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

MAR 23 2011

OFFICE OF
AIR AND RADIATION

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

Dear Mr. Stroble:

On January 31, 2011, the Carlsbad Field Office (CBFO) requested, as a Tier 1 (T1) change, that the U.S. Environmental Protection Agency (EPA) approve the addition of three Lot 4A canister liners to the remote-handled (RH) transuranic (TRU) waste stream, ID-HFEF-S5400-RH from the Idaho National Laboratory (INL). A *canister liner* is defined in CCP-AK-INL-581 as an interim waste container and not the final waste package. EPA has reviewed the information provided and approves the addition of the canister liners that have been packaged into six 55-gallon containers to the above waste stream and, as a result, INL-CCP may dispose of this waste at the Waste Isolation Pilot Plant (WIPP). This approval also allows future addition of waste to this stream with a waste pedigree (radiological and physical contents) similar to the waste approved in this letter and as detailed in the report. The enclosed report (EPA Docket No. A-98-49; II-A4-145) supports EPA's approval decision based on the information reviewed.

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

Sincerely,

Tom Peake, Director
Center for Waste Management and Regulations

Enclosure

cc: Electronic Distribution
Christine Gelles, DOE EM
Alton Harris, DOE EM
Ed Ziemianski, CBFO
J R Stroble, CBFO
Courtland Fesmire, CBFO
Martin Navarrete, CBFO QA
Dennis Miehls, CBFO QA
Jerry Wells, DOE ID
Tally Jenkins, DOE ID
D K Ploetz, WTS-CCP
Allison Pangle, CTAC
Steve Zappe, NMED

DOCKET NO: A-98-49; II-A4-145

WASTE CHARACTERIZATION REPORT

EPA TIER 1 EVALUATION OF THE CENTRAL CHARACTERIZATION PROJECT REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM FOR IDAHO NATIONAL LABORATORY: ADDITION OF LOT 4A CONTAINERS TO WASTE STREAM ID-HFEF-S5400-RH

February-March 2011

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Center for Waste Management and Regulations
1200 Pennsylvania Avenue, NW
Washington, DC 20460

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ATTACHMENTS

ACRONYMS

A/V	audio/visual
AF	accountable fissile
AK	acceptable knowledge
AKE	acceptable knowledge expert
AKSR	acceptable knowledge summary report
Am	americium
Ba	barium
BDR	batch data report
Br	bromine
BR-3	Belgium Reactor 3
CBFO	Carlsbad Area Field Office
CCP	Central Characterization Project
Ce	cerium
CFR	*Code of Federal Regulations*
CH	contact-handled
Ci	curie
Cm	curium
Co	cobalt
CRR	Characterization Reconciliation Report
Cs	cesium
CSSF	Correlation and Surrogate Summary Form
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
DU	depleted uranium
DUO_2	depleted uranium oxide fuel
EBR	experimental breeder reactor
EPA	U.S. Environmental Protection Agency
FCF	Fuel Conditioning Facility
g	gram

g/cm3	grams per cubic centimeter
HFEF	Hot Fuel Examination Facility
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ITR	Independent Technical Reviewer
IWTS	Integrated Waste Tracking System
La	lanthanum
L&O	Laboratory and Office
m	meter
MCNP5	Monte Carlo N-Particle Transport Code RSICC Computer Code Collection, Oak Ridge National Laboratory
MFC	Materials and Fuel Complex
mR/hr/Ci	milli Roentgen per hour per Curie
mrem/hr	millirem per hour
nCi/g	nanocurie per gram
NCR	non-conformance report
NDA	nondestructive assay
ORIGEN	Oak Ridge Isotope Generation
Pu	plutonium
RERTR	reduced enrichment research and test reactor
RH	remote-handled
RSWF	Radioactive Scrap and Waste Facility
RTR	real-time radiography
SPM	Site Project Manager
Sr	strontium
SURV	material surveillance
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty
TRU	transuranic
U	uranium
VE	visual examination
WCPIP	Waste Characterization Program Implementation Program

WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WMP	waste material parameter
WSPF	Waste Stream Profile Form
WWIS	WIPP Waste Information System
Y	yttrium
Zr	zirconium

1.0 EXECUTIVE SUMMARY

This report supports the U.S. Environmental Protection Agency's (EPA) Tier 1 (T1) approval of retrievably-stored, remote-handled (RH) transuranic (TRU) heterogeneous debris (S5400) waste from the U.S. Department of Energy's (DOE's) Idaho National Laboratory (INL). Specifically, this approval supports the addition of three Lot 4A canister liners[1] to Waste Stream ID-HFEF-S5400-RH, as requested by the Carlsbad Field Office (CBFO) on January 31, 2011.

The Central Characterization Project (CCP) is responsible for characterizing the above wastes using the system of controls that EPA evaluated during the baseline inspection conducted in July 2006, and approved in January 2007. Waste Stream ID-HFEF-S5400-RH, Lot 1A was approved for emplacement at the Waste Isolation Pilot Plant (WIPP) on February 1, 2010, and Lot 1B was approved on August 23, 2010. A summary of EPA's approval of the INL RH TRU waste characterization program is included as Attachment A.

This report presents the results of the T1 evaluation. EPA conducted a desktop review of the Acceptable Knowledge (AK) waste characterization process (Section 5.1), documentation associated with the radiological characterization waste characterization process (Section 5.2), and documentation associated with the Real-Time Radiography (RTR) waste characterization process (Section 5.3). EPA did not identify any changes to the tiering table during this T1 review. Minor modifications to bring the table in line with previous reports and changes in format were made to the INL RH tiering table. The revised tiering table included as Table 1 below applies to all RH waste characterization activities occurring at INL-CCP.

While previous T1 changes adding RH waste streams have been container[2] limited, this approval is not limited to a specific number of waste containers in Waste Stream ID-HFEF-S5400-RH, Lot 4A. INL-CCP may add containers to the approved INL RH waste streams, if:

- Additional containers have similar pedigree to the approved waste stream; and
- INL-CCP can demonstrate that the radionuclide scaling factors used for the RH waste stream (ID-HFEF-S5400-RH, Lot 4A) are technically appropriate for use in the Dose-to-Curie (DTC) determination of the radiological characterization of the additional containers.

If a population of additional containers requires new or different radionuclide scaling factors, those additional containers will be subjected to EPA's T1 evaluation and approval prior to disposal at the WIPP.

EPA determined that the procedures and processes used by INL-CCP for the addition of three canister liners from Lot 4A to RH TRU Waste Stream ID-HFEF-S5400-RH are adequate. EPA, therefore, approves the addition of Lot 4A containers to Waste Stream ID-HFEF-S5400-RH as a T1 change to INL-CCP's RH baseline approval.

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[1] A *canister liner* is defined in CCP-AK-INL-581 as an interim waste container and not the final waste package.

[2] Containers is a generic term which applies to cans, canisters, drums, and any other types of waste packaging units that may be characterized individually for their radiological and physical contents.

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 sending e-mails to the WIPPNEWS list, in accordance with 40 *Code of Federal Regulations* (CFR) 194.8(b)(3).

