	3487	230465	226978	Todd Brautigam	

Earth Sciences Consultants, Inc.
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Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221
Instrument S/N:	75448
Detector Model:	44-10-C
Detector S/N:	112016
Calibration Due:	3/5/01

Source S/N:	99.2193
Source DPM:	na
Radiation Detected:	gamma
Acceptable Range: (Refer to ESC/HPM-2-1)	214228/238394 scaler
	203707/248975 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
1/3/01	3227	232676	229449	D.Baker	none
1/4/01	3308	233200	229892	D.Baker	none
1/5/01	3309	228477	225168	D.Baker	none
1/8/01	3365	232553	229188	D.Baker	none
1/9/01	3369	233112	229743	D.Baker	none
1/10/01	3201	233723	230522	D.Baker	none
1/11/01	3324	225100	221776	D.Baker	none
1/12/01	3378	224819	221441	D.Baker	none
1/15/01	3424	219661	216237	D.Baker	none
1/16/01	3390	221069	217679	D.Baker	none
1/17/01	3406	234570	231164	D.Baker	none
1/18/01	3358	225487	222129	D.Baker	none
1/19/01	3315	224457	221142	D.Baker	none
1/20/01	3345	222107	218762	D.Baker	none
1/21/01	3254	221864	218610	D.Baker	none
1/22/01	3158	222468	219310	D.Baker	none
1/23/01	3365	227783	224418	D.Baker	none
1/24/01	3186	228011	224825	D.Baker	none
1/25/01	3208	226948	223740	D.Baker	none

Applied Health Physics,Inc.

2986 Industrial Blvd., Bethel Park, Pa 15102 Phone: (412) 835-9555 Fax: (412) 835-9559

CALIBRATION CERTIFICATE

This certificate shall not be reproduced except in full, without the written approval of Applied Health Physics, Inc.

Applied Health Physics, Inc.		**Contact**	Todd Mobley	**PO #**	
2986 Industrial Blvd.		**Contact Phone:**	(412) 835-9555	**Calibration Date**	1/29/01
		Contact	Cindy Barto		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	75448	**Probe SN**	112016
Manufacturer	Ludlum	**Probe Manufacturer**	Ludlum
Model	2221	**Probe Model**	44-10w/Shielding

Scale 1 X1		Scale 2 X10		Scale 3 X100	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
100	100	1000	1000	10000	10000
300	300	3000	3000	30000	30000

Scale 4 X1K		Scale 5		Scale 6	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
100000	100000				
300000	300000				

Units for above readings: CPM

Battery Check: 5.2 **Check Source:** N/A **Technician:** C. Barto Cynthia Barto

Quality Assurance: T. Mobley

Exposure/Dose Rate	Electronic Calibration	Efficiency Check
Cs-137 ☐ Ra-226 ☑	MP-500 S#94932 ☑	Alpha % 11.3, Ra-226
		Beta % N/A
		Gamma % N/A

Geometry to Source: Perpendicular/Electronic

Receiving comments: OK

Maintenance comments and scale adjustments: Count rate efficiency=77436CPM/mR/h Ra-226
Calibration performed with detector shielding in place.
Calibrated for lease to Earth Sciences

Temperature: 73.4

Humidity % 28

Note: If no scale adjustments are listed, readings are as found.

Calibration Due Date: 7/29/01

Notice: Applied Health Physics, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology under Nuclear Regulatory Commission License # 37-09135-01 and PA State License # PA-0228. This Calibration system conforms to the requirements of NRC regulation 10-CFR-34, 10-CFR-35, ANSI/NCSL Z540-1-1994, ANSI-STD N323A-1997 and N323-1978. This certificate is an essential record and should be maintained for inspection by the regulatory agency.

