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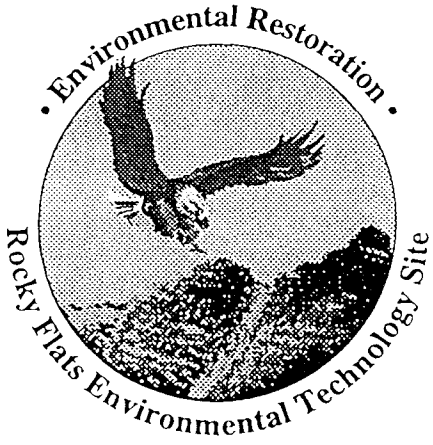
CANBERRA IN-SITU SERVICES

DATA REVIEW

RF/RMRS-98-267



September 1, 1998
Revision 0

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CEX-010-98

ADMINISTRATIVE INFORMATION

Site: Rocky Flats Environmental Technology Site (RFETS), Golden, Colorado

Project Name: Site Characterization of the 903 Drum Storage Area (IHSS 112), 903 Lip Area (IHSS 155), and Americium Zone

Date Prepared: September 1, 1998

Approvals

I have read and concur for release of this procedure with respect to the hazards, regulatory requirements and objectives of the project.

Name
Canberra Project Manager

9/3/98
Date

Name
RMRS Quality Assurance Representative

9/3/98
Date

Name
RMRS Contract Technical Representative/Project Manager

9/3/98
Date

Name
RMRS Radiological Engineering

9/3/98
Date

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APPENDIX

1.0 PURPOSE

This procedure describes how the data review process for In-Situ High Purity Germanium (HPGe) projects will be conducted. All data generated for this project will be generated from in-situ gamma measurements utilizing the Canberra Genie PC and ISOCS calculations.

The purpose of this procedure is threefold:

1.1 Data review determines that raw data has been properly collected and reduced.

1.2 Data validation is an in-depth technical review of the data (or a representative percentage of the data) that determines whether characterization was performed within quality control requirements and tolerances.

1.3 Data verification ensures that requirements stated in characterization plans were implemented as prescribed.

2.0 SCOPE

This procedure applies to all individuals performing review and reporting of In-Situ gamma spectrometry results provided by Canberra software.

3.0 RESPONSIBILITIES

The following personnel are responsible for activities identified in Section 4.0 of this procedure.

Project Manager – The Project Manager (PM) will be assigned to monitor the progress and cost of the contract. Monthly project status reports in compliance with the Contract Technical Representative's (CTR), specifications shall be furnished. Additionally, the PM directs the technical, budget and schedule efforts and activities per the Statement of Work (SOW). The PM also provides status information and assists in resolving problems.

Gamma Spectrometry Specialist I – A Gamma Spectrometry Specialist (GSS I) will be assigned to be responsible for all aspects of gamma spectrometry interpretation in conjunction with the spectral analysis software and for the proper operation and maintenance of the gamma spectrometry instrumentation.

Gamma Spectrometry Specialist II – A Gamma Spectrometry Specialist (GSS II) will be responsible for the collection of gamma spectrometry data and for the proper operation and maintenance of the gamma spectrometry instrumentation.

Health and Safety Specialist – A Health and Safety Specialist (HSS) will be assigned to ensure that the requirements of the Site Radiological Control Manual and task-specific HASP and K-H Health and Safety Practice manual are followed for the project. The HSS will provide compliance for the work performed in accordance with the ALARA Job Review and the RWP.

Technical Specialist – The Technical Specialist will provide technical support, write procedures, provide technical support during audits, perform review and validation of all In-Situ gamma measurements, evaluate and resolve all technical issues and present sound and prudent advice on approach and techniques.

4.0 PROCEDURE FOR DATA REVIEW

Data review involves scrutiny and signature release from the Technical Specialist, project manager and QA representative. The position of Technical Specialist and QA representative and/or project manager may be combined for the Project. The Technical Specialist shall be the initial reviewer (peer reviewer) of all QC calculations as defined in Appendix A. Any nonconformance identified during the process shall be documented as a nonconformance report (NCR) per RMRS Nonconformance Reporting Procedure (Ref 6.1)

4.1 Review of In-Situ Data and Results

4.1.1 Each acquired sample spectrum will be reviewed in the field by the GSS operator for agreement between expected photopeaks and detected peaks.

4.1.2 Each sample measurement will be stored on both the hard disk and a backup disk. The GSS operator will review and verify the file presence on both the backup disk and the hard disk and will note this in the sample logbook.

4.1.3 Following field measurement, the gamma spectrum will be processed with a peak search program, a nuclide identification program and a calculation of minimum detectable concentration (MDC).

