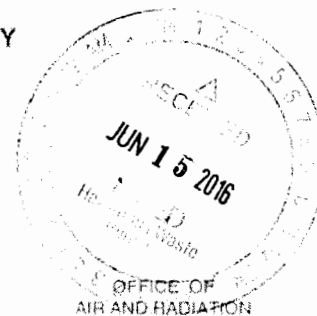




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

ENTERED



JUN 15 2016

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

Dear Mr. Stroble:

On October 16, 2015, the Carlsbad Field Office (CBFO) requested U.S. Environmental Protection Agency (EPA) approval of a Tier 1 (T1) change to add Waste Stream SR-RH-MNDPAD1.01, generated at Mound, Ohio, and shipped to the Savannah River Site (SRS) for characterization and certification in conformance with the EPA-approved remote-handled (RH) transuranic (TRU) debris waste characterization program implemented by the Central Characterization Project (CCP) at SRS.

EPA approves the T1 change request and, using the EPA-approved waste characterization processes discussed in the enclosed report (EPA Air e-Docket No: EPA-HQ-OAR-2001-0012-0462), SRS-CCP has completed characterization of all thirteen Mound RH TRU waste containers and upon certification, can be shipped to the Waste Isolation Pilot Plant (WIPP) for disposal. One of the thirteen containers has been identified as a contact-handled waste and should be certified and tracked accordingly for disposal.

This approval affects future RH T1 change requests as follows. For characterization of Mound waste, SRS-CCP used appropriately EPA-approved RH TRU waste characterization processes. The RH determination, based on the external radiation dose rate of greater than or equal to 200 mrem/hr, is to represent the total of gamma and neutron dose. However the documentation provided by SRS-CCP for this T1 change did not report this information in accordance with accepted industry practice. In this case the number is inaccurately presented as gamma only. It is actually the total of both the gamma and neutron dose rate measurements. Therefore, the proper notation should be "total dose rate." In the future, however, RH determination using the existing approach may result in incorrect interpretation of the RH determination. Therefore, EPA requires that, before CBFO submits future SRS RH T1 change requests, SRS must modify the currently used system for reporting RH external dose rates and provide relevant objective evidence with the T1 change request.

Along with the concurrence request for CBFO's SRS site certification memo to add Mound waste, the DOE needs to provide evidence for completion of enhanced Acceptable Knowledge documentation for this waste stream as required by the Waste Acceptance Criteria, Revision 8.0.



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 written in a cursive style with a long, sweeping underline.

Tom Peake
Director
Center for Waste Management and Regulations

Enclosure

cc: Electronic Distribution
Alton Harris, DOE EM
Casey Gadbury, CBFO
Norma Castaneda, CBFO TSTD
Tom Carver, CBFO TSTD
Mike Brown, CBFO QA
Site Documents, CBFO-LANL
Ray Lee, EPA HQ

DOCKET NO: A-98-49; II-A4-204
EPA AIR E-DOCKET NO: EPA-HQ-OAR-2001-0012-0462

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 WASTE STREAM SR-RH-MNDPAD1.01

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

June 2016

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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
Attachment C:	EPA Inspection Issue Tracking Form, Issue No. SRS-CCP-T1-RH-2016-RC-1CR, Final

ACRONYMS AND INITIALIZATIONS

AK	acceptable knowledge
AKA	AK Assessment Memorandum
Am	americium
BDR	batch data report
CBFO	Carlsbad Field Office
CCE	Chemical Compatibility Evaluation Memorandum
CCP	Central Characterization Program
CFR	Code of Federal Regulations
CH	contact-handled
Cs	cesium
DOE	U.S. Department of Energy
DTC	dose-to-curie
EPA	U.S. Environmental Protection Agency
ISOCS	In Situ Object Counting System
ITR	Independent Technical Reviewer
m	meter
MCNP5	Monte Carlo N-Particle Transport Code RSICC Computer Code Collection, Oak Ridge National Laboratory
mR/hr/Ci	milliroentgen per hour per curie
mrem/hr	millirem per hour
nCi/g	nanocuries per gram
NDA	nondestructive assay
Np	neptunium
Pu	plutonium
R	roentgen
R/hr	roentgen per hour
rem	Roentgen equivalent man
RH	remote-handled
RTR	real-time radiography
SC&A	S. Cohen and Associates (SC&A, Inc.)
SF	scaling factor
SPM	Site Project Manager

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 approval of a Tier 1 (T1) change to add Waste Stream SR-RH-MNDPAD1.01 to the approved characterization program at the U.S. Department of Energy's (DOE's) Savannah River Site (SRS) consistent with the limitations described in this report. In April 2012, EPA approved the Central Characterization Program (CCP) to characterize remote-handled (RH) waste at SRS (see EPA Docket No. A-98-49; II-A4-161). Using only the EPA-approved waste characterization processes discussed in this report, SRS-CCP can characterize Waste Stream SR-RH-MNDPAD1.01 for disposal at the Waste Isolation Pilot Plant (WIPP).

EPA conducted continued compliance inspections of SRS-CCP in August and October 2014, concluding that SRS-CCP continues to adequately implement the RH TRU waste characterization processes, procedures and equipment at SRS that EPA approved in the April 2012 baseline approval and in subsequent tiering changes listed in Attachment A. On October 16, 2015, the Carlsbad Field Office (CBFO) requested EPA's approval of a T1 change to add Waste Stream SR-RH-MNDPAD1.01. Because there were no new equipment reviews or additional new processes on site at SRS as part of the T1 request, EPA conducted a desktop review of this change.

