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

AUG 23 2010

OFFICE OF
AIR AND RADIATION

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

Dear Mr. Gadbury:

On February 8, 2010, the Carlsbad Field Office (CBFO) requested that the U.S. Environmental Protection Agency (EPA) approve Lot 1B of the remote-handled (RH) transuranic (TRU) debris waste stream (ID-HFEF-S5400-RH) at Idaho National Laboratory (INL) as a Tier 1 change. This letter approves the subject waste stream and as a result, INL may dispose of this waste at the Waste Isolation Pilot Plant (WIPP). The enclosed report (EPA Docket No. A-98-49; II-A4-131) supports EPA's approval decision. As a part of this review, EPA also evaluated and approves the OSPREY™ system, a $La_3Br(Ce)$ detector with Canberra Osprey™ Universal MCA detector used to assay the drums in Lot 1B at the INL.

The Central Characterization Project (CCP) characterized this waste using remote-handled (RH) waste characterization processes approved by EPA in February 2007. EPA determined that the procedures and processes used by INL-CCP staff for characterizing this waste were adequate. As a result of our evaluation, EPA has made several changes to the tiering table (See Table 1 of the enclosed report). The revised Tier 1 and Tier 2 changes will apply to all CCP's RH TRU waste characterization activities at INL.

While previous Tier 1 changes adding RH waste streams have been container limited, this approval is not limited to a specific number of waste containers in waste stream ID-HFEF-S5400-RH, Lot 1B. INL-CCP may add containers (as explained in Footnote 1 in the enclosed report) to the approved INL RH waste streams, if:

- Additional containers have similar pedigree as 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 1B), are technically appropriate for use in the Dose-to-Curie (DTC) determination of the radiological characterization of the additional containers.

Any addition of new containers to this waste stream must comply with the revised INL-CCP tiering table including the following:

1. EPA notification: When notifying EPA, an INL-CCP must (a) identify the approximate number of additional containers **and** the approximate additional volume of waste, and (b) provide the timeframe for waste generation, characterization and disposal.

2. Submission of documents: Upon characterizing a sufficient number of containers to generate 1-2 Batch Data Reports, INL-CCP must provide the list of characterized containers and a revised AKSR and supporting source documents, and an updated radiological characterization report. If any of the documents are not changed, CBFO should make that clear to EPA. From this list, EPA may select a few containers for a detailed review to verify that the additional containers belong to the approved waste stream.

EPA expects CBFO to notify us of the addition of containers to this waste stream during our weekly call.

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

Tom Peake, Director
Center for Waste Management and Regulations

Enclosure

cc: Electronic Distribution
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DOCKET NO: A-98-49, II-A4-131

WASTE CHARACTERIZATION REPORT

EPA TIER 1 EVALUATIONS OF THE CENTRAL CHARACTERIZATION PROJECT REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM FOR IDAHO NATIONAL LABORATORY: ADDITION OF LOT 1B CONTAINERS TO WASTE STREAM ID-HFEF-S5400-RH AND USE OF THE OSPREY™ SYSTEM FOR MEASURING ^{60}Co and ^{137}Cs

June-July 2010

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

August 2010

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ATTACHMENTS

ACRONYMS

AGHCF	Alpha Gamma Hot Cell Facility
AK	acceptable knowledge
AKE	acceptable knowledge expert
AKSR	acceptable knowledge summary report
Am	americium
ANL-E	Argonne National Laboratory – East
Ba	barium
BDR	batch data report
Br	bromine
CBFO	Carlsbad Area Field Office
CCP	Central Characterization Project
Ce	cerium
CFR	*Code of Federal Regulations*
CH	contact-handled
Ci	curie
Co	cobalt
CRR	Characterization Reconciliation Report
Cs	cesium
CSSF	Correlation and Surrogate Summary Form
CTP	Confirmatory Test Plan
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
EBR	experimental breeder reactor
EPA	U.S. Environmental Protection Agency
ETR	Engineering Test Reactor
FCF	Fuel Conditioning Facility
FFTF	Fast Flux Test Facility
Fs	fissium
g	gram

g/cm3	grams per cubic centimeter
HFEF	Hot Fuel Examination Facility
HLW	high-level waste
ID	Idaho
IFR	integral fast reactor
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ISOCS	In-Situ Object Counting System
ITR	Independent Technical Reviewer
L&O	Laboratory and Office
La	lanthanum
LANL	Los Alamos National Laboratory
LLW	low-level waste
LMFBR	liquid metal fast breeder reactor
m	meter
m^3	cubic meter
MCA	Multichannel Analyzer
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
RBCB	Run-Beyond-Clad-Breach
RCTR	Radiological Characterization Technical Report
RERTR	reduced enrichment research and test reactor
RH	remote-handled
RSWF	Radioactive Scrap Waste Facility
RTR	real-time radiography

RWMC	Radiological Waste Management Complex
SCG	Summary Category Group
SNF	spent nuclear fuel
SPM	Site Project Manager
Sr	strontium
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty
TREAT	Transient Reactor Test Facility
TRU	transuranic
U	uranium
VE	visual examination
WCPIP	Waste Characterization Program Implementation Program
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WSPF	Waste Stream Profile Form
WWIS	WIPP Waste Information System
Zr	zirconium

1.0 EXECUTIVE SUMMARY

This report supports the U.S. Environmental Protection Agency's (EPA or the Agency) Tier 1 (T1) approval of retrievably-stored, remote-handled (RH) transuranic (TRU) debris (S5000) waste from the U.S. Department of Energy's (DOE's) Idaho National Laboratory (INL) and the use of the OSPREY™ system for differentiating the dose rate contribution of ^{60}Co and ^{137}Cs. Specifically, this approval supports the addition of 58 Lot 1B cans to Waste Stream ID-HFEF-S5400-RH, as requested by the Carlsbad Field Office (CBFO) on February 8, 2010 and use of the OSPREY™ gamma measurement system requested on June 23, 2010.

The CCP is responsible for characterizing the above wastes using the system of controls, which 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 disposal at the WIPP on February 1, 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 evaluations. EPA evaluated the Acceptable Knowledge (AK) waste characterization process (Section 4.1) and the documentation associated with the radiological characterization waste characterization process (Section 4.2) as a desktop review. However, INL-CCP indicated that a new instrument, a $La_3Br(Ce)$ detector with Canberra Osprey™ Universal MCA detector, was used to assay the drums in Lot 1B. Therefore, on July 13, 2010, EPA conducted a separate onsite evaluation of the Osprey™ system at INL-CCP. EPA identified changes to the tiering table by adding the following:

- One radiological characterization T1 change related to the use of a different gamma detector for the OSPREY™ system
- Two radiological characterization Tier 2 (T2) changes requiring notification when a revised radiological characterization report associated with the addition of containers to the approved waste stream and providing radiological batch data reports (BDRs) for these containers is available
- Three AK T2 changes requiring EPA notification when (1) additional containers characterized using the same scaling factors are added to the approved waste stream, (2) a revised AK Summary Report (AKSR) addressing addition of containers to the approved waste stream and supporting source documents are complete, and (3) Attachment 4 of CCP-TP-005 is generated to reflect the updated AKSR Source Document Reference List
- One VE/RTR T2 change requiring the submission of the appropriate BRDs for the population of waste containers that are being added to the approved waste stream

Table 1 below is the revised tiering table that incorporates the above tiering changes and will apply to all RH waste characterization activities occurring at INL-CCP. The revised table also includes two new T2 changes that are stated below.

While previous T1 changes adding RH waste streams have been container[1] limited, this approval is not limited to a specific number of waste containers in waste stream ID-HFEF-S5400-RH, Lot 1B. INL-CCP may add containers (as described in Footnote 1, below) 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 1B), are technically appropriate for use in the Dose-to-Curie (DTC) determination of the radiological characterization of the additional containers.

Any addition of new containers to the approved waste streams must meet the revised INL-CCP tiering table including the following:

1. EPA notification: When notifying EPA, an INL-CCP must (a) identify the approximate number of additional containers **and** the approximate additional volume of waste, and (b) provide the timeframe for waste generation, characterization and disposal.

2. Submission of documents: Upon characterizing a sufficient number of containers to generate 1-2 Batch Data Reports, INL-CCP must provide the list of characterized containers and a revised AKSR and supporting source documents, and an updated radiological characterization report. If any of the documents are not changed, CBFO should make that clear to EPA. From this list, EPA may select a few containers for a detailed review to verify that the additional containers belong to the approved waste stream.

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 58 containers from Lot 1B to RH TRU Waste Stream ID-HFEF-S5400-RH and the operation of the OSPREY™ system were adequate. EPA, therefore, approves the addition of Lot 1B containers to Waste Stream ID-HFEF-S5400-RH and the OSPREY™ system as T1 changes to INL-CCP's RH baseline approval.

[1] 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.

Table 1. Tiering of RH TRU Waste Characterization Processes Implemented by INL-CCP (Revised August 23, 2010)

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) that have the potential to affect the characterization process: CCP-AK-INL-500, CCP-AK-INL-501, or CCP-AK-INL-502 Load management for any RH waste stream	Notification to EPA when AKSR, Radiological Characterization Report and Certification Confirmation Test Plan (e.g., CCP-AK-INL-500, CCP-AK-INL-501, and CCP-AK-INL-502) updates are approved by CBFO Notification to EPA when changes to AK documentation as a result of WCPIP revisions have been made (e.g., CRR) Notification to EPA when a Correlation or Surrogate Summary Form is completed 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 Notification to EPA once waste stream data package for debris waste stream and any modifications to the WSPF, including the CRR and AK Summary, are completed Notification to EPA that the final Dose-to-Curie (DTC) determination is complete for RH containers numbers 728 through 737, as identified in AK Reference P030 AK accuracy reports (prepared annually, at a minimum) **Notification to EPA of availability of a revised AKSR and source documents supporting the addition of containers to the approved waste stream*** **Notification to EPA when Attachment 4 of CCP-TP-005 is generated to reflect the updated AKSR Source Document Reference List**
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 $La_3Br(Ce)$ detector observed in July 2010** Any new waste stream not approved under this baseline or addition of containers to Waste Stream ID-ANLE-S5000 that	Notification to EPA upon completion of revisions of CCP-AK-INL-501 or CCP-TP-504 that require CBFO approval **With notification, revised radiological characterization report, if generated, when containers are added to the approved waste stream*** **Radiological content data provided in BDRs for the population of additional containers***

Table 1. Tiering of RH TRU Waste Characterization Processes Implemented by INL-CCP (Revised August 23, 2010)

RH Waste Characterization Process Elements	INL-CCP RH Waste Characterization Process – T1 Changes	INL-CCP RH Waste Characterization Process – T2 Changes
	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	**Physical content data provided in BDRs for the population of additional containers***
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 **Physical content data provided in BDRs for the population of additional containers***
WIPP Waste Data System, WDS (previously known as WWIS)	None	Changes made to WDS procedure(s) that require CBFO approval

Notes:

- This table has been modified by deleting the references to specific sections of the baseline inspection report where each T1 or T2 element is discussed.
- 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.
- *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.
- Additions to the original tiering table as a result of this T1 evaluation appear in **bold**.

* These marked changes apply when containers are added to Lot 1B of waste stream ID-HFEF-S5400-RH and are characterized using the same radionucliude scaling factors as were used to characterize the original approved waste stream. EPA notification is required when the site identifies the need to characterize additional containers belonging to the approved waste stream.

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 (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 SCOPE OF THESE TIER 1 EVALUATIONS

The T1 evaluations encompassed the addition of Lot 1B, consisting of 58 Hot Fuel Examination Facility-5 (HFEF-5) cans, to INL RH Waste Stream ID-HFEF-S5400-RH, as discussed in Section 4.0 and a separate onsite evaluation of the OSPREY™ detector at INL, the results of which are described in Section 4.2 (3) of this report.

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. Waste characterization processes evaluated as part of the desktop review (Section 4.0, below) include: AK and radiological characterization. Additionally, 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 (HFEF Waste)

Name	Affiliation & Function
Ed Feltcorn	EPA Headquarters, Lead Inspector
Rajani Joglekar	EPA Headquarters, Inspector
Connie Walker	SC&A, Technical Evaluator – Acceptable Knowledge
Patrick Kelly	SC&A, Technical Evaluator – Radiological Characterization

Table 2. T1 Evaluation Participants (HFEF Waste)

Name	Affiliation & Function
Amir Mobasheran	SC&A, Technical Evaluator – Radiological Characterization
Kevin Peters	CCP, Acceptable Knowledge
Irene Quintana	CCP, Site Project Manager

4.0 TECHNICAL EVALUATION OF THE ADDITION OF LOT 1B

CCP-AK-INL-580, Revision 2 (the AK Summary Report or AKSR) states that Waste Stream ID-HFEF-S5400-RH consists of 85 HFEF-5 cans of RH TRU heterogeneous debris waste that was generated during hot cell and laboratory activities. The waste includes that generated from hot cell operations conducted in two locations: 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 as part of analytical chemistry operations conducted in Building 752, the Laboratory and Office (L&O) Building Analytical Laboratory. Waste was generated during implementation of various reactor programs, primarily the Integral Fast Reactor (IFR) irradiation alloy fuel performance studies, Run-Beyond-Clad-Breach (RBCB), and programs associated with various other subassemblies irradiated in the Experimental Breeder Reactor-II (EBR-II). AK documentation also states that other programs contributed waste material to the stream, including the Liquid Metal Fast Breeder Reactor (LMFBR) fuel examinations from Fast Flux Test Facility (FFTF), Sodium Loop Safety Facility experiments conducted in the Engineering Test Reactor (ETR), and test specimens and examination of loop experiments irradiated in the Transient Reactor Test Facility (TREAT) reactor, primarily EBR-II fuels. Waste was generated in the L&O Building Analytical Laboratory and Argonne National Laboratory–East (ANL-E) Alpha Gamma Hot Cell Facility (AGHCF), where fuel specimens from all of these programs were sent for destructive examination and subsequently returned to HFEF or FCF.

The Radiological Characterization Technical Report for this waste stream (CCP-AK-INL-581, Revision 1, referred to as the Radiological Characterization Report or RCTR) indicates that waste within the waste stream consists of two separate "lots" that were placed in different locations: "Waste Stream ID-HFEF-S5400-RH consists of 28 HFEF-5 canister liners of RH TRU heterogeneous debris waste stored at the Idaho Nuclear Technology and Engineering Center (INTEC) and 58 HFEF-5 canister liners stored at the Materials and Fuels Complex (MFC). The 28 HFEF-5 canister liners stored at INTEC are identified as Lot 1A throughout this report while the 58 HFEF-5 canister liners stored [at the] MFC are identified as Lot 1B." INL-CCP will divide each can into two or more 55-gallon drums, so the number of drums to be generated is roughly double the identified canisters or cans. Lot 1B waste will be transferred from the MFC's Radioactive Scrap Waste Facility (RSWF) to INTEC. Lot 1A wastes were approved by EPA on February 1, 2010 (EPA Docket No. A-98-49, II-A4-122). Lot 1B wastes packaged in 58 canisters are the subjects of this T1 report.

CCP-AK-INL-582, Revision 1 states that with the exception of "payload container based parameters," AK will be used to document that each RH TRU waste DQO is met. This document states, "The CCP intends to use a combination of methods to qualify the AK information

defining the isotopic ratios, physical form, and absence of residual liquids associated with this waste stream because it makes the best use of the information available (such as availability of confirmation sample results)." Specifically, INL-CCP proposed to develop isotopic data from fuel pin information and use Oak Ridge Isotope Generation (ORIGEN) to develop isotopic ratios. The isotopic ratios were to be verified (qualified) through use of the mass spectrometry data associated with Los Alamos National Laboratory (LANL) fuel pins. This approach is the same as that which EPA evaluated and approved for the baseline inspections of RH waste streams from INL, ANL-E, and LANL[2]. AK documentation states that Lot 1B containers were expected to contain more Cobalt-60 (^{60}Co) than Lot 1A, so a different measurement system (OSPREY™) would be used as part of the Dose-to-Curie (DTC) calculations [see Section 4.2 (3) of this report].

4.1 Acceptable Knowledge

EPA examined the AK process and associated information to verify the inclusion of cans from Lot 1B to RH Waste Stream ID-HFEF-S5400-RH.

Waste Characterization Element Description

As part of the inspection, EPA reviewed the following with respect to the use of AK for waste characterization:

- Definition and identification of the waste stream
- Radiological characteristics of the waste
- Physical composition of the waste
- Identification of high-level waste (HLW), TRU vs. low-level waste (LLW), spent nuclear fuel (SNF)
- Compiling AK documentation and assembly of required information, including the AK Summary and adequacy of WCPIP AK process implementation
- AK data traceability
- AK source document sufficiency
- WCPIP interpretation including AK qualification, and Certification Plan/Confirmatory Test Plan (CTP) preparation/adequacy and use of LANL mass spectroscopy data
- Characterization Reconciliation Report (CRR) adequacy
- Correlation and Surrogate Summary Form (CSSF) and Contact Handled (CH)-RH correlation
- Personnel training

[2] The INL-CCP RH final approval is in EPA Docket No. A-98-49; II-A4-72; the ANL-E RH final approval is in A-98-49; II-A4-72; and the LANL-CCP RH final approval is in A-98-49; II-A4-88.

- Waste Stream Profile Form (WSPF) adequacy and compliance with WCPIP requirements
- Non-conformance reports (NCRs) and AK discrepancy resolution (DR)
- AK accuracy
- Defense determination
- Load management
- Data quality objectives (DQOs) attained through AK Qualification

Documents, Waste Containers, and Batch Data Reports Reviewed

Several attachments, source documents, required forms, and other data were provided to EPA, and relevant sources were examined as part of this T1 inspection. The listing of source documents examined is presented in Attachment C, and the list of batch data reports (BDRs) examined is presented in Table 3.

Table 3. Batch Data Reports Examined

Drum Number	RTR BDR Number	DTC BDR Number
SN156A	INLRHRTR10007	INLRHDTC10010
SN156B	INLRHRTR10007	INLRHDTC10010
SN136A	INLRHRTR10007	INLRHDTC10010
SN136B	INLRHRTR10007	INLRHDTC10010
SN158A	INLRHRTR10007	INLRHDTC10010
SN158B	INLRHRTR10007	INLRHDTC10010
SN172A	INLRHRTR10007	INLRHDTC10010
SN172B	INLRHRTR10007	INLRHDTC10010
SN160A	INLRHRTR10007	INLRHDTC10010
SN160B	INLRHRTR10007	INLRHDTC10010

Technical Evaluation

(1) Inclusion of Lot 1B in Waste Stream ID-HFEF-S5400-RH was examined with respect to waste stream definition and was found to be adequate.

The WCPIP defines a waste stream as consisting of "waste material generated from a single process or activity, or as waste with similar physical, chemical, and radiological properties." The waste stream was evaluated against this definition to determine the processes and activities associated with waste generation and Lots 1A and 1B in particular, as well as the physical, chemical and radiological composition of Lots 1A and 1B to verify inclusion of the lots in the same waste stream.