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221	Source S/N:	99.2193
Instrument S/N:	75448	Source DPM:	na
Detector Model:	44-10-C	Radiation Detected:	gamma
Detector S/N:	112016	Acceptable Range: (Refer to ESC/HPM-2-1)	190836/192414 scaler
Calibration Due:	7/29/01		172463/210788 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
1/30/01	2903	194269	191366	D.Baker	None
1/31/01	2802	194674	191872	D.Baker	None
2/1/01	2976	194534	191558	D.Baker	None
2/2/01	2948	193905	190957	D.Baker	None
2/3/01	2878	194705	191827	D.Baker	None
2/4/01	2987	194751	191764	D.Baker	None
2/5/01	2822	194586	191764	D.Baker	None
2/6/01	2915	194087	191172	D.Baker	None
2/7/01	2873	194270	191397	D.Baker	None
2/8/01	2847	193690	190843	D.Baker	None
2/9/01	2860	194482	191622	D.Baker	None
2/10/01	2915	194367	191452	D.Baker	None
2/11/01	2874	194327	191453	D.Baker	None
2/12/01	2861	194670	191809	D.Baker	None
2/13/01	2702	195004	192302	D.Baker	None
2/14/01	2925	194477	191552	D.Baker	None
2/15/01	2880	194426	191546	D.Baker	None
2/16/01	2931	194913	191982	D.Baker	None
2/17/01	3005	194240	191235	D.Baker	None
2/18/01	2928	195021	192093	D.Baker	None
2/19/01	3001	194305	191304	D.Baker	None
2/22/01	2960	195309	192349	D.Baker	None

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221	Source S/N:	99.2193
Instrument S/N:	75448	Source DPM:	na
Detector Model:	44-10-C	Radiation Detected:	gamma
Detector S/N:	112016	Acceptable Range: (Refer to ESC/HPM-2-1)	190836/192414 scaler
Calibration Due:	7/29/01		172463/210788 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
2/27/01	2879	194996	192117	D.Baker	None
2/28/01	2923	195007	192084	D.Baker	None
3/1/01	2945	195214	192269	D.Baker	None
3/2/01	2867	195012	192145	D.Baker	None
3/3/01	2916	194889	191973	D.Baker	None
3/4/01	2877	194799	191922	D.Baker	None
3/5/01	2883	195066	192183	D.Baker	None
3/6/01	2794	194776	191982	D.Baker	None
3/7/01	2907	194517	191610	D.Baker	None
3/8/01	2866	194677	191811	D.Baker	None
3/12/01	2837	194883	192046	D.Baker	None
3/13/01	2791	195121	192330	D.Baker	None
3/14/01	2874	194688	191814	D.Baker	None
3/15/01	2933	193999	191066	D.Baker	None
3/16/01	2864	194098	191234	D.Baker	None
3/19/01	2918	194578	191660	D.Baker	None
3/20/01	2795	194667	191872	D.Baker	None
3/26/01	2845	194321	191476	D.Baker	None
3/27/01	2955	195011	192056	D.Baker	None
3/28/01	2867	194398	191531	D.Baker	None
3/29/01	2793	194026	191233	D.Baker	None
3/30/01	2879	195002	192123	D.Baker	None

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221	Source S/N:	99.2193
Instrument S/N:	75448	Source DPM:	na
Detector Model:	44-10-C	Radiation Detected:	gamma
Detector S/N:	112016	Acceptable Range: (Refer to ESC/HPM-2-1)	190836/192414 scaler
Calibration Due:	7/29/01		172463/210788 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
4/2/01	2899	194561	191662	D.Baker	None
4/3/01	2916	195002	192086	D.Baker	None
4/4/01	2766	194665	191899	D.Baker	None
4/5/01	2816	194667	191851	D.Baker	None
4/6/01	2907	194789	191882	D.Baker	None
4/7/01	2786	193998	191212	D.Baker	None
4/9/01	2922	193789	190867	D.Baker	None
4/20/01	2788	194567	191779	D.Baker	None
4/21/01	2806	194335	191529	D.Baker	None
5/7/01	2834	195000	192166	D.Baker	None
5/8/01	2861	194663	191802	D.Baker	None
5/9/01	2910	194882	191972	D.Baker	None
5/10/01	2799	194237	191438	D.Baker	None
5/11/01	2903	193996	191093	D.Baker	None
5/29/01	2844	194361	191517	D.Baker	None
5/30/01	2948	194227	191279	D.Baker	None

Appendix C-3

Ludlum Model 2221 Scaler/Rate Meter with
Model 44-10 2" x 2" NaI Scintillation Gamma Detector
Serial Nos. 75473 (Meter) and 081084 (Detector)
Calibration Certificate and Source/Background Log

Applied Health Physics, Inc.