The scope of EPA's T1 evaluation is the radiological characterization approach and real-time radiography (RTR) process used to characterize Waste Stream SR-RH-MNDPAD1.01. EPA's baseline approval of the RH SRS-CCP waste characterization program included the acceptable knowledge (AK) process for all RH transuranic (TRU) debris waste streams that have companion¹ contact-handled (CH) debris waste streams. EPA confirmed that Waste Stream SR-RH-MNDPAD1.01 is an RH debris waste stream and that Waste Stream SR-MD-PAD1 is the applicable CH companion waste stream. Because the AK process used to characterize Waste Stream SR-RH-MNDPAD1.01 was the same as EPA evaluated during the baseline approval, EPA did not include AK in the scope of this T1 review.

In August 2015, CCP significantly revised the AK procedure to include additional steps and generate additional records. The additional requirements went into effect after SRS-CCP completed the AK characterization and after CBFO requested this T1 evaluation. Therefore, the introduction of CCP-TP-005, Revision 27, did not change EPA's decision to exclude AK from the scope of this T1 evaluation.

All TRU wastes intended for disposal at WIPP must meet the enhanced AK requirements of the current revision of CCP-TP-005 as required by the Waste Acceptance Criteria, Revision 8.0, prior to disposal, including Waste Stream SR-RH-MNDPAD1.01. DOE/SRS-CCP needs to provide EPA with evidence that the requirements of the current revision of CCP-TP-005 have been met for Waste Stream SR-RH-MNDPAD1 prior to shipping the waste. This may include providing EPA with final copies of the CCP-TP-005, Attachment 9, Interface Waste Management Documents List, the AK Assessment Memorandum (AKA), Chemical

¹ A companion CH waste stream has the same summary category group, same waste stream definition and same radiological and physical properties as the subject RH waste stream. The only difference between containers in the companion CH waste stream and those in the subject RH waste stream is the waste's external dose rate, i.e., less than or greater than 200 millirem per hour (mrem/hr), which makes the waste CH or RH, respectively.

Compatibility Evaluation Memorandum (CCE), or other memoranda, as appropriate. EPA added these three records to Table 1 as AK Tier 2 (T2) changes even though they were not part of the scope of this T1 evaluation.

EPA did not identify any findings during this T1 evaluation. EPA identified one radiological characterization concern requiring a response related to RH determinations. SRS-CCP provided a response to the concern on March 28, 2016. EPA finds the concern response to be adequate to support the RH determinations for the 13 drums currently documented as part of Waste Stream SR-RH-MNDPAD1.01 and there are no open issues as a result of this T1 evaluation. However, this documentation is not consistent with industry-accepted practices for reporting measurements of external radiation. As a result, EPA will not accept this type of inconsistent use of nomenclature when reporting RH determination basis for future evaluations. The RH determination documentation at SRS must be modified such that it is consistent with accepted practices for reporting measurements of external radiation and a reasonably qualified member of the public can understand it before the documentation will be accepted for future WIPP-bound waste. When CBFO submits the next SRS RH T1 change, along with a change request, DOE needs to provide supporting objective evidence (e.g. a spreadsheet showing changes to reporting documentation for external radiation dose) indicating that changes to the RH determination process to reflect industry standards and clarity have been made.

In addition to responding to the concern, SRS-CCP revised several documents and calculation packages in response to specific technical issues that the EPA evaluation team identified. SRS-CCP provided the revised documents for EPA's review. Attachment B is a list of all documentation reviewed, including batch data reports (BDRs) and calculation packages.

As a result of this evaluation, EPA did not make any changes to the SRS-CCP RH T1 designations. EPA revised the AK T2 designations as described in the paragraph above (see Table 1). T1 and T2 changes that were initiated during the baseline and subsequent T1 approvals remain in effect and are listed as applicable in sections 6.1 and 6.2 of this report.

In the past, EPA has approved the use of radiological data from assays of CH TRU containers performed on EPA-approved NDA equipment for characterizing radiological contents of RH waste containers. EPA will continue to approve such use on a case-by-case basis. The reverse of such application (i.e., use of RH radiological data for characterizing CH waste containers) may be necessary in the future and would also require EPA approval on a case-by-case basis.

Based on the information provided, EPA approves this T1 change to add Waste Stream SR-RH-MNDPAD1.01, an RH debris waste stream that has a companion CH Waste Stream (Waste Stream SR-MD-PAD1), with the limitations specified in this report. Specifically, although SRS-CCP currently presents Waste Stream SR-RH-MNDPAD1.01 as containing 13 drums, EPA's approval also includes any additional drums that SRS-CCP adds to Waste Stream SR-RH-MNDPAD1.01 in the future, provided they have the same pedigree as the 13 subject drums, are characterized using the same EPA-approved characterization processes evaluated during this inspection and meet WIPP approval criteria for RH waste.

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.

Table 1. Tiering of Remote-Handled Transuranic Waste Characterization Processes Implemented by SRS-CCP (Based on August 20–September 1, 2011, and December 6–7, 2011, Baseline Inspection, Updated February 2016)