The AKSR stated that waste stream ID-HFEF-S5400-RH is a debris waste stream generated at three primary locations at INL: INL MFC Building 785, HFEF (formerly HFEF-North); Building 765, FCF (formerly HFEF-South); and Building 752, the L&O Building Analytical Laboratory. HFEF supported the LMFBR program by preparing and examining samples associated with irradiation experiments. The AKSR also indicated that materials examined in the HFEF, in

support of fuel and structural material development, were irradiated in the EBR-II reactor, but material from the TREAT reactor, the FFTF, the ETR, or the Power Burst Facility were also tested in HFEF. FCF was activated in 1963 for use as a fuel reprocessing and refabrication facility for EBR-II, although this mission changed to support the Breeder Reactor Program. The Analytical Laboratory provides radiochemical analysis, cold fuel manufacturing, and nondestructive assay (NDA), and accepted material from both HFEF and FCF. The AKSR stated that the "Analytical Laboratory hot cells are utilized for the chemical analyses and experiments on analytical samples of highly irradiated nuclear fuels and materials in support of facilities including EBR-II, FCF, HFEF, and TREAT." Wastes generated at HFEF and FCF were not commingled, but wastes originating from the Analytical Laboratory were transferred back to the HFEF and/or FCF, effectively commingling wastes managed in the three areas. Therefore, while the AKSR distinguished between activities performed in the three areas, the waste management practices effectively commingled the wastes from each area.

AK data suggest that Lot 1A was generated from about 1978–1988, and Lot 1B waste was generated after Lot 1A. EPA attempted to determine whether the processes used after 1988 differed from those before 1988, and whether the waste generated post-1988 would be from the same processes/activities as Lot 1A, as well as whether Lot 1B exhibited similar physical and radiological properties with respect to the overall waste stream description. However, it was difficult to ascertain the activities and waste-generating processes associated with Lots 1A and 1B, because the AKSR did not differentiate between the two lots. Also, while the Radiological Characterization Report differentiated Lot 1A and Lot 1B, it did not provide detailed information about lot generation, differentiation, and waste management. To clarify these elements and ensure that Lots 1A and 1B belonged in the same waste stream, EPA posed several questions presented below, which are accompanied by CCP's response to these questions that have been provided to EPA as freeze file[3] changes and Mark-Ups to the AKSR.

> **EPA Question 1:** Why was the drum population divided into Lots A and B, and placed in storage in two separate locations, INTEC and MFC? Note that Lot 1A was placed in storage from 1978–1988, while the remainder of the waste stream includes waste generated after this date.
>
> **Response to Question 1:** Lots 1A and 1B were incorporated into AK initially based on storage location. The initial scope was Lot 1A, which was generated up to 1988 and originally stored at the Radiological Waste Management Complex (RWMC). The Lot 1B waste was generated later and stored at MFC. The site did not differentiate the populations based on the material contents or waste properties. The reason not all of the containers were transferred to RWMC for storage is because of [Department of Transportation or Nuclear Regulatory Commission] licensing issues in the late 1980s with the HFEF cask used in transporting the HFEF-5 cans. Therefore, they were stored at the RSWF at MFC. … The difference between the lots described in the RCTR is related to larger quantities of subassembly hardware (shanks, hex-cans, etc.) in the Lot 1 B containers. Some, but not all, of the Lot 1B containers include large quantities of hardware—generally the containers generated in later years—resulting in a large

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

variability of the ^{60}Co to Cesium-137 (^{137}Cs) ratios across the population. The scaling factors for the other isotopes are not impacted by this variability. However, because of this variability, an additional step consisting of a gamma measurement of each drum generated from repackaging of Lot 1B canisters is conducted to determine the individual ^{60}Co to ^{137}Cs ratio. This gamma measurement assigns the gamma dose rate fractions for ^{137}Cs and ^{60}Co using the same scaling factors as for the Lot 1A waste containers. The presence of the hardware (shanks, hex-cans, etc.) was identified in the container documentation in Reference U552. The review of the container documentation for subassembly hardware was conducted over the entire population; however, this review was not formally documented and individual containers were not specifically identified or tracked, since it was decided to conservatively gamma scan the waste from each canister in the population.

EPA Question 2: The authors of the CCP Radiological Characterization Report used AK data to conclude that the waste in Lot 1B exhibited different ^{60}Co concentration than Lot 1A and subsequent discovery of a bimodal distribution. Please describe and provide the AK documentation (as referenced in U581) that led the authors to conclude that the MFC material had different ^{60}Co concentration than the Lot 1A.

Response to EPA Question 2: During our [CCP's] meetings with the waste management personnel at the beginning of the characterization effort for the Lot 1A and Lot 1B waste canister liners, they [the site] indicated that the Lot 1B canister liners had significantly more subassembly hardware (shanks, hex-cans, etc.). Upon review of AK source document U552 (which is collection of the Sealion Liner information) we confirmed the presence of large quantities of hardware by looking at the liner information for each of the 54 liners in Lot 1B; there are larger quantities of subassembly hardware in the Lot 1B than is contained in the Lot 1A canister liners. These are the reasons that led us to conclude that the Lot 1B material had different ^{60}Co concentration than the Lot 1A. As a footnote, the confirmation for us also came based upon the [In-Situ Object Counting System (ISOCS)] measurements for the Lot 1B waste containers which indicated larger quantities of ^{60}Co than the quantities of ^{60}Co obtained from the Lot 1A ISOCS measurements.

EPA Question 3: What is the correct and accurate number of liners/cans in the waste stream, noting that the AKSR states that a total of 85 HFEF-5 Cans are present, the Radiological Report states that there is a total of 82 HFEF-5 Cans, and the Tier 1 request indicates there is a total of 86 HFEF-5 Cans (it is assumed that Lot 1A is composed of 28 cans)?

Response to EPA Question 3: Originally Lot 1B, incorporated into the AKSR with Revision 1, included a total of 58 additional HFEF-5 cans. However, three of these HFEF-5 cans were moved from Lot 1B to Lot 5 to be incorporated later, and one was determined to be low level. The AKSR includes three additional HFEF-5 cans in Revision 2. These consist of the Lot 4A HFEF-5 cans... None of these have been or currently are included in the RCTR. Therefore, the total number of HFEF-5 cans described in the RCTR is 82 (Lots 1A and 1B) while the AK report includes these plus three more in Lot 4A.

EPA Question 4: What is the relationship of Lot 4A to Lots 1A and 1B with respect to radiological content?
Response to EPA Question 4: The three Lot 4A HFEF-5 cans consist of additional HFEF waste, same generating facilities/processes, same physical, chemical, and radiological constituents which have been added to the waste stream. However, these HFEF-5 cans are not included in Revision 1 of the RCTR. Lot 4A and Lot 1A are expected to exhibit similar ^{60}Co concentrations.

As indicated above, source documents identified different numbers of HFEF cans within this waste stream. CCP explains the difference in that the RCTR identified only Lot 1A and Lot 1B containers (82) and the AKSR included three additional containers from Lot 4A (85). It is assumed that the 58 containers identified in the Tiering Request included a can that was subsequently removed from the waste stream, apparently due to container issues.

The question responses were examined in the context of the waste generation processes and waste characteristics as presented in the AKSR and related source documents to determine whether the single process argument and/or commonality of physical, chemical and radiological properties argument were valid for this waste stream upon inclusion of Lot 1B. Radiological and physical characteristics of Lot 1B were also evaluated (Items 2 and 3 below). Available data provided to EPA for review suggests that management of Lot 1A and Lot 1B drums in two separate areas was a function of site waste management practices in place at the time of waste generation and was not performed to intentionally segregate the waste into different populations. However, activities performed after generation of Lot 1A facilitated the inclusion of more subassembly hardware in the waste stream, hence the increased ^{60}Co concentration in the Lot 1B material. Note that the same scaling factors are applied to Lots 1A and 1B, because when taken as a whole, the isotopic signature of the entire grouping of fuel pins can be applied to both Lots 1A and 1B. All of this information suggests that the waste stream is adequately defined and includes both Lots 1A and 1B.

Additional information supporting the waste stream determination with respect to Lots 1A and 1B has been incorporated in the AKSR through freeze file changes and Mark-Ups of the AKSR. Revision of the AKSR to include this information is a T2 change. Revision of the AKSR to include waste outside of the scaling factors and DTC processes presented in CCP-AK-INL-581, Revision 1 is a T1 change.

(2) The radiological characteristics of the waste stream were evaluated and were found to be adequate.

The AKSR was revised in June 2010 to include more information pertaining to the radiological composition of the HFEF waste stream and to reflect information presented in the Radiological Characterization Report. The source of this more detailed information included, but was not limited to, waste can logs, fuel masses tables and other data tables, container logs, and analytical lab results, as well as inventory data, material transfer records and other information. The AKSR provided a breakdown of the fuels examined in the HFEF and FCF, and indicated that a subset of these fuels was sent to the Analytical Laboratory, with wastes from the laboratory subsequently transferred back to the HFEF and/or FCF for disposal. Specifically, the AKSR indicated that

EBR-II related subassemblies constitute approximately 89.2% of the total fuel elements examined at the three facilities, with non-EBR-II reactors/programs such as the Belgium Reactor, FFTF, and Reduced Enrichment Research Test Reactor Program (RERTR) contributing about 10.8% of the fuel elements examined. The AKSR indicated that the EBR-II irradiated fuels are predominantly Uranium-Strontium-Plutonium (U-Sr-Pu) or Uranium-Strontium (U-Sr) alloy fuels, as well as Uranium-Fissium (U-Fs) and depleted uranium rod subassemblies and fuels. Non-EBR-II fuels included uranium silicide fuels, U-Sr or U-Sr-Pu alloy irradiated at the FFTF and Light Water Reactor, and thorium fuels from the Shippingport reactor. The predominant isotopes identified by weight were ^{235}U, ^{238}U and ^{239}Pu. Over 95 percent of the total activity in the waste stream is from Cerium-144 (^{144}Ce), ^{58}Co, ^{60}Co, Chromium-51, ^{137}Cs, Manganese-54, ^{90}Sr, and Yttrium-90.

