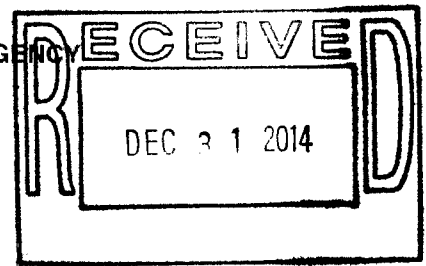




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

ENTERED



DEC 31 2014

OFFICE OF
AIR AND RADIATION

Mr. J R Stroble
Director, CBFO TRU Sites and Transportation Division
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, NM 88221-3090

Dear Mr. Stroble:

On May 30, 2014, the Carlsbad Field Office (CBFO) requested that the U.S. Environmental Protection Agency approve the addition of a 55-gallon drum containing remote-handled (RH) debris waste from the alpha gamma hot cell in Building JN-1 at the Battelle Columbus Laboratory (BCL). This drum was characterized by the Central Characterization Project (CCP) at the Savannah River Site (SRS) as a Tier 1 change. When initially surveyed for dose rate, the drum was measured at 150 millirem/hour (mR/hr) and was shipped to SRS as a contact-handled (CH) waste drum. In 2012, SRS-CCP surveyed the drum twice to obtain a surface dose rate as the drum was being characterized. At that time the dose rate was measured at 320 and 450 mR/hr. This required that the container be processed as a RH drum and added to an approved RH waste stream, SR-BCLDP.003.

EPA approves Drum No. BC0152, characterized using the EPA-approved transuranic (TRU) RH waste characterization processes implemented by SRS-CCP. SRS-CCP may dispose this drum at the Waste Isolation Pilot Plant (WIPP) when WIPP reopens. The enclosed report, (EPA Docket No. A-98-49; II-A4-196 and EPA Air eDocket No. EPA-HQ-OAR-2001-0012-0448), supports EPA's decision.

While no BCL RH waste remains at SRS, however, a small number of the BCL waste containers are stored at the Hanford Site. When characterization of these containers is initiated for the disposal at WIPP, EPA notification is necessary. Upon notification EPA will determine the scope of the EPA inspection and approval process.



If you have any questions regarding this approval, please contact Rajani Joglekar at (202) 343-9462 or Ed Feltcorn at (202) 343-9422.

Sincerely,

A handwritten signature in black ink that reads "Tom Peake". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Tom Peake
Director
Center for Waste Management and Regulations

Enclosure

cc: Electronic Distribution
Doug Tonkay, DOE EM
Alton Harris, DOE EM
Courtland Fesmire, CBFO
Norma Castaneda, CBFO
Martin Navarrete, CBFO QA
Dennis Miehl, CBFO QA
Ricardo Maestas, NMED
Raymond Lee, EPA HQ
Site Documents

**DOCKET NO: A-98-49; II-A4-196
EPA AIR E-DOCKET NO: EPA-HQ-OAR-2001-0012-0448**

**WASTE CHARACTERIZATION TIER 1 CHANGE REPORT
EPA TIER 1 EVALUATION
OF THE CENTRAL CHARACTERIZATION PROGRAM
REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM
FOR THE SAVANNAH RIVER SITE:
ADDITION OF DRUM NUMBER BC0152**

**U.S. Environmental Protection Agency
Radiation Protection Division
Center for Waste Management & Regulations
1200 Pennsylvania Avenue, NW
Washington, DC 20460**

December 2014

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ATTACHMENTS

- Attachment A: Approval Summary for Savannah River Site Remote-Handled Waste Characterization Program
- Attachment B: List of Documents Reviewed by EPA during T1 Evaluation

ACRONYMS AND INITIALIZATIONS

AK	acceptable knowledge
AKSR	acceptable knowledge summary report
Am	americium
BCLDP	Battelle Columbus Laboratories Decommissioning Project
BDR	batch data report
CBFO	Carlsbad Field Office
CCP	Central Characterization Program
CFR	Code of Federal Regulations
CH	contact-handled
Ci	curie
Co	cobalt
Cs	cesium
DOE	U.S. Department of Energy
DTC	dose-to-curie
EA	expert analyst
EPA	U.S. Environmental Protection Agency
ISOCS	In Situ Object Counting System
LWR	light water reactor
MCNP5	Monte Carlo N-Particle Transport Code RSICC Computer Code Collection, Oak Ridge National Laboratory
mrem/hr	millirem per hour
NABC	Non Destructive Assay Box Counter
NDA	nondestructive assay
Pu	plutonium
RH	remote-handled
SC&A	S. Cohen and Associates (SC&A, Inc.)
SCG	summary category group
SF	scaling factor
SRS	Savannah River Site
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty

TRU	transuranic
U	uranium
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION

This report supports the U.S. Environmental Protection Agency's (EPA's) approval of a Tier 1 (T1) change to characterize Drum No. BC0152 under the approved remote-handled (RH) transuranic (TRU) waste characterization program at the U.S. Department of Energy's (DOE's) Savannah River Site (SRS). In April 2012, EPA approved the Central Characterization Program (CCP)¹ to characterize RH TRU waste at SRS. EPA concludes that by using the EPA-approved RH radiological waste characterization program elements discussed in this report, SRS-CCP can characterize the TRU sludge waste container, Drum No. BC0152, generated at the Battelle Columbus Laboratory (BCL) for disposal at the Waste Isolation Pilot Plant (WIPP). This container is added to an RH sludge/debris waste stream, SR-BCLDP.003, which EPA approved in September 2010 as a T1 change.

On May 30, 2014, as a T1 change request, the Carlsbad Field Office (CBFO) requested EPA to approve the radiological characterization of Drum No. BC0152. Because SRS-CCP did not use new equipment or processes for radiological characterization of the subject waste, EPA conducted a desktop review of this change. This waste container originally belonged to SRS Contact-Handled (CH) Waste Stream SR-BCLDP.003.001. However, due to the surface dose rate measured above 200 millirem per hour, the container was classified as a RH waste container and was subjected to radiological characterization to confirm the designation and quantify radiological contents requiring EPA approval.

The Battelle Columbus Laboratories Decommissioning Project (BCLDP) at BCL, Columbus, Ohio, generated more than 100 waste containers as part of laboratory dismantling activities and partially characterized them. Eleven of which belonged to hydraulic sludge and debris waste stream with seven RH, three CH and one low-level containers. In 2005, when BCL ceased TRU waste operations, BCL shipped all of the BCLDP containers to SRS for storage, characterization and disposal at WIPP. As of 2010, all BCL waste containers except the subject waste container, BC0152, in storage at SRS since 2005, have been characterized and shipped to WIPP for disposal. Once this container in this T1 change leaves SRS, no additional BCL waste characterization at SRS is necessary.

In August 2008, EPA issued a baseline approval of the SRS-CCP RH TRU waste characterization program where BCL RH debris waste stream was characterized (see EPA Docket No. A-98-49; II-A4-104). Subsequently, SRS-CCP sought two T1 change approvals listed in Attachment A. The September 2010 T1 change approval consisted of six RH waste streams, SR-BCLDP.003 being one of those (see EPA Docket No. A-98-49; II-A4-129). The August 2008 SRS-CCP RH baseline approval stated that if SRS-CCP were to characterize any non-BCL waste for WIPP disposal, a new baseline inspection and approval would be necessary. In April 2012, EPA approved the SRS-CCP RH TRU waste characterization program (see EPA Docket No. A-98-49; II-A4-161). Attachment A lists subsequent tiering changes to the April 2012 RH baseline approval.

¹ The Central Characterization Program was formerly known as the Central Characterization Project, and both names are used in the documentation reviewed for this evaluation.

EPA conducted a continued compliance inspection of SRS-CCP's CH and RH waste characterization programs that were operational in August 2014. This inspection did not cover the RH TRU waste characterization program for BCL waste as no BCL-originated waste remains at SRS requiring to maintain an active BCL waste-specific program. EPA concluded that SRS-CCP continues to adequately implement the CH and RH TRU waste characterization processes, procedures and equipment at SRS that EPA approved as July 2006 and April 2012 baselines and subsequent tiering changes listed in Attachment A.

EPA did not identify any findings or concerns during this evaluation. As a result of this evaluation, EPA did not make any changes to the SRS-CCP RH T1 and Tier 2 (T2) designations established during the baseline approval and modified during subsequent T1 evaluations and the 2014 continued compliance inspection. The tiering designations, therefore, presented in Table 2 of the final report for EPA's 2014 continued compliance inspection of SRS-CCP (see EPA Docket No. A-98-49; II-A4-195; report forthcoming) remain in effect.

Based on the information provided, EPA concluded that SRS-CCP used the EPA-approved system of controls to characterize Drum No. BC0152. This single container of TRU waste is the subject of this T1 report, and EPA's approval is limited to this waste container. Characterization of any RH solid/sludge waste (S3000) by SRS-CCP remains a T1 change.

This report serves as EPA's public notification of the results of the proposed T1 change and its evaluation. This information will be provided through the EPA website and by emails to the WIPPNEWS list, in accordance with Title 40 of the Code of Federal Regulations [40 CFR 194.8(b)(3)].

2.0 PURPOSE OF TIER 1 EVALUATIONS

Certain changes to the waste characterization activities from the date of the site's baseline inspection must be reported to and, if applicable, approved by EPA according to the tiering requirements set forth in 40 CFR 194.8 regulations and incorporated into the SRS-CCP RH baseline final report (see EPA Docket No. A-98-49; II-A4-161).

Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004, Federal Register notice (Vol. 69, No. 136, pages 42571–42583), EPA must perform a single baseline inspection of a TRU waste generator site's waste characterization program. The purpose of EPA's baseline inspection is to approve the site's waste characterization program, based on the demonstration that the program's components, with applicable conditions and limitations, can adequately characterize TRU wastes and comply with the regulatory requirements imposed on TRU wastes destined for disposal at the WIPP.

Following EPA's baseline approval, EPA is authorized to evaluate and approve changes, if necessary, to the site's approved waste characterization program by conducting additional inspections under the authority of 40 CFR 194.24(h). Changes requiring EPA notification and approval prior to implementation (T1) and those requiring post-implementation notification (T2) are identified in the site-specific baseline inspection reports and subsequent T1 evaluation reports. When evaluating proposed T1 changes for approval, EPA may conduct a site inspection to observe implementation of the change or can opt to conduct a desktop review of information

provided specific to a change. DOE may choose to characterize and dispose of any previously approved TRU waste using processes, procedures or equipment implemented as T2 changes at risk of subsequent EPA disapproval.

3.0 PURPOSE OF THIS REPORT

This report presents the results of EPA’s evaluation of a T1 change to add Drum No. BC0152 to SRS-CCP’s approved waste characterization program as part of RH Waste Stream SR-BCLDP.003. This report presents the technical basis for and results of EPA’s approval. EPA’s approval decision of the addition of Drum No. BC0152 has been conveyed to DOE separately by letter. EPA will also announce the decision on its website at www.epa.gov/radiation/wipp, in accordance with 40 CFR 194.8(b)(3).

Any of the T1 change request-specific documents mentioned in this report can be requested from the following address:

Manager, National TRU Program
 Carlsbad Field Office
 U.S. Department of Energy
 P O Box 3090
 Carlsbad, NM 88221-3090

4.0 SCOPE OF THE TIER 1 EVALUATION

The scope of EPA’s T1 evaluation is the acceptable knowledge (AK) and radiological characterization approach used to characterize BCLDP RH Drum No. BC0152. Section 6.0 of this report details the AK and radiological characterization technical elements assessed during this evaluation.

5.0 EPA EVALUATION PERSONNEL

The EPA evaluation team members consisted of the personnel listed in Table 2 with their affiliations and functions. EPA relied primarily on reviews of documents and information provided by SRS-CCP. When additional information or clarifications were needed, EPA had discussions with Irene Joo, the CCP RH Project Manager, who served as the point of contact for this T1 evaluation.

Table 1. EPA Tier 1 Evaluation Team Members

Name	Affiliation & Function
Rajani Joglekar	Lead Inspector, EPA
Kira Darlow	Technical Evaluator – Acceptable Knowledge, SC&A
Rose Gogliotti	Technical Evaluator – Radiological Characterization, SC&A
Patrick Kelly	Technical Evaluator – Radiological Characterization, SC&A
Amir Mobasheran	Technical Evaluator – Radiological Characterization, SC&A

6.0 TECHNICAL EVALUATION

BCLDP Hydraulic Sludge and Debris Generation and Evaluation Timeline

Between 1988 and 1997, BCLDP decontamination and demolition operations generated approximately 50 small bags of debris and absorbed sludge while cleaning out waste from historic hydraulic oil leaks into the pump room with dose rate ranging 20-2000 mR/hr. In 2002, 11 hydraulic sludge and debris drums (Sludge/debris Waste Stream S3212) were generated. The measured dose rate for seven of these containers ranged from 80 to 600 mR/hr. In 2003, the measured dose rate for the four remaining drums ranged from 30 to 1,250 mR/hr. In 2002, the BCLDP Health Physics Survey Report for BC0152 identified a maximum dose rate of 150 mR/hr, therefore it was classified as a CH drum. The Discrepancy Report (DR017) prepared by SRS-CCP in February 2008, delineated 11 hydraulic sludge and debris as seven RH waste (SR-BCLDP.003), three CH (including BCL0152) and one low-level waste containers.

RH Waste Overview

Drum No. BC0152 is part of Waste Stream SR-BCLDP.003, which consists of absorbed hydraulic sludge and debris waste generated during decontamination and demolition of the hot cells in the Building JN-1 Hot Cell Laboratory at the Battelle West Jefferson North Facility. Each drum in Waste Stream SR-BCLDP.003, including Drum No. BC0152, contains greater than 50 percent by volume absorbed hydraulic sludge.

Based on historical BCLDP characterization and survey results, Drum No. BC0152 was originally included in contact-handled TRU Waste Stream SR-BCLDP.003.001, and was characterized under the SRS-CCP CH TRU program including non-destructive assay (NDA). However, when SRS-CCP was readying the container for shipment to WIPP the contact dose² rate surveys indicated that at least one part of the container (a "hot spot") measured in excess of 200 millirem per hour (mrem/hr). SRS-CCP, therefore, reassigned this drum to RH TRU Waste Stream SR-BCLDP.003. The reason for two different contact dose rate measurements on the same BCL container is speculated as shifting of waste material during movement and handling of the container for characterization. SRS-CCP determined that the hot spot (or spots) corresponded to pieces of concrete floor that were generated during demolition of the JN-1 hot cell. AK indicated that the floor had been washed repeatedly over the years of operation using a variety of cleaning fluids, including water, solvents and chelating agents.

Documents Provided

EPA evaluated the SRS-CCP documentation that supported the addition of Drum No. BC0152. Initially, AK document, CCP-AK-SR-530, for RH hydraulic sludge and debris waste had only seven drums in waste stream SR-BCLDP.003. In 2012, this document was revised to include three additional drums including BCL0152 as a new CH hydraulic sludge and debris waste

² *Rem* or *millirem* is a unit of dose equivalent, which is often called *dose* or when it is expressed per unit time, a *dose rate*. The criterion for RH determination is expressed in terms of a dose rate in rem, which, while technically incorrect, is commonly used. In this report, the terms *dose* and *dose rate* are used in place of the technically correct term *dose equivalent* or *dose equivalent rate*, and the terms *R* and *rem* are used interchangeably. The actual differences among these values for the purpose of this report are negligible.

stream SR-BCLDP.003.001 with a CCP Waste Stream Evaluation Report C1002. SRS-CCP prepared a new AK Re-evaluation Checklist and Discrepancy Report DR1002 to justify the inclusion of BCL0152 in RH waste stream RH-BCLDP.003, based on the fact that the physical and radiological properties for this drum is consistent with and bounded by this RH waste stream. The AK Summary report did not require additional changes as the AKE's evaluation confirmed that the waste aligns with the existing description in the AK Summary report; only the contact dose rate required the container to be placed in the RH program.

SRS-CCP provided CCP-AK-SRS-530, Revision 4; CCP-AK-SRS-532, Revision 1; and CCP-AK-SRS-531, Revision 1, to EPA as the main documents for review, as well as other calculation packages, reports and memoranda. The documents that EPA reviewed for this evaluation are cited in different sections throughout the report and are listed in Attachment B.

6.1 Acceptable Knowledge

EPA examined SRS-CCP's programmatic requirements, the AK process and associated information relative to characterization of RH SRS debris (SCG S5000), (2) CH SRS debris, soil and solid (SCG S5000, S4000 and S3000) waste during the continued compliance inspection in August 2014 (see EPA Docket No. A-98-49; II-A4-195; report forthcoming). Specifically, EPA evaluated applicable CCP procedures; training for all personnel involved with RH TRU characterization; the processes of AK compilation, AK verification, AK accuracy assessment and AK discrepancy resolution; completion and adequacy of required forms and reports; and the SRS-CCP waste stream certification process. SRS-CCP initially characterized Drum No. BC0152 as part of CH Waste Stream SR-BCLDP.003.001.

EPA approved SRS-CCP CH waste characterization program processes to characterize solids/sludge (S3000) waste in March 2010 (see EPA Docket No. A-98-49; II-A4-123). The remaining containers in CH Waste Stream SR-BCLDP.003.001 were certified as meeting all CH characterization requirements and were emplaced at WIPP in June 2013. Drum No. BC0152, however, fell out of Waste Stream SR-BCLDP.003.001 because contact dose rate surveys indicated that the container should be reclassified as RH waste due to a surface dose rate of greater than 200 mRem/hr. It was not reclassified due to any type of discrepancy in waste generation or contents. SRS-CCP AK personnel prepared necessary documentation supporting this reclassification included in Source Documents C1002 and DR 1002, which EPA reviewed and concluded as technically adequate. The historical AK used to characterize CH Waste Stream SR-BCLDP.003.001 and RH Waste Stream SR-BCLDP.003 is identical. Therefore, EPA determined that the historical AK for Drum No. BC0152 did not need to be reevaluated and reapproved based on the reclassification from CH to RH.

EPA also evaluated and approved the historical AK, including the AK summary report (AKSR; CCP-AK-SRS-530, Revision 2) for Waste Stream SR-BCLDP.003 during a T1 evaluation in 2010 (see EPA Docket No. A-98-49; II-A4-129). SRS-CCP did not significantly alter the AKSR when moving Drum No. BC0152 from Waste Stream SR-BCLDP.003.001 to Waste Stream SR-BCLDP.003. EPA's requirement that the SRS-CCP RH program undergo a baseline inspection prior to adding any additional containers to Waste Stream SR-BCLDP.003 was an administrative control and not an indication of inadequate AK process implementation. Therefore, EPA

determined that the AK for Waste Stream SR-BCLDP.003 did not need to be reapproved based on the inclusion of Drum No. BC0152.

CCP as a whole, including SRS-CCP, applies the same procedures, including AK compilation, AK verification, AK accuracy assessment, AK discrepancy resolution processes, report compilation and revision, and waste stream certification to all RH waste regardless of the applicable SCG. Additionally, the same AK and Site Project Management personnel are responsible for characterization and certification of all RH waste irrespective of the applicable SCG. Therefore, EPA determined that the review and continued approval of SRS-CCP's implementation of the AK process relative to characterization of RH debris (SCG S5000) also applies to characterization of Drum No. BC0152.

Summary of Acceptable Knowledge Findings and Concerns

The EPA evaluation team did not identify any AK-related findings or concerns relative to the characterization of Drum No. BC0152 during this T1 change evaluation.

Acceptable Knowledge Approval

Based on the results of this evaluation, EPA approves the characterization of Drum No. BC0152 consistent with the limitations specified in this report.

Based on this evaluation, there are no changes to the AK T1 or T2 designations. Characterization of any additional SCG S3000 waste remains a T1 change. T1 and T2 changes that were initiated during the baseline approval and subsequent T1 evaluations and continued compliance inspections remain in effect.

6.2 Radiological Characterization

EPA examined SRS-CCP's programmatic requirements, the In Situ Object Counting System (ISOCS), the Non Destructive Assay Box Counter (NABC), the dose-to-curie (DTC) process and associated information during the continued compliance inspection in August 2014 (see EPA Docket No. A-98-49; II-A4-195; report forthcoming). Specifically, EPA evaluated training for all personnel involved with CH and RH TRU characterization, the SRS-CCP measurement control program for CH and RH TRU instruments and the SRS-CCP CH and RH TRU procedures and technical documents. Therefore, EPA limited the scope of this evaluation to the technical adequacy of the information supporting the addition of BCLDP Drum No. 0152.

Waste Characterization Element Description

EPA evaluated the radiological characterization of Drum No. BC0152 in terms of technical adequacy, as supported by the documents, procedures and controls, and the knowledge and understanding of the personnel involved in the RH waste characterization program. During this RH evaluation, EPA evaluated the following elements of the SRS-CCP radiological characterization program:

- Overall radiological characterization.

- Development of cesium-137 (^{137}Cs)-based radionuclide scaling factors via comparison with the original RH Waste Stream SR-BCLDP.003 scaling factors and CH NDA results from the NABC.
- Representativeness and technical adequacy of the analytical data used to support the scaling factors.
- Uncertainty analysis.

Each of these is discussed in the sections that follow.

Technical Evaluation

The EPA evaluation team evaluated the following aspects:

- (1) EPA evaluated the overall radiological characterization process and its documentation and found them to be adequate.

Drum No. BC0152 was generated at BCLDP. It was later moved to SRS for storage and initially was characterized as CH waste by SRS-CCP. SRS-CCP later determined Drum No. BC0152 to be RH waste. SRS-CCP performed a valid assay of this drum as CH waste using the EPA-approved NABC prior to determining that it was RH waste. The NABC is not approved for formal assays of RH waste, preventing SRS-CCP from using the NABC data to characterize this drum directly.

Because Drum No. BC0152 is part of Waste Stream SR-BCLDP.003, SRS-CCP considered using the scaling factors previously approved for this waste.³ This would be a reasonable approach if the drum's radionuclide contents were entirely consistent with those previously established for this waste stream. However, the presence of the concrete floor chunks discussed above invalidates the technical basis for using the previously established scaling factors to characterize Drum No. BC0152 because the repeated washings of the hot cell floor would have affected the concrete's ^{137}Cs and actinide concentrations. The AK did not provide sufficient information to quantify the extent of these changes and derive a meaningful isotopic distribution for this drum.

For these reasons, SRS-CCP used the hybridized approach represented in Figure 1 to generate radionuclide-specific scaling factors for Drum No. BC0152. The original SR-BCLDP.003 scaling factors were modified by the NABC assay results, as discussed in Item 2, below. SRS-CCP then applied the historical DTC record from Waste Stream SR-BCLDP.003 to the hybridized container scaling factors to generate the radionuclide content of the drum, as

³ These scaling factors were based on the analysis of 69 swipe samples in combination with ORIGEN2.2 modeling of the Light Water Reactor (LWR) fuel pins that were examined in the BCLDP hot cells. SRS-CCP generated these scaling factors for Waste Stream SR-RL-BCLDP.001 (see EPA Docket No. A-98-49; II-A4-104, August 2008) and later applied the same scaling factors to Waste Stream SR-BCLDP.003 (see EPA Docket No. A-98-49; II-A4-129, September 2010). In this report, the debris scaling factors (SF_{Debris}) and the initial scaling factors for Waste Stream SR-BCLDP.003 are the same.

discussed in Item 4, below. These radionuclide values were decay corrected to reflect the drum's current activities.

During the course of this T1 evaluation, SRS-CCP revised the documents supporting radiological characterization in response to EPA's comments and discussions between SRS-CCP and EPA technical personnel. EPA determined that the radiological characterization process for Drum No. BC0152 was technically adequate and appropriately documented in the revised documents. There were no outstanding issues regarding the radiological characterization process for Drum No. BC0152.

Consistent with the T1 and T2 designations that EPA established during the baseline approval, any new RH waste stream not approved to date or the addition of drums to Waste Stream SR-BCLDP.003 remains a T1 change. Similarly, any change to CCP-AK-SRS-531 that requires CBFO approval remains a T2 change.

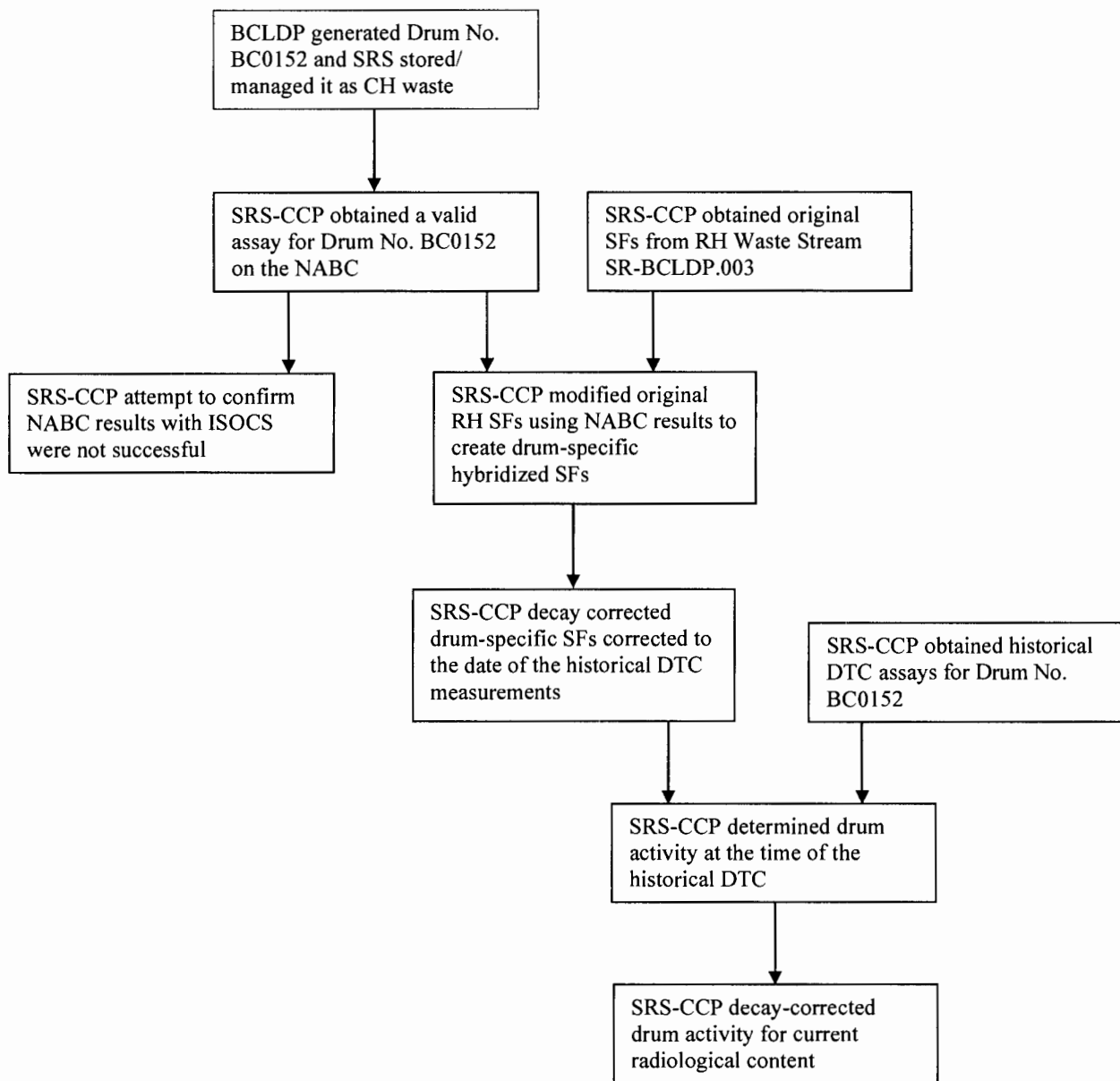


Figure 1. Characterization of Drum No. BC0152

- (2) EPA found that SRS-CCP correctly derived and appropriately documented cesium-137-based radionuclide scaling factors.

SRS-CCP described the development of scaling factors for Drum No. BC0152 in CCP-AK-SRS-531, Revision 1, Attachment A. This process incorporated several types of measurements resulting in the use of hybridized scaling factors.

Prior to determining that the drum was RH, SRS-CCP assayed it on the NABC. While the NDA Expert Analyst (EA) determined that the NABC assay was acceptable in that it met all the measurement acceptance criteria, it was barely above detection and had a large uncertainty (the

EA stated that the spectrum was “marginal”). The NABC scaling factors for both plutonium-239 (²³⁹Pu) and americium-241 (²⁴¹Am) differed considerably from the initial scaling factors for Waste Stream SR-BCLDP.003. Additionally, the assay only provided useable values for ¹³⁷Cs, ²³⁹Pu, ²⁴¹Am, europium-152 and cobalt-60 (⁶⁰Co).

The NABC is an EPA-approved assay modality for CH waste but is not approved to provide the assay of record for RH wastes. The ISOCS is a WIPP-certified system at SRS for the determination of isotopic distribution (ratios) in RH TRU waste.⁴ Therefore, after SRS-CCP determined the drum to be RH, SRS-CCP personnel attempted to confirm either the initial Waste Stream SR-BCLDP.003 scaling factors or the NABC-measured radionuclide values using the ISOCS. However, the ISOCS assay provided useable data only for ¹³⁷Cs, so it was not helpful for comparing scaling factors.

Since SRS-CCP was unable to definitively establish the radionuclide results of Drum No. BC0152 by applying either the initial Waste Stream SR-BCLDP.003 scaling factors or using the NABC results directly, SRS-CCP developed a hybrid set of scaling factors based on the original Waste Stream SR-BCLDP.003 scaling factors that were modified by the NABC results. SRS-CCP determined that the Pu to uranium (U) ratios should remain constant, and adjusted them to account for the ²³⁹Pu to ¹³⁷Cs ratio determined by the NABC using the equation:

$$SF_i = SF_{iDebris} * ({}^{239}\text{Pu } SF_{NABC}) / ({}^{239}\text{Pu } SF_{Debris})$$

SRS-CCP used the ²⁴¹Am ratio provided by the NABC without adjustment and quantified the fission/activation products using the scaling factors from the original Waste Stream SR-BCLDP.003 without modification. SRS-CCP and EPA technical personnel discussed this issue at length. EPA determined that SRS-CCP’s scaling factor development approaches were technically adequate and appropriately documented.

- (3) EPA previously evaluated computer modeling to develop the dose-to-curie correlation and found it to be adequate.

SRS-CCP used MicroShield® to develop the original DTC correlation for Waste Stream SR-BCLDP.003 based on the packaging configuration of BCLDP waste. This modeling assumed there were independent, 1-curie (Ci) sources of both ¹³⁷Cs and ⁶⁰Co that were uniformly distributed within the drum. Using waste density and the DTC correlation allows calculation of the activity attributable to ¹³⁷Cs, which is then used with decay-corrected scaling factors (excluding ⁶⁰Co) to determine the activities of the radionuclides of interest. The activities for ¹³⁷Cs and ⁶⁰Co are calculated directly from their corresponding DTC correlations. SRS-CCP described the DTC correlation in CCP-AK-SRS-531, Revision 1, and detailed it in SRS-RH-02. EPA did not identify any issues regarding the use of Microshield® to support the DTC correlation for Drum No. BC0152.

Consistent with the T1 and T2 designations that were established during the SRS-CCP baseline approval, the use of any method to determine scaling factors other than those documented in CCP-AK-SRS-531, Revision 1, remains a T1 change.

⁴ The SRS-CCP ISOCS is described in detail in EPA Docket No.A-98-49-A4-161, August 2012.

- (4) EPA assessed radionuclide documentation in the dose-to-curie determination and found it to be adequate.

SRS-CCP did not generate the radionuclide values summarized in CCP-AK-SRS-531 using DTC procedure CCP-TP-504. SRS-CCP stated that the DTC approach they used was consistent with what had been done previously for Waste Stream SR-BCLDP.003, i.e., using the two dose rates generated by BCLDP in 2002. EPA approved this approach in 2008.⁵ Performing DTC in accordance with CCP-TP-504 would have required SRS-CCP to generate new MCNP5 or Microshield® models for the drum's configuration. EPA agreed that the historical DTC approach was technically adequate for this drum. However, EPA expects all future DTC measurements for SRS RH waste or RH waste from other TRU generator sites to be compliant with the current revision of CCP-TP-504 or an equivalent procedure. Regardless of previous approvals, all future DTC measurements for SRS-CCP RH TRU waste containers must be completed under a currently approved procedure. EPA did not identify any concerns regarding SRS-CCP's determination of radionuclides in DTC BDRs for Drum No. BC0152.

- (5) EPA evaluated the remote-handled determinations and found them to be adequate.

SRS-CCP initially managed Drum No. BC0152 as CH waste. Based on contact dose-rate surveys performed in September 2013, SRS-CCP identified that the drum had contact dose rates in excess of 200 mrem/hr, making it RH waste. EPA did not identify any concerns regarding SRS-CCP's RH determination for Drum No. BC0152.

- (6) EPA evaluated the determination the determination that this waste was transuranic and found it to be adequate.

SRS-CCP documented the TRU determination in the DTC conversion record listed in Table A6-3 in CCP-AK-SRS-531, Revision 1. Drum No. BC0152 meets the requirements of TRU waste, i.e., has TRU alpha activity concentrations greater than 100 nanocuries per gram. EPA did not identify any concerns regarding SRS-CCP's determination that Drum No. BC0152 is TRU waste.

- (7) EPA evaluated the technical basis and documentation of total measurement uncertainty and found them to be adequate.

The total measurement uncertainty (TMU) for Drum No. BC0152 is based on the propagation of uncertainties present in the determination of the waste stream's radiological constituents. These aspects are assumed to be independent, which allows them to be added in quadrature.⁶ The TMU determination included contributions of the following:

- ¹³⁷Cs DTC correlation

⁵ See EPA Docket No.A-98-49-A4-104, August 2008.

⁶ Adding in quadrature is a standard statistical technique that allows one to combine the square root of the sum of each contributor to uncertainty squared, resulting in a lower value than what would be obtained if the values were simply added. For example, the TMU for ¹³⁷Cs is derived by taking the square root of (25%)² plus (10%)² plus (19.69%)² plus (45.61%)², which equals 56.5%, which is less than the value obtained by simply summing the individual uncertainty values (i.e., 100.3%), as shown in CCP-AK-SRS-531, Revision 1, Table A6-2.

- ¹³⁷Cs activity measurement
- Scaling factor development, including modifications for the use of a hybridized factor
- MCNP5 Model
- Other gamma emitters

A general treatment of TMU for Drum No. BC0152 is presented in Table A6-2, CCP-AK-SRS-531, Revision 1, and is detailed in SRS-RH-05. The overall uncertainties are consistent with what EPA has observed for RH determinations at other RH TRU generator sites. EPA did not identify any concerns regarding SRS-CCP's determination of TMU for Drum No. BC0152.

Summary of Radiological Characterization Findings and Concerns

The EPA evaluation team did not identify any radiological characterization-related findings or concerns relative to the characterization of Drum No. BC0152 during this T1 change evaluation.

Radiological Characterization Approval

Based on the results of this evaluation, EPA approves the characterization of Drum No. BC0152, consistent with the limitations specified in this report.

Based on this evaluation, there are no changes to the radiological characterization T1 or T2 designations. Characterization of any new waste stream not previously approved or addition of containers to an approved waste stream that requires changing the established radionuclide scaling factors remains a T1 change. T1 and T2 changes that were initiated during the baseline approval remain in effect.

7.0 FINDINGS AND CONCERNS

Summary of Findings and Concerns

The EPA inspection team did not identify any findings or concerns relative to the characterization of Drum No. BC0152 during this T1 change evaluation.

8.0 CONCLUSIONS

Changes to Tiering

As a result of this evaluation, EPA did not make any changes to the SRS-CCP RH T1 and T2 designations that were established during the baseline approval and modified during subsequent T1 evaluations and the 2014 continued compliance inspection. The tiering designations presented in Table 2 of the final report for EPA's 2014 continued compliance inspection of SRS-CCP (see EPA Docket No. A-98-49; II-A4-195; report forthcoming) remain in effect and are listed as applicable in sections 6.1 and 6.2.

Approval

EPA concluded that the waste characterization processes of AK and radiological characterization used to characterize Drum No. BC0152 are adequate, as evidenced by the records evaluated. There are no open issues relative to this T1 evaluation.

Based on the results of this evaluation, EPA approves this T1 change consistent with the limitations specified in this report. Specifically, EPA's approval includes Drum No. BC0152 only. Characterization of additional RH S3000 waste remains a T1 change. SRS-CCP may continue to characterize previously approved RH TRU waste consistent with the restrictions specified with the approvals listed in Appendix A to this report.

ATTACHMENT A

**APPROVAL SUMMARY FOR SAVANNAH RIVER SITE REMOTE-HANDLED
WASTE CHARACTERIZATION PROGRAM**

Approved Activity	Approval Dates	EPA Docket Number
SRS RH Baseline Approval of BCL Waste	August 21, 2008	A-98-49; II-A4-104
T1 Change – Addition of Six (6) Waste Streams: SR-BCLDP.001.001 – Homogenous Waste SR-BCLDP.001.002 – Composite Filter Debris SR-BCLDP.002- Cemented Sludge SR-BCLDP.003 – Hydraulic Sludge and Debris SR-BCLDP.004.001 – Cartridge Water Filter SR-BCLDP.004.003 – TRI-NUC Vacuum Filters	September, 9, 2010	A-98-49; II-A4-129
T1 Change – Addition of BCO148 (simulated HL waste) to SR-RL-BCLDP.002	June 8, 2011	A-98-49; II-A4-149
SRS RH non-BCL Baseline Approval	April 2012	A-98-49; II-A4-161
T1 Change – Addition of Waste Stream SR-RH-235F.01	February 11, 2013	A-98-49; II-A4-170
T1 Change – Addition of Waste Stream SR-RH-221H.01	August 20, 2013	A-98-49; II-A4-177
T1 Change – Addition of Waste Stream SR-RH-SDD.01	May 22, 2014	A-98-49; II-A4-184
2014 Continued Compliance Inspection	Report forthcoming	A-98-49; II-A4-195

ATTACHMENT B

LIST OF DOCUMENTS REVIEWED BY EPA DURING T1 EVALUATION

Memorandum from Kevin Peters to I. Joo, Waste Stream Container Evaluation Memorandum, September 11, 2012

CCP-AK-SRS-530, Central Characterization Program Acceptable Knowledge Summary Report for Battelle Columbus Laboratories Decommissioning Project (BCLDP) Homogeneous Transuranic Waste from the Building JN-1 Hydraulic Room, Waste Streams: SR-BCLDP.003 – Hydraulic Sludge and Debris and SR-BCLDP.003.001 - CH Hydraulic Sludge and Debris, Revision 4, October 29, 2012

CCP-AK-SRS-531, Central Characterization Program Remote-Handled Transuranic Radiological Characterization Technical Report for Remote-Handled Transuranic Hydraulic Sludge and Debris from Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility, Revision 1, April 7, 2014

CCP-AK-SRS-532, Central Characterization Program RH TRU Certification Plan for 40 CFR Part 194 Compliance for BCLDP RH Waste Stream: SR-BCLDP.003, Revision 1, April 29, 2014

Memorandum to EPA, Radiological Characterization Approach for Drum BC0152 in Waste Stream BCLDP Hydraulic Sludge and Debris, January 29, 2014

Memorandum to I. Joo, Response to EPA Comments Regarding the Characterization of BC0152, Derek Ott, June 12, 2014

Email from I. Joo, to Rajani Joglekar, providing BCLDP Hydraulic Sludge and Debris Waste Timeline, December 3, 2014

SRS-RH-01, Scaling Factor Development (P727), Revision 2, November 6, 2007

SRS-RH-02, Dose-to-Curie Correlation for Cs-137 and Co-60 (P728), November 9, 2007

SRS-RH-05, Dose to Curie Spreadsheet (P731), June 24, 2008

SRS-RH-06, Uncertainty Analysis (P732), November 9, 2007

SRS-RH-32, DTC Spreadsheet for Drum BC0152, Revision 0, Derek Ott, May 12, 2014

SRLBC0742, NDA Batch Data Report, SRS E-Area, September 26, 2012

SRLBR0098, SRS RTR Batch Data Report, RH, July 9, 2013

DR1002, CCP-TP-005, Rev. 24, CCP Acceptable Knowledge Documentation, November 28, 2011

C1002, CCP-TP-005, Rev. 24, CCP Acceptable Knowledge Documentation, November 28, 2011