Process Elements	SRS-CCP RH Waste Characterization Process – T1 Changes	SRS-CCP RH Waste Characterization Process – T2 Changes*
Acceptable Knowledge	<p>Any new SCG S3000 or S4000 RH waste stream</p> <p>Any new SCG S5000 RH waste stream that <u>does not</u> have a companion CH waste stream</p> <p>Load management for any RH waste stream</p> <p>Substantive modification** to EPA-approved AKSRs and certification confirmation test plans (e.g., CCP-AK-SRS-580, CCP-AK-SRS-582, CCP-CP-SRS-562)</p>	<p>Submission of a list of SRS-CCP RH AKEs and SPMs that performed work during the previous quarter</p> <p>Notification to EPA upon characterization of any new SCG S5000 RH waste stream that <u>does</u> have a companion CH waste stream</p> <p>Notification to EPA upon availability of or nonsubstantive modification** to AKSRs and certification confirmation test plans (e.g., CCP-AK-SRS-580, CCP-AK-SRS-582, CCP-CP-SRS-562)</p> <p>Notification to EPA upon availability of or modification to:</p> <ul style="list-style-type: none"> • Site procedures requiring CBFO approval • CCP-TP-005, Attachments 4, 6, 8, 9 and 15, including when Attachment 4 is generated to reflect the updated AKSR Source Document Reference List • WSPF, CIS, CRR and related attachments, and any subsequent revisions to these documents • AK accuracy reports (annually, at a minimum) • Add container, AKA, CCE or other relevant memoranda • Additional discrepancy resolution reports and nonconformance reports
Radiological Characterization, including Dose-to-Curie	<p>Use of the MCS/ISOCS to provide any information other than the relative determinations of gamma-emitting radionuclides for use as scaling factors</p> <p>Future use of the ORTEC/ISOCS for any RH TRU waste</p> <p>Application of new (i.e., not EPA-approved) scaling factor processes for isotopic determination (applies to new RH waste streams and to the addition of containers to an approved waste stream)</p> <p>Substantive modification** to EPA-approved procedures or radiological characterization technical reports (e.g., CCP-TP-504, CCP-AK-SRS-581, CCP-RC-SRS-561)</p>	<p>Submission of a list of SRS-CCP DTC and ISOCS operators, EAs and ITRs that performed work during the previous quarter</p> <p>Notification to EPA upon:</p> <ul style="list-style-type: none"> • Characterization of any new RH waste stream using an approved scaling factor process for isotopic determination • Modification of the procedures or radiological characterization technical reports (e.g., CCP-TP-504, CCP-AK-SRS-581, CCP-RC-SRS-561) requiring CBFO approval • Availability of calculation package CCP-SRS-44 or equivalent records
Visual Examination	Any use of visual examination	N/A
Real-Time Radiography	Real-time radiography by any new process	<p>Submission of a list of SRS-CCP RH RTR operators and ITRs that performed work during the previous quarter</p> <p>Notification to EPA upon:</p> <ul style="list-style-type: none"> • Substantive modification** to site procedures requiring CBFO approval

Process Elements	SRS-CCP RH Waste Characterization Process – T1 Changes	SRS-CCP RH Waste Characterization Process – T2 Changes*
		<ul style="list-style-type: none"> • Characterization of SCG S3000 or S4000 RH waste by an approved process

New T1s, T2s and significant modifications to existing T1s or T2s are in **bold** text; T1s or T2s that were only revised for style are not shown in bold.

* SRS-CCP will report all unmarked T2 changes to EPA every three months.

** “Substantive modification” refers to a change with the potential to affect SRS-CCP’s RH waste characterization processes or documentation of them, excluding changes that are solely related to the environment, safety and health; nuclear safety; or the Resource Conservation and Recovery Act; or that are editorial in nature or are required to address administrative concerns. EPA may request copies of new references that DOE adds during a document revision.

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 Waste Stream SR-RH-MNDPAD1.01 to SRS-CCP's approved waste characterization program. This report presents the technical basis for and results of EPA's approval decision. EPA's approval of the addition of Waste Stream SR-RH-MNDPAD1.01 with the limitations discussed in this report 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).

The DOE documents that EPA reviewed for this evaluation are cited in different sections throughout the report and are listed in Attachment B. Any of these documents can be requested from the following address:

Director, TRU Sites and Transportation Division
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 radiological characterization approach and RTR process used to characterize Waste Stream SR-RH-MNDPAD1.01. EPA's baseline approval of the RH SRS-CCP waste characterization program included the AK process for all RH TRU debris waste streams that have companion CH debris waste streams. Therefore, as a result of the following three circumstances, EPA did not include AK in the scope of this T1 review:

- Waste Stream SR-RH-MNDPAD1.01 is an RH debris waste stream.
- Waste Stream SR-MD-PAD1 is the applicable CH companion waste stream.
- The AK process has not changed since the baseline approval.

Sections 6.1 and 6.2 of this report detail the radiological characterization and RTR technical elements assessed during this evaluation.

5.0 EPA EVALUATION PERSONNEL

The EPA evaluation team members consisted of the personnel listed in Table 1 with their affiliation and function. 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 2. EPA Tier 1 Evaluation Team Members

Name	Affiliation & Function
Rajani Joglekar	Lead Inspector, EPA
Patrick Kelly	Technical Evaluator – Radiological Characterization, SC&A
Amir Mobasheran	Technical Evaluator – Radiological Characterization, SC&A
Amy Meldrum	Technical Evaluator – Radiological Characterization, SC&A
Kira Darlow	Technical Evaluator – Real-Time Radiography, SC&A

6.0 TECHNICAL EVALUATION

RH Waste Overview

Waste Stream SR-RH-MNDPAD1.01 consists of 13 drums of RH TRU debris waste. The Mound Site primarily generated this waste between 1961 and 1963 from the processing of plutonium-238 (²³⁸Pu) for the fabrication of radioisotopic heat sources for space and defense applications. DOE shipped the Mound-generated waste to SRS between October 1970 and October 1972 for retrievable storage. Since SRS determined that plutonium recovery was not economically viable, WIPP disposal was the only waste management/disposition option for this waste. SRS-CCP originally included these 13 drums in the approximately 1,019 drums of CH TRU Waste Stream SR-MD-PAD1, stored in 55-gallon drums, and characterized under a CH TRU program using their EPA-approved non-destructive assay (NDA) system. However, upon conducting further external dose rate measurements prior to shipment to WIPP for disposal, SRS noted that these 13 drums had surface dose rates exceeding the 200 millirem per hour (mrem/hr) limit for CH waste and, therefore, SRS-CCP reassigned them to RH TRU Waste Stream SR-RH-

MNDPAD1.01.² SRS no longer has legacy CH TRU waste on site, however, in the event that SRS discovers additional containers of the Mound waste, these additional drums from the accompanying CH waste stream may be designated as RH waste as more surveys are conducted.