The AKSR did not include any information pertaining to the radiological composition of Lots 1A and 1B, which are dissimilar enough to warrant different radiological characterization techniques. INL-CCP assumed that the radiological composition of all material managed in the HFEF and FCF from 1977–2007 could be assessed and averaged into a single scaling factor, and EPA questioned this approach, given the fact that different assay approaches were required for different components of the stream. CCP-AK-INL-581, Revision 1 states that AK information not included in the AKSR was examined in-depth to obtain a more detailed depiction of the Lot 1A and Lot 1B radionuclide distributions and justified the radiological characterization approach, thus indicating that the information necessary to address EPA's concern is both available and evaluated. To explore this reasoning, EPA posed the following questions and received the associated responses which were included in freeze file changes and AKSR Mark-Ups, as follows:

> **EPA Question 5:** Lots 1A and 1B were generated during different time periods. Were different fuel elements/subassemblies managed in the HFEF and FCF during the waste generation time periods associated with Lots 1A and 1B?
> **Response to EPA Question 5:** Yes, different subassemblies and element numbers [were managed], but [they were] the *same or very similar* fuel types. Of the 129 fuel elements, the majority of the fuel types were common to both the Lot 1A and Lot 1B waste; they are:
>
> - Mark-I and Mark-II fuels composed of U and 5% Fs (see Figure 2-1 [of the RCTR]),
> - Mark-IIC, Mark-IICS, and Mark-III composed of U and 10% Zirconium (Zr) (see Figure 2-1 [of the RTCR]),
> - IFR fuel composed of U-10%Zr or U-%Pu-10%Zr, or
> - RBCB experiments.
>
> So while an earlier subassembly may be in a Lot 1A waste canister (having Mark-II fuel), a later [subassembly] may be in a Lot 1B canister liner having the same fuel type (Mark-II). Additionally, there is not necessarily a correlation between irradiation time (important to [spent fuel] generation) and waste packaging date. It is the out-of-reactor date that matters to us, rather than when the waste was packaged or generated in the hot cell.

EPA Question 6: What information did you examine to determine that application of the general scaling factor to both Lots 1A and 1B was applicable, given the different time periods of generation?
Response to EPA Question 6: We applied the same scaling factors to both lots for the following reasons:

- The Lot 1A and Lot 1B canisters were of one waste stream,
- They were similar in fuel type composition and burn-up, and
- They were both debris waste (only the Lot 1B has more hardware).

EPA Question 7: What was your thought process/evidence associated with determining that a generalized radiological composition is applicable to both Lots (e.g., was the same type of fuel managed in both throughout so there's no radiological distinction—cells weren't decontaminated, so there's the possibility that waste removed from the cells could contain material generated from previous experiments, etc?).
Response to EPA Question 7: In general see the first two responses, but the greatest contribution for both lots comes from EBR-II fuels and experiments and the same experiments contributed to both lots which indicate significant commingling. In addition there may be very slight differences between the two lots, but these very slight differences would be covered by the scaling factor uncertainty incorporated in DTC spreadsheet. For example, there were several RERTR plates in this waste stream and all were in the Lot 1A waste; likewise, there were several Belgium Reactor fuel elements in this waste stream and all were in the Lot 1B waste. But these were both very minor contributors to the development of the general scaling factors and any variation between lots (or canisters within the same lot) would be covered by the associated uncertainties.

Based on the response provided above and information examined in the AKSR (including freeze file changes and/or Mark-Up revision), the RCTR, and related source documents, the radiological composition of the waste stream has been adequately determined and the inclusion of Lots 1A and 1B in the same waste stream is justified. The revised AKSR, including revisions made as a result of the Lot 1B review and the RCTR, provides adequate information about Lot 1B and shows that while the material contains more ^{60}Co than Lot 1A, it is still within the bounds of the waste stream. EPA expects the AKSR Markups to be included in the next formal revision of the AKSR. Notification of revisions to the AKSR and RCTR are T2 changes.

(3) Physical characteristics of the waste stream were examined, including the presence of prohibited items (liquids) and found to be adequately addressed.

The AKSR states that Waste Stream ID-HFEF-S5400-RH contains the spectrum of debris material including various cellulosics (e.g., cardboard, cotton balls and swabs, HEPA filters, Kim wipes), plastics (e.g., bags, bottles, caps, personal protective equipment, sample vials, polyvinylchloride), rubber (cords, gaskets, gloves, hoses, tubing), glass (e.g., beakers, ceramics, fiberglass insulation, labware, sample vials), and ferrous/non-ferrous metal (e.g., cladding pieces, equipment/tools, fuel pin cuttings/filings and samples, hardware, piping, rods, scrap, sources, subassembly hardware, wire). The AKSR included a revised tabulation of waste material parameters by weight based on the contents of material in 82 HFEF-5 cans, which clearly included (simply by the number of cans involved) both Lot 1A and Lot 1B wastes. This

tabulation showed that the waste stream is anticipated to be approximately 70% inorganic and 30% organic material, with metals making up the vast majority of the waste stream by weight (53%). INL-CCP representatives indicated that they did not evaluate the physical composition of Lot 1B separate from Lot 1A; instead, the waste material parameter determinations took into account 82 cans of Lot 1A and Lot 1B waste. Examination of Real-Time Radiography (RTR) records and packaging information for Lot 1B drums SN156A, SN156B, SN136A, SN136B, SN158A, SN158B, SN172A, SN172B, SN160A, and SN160B shows that the drums are composed primarily of debris including scrap metals, as well as various cellulosics and other debris such as light fixtures, broken glass, sanding discs, plastic bags/scrap plastic, and other debris. Comparison of these BDRs with those included in EPA's original HFEF Lot 1A approval indicates that the contents of the two lots are comparable with respect to physical composition, although Lot 1B may contain more cladding.

EPA discovered, during its original tiering review of the 28 cans in Lot 1A, that while the South (FCF) and North (HFEF) cell wastes were distinct and not physically commingled, laboratory waste was transferred through a pneumatic transfer system to either of the labs, thus contributing to commingling of wastes between the three areas (HFEF, FCF and Laboratory). INL-CCP revised the AKSR to address more detailed descriptions of the RH TRU waste management practices, including specifics regarding the sizes of internal waste containers and the collection, transfer and staging practices for materials within the facilities of interest. This information, together with the data obtained by evaluating the physical composition of Lot 1B, verifies that the physical characteristics of Lot 1B are adequately encompassed in the AKSR physical discussion.

(4) The presence of non-TRU material in the waste was examined and was found to be adequate.

INL-CCP stated the following with respect to the occurrence of spent nuclear fuel (SNF) and high level waste (HLW) in Waste Stream ID-HFEF-S5400-RH: "The WIPP [*Land Withdrawal Act*] ...prohibits the disposal of [SNF] and [HLW] as defined by the [*Nuclear Waste Policy Act*]... [and DOE clarifies that]... Test specimens of fissionable material irradiated for research and development only, and not production of power or plutonium, may be classified as waste, and managed in accordance with [the DOE Order M 435.1-1] when it is technically infeasible, cost prohibitive, or would increase worker exposure to separate the remaining test specimens from other contaminated material." INL-CCP contends that material within Waste Stream ID-HFEF-S5400-RH Lot 1B is properly considered to be test specimens and thus falls under this exclusion. INL-CCP has stated that since SNF is not present, HLW could not have been produced as a result of physical or chemical processing of these materials. INL-CCP concludes:

> *Waste Stream ID-HFEF-S5400-RH consists of heterogeneous debris [that]... inherently contains test residues, test materials, and the resultant test fragments from the fuel pin test specimens, including irradiated pin fragments and dispersed particulate (fines and dust). The analysis and examination of irradiated fuels did not involve reprocessing of constituent elements from reactor fuel. In addition, waste from fuel reprocessing and the analysis of reprocessed fuel performed in these facilities was not identified in this waste stream. Therefore, the waste is not*

a spent nuclear fuel, not high-level waste, nor a waste historically managed as high-level waste, and is eligible for disposal at the WIPP as RH TRU waste.

INL-CCP representatives indicated that they do not anticipate any of the resulting analyses will identify low-level waste (LLW). The arguments evaluated by EPA apply to the waste stream as a whole, and therefore encompass Lot 1B. EPA examined the SNF, HLW and LLW arguments and found them to be consistent with those presented in other approved RH waste stream AKSRs.

(5) Sufficiency of the AK Summary Report and implementation of the AK process were evaluated and were found to be adequate.

Attachment A of the WCPIP mandates a process that should be followed to collect and analyze AK data, similar to the process used for CH waste. Both the content of the AKSR and sufficiency of AK implementation were assessed.

EPA examined the AK Summary Report (AKSR) and found that information with respect to waste stream generation, commingling of radiological constituents, and radiological characterization was lacking with respect to differentiation and identification of Lots 1A and 1B as indicated in Items 1-3, above. However, INL-CCP provided extensive revisions to the AKSR through freeze file changes as documented in the AKSR Mark-Up. EPA found these changes to be adequate evidence of INL-CCP's commitment to modify the various documents. EPA expects to be notified when the AKSR is updated to include the submitted modifications; this update will be provided to EPA as a T2 change.

(6) Data traceability was examined and was found to be adequate.

INL-CCP provided traceability information for five cans subsequently repackaged with two drums being generated for each can. Each drum underwent the RTR process. Drums generated were identified as SN156A, SN156B, SN136A, SN136B, SN158A, SN158B, SN172A, SN172B, SN160A, and SN160B. Reference U552 provided traceability information for each can (which corresponds directly to the final drum numbers). U552 includes information from the Sealion database that presents waste generation dates, waste storage information, can/originator data, and physical, chemical and radiological data. This database showed that, for example, can SN-158 was generated in 2001, and was transferred to RSWF in 2001. Additionally, documentation from waste generation through waste shipment is presented in reference U552, including, but not limited to, Storage and Disposal requests, Unresolved Safety Question Safety Evaluation Forms, RSWF Transfer evaluation checklists, RH TRU Waste Can Loading Logs, Calculated Curie Content sheets (including the specific fuel pins/elements associated with waste in each container), HFEF Waste Container Logs, Item inventories, and various forms like the waste contents form that details the physical composition of waste material in each can determined at the time of waste generation. Documentation was provided showing transfer of select Lot 1B containers to INTEC. INL-CCP's BDRs for select containers were also provided, as were screen shots associated with CCP's Project Office Data Tracking System, wherein waste container data are input. This information demonstrates that there are abundant historical data pertaining to each container, and that information is traceable on a container basis.

EPA used the above information, together with spreadsheets and references provided by INL-CCP (e.g., U552), to evaluate the type of data available for each drum, and the traceability of that information. EPA's review indicated that paperwork is available from the final INL-CCP drum at the can/container level and is often traceable to individual fuel pins. This conclusion is echoed in INL-CCP-AK-581, which states, "The review of the AK source documents associated with ID-HFEF-S5400-RH identified the subassemblies and fuel elements associated with each HFEF canister liners." EPA concluded that the information examined suggests detailed information is available for each container/can, and can be traced from the point of generation through INL-CCP drum management.

(7) Sufficiency of AK Support Documents and Related Document Tracking was evaluated and was found to be adequate.

INL-CCP provided numerous supporting documents. The AKSR also included a reference list that is a subset of the listing in Attachment 2 (provided as Attachment 4 of CCP-TP-005). EPA observed that the Attachment 2 did not include all of the references presented in the AKSR (e.g., DR004 is missing from the Attachment). The references included in the AKSR reference list and those AK references listed in Attachment 4 of CCP-TP-005 do not agree, and Attachment 4 must be updated to include all references cited in the AKSR and radiological characterization technical report. EPA recognizes that the reference lists are dynamic, but also expects that references in both documents would be compared and that Attachment 4 be updated to serve as a master reference list. Submission of a revised Attachment 4 of CCP-TP-005 to reflect the AKSR Source Document Reference List is, therefore, a T2 change. The Tiering Table (Table 1 of this report) for INL-CCP has been modified to reflect this change.

(8) Contents of the program documents were evaluated and the use of Los Alamos National Laboratory's mass spectrometry data for Dose-To-Curie AK Qualification, and was found to be adequate.

EPA's March 26, 2004, RH WCPIP letter indicated that sites must generate a Certification Plan that explains how RH waste characterization will take place at each site, as well as a Confirmatory Testing Plan (CTP) when this plan is required as part of AK Qualification. EPA's intent was that the sites specify and document exactly how characterization is to take place on a waste stream basis, followed by a detailed plan explaining implementation of confirmatory testing when this is to take place. INL-CCP-AK-582, Revision 1 states that the INL-CCP would use a combination of methods to qualify AK defining the isotopic ratios using the ORIGEN modeling and confirmed by LANL measurement data. EPA reviewed this approach in detail as part of the Lot 1A evaluation. In its 2010 approval of Lot 1A, EPA concluded that INL-CCP demonstrated applicability of the LANL mass spectroscopy data to the INL program by showing commonality of experiments, sponsors and other data. Because Lot 1B and Lot 1A are within the same waste stream (see Items 1-3, above), the approach continues to be acceptable for Lot 1B. Notification of revision of CCP-AK-INL-581, Revision 1 is a T2 change. EPA also evaluated the CTP to determine whether it included the specific elements that CTP must have as defined in the WCPIP and found the CTP to be complete in this regard. Notification of revisions to CCP-AK-INL-582, Revision 1 is a T2 change.

(9) Content and technical adequacy of the Characterization Reconciliation Report were evaluated and both were found to be adequate.

INL-CCP representatives indicated that no updated CRR has been prepared that addresses Lot 1B. Therefore, only the Characterization Reconciliation Report (CRR) associated with Lot 1A was available for review. EPA examined this CRR as part of its Lot 1A approval, during which the content of the CRR was examined to ensure that this report reflected requirements of CCP-TP-506, *CCP Preparation of the Remote-Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report*. Specifically, the CRR was evaluated to determine the completeness and adequacy of its contents as required in the WCPIP. EPA found that the Excel version of the CRR for Lot 1A included the necessary information, and a signed copy of the CRR was also provided. Notification of availability of a revised CRR, particularly a revision that addresses Lot 1B, is a T2 change.

(10) Use of a Correlation and Surrogate Summary Form was evaluated and was found to be adequate.

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. The INL-CCP representative indicated that CH data were not used in this manner, so a CSSF was not prepared for this stream, including Lot 1B.

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

Scott Smith is the AK Expert (AKE) who prepared the AKSR, and Mark Doherty is the Site Project Manager (SPM) who prepared the Certification Plan/CTP. Dave Moody prepared the Radiological Characterization Report and is also an AKE. These individuals are responsible for revisions to the AKSR, RCTR, and CTP, including updates pertinent to Lot 1A and Lot 1B. The AKE Qualification Cards were examined to determine whether their training was up-to-date as part of the Lot 1A review, but the analysis showed that required reading relative to INL had not been documented. CCP representatives indicated that e-mail verification is used to ensure each individual receives and completes site-specific reading. Documentation that these individuals read the required INL documentation, as part of the Lot 1B evaluation, was provided to EPA.

(12) The Waste Stream Profile Form was examined and was found to be adequate.

The approved Waste Stream Profile Form (WSPF) was provided to EPA for Waste Stream ID-HFEF-S5400-RH. The waste stream was approved on February 12, 2010. The CRR associated with the WSPF did not include any Lot 1B drums and the attached AKSR was not the most recent revision. Otherwise, the WSPF appeared complete with respect to WCPIP requirements. Notification of availability of changes (e.g., Change Requests) to the WSPF is a T2 change.

(13) Non-conformance and discrepancy resolution documents were examined and were found to be adequate.

INL-CCP representatives provided a single non-conformance report (NCR) associated with Lot 1B. NCR-RHINL-0002-10 was issued for drum N-20A because the measurement system "did not meet the count-to-precision requirements at less than 5%." DR004 was issued because liquids were discovered in Lot 1A drums, counter to information presented in the AK record. The provided discrepancy resolution (DRs) and NCRs verified continued preparation of these key documents as part of the AK process.

(14) AK accuracy was assessed and was found to be adequate.

INL-CCP representatives indicated that no updated AK Accuracy report has been prepared to address Lot 1B. EPA examined the Lot 1A AK Accuracy report as part of the Lot 1A review, and AK accuracy was assessed with respect to the required contents as presented in the WCPIP. The WCPIP requires AK accuracy be assessed in three areas: reassignment of the waste to a different Summary Category Group (SCG); reassignment of the waste to a different waste stream; and waste stream-specific assessment of radiological parameter accuracy. INL-CCP provided a draft AK accuracy report that indicated no discrepancies were noted, and which listed verification of AK-based DQOs. Again, this AK Accuracy Report dealt solely with Lot 1A; INL-CCP representatives indicated that no new AK Accuracy Report has been prepared that includes Lot 1B. Although not explicitly stated, presentation of the DQOs in this manner shows that the SCG assignment was not modified, the drums were not placed in a different waste stream, and some of the general radiological parameters (i.e., TRU and RH determination) were met through implementation of the WCPIP and comparison to the AK Record. Notification of availability of a final AK Accuracy Report for this stream is a T2 change.

(15) Defense status of the waste was evaluated and was found to be adequate.

The AKSR provided information in Section 4.1.4, Defense Determination, regarding the correlation of specific process areas to wastes from HFEF, FCF, and the Analytical Laboratory. The text also linked these materials to defense-related activities, including activities associated with generation of Lot 1B, and also adequately explained waste commingling and cited numerous references. Therefore, the information provided regarding the defense status of the waste was adequate.

(16) Load Management was assessed and was determined to not apply to this waste stream.

INL-CCP representatives indicated that load management will not be performed for this waste stream. Implementation of load management is a T1 change.

(17) Attainment of Data Quality Objectives through AK qualification was evaluated and was found to be adequate.

As a result of the analysis presented in Items 1-16, above, EPA was able to assess how each Data Quality Objective (DQO) will be addressed. The following DQOs must be addressed as per the WCPIP:

- Defense determination

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

When evaluated as a whole, CCP-AK-INL-580, Revision 2, CCP-AK-INL-581, Revision 1, CCP-AK-INL-582, Revision 2, and the supporting source documents presented in Attachment C of this report indicate that the DQOs, as specified in the WCPIP, have been met.

Summary of Acceptable Knowledge

Findings or Concerns

The EPA Inspection Team did not identify any findings or concerns relative to the addition of the containers from Lot 1B of Waste Stream ID-HFEF-S54000-RH, which were the subject of this T1 change evaluation.

Tiering Changes

Based on the results of this T1 evaluation, there are no changes to the T1 designations and three AK T2 changes requiring EPA notification when (1) additional containers characterized using the same scaling factors are added to the approved waste stream, (2) a revised AKSR addressing addition of containers to the approved waste streams and supporting source documents is complete and (3) Attachment 4 of CCP-TP-005 is revised to include the updated AKSR Source Document Reference List. Accordingly, the AK portion of the tiering table is revised. For addition of new containers belonging to this waste stream refer to the revised tiering table – Table 1 of the Executive Summary.

Conclusion

Based on the results of this evaluation, EPA is approving the T1 request for the Waste Stream ID-HFEF-S5400-RH with the limitations discussed above.

4.2 Radiological Characterization

RH Waste Overview

Waste Stream ID-HFEF-S5400-RH consists of a total of 82 HFEF-5 canister liners, generated from April 1977 to September 2007, and resulted from the handling and examination of irradiated fuel pins and other reactor materials from a variety of reactor programs. From the total of 82 HFEF-5 canister liners, 28 (identified as Lot 1A) are stored at INTEC and 58 (identified as Lot 1B) are stored at the MFC. INL-CCP expects that, upon repackaging (estimating one canister

liner to be repackaged into two 55-gallon drums), these materials will generate approximately 164 55-gallon drums for a total waste volume of approximately 35 m^3.