Table 1. Tiering of RH TRU Waste Characterization Processes Implemented by INL-CCP (Revised March 2011)

RH Waste Characterization Process Elements	INL-CCP RH Waste Characterization Process – T1 Changes	INL-CCP RH Waste Characterization Process – T2 Changes*
Acceptable Knowledge (AK)	Addition of containers to approved Waste Streams if new or different radionuclide scaling factors are required Any new waste streams not approved under this baseline Substantive modification(s)*** to CCP-AK-INL-5X0, CCP-AK-INL-5X1, or CCP-AK-INL-5X2 that have the potential to affect the characterization process Load management for any RH waste stream	Notification to EPA when updates to the following documents have been completed: • All future revisions of the AKSR, and Certification Confirmation Test Plan (e.g., CCP-AK-INL-500 and CCP-AK-INL-502) • AK accuracy reports (prepared annually, at a minimum) • Attachment 4 of CCP-TP-005 is generated to reflect the updated AKSR Source Document Reference List • Changes to AK documentation as a result of WCPIP revisions (e.g., CRR)** • A Correlation or Surrogate Summary Form for each of the RH containers in this waste stream identified as CH, based upon measured dose rates that present NDA results for assayed containers • The waste stream data package for debris waste stream and any modifications to the WSPF, including the CRR and AK Summary • Final DTC determination for RH containers numbers 728 through 737, as identified in AK Reference P030 Submission of an updated AKSR documenting that the pedigree of the additional containers is the same as the containers approved during baseline approval† Submission of a list of fully characterized containers from a population of additional containers proposed as a T2 change, above†
Radiological Characterization, including Dose-to-Curie (DTC)	Application of new scaling factors for isotopic determination other than those documented in CCP-AK-INL-501 Use of any alternate radiological characterization procedure other than DTC with established scaling factors as documented in CCP-TP-504 or substantive modification*** of the DTC procedure Use of any alternate gamma detector with the OSPREY™ system characterization procedure other than the $La_3Br(Ce)$	Notification to EPA upon completion of revisions of CCP-AK-INL-501 or CCP-TP-504 that require CBFO approval Submission of DTC BDRs or calculation packages for containers selected by EPA from a list of fully characterized containers provided by INL-CCP†

Table 1. Tiering of RH TRU Waste Characterization Processes Implemented by INL-CCP (Revised March 2011)

RH Waste Characterization Process Elements	INL-CCP RH Waste Characterization Process – T1 Changes	INL-CCP RH Waste Characterization Process – T2 Changes*
	detector observed in July 2010 Any new waste stream not approved under the baseline and/or subsequent T1 evaluations or addition of containers to an approved waste stream that requires changing the established radionuclide scaling factors	
Visual Examination of audio/video media (VE)	Use of VE to characterize additional debris waste streams or waste from other Summary Waste Categories	Notification to EPA upon completion of changes to VE procedure(s) that require CBFO approval Submission of VE BDRs for containers selected by EPA from a list of fully characterized containers provided by INL-CCP†
Real-Time Radiography (RTR)	Any new S5000 waste stream other than ID-ANLE-S5000 or wastes from an S3000 or S4000 waste stream Notification to EPA prior to addition of a new RTR unit(s)	Notification to EPA upon completion of changes to RTR procedure(s) that require CBFO approval Submission of RTR BDRs for containers selected by EPA from a list of fully characterized containers provided by INL-CCP†
WIPP Waste Data System, WDS (previously known as WWIS)	None	Changes made to WDS procedure(s) that require CBFO approval

Notes:

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

** Excluding changes that are editorial in nature or are required to address administrative concerns. New references that are included as part of the document revision may be requested by EPA.

*** *Substantive modification* refers to a change with the potential to affect INL-CCP's RH waste characterization process, e.g., the use of an inherently different type of measurement instrument or the use of the high-range probe as described in CCP-TP-504.

† INL-CCP will report this T2 change immediately.

2.0 PURPOSE OF A TIER 1 EVALUATION

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 in the INL-CCP RH Baseline Final Report cited in Attachment A.

Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004, *Federal Register* notice, EPA must perform a single baseline inspection of a TRU waste generator site's waste characterization program (Vol. 69, No. 136, pages 42571–42583, July 16, 2004). 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 [Tier 2 (T2)] notification, are identified in the site-specific baseline inspection reports. When evaluating proposed T1 changes for approval, EPA may conduct a site inspection to observe first-hand the 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, at risk of subsequent EPA disapproval, any previously approved TRU waste using processes/procedures/equipment implemented as T2 changes. EPA reviews T2 changes on a quarterly basis and EPA may conduct continued compliance inspections to evaluate implemented T2 changes to verify adequacy.

3.0 PURPOSE OF THIS REPORT

This report presents the results of EPA's evaluation of a T1 change to approve the inclusion of Lot 4A canister liners in Waste Stream ID-HFEF-S5400-RH (see Section 5.0, below), as described in CCP-AK-INL-580, Revision 2 and freeze file[3] reference C439. This report presents the technical basis and results of EPA's approval decision, conveyed to DOE separately by letter. As discussed previously, 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:

[3] *Freeze File:* As a result of EPA inspections or T1 evaluations, if INL-CCP must revise documents to address EPA issues, INL-CCP makes those changes and provides a copy to EPA as objective evidence for the changes made. These revisions are then processed by INL-CCP's document control process to generate an official version as the most current revision.

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

4.0 SCOPE OF THIS TIER 1 EVALUATION

The scope of this evaluation covers inclusion of three canister liners of Lot 4A heterogeneous debris waste as described in CCP-AK-INL-500, Revision 2 and freeze file reference C439 in Waste Stream ID-HFEF-S5400-RH. The waste from these liners was repackaged into six 55-gallon drums as shown in Table 3 of the AK Section below. The evaluation was performed by comparing elements assessed in the previous EPA approvals with information about the new waste containers that was provided by INL-CCP/CBFO to ensure that they fit within the approvals issued by EPA previously. Because this evaluation involved expanding an existing waste stream to incorporate new containers and not the addition of a new Summary Category Group or waste stream, inspection checklists were not used.

The RH wastes that were the subject of this T1 evaluation are retrievably-stored debris that INL-CCP plans to characterize for disposal at WIPP. During this evaluation, EPA examined the updated AK information to verify that the additional waste containers have the same pedigree as that of the approved ID-HFEF-S5400-RH debris waste stream and are characterized using appropriate radiological characterization and RTR processes.

Personnel who participated in the T1 evaluation are listed in Table 2, along with each person's affiliation and function during the evaluation.

Table 2. T1 Evaluation Participants

Name	Affiliation & Function
Rajani Joglekar	EPA Headquarters – Lead Inspector
Ed Feltcorn	EPA Headquarters – Inspector
Connie Walker	SC&A, Technical Evaluator – Acceptable Knowledge
Patrick Kelly	SC&A, Technical Evaluator – Radiological Characterization
Amir Mobasheran	SC&A, Technical Evaluator – Radiological Characterization
Harry Chmelynski	SC&A, Statistician
Dorothy Gill	SC&A, Technical Evaluator – Real-Time Radiography
Scott Smith	Technical Specialists – Acceptable Knowledge Expert
Jesse Klingensmith	INL-CCP – Radiological Characterization Expert
Irene Quintana	URS – Site Project Manager

5.0 TECHNICAL EVALUATION: WASTE STREAM ID-HFEF-S5400-RH, LOT 4A

Waste Overview

AK Summary Report (AKSR) CCP-AK-INL-580, Revision 2 and CCP-AK-INL-581, Revision 2 describe Waste Stream ID-HFEF-S5400-RH. This waste stream consists of 85 cans of RH TRU

heterogeneous debris waste generated during hot cell and laboratory activities at the Hot Fuel Examination Facility (HFEF). The waste was generated from operations in two hot cells: Building 785, HFEF (formerly HFEF-North) and fuel fabrication and reprocessing at Building 765, Fuel Conditioning Facility [(FCF), formerly HFEF-South]. Waste was also generated from analytical chemistry operations in Building 752, the Laboratory and Office (L&O) Building Analytical Laboratory. Pertinent aspects of these processes are described below. These wastes are identified as Lot 1A, Lot 1B, and Lot 4A. EPA previously approved Lot 1A and Lot 1B in separate T1 evaluations (see Docket Nos. A-98-49; II-A4-122 and A-98-49; II-A4-131). Lot 4A contains three additional canister liners that were generated in HFEF Building 785 (Nos. SN170, SN177 and SN178) and is the subject of this T1 evaluation.