2986 Industrial Blvd., Bethel Park, Pa 15102 Phone: (412) 835-9555 Fax: (412) 835-9559

CALIBRATION CERTIFICATE

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Applied Health Physics, Inc.		**Contact**	Todd Mobley	**PO #**	
2986 Industrial Blvd.		**Contact Phone:**	(412) 835-9555	**Calibration Date**	1/29/01
		Contact	Cindy Barto		
		Contact Phone:			
Bethel Park	PA 15102				

Instrument SN	75473	**Probe SN**	081084
Manufacturer	Ludlum	**Probe Manufacturer**	Ludlum
Model	2221	**Probe Model**	44-10

Scale 1 X1		**Scale 2** X10		**Scale 3** X100	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
100	100	1000	1000	10000	10000
300	300	3000	3000	30000	30000

Scale 4 X1K		**Scale 5**		**Scale 6**	
Source	**Reading**	**Source**	**Reading**	**Source**	**Reading**
100000	100000				
300000	300000				

Units for above readings: CPM

Battery Check: 5.2 **Check Source:** N/A **Technician:** C. Barto Cynthia Barto

Quality Assurance: T. Mobley

Exposure/Dose Rate	**Electronic Calibration**	**Efficiency Check**
Cs-137 ☐ Ra-226 ☑	MP-500 S#94932 ☑	**Alpha %** 16.6, Ra-226
		Beta % N/A
Geometry to Source: Perpendicular/Electronic		**Gamma %** N/A

Receiving comments: OK

Maintenance comments and scale adjustments: Count rate efficiency = 80814CPM/mR/h Ra-226
Calibration performed with detector shielding in place.
Calibrated for lease to Earth Sciences

Temperature: 73.6

Humidity % 28

Note: If no scale adjustments are listed, readings are as found.

Calibration Due Date: 7/29/01

Notice: Applied Health Physics, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology under Nuclear Regulatory Commission License # 37-09135-01 and PA State License # PA-0228. This Calibration system conforms to the requirements of NRC regulation 10-CFR-34, 10-CFR-35, ANSI/NCSL Z540-1-1994, ANSI-STD N323A-1997 and N323-1978. This certificate is an essential record and should be maintained for inspection by the regulatory agency.

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2221	Source S/N:	99.2193
Instrument S/N:	75473	Source DPM:	na
Detector Model:	44-10	Radiation Detected:	gamma
Detector S/N:	81084	Acceptable Range: (Refer to ESC/HPM-2-1)	320054/341837 scaler
Calibration Due:	7/29/01		297851/364040 rate

Date	Background Count Rate	Gross Source Count Rate	Net Source Count Rate	Technician	Comments
2/12/01	3468	334872	331404	D.Baker	None
2/13/01	3485	339334	335849	D.Baker	None
2/14/01	3336	340069	336733	D.Baker	None
2/15/01	3558	340346	336788	D.Baker	None
2/16/01	3596	339073	335477	D.Baker	None
2/17/01	3612	330150	326538	D.Baker	None
2/18/01	3272	334987	331715	K. Brown	None
2/19/01	3671	332863	329192	K. Brown	None
2/22/01			0	D.Baker	Returned to AHP
			0		
			0		
			0		
			0		
			0		
			0		

Appendix C-4

Ludlum Model 2224 Alpha-Beta Scaler/Rate Meter with
Model 43-68 100 cm^2 Gas Proportional Alpha-Beta Detector
Serial Nos. 116240 (Meter) and 507 (Detector)
Calibration Certificate and Gas Decay Logs

GTS Instrument Services
2045 Route 286
Pittsburgh, PA 15239-2839
724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION

RENTAL EQUIPMENT

Customer Name: GTS INSTRUMENT SERVICES
Customer Address: 2045 Rt. 286
Pittsburgh, PA 15239

Customer P.O.#
Work Order #

INSTRUMENT INFORMATION

Instrument Manufacturer: Ludlum
Model: 2224 Serial Number: 116240 (315)
External Probe(s): Serial #:
Calibration Method: Pulser s/n 120935

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response: Before Calib.	Instrument Response: After Calib.	Comment
1	X1	100 CPM		100 CPM	All Calibrations Btn. + & - 10%
2		200		200	
3		400		400	Battery: OK
4					
	X10	1K		1K	Mechanical Zero: OK
		2K		2K	
7		4K		4K	BETA: Threshold = 4.5mV
8					Window = 41.6mV
9	X100	10K		10K	Background = 158.5
10		20K		20K	Audio: OK
11		40K		40K	
12					ALPHA: Threshold = 128mV
13	X1000	100K		100K	Background = 2
14		200K		200K	
15		400K		400K	
16					
17	SCALER	400		402	
18		4K		4,024	
19		40K		40,224	
20		400K		402,308	
21					
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by: James Christopher (Signed)
Calibration Date: 04-18-00
Next Calibration Due: 04-18-01

I certify that the above information is correct:
Administrative Coordinator — Date: 04-18-00