Documents, Batch Data Reports and Calculation Packages

EPA evaluated the SRS-CCP documentation that supported radiological characterization of Waste Stream SR-RH-MNDPAD1.01. SRS-CCP provided the radiological characterization technical report (RCTR) CCP-RC-SRS-621, Revision 2, to EPA as the primary document for EPA's review. Following the teleconference between the EPA and SRS-CCP on Wednesday, December 2, 2015, SRS-CCP revised CCP-RC-SRS-621 in response to EPA's comments and provided it to EPA on January 22, 2016. EPA reviewed the revised RCTR (Revision 3) and discussed it in a teleconference with SRS-CCP on January 28, 2016. EPA determined that Revision 3 was adequate. Attachment B lists all documentation reviewed by EPA, including BDRs and calculation packages.

6.1 Radiological Characterization

EPA examined SRS-CCP's programmatic requirements for RH waste, the DTC process and associated information during the continued compliance inspection in August 2014 (see EPA Docket No. A-98-49; II-A4-195 or EPA e-Docket No. EPA-HQ-OAR-2001-0012-0449; February 23, 2015). Specifically, EPA evaluated training for all personnel involved with RH TRU characterization, the SRS-CCP measurement control program for RH TRU instruments for radiological characterization and the SRS-CCP RH TRU procedures and technical documents for the same. Therefore, EPA limited the scope of this evaluation to the technical adequacy of the information supporting the inclusion of Waste Stream SR-RH-MNDPAD1.01 in the SRS-CCP approval.

Waste Characterization Element Description

EPA evaluated the radiological characterization of SRS-CCP RH Waste Stream SR-RH-MNDPAD1.01 in terms of its technical adequacy, as supported by the program's documents, procedures and controls and by the knowledge and understanding of the personnel involved in the RH waste characterization program. During this evaluation, the EPA team evaluated the following elements of the SRS-CCP radiological characterization program:

- Overall radiological characterization.
- RH waste and its CH companion waste.

² The criterion for RH determination is expressed in terms of a "dose rate in rem", which, while technically incorrect, is commonly used. "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." Additionally, field measurements are often expressed in units of "Roentgens," "R" or "R/hr," which represent the "external exposure" or "external exposure rate", respectively. 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 are negligible with respect to photons (gamma radiation). However, a neutron contribution complicates the situation, see discussion in section 6.1, Item (5), below.

- Development of scaling factors.
- Adequacy of the modeling approach, using MCNP5, development of the DTC correlations and determination of radionuclides within each drum.
- Determinations that the waste in question is RH TRU.
- Uncertainty analysis.

Each of these is discussed in the sections that follow.

Technical Evaluation

EPA evaluated the adequacy of the radiological characterization process specific to Waste Stream SR-RH-MNDPAD1.01, as described in CCP-RC-SRS-621, Revision 3, and supporting calculation packages.

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

The overall approach to the radiological characterization of Waste Stream SR-RH-MNDPAD1.01 is the dose-to-curie (DTC) approach, with americium-241 (^{241}Am) as the key radionuclide. The EPA evaluation team prepared a flow diagram to reflect this process, shown in Figure 1. EPA determined that the radiological characterization process for Waste Stream SR-RH-MNDPAD1.01 was technically adequate and appropriately documented.

- (2) EPA evaluated the consideration of the radiological characteristics of the RH drums' contact-handled companion waste stream for confirmation of AK information and determined that they are adequate and appropriately documented.

The 13 RH drums subject to radiological characterization originally belonged to the companion CH Waste Stream SR-MD-PAD1, whose overall 1,019 55-gallon drums had undergone NDA via an EPA-approved gamma spectrometry system. SRS-CCP stated that these 13 drums had surface dose rates exceeding 200 nrem/hr and were assigned to RH TRU Waste Stream SR-RH-MNDPAD1.01. SRS-CCP provided EPA with an Excel spreadsheet (SRS-620) containing the radiological data for the CH drums. SRS-CCP converted the log-mean averages of the ^{241}Am scaling factors developed from the CH assay database to masses to derive a plutonium isotopic distribution. SRS-CCP compared the masses against the plutonium isotopic distribution determined from AK and found the values to be in good agreement. EPA found the CH data utilization technically adequate and appropriately documented.