4.1.4 All calculated activities will be reviewed for reasonableness by comparison with previous site measurements.

4.1.5 The Project Manager or his designee will review each gamma spectrum to assure that all peaks are identified. If any unidentified peaks are present, they will be evaluated for significance, and if necessary resolved using an appropriate table of gamma nuclide energies such as Shirley, Erwin & Soyka or Kocher.

4.2 Review of In-Situ Data and Results – The Technical Specialist shall:

4.2.1 Assure that all batch QC was performed. This will include a calibration check, background check, duplicate measurement, and a field control measurement. Additionally, the PM will assure that a crosscheck has been performed for global positioning, temperature, pressure and humidity per the QAPjP.

4.2.2. Verify that the soil parameters used for the In-Situ efficiencies are applied. This verification will be documented on the Data Review Checklist as shown in Appendix C.

4.3 DATA REVIEW

One hundred percent of the data shall receive an initial review by the Technical Specialist, or designee for each Data Batch prior to the completion and transmittal of the Package to RMRS CTR. The PM and/or the Technical Specialist will complete the appropriate section of the Data Review Checklist and shall ensure that:

All data have received independent technical review. Difficult resolutions will be referred to the Technical Specialist, who has the authority to re-analyze data using new or modified parameters or values to obtain corrected or revised results. All changes to original data shall be lined out, initialed and dated by the individual making the change. A justification for changing the original data must also be included. If re-analysis is performed, the new printed report will be attached to the original printed report with a note that this is a re-analysis, reason for re-analysis, initialed and dated. Original data will not be obliterated or otherwise disfigured so as not to be readable.

5.0 REFERENCES

5.1 Control of Non-conforming Items, 1-65-ADM-15.01

5.2 Detector Characterization Document, D903-002

5.3 ISOCS Gamma Spectroscopy Routine Operations Procedure, RF/RMRS-98-268

5.5 "Experimental Statistics", NIST Handbook 91 by Mary Natrella (1963)

5.6 Electronic Data Deliverables Build Procedure (EDD), RF/RMRS-98-266

5.7 Evaluation of Radiochemical Data Usability, ES/ER/MS-5, Lockheed Martin, Environmental Restoration Program, April 1997.

APPENDIX A

QC MEASUREMENTS

QC measurement results are viewed by the operator after each such analysis. The QC control charts shall be plotted weekly and filed in the QC file in the fireproof cabinet. The Technical Specialist shall review these measurements to ensure that individual QC measurements fall within the bounds set by the QAPjP.

QC duplicate measurements will be reviewed by the Technical Specialist using the calculation from the Statement of Work.

At least one replicate measurement shall be performed for every measurement set. The replicate is constituted by remeasuring an in situ measurement within the measurement set of interest. Error tolerance must comply with the statistically-based comparison (equivalence test) given below:

$$F = |S - R|$$

$$E = \sqrt{E_S^2 + E_R^2}$$

$$F / E \leq 1.96$$

$F =$ Delta between real and replicate
$S =$ Original in situ activity

$R =$ Replicate in situ activity

$E_R =$ Total Propagated Uncertainty of Replicate

$E_S =$ Total Propagated Uncertainty of Original Measure

If the QC measurement fails, a second QC measurement should be run on the same day or for the same batch, and the cause for a second failure will be determined and documented in the QC log.

Minimum Detectable Concentration (MDC)

The MDC is a measure of the level of activity, or concentration, that is practically achievable with a given Gamma Spectrometry system, for a specific type of measurement. The MDC is an a priori estimate of the detection capabilities of a system and method. The MDC is calculated such that the preselected risk for falsely concluding that activity is present is 5%, and the predetermined degree of confidence for correctly detecting activity when it is present is 95%. The MDC may be calculated from:

MDC = 2.71/(K1*K2) + 4.65*Sb/(K1*K2)

APPENDIX A (cont'd)

where K1 is an efficiency factor relating the detector response to the activity, K2 relates the total activity determined by the measurement system to an activity concentration in soil under

a given set of measurement conditions, and Sb is the standard deviation of the background measurement.

Note: The difference between MDA (minimum detectable activity) and MDC (minimum detectable concentration) for radiochemical measurements is that in general MDA is calculated without sample weight or volume, whereas the MDC will include this. Therefore, for a consistent counting geometry and measurement protocol, a MDA is comparable from one counting system to another. However, MDC's are not comparable from one counting system to another unless the sample size is comparable. Otherwise, this would be comparing "apples to oranges". For the purpose of this project, since the same sample size will be utilized throughout the project there is effectively no substantial difference between MDA and MDC since the later is being divided by a constant mass.