EPA evaluated the AK, radiological characterization, and RTR processes and associated information to determine whether INL-CCP demonstrated compliance with 40 CFR 194.8 to add Lot 4A containers. EPA concludes that INL-CCP continues to appropriately apply the system of controls approved by EPA during the Baseline Inspection.

Documents, Waste Containers and Batch Data Reports Reviewed

EPA examined attachments, source documents, forms, and other data as part of this T1 evaluation. The listing of all documentation examined is in Attachment B, and the list of Batch Data Reports (BDRs) examined is presented in Table 3.

Table 3. Batch Data Reports Evaluated

Canister Liner	Drum Number	RTR BDR Number	DTC BDR Number
SN170	MFC060105B	INLRHRTR10019	INLRHDTC10022
SN170	MFC060105A	INLRHRTR10019	INLRHDTC10022
SN177	MFC070118B	INLRHRTR10019	INLRHDTC10022
SN177	MFC070119A	INLRHRTR10019	INLRHDTC10022
SN178	MFC070119B	INLRHRTR10019	INLRHDTC10022
SN178	MFC070118A	INLRHRTR10019	INLRHDTC10022

5.1 Acceptable Knowledge

EPA examined the AK process and associated information to approve the T1 request that added Lot 4A to RH Waste Stream ID-HFEF-S5400-RH.

Waste Characterization Element Description

As part of this evaluation, EPA reviewed the following with respect to the use of AK for waste characterization as impacted by the proposed addition of new containers:

- Waste stream identification and definition
- Radionuclide content of additional waste
- Physical composition of additional waste
- Identification of high-level waste and spent nuclear fuel
- Defense origin of additional waste

- AK data traceability
- Waste Stream Profile Form (WSPF) and Characterization Reconciliation Report (CRR)
- AK source document sufficiency
- Modifications to the Certification Plan/Confirmatory Test Plan
- Non-Conformance Reports (NCRs) and AK Discrepancy Resolution (DR) forms
- AK accuracy
- Correlation and Surrogate Summary Form (CSSF) and Contact-Handled (CH)-RH correlation
- Load management
- Identification and attainment of Data Quality Objectives (DQOs)

Technical Evaluation

To assess the appropriateness of inclusion of Lot 4A in Waste Stream ID-HFEF-S5400-RH, EPA evaluated information related to the waste's process origin, radiological and physical characteristics. EPA's evaluation included the following: how these data had been integrated, impacts of the information on the waste stream, changes to the radiological and physical characteristics of the waste, and other elements that could affect pertinent characteristics of Waste Stream ID-HFEF-S5400-RH. Results of the analysis are presented below. When information presented in the text is supported directly by an AK reference, the reference is cited in parentheses.

(1) The definition of Waste Stream ID-HFEF-S5400-RH was examined with respect to the addition of Lot 4A and found to be adequate.

Waste Stream ID-HFEF-S5400-RH consists of heterogeneous debris generated by activities within the HFEF and FCF, and supported by the L&O Building Analytical Laboratory. Lot 4A waste consists of heterogeneous debris stored in three canister liners (SN170, SN177 and SN178) generated in HFEF Building 785. The wastes were generated during implementation of various reactor programs, including management of depleted uranium oxide fuel (DUO_2), Belgium Reactor 3 (BR-3) fuel elements, and ZeoGlass salts from electrorefining of spent Experimental Breeder Reactor (EBR)-II core driver fuels. Lot 4A also includes: waste from management of a material surveillance (SURV)-10 subassembly, which has 19 capsules containing over 100 individual samples that were to be examined to determine the compatibility of various materials with the EBR-II environment; waste from Reduced Enrichment for Research and Test Reactor (RERTR) fuel elements; and M5 Program commercial fuel elements that consisted of four commercial fuel elements from North Anna Power Station experiments conducted by Electric Power Research Institute and Framatome. Approximately 50% by mass of Lot 4A is "unattributed," i.e., waste that cannot be associated with a specific reactor program based on AK. INL-CCP assigned over 93% of the total accountable fissile (AF) activity to unattributed waste.

Prior to inclusion of Lot 4A, Waste Stream ID-HFEF-S5400-RH was defined as having been generated from July 1997–September 2007. Lot 4A was generated between March 2005 and November 2007, which overlaps sufficiently with the original time frame (Reference C4100). The AKSR was modified by adjusting the final waste generation date from September 2007 to November 2007, to account for the full Lot 4A generation period.

The AKSR was updated through a freeze file modification to include a summary of programs associated with Lot 4A waste generation (Reference C439). Unattributed waste constitutes nearly 50% of Lot 4A by weight, and INL-CCP assumed that the radiological composition of this waste is similar to that of Waste Stream ID-HFEF-S5400-RH based upon waste generation location and other factors. EPA accepts this assumption. EPA examined the process origin, traceability, physical composition and radiological composition of Lot 4A and found it was bounded by the previously approved Waste Stream ID-HFEF-S5400-RH description (References C4092, C4100, C4125, C4126, P029, P083, P092, P105, P254, P261, P262, P266, P876, P877, P 4053, P4115, P4116, P4117, U483, U484, U541, U552, U729, U4014 and U4020). This conclusion is based on the waste generation locations, dates, and processes and radiological and physical composition, as described above. Based on this information, the waste stream is adequately defined. Specific aspects of this analysis are detailed in Items (2), (3), (4), (5) and (7).

(2) The radiological characteristics of Lot 4A were assessed with respect to their similarity to Waste Stream ID-HFEF-S5400-RH and found to be adequate.

The majority of Waste Stream ID-HFEF-S5400-RH was generated from processing fuel assemblies and experiments associated with EBR-II irradiated fuels, most commonly binary and ternary fuels[4] (References C028, C033, C072, C127, C465, C503, C4092, C4100, P085, P263, U196, U483, U484, U541, U551 and U552). U-fissium[5] fuels were the second most common EBR-II irradiated fuels examined in the HFEF or FCF, and these included several depleted uranium (DU)-bearing materials and items (References C465, C503, C4092, P263, U483, U484, U541, U551 and U552). Approximately 10% of Waste Stream ID-HFEF-S5400-RH consists of waste materials generated by examination of fuels from other reactors. Based on generator data, the two most predominant radionuclides for the waste stream are ^{235}U and ^{238}U, while over 95% of the total activity in the waste stream is from fission products (References C463, C522, C4092, C4095, C4100, P067, P083, P092, U483, U484, U541, U551, U552 and U607).

As described in Item (1) above, 93% of the AF activity in Lot 4A is from unattributed waste, and is described by the general ID-HFEF-S5400-RH composition presented in the previous paragraph. The remaining Lot 4A AF activity is derived from three specific waste generation programs that contained fuel specimens, as follows:

- 6.27% - electrorefining process of spent EBR-II core driver fuels (ZeoGlass salts)
- 0.22% - light water reactor fuel specimens associated with the irradiation in the BR-3
- 0.19% - DU or DUO_2 outer blanket fuel specimens

INL-CCP also determined that waste not associated with these programs, including unattributed waste, has the same radiological composition as Lot 1 waste, i.e., it is primarily EBR-II-related waste (see Table 5 in the AKSR). Table A1-2 in CCP-AK-INL-581, Revision 2 presents general AF mass and activity percentages for the different waste generation programs and verifies the

[4] Approximate percent compositions for binary and ternary fuels are 90% uranium (U) and 10% zirconium (Zr) and 67% U, 25% plutonium (Pu), and 10% Zr, respectively.

[5] *Fissium* is an equilibrium mixture of fission products in reactor fuel that improves the stability of uranium and uranium-plutonium fuel alloys under fast neutron irradiation.

fraction of reported activity for each of these components in Waste Stream ID-HFEF-S5400-RH. INL-CCP examined the general radiological composition of each liner based on waste container and disposal logs, the SeaLion database, and Integrated Waste Tracking System (IWTS) container profiles and concluded that the radiological properties of Lot 4A were consistent with Waste Stream ID-HFEF-S5400-RH (Reference C4100). The approximate waste contents of the three liners were as described in Table 4.