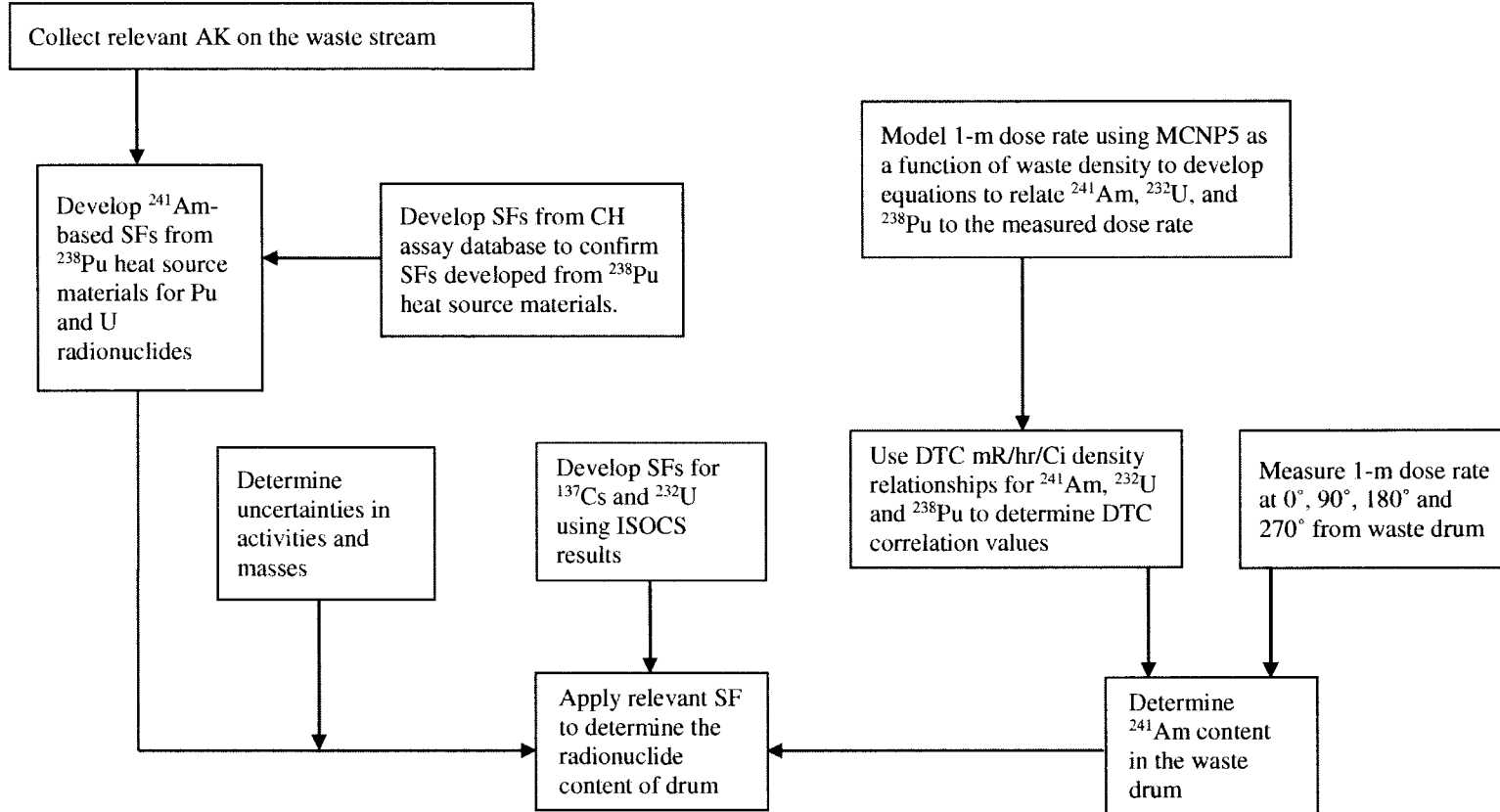


Figure 1. Flow Diagram for the Radiological Characterization Process of Waste Stream SR-RH-MNDPAD1.01

- (3) EPA reviewed the development of scaling factors and found the process to be adequate and appropriately documented.

SRS-CCP developed scaling factors for the 13 RH drums based mainly on information about the waste stream and the CH companion drums, as documented in SRS-RH-84, Revision 1, SRS-620. The dominant gamma emitter in this waste is ^{241}Am , and SRS-CCP also considered the contributions of uranium-232 (^{232}U), neptunium-237 (^{237}Np), and ^{238}Pu . However, because of its small contribution to gamma emission, as evidenced by the In-Situ Object Counting System (ISOCS) data, SRS-CCP did not consider ^{237}Np in the computer modeling/calculations leading to an estimate for the quantity of ^{241}Am within each drum. For the plutonium and uranium radionuclides, SRS-CCP developed ^{241}Am -based scaling factors (decay corrected to March 1, 2014) from AK on ^{238}Pu heat source materials based on the following considerations:

- ^{238}Pu heat source materials dominate the waste stream.
- Most of the plutonium and uranium radionuclides could not be measured by ISOCS.
- Radiochemistry data on the ^{238}Pu content of heat source materials available in the AK documentation, including concentrations of ^{241}Am and uranium, the uranium and plutonium isotopic distributions and impurities.

SRS-CCP obtained scaling factors for the plutonium and uranium radionuclides from their activity distribution (Ci/g), which had been determined from their mass distribution (g/g) within the plutonium metal and the application of their specific activities.

For cesium-137 (^{137}Cs), ^{232}U , and ^{237}Np , the ^{241}Am -based scaling factors, SRS-CCP developed drum-specific scaling factors from ISOCS assay data for the 13 RH drums. However, while SRS-CCP developed a distinct ^{241}Am -based ^{232}U scaling factor for each of the 13 RH drums, a single measurement from the ISOCS assays was available for ^{137}Cs , leading to a value of 1.02E-05 as the only available scaling factor for ^{137}Cs . For ^{237}Np , SRS-CCP determined the arithmetic mean of the scaling factors developed from the available ISOCS measurements; however, SRS-CCP did not use the non-reportable ^{237}Np in the radiological characterization process, as discussed above.

SRS-CCP compared the scaling factors developed from the analyses to the geometric means of the scaling factors determined from the CH assay data. All of the scaling factors compared within a factor of two (the ratio of the larger factor to the smaller factor when compared pairwise), except for ^{241}Pu , which had a comparison factor of 2.02.

EPA reviewed the analyses and computations leading to the development of ^{241}Am -based scaling factors and found them to be technically adequate and appropriately documented.

- (4) EPA reviewed the modeling, the development of dose-to-curie correlations and the radionuclide determination and found them to be technically adequate and appropriately documented.

SRS-CCP used MCNP5 to develop density-dependent DTC correlations for ^{241}Am , ^{232}U , and ^{238}Pu , as documented in SRS-RH-89, Revision 1. SRS-CCP modeled 1-curie (Ci) sources of

^{241}Am , ^{232}U , and ^{238}Pu in a lined 55-gallon drum at waste densities ranging from 0.05 grams per cubic centimeter (g/cm^3) to $0.75 \text{ g}/\text{cm}^3$ within a concrete enclosure. The curies of ^{241}Am within each drum can be determined using the DTC correlations developed for the three gamma emitters, the waste density, the average of the four one-meter gamma dose rates, and the ^{241}Am -based scaling factors of ^{232}U and ^{238}Pu . This determination and its subsequent radiological characterization are documented in SRS-RH-87, Revision 4. CCP-SRS is planning to apply the DTC approach to nine of the RH drums for radiological characterization.

EPA reviewed the modeling approach and the development of DTC correlations for the determination of radionuclides for a typical drum (container No. SR46064SA). EPA found these aspects to be technically adequate and appropriately documented.

(5) EPA evaluated the remote-handled determination and found it to be adequate.

SRS-CCP initially managed these 13 drums as part of the companion CH Waste Stream SR-MD-PAD1. SRS-CCP stated they had dose-rate surveys from 2010–2012 identifying the drums as RH, i.e., they had contact dose rates greater than 200 mrem/hr. The RH determination is based on the contact dose rate of a container and dose rates collected during the DTC process are provided in units of mrem/hr at a distance of one meter from the container. To convert these values to contact dose rates for the RH determination, the values must be corrected by applying an appropriate multiplier, typically on the order of 15 to 30 (EDF-102217, EDF-4365, EDF-9763). This means that the one meter gamma dose rates listed in DTC BDRs should be greater than approximately 5 mrem/hr to yield contact dose rates greater than 200 mrem/hr, assuming a minimal neutron contribution.

However, the DTC BDRs that SRS-CCP provided showed one meter gamma dose rates that were all less than approximately 4 mrem/hr, indicating they did not qualify as RH or, that there was a considerable neutron component. Accordingly, the DTC DBRs alone were not suitable to document the RH determinations. EPA obtained dose rate surveys from SRS-CCP which indicated significant neutron contributions for most containers but the surveys were ambiguous. EPA discussed this with SRS-CCP personnel, indicating that the surveys sheets listed a “DR γ ” (Gamma Dose Rate) value that was inconsistent with the dose rates listed for a specific container. According to SRS-CCP, the “DR γ ” is not the gamma dose rate but the total dose rate and the actual gamma dose rate is derived by subtracting the “DR n” from the total dose rate. EPA finds this verbal explanation and the documentation it was intended to clarify to be inadequate. The documentation that SRS-CCP provided to support the RH determination is at odds with industry-accepted protocols and EPA initiated Issue No. SRS-CCP-T1-RH-2016-RC-1CR, included at Attachment C to this report, in response.

SRS-CCP provided a response to the concern on March 28, 2016. Based on the SRS-CCP information, EPA accepts that these containers are RH waste, with the exception of container No. SR46064SA, which showed a contact dose rate of 200 mrem/hr. However, this documentation is not consistent with industry accepted practices for reporting measurements of external radiation. As a result, EPA will not accept this type of RH determination for future evaluations. The existing procedure for reporting the external dose for the RH determination documentation at SRS must be modified to make them consistent with accepted practices for

reporting measurements of external radiation and a reasonably qualified member of the public can understand it before the documentation will be accepted for future WIPP-bound waste.

- (6) EPA evaluated 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 DTC BDR Nos. SRSRHDT13003 and SRSRHDT13004, which showed TRU alpha activities exceeding 100 nanocuries per gram (nCi/g) for all of the 13 RH drums.

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

The total measurement uncertainty (TMU) for each RH drum is based on the propagation of uncertainties present in the radiological characterization process. These aspects are assumed to be independent, which allows them to be added in quadrature.³ The TMU determination included contributions of the following:

- ²⁴¹Am, ²³²U and ²³⁸Pu DTC correlations.
- Other gamma emitters.
- Dose rate measurement.
- Waste density.
- ²⁴¹Am activity determination
- Mass and source distributions within the waste drum.
- MCNP5 model.
- Plutonium and uranium isotopic distributions.
- Uranium and ²⁴¹Am impurities.
- ISOCS determination of ²⁴¹Am, ²³²U and ¹³⁷Cs activities.
- Other scaling factors

A general treatment of TMU for container No. SR46064SA is presented in CCP-RC-SRS-621, Revision 3, Table 5-3, and is detailed in SRS-RH-86 and SRS-RH-52. Additional calculations are shown in Excel spreadsheet "SRS 620 Uncertainty Analysis." 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 and documentation of TMU.

Summary of Radiological Characterization Findings and Concerns

The EPA evaluation team did not identify any radiological characterization-related findings relative to the addition of Waste Stream SR-RH-MNDPAD1.01 during this T1 change

³ 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 ²⁴¹Am in Drum SR46064SA is derived by taking the square root of (33.8%)² plus (25%)² plus (10%)² plus (26.9%)² plus (8.4%)² plus (13.1%)², which equals 53.2%, which is less than the value obtained by simply summing the individual uncertainty values (i.e., 117.2%), as shown in CCP-RC-SRS-621, Revision 3, Table 5-3.

evaluation. EPA did identify one concern requiring a response related to the RH determinations, as discussed in Item (5), above.

Radiological Characterization Approval

Based on the results of this evaluation, EPA determined that the radiological characterization approach specific to Waste Stream SR-RH-MNDPAD1.01, as described in CCP-RC-SRS-621, Revision 3, and supporting calculation packages and other documents reviewed as part of this T1 change request, is adequate.

Based on this evaluation, there are no changes to the radiological characterization T1 or T2 designations. T1 and T2 changes that EPA initiated during the baseline and subsequent approvals remain in effect.

6.2 Real-Time Radiography

EPA examined SRS-CCP's programmatic requirements, the RTR process and associated information during the continued compliance inspection in October 2014 (see EPA Docket No. A-98-49; II-A4-195 or EPA e-Docket No. EPA-HQ-OAR-2001-0012-0449; February 23, 2015). Specifically, EPA evaluated the training process for all personnel involved with the RH TRU RTR characterization process and the SRS-CCP RH TRU RTR procedure and technical documents. Therefore, EPA limited the scope of this evaluation to the technical adequacy of the information supporting the addition of Waste Stream SR-RH-MNDPAD1.01.

Technical Evaluation

- (1) EPA reviewed batch data reports and determined that SRS-CCP adequately generated real-time radiography data.

EPA reviewed BDR Nos. SR4RTR0315, SR4RTR0316 and SRLBR0080 to ensure that SRS-CCP generated data in accordance with procedure CCP-TP-053, CCP RH Standard Real-Time Radiography Inspection Procedure.

EPA has previously reviewed procedure CCP-TP-053, which continues to provide adequate and complete instructions for performance of RTR of RH waste. SRS-CCP performed RTR examinations in February 2013 under Revision 12 of the procedure. The procedure includes an RTR measurement control report form and RTR data forms. The procedure also includes an Independent Technical Reviewer (ITR) review checklist, BDR cover sheet and report table of contents. SRS-CCP performed the project-level review using CCP-TP-001, Revision 20, Attachment 2, CCP SPM [Site Project Manager] Radiography Project Level Validation Checklist and Summary. SRS-CCP completed all of these forms as required.

Operators performed successful image quality tests, recorded on Attachment 1 of procedure CCP-TP-053, on each day of RTR activity. The waste examined was debris waste (waste matrix code S5400) from Waste Streams SR-RH-773A.01 (six drums), SR-RH-FBL.02 (16 drums) and SR-RH-MNDPAD1.01 (13 drums). SRS-CCP personnel also performed and recorded the required Independent Observation and Replicate quality control examinations for these BDRs. SRS-CCP personnel reviewed the BDRs at the data generation (ITR) and project (SPM) levels.

There are eight nonconformance reports associated with BDR No. SR4RTR0315, but none of the NCRs are related to Waste Stream SR-RH-MNDPAD1.01.

- (2) EPA verified that only trained and qualified individuals participated in the real-time radiography process.

EPA reviewed lists of qualified individuals for the dates when SRS-CCP performed RTR operations for the drums in Waste Stream SR-RH-MNDPAD1.01. RTR operators and ITRs must also be qualified to work on specific waste streams. EPA reviewed the RH SRS Nondestructive Examination Personnel Waste Streams Qualified List and the attendance sheet from the AK briefing on the AK Summary Report (CCP-AK-SRS-620, Revision 0) for Waste Stream SR-RH-MNDPAD1.01. EPA determined that the RTR operators and ITR were trained for this waste stream.

Summary of Real-Time Radiography Findings and Concerns

The EPA evaluation team did not identify any RTR-related findings or concerns relative to the addition of Waste Stream SR-RH-MNDPAD1.01 during this T1 change evaluation.

Real-Time Radiography Approval

Based on the results of this evaluation, EPA determined that properly trained and qualified individuals generated and recorded the RTR data specific to Waste Stream SR-RH-MNDPAD1.01 as reported in BDR Nos. SR4RTR0315, SR4RTR0316 and SRLBR0080.

Based on this evaluation, there are no changes to the RTR T1 or T2 designations. T1 and T2 changes that EPA initiated during the baseline and subsequent approvals remain in effect.

7.0 FINDINGS AND CONCERNS

The EPA inspection team did not identify any findings relative to the addition of Waste Stream SR-RH-MNDPAD1.01 during this T1 change evaluation. EPA did identify one concern requiring a response in radiological characterization related to the RH determinations, Issue No. SRS-CCP-T1-RH-2016-RC-1CR, as discussed in section 6.1, Item (5), above. SRS-CCP's response to the concern was adequate in that it can serve as objective evidence that the containers are RH. There are no open issues as a result of this T1 evaluation. However, as stated in our concern, the documentation provided by SRS-CCP for this T1 change did not report this information in accordance with accepted industry practice. In this case the number is inaccurately presented as gamma only. It is actually the total of both the gamma and neutron dose rate measurements. Therefore, the proper notation should be "total dose rate." In the future, however, RH determination using the existing approach may result in incorrect interpretation of the RH determination. Therefore, EPA requires that, before CBFO submits future SRS RH T1 change requests, SRS must modify the currently used system for reporting RH external dose rates and provide relevant objective evidence with the T1 change request.

8.0 CONCLUSIONS

Changes to Tiering

As a result of this evaluation, EPA did not make any changes to the SRS-CCP RH T1 designations. EPA revised the AK T2 designations as described in Introduction (see section 1.0 and Table 1). T1 and T2 changes that were initiated during the baseline and subsequent T1 approvals remain in effect and are listed as applicable in sections 6.1 and 6.2 of this report.

Approval

This T1 evaluation consisted of the radiological characterization approach and RTR process to characterize SRS Waste Stream SR-RH-MNDPAD1.01. Based on the information provided, EPA approves this T1 change to add Waste Stream SR-RH-MNDPAD1.01, an RH debris waste stream that has a companion CH Waste Stream (Waste Stream SR-MD-PAD1), with the limitations specified in this report. Specifically, although SRS-CCP currently presents Waste Stream SR-RH-MNDPAD1.01 as containing 13 drums, EPA's approval also includes any additional drums that SRS-CCP adds to Waste Stream SR-RH-MNDPAD1.01 in the future, provided they have the same pedigree, are characterized using the same EPA-approved characterization processes evaluated during this evaluation, and meet the WIPP criteria for RH waste.

In the past, EPA has approved the use of radiological data from assays of CH TRU containers performed on EPA-approved NDA equipment for characterizing radiological contents of RH waste containers. EPA will continue to approve such use on a case-by-case basis. DOE may apply the reverse of such application (i.e., use of RH radiological data for characterizing CH waste containers) in the future, this would also require EPA approval on a case-by-case basis.

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

Approved Activity	EPA Inspection Number, Approval Dates	EPA Docket Number
SRS RH Baseline Approval	EPA-SRS-CCP-RH-08.11-8, 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	February 23, 2015	A-98-49; II-A4-195
T1 Change – Drum No. BC0152	December 31, 2014	A-98-49; II-A4-196
T1 Change – SR-RH-SWD.01	August 3, 2015	A-98-49; II-A4-197

ATTACHMENT B: LIST OF DOCUMENTS REVIEWED BY EPA DURING THE T1 EVALUATION

D007, Radiological Characterization of Actinide Sealed Source Waste for Disposal at WIPP, J. Vance and M. Pearson, LANL, P2010-1251, March 1, 2005

CBU-HCP-2003-00091, Memorandum from Frank Weitz to Chris Rodrigues: Sample Analysis of Tank 8.5 Neptunium (Np) Solution, April 14, 2003

CCP Attendance Sheets, Course: CCP-AK-SRS-620, Revision 0, December 12, 2012

CCP-AK-SRS-620, Central Characterization Program Acceptable Knowledge Summary Report for Mound Site RH Transuranic Waste in Retrievable Storage at the Savannah River Site, Waste Stream SR-RH-MNDPAD1.01, Revision 0, November 26, 2012

CCP-RC-SRS-621, Central Characterization Program Remote-Handled Transuranic Radiological Characterization Technical Report for Mound Site RH Transuranic Waste in Retrievable Storage at the Savannah River Site, Waste Stream: SR-RH-MNDPAD1.01, Revision 2, May 12, 2015, and Revision 3, February 17, 2016

DTC BDR Nos. SRSRHDTTC13003 and SRSRHDTTC13004

EDF-10217, Engineering Design File No. 10217, Project No. 23048, Neutron and Gamma-Ray Dose Conversion Factors from 1 Meter to Contact for ANL-E Canisters (Lot 2) Repackaged Waste, Revision 0, March 19, 2012

EDF-4365, Engineering Design File No. 4365, Project File No. 23048, Expected Dose Rate Reduction Factors from Argonne National Laboratory-East Remote-Handled Waste in a 30-gal Drum, February 13, 2004

EDF-9763, Engineering Design File No. 9763, Project No. 23048, Neutron and Gamma-Ray Dose Conversion Factors from 1 Meter to Contact for Lots 1b, 4a and 5c HFEF Repackaged Waste, Revision 0, May 2, 2013

List of Qualified Individuals, CCP - RH Program - SRS, February 26, 2013, 3:11 PM

Radiological Survey Reports for Drum Nos. SR46073R, SR46036Q, SR46064SA, SR46037U, SR46072MB, SR662901C, SR46036P, SR46083U, SR46076N, SR6622901D, SR46065UB, SR6622901A, and SR46073PA; May 18, 2010 through October 3, 2012

RTR BDR Nos. SR4RTR0315, SR4RTR0316 and SRLBR0080

Documentation package from F. Lee Fox to I. Joo Re: Interpretation of Dose Rate Surveys, March 28, 2016

SRS-RH-235F.01, Uncertainty Analysis for SR-RH-235F.01, Jene Vance, October 11, 2012

SRS-RH-84, Determination of Scaling Factors for the SRS-620 Drums, Derek Ott, Revision 1, February 12, 2015 and SRS-620 Scaling Factors, Revision 1, Excel spreadsheet, provided October 2015

SRS-RH-85, Determination of Reportable Radionuclides for SRS-620 Waste, Derek Ott, Revision 1, February 11, 2015 and SRS-620 Reporting Requirements, Revision 1, Excel spreadsheet, provided October 2015

SRS-RH-86, Uncertainty Analysis for SRS-620 Drums, Derek Ott, Revision 1, February 18, 2015 and SRS 620 Uncertainty Analysis, Excel spreadsheet, provided October 2015

SRS-RH-87, DTC and Related Calculations for MNDPAD1.01, Derek Ott, Revision 4, June 24, 2015 and Microsoft Excel spreadsheet DTC for SRS-RH-620, provided October 2015

SRS-RH-89, DTC Modeling and Sensitivity Studies for SRS-RH-MNDPAD1.01, Derek Ott, Revision 1, February 9, 2015

**ATTACHMENT C: EPA INSPECTION ISSUE TRACKING FORM,
ISSUE NO. SRS-CCP-T1-RH-2016-RC-1CR, FINAL**

Inspection No. SRS-CCP-T1-RH-2016	Issue Number: SRS-CCP-T1-RH-2016-RC-1CR Date: 1-26-2016
Inspector: A. Meldrum, P. Kelly Attachments? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Sample Size: Population size (if known):
<p>Description of Issue: SRS-CCP provided Form No.VSDS Standard Map RSLs, Survey SWIN-M-20150331-7 (attached) as objective evidence that containers in SRS RH Waste Stream SR-RH-620-MNDPAD1.01 were RH, i.e., had a surface dose rate in excess of 200 mrem/hr. These containers have both a photon (gamma) and neutron component, and the total dose rate should be a summation of those two values, when applicable. The information on the form is presented in a non-standard format, making it not usable as objective evidence to support SRS-CCP's contention that the container is in fact RH.</p> <p>Specifically, the value labelled "DR γ" is not the gamma dose rate, but the total dose rate, according to SRS-CCP, i.e., the sum of the container's gamma and neutron dose rates. It appears the gamma dose rate is derived by subtracting the container's neutron dose rate (DR n) from what is said to be the total dose rate (DR γ). This is a non-standard approach and is contradicted by the SRS-CCP form.</p> <p>SRS-CCP is unable to document the RH status of these wastes based on the information provided and EPA cannot confirm the waste's status as RH. EPA expects that a value labeled "DR γ" will be the observed gamma dose rate and that a value labeled (DR n) will be the observed neutron dose rate.</p>	
B. Regulatory Reference: 40 CFR 194.24(c)	
C. Site requirement(s): Not applicable	
D. Discussed with: Irene Joo,	
E. Additional Comments: None	
F. Site Response Information:	
Site Response Required? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Site Response Due Date:	