Earth Sciences Consultants, Inc.
One triangle Lane
Export, PA 15632

Form HPM-1-2-2
Gas Decay Log

Effective Date: September 2000
Revision: 0

Date	Inst. S/N	Cal Due Date	Alpha BKG	Beta BKG	Alpha Source DPM	Beta Source DPM	Time Out	Source Count Alpha	Source Count Beta	Alpha Eff % Out	Beta Eff % Out	Time In	Source Count Alpha	Source Count Beta	Alpha Eff % In	Beta Eff % In	Comments
10/2/00	116240	4/18/01	3	220	15540	27000	10:10	1795	3914	11.5%	13.7%	N/A	0	0	0.0%	-0.8%	Not Used
10/3/00	116240	4/18/01	1	220	15540	27000	13:30	1992	3864	12.8%	13.5%	16:10	1859	4009	12.0%	14.0%	Not Used
10/4/00	116240	4/18/01	1	220	15540	27000	10:15	1864	3864	12.0%	13.5%	N/A	0	0	0.0%	-0.8%	Not Used
10/5/00	116240	4/18/01	2	220	15540	27000	7:00	1880	3879	12.1%	13.6%	N/A	0	0	0.0%	-0.8%	Not Used
10/6/00	116240	4/18/01	1	220	15540	27000	7:15	1963	3904	12.6%	13.6%	N/A	0	0	0.0%	-0.8%	Not Used
10/7/00	116240	4/18/01	1	220	15540	27000	7:10	1799	3900	11.6%	13.6%	N/A	0	0	0.0%	-0.8%	Not Used
10/9/00	116240	4/18/01	2	220	15540	27000	7:10	1908	3866	12.3%	13.5%	N/A	0	0	0.0%	-0.8%	Not Used
10/10/00	116240	4/18/01	1	220	15540	27000	7:10	1896	3799	12.2%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
10/11/00	116240	4/18/01	1	220	15540	27000	7:15	1878	3864	12.1%	13.5%	N/A	0	0	0.0%	-0.8%	Not Used
10/12/00	116240	4/18/01	1	220	15540	27000	7:10	1955	3944	12.6%	13.8%	N/A	0	0	0.0%	-0.8%	Not Used
10/13/00	116240	4/18/01	2	220	15540	27000	7:00	1964	3822	12.6%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
10/14/00	116240	4/18/01	1	220	15540	27000	7:00	1892	3865	12.2%	13.5%	N/A	0	0	0.0%	-0.8%	Not Used
10/16/00	116240	4/18/01	1	220	15540	27000	7:15	1909	3905	12.3%	13.6%	N/A	0	0	0.0%	-0.8%	Not Used
10/17/00	116240	4/18/01	1	220	15540	27000	7:30	1924	3799	12.4%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
10/18/00	116240	4/18/01	2	220	15540	27000	6:45	1889	3845	12.1%	13.4%	N/A	0	0	0.0%	-0.8%	Not Used
10/19/00	116240	4/18/01	1	220	15540	27000	7:00	1964	3571	12.6%	12.4%	N/A	0	0	0.0%	-0.8%	Not Used
10/20/00	116240	4/18/01	2	220	15540	27000	8:00	1864	3644	12.0%	12.7%	N/A	0	0	0.0%	-0.8%	Not Used
10/23/00	116240	4/18/01	1	220	15540	27000	8:00	1921	3789	12.4%	13.2%	N/A	0	0	0.0%	-0.8%	Not Used