Table 4. Approximate Canister Liner Waste Contents

Canister Liner	Portion of Contents That are Unattributed Waste	Portion of Total AF Activity in Liner
SN170	76%	6.68%
SN177	22%	58.31%
SN178	10%	35.01%

As described in Sections (1) and (6), the AKSR required minor modifications and INL-CCP provided a freeze file change clarifying the radiological composition of Lot 4A waste (Reference C439). Based on these data, the radiological composition of Lot 4A fits within the general radiological composition of Waste Stream ID-HFEF-S5400-RH based on Lot 1.

(3) Physical characteristics of Lot 4A were assessed with respect to the physical characteristics of Waste Stream ID-HFEF-S5400-RH and found to be adequate.

Lot 4A is composed of canister liners SN170, SN177 and SN178, each of which was divided upon repackaging into two drums, as described in Item (7) below. The drums are listed in Table 3 and all underwent RTR, which provided detailed information for each liner as described below.

Canister liner SN170 is predominantly unattributed waste and includes materials described in Items (1) and (2) above. RTR results indicated that the drums contain scrap metal, paint cans and lids, various metal cans, absorbent, sanding discs, plastic or poly bags and scrap plastic, glass beakers, and paint brushes.

Canister liner SN177 contains wastes associated only with the RERTR and M5 programs, as described in Items (1) and (2) above, including grinding plates/papers and polishing cloths. AK records indicate that the waste is associated with the examination and disposal of fuel specimens, but AK documents indicated that no specific fuel specimens were in the waste. The SN177 Waste Can Loading Log indicates that the majority of the AF activity is unattributed waste with a very small contribution from the RERTR program. RTR results indicate that the drums contain scrap metal, wire, light bulbs, sanding discs, plastic bags and scrap plastics, plastic bottles with solidified material, and glass waste.

The majority of waste indicated in the SN178 Waste Can Loading Log is associated with subassembly hardware as described in Items (1) and (2) above. AK documentation indicated that the waste included hex can pieces, shanks and pole pieces from various EBR-II subassemblies. RTR results indicated the presence of glass labware, plastic bags and bottles, absorbent, scrap metal and metal pipes.

The AKSR states that Waste Stream ID-HFEF-S5400-RH is composed of approximately 30% organic waste materials and 70% inorganic waste materials, with significant variation between individual drums. INL-CCP calculated the waste material parameters (WMPs) for each liner based on waste item weights and estimates in the IWTS container profiles, and showed that the WMP estimates for each liner were bounded by the waste stream weight percentages (Reference C4100). The WMPs in the six drums fall within the general physical composition of Waste Stream ID-HFEF-S5400-RH. Based on this information, the physical composition of Lot 4A is adequately defined and is consistent with Waste Stream ID-HFEF-S5400-RH.

(4) The identification of Lot 4A waste as transuranic and not high-level waste or spent nuclear fuel was examined and found to be adequate.

INL-CCP provided a freeze file modification to the AKSR (Reference C439), clarifying that Lot 4A does not contain spent nuclear fuel or high-level waste because the items are test specimens associated with research and development. Analysis of these specimens did not include the reprocessing of constituent elements from reactor fuel. INL-CCP concluded that Waste Stream ID-HFEF-S5400-RH does not contain spent nuclear fuel or high-level waste prior to the addition of Lot 4A, so inclusion of Lot 4A does not alter this original determination. EPA agrees with this conclusion.

(5) The identification of Lot 4A as defense waste was examined and found to be adequate.

The WIPP requires generator sites to use AK to determine that a TRU waste stream meets the definition of TRU defense waste. TRU waste is eligible for disposal at the WIPP if it has been generated in whole or in part by one of the atomic energy defense activities listed in Section 10101(3) of the *Nuclear Waste Policy Act*. Waste in canister liners that originated from non-defense sources, such as BR-3 and M5 fuels, are not defense related. However, each of the waste liners also contains waste associated with defense-related activities, particularly since the unaccounted waste was attributed to EBR-II-based programs. The AKSR concludes that as a result of the inherent commingling of materials originating from the numerous defense activities, segregation of non-defense waste streams is not possible. Therefore, Waste Stream ID-HFEF-S5400-RH is eligible for disposal at the WIPP as a waste stream generated "in part" by atomic energy defense activities, and the inclusion of Lot 4A does not alter this determination (Reference P001). EPA accepts these arguments.

(6) Sufficiency of the Acceptable Knowledge Summary Report and implementation of the acceptable knowledge process were evaluated and found to be adequate.

The AKSR was modified through a freeze file (Reference C439) to add information about Lot 4A, including a description of the lot, process origin information, radiological composition of the lot, high-level waste/spent nuclear fuel content and defense origin. The AKSR is adequate as modified by freeze file changes.

(7) Data traceability of Lot 4A was examined and found to be adequate.

Lot 4A waste was originally placed in canister liners SN170, SN177 and SN178. Each canister liner, or liner, was repackaged into two 30-gallon drums, each of which was over-packed into a 55-gallon drum, resulting in a total Lot 4A population of six 55-gallon drums (Reference C4100). References U552 and P180 present traceability information about the liners, and include the following forms, lists, and database printouts:

- Radioactive Scrap Waste Storage/Disposal Request and Authorization
- RH TRU Fissionable Material Content Summary, by SN number
- RH TRU Waste Can Loading Log, by SN number
- INL radiological database System Query, Waste Container Log
- Hot Fuel Examination Facility, Zone Inventory Report Zone 2M
- List of Accountable Materials Thrown Away in S/N Can IWC-170
- Loaded SN Type Inner Waste Can "Rad." Reading Diagram
- SeaLion Database Searchable Liner Online, F-7 and F-25
- Integrated Waste Tracking System Waste Profile Form
- Integrated Waste Tracking System Radiological Reports
- Radioactive Scrap and Waste Facility (RSWF) Transfer Evaluation Sheet
- RSWF Material Acceptance Checklist
- Material Acceptance for Storage documentation
- External Material Shipment and Receipts Form
- Accountable Nuclear Material Disposition Form
- Calculated Material and Fissile Content Work Sheets
- Evaluation of Radiological Contents by TRU Waste Cans
- Weld Data Sheets
- Analytical Laboratory Reports, various

Reference U992 contains the RH Container Repackaging datasheets for each of the three liners. INL-CCP also used the above information to link liner contents with various programs, and this information was subsequently used to evaluate the physical and radiological contents of each liner (Reference C4100). Canister liner SN170 was generated at workstation 2M, and includes ceramics, ZeoGlass salts, debris from sampling of DU subassemblies, subassembly SURV-10 and BR-3 fuel specimens. The majority of waste in liner SN170 was not associated with specific subassemblies or fuel elements and was packaged in 2007, and sent directly to the Idaho Nuclear Technology and Engineering Center (INTEC) for repackaging. Canister liner SN177 was also generated at workstation 2M and consisted of debris from the examination and disposal of unspecified fuel and subassemblies of RERTR and M5 fuel. Canister liner SN178 was generated at various HFEF work stations (i.e., 1M, 4M, 10M, 11M and 15M) and the Main Cell and contained hardware from numerous subassemblies and specimen material, including a General Electric control blade velocity limiter, Neutron Radiography facility hardware, and Decladding by Oxidation waste. Liners SN177 and SN178 were first sent to the RSWF and were later shipped to INTEC, where they were repackaged into drums as described above. Evaluation of the data presented confirms the general radiological content and waste forms associated with each

liner, as well as waste generation, disposition and repackaging. Traceability of supporting AK data is adequately supported.

(8) Modifications of the Waste Stream Profile Form and related Characterization Reconciliation Report were examined and found to be adequate.

