Controlled Copy

CCP-TP-504

Revision 10

CCP Dose-to-Curie Survey Procedure for Remote-Handled Transuranic Waste

EFFECTIVE DATE: 05/13/2010

Irene Quintana

PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	02/23/2006	Initial issue.
1	03/01/2006	Revised to correct editorial error, and three additional minor changes.
2	05/04/2006	Revised to address Carlsbad Field Office (CBFO) Document Review Record (DRR) comments and to include dose-to-curie conversion instructions. Document title changed.
3	07/07/2006	Revised to accommodate remote source checks of RO-7, and meet quality assurance objective (QAO) requirements.
4	02/27/2007	Revised to eliminate references to RO-7BH Ion Chamber Probe.
5	06/15/2007	Revised to incorporate corrective actions identified by CAR-RHINL-0001-07, by adding a requirement to document the position of the ion chamber probe on Attachment 2, Container Data Sheet.
6	02/06/2008	Revised to add the FH 40 G Dose Rate Measuring Unit.
7	08/20/2008	Revised to come into compliance with the Idaho National Laboratory (INL) Tier 1 approval which requires both ranges of the new meter to be checked.
8	04/23/2009	Revised in response to Central Characterization Project (CCP) Corrective Action Report (CAR)-RHANL-0001-09. Also revised to add Comments section to Attachment 6, add steps to generate and submit electronic data compact discs (CD's), remove Operator Aid references in Section 4.1.2 [A], and various editorial and minor changes.
9	01/15/2010	Revised to incorporate corrective actions identified by Carlsbad Field Office (CBFO) Corrective Action Report (CAR)-09-055, by adding a requirement to perform replicate measurements and establish acceptable range(s) for daily source checks.
10	05/13/2010	Revised to add Section 4.5 to direct the performance of gamma spectroscopy measurements during the Dose-to-Curie (DTC) process. To accommodate the addition of this new section some additional changes in the text were required.

Controlled
Copy

TABLE OF CONTENTS

1.0 PURPOSE 4
1.1 Scope 4
2.0 REQUIREMENTS 5
2.1 References 5
2.2 Training Requirements 5
2.3 Equipment List 6
2.4 Software 6
2.5 Precautions and Limitations 6
2.6 Definitions 8
3.0 RESPONSIBILITIES 9
3.1 Operator 9
3.2 Independent Technical Reviewer (ITR) 9
3.3 Lead Operator (LO) 10
3.4 NDA Technical Lead or Expert Analyst 10
3.5 Site Project Manager (SPM) 10
3.6 Facility Records Custodian 10
3.7 CCP Records Custodian 10
4.0 PROCEDURE 11
4.1 Dose Rate Procedure 11
4.2 Curie Conversion Procedure 19
4.3 Batch Data Report (BDR) 21
4.4 Replicate Measurement Activities 23
4.5 Gamma Spectroscopy Measurements 24
5.0 RECORDS 29

LIST OF ATTACHMENTS

Attachment 1 – Measurement Control Report 30
Attachment 2 – Container Data Sheet 31
Attachment 3 – Waste Container Dose-to-Curie Conversion Record (Example) 32
Attachment 4 – Batch Data Report Cover Sheet 33
Attachment 5 – Batch Data Report Table of Contents 34
Attachment 6 – Batch Data Report Narrative Summary 35
Attachment 7 – ITR Checklist 36
Attachment 8 – SPM Checklist 38
Attachment 9 – Gamma Spectroscopy Daily Check List and Measurement Controls 39

1.0 PURPOSE

This procedure is used to determine the total transuranic (TRU) activity concentrations and the individual isotopic activity in containers of remote-handled (RH) TRU waste. Specifically, this procedure provides instructions for startup, operations, and shutdown of the RH dose rate measurement instrumentation, the conversion of the dose rate measurement data to radioisotopic activity, and the performance of gamma spectroscopy to differentiate the fractional contributions from gamma-emitting radionuclides in the waste to the external dose rate. The data review and validation process for the data collected and reported through the performance of this procedure is also described.

1.1 Scope

This procedure applies to personnel responsible for operating and/or supervising the operations of the Gamma Dose Rate Measurement Instrumentation and turntable.

This procedure also applies to personnel responsible for conversion of the dose rate measurement data to radioisotopic activity contained in RH TRU waste containers and the differentiation of the fractional contributions of gamma-emitting radionuclides in the waste to the external dose rate.

This procedure also describes the assembly of the Batch Data Report (BDR), and the data review, validating, and reporting of the dose rate measurements collected with the dose rate instrument. A testing BDR, or equivalent, includes data pertaining to dose measurement of up to 20 waste containers.

This procedure is based on the Dose-to-Curie (DTC) estimation method described in Attachment B, Dose-to-Curie Survey Procedure for Remote-Handled TRU Waste, of DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*.

The technical basis for application of the DTC conversion methodology is specified in waste stream-specific Radiological Characterization Reports. A Radiological Characterization Report describes the modeling methodology and quantifies the DTC scaling factors and measurement uncertainty applicable for a given waste stream. Waste stream-specific Radiological Characterization Reports are not specifically referenced in this procedure.

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- CCP-PO-002, *CCP Transuranic Waste Certification Plan*
- Thermo Electron Corporation Product Specifications for Model RO-7 High Range Survey System, ftp://q.wipp.ws/CCP Eqpt Manuals
- Thermo Electron Corporation Operating Instructions for Model FH 40 G Dose Rate Measuring Unit, ftp://q.wipp.ws/CCP Eqpt Manuals
- American National Standards Institute (ANSI) N323A-1997, *Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments,* ftp://q.wipp.ws/CCP Eqpt Manuals
- Canberra Osprey Manual
- Genie 2000 Manual

Referenced Documents

- DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*
- CCP-PO-005, *CCP Conduct of Operations*
- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
- CCP-QP-008, *CCP Records Management*
- CCP-QP-022, *CCP Software Quality Assurance Plan*

2.2 Training Requirements

2.2.1 Personnel will read and understand the applicable health and safety plan prior to performing this procedure.

2.2.2 Personnel performing this procedure will be trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan,* prior to performing this procedure.

2.3 Equipment List

2.3.1 RO-7 instrument

2.3.2 RO-7 Probes (RO-7 low dose [LD] and/or RO-7 beta medium [BM])

2.3.3 Equipment Check Source(s)

2.3.4 FH 40G instrument

2.3.5 FHZ 612 Probe (for use with FH 40G instrument)

2.3.6 Calibrated Scale

2.3.7 Scale Check Weight

2.3.8 Drum Turntable

2.3.9 Standard Instrument Jig that holds the probe at one meter as defined in Attachment B of DOE/WIPP-02-3214

2.3.10 Portable gamma spectroscopy system (e.g., the Canberra Osprey System)

2.4 Software

2.4.1 EXCEL spreadsheet “Waste Container Dose-to-Curie Conversion Record,” which is controlled in accordance with CCP-QP-022, *CCP Software Quality Assurance Plan*

2.4.2 Genie 2000

2.5 Precautions and Limitations

2.5.1 Ensure equipment selected for use from Section 2.3 is approved for use at the site prior to beginning operations by contacting the Site Project Manager (SPM), as needed.

2.5.2 Ensure a Source Check Reference Value and Acceptable Range has been established for the equipment selected for use in accordance with Section 4.4.

2.5.3 The requirements of the applicable site Radiological Control Manual must be observed.

2.5.4 The Lead Operator (LO) must be notified for determination of nonconformance reporting in the event that daily checks are found to be out of tolerance.

2.5.5 Waste containers may **NOT** be stored in the measurement area if they significantly affect the background reading.

2.5.6 Personnel performing this procedure must wear the required Personal Protective Equipment (PPE) defined by the site-specific safety program.

2.5.7 Personnel working in the measurement area must observe warning devices and postings.

2.5.8 Personnel must be aware of moving equipment when waste containers are being placed in the measurement area.

2.5.9 Personnel working in the measurement area must maintain awareness of surroundings and tripping hazards.

2.5.10 Temporary radiation shielding may be used in the measurement area.

2.5.11 Radioactive sources/standards are to be treated and controlled as sealed radioactive sources in accordance with the site-specific program.

2.5.12 Personnel working in the measurement area must maintain an awareness of Radiation Dose Hazards and observe as low as reasonably achievable (ALARA) to minimize exposure through time, distance, and shielding.

2.5.13 Personnel working in the measurement area must be aware of emergency response and spill response actions.

2.5.14 Containers are highly radioactive and exposure can be harmful, personnel are to comply with the requirements identified in the Radiological Work Permit (RWP) at all times.

2.5.15 Any container found to have DTC results greater than Host Site safety basis limits will be controlled as identified by Host site procedures or CCP issued Standing Orders.

2.5.16 If a condition adverse to quality is identified, the individual(s) identifying the condition shall initiate a nonconformance report (NCR) in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*.

2.6 Definitions

2.6.1 **Dose Rate** – For the purpose of this procedure, Dose Rate refers to the exposure rate due to gamma radiation. No contribution from neutron or beta radiation is included.

2.6.2 **Source Check Reference Value** – Dose rate value used to establish the acceptance source check range of the probe and instrument combination that will be used. The reference value is established by calculating the average value of 10 replicate measurements of the Equipment Check Source(s). The measurements are performed with the appropriate probe(s) oriented in a reproducible position relative to the check source(s).

2.6.3 **Acceptance Range** – Acceptable range for the dose rate reading obtained when performing a daily source check. The acceptance range is + or – 20 percent of the Source Check Reference Value established for probe and + or – 5 percent of the Source Check Activity Reference Value for gamma instrument.

3.0 RESPONSIBILITIES

3.1 Operator

3.1.1 Executes dose rate measurement of containers through performance of routine startup, normal operations, shutdown of the dose measurement instrumentation, and completion of Attachment 1, Measurement Control Report, and Attachment 2, Container Data Sheet.

3.1.2 Collects gamma spectroscopy data.

3.1.3 Performs DTC conversions as follows:

[A] Enters the date of the container survey and the waste stream designation into the Waste Container Dose-to-Curie Conversion Record spreadsheet, (see Attachment 3, Waste Container Dose-to-Curie Conversion Record, for an example).

[B] Enters site-specific measurements into the spreadsheet.

[C] Enters the container number and container weight into the spreadsheet.

[D] Evaluates DTC results.

[E] Determines if the container contents meet TRU waste criteria.

3.1.4 Assembles the BDR and completes Attachment 4, Batch Data Report Cover Sheet.

NOTE

The Independent Technical Reviewer (ITR) is someone, other than the Operator, who is qualified to have performed the work.

3.2 Independent Technical Reviewer (ITR)

3.2.1 Reviews the collected data and the spreadsheet parameter inputs, and ensures the documentation is complete and accurate.

3.2.2 Completes Attachment 7, ITR Checklist.

3.3 Lead Operator (LO)

3.3.1 Ensures that this procedure is followed by the Operators and the documentation is complete and accurate.

3.3.2 Documents any NCR, as necessary, on Attachment 6, Batch Data Report Narrative Summary.

3.3.3 Paginates BDR and completes Attachment 5, Batch Data Report Table of Contents, and Attachment 6.

3.4 NDA Technical Lead or Expert Analyst

3.4.1 Evaluate collected gamma spectroscopy data.

3.4.2 Issues documented evaluation of gamma spectroscopy results.

3.5 Site Project Manager (SPM)

3.5.1 Reviews and approves the BDR and completes Attachment 8, SPM Checklist.

3.6 Facility Records Custodian

3.6.1 Receives, processes, and transmits completed BDRs, (compact discs) CDs, and Attachment 8, in accordance with CCP-QP-008, *CCP Records Management.*

3.7 CCP Records Custodian

3.7.1 Receives and processes Attachment 8, in accordance with CCP-QP-008.

4.0 PROCEDURE

4.1 Dose Rate Procedure

Operator

4.1.1 Perform Shift Startup as follows:

[A] Turn ON the drum turntable **AND** verify operation.

[B] Turn OFF the drum turntable.

[C] Verify that the calibration of the scale is current, **AND** record the following on Attachment 1:

- Date
- Scale ID
- Scale Calibration Due Date
- Scale Error

[D] Verify scale is operating.

[E] Place check weight on scale.

[F] Verify scale is reading within 2 percent of the check weight.

[G] **IF** scale is reading within 2 percent of the check weight, **THEN** continue,

ELSE,

STOP WORK, **AND** perform the following:

[G.1] Notify the LO and Vendor Project Manager (VPM).

[G.2] Investigate the cause, **AND** determine if an NCR is required.

[G.3] **IF** an NCR is required,
THEN initiate an NCR in accordance with CCP-QP-005.

[G.4] **IF** an NCR is **NOT** required,
THEN note the resolution in the DTC Operational Logbook in accordance withCCP-PO-005, *Conduct of Operations*.

[H] Document scale check acceptability (YES/NO) on Attachment 1.

4.1.2 Perform a Daily Source Check of the instrument as follows:

NOTE

A Daily Source Check is performed at least once per day prior to the first dose rate measurement of the shift or when switching to a probe that has not been source checked on the same shift.

NOTE

Daily Source Checks may be performed simultaneously or before shift startup.

NOTE

Two Ion Chamber Probes are available for use with the RO-7.

RO-7LD – range 1,999 milliroentgen per hour (mR/hr) at full scale with resolution of 1 mR/hr

RO-7BM – range 199,900 mR/hr at full scale with resolution of 100 mR/hr

One Geiger Mueller (GM) probe is available for use with the FH 40 G

FHZ 612 – measuring range between 10 microroentgen per hour (µR/hr) and 1,000 roentgen per hour (R/hr), automatic range switching

The appropriate probe must be connected to the instrument prior to any source checks, background measurements, **OR** container measurements.

Container dose rate measurements may necessitate using a lower range probe for background measurements. Background measurements taken with a lower range probe may be used for any container dose rate measurements taken with a higher range probe. If this occurs, an Attachment 1 will be generated which is to be included in the BDR documenting the lower range probe source check by recording the date and performing steps 4.1.2[A] through 4.1.2[O] All non-applicable (N/A) fields on Attachment 1 will be N/A'd.

NOTE

The probes are positionally sensitive. The probes must be oriented in the same geometry in relation to the measured container each time. This orientation must be consistent with the calibration geometry.

The instrument detector must be 1.0 meter from the outside of the container. A Jig that positions the instrument with relation to the container is used to ensure reproducible results.

[A] Verify that the calibration, if applicable, on the instrument and probe are current, **AND** record the following on Attachment 1:

- Instrument No.

NOTE

The FH 40 G does not require calibration as it is only a display unit. The probe connected to the FH 40 G must be calibrated.

- Instrument Calibration Due Date (N/A if not applicable)
- Probe No.
- Probe Calibration Due Date

NOTE

Container dose rate measurements may only require the use of one RO-7 (LD or BM) probe during the operational day. Therefore, a Daily Source Check will only be performed on the probe(s) used during that operational day. All other non-applicable fields will be N/A'd on Attachment 1.

NOTE

Probe FHZ 612 has two GM tubes. At dose rates of more than 800 mR/hr indication is automatically switched to the high dose rate detector. A Daily Source Check needs to be performed on both low and high range.

- Source Check Reference Value for LD probe or low range for FHZ 612 (mR/hr)
- Acceptance Range for LD probe or low range for FHZ 612 (mR/hr)

- Source Check Reference Value for BM probe or high range for FHZ 612 (mR/hr)

- Acceptance Range for BM probe or high range for FHZ 612 (mR/hr)

[B] Verify the instrument display indications coincide with the probe connected.

[C] Document battery check acceptability (YES/NO) on Attachment 1.

NOTE

Adjustment of the instrument zero reading, if necessary, must be performed in a low-radiation area away from where the container dose measurements are performed or isolated from background radiation in a shielded environment (e.g. lead pig).

NOTE

Check source(s) shall provide an instrument response within the following ranges depending on the probe in use:

50 mR/hr ≤ RO-7LD probe ≤ 1,200 mR/hr

5,000 mR/hr ≤ RO-7BM probe ≤ 120,000 mR/hr

10 μR/hr ≤ FHZ 612 probe ≤ 800 mR/hr

800 mR/hr ≤ FHZ 612 probe ≤ 1,000,000 mR/hr

[D] Verify the appropriate check source for the LD probe or low range for the FHZ 612 is installed in a reproducible configuration.

[E] Record the Measured Daily Source Check Dose Rate Value for LD probe or low range for FHZ 612 (mR/hr) on Attachment 1.

NOTE

The source check value must be within ±20 percent of the reference value for the source(s) used.

[F] Compare the Daily Source Check Dose Rate Value for LD probe or low range for FHZ 612 to the reference value.

Controlled
Copy

[G] **IF** the Daily Source Check Dose Rate Value is within ±20 percent of the reference value,
THEN continue work,

ELSE,

STOP WORK, **AND** perform the following:

[G.1] Notify the LO and VPM.

[G.2] Investigate the cause, **AND** determine if an NCR is required.

[G.3] **IF** an NCR is required,
THEN initiate an NCR in accordance with CCP-QP-005.

[G.4] **IF** an NCR is **NOT** required,
THEN note the resolution in the DTC Operational Logbook in accordance with CCP-PO-005.

[H] Document Daily Source Check Dose Rate Value acceptability (YES/NO) on Attachment 1.

[I] Verify the appropriate check source for the BM probe or high range for the FHZ 612 is installed in a reproducible configuration.

[J] Record the Measured Daily Source Check Dose Rate Value for BM probe or high range for FHZ 612 (mR/hr) on Attachment 1.

[K] Compare the Daily Source Check Dose Rate Value for BM probe or high range for FHZ 612 to the reference value.

[L] **IF** the Daily Source Check Dose Rate Value is within ±20 percent of the reference value,
THEN continue work,

ELSE,

STOP WORK, **AND** perform the following:

[L.1] Notify the LO and VPM.

[L.2] Investigate the cause, **AND** determine if an NCR is required.

[L.3] **IF** an NCR is required,
THEN initiate an NCR in accordance with CCP-QP-005.

[L.4] **IF** an NCR is **NOT** required,
THEN note the resolution in the DTC Operational Logbook in accordance with CCP-PO-005.

[M] Document Daily Source Check Dose Rate Value acceptability (YES/NO) on Attachment 1.

[N] Verify the source is removed from the operations area.

[O] Print name, sign, **AND** date Attachment 1.

4.1.3 **IF** gamma spectroscopy measurements are required,
THEN perform section 4.5 through 4.5.13 before continuing to section 4.1.5.

4.1.4 **IF** gamma spectroscopy measurements are NOT required,
THEN continue to section 4.1.5.

4.1.5 Perform Container Measurement as Follows:

[A] Verify that the appropriate probe is installed in the instrument Jig such that the probe is oriented at mid-height of the container to be measured and centered between the sides.

[B] Record the following on Attachment 2:

- Date

- Container No.
- Probe Position (e.g., 30-gallon, 55-gallon)
- Instrument No.
- Probe No.
- Estimated Dose Rate (mR/hr) reading for the container to be measured.

NOTE

Background radiation levels must be no greater than one-tenth of the estimated container dose rate.

[C] Measure and record the background reading.

[D] **IF** the background measurement is too high, **THEN** notify the LO **AND** take action to reduce the background level, **OR** find a new location, **AND** re-perform step 4.1.5[C].

[E] **IF** background measurement is acceptable, **THEN** record background reading (mR/hr) and acceptability (YES/NO) on Attachment 2, **AND** continue.

[F] Verify the container number matches that which is recorded in step 4.1.5[B].

NOTE

The outside of the container must be unshielded.

[G] Measure **AND** record the Gross Weight (kg) on Attachment 2.

[H] Verify the container is on the turntable.

NOTE

If any of the Dose Rate Measurements exceed the operating range of the selected probe, then the measurements will need to be repeated with a probe installed with the correct operating range.

[I] Measure **AND** record the dose rate (mR/hr) on Attachment 2 in the Dose Rate 1 (mR/hr) field.

[J] Rotate the container approximately 90 degrees with the turntable.

[K] Measure **AND** record the dose rate (mR/hr) on Attachment 2 in the Dose Rate 2 (mR/hr) field.

[L] Rotate the container approximately 90 degrees with the turntable.

[M] Measure **AND** record the dose rate on Attachment 2 in the Dose Rate 3 (mR/hr) field.

[N] Rotate the container approximately 90 degrees with the turntable.

[O] Measure **AND** record the dose rate on Attachment 2 in the Dose Rate 4 (mR/hr) field.

[P] **IF** one or more of the four dose rate measurements are outside the operating range of the probe,
THEN notify the LO.

NOTE

Background radiation levels must be no greater than one-tenth of the highest measured dose rate.

[Q] Compare the measured container dose rates to the background Dose Rate, **AND** document the results (YES/NO) on Attachment 2.

[Q.1] **IF** the background measurement is greater than 10 percent of the highest measured container dose rate,
THEN notify the LO, initiate an NCR in accordance with CCP-QP-005, **AND** document in the DTC Operational Logbook in accordance with CCP-PO-005.

[R] Print name, sign, **AND** date Attachment 2.

4.1.6 **IF** gamma spectroscopy measurements are required, **THEN** perform section 4.5.14 through 4.5.25 before continuing on to section 4.1.8.

4.1.7 **IF** gamma spectroscopy measurements are NOT required **THEN** continue to section 4.1.8.

4.1.8 Remove the container from the turntable.

4.1.9 Repeat steps 4.1.5[A] through 4.1.8 for each container in the BDR.

4.1.10 Perform Shift Shutdown of instrument as follows:

[A] Turn OFF the Instrument.

[B] **IF** gamma spectroscopy measurements were required, **THEN** perform steps 4.5.27 through 4.5.31.

NOTE

The Instrument may be turned OFF during the shift as long as the zero is not adjusted.

4.2 Curie Conversion Procedure

NOTE

Attachment 3 is an example of the Waste Container Dose-to-Curie Conversion Record printout generated by this procedure. The spreadsheets are controlled in accordance with CCP-QP-022.

4.2.1 Identification of Input Parameters for Container Calculations

[A] Obtain Attachment 2 for the designated container.

[B] Obtain the Visual Examination (VE) Data Form or Real-Time Radiography (RTR) Data Form and required Acceptable Knowledge (AK) information for the container, and the evaluation of Gamma Spectroscopy results (if applicable).

[C] Open the appropriate Waste Container Dose-to-Curie Conversion Record spreadsheet.

[D] Enter the following in the spreadsheet:

[D.1] Procedure revision number.

[D.2] Date of the gamma survey measurements.

[D.3] Waste Stream Designation, as applicable.

[D.4] Cask Number, if applicable.

[D.5] Container Number.

[D.6] Container Gross Weight.

NOTE

Container net weight is calculated using the Waste Container Dose-to-Curie Conversion Record spreadsheet.

[D.7] Estimated Can Size for Cans #1, #2, #3, as appropriate for the number of cans in the container. (Internal cans are waste stream dependent. If the waste stream in question does not have internal cans in the packaging configuration, this section will not be on the spreadsheet).

NOTE

Estimated fill percentage(s) may be obtained from the Radiological Characterization Report for the applicable waste stream if unavailable on RTR or VE forms. The fill percentage reported by RTR and VE is reported in a range (e.g., 91-100%). The estimated fill percentage in step 4.2.1[D.8] will be recorded as the midpoint of this range (e.g., 91-100% recorded as 95%), if applicable.

[D.8] Estimated Fill Percentage for Cans #1, #2, #3, as appropriate for the number of cans in the container. (Internal cans are waste stream dependent. If the waste stream in question does not have internal cans in the packaging configuration, this entry will be for the container being evaluated), if applicable.

[D.9] Four quadrant dose rate measurements.

[D.10] Waste Material Type (e.g., steel, cement, organic)

[D.11] Average fractional contribution to external dose rate of Co-60 based on gamma spectroscopy results reported by NDA technical Lead or EA (as applicable).

[E] Review the spreadsheet for technical accuracy.

[F] **IF** the Tru Alpha Activity Concentration is less than or equal to 100 nanocuries per gram (nCi/g),
THEN initiate an NCR in accordance with CCP-QP-005.

[G] Save the spreadsheet file, using the container number as the file name.

[H] Print the spreadsheet.

[I] Print name, sign, **AND** date the spreadsheet.

[J] Repeat steps 4.2.1[A] through 4.2.1[I] for each container in the BDR.

[K] Forward all electronic spreadsheet files to the LO.

4.3 Batch Data Report (BDR)

NOTE

BDR numbers are assigned based on the following: site ID, RH DTC designator for DTC, last two digits of the year, and the next sequential number to start back at 001 at the beginning of the new year. (e.g., INLRHDTC06001).

Operator

4.3.1 Assemble BDR as follows:

- Attachment 4, Batch Data Report Cover Sheet
- Attachment 5, Batch Data Report Table of Contents
- Attachment 6, Batch Data Report Narrative Summary
- Attachment 7, ITR Checklist
- Attachment 1, Measurement Control Report(s)

- Attachment 2, Container Data Sheet(s)
- Waste Container Dose-to-Curie Conversion Record(s)
- Attachment 9 Gamma Spectroscopy Daily Checklist and Measurement Controls (if applicable).
- Evaluation of Gamma Spectroscopy results (if applicable).
- Copy of NCRs (as applicable)

4.3.2 Record BDR numbers on Attachment 1, Attachment 2, and Attachment 9 (if applicable).

4.3.3 Complete all information on Attachment 4.

4.3.4 Submit the BDR to the ITR.

ITR

4.3.5 Review Attachment 1(s), Attachment 2(s), Waste Container Dose-to-Curie Conversion Record(s), **AND** resolve any comments with the DTC Operator.

4.3.6 Record the BDR number on Attachment 7.

4.3.7 Review the BDR to the criteria of Attachment 7, **AND** document on Attachment 7.

4.3.8 Print name, sign, **AND** date Attachment 7.

4.3.9 Submit the BDR to the LO.

LO

4.3.10 Verify the BDR is complete and accurate, **AND** paginate the BDR.

4.3.11 Complete Attachment 5 and Attachment 6.

4.3.12 Print name, sign, and date Attachment 6.

4.3.13 Copy electronic data to CD and backup CD.

4.3.14 Label CD including the following:

- Originating Organization
- File Name
- File Directory
- Last Entry Date
- Retention Period
- Original Software used
- Version of Software used

4.3.15 Submit the BDR and CDs to the Facility Records Custodian, in accordance with CCP-QP-008.

Facility Records Custodian

4.3.16 Receive, process, and transmit completed BDR and CDs in accordance with CCP-QP-008.

SPM

4.3.17 When notified the BDR is ready for review, obtain a copy of the BDR.

4.3.18 Record BDR number on Attachment 8.

4.3.19 Review the BDR to the criteria of Attachment 8, **AND** document on Attachment 8.

4.3.20 Print name, sign, **AND** date Attachment 8.

4.3.21 Submit the completed Attachment 8 to the Facility Records Custodian/CCP Records Custodian in accordance with CCP-QP-008.

Facility Records Custodian/CCP Records Custodian

4.3.22 Receive, process, and when applicable, transmit Attachment 8, in accordance with CCP-QP-008.

4.4 Replicate Measurement Activities

4.4.1 Verify that the Source Check Reference values(s) and Acceptable Range(s) used to perform a Daily Source Check on the instrument

and probe have been established since the latest instrument/probe calibration date.

4.4.2 If necessary, perform replicate measurements and establish the reference value(s) and acceptable range(s) in accordance with the recommendations in the instrumentation user manuals and ANSI Standard N323A-1997.

4.4.3 Document the results of this activity in the DTC Operational Log Book and post the value(s) and acceptable range(s) on an Operator Aid.

4.5 Gamma Spectroscopy Measurements

NOTE

Gamma spectroscopy measurements may be required to differentiate the external exposure rate contributions from various gamma-emitting radionuclides (such as Cs-137 and Co-60) in the waste container. These measurements are not required every time and will be performed as technically necessitated.

NOTE

The detector and electronics should be installed in the shielded measurement location prior to system operation. The selection of the appropriately sized collimators and/or filters will be based on the initial radiological control measurement performed by the Host site.

CAUTION

During waste characterization activities, the area in which the actual measurements will be performed may be a High Radiation Area. All site radiological postings and controls must be strictly followed.

4.5.1 Ensure that the appropriate collimator and/or filters are in the front of the lead chamber as directed by the LO.

[A] Document the following on Attachment 9:

- Date

[B] Document collimator in use (YES/NO) on Attachment 9.

[C] Document collimator size on Attachment 9. (N/A if not applicable).

[D] Document filter in use (YES/NO) on Attachment 9.

[E] Document filter size on Attachment 9. (N/A if not applicable).

[F] Document probe number on Attachment 9.

NOTE

A Daily Source Check is performed at least once per day prior to the first dose rate measurement of the shift or when switching to a probe that has not been source checked on the same shift.

NOTE

Daily Source Checks may be performed simultaneously or before shift startup.

4.5.2 Ensure the computer system is on.

4.5.3 If the system is off, turn on the high voltage to the detector and associated electronics.

NOTE

The stabilization time will be dependent on the type of electronics and detector. The LO will provide the appropriate time to allow system stabilization.

4.5.4 Allow the system to stabilize for the time period designated by the LO and record this time period in the Operational Log Book (OLB).

4.5.5 Log into the designated software for remotely operating the detector and associated electronics, as appropriate.

4.5.6 Verify the appropriate calibration source or sources are installed in the calibration jig in a reproducible configuration.

[A] Document the following on Attachment 9.

- 661.6 keV Centroid Boundary Limits (Predicted Channel, Lower Boundary, and Upper Boundary)
- Source Check Reference Value for probe (uCi) (Value, and Acceptance Range -5%/+5%)

NOTE

The count time will be dependent on the activity of the source (i.e., either calibration source, measurement control source, or waste container) and the type of collimator and/or filter. The LO will designate the type of collimator and/or filter, and the anticipated count time for each arrangement. If deemed necessary by the LO, the count time may be set to achieve a certain precision in the counting statistics (i.e., count-to-precision at less than 5 percent).

4.5.7 Set the count time for the detector system, (as applicable) and note in OLB.

4.5.8 Initiate the measurement control measurement with the calibration source.

NOTE

If the system dead time is greater than 80%, then either additional filter thickness needs to be added or the size of the collimator opening needs to be reduced. This will be directed by the LO and may necessitate additional setup measurements.

NOTE

Acceptable limits for measurement controls will be determined by replicate measurements as described in Section 4.4 of this procedure.

4.5.9 Determine the centroid of the Cs-137 peak at 661.6 kiloelectron volt (keV).

4.5.10 Determine the cumulative counts in the peak region for the Cs-137 peak at 661.6 keV.

[A] Document the following on Attachment 9.

- 661.6 keV Centroid Channel.
- Measurement Control Value (uCi).

4.5.11 **IF** the centroid of the Cs-137 peak at 661.6 keV and the cumulative counts in the peak region for the Cs-137 peak at 661.6 keV are not within the established measurement control limits,
THEN repeat steps 4.5.9 through 4.5.11 no more than two times.

[A] After three attempts, follow the LO's directions to curtail operations and resolve the condition and document in the Operational Logbook in accordance with CCP-PO-005.

4.5.12 **IF** the centroid of the Cs-137 peak at 661.6 keV and the cumulative counts in the peak region for the Cs-137 peak at 661.6 keV are within the established measurement control limits, Document the following on Attachment 9.

[A] 661.6 keV Centroid Channel Acceptability (YES/NO).

[B] Measurement Control Acceptability (YES/NO).

[C] Print name, sign, **AND** date attachment 9.

THEN remove the source from the source jig and proceed with waste drum measurements.

4.5.13 Verify the container is on the turntable

4.5.14 Perform initial gamma spectroscopy measurement.

NOTE

The collected gamma spectra will be saved to the operational computer prior to transfer under the following file convention. The file folder will be named for the drum measured (i.e., SN172A). Each file saved be designated as SN172A_0_DEG_02192010 where SN172A is the drum identifier, 0_DEG is the degrees of rotation (i.e., 0, 90, 180, 270) for the four measurements, and 02192010 is the date of the measurement (i.e., 02/19/2010).

4.5.15 Save the collected gamma spectral file

4.5.16 Rotate the container approximately 90 degrees with the turntable.

4.5.17 Perform the second gamma spectroscopy measurement.

4.5.18 Save the second collected gamma spectral file.

4.5.19 Rotate the container approximately 90 degrees with the turntable.

4.5.20 Perform the third gamma spectroscopy measurement.

4.5.21 Save the third collected gamma spectral file

4.5.22 Rotate the container approximately 90 degrees with the turntable.

4.5.23 Perform the fourth gamma spectroscopy.

4.5.24 Save the fourth collected gamma spectral file.

4.5.25 Remove the container from the turntable.

4.5.26 Repeat steps 4.5.14 through 4.5.25 as needed for each container.

4.5.27 Shutdown the gamma spectroscopy system by powering down the system high voltage.

4.5.28 Submit a copy of collected electronic files to the NDA Technical Lead or EA for data evaluation.

4.5.29 Shutdown the computer system.

NOTE

Evaluation of the collected gamma spectra is performed by the NDA Technical Lead or designated Expert Analyst.

4.5.30 Evaluate the collected gamma spectroscopy results.

4.5.31 Issue summary of gamma spectroscopy results documenting fractional contributions of gamma-emitting radionuclide to external dose rates.

5.0 RECORDS

Records generated during the performance of this procedure are maintained as quality assurance (QA) records in accordance with CCP-QP-008. The records are the following:

5.1.1 QA/Lifetime

[A] BDR, including:

[A.1] Attachment 1, Measurement Control Report(s)

[A.2] Attachment 2, Container Data Sheet(s)

[A.3] Attachment 3, Waste Container Dose-to-Curie Conversion Record(s)

[A.4] Attachment 4, Batch Data Report Cover Sheet

[A.5] Attachment 5, Batch Data Report Table of Contents

[A.6] Attachment 6, Batch Data Report Narrative Summary

[A.7] Attachment 7, ITR Checklist

[A.8] Attachment 8, SPM Checklist

[A.9] Copy of NCRs, if applicable

[A.10] Attachment 9, Gamma Spectroscopy Daily Check List and Measurement Controls (as applicable)

[A.11] Evaluation of Gamma Spectroscopy results (if applicable).

5.1.2 QA/Nonpermanent

[B] Electronic File(s) of Waste Container Dose-to-Curie Conversion Record(s) (Primary and Backup)

Controlled
Copy

Attachment 1 – Measurement Control Report

BDR Number: _____

DATE:			
Scale ID.:			
Scale Calibration Due Date:			
Scale Error:			
Scale Check Acceptable:	YES	NO	
Instrument No.:			
Instrument Calibration Due Date:			
Probe No.:			
Probe Calibration Due Date:			
	Value	Acceptance Range	
Source Check Reference Value for LD probe or low range for FHZ 612 (mR/hr)		-20%	+20%
Source Check Reference Value for BM probe or high range for FHZ 612 (mR/hr)		-20%	+20%
Battery Check	YES	NO	
Measured Daily Source Check Dose Rate Value for LD probe or low range for FHZ 612 (mR/hr)			
Daily Source Check for LD probe or low range for FHZ 612 Acceptable:	YES	NO	
Measured Daily Source Check Dose Rate Value for BM probe or high range for FHZ 612 (mR/hr)			
Daily Source Check for BM probe or high range for FHZ 612 Acceptable	YES	NO	

Printed Name Signature Date

Controlled
Copy

Attachment 2 – Container Data Sheet

BDR Number: _____

Date:	
Container No.:	
Probe Position:	
Instrument No.:	
Probe No.:	
Estimated Dose Rate (mR/hr):	
Measured Background Dose Rate (mR/hr):	
Measured Background Dose Rate < 0.1 of the Estimated Dose Rate?	YES NO
Gross Weight (kg):	
Dose Rate 1 (mR/hr):	
Dose Rate 2 (mR/hr):	
Dose Rate 3 (mR/hr):	
Dose Rate 4 (mR/hr):	
Measured Background Dose Rate <0.1 of the Measured Dose Rate.	YES NO

Printed Name Signature Date

Attachment 3 – Waste Container Dose-to-Curie Conversion Record (Example)

Operating Procedure		CCP-TP-504 Rev. 3		
Date of Survey		6/1/2006		
Waste Stream Designation		ID-ANLE-S5000		
Container Number		12345678		
Container Gross Weight		70	kg	
Waste Cans	Can #1	Can #2	Can #3	
Can Sizes	5	5	5	gallons
Estimate Fill Percentages	78.5	78.5	78.5	%
Container Net Weight		46.5	kg	

Measured Container Dose Rate		
Quandrant #1	300	mR/hr
Quandrant #2	500	mR/hr
Quandrant #3	600	mR/hr
Quandrant #4	400	mR/hr
Calculated Average Dose Rate	450	mR/hr
Waste Material Type	Organic	

Nuclide	Curie Scaling Factors	Activity (Ci)	Grams	FGE	PECi	Watts	Uncertainty	Uncertainty in Curies	Uncertainty in Grams
U-233	**3.30E-05**	7.63E-05	7.82E-03	7.04E-03	0.00E+00	2.22E-06	74.81%	5.71E-05	5.85E-03
U-234	**5.93E-05**	1.37E-04	2.17E-02	0.00E+00	0.00E+00	3.95E-06	74.81%	1.03E-04	1.62E-02
U-235	**1.91E-06**	4.41E-06	2.01E+00	1.29E+00	0.00E+00	1.22E-07	74.81%	3.30E-06	1.51E+00
U-238	**2.71E-06**	6.27E-06	1.84E+01	0.00E+00	0.00E+00	1.59E-07	74.81%	4.69E-06	1.38E+01
Pu-238	**8.22E-02**	1.90E-01	1.10E-02	1.24E-03	1.73E-01	6.30E-03	55.61%	1.06E-01	6.11E-03
Pu-239	**1.91E-02**	4.41E-02	7.00E-01	7.00E-01	4.41E-02	1.37E-03	54.41%	2.40E-02	3.81E-01
Pu-240	**1.21E-02**	2.81E-02	1.22E-01	2.75E-03	2.81E-02	8.74E-04	54.47%	1.53E-02	6.65E-02
Pu-241	**7.64E-01**	1.77E+00	1.70E-02	3.82E-02	3.46E-02	5.62E-05	54.42%	9.61E-01	9.24E-03
Pu-242	**4.16E-05**	9.61E-05	2.42E-02	1.82E-04	8.74E-05	2.83E-06	55.61%	5.35E-05	1.35E-02
Am-241	**3.00E-02**	6.95E-02	2.00E-02	3.74E-04	6.95E-02	2.32E-03	96.15%	6.68E-02	1.92E-02
Cs-137	**1.00E+00**	2.31E+00	2.63E-02	0.00E+00	0.00E+00	2.56E-03	97.99%	2.27E+00	2.57E-02
Ba-137m	**9.46E-01**	2.19E+00	4.07E-09	0.00E+00	0.00E+00	8.62E-03	97.99%	2.14E+00	3.98E-09
Sr-90	**7.30E-01**	1.69E+00	1.22E-02	0.00E+00	0.00E+00	1.96E-03	97.99%	1.65E+00	1.20E-02
Y-90	**7.30E-01**	1.69E+00	3.10E-06	0.00E+00	0.00E+00	9.34E-03	97.99%	1.65E+00	3.04E-06
Totals		9.97E+00	2.14E+01	2.04E+00	3.49E-01	3.34E-02		#REF!	

	Value	(one Sigma)	
Tru Alpha Activity Concentration	7.14E+03	2.76E+03	nCi/g
Tru Alpha Activity	3.32E-01	1.28E-01	Ci
Total Pu-239 Equiv Activity	3.49E-01	4.70E-01	Ci
Total Pu-239 Fissle Gram Equiv	2.04E+00	1.78E+00	g
Total Decay Heat	3.34E-02	1.27E-02	W
Volume Activity	8.78E-02	2.85E-02	Ci/L

Originator _____ (Print Name)

Signed _____ Date _____

Controlled
Copy

Attachment 4 – Batch Data Report Cover Sheet

Site ID:	BDR Number**:**
Waste Container ID Number:	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Controlled
Copy

Attachment 5 – Batch Data Report Table of Contents

BDR Number:_____

Testing Facility:_____

SECTION	PAGE NUMBER
Batch Data Report Cover Sheet, Attachment 4	
Batch Data Report Table of Contents, Attachment 5	
Batch Data Report Narrative Summary, Attachment 6	
ITR Checklist, Attachment 7	
Measurement Control Report(s), Attachment 1	
Container Data Sheet(s), Attachment 2	
Waste Container Dose-to-Curie Conversion Record(s), Attachment 3	
Attachment 9 Gamma Spectroscopy Daily Check List and Measurement Controls (if applicable)	
Evaluation of Gamma Spectroscopy results (if applicable)	
Copies of NCR(s), if applicable	

Attachment 6 – Batch Data Report Narrative Summary

BDR Number: _____

BDR Date:_____

Quality Control Summary:

Nonconformance:

Comments:

Printed Name: _____

Signature and Date: _____/_____

Attachment 7 – ITR Checklist

BDR Number: _____

Description of Criteria Reviewed	Criteria Met (Check One)
ITR Checklist	
The BDR contains no more than 20 containers.	☐ YES ☐ NO
There is a container data sheet present for each of the containers listed on the BDR cover sheet and a measurement control sheet(s) that covers the range of dates for each of the container data sheets.	☐ YES ☐ NO
The container data sheets and associated measurement control sheets are complete and contain:	
• Instrument calibration is satisfactory. (Accuracy)	☐ YES ☐ NO
• Instrument battery check is satisfactory.	☐ YES ☐ NO
• Instrument source check is satisfactory. (Precision)	☐ YES ☐ NO
• The highest measured dose rate was at least 10 times greater than the measured background for each container not rejected by an NCR. (Completeness)	☐YES ☐ NO
• The correct revision of the procedure was used. (Comparability)	☐ YES ☐ NO
• The Operator signed and dated each container data sheet and associated measurement control sheet.	☐ YES ☐ NO
The Quality Assurance Objectives have all been met.	☐ YES ☐ NO
Data generation and reduction were conducted in a technically correct manner in accordance with the methods used (procedure with revision).	☐ YES ☐ NO
Calculations have been verified by a valid calculation program, a spot check of verified calculation programs, and/or 100 percent check of all hand calculations (e.g., 10 percent of estimated container dose calculation).	☐ YES ☐ NO
The dose rates on the container data sheets are technically reasonable and reported in the proper units and correct number of significant figures.	☐ YES ☐ NO
The data has been checked for transcription errors between the container data sheets and the conversion records.	☐ YES ☐ NO
The conversion records are complete and show:	
• Total TRU activity concentration is greater than 100 nanocuries per gram (nCi/g).	☐ YES ☐ NO
• Operator printed name, signature, and date.	☐ YES ☐ NO

Controlled
Copy

Attachment 7 – ITR Checklist (Continued)

BDR Number: _____

Description of Criteria Reviewed	Criteria Met (Check One)
The results shown on the conversion records are technically reasonable and reported in the proper units and correct number of significant figures.	☐YES ☐NO
The BDR is complete (i.e., contains the forms listed in the table of contents) for this point of generation.	☐YES ☐NO
Any NCRs generated are contained in the testing BDR.	☐YES ☐N/A
Comments:	
ITR Approval Printed Name Signature Date	

Attachment 8 – SPM Checklist

BDR Number: _____

Description of Criteria Reviewed	Criteria Met (Check One)
The Independent Technical Review has been completed and signed.	☐ YES ☐ NO
The results are technically reasonable.	☐ YES ☐ NO
The data have been checked for transcription errors.	☐ YES ☐ NO
Instrument calibration is satisfactory. (Accuracy)	☐ YES ☐ NO
Instrument source check is satisfactory. (Precision)	☐ YES ☐ NO
The dose rate was at least 10 times the measured background for each container not rejected by an NCR. (Completeness)	☐ YES ☐ NO
The correct revision of the procedure was used. (Comparability)	☐ YES ☐ NO
The BDR is complete (i.e., contains the forms listed in the table of contents) for this point of generation.	☐ YES ☐ NO
Data meet all applicable Quality Assurance Objectives (QAOs).	☐ YES ☐ NO
Any NCRs generated are contained in the testing BDR.	☐ YES ☐ NO ☐ N/A
Comments:	
SPM Approval Printed Name Signature Date	

Controlled
Copy

Attachment 9 – Gamma Spectroscopy Daily Check List and Measurement Controls

BDR Number: _____

DATE:			
Collimator in use	YES	NO	
Collimator size (In)			
Filter(s) in use	YES	NO	
Filter(s) size			
Probe No.:			
	Predicted Channel	Lower Boundary	Upper Boundary
661.6 keV Centroid Boundary Limits:			
661.6 keV Centroid Channel:			
661.6 keV Centroid Channel Acceptable:	YES	NO	
	Value	Acceptance Range	
Source Check Reference Value for probe (uCi)		-5%	+5%
Measurement Control Value (uCi)			
Measurement Control Acceptable:	YES	NO	

Printed Name Signature Date