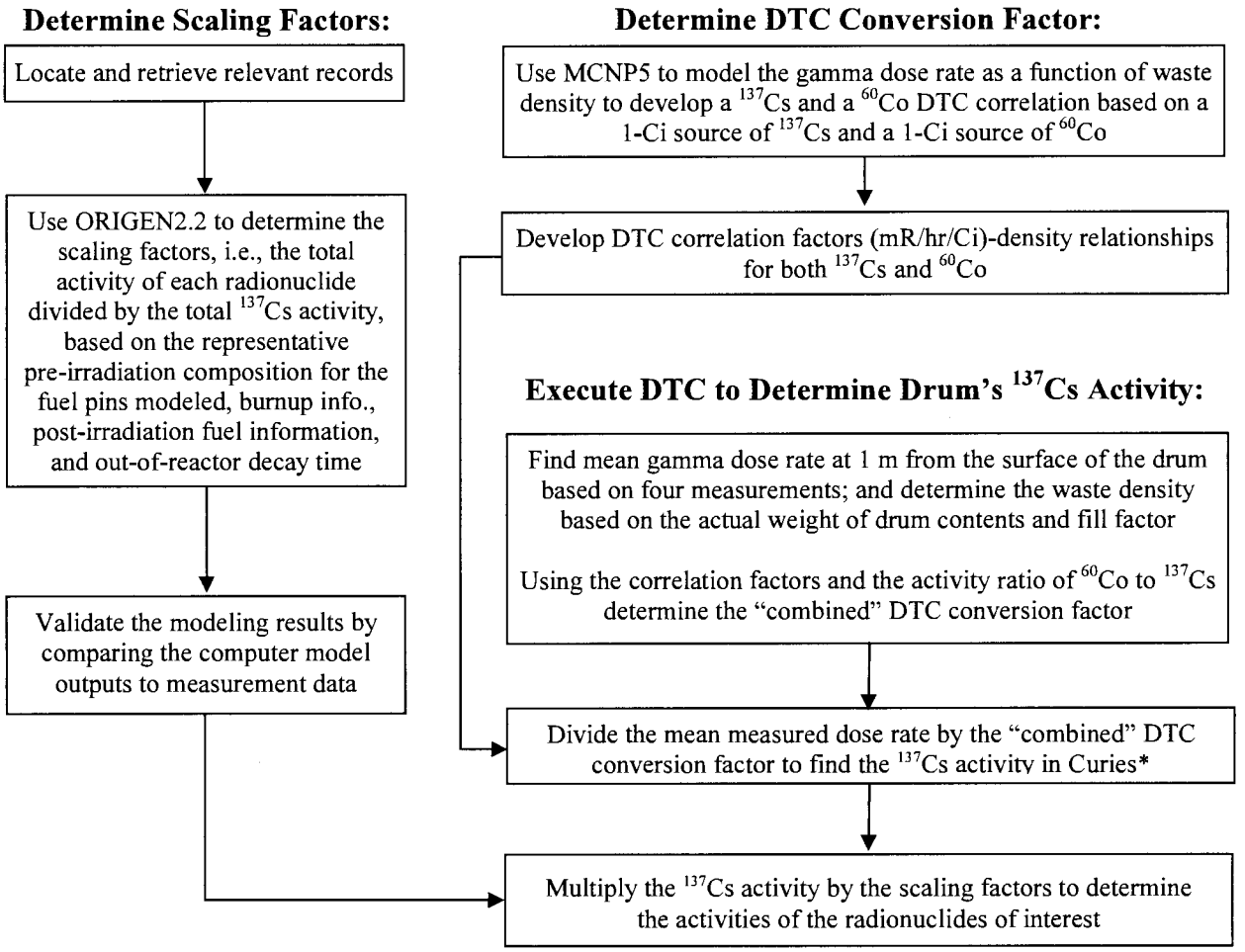
The Lot 1A canisters were evaluated previously and the 58 HFEF-5 canister liners, identified as Lot 1B of the Waste Stream ID-HFEF-S5400-RH, are the subject of this Tier 1 evaluation.

Radiological Characterization Overview

The overall approach to characterizing these waste drums is DTC in conjunction with radionuclide-specific scaling factors, a technique that EPA has observed and approved at several sites previously. The radionuclide-specific scaling factors were developed based on information describing the attributes of the fuel pins and fuel materials that generated these wastes, i.e., detailed radionuclide composition and burnup information. The computer modeling used incorporated 129 of the 157 total fuel pins known (82%) and resulted in a single set of scaling factors to be applied to the entire waste stream. An overview of the radiological characterization process used for the ID-HFEF-S5400-RH, Lot 1B wastes is provided in Figure 1, below.

The DTC measurement aspect of this waste stream was not directly assessed during this T1 evaluation in Washington, D.C. The DTC operation at INL had been evaluated during the INL-CCP baseline inspection and EPA had approved it at that time. EPA did evaluate the characterization methods used for the INL-CCP HFEF RH wastes in terms of the technical adequacy of the approach, as supported by the program's documents, procedures, and controls, and the knowledge and understanding of the personnel involved in the RH waste characterization program. However, the DTC process at INL was assessed in conjunction with the OSPREY evaluation discussed below, and it was found to be essentially unchanged and acceptable.

Because these wastes had potentially problematic concentrations of ^{60}Co, INL-CCP used a new measurement technique, the OSPREY™ lanthanum bromide [$La_3Br(Ce)$] scintillation detector and digital multi channel analyzer (MCA). The purpose of the OPSREY™ is to determine the relative contributions of ^{60}Co and ^{137}Cs to each drum's external exposure (dose) rate by obtaining a gamma spectrum which is analyzed to obtain the fractional contribution of both radionuclides to a container's measured dose rate. Once the ^{137}Cs contribution is determined for a container, it is used in the DTC process. The OSPREY™ system was assessed during an on-site evaluation ay INL that is summarized in Attachment C to this report.



* 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 1B

Documents Reviewed

The list provided in Attachment C includes all documents related to the INL-CCP RH TRU radiological characterization program that were examined to support this T1 evaluation. This listing is comprehensive and includes documents that supported AK.

Technical Evaluation

(1) The EPA inspection team evaluated the correlation of the waste records for the 54 Lot 1B canister liners with the ^{137}Cs and ^{60}Co concentrations.

The information that formed the basis of the radiological characterization process identified the radionuclides' pre-irradiation composition of fuel, burnup information, and 129 fuel pins out of a

total population of 157. Specifically, records for the 54 canister liners were reviewed to identify the fuel elements in this waste stream, including the record types listed in CCP-AK-INL-581, Revision 1, Section 3.1. Pre-irradiation fuel composition and burnup information was collected from these records, and this was used as input to ORIGEN2.2 for the 129 fuel pins. This exercise resulted in the development of values for ^{137}Cs and other radionuclides, and the derivation of scaling factors, to be used along with the relationship of easily measurable gamma doses from ^{137}Cs and ^{60}Co to other radionuclides, as discussed below. These activities are documented in INL-RH-61, INL-RH-62 and INL-RH-64 and incorporated information from ANL-E, Argonne National Laboratory-West, INL, and LANL, including the following:

- Fuel pin type and characteristics from fuel suppliers and reactor operators
- ^{235}U and ^{233}U enrichments
- Engineering Design Files (EDFs)
- Individual pin burnup calculation records
- Statement of Uranium burnup and Plutonium bred post irradiation
- Mass spectrometry results for destructive assay of 400 fuel pins at LANL
- Other records related to AGHCF activities, names of experimenters, etc.

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

- Activity in curies (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, ^{90}Sr, ^{233}U, ^{234}U, and ^{238}U
- Associated uncertainty for all values listed in previous bullet
- Fissile Gram Equivalent
- Pu Equivalent Curies
- Decay heat in Watts

The constants and other values required for these calculations were taken from the appropriate sources (CH Waste Acceptance Criteria and TRU Waste Authorized Methods for Payload Control) and were spot-checked for accuracy.

For these wastes, it was necessary to derive the contribution of ^{60}Co to the measured external dose rate. This was done by running 12 MCNP5 cases with the source term uniformly distributed throughout a waste container for a range of waste densities from 1.0E-4 to 2.0 g/cm^3 for a 1-Ci source of both ^{60}Co and ^{137}Cs. The results of these were then 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 1, Figures 6-2 and 6-3, respectively. The actual DTC calculations are performed using an Excel spreadsheet where the input includes [see Section (3), below]:

- Drum identification number
- Container gross weight
- Fill height in percent

- Fill height material type (concrete, organic or steel)
- Four external dose rate measurements
- Fractional dose rates for ^{137}Cs and ^{60}Co using the OSPREY™ system

The partitioning of the measured dose rates to ^{137}Cs and ^{60}Co using the OSPREY™ system is addressed in (3), below. There were no concerns regarding the correlation of waste records for the 54 canister liners with ^{137}Cs and ^{60}Co concentrations for this HFEF RH waste stream.

(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 were 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 are 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 and ^{60}Co for these HFEF Lot 1B RH TRU wastes
- Adjustment of the source distribution inside the drums for ^{137}Cs and ^{60}Co using MCNP5 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 and routine assays performed via DTC

  Note: Decay corrections should be made to a new shipping date.
- The ORIGEN2.2 results are used to develop radionuclide-specific scaling factors that, in turn, are used to determine activity levels of the radionuclides of interest from ^{137}Cs activity obtained from the measured external dose rates and 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[4]
- 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 (55-gallon drum)

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[4] 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.

- Adjustment of scaling factors based on the benchmark analysis of 400 fast reactor fuel pins at LANL, as documented in LANL-RH-04
- Assaying each drum generated from the Lot 1B canister liners using the OSPREY™ system to determine the ^{137}Cs and ^{60}Co dose rate fractions for each drum

The radionuclide-specific scaling factors for these HFEF RH TRU wastes that were developed, as shown in Table 4, below, are taken from INL-RH-64 and INL-RH-69:

Table 4. Radionuclide-Specific Scaling Factors

Radionuclide	DTC Scaling Factor
^{233}U	6.83E-05
^{234}U	8.75E-05
^{235}U	8.70E-06
^{238}U	1.13 E-06
^{238}Pu	1.03E-02
^{239}Pu	2.72E-02
^{240}Pu	1.08E-02
^{241}Pu	2.05E-01
^{242}Pu	4.33E-06
^{241}Am	1.08E-02
^{137}Cs	-
^{137m}Ba	9.46E-01
^{90}Sr	8.45E-01
^{60}Co	2.10E-01

There are no issues related to the technical adequacy or documentation of radionuclide scaling factors for HFEF RH TRU Waste Stream ID-HFEF-S5400-RH, Lot 1B.

(3) The OSPREY™ gamma system was evaluated and was fund to be adequate for determining the fractional contributions of ^{60}Co and ^{137}Cs

On July 13, 2010, EPA conducted an on-site evaluation of the OSPREY™ $La_3Br(Ce)$ measurement system at the INTEC facility at INL. INL-CCP had proposed to use this system to provide the fraction contributions of ^{60}Co and ^{137}Cs to a container's measured dose rate due to the presence of significant quantities of ^{60}Co in Lot 1B containers. EPA assessed this system as part of this T1 evaluation for the purpose of determining its technical adequacy for use in characterizing waste containers from Lot 1B.

Participants

The individuals participating in this part of the T1 evaluation are listed in Table 1, below.

Table 1. OSPREY™ Evaluation Participants

Name	Affiliation & Function
Ed Feltcorn	EPA Headquarters – Evaluation Lead
Patrick Kelly	SC&A, Technical Evaluator – Radiological Characterization
Bryce Woodbury	Canberra Industries – Radiological Characterization
James Roswell	Canberra Industries – Radiological Characterization
Irene Quintana	CCP – Site Project Manager
Joe Harvill	WTS-CCP – Radiological Characterization
Raj Bhatt	CWI – Observer
Greg Smith	WTS – CCP
Corey Boland	Canberra Industries – Radiological Characterization
Kathy Leonard	Navarro – CBF Observer

Evaluation of OSPREY™ System and Data Collection

The OSPREY™ is a complete MCA system that supports scintillation spectrometry, both sodium iodide (NaI) and $La_3Br(Ce)$ detectors. However, for this application, only the $La_3Br(Ce)$ detector will be used because it has superior resolution for the radionuclides of interest in this application. The detector is fitted with a ¼" collimator which was shown to be adequate during performance testing documented in the test plan summary report. Dead time is potentially a consideration for these drums given contact dose readings in the R/hr range. Daily performance tests include a check for collimator size, a peak centroid check for the 662 Kev ^{137}Cs line, a background check and daily source checks with pre-established acceptance criteria. These are documented in the DTC and OSRPEY™ BDR INLRHDTC 10011. The design, technical details and calibration were suited to determining the relative contributions of ^{60}Co and ^{137}Cs in HFEF Lot 1B containers.

The OSPREY™ system is located in Control Room 302 of Building 659 (called the Broom Closet) in the same room as the DTC and RTR controls. The EPA evaluation team observed the $La_3Br(Ce)$ detector from a distance since access to the room where the detector was installed was not allowed. The OSPREY™ operator was Corey Boland (Stephen C. Boland) and he was appropriately qualified and trained, as documented by the List of Qualified Individuals (LOQI) and his qualification cards, both of which EPA evaluated. All OSPREY™ operations were recorded as required in the logbook, Remote-Handled Dose-to-Curie Operational Logbook 2010, INL-RH-DTC-005, Idaho National Laboratory INTEC-CCP-659. The operator checked the current revision of the operating procedure CCP-TP-504, Revision 10, via the CCP ftp site. There were two Operator Aids posted in the room; one for DTC and one for OSPREY™, and EPA obtained copies of both. There were separate DTC and OSPREY™ operators. The DTC operator was Chris Davis who was also appropriately trained and qualified for DTC. The DTC was performed first, and upon its completion, Corey Boland initiated the OSPREY™ measurements. The appropriate source checks were executed for both DTC and OSPREY™ measurements using sources that had a documented pedigree. Container No. N-20-B was assayed and it had a contact dose reading of 1494 R/hr. The four DTC measurements for the container were as follows:

- 0 Degrees – 290 mR/hr Gamma, 0 neutron
- 90 Degrees – 360 mR/hr gamma, 0 neutron
- 180 Degrees – 280 mR/hr gamma, 0 neutron
- 270 Degrees – 300 mR/hr gamma, 0 neutron

The OSPREY™ spectra are saved to specific files and the data are worked up by the ITR later. The files are CAM Files that are named to correspond to the degrees of the four quadrant measurements, as follows:

- File 1 – N-20-9 0
- File 2 – N-20-9 90
- File 3 – N-20-9 180
- File 4 – N-20-9 270

This container that EPA observed during DTC and OSPREY™ operation was included in DTC BDR No. INLRHDTC10011 that was provided following the on-site evaluation.

EPA obtained the following information regarding the breadth of the population of Lot 1B containers that are scheduled for measurement via the OSPREY™ system:

- There are approximately 108 55-gallon containers currently; this number may change and could increase slightly
- To date, 10 containers have been assayed with the OSPREY™ plus the four that EPA observed at INTECH on July 13, 2010
- There is a single $La_3Br(Ce)$ for use by INL-CCP, and while the system can be used with a NaI scintillation detector, INL-CCP will use only the $La_3Br(Ce)$ detector that EPA observed in use at INTEC
- The OSPREY™ system will be used to process only HFEF Lot 1 B containers

Documentation

The documentation that was provided for the OSPREY™ system and its operation is listed in Attachment C. EPA evaluated the documentation to ensure that it provided adequate technical support for its approval of the OSPREY™ system. The format of some documents was not consistent with what had been provided to EPA to support previous T1 evaluations. However, upon closer examination, there was sufficient technical and compliance-related information to support approval of the OSPREY™ system for this application, although the manner and time frame in which it was provided unnecessarily complicated this evaluation. In the future, EPA will require the following information to be included in a formal report that is available to EPA prior to the T1 evaluation before considering conducting the requested evaluation:

- Clear description of the system(s) proposed for EPA approval and the intended use of each, i.e., what will be measured and how the data will be used

- Listing of all system calibrations, background and efficiency determinations and other relevant performance tests, including a description of each test and the acceptance criteria that will be applied to each
- Results of the performance tests described in the previous bullet
- Complete evaluation of the uncertainties associated with the proposed system(s), to be included as a separate document or section of another document that comprehensively addresses the uncertainty of the system(s), i.e., TMU
- Results (BDRs or the equivalent) resulting from the application of the system(s) proposed for approval to actual waste drums
- Comprehensive listing of all calibration, maintenance, operational and data-related procedures that are germane to the system(s) proposed for approval

Summary

Based on the results of EPA's evaluation of the OSPREY™ system at INTEC, EPA approves its use for determining the fractional contributions of ^{60}Co and ^{137}Cs to the dose rate of HFEF Lot 1B containers.

(4) The technical basis of the Dose-T0-Curie correlation and its documentation were evaluated and both aspects were acceptable.

The DTC correlation was evaluated based on DTC BDR No. INLRHDTC09006, which INL-CCP provided during the T1 evaluation. The correct version of the DTC Excel spreadsheet was used for the calculations, i.e., it contained the radionuclide scaling factors that were developed for these HFEF wastes contained in INL-RH-64, and Table 1, above. EPA technical personnel verified that the DTC BDR cited above included the following:

- BDR Cover Sheet, Attachment 4
- BDR Table of Contents, Attachment 5
- BDR Narrative Summary, Attachment 6
- Independent Technical Reviewer (ITR) Review Checklist, Attachment 7
- Measurement Control Report, Attachment 1
- Container Data Sheet(s), Attachment 2
- Waste Container DTC Conversion Record(s), Attachment 3
- Evidence of signatures by the ITR and a SPM
- Type of waste in each container (steel, concrete, organics)
- Fill height of the container: < 25% full; 25% - 66% full; 66% - 90% full; > 90% full

There were no issues related to the DTC correlation and its documentation for these HFEF RH TRU wastes.

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

CCP-AK-INL-581, Revision 1 is the main document that describes the radiological characterization process that INL-CCP used for the HFEF Lot 1B wastes. This document is supported by a series of 24 calculation packages, listed in Table 8-1, that were reviewed in the process of evaluating the HFEF 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. The EPA evaluation team found that the CCP-AK-INL-581, Revision 1 adequately documented the radiological characterization process for the HFEF Lot 1B wastes, and the calculation packages cited above adequately supported the activities upon which the radiological characterization of the HFEF wastes were based. There were no issues related to the documentation of technical aspects of the INL-CCP radiological characterization approach for the HFEF Lot 1B RH wastes.

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

The development of TMU for Waste Stream ID-HFEF-S5400-RH 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, MCNP5 code, and modeling uncertainties
- Measurement uncertainty – including dose rate uncertainty from measuring ^{137}Cs and ^{60}Co and from allocating the dose rate to ^{137}Cs and ^{60}Co using the OSPREY
- Scaling factor uncertainty – including ORIGEN2.2 uncertainty and aspects related to fuel pin composition and contribution
- Contributions of other gamma emitters
- Drum-to-drum variation

A general treatment of TMU for this HFEF waste stream is presented in CCP-AK-INL-581, Revision 1 and Calculation Package LANL-RH-25, Revision 0, *Uncertainty Analysis of Canisters w/364 Cans*; and INL-RH-66, *HFEF Lots 1A and 1B Uncertainty Calculation at Idaho National Laboratory (INL) RH Radiological Characterization.* The principal sources of uncertainty are the ^{137}Cs dose rate determination and the relative contribution of each fuel pin to the total. There were no concerns regarding the technical derivation and documentation of TMU for INL-CCP Waste Stream ID-HFEF-S5400-RH, Lot 1B.

(7) RH and TRU determinations were assessed and were found to be adequate.

The determinations that these containers meet the definitions of TRU waste and RH waste were examined during the baseline inspection based on DTC BDR No. INLRHDTC09006. Both the

RH and TRU determination are parts of the actual DTC measurements that are performed at the INTEC Facility at INL, which was assessed as part of evaluating the OSPREY measurement system, see Attachment C to this report. EPA verified that no aspects of the DTC process had changed significantly from what EPA had observed during the baseline inspection and that the DTC process was technically adequate and appropriately executed and documented. The results for the containers that were reviewed as part of this T1 evaluation as documented in the DTC BDR indicated the following:

- All containers were clearly TRU, i.e., contained more than 100 nano Ci per gram (nCi/g) of transuranic radionuclides.
- All containers were clearly RH, i.e., had an external contact dose rate greater than 200 millirem per hour (mRem/hr).