A draft CRR was provided that identified the six 55-gallon drums in Lot 4A. The CRR showed that the WCPIP requirement to prepare a CRR was adequately demonstrated for these six drums. The WSPF dated February 12, 2010, was provided, but the form was not yet updated through a Change Request to include Lot 4A. Notification of availability of an updated WSPF remains a T2 change.

(9) Sufficiency of acceptable knowledge support documents and related document tracking with respect to the addition of Lot 4A references was evaluated and found to be adequate.

Attachment 4, the CCP-AK-INL-580, Revision 2 reference list, the CCP-AK-INL-581, Revision 2 reference list, and the list of new references provided as part of the T1 review indicate that many must be updated. For example, Attachment 4, dated November 10, 2010, does not include references presented in CCP-AK-INL-581, which was approved November 16, 2010. Also, new references have been either generated (Reference C439) or obtained (Reference C4100) as part of the T1 Lot 4A evaluation, and these must be added to the AKSR reference list and Attachment 4. EPA expects the AKSR and Attachment 4 to be updated to include all relevant references, including those cited in CCP-AK-INL-581. The AKSR reference list will be updated in conjunction with text modifications [see Item (6) above]. Notification of availability of updates to the AKSR and Attachment 4 remain T2 changes.

(10) Interpretation of the Waste Characterization Program Implementation Plan, with respect to contents of the Certification Plan and the Confirmatory Test Plan, was evaluated and found to be adequate.

CCP-AK-INL-582, Central Characterization Project RH TRU Waste Certification Plan for 40 CFR Part 194 Compliance and Confirmation Test Plan for INL RH Waste Stream: ID-HFEF-S5400-RH, Revision 2, November 24, 2010 was adequately revised to include Lot 4A. The Certification Plan includes the general characterization approach for the Lot 4A containers in Waste Stream ID-HFEF-S5400-RH, which was to develop a single set of composite scaling factors for Lot 4A based on the assumption that the unattributed waste has the same isotopic composition as Lots 1A and 1B. The contributions were weighted in the composite set of scaling factors based upon the percentage of total AF material. RERTR, M5 program and SURV-10 program wastes are present in Lot 4A, but no fuel elements were identified so no AF material could be assigned to the waste. The Certification Plan concludes that Lot 4A is part of the waste stream because of overlapping waste generation dates and the presence of several common fuel types (e.g. BR-3 fuels and significant quantities of subassembly hardware).

(11) Personnel training records were evaluated and found to be adequate.

Personnel training records for Irene Quintana and Scott Smith were verified during the T1 review. EPA examined the RH AK qualification cards for Mr. Smith, the RH Site Project Manager (SPM) Qualification Card for Ms. Quintana, and the INL-specific AK Qualification Card for Mr. Smith. EPA concludes that INL-CCP personnel continue to be adequately trained.

(12) Non-conformance reports and discrepancy resolution forms were examined and found to be adequate.

An NCR was not prepared for drums in Lot 4A. INL-CCP representatives indicated that Discrepancy Resolution (DR) forms were also not prepared for Lot 4A. EPA recently reviewed Non-conformance Report (NCR) and DR preparation as part of a continued compliance inspection (Inspection No. EPA-INL-CCP-09.08-24, see EPA Docket No. A-98-49, II-A4-142) and found both to be adequate. EPA concludes that the NCR and DR processes continue to be adequately implemented as part of the Lot 4A characterization process.

(13) Acceptable knowledge accuracy was assessed and found to be adequate.

INL-CCP provided a draft AK accuracy report dated February 16, 2011, for Waste Stream ID-HFEF-S5400-RH, Lots 1-18[6], as well as a final AK accuracy report dated February 23, 2011. The final report concluded that to date, no significant radiological information discrepancies have been noted with the containers in this waste stream. None of the accepted containers were reassigned to a different Summary Category Group, but two AK accuracy discrepancies were identified wherein two containers were found to have TRU alpha activity concentrations less than 100 nanocuries per gram (nCi/g). The waste stream accuracy was 98.3%. Lots 1-18 consist of 146 containers, but do not include Lot 4A because these drums were not yet certified by INL-CCP for shipment when the AK accuracy report was prepared. The AK accuracy report is adequate.

(14) Use of a Correlation and Surrogate Summary Form was evaluated and found to be not applicable.

Completion of a (Correlation and Surrogate Summary Form) CSSF is required when AK information from a related CH waste stream is used in the RH waste characterization process. CH data were not used in this manner for Waste Stream ID-HFEF-S5400-RH, so a CSSF was not required or prepared for this waste stream.

(15) Load management was evaluated and found to be not applicable.

Load management is not intended for Waste Stream ID-HFEF-S54500-RH and this will not change with inclusion of Lot 4A. Implementation of load management remains a T1 change.

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[6] AK Accuracy reports are prepared by characterization lots assigned by INL-CCP, which are unrelated to the drum Lots 1A, 1B and 4A assigned by INL.

(16) Attainment of data quality objectives through acceptable knowledge qualification was evaluated and found to be adequate.

As a result of the analyses presented in Items (1) - (15) above, EPA assessed how each of the following DQOs was addressed:

- Defense determination
- TRU waste determination
- RH waste determination
- Activity determination (total and per canister, including quantification and identification of the 10 EPA WIPP-tracked radionuclides)
- Residual liquids
- Physical form, including metals, cellulose, plastic and rubber

When evaluated as a whole, CCP-AK-INL-580, Revision 2, CCP-AK-INL-581, Revision 2, CCP-AK-INL-582, Revision 2, Reference C439, and the supporting source documents presented in Attachment B of this report indicate that the DQOs, as specified in the Waste Characterization Program Implementation Plan, have been met.

Summary of Acceptable Knowledge

Findings or Concerns

The EPA evaluation team did not identify any findings or concerns relative to the addition of Lot 4A to Waste Stream ID-HFEF-S5400-RH during this T1 change evaluation.

Tiering Changes

Based on the results of this T1 evaluation, there are no changes to the AK T1 and T2 designations identified during the Baseline Inspection and subsequent T1 evaluations. Table 1 shows the current INL-CCP RH tiering table.

Conclusions

Based on the results of this evaluation, EPA is approving the T1 request for addition of Lot 4A to Waste Stream ID-HFEF-S5400-RH.

5.2 Radiological Characterization

EPA evaluated the radiological characterization process to determine whether INL-CCP demonstrated compliance with 40 CFR 194.8 for a proposed T1 change to add Lot 4A to Waste Stream ID-HFEF-S5400-RH. As stated above, Lot 4A consists of a total of six 55-gallon drums that are part of Waste Stream ID-HFEF-S5400-RH and these six drums are the subject of this T1 evaluation.

Radiological Characterization Overview

The overall approach to characterizing the Lot 4A drums is Dose-to-Curie (DTC) in conjunction with radionuclide-specific scaling factors, a technique that EPA has observed and approved at several RH sites. The scaling factor for a radionuclide is defined as the ratio of the activity of that radionuclide to the activity of another radionuclide, usually cesium-137 (^{137}Cs). A single composite set of ^{137}Cs-based scaling factors for all six drums of Lot 4A waste was derived based on the weighted arithmetic mean of four sets of ^{137}Cs-based scaling factors from the contribution of DUO_2 fuel specimens, BR-3 fuel specimens, ZeoGlass salts from the electrorefining process of EBR-II core drivers and HFEF Lot 1 debris. The fractional contribution of each source to the total AF activities was used as its statistical weight.

The four sets of scaling factors were determined based on ORIGEN2.2 computer runs. Information on pre-irradiation fuel composition, burnup and decay period (from the removal date from the reactor to the assumed shipping date of March 1, 2011) was incorporated in the ORIGIN2.2 inputs. The resultant radionuclide activities were used to determine four individual sets of scaling factors, one for each of the four waste sources comprising Lot 4A:

1. For the unattributed debris waste, or hot cell contamination, no specific fuel elements were identified in the Lot 4A Waste Can Loading Logs. Debris waste from the RERTR, M5 program and four specific subassemblies were referenced, and therefore used as input to the ORIGEN2.2 computer runs. The resultant activities were added to the results for the 129 fuel pins involved in Lot 1 analysis to develop scaling factors. The Lot 1A scaling factors were used because of the similarities between the Lot 1A and Lot 4A wastes and the overlap of their generation periods. The adjustment factors, as discussed for Lot 1A, were applied to the fast reactor pins and subassemblies and are based on benchmark analysis of 400 fast reactor pins and account for neutron spectrum differences.

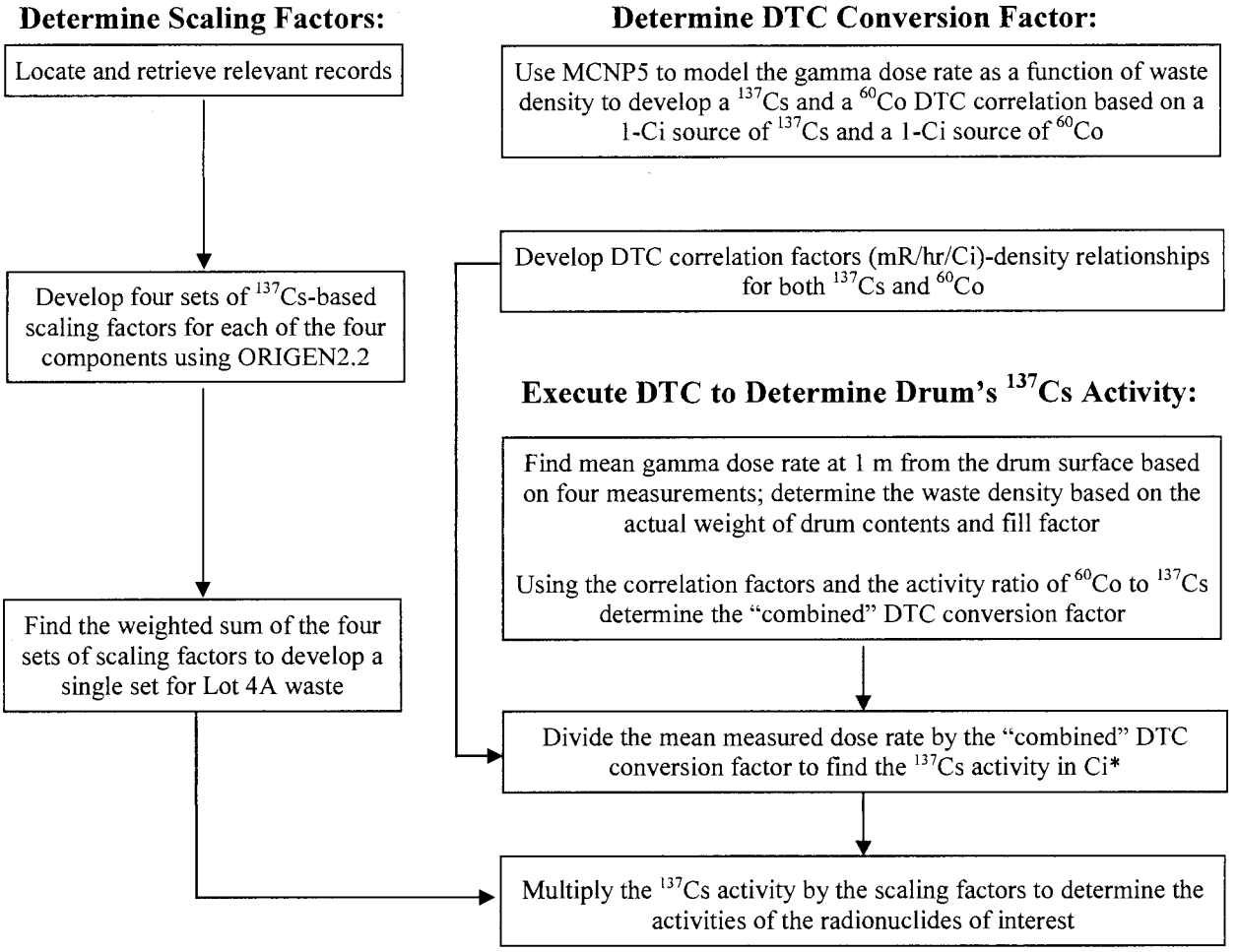
2. For the irradiated BR-3 fuel, scaling factors were developed based on activities at nominal burnup for a single ORIGEN2.2 case.

3. For ZeoGlass salts, running several hundred ORIGEN2.2 cases provided radionuclide activities for 97 subassemblies (61 U fuel pins per assembly), 133 U fuel pins and 350 U-Pu fuel pins. The U fuel pins and the U-Pu fuel pins comprised approximately 94% and 6%, respectively, and two sets of scaling factors were developed, one for U fuel pins and one for U-Pu fuel pins. A weighted combination of the two sets of scaling factors (equal weights for all fuel pins) led to a single set of scaling factors for the ZeoGlass salts.

4. For the irradiated DUO_2, the scaling factors were determined from running 25 ORIGEN2.2 cases for 25 DU outer blanket EBR-II subassemblies and their range of typical burnups.

The statistically weighted sum of the four sets of scaling factors discussed above led to the development of a single set of ^{137}Cs-based scaling factors for the Lot 4A waste. The percentages of AF activities used as the statistical weights were 0.22% (BR-3), 6.27% (ZeoGlass), 0.19%

(DUO_2 fuel), and 93.32% (other). Details of the scaling factor calculations are provided in CCP-AK-INL-581, Revision 2, Appendix A and supporting calculation packages. An overview of the radiological characterization process used for the Lot 4A waste is provided in Figure 1 below.



* If the fractional dose rates are provided by the Canberra Osprey™ system, the ^{137}Cs activity can simply be found by dividing the share of ^{137}Cs from the total dose rate by the ^{137}Cs DTC correlation factor.

Figure 1. Flow Diagram of the Characterization Process: ID-HFEF-S5400-RH, Lot 4A

The DTC measurement aspect of the radiological characterization process for Lot 4A was not directly assessed during this T1 evaluation. This aspect was originally evaluated during the INL-CCP baseline inspection and again more recently during the T1 evaluation of the OSPREY gamma system at INTEC (see EPA Docket Nos. A-98-49; II-A4-72 and A-98-49; II-A4-131, respectively). There have been no significant changes to the DTC process at INTEC. EPA did evaluate the technical adequacy of the radiological characterization process used for Lot 4A of Waste Stream ID-HFEF-S5400-RH, as supported by the INL-CCP documents, procedures, and controls and involved personnel knowledge and understanding.

Technical Evaluation

(1) Correlation of the waste records for the six 55-gallon drums of ID-HFEF-S5400-RH, Lot 4A with the ^{137}Cs concentration was found to be adequate.

EPA reviewed the information that formed the basis of the radiological characterization process, the radiological data for the four sources contributing to the Lot 4A waste. Specifically, this included information from the Waste Can Loading Logs, as documented in the technical report CCP-AK-INL-581, Revision 2, Appendix A and its supporting calculation packages. The curie (Ci) estimates of the radionuclide contents of all fuel subassemblies/fuel pins contributing to Lot 4A had been determined via reactor physics calculations performed using ORIGEN2.2. These Ci quantities were used to find the single set of ^{137}Cs-based scaling factors for Lot 4A waste as a statistical composite of four sets of ^{137}Cs-based scaling factors, corresponding to four "types" of waste associated with the four sources.

The composite set of scaling factors, the relationship between a waste drum's easily measurable ^{137}Cs gamma dose and cobalt-60 (^{60}Co) gamma dose, and the waste density were used to determine the Ci amounts of all reportable radionuclides. These activities are documented in INL-RH-32, INL-RH-33, INL-RH-36 and INL-RH-65 (References U4015, U4016, U4019 and U652, respectively) and incorporate the following information:

- Activity estimates of a relatively large number of radionuclides, including the actinides and fission products, contained in the sources for the waste as calculated using ORIGEN2.2
- Derivation of four sets of scaling factors for the four types of waste comprising Lot 4A waste, using the above-mentioned radionuclide activity estimates
- Use of Lot 1A scaling factors as the basis, and incorporation of adjustment factors, for determination of scaling factors for hot cell contamination
- Additional calculations to confirm modeling approach selected

Calculation of the ^{137}Cs activity of a container allows for calculation of the following quantities for each RH container measured:

- Activity in Ci and mass in grams (g) for each of the 10 WIPP-tracked radionuclides, i.e., ^{137}Cs, americium-241 (^{241}Am), ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, strontium-90 (^{90}Sr), ^{233}U, ^{234}U and ^{238}U
- Associated uncertainty for all radionuclide values listed in previous bullet
- Fissile Gram Equivalent
- Pu Equivalent Ci
- Decay heat in Watts

INL-CCP used the constants and other values required for these calculations from the appropriate sources (e.g., TRAMPAC) and EPA verified by spot-checking the calculations for accuracy.

Similar to Lot 1 analysis, shielding calculations were performed using MCNP® with the 1-Ci source of ^{137}Cs and 1-Ci source of ^{60}Co uniformly distributed throughout a 55-gallon waste drum for a range of waste densities from 0.1 g per cubic centimeter (g/cm^3) to 2.0 g/cm^3. The results of these were used to derive a DTC correlation as a function of density for ^{137}Cs and ^{60}Co, as shown in CCP-AK-INL-581, Revision 2, Figures 6-1 and 6-2. The actual DTC calculations are performed using an Excel spreadsheet [see Item (3) below] where the inputs include:

- Drum identification number
- Drum gross weight
- Fill height in percent
- Fill height material type (concrete, organic or steel)
- Four measurements of each drum's external gamma dose from ^{137}Cs and ^{60}Co

There were no concerns regarding the correlation of waste records with ^{137}Cs concentrations for the six Lot 4A 55-gallon drums.

(2) The development of radionuclide scaling factors was evaluated and was found to be technically adequate and appropriately documented.

EPA evaluated the following aspects:

- Activity values derived from modeling and statistical metrics using the mean and standard deviation values for each radionuclide
- The appropriateness of the choice of physical constants and radionuclide-specific attributes (specific activity, physical half-life, decay heat, neutron cross-sections, photon transition probabilities, etc.) and the technical correctness of the values assigned to each attribute
- Isotopic activity values correlated to the radionuclides whose physical half-lives are such that they could be responsible for the measured external dose rate, i.e., ^{137}Cs for these ID-HFEF-S5400-RH wastes
- Adjustment of the source distribution inside the drums for ^{137}Cs and ^{60}Co using earlier MCNP5 calculations, calculated as a function of bulk waste density
- Potential contributions of the short-lived radionuclides to the total measured dose rate
- Appropriate decay correction according to INL-CCP procedure (CCP-TP-504, Revision 8) of all radionuclide values for purposes of model development

  Note: Decay corrections should be made to the actual shipping date.
- The ORIGEN2.2 results are used to develop radionuclide-specific scaling factors that are used to determine activity levels of the radionuclides of interest in conjunction with the ^{137}Cs activity obtained from the measured external dose rates and the DTC relationship

- Activity and uncertainty values determined for the ten WIPP-Tracked radionuclides (^{233}U, ^{234}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{241}Am, ^{137}Cs and ^{90}Sr)
- The determination of the contribution of all radionuclides to the radiological hazard[7]
- Shielding and other calculations supporting the scaling factors performed using MCNP5 to derive the appropriate DTC relationships as a function of waste density for the appropriate geometry following repackaging (30-gallon drum inside a 55-gallon drum)

The radionuclide-specific scaling factors for these ID-HFEF-S5400-RH wastes that were developed, as shown in Table 5 below, are taken from INL-RH-33 (Reference U4016):

Table 5. Radionuclide-Specific Scaling Factors

Radionuclide	DTC Scaling Factor
^{137}Cs	1.00E+00
^{137m}Ba	9.46E-01
^{90}Sr	8.44E-01
^{90}Y	8.44E-01
^{233}U	6.09E-05
^{234}U	9.17E-05
^{235}U	8.35E-06
^{236}U	8.92E-06
^{238}U	1.33E-06
^{238}Pu	1.26E-02
^{239}Pu	2.56E-02
^{240}Pu	1.01E-02
^{241}Pu	2.06E-01
^{242}Pu	4.66E-06
^{241}Am	1.03E-02
^{244}Cm	4.53E-03

In evaluating CCP-AK-INL-581, errors and a lack of clarity related to the formulas on pages 74 and 75 were noted. Specifically, the formulas for the calculation of *percent standard deviation of radionuclide X* for the binary fuel and the ternary fuel were not correct. The standard deviation formula had incorrectly involved the activities of *X* and their *mean* obtained from the ORIGEN2.2 runs for the source components, instead of the scaling factors of *X* and their *means* from the same sources. Also, the statistical weight of 1/61 had been used incorrectly in the second term of the numerator of the radicand in each of the two formulas. The unclear variables were those representing the activities of X and ^{137}Cs, and their corresponding *means*. EPA communicated the errors and the lack of clarity to INL-CCP staff, Jesse Klingensmith, who had performed the calculations. As a result, INL-CCP corrected the formulas, redid the statistical calculations, and clarified the terms and summation notations. Regarding the impacts of the

[7] Although the determination of a waste container's radiological hazard is not an EPA requirement, this information may be useful in understanding other aspects of a container's radiological characterization.

corrections on the final results, INL-CCP staff stated that the impact on the error estimates for the final scaling factors is less than or equal to 0.1%. EPA expects the corrected formulas will be incorporated in a revision of CCP-AK-INL-581. There are no issues related to the technical adequacy or documentation of radionuclide scaling factors for ID-HFEF-S5400-RH, Lot 4A.

(3) The technical basis of the Dose-to-Curie correlation and its documentation were evaluated and both aspects found acceptable.

EPA evaluated the DTC correlation based on DTC BDR No. INLRHDTC10022 which contains all six Lot 4A drums to verify that the DTC BDR includes the following:

- The correct version of the DTC Excel spreadsheet was used for the calculations (SCO 1140 ID-HFEF-S5400-RH, Lot 4A)
- The radionuclide scaling factors used were the same as documented in INL-RH-34 (Reference U4017)
- The current version of the DTC operating procedure was used (CCP-TP-504, Revision10)
- All six drums were clearly TRU, i.e., had TRU alpha concentrations greater than 100 nCi/g, with a range of approximately 1,140 to 694,000 nCi/g
- All six containers were clearly RH waste, i.e., had contact dose rates in excess of 200 millirem per hour (mrem/hr), with a range of 7 to 97 rem per hour (7,000 to 97,000 mrem/hr)
- All six containers identified the 10 WIPP-tracked radionuclides and quantified the uncertainty associated with each
- All quality control parameters were performed and all were acceptable
- The BDR had all required signatures, i.e., Independent Technical Reviewer (ITR) and SPM
- The BDR contained a memorandum from Bryce Woodbury (DTC Expert Analyst) that provided revised ratios for Cs/Co as a result of identifying the need to apply a correction for ^{134}Cs in drum Nos. MFC070118A and MFC070118B

There were no issues related to the DTC correlation and its documentation for the Lot 4A wastes.

(4) Technical aspects and documentation of the radiological characterization process were evaluated and found to be adequate.