Earth S. .s Consultants, Inc.
One triangle Lane
Export, PA 15632

Form HrM-1-2-2
Gas Decay Log

Effective Date: . .nber 2000
Revision: 0

Date	Inst. S/N	Cal Due Date	Alpha BKG	Beta BKG	Alpha Source DPM	Beta Source DPM	Time Out	Source Count Alpha	Source Count Beta	Alpha Eff % Out	Beta Eff % Out	Time In	Source Count Alpha	Source Count Beta	Alpha Eff % In	Beta Eff % In	Comments
11/2/00	116240	4/18/00	1	220	15540	27000	N/A	1896	3725	12.2%	13.0%	N/A	0	0	0.0%	-0.8%	Not Used
11/3/00	116240	4/18/00	1	220	15540	27000	N/A	1924	3802	12.4%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/6/00	116240	4/18/00	1	220	15540	27000	N/A	1920	3799	12.3%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/7/00	116240	4/18/00	1	220	15540	27000	N/A	1897	3689	12.2%	12.8%	N/A	0	0	0.0%	-0.8%	Not Used
11/8/00	116240	4/18/00	2	220	15540	27000	N/A	1877	3698	12.1%	12.9%	N/A	0	0	0.0%	-0.8%	Not Used
11/9/00	116240	4/18/00	1	220	15540	27000	N/A	1896	3807	12.2%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/10/00	116240	4/18/00	3	220	15540	27000	N/A	1915	3800	12.3%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/13/00	116240	4/18/00	1	220	15540	27000	N/A	1849	3821	11.9%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/14/00	116240	4/18/00	1	220	15540	27000	N/A	1897	3727	12.2%	13.0%	N/A	0	0	0.0%	-0.8%	Not Used
11/15/00	116240	4/18/00	2	220	15540	27000	N/A	1902	3845	12.2%	13.4%	N/A	0	0	0.0%	-0.8%	Not Used
11/16/00	116240	4/18/00	1	220	15540	27000	N/A	1916	3699	12.3%	12.9%	N/A	0	0	0.0%	-0.8%	Not Used
11/17/00	116240	4/18/00	3	220	15540	27000	N/A	1907	3815	12.3%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used
11/18/00	116240	4/18/00	2	220	15540	27000	N/A	1877	3756	12.1%	13.1%	N/A	0	0	0.0%	-0.8%	Not Used
11/20/00	116240	4/18/00	1	220	15540	27000	N/A	1846	3796	11.9%	13.2%	N/A	0	0	0.0%	-0.8%	Not Used
11/21/00	116240	4/18/00	1	220	15540	27000	N/A	1907	3801	12.3%	13.3%	N/A	0	0	0.0%	-0.8%	Not Used

Earth S[illegible]s Consultants, Inc.
One triangle Lane
Export, PA 15632

Form HrM-1-2-2
Gas Decay Log

Effective Date: S[illegible]mber 2000
Revision: 0

Date	Inst. S/N	Cal Due Date	Alpha BKG	Beta BKG	Alpha Source DPM	Beta Source DPM	Time Out	Source Count Alpha	Source Count Beta	Alpha Eff % Out	Beta Eff % Out	Time In	Source Count Alpha	Source Count Beta	Alpha Eff % In	Beta Eff % In	Comments
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000	N/A			0.0%	0.0%	N/A	0	0	0.0%	0.0%	Not Used

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Form HPM-1-2-2
Gas Decay Log

Effective Date: September 2000
Revision: 0

Date	Inst. S/N	Cal Due Date	Alpha BKG	Beta BKG	Alpha Source DPM	Beta Source DPM	Time Out	Source Count Alpha	Source Count Beta	Alpha Eff % Out	Beta Eff % Out	Time In	Source Count Alpha	Source Count Beta	Alpha Eff % In	Beta Eff % In	Comments
2/20/01	116240	4/18/00	2	212	15540	27000	9:30	1958	3849	12.6%	13.5%	11:00	1982	3684	12.7%	12.9%	None
2/20/01	116240	4/18/00	2	214	15540	27000	12:30	1967	3902	12.6%	13.7%	2:49	1874	3789	12.0%	13.2%	None
2/20/01	116240	4/18/00	2	212	15540	27000	4:30	1989	3866	12.8%	13.5%	5:00	1896	3724	12.2%	13.0%	None
2/21/01	116240	4/18/00	3	249	15540	27000	8:45	1928	3888	12.4%	13.5%	10:00	1891	3766	12.1%	13.0%	None
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used
	116240	4/18/00			15540	27000				0.0%	0.0%		0	0	0.0%	0.0%	Not Used

Appendix C-5

Ludlum Model 2929 Alpha-Beta Scaler with
Model 43-10-1 Sample Counter
Serial Nos. 95574 (Scaler) and 094383 (Detector)
Calibration Certificate and Source/Background and Daily Use Logs

GTS Instrument Services
2045 Route 286
Pittsburgh, PA 15239-2839
724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION

Customer Name: Earth Science Consultants
Customer Address: 1 Triangle Lane
Export, PA 15632

Customer P.O.#
Work Order # I-00-08-209

INSTRUMENT INFORMATION

Instrument Manufacturer Ludlum
Model 2929 Serial Number 95574
External Probe(s) 43-10-1 Serial # 094383

