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

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OFFICE OF
AIR AND RADIATION

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

Dear Mr. Mackie:

On February 8, 2010, the Carlsbad Field Office (CBFO) requested, as a Tier 1 (T1) change, that the U.S. Environmental Protection Agency (EPA) approve four (4) remote-handled (RH) transuranic (TRU) solid waste containers of Test Reactor Area (TRA) Sludge from Idaho National Laboratory (INL). EPA has reviewed the information provided and approves the addition of these containers from waste stream ID-RTC-S3000 and, as a result, INL may dispose of this waste at the Waste Isolation Pilot Plant (WIPP). This approval also allows future addition of waste to this stream with a waste pedigree (radiological and physical contents) similar to the waste approved in this letter. Any other additional S3000 waste must be approved by EPA using the Tier 1 process.

The enclosed report (EPA Docket No. A-98-49; II-A4-137) supports EPA's approval decision based on the information reviewed.

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

Sincerely,

Tom Peake

Tom Peake, Director
Center for Waste Management and Regulations

Enclosure

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EPA DOCKET NO: A-98-49, II-A4-137

WASTE CHARACTERIZATION REPORT

EPA TIER 1 EVALUATION OF THE CENTRAL CHARACTERIZATION PROJECT REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM AT THE IDAHO NATIONAL LABORATORY: ADDITION OF WASTE STREAM ID-RTC-S3000

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Center for Waste Management and Regulations
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November 2010

TABLE OF CONTENTS

Section		Page
Acronyms		ii
1.0	Executive Summary	1
2.0	Purpose of Tier 1 Evaluation	4
3.0	Purpose of This Report	4
4.0	Scope of the Tier 1 Evaluation	4
5.0	Evaluation of New Waste Stream ID-RTC-S3000	5
	5.1 Acceptable Knowledge	6
	5.2 Radiological Characterization	17
6.0	Summary of Results	23
7.0	Conclusions	24

ATTACHMENTS

Attachment A: Approval Summary for INL-CCP Remote-Handled Waste Characterization Program

Attachment B: Listing of Documents Reviewed for This Evaluation

ACRONYMS

AK	acceptable knowledge
AKE	acceptable knowledge expert
AKSR	acceptable knowledge summary report
Am	americium
ANL	Argonne National Laboratory
BDR	batch data report
CBFO	Carlsbad Area Field Office
CCP	Central Characterization Project
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
CTS	Catch Tank System
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
EDF	engineering design file
EPA	U.S. Environmental Protection Agency
Eu	europium
FGE	fissile gram equivalent
g/cm^3	grams per cubic centimeter
HFEF	Hot Fuel Examination Facility
HