53234

95E0432
January, 1995

Technical Evaluation of The IHSS 180 Radioanalytical Data From

draft report "Phase I RFI/RI Report Operable Unit No. 15, Inside Building Closures," dated August 1994

Kathy M. Hagglund

EG&G ROCKY FLATS

General Radiochemistry Lab
Building 881

U/NU

INTRODUCTION

The draft report "Phase I RFI/RI Report Operable Unit No. 15, Inside Building Closures," dated August 1994, had lead some people to conclude that there was americium and plutonium present in Building 883. From these conclusions it was surmised that americium would be the limiting factor in the cleanup and closure of IHSS 180.

Given the history of Building 883, these conclusions were considered unlikely. Analytical Services was contracted to review radioanalytical data pertaining to the closure of IHSS 180, which is a drum storage area located within Room 104 of Building 883. This data was derived from work performed by an off-site radiochemistry laboratory, and is found within the draft report referenced above.

The purpose of the evaluation was to answer two questions. First, does the analytical data support the conclusion that americium and plutonium are present in IHSS 180. Secondly, if americium is indeed present, evaluate the assumptions used in the dose model which led to the conclusion that americium is the dose limiting isotope for this project.

The results can be blank corrected by directly subtracting the activity of the blank from the activity of the sample ONLY if the aliquot volumes of the sample and blank are the same. If the volumes are not the same, the activity concentrations of the sample and the blank must first be converted to activity per aliquot, using the aliquot volumes of the sample and blank. Then the activity of the blank is subtracted from the activity of the sample and the activity of the sample converted back to a concentration basis. The error of the blank corrected result is calculated by taking the square root of the sum of the squares of the uncertainties reported for the sample and the blank.

Detection Limit

The reported activities are generally higher than the reported detection limits, which would lead one to believe that the reported results reflect actual measurable activities. This is probably due, at least in part, to tracer contamination as discussed above. However, one other contributing factor is that the reported detection limits are based on the GRRASP SOW requirements. The detection limit equation specified in GRRASP is an instrument detection limit (IDL) and is not a good estimate of the lowest level of activity which the laboratory can actually detect AND quantify. The minimum detectable activity (MDA) is best estimated by evaluating a history of laboratory blanks analyzed during the time when the sample analyses were performed. The reported activities are so low, it is likely that if the MDA was estimated using a population of laboratory blanks, the reported sample activities would be less than the MDAs for the measurements.

Analytical Data Summary and Evaluation

The analytical data was evaluated using the following procedure. The average activities for Pu239/240 and Am241 were calculated for the samples, replicates and duplicates. The averages of the results for the equipment rinsates were calculated. The average detection limits for all analyses were calculated. Finally, the results were compared to the results for the hot water source which was used for the sample collection.

Description	Average Pu-239/240 pCi/L	Average Am-241 pCi/L
Samples, Replicates and Duplicates	0.005	0.004
Equipment Rinsates	0.002	0.006
Hot Water Source	0.002	0.004
Average Detection Limit	0.004	0.004

FINDINGS

Sample Collection Evaluation

The samples were collected by spraying pressurized hot water on the area to be sampled and immediately aspirating the water. The aspirated water was then subdivided into analytical samples for a variety of analyses. The portion of the collected water which was used for the radionuclide analysis was filtered before being submitted for analysis. This was a serious error in the sampling plan. If plutonium and americium were present in the aspirated water, they would be present in particulate form and would not be appreciably soluble in the hot water collection medium. Therefore, if any plutonium or americium were present in the sampling area, it is probable that they would have been filtered out during the sample collection. In order to accurately determine which contaminants were present, the samples should not have been filtered prior to analysis.

Blank Correction Issues

The radioanalytical data were produced under the General Radiochemistry and Routine Analytical Services Protocol Part B (GRRASP) Statement of Work (SOW). The GRRASP SOW requires that the reported results are not blank corrected and that the associated blanks for the analyses be reported separately. According to Karen Schoendaller, Radiochemistry Technical Lead for Sample Management Office/Environmental Restoration, the users of the RFEDS database have been informed that they have the responsibility to blank correct the data before using the data. Blank correction is necessary for analyses which use an internal tracer, such as plutonium and americium analyses, because even the purest tracers available will contain a very small concentration of the analyte isotope(s). The contribution of the analyte isotope from the tracer must be accounted for, particularly when the data is being used to determine if the analyte isotope is present at very low concentrations.

The analytical data should be reviewed to ascertain whether the results included in this report were properly blank corrected. One note of caution, although the GRRASP SOW requires that data be reported without blank correction, some laboratories have interpreted this requirement to mean that correction for tracer contamination is allowed and that the restriction only disallows correction for "laboratory contamination". The complete data packages should be carefully reviewed to determine exactly how the reported data was generated. If the data were not corrected for tracer contamination, it should be corrected and reevaluated. If the results were corrected for tracer contaminants, then the results are acceptable for use as reported as long as the other limiting factors are considered.

EVALUATION AND DATA SUMMARY

The data and applicable information pertaining to IHSS 180 were reviewed. The following radioanalytical data for plutonium and americium were extracted from the report and are displayed in the table below.

Sample ID	Description	Pu-239/240 pCi/L	Am-241 pCi/L
BU00022ER	Hot Water Source	0.002 ± 0.004 MDA 0.006	0.004 ± 0.006 MDA 0.006
BU00023ER	Sample	0.005 ± 0.006 MDA 0.004	0.008 ± 0.006 MDA 0.002
BU00024ER	Duplicate of BU00023ER	0.007 ± 0.006 MDA 0.002	0.000 ± 0.003 MDA 0.009
BU00025ER	Equipment Rinsate	0.002 ± 0.004 MDA 0.004	0.008 ± 0.008 MDA 0.003
BU00026ER	Sample	0.007 ± 0.006 MDA 0.006	0.007 ± 0.006 MDA 0.002
BU00027ER	Sample	0.006 ± 0.004 MDA 0.004	-0.002 ± 0.008 MDA 0.015
BU00028ER	Duplicate of BU00027ER	0.007 ± 0.004 MDA 0.001	0.004 ± 0.004 MDA 0.001
BU00029ER	Equipment Rinsate	0.001 ± 0.004 MDA 0.005	0.003 ± 0.004 MDA 0.001
BU00030ER	Sample	0.004 ± 0.004 MDA 0.001	0.006 ± 0.004 MDA 0.002
BU00030ER	Lab Replicate of BU00030ER	0.002 ± 0.004 MDA 0.005	NA

The purpose of collecting an equipment blank sample is to verify that the sampling equipment is adequately decontaminated between sampling sites. Although, one can not assume that the equipment rinsates are blanks, if the samples contain detectable contaminants, the activity in the rinsates should certainly be less than the activity in the samples. This data summary shows that the americium activity in the equipment rinsates and in the hot water source is greater than or equal to the average americium activity for the samples, replicates, and duplicates. This suggests either that the source water was contaminated (unlikely) or that the americium was not present in measurable concentration in the samples.

The average plutonium for the samples, replicates and duplicates is slightly higher than the equipment rinsates and the hot water source, however, all reported activities are very low. The average activities are approximately the same as the average detection limit and these detection limits may not be a good estimate of the true minimum detectable activity for the reasons discussed earlier in this report.

Dose Assessment

Finally, the dose assessment portion of the report was reviewed. The assessment was limited to an evaluation of the assumptions which were made for assigning input parameters. Two problems were noted in this area. First, the activity of the dust was calculated to be 5.6×10^6 pCi/kg. This value is likely to be too high by at least a factor of 200. Total alpha activity in typical, "uncontaminated" soil is generally less than 2.8×10^4 pCi/kg. Given the significance of this value in the dose assessment, the dust should have, at a minimum, be analyzed for gross alpha/gross beta activity in order to get a good estimate of the total activity in the dust. An even better dose modeling assessment could be done if the dust is analyzed for isotope specific activities.

The second problem noted was that the activity in the area was determined by taking the highest smear obtained, and then assuming that the activity was solely due to each "detected" isotope. Since the smear count was gross activity, some assumptions have to be made about the isotope present. However, assuming that all of that activity was due to plutonium, americium or radium was a very poor assumption, since this building was a uranium process building.

Summary

- The sampling and analysis plan was not appropriate for the intended use of the data. In order to detect all isotopes present, the water samples should have been analyzed without filtering the samples.

  - In addition, the manner that the analytical data from the hot water rinsates was used did not warrant the significant time and money that was spent to collect that data.

- The results of the water rinsate samples were only used to determine which isotopes were present. That could have been done by analyzing a composite of all the hot water rinsates or even better, by destructive analyzing the smear papers for isotope specific activities after they were counted for gross activity.

- Given that the samples were filtered prior to analysis, the analytical data is probably of little value <u>even</u> if the data are blank corrected and the MDAs are estimated with blank population data.

  - If the analytical data will be used to determine presence of contaminant isotopes, it should be reevaluated as described in this report.

- The assumptions that were made in the dose model calculations need to be reevaluated. Additional analytical data would appear to be necessary in order for a good dose assessment to be done.

  - First, the total activity of the dust needs to determined, preferably using a destructive analytical technique such as gross alpha/gross beta analysis.

  - Secondly, the isotope ratios in the dust should be determined analytically so that more appropriate assumptions can be used to determine better inputs into the dose model calculations. In the event that isotope specific data is not available, using process knowledge of the material handled in the Building would be better than assuming that the activity is due to plutonium or americium.