CCP-AK-INL-581, Revision 2, Appendix A is the main document that describes the radiological characterization process that INL-CCP used for the Lot 4A RH TRU wastes. This document is supported by a series of 13 calculation packages, listed in CCP-AK-INL-581, Revision 2, Table A7-1 that were reviewed in the process of evaluating the Lot 4A wastes. These packages had been prepared and reviewed initially by Jene Vance, Jim Holderness, Dave Moody and Jessie Klingensmith to support several CCP RH TRU evaluations. There were no issues related to the

technical adequacy or documentation of the radiological characterization process for the Lot 4A wastes.

(5) The technical basis and derivation of Total Measurement Uncertainty were evaluated and found to be adequate.

The development of Total Measurement Uncertainty (TMU) for Waste Stream ID-HFEF-S5400-RH waste is based on the propagation of uncertainties present in all aspects of the determination of the radiological constituents of RH TRU waste. These aspects are assumed to be independent, which allows them to be added in quadrature. The TMU determination included contributions of the following:

- DTC correlation – including drum weight measurement, MCNP® code, and modeling uncertainties
- Measurement uncertainty – including dose rate uncertainty from ^{137}Cs and ^{60}Co
- Scaling factor uncertainty – including ORIGEN2.2 uncertainty
- Contributions of other gamma emitters
- Drum-to-drum variation

A general treatment of TMU for RH TRU Waste Stream ID-HFEF-S5400-RH, Lot 4A is presented in CCP-AK-INL-581, Appendix A and Calculation Package INL-RH-34, *HFEF Lot 4A Uncertainty Calculation* (Reference U4017). The principal sources of uncertainty are uncertainties in ^{137}Cs activity, ORIGEN2.2 benchmarking, and drum-to drum contribution. There were no concerns regarding the technical derivation and documentation of TMU for INL-CCP Waste Stream ID-HFEF-S5400-RH, Lot 4A.

Summary of Radiological Characterization

Findings or Concerns

The EPA inspection team did not identify any findings or concerns related to radiological characterization of the Lot 4A drums.

Tiering Changes

Based on the results of this T1 evaluation, there are no changes to the radiological characterization T1 and T2 designations identified during the INL-CCP RH Baseline Inspection and subsequent RH T1 evaluations. Table 1 shows the current INL-CCP tiering table.

Conclusion

EPA evaluated the radiological characterization process to determine whether INL-CCP demonstrated compliance with 40 CFR 194.8 to add six drums of Lot 4A to Waste Stream ID-HFEF-S5400-RH. EPA concludes that INL-CCP continues to appropriately apply the system of

controls approved by EPA during the Baseline Inspection and EPA therefore approves the T1 change to include Lot 4A in INL-CCP Waste Stream ID-HFEF-S5400-RH. EPA concludes that INL-CCP appropriately applied the EPA approved system of controls for radiological characterization when characterizing containers for Lot 4A waste and EPA therefore approves the addition of six containers in Lot 4A to INL-CCP Waste Stream ID-HFEF-S5400-RH which was approved for Lot 1A containers in February 2010 and Lot 1B containers in August 2010.

5.3 Real-Time Radiography

INL-CCP was approved to use RTR to characterize this waste stream previously and their approval was unaffected by this proposed T1 change. EPA did evaluate the one RTR BDR that contained the results of all six Lot 4A drums, as described below.

Technical Evaluation

EPA reviewed RTR data that INL-CCP generated for six containers in Waste Stream ID-HFEF-S5400-RH, Lot 4A, containers MFC060105A, MFC060105B, MFC070118A, MFC070118B, MFC0701119A and MFC070119B. The RTR results were reported in RTR BDR INLRHRTR10019 which INL-CCP generated using Procedure CCP-TP-508, *CCP RH Standard Real-Time Radiography Inspection Procedure*. EPA reviewed this procedure and determined it was adequate for providing clear instructions for RTR operations and records generation. INL-CCP tracks operator/ITR (Independent Technical Reviewer) qualification by use of a List of Qualified Individuals. By reviewing these records, EPA determined that the RTR examinations in BDR INLRHRTR10019 were performed by qualified personnel. BDR INLRHRTR10019 included successful RTR Measurement Control Reports for the 2 days when containers were examined. RTR operations require a second operator to perform quality control examinations in each batch, specifically an Independent Observation and Replicate Scan. The Independent Technical Review was performed by another CCP-qualified RTR operator, as required. The documentation for BDR INLRHRTR10019 demonstrates that RTR data were generated and reviewed in accordance with requirements. No NCRs were associated with this batch.

Summary of Real-Time Radiography

Findings or Concerns

The EPA inspection team did not identify any findings or concerns related to RTR for the Lot 4A drums.

Tiering Changes

Based on the results of this T1 evaluation, there are no changes to the RTR T1 and T2 designations identified during the INL-CCP RH Baseline Inspection and subsequent RH T1 evaluations. Table 1 shows the current INL-CCP tiering table.

Conclusion

EPA evaluated RTR to determine whether INL-CCP demonstrated compliance with 40 CFR 194.8 to add six drums of Lot 4A to Waste Stream ID-HFEF-S5400-RH. EPA concludes that INL-CCP continues to appropriately apply the system of controls approved by EPA during the Baseline Inspection and EPA therefore approves the T1 change to include Lot 4A in INL-CCP Waste Stream ID-HFEF-S5400-RH.

6.0 SUMMARY OF RESULTS

Findings and Concerns

The EPA Inspection Team did not identify any findings or concerns relative to the addition of Lot 4A to Waste Stream ID-HFEF-S5400-RH during this T1 change evaluation.

Tiering Changes

There are no changes to the T1 and T2 designations identified during the INL-CCP RH Baseline Inspection and subsequent RH T1 evaluations. Table 1 shows the current INL-CCP tiering table.

7.0 CONCLUSIONS

During this T1 change evaluation, EPA examined the addition of Lot 4A to Waste Stream ID-HFEF-S5400-RH. Based on the results of this evaluation, EPA is approving addition of Lot 4A to Waste Stream ID-HFEF-S5400-RH with the limitations discussed above.

ATTACHMENT A

APPROVAL SUMMARY FOR INL RH WASTE CHARACTERIZATION PROGRAM

Specific INL RH Approval	Date	EPA Docket Number
INL RH Baseline Approval	January 2007	A-98-49; II-A4-72
Tier 1 Change – Approval of WIPP Waste Identification System	January 2007	A-98-49; II-A4-74
Tier 1 Change – Approval of Visual Examination of A/V Records	January 2007	A-98-49; II-A4-75
Tier 1 Change – Approval of Real Time Radiography	February 2007	A-98-49; II-A4-80
Tier 1 Change – Approval of K-Cell Wastes	January 2008	A-98-49; II-A4-97
Tier 1 Change – Approval of High Range Gamma Probe for DTC	April 2008	A-98-49; II-A4-98
Tier 1 Change – Approval of Visual Examination Technique	September 2009	A-98-49; II-A4-118
Tier 1 Change – Addition of Twelve Containers to Waste Stream ID-ANLE-S5000 and Approval of Waste Stream ID-HFEF-S5400-RH, Lot 1A	February 2010	A-98-49; II-A4-122
Tier 1 Change – Approval of Waste Stream ID-MFC-S5400-RH	June 2010	A-98-49; II-A4-126
Tier 1 Change – Approval of Waste Stream ID-INTEC- RH	August 2010	A-98-49; II-A4-130
Tier 1 Change – Addition of Lot 1B to Waste Stream ID-HFEF-S5400-RH and Approval of OSPREY System	August 2010	A-98-49; II-A4-131
Tier 1 Change – Approval of Waste Stream IN-ID-NRF-153	November 2010	A-98-49; II-A4-135
Tier 1 Change – Approval of Waste Stream ID-RTC-S3000	November 2010	A-98-49; II-A4-137

ATTACHMENT B

LISTING OF DOCUMENTS REVIEWED FOR THIS EVALUATION

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