There were no technical or documentation-related concerns regarding the TRU and RH determinations for the containers in Waste Stream ID-HFEF-S5400-RH, Lot 1B.

Summary of Radiological Characterization

Findings or Concerns

The EPA inspection team did not identify any findings or concerns related to radiological characterization.

Tiering Changes

Based on the results of this T1 evaluation, there is one change to the T1 designation and two T2 changes for radiological characterization. The T1 change is related to the use of a different gamma detector for the OSPREY™ system. The two T2 changes are (1) requiring notification regarding the availability of a revised radiological characterization technical report associated with the addition of containers to the approved waste stream, and (2) providing radiological BDRs for additional containers.

In addition, the radiological characterization portion of the tiering table, however, is revised to address addition of RH canisters belonging to the same waste stream (ID-HFEF-S5400-RH). If additional containers for this waste stream are generated and will be characterized using the same scaling factors as those used for the canisters approved as part of this T1 change request, then the following information for radiological characterization is necessary. Upon characterizing a sufficient number of containers from this population to generate 1-2 BDRs, INL-CCP must provide the list of characterized containers and an updated radiological characterization report. From this list, EPA will select a few containers for detailed review to verify that the additional containers belong to the approved waste stream. However, if the containers require new or different radionuclide scaling factors, the additional containers will be subjected to EPA's Tier 1 evaluation and approval prior to disposal at WIPP.

Conclusion

Based on the results of this evaluation, EPA is approving the T1 request for the Waste Stream ID-HFEF-S5400-RH with the limitations discussed above. This approval includes the use of the OSPREY™ system at INTEC for determining the fractional contributions of ^{60}Co and ^{137}Cs to a container's dose rate of HFEF Lot 1B containers.

5.0 FINDINGS AND CONCERNS

The EPA inspection team did not identify any findings or concerns related to AK or radiological characterization.

6.0 CONCLUSIONS

EPA concluded that the waste characterization processes of AK and radiological characterization proposed for use to characterize RH TRU wastes from INL-CCP are adequate. There are no open issues relative to this T1 evaluation.

Approval

EPA determined that the procedures and processes used by INL-CCP for the addition of 58 containers from Lot 1B to RH TRU Waste Stream ID-HFEF-S5400-RH and the operation of the OSPREY™ system were adequate. EPA, therefore, approves the addition of Lot 1B containers to Waste Stream ID-HFEF-S5400-RH and the OSPREY™ system as T1 changes to INL-CCP's RH baseline approval.

Tiering Changes

Based on the results of this T1 evaluation, there are changes to the tiering table by adding the following:

- One radiological characterization T1 change related to the use of a different gamma detector for the OSPREY™ system
- Two radiological characterization T2 changes as follows (1) requiring notification regarding the availability of a revised radiological characterization technical report associated with the addition of containers to the approved waste stream, and (2) providing radiological BDRs for additional containers.
- Three AK T2 changes requiring EPA notification when (1) additional containers characterized using the same scaling factors are added to the approved waste stream, (2) a revised AKSR addressing addition of containers to the approved waste streams and supporting source documents is complete and (3) Attachment 4 of CCP-TP-005 is updated to reflect the AKSR Source Document Reference List
- One VE/RTR T2 change requiring the submission of the appropriate BRDs for the population of waste containers that are being added to the approved waste stream

Addition of containers to the approved waste stream:

While previous Tier 1 changes adding RH waste streams have been container[5] limited, this approval is not limited to a specific number of waste containers in waste stream ID-HFEF-S5400-RH, Lot 1B. INL-CCP may add containers (as explained in Footnote 5, above) 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 1B), are technically appropriate for use in the Dose-to-Curie (DTC) determination of the radiological characterization of the additional containers.

Any addition of new containers to the approved waste streams must meet the revised INL-CCP tiering table including the following:

3. EPA notification: When notifying EPA, an INL-CCP must (a) identify the approximate number of additional containers **and** the approximate additional volume of waste, and (b) provide the timeframe for waste generation, characterization and disposal.

4. Submission of documents: Upon characterizing a sufficient number of containers to generate 1-2 Batch Data Reports, INL-CCP must provide the list of characterized containers and a revised AKSR and supporting source documents, and an updated radiological characterization report. If any of the documents are not changed, CBFO should make that clear to EPA. From this list, EPA may select a few containers for a detailed review to verify that the additional containers belong to the approved waste stream.

[5] 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.

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 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-A4-72
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 Addition of Waste Stream ID-HFEF-S5400-RH, Lot 1A	January 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-S5400-RH	August 2010	A-98-49, II-A4-130

ATTACHMENT B

LISTING OF DOCUMENTS REVIEWED FOR THIS EVALUATION

CCP-AK-INL-580, Central Characterization Project Acceptable Knowledge Summary Report For Remote-Handled Debris Waste From Materials and Fuels Complex Hot Fuel Examination Facility at the Idaho National Laboratory, Waste Stream ID-HFEF-S400-RH, Revision 2, June 1, 2010

CCP-AK-INL-581, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Debris Waste from the Hot Fuel Examination Facility (HFEF) at the Idaho National Laboratory, Revision 1, April 30, 2010

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 1, May 27, 2010

CCP-TP-504, CCP Dose-to-Curie Survey Procedure for Remote Handled Transuranic Waste, Revision 10, May 13, 2010

CCP-TP-005, Revision 18, CCP Acceptable Knowledge Documentation, Effective Date November 16, 2006, Attachment 4

C4096, Correspondence, E-mail to Jesse J. Klingensmith (AFS) and Irene Quintana, RE: EDF-8860 Markup, September 30, 2009

DR004, Liquids Identified in HFEF-5 Cans, Scott Smith, July 2010

Inter-Office Correspondence, From C. M. Gomez, to M. Sensibaug, Acceptable Knowledge Accuracy Report, Materials and Fuels Complex Hot Fuel Examination Facility at the Idaho National Laboratory, Waste Stream Number ID-HFEF-S5400-RH Lots 1-9, October 12, 2009

Inter-Office Correspondence, from H.J. Neeley to CCP Records, RE: Transmittal of Waste Stream Profile Form (Attachment 4) for ID-HFEF-S5400, February 23, 2010

M014, Miscellaneous, LANL RH TRU Radiological Characterization, Fuel Pin Composition Calculation, J. Vance, RH-Q4, February 22, 2006

M036, Miscellaneous, LANL RH TRU Radiological Characterization, Uncertainty Analysis, J. Vance, May 8, 2006

U285, Unpublished Documents, Logbook Documented Subassemblies Associated with Experiments, Experiment Sponsors, and Timeframes of Experiments, beginning in 1966 and ending in 1991. Sponsors Included: AIR-1, AIR-2, ANL, BCL, BMI, BNWL, EBR-II, EG&G, GE, HEDL, IFRO, INC, KAPL, LASL, MCT, NRL, NUMEC, ORNL, PNWL (PNL), RMMS, UNC, USNRL, WADCO, WAESD, WAPD, WARD, WHC, July 1991

U483, Unpublished Documents, HFEF Transuranic Waste Can Log Cards, Various Dates

U484, Unpublished Documents, Radioactive Scrap & Waste Storage/Disposal Request and Authorization Documents, Forms and Related Source Document Reference Information from 1978-1988, document is undated

U541, Unpublished Documents, Shipping Papers Gathered from MFC for ILTSF HFEF-5 Inserts, February 10, 1983

U551, Unpublished Documents, Compilation of HFEF Process Work Sheets and HFEF Procedure Change Notices; includes HFEF PWS Log, Various Dates

U552, Unpublished Documents, Compilation of MFC Liner Documents Source Document Reference Information, Various Authors and Dates

Calculation Package, HFEF Lot 1B Dose Fraction Uncertainty, INL-RH-110, Jesse J. Klingensmith, Revision 0, July 6, 2010

U856, Unpublished Documents, Calculation Package, Derivation of Burnup and Composition for Thorium Pins, Jene Vance, INL-RH-15, Revision 0, May 8, 2006

U843, Unpublished Documents, Calculation Package, Scaling Factors Development, James H. Holderness, INL-RH-02, Revision 0, June 5, 2006

U997, DTC Calculation Package, HFEF Lot IB DTC Spreadsheet, David W. Moody, INL-RH-69, Revision 0, April 29, 2010

Canberra Osprey™ Test Plan Summary Report, Performed 2010, Summary Prepared July 2010

DTC and OSPREY™ BDR No, INLRHDTC10010 – Container Nos. SN156A, SN156B, SN136A, SN158A, SN158B, SN136B, SN172A, SN172B, SN160A, SN160B

DTC and OSPREY™ BDR No. INLRHDTC10011 – Container Nos. SN173A, SN173B, SN144A, SN144B, N20A, N20B, SN157B, SN157B, SN145B, SN125B

CCP Operator Aid: RH-DM-INL-003, Revision 0, May 25, 2010

CCP Operator Aid: RH-DM-INL-002, Revision 11, March 11, 2010

RH Program – INL List of Qualified Individuals, 7-26-2010, 11:06 AM, pages 3 and 4

OSPREY System Operator/Independent Technical Reviewer (ITR) Qualification Card: Steven Corey Boland, 4 pages; James Roswell, 4 pages; Bryce Woodbury, 2 pages

Email Correspondence: W. Mueller to B. Woodbury and E. Gulbransen regarding La_3Br Efficiency, dated July 8, 2010

Email Correspondence: B. Woodbury to J. Klingensmith regarding Uncertainties for the DTC Spreadsheet, dated July 1, 2010

Email Correspondence: B. Woodbury to J. Klingensmith regarding HFEF Lot 1B DTC Uncertainty, dated June 30, 2010