Calibration Method ^{99}Pulser s/n 101500
^{99}Tc s/n S1256
^{230}Th s/n 11623

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response Before Calib.	Instrument Response After Calib.	Comment
1	BETA				All Calibrations Btn. + & - 10%
2	0.1 MIN	40K CPM	4,000 CPM	4,000	
3					HV Mechanical Zero: OK
4	1	40K	40,095	40,095	Audio: OK
5					
6	10	40K	401,262	401,262	BETA:
7					Input Sensitivity: 4.5mV
8	ALPHA				Window = 50mV
9	0.1 MIN	40K	4,000	4,000	^{99}TRc Efficiency = 15.4%
10					
11	1	40K	40,100	40,100	ALPHA
12					Input Sensitivity = 180mV
13	10	40K	401,092	401,092	^{230}Th Efficiency = 22.8%
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by: (Signed)
Calibration Date: 09-05-00
Next Calibration Due: 09-05-01

I certify that the above information is correct:
Administrative Coordinator
09-05-00
Date

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141
Source Amount	0.007 mCi
Radiation Detected:	alpha/beta
Acceptable Range:	2598/2325 α
(Refer to ESC/HPM-2-1)	479/402 β

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
10/2/00	1	61	2459	486	2458	425	D.Baker	none
10/3/00	2	64	2494	490	2492	426	D.Baker	none
10/4/00	1	69	2484	499	2483	430	D.Baker	none
10/5/00	1	55	2508	503	2507	448	D.Baker	none
10/6/00	1	58	2547	510	2546	452	D.Baker	none
10/7/00	2	59	2406	487	2404	428	D.Baker	none
10/9/00	3	60	2419	488	2416	428	D.Baker	none
10/10/00	2	54	2505	456	2503	402	D.Baker	none
10/11/00	1	57	2499	489	2498	432	D.Baker	none
10/12/00	2	65	2451	519	2449	454	D.Baker	none
10/13/00	1	60	2513	476	2512	416	D.Baker	none
10/14/00	1	61	2469	485	2468	424	D.Baker	none
10/16/00	2	57	2497	476	2495	419	D.Baker	none
10/17/00	2	55	2379	459	2377	404	D.Baker	none
10/18/00	2	63	2511	501	2509	438	D.Baker	none
10/19/00	1	64	2489	511	2488	447	D.Baker	none
10/20/00	2	59	2499	500	2497	441	D.Baker	none
10/23/00	3	54	2489	476	2486	422	D.Baker	none

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141
Source Amount	0.007 mCi
Radiation Detected:	alpha/beta
Acceptable Range:	2598/2325 α
(Refer to ESC/HPM-2-1)	479/402 β

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
11/2/00	1	54	2435	474	2434	420	D.Baker	none
11/3/00	1	67	2418	518	2417	451	D.Baker	none
11/6/00	2	51	2466	473	2464	422	D.Baker	none
11/7/00	3	54	2464	501	2461	447	D.Baker	none
11/8/00	2	61	2369	490	2367	429	D.Baker	none
11/9/00	1	51	2380	456	2379	405	D.Baker	none
11/10/00	2	55	2416	476	2414	421	D.Baker	none
11/13/00	2	62	2350	489	2348	427	D.Baker	none
11/14/00	3	54	2409	483	2406	429	D.Baker	none
11/15/00	1	57	2424	490	2423	433	D.Baker	none
11/16/00	1	60	2505	500	2504	440	D.Baker	none
11/17/00	3	61	2406	502	2403	441	D.Baker	none
11/18/00	2	57	2407	489	2405	432	D.Baker	none
11/20/00	1	53	2348	470	2347	417	D.Baker	none
11/21/00	1	54	2499	476	2498	422	D.Baker	none

Ludlum Model 2929 Daily Use Log

Instrument Model:	2929	Source S/N:	99TH2204141 / 93-1256C	
Instrument S/N:	95574	Source Amount	15540 / 27000	
Detector Model:	43-10-1	Radiation Detected:	alpha/beta	
Detector S/N:	094383	Acceptable Range:	Net Alpha: 3410-3561	
Calibration Due:	9/5/01	(Refer to ESC/HPM-2-1)	Net Beta: 3164-3601	

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
11/27/00	0	47	3411	3282	3411	3235	T.Brautigam	Source Holder in
11/28/00	0	55	3531	3295	3531	3240	T.Brautigam	Source Holder in
11/29/00	0	46	3535	3345	3535	3299	T.Brautigam	Source Holder in
11/30/00	0	46	3456	3295	3456	3249	T.Brautigam	Source Holder in
12/1/00	0	48	3370	3291	3370	3243	T.Brautigam	Source Holder in
12/4/00	0	45	3425	3259	3425	3214	T.Brautigam	Source Holder in
12/5/00	0	46	3337	3264	3337	3218	T.Brautigam	Source Holder in
12/6/00	0	51	3474	3231	3474	3180	T.Brautigam	Source Holder in
12/7/00	1	46	3526	3329	3525	3283	T.Brautigam	Source Holder in
12/8/00	0	53	3430	3255	3430	3202	T.Brautigam	Source Holder in
12/9/00	0	51	3487	3370	3487	3319	T.Brautigam	Source Holder in
12/11/00	0	51	3479	3305	3479	3254	T.Brautigam	Source Holder in
12/12/00	0	65	3548	3311	3548	3246	T.Brautigam	Source Holder in
12/13/00	0	62	3480	3289	3480	3227	T.Brautigam	Source Holder in
12/14/00	0	54	3482	3287	3482	3233	T.Brautigam	Source Holder in
12/15/00	1	63	3499	3304	3498	3241	T.Brautigam	Source Holder in
12/16/00	0	46	3509	3306	3509	3260	T.Brautigam	Source Holder in
12/17/00	1	58	3522	3311	3521	3253	T.Brautigam	Source Holder in
12/18/00	0	55	3534	3322	3534	3267	T.Brautigam	Source Holder in
12/19/00	1	61	3456	3366	3455	3305	T.Brautigam	Source Holder in

Ludlum Model 2929 Daily Use Log

12/20/00	0	55	3499	3402	3499	3347	T.Brautigam	Source Holder in
12/21/00	0	63	3509	3346	3509	3283	T.Brautigam	Source Holder in
12/22/00	0	62	3466	3376	3466	3314	T.Brautigam	Source Holder in

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141
Source Amount	0.007 mCi
Radiation Detected:	alpha/beta
Acceptable Range:	3410/3561 α
(Refer to ESC/HPM-2-1)	3164/3601 β

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
1/3/01	0	49	3492	3292	3492	3243	dsb	none
1/4/01	0	56	3466	3510	3466	3454	dsb	none
1/5/01	0	43	3497	3314	3497	3271	dsb	none
1/8/01	0	59	3476	3300	3476	3241	dsb	none
1/9/01	0	46	3473	3284	3473	3238	dsb	none
1/10/01	0	47	3469	3326	3469	3279	dsb	none
1/11/01	0	61	3422	3445	3422	3384	dsb	none
1/12/01	0	51	3458	3317	3458	3266	dsb	none
1/15/01	0	53	3439	3290	3439	3237	dsb	none
1/16/01	0	56	3554	3301	3554	3245	dsb	none
1/17/01	0	49	3487	3416	3487	3367	dsb	none
1/18/01	0	54	3465	3312	3465	3258	dsb	none
1/19/01	0	46	3429	3349	3429	3303	dsb	none
1/20/01	0	63	3414	3406	3414	3343	dsb	none
1/21/01	0	54	3436	3253	3436	3199	dsb	none
1/22/01	1	54	3464	3306	3463	3252	dsb	none
1/23/01	1	56	3506	3381	3505	3325	dsb	none
1/24/01	0	70	3421	3439	3421	3369	dsb	none
1/25/01	0	38	3397	3296	3397	3258	dsb	none

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141	93-1256C
Source Amount	0.007 mCi	27000 DPM
Radiation Detected:	alpha	beta
Acceptable Range:	3230/3494 α	3002/3451 β
(Refer to ESC/HPM-2-1)		

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
2/1/01	1	55	3365	3332	3364	3277	D.Baker	None
2/2/01	1	44	3381	3228	3380	3184	D.Baker	None
2/3/01	0	38	3296	3242	3296	3204	D.Baker	None
2/4/01	0	46	3423	3337	3423	3291	D.Baker	None
2/5/01	1	64	3469	3106	3468	3042	D.Baker	None
2/6/01	0	55	3398	3225	3398	3170	D.Baker	None
2/7/01	0	48	3417	3167	3417	3119	D.Baker	None
2/8/01	0	43	3242	3224	3242	3181	D.Baker	None
2/9/01	0	43	3346	3336	3346	3293	D.Baker	None
2/10/01	0	40	3370	3249	3370	3209	D.Baker	None
2/11/01	0	46	3316	3243	3316	3197	D.Baker	None
2/12/01	0	65	3397	3216	3397	3151	D.Baker	None
2/13/01	0	39	3367	3276	3367	3237	D.Baker	None
2/14/01	0	54	3268	3264	3268	3210	D.Baker	None
2/15/01	1	41	3395	3227	3394	3186	D.Baker	None
2/16/01	0	71	3446	3187	3446	3116	D.Baker	None
2/17/01	0	59	3389	3272	3389	3213	D.Baker	None
2/18/01	2	54	3346	3121	3344	3067	D.Baker	None
2/19/01	1	45	3299	3208	3298	3163	D.Baker	None
2/20/01	1	58	3315	3167	3314	3109	D.Baker	None
2/21/01	1	43	3349	3199	3348	3156	D.Baker	None

Earth Sciences Consultants, Inc.
One Triangle Lane
Export, PA 15632
(724) 733-3000

Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
Revision: 0

Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141	93-1256C
Source Amount	0.007 mCi	27000 DPM
Radiation Detected:	alpha	beta
Acceptable Range:	3230/3494 α	3002/3451 β
(Refer to ESC/HPM-2-1)		

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
2/27/01	0	59	3412	3249	3412	3190	D.Baker	None
2/28/01	0	60	3356	3249	3356	3189	D.Baker	None
3/1/01	0	62	3453	3207	3453	3145	D.Baker	None
3/2/01	0	70	3405	3245	3405	3175	D.Baker	None
3/3/01	0	55	3347	3282	3347	3227	D.Baker	None
3/4/01	0	58	3309	3224	3309	3166	D.Baker	None
3/5/01	0	39	3402	3273	3402	3234	D.Baker	None
3/6/01	0	41	3345	3255	3345	3214	D.Baker	None
3/7/01	1	42	3299	3267	3298	3225	D.Baker	None
3/8/01	1	57	3347	3246	3346	3189	D.Baker	None
3/12/01	0	39	3349	3219	3349	3180	D.Baker	None
3/13/01	0	49	3289	3267	3289	3218	D.Baker	None
3/14/01	0	66	3346	3291	3346	3225	D.Baker	None
3/15/01	0	51	3328	3267	3328	3216	D.Baker	None
3/16/01	1	44	3319	3219	3318	3175	D.Baker	None
3/19/01	0	50	3409	3261	3409	3211	D.Baker	None
3/20/01	1	70	3411	3233	3410	3163	D.Baker	None
3/26/01	0	68	3387	3217	3387	3149	D.Baker	None
3/27/01	0	56	3367	3259	3367	3203	D.Baker	None
3/28/01	0	54	3359	3267	3359	3213	D.Baker	None
3/29/01	0	62	3407	3246	3407	3184	D.Baker	None
3/30/01	0	43	3402	3212	3402	3169	D.Baker	None

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Form HPM-1-2-1
Source/Background Log

Effective Date: September 2000
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Instrument Model:	2929
Instrument S/N:	95574
Detector Model:	43-10-1
Detector S/N:	94383
Calibration Due:	9/5/01

Source S/N:	99TH2204141	93-1256C
Source Amount	0.007 mCi	27000 DPM
Radiation Detected:	alpha	beta
Acceptable Range:	3230/3494 α	3002/3451 β
(Refer to ESC/HPM-2-1)		

Date	Background Count Rate Alpha (cpm)	Background Count Rate Beta (cpm)	Gross α Source Count Rate (cpm)	Gross β Source Count Rate (cpm)	Net α Source Count Rate (cpm)	Net β Source Count Rate (cpm)	Technician	Comments
4/2/01	0	60	3411	3090	3411	3030	D.Baker	None
4/3/01	0	59	3389	3156	3389	3097	D.Baker	None
4/4/01	0	49	3376	3249	3376	3200	D.Baker	None
4/5/01	0	39	3299	3316	3299	3277	D.Baker	None
4/6/01	0	67	3349	3249	3349	3182	D.Baker	None
4/7/01	0	55	3367	3155	3367	3100	D.Baker	None
4/9/01	0	48	3408	3197	3408	3149	D.Baker	None
4/20/01	0	44	3367	3259	3367	3215	D.Baker	None
4/21/01	1	59	3364	3316	3363	3257	D.Baker	None
5/7/01	1	56	3288	3364	3287	3308	D.Baker	None
5/8/01	0	42	3346	3397	3346	3355	D.Baker	None
5/9/01	0	47	3329	3400	3329	3353	D.Baker	None
5/10/01	0	48	3250	3456	3250	3408	D.Baker	None
5/11/01	0	52	3276	3319	3276	3267	D.Baker	None
5/29/01	1	46	3319	3225	3318	3179	D.Baker	None
5/30/01	0	60	3250	3197	3250	3137	D.Baker	None