Total Uncertainty

The total uncertainty is the quadrature of the random components of the individual measurements, plus the magnitude of the estimated individual systematic relative uncertainties. Therefore, all measurements made in order produce a single analytical result and will be applied to the estimate of total uncertainty.

$$TPU = \frac{\sqrt{\sigma_{NBCR}^2 + (NBCR)^2 * (RE_{EFF}^2 + \Sigma RE_{CF}^2)}}{2.22 * EFF * ABN * e^{-\lambda t} * CF}$$

Where:
EFF = Detector Efficiency
ABN = Abundance fraction of the emissions used for analyte identification
σNBCR 2 = Variance of the net background corrected count rate
REEFF2 = Square of the relative error of the efficiency term
RECF2 = Square of the relative error of other correction factors
λ = Analyte decay constant
t = Time to mid point of count time
CF = Other correction factors as appropriate

The calculational methodology has been adopted for this procedure and is contained in Appendix C of ES/ER/MS-5 of the Lockheed Martin Document *Evaluation of Radiochemical Data Usability* J.G.Paar & D.R.Porterfield dated April 1997.

APPENDIX B

Data Package Review Checklist

	Caveat?	*Compliance?*	
1. COVER PAGE		*√Yes*	*XNo*
All components are present per SOW § 2.7.1			

2. NARRATIVE			
All components are present per SOW § 2.7.2, including all results & controls out of tolerance.			

3A. SAMPLE RESULTS SUMMARY			
a) For each shot, the results shall include the following: analytes, activity, units, uncertainty at 3-sigma (TPU), MDA, method for calculating MDA, system ID, location ID, geometry, and any comments.			
b) All results reported for each requested radionuclide (SOW Exhibit C)			
c) Appropriate use of significant figures.			
e) Electronic and/or hardcopy of spectral library (one-time submittal)			
f) Electronic and/or hardcopy of final spectra from measured areas/sources			
g) Results from measured areas correlated to location, "measurement set" ID, and any related QC measurements (i.e., energy calibrations, efficiency calibrations, replicates, blanks {background}, and control area)			

3B. QC SAMPLE RESULTS SUMMARY			
a) Calibrations certificates for radioactive sources (one-time submittal)			
b) Source check results within tolerance			
c) "Blank" (background) measurements are reported, including location and MDA			
d) For locations that required re-analysis, all measurement set information included with the results.			
e) For each QC sample type (Replicate, Control Area, and Background) the QC type (SOW § 2.7.3.2) and QC location identification is provided.			
f) For each QC sample, the results shall include the following: QC type and identification, analytes, activity, units, uncertainty at 3-sigma , MDA, location ID, geometry, and any comments.			
g) All QC deficiencies are detailed in the Narrative.			
h) The following information is required for each replicate sample: MDA, location identification and the comparative analyte results.			
i) The following information is required for the Control Area (CA) Results: CA standard value, CA standard uncertainty at 3-sigma and CA "% recovery".			
j) The Preparation Blank activity meets the requirements specified in RC03, Exhibit E. if applicable			
k) Detector characterization specifications, for each detector, including peak shapes (one-time submittal)			
l) MDA determination at 95% confidence w/ $\geq$ 5 replicate measurements (one-time submittal)			

APPENDIX B (cont'd)

4. INSTRUMENT CALIBRATION SUMMARY	*Caveat?*	*Compliance?*	
		√Yes	*XNo*
a) The energy calibration parameters are within established tolerances, and are reported as specified in § 2.8.2 of the SOW, including: instrument and detector ID, date, source ID, energy span and geometry used, linear response of system and gain.			
b) The background shot information will include the following: instrument and detector ID, date, "start" and "end" region of interest (ROI).			
c) Detector efficiency information will include the following: instrument and detector ID, date of the efficiency analysis, calibration source ID, matrix, geometry, detector characterization data and characterization verification data.			

5. COUNTING RAW DATA SUMMARY			
The raw data summary will consist at a minimum of the following: analysis date and time, instrument ID, SOP identifier, location ID, QC locations and identifications, and the analysts initials.			

6. ELECTRONIC DATA DELIVERABLE (EDD)			
a) The EDD is in compliance with Table B-2 of the SOW.			
b) Completeness of data $\geq$ 95% (§6.5).			

Respond to each checklist item in the "Caveat?" column with a footnote as applicable and provide the caveat in the "Footnotes" section below.

FOOTNOTES:

I certify that all responses to this checklist accurately reflect the completeness and quality aspects of this sample data package as outlined in the associated Statement of Work. Furthermore, I understand that inaccuracies in the completion of this checklist will be considered a nonconformance to Subcontract Requirements as evidenced by the following signature of the laboratory manager or designee.

Print/Typed Name: _____ Title: _____

Signature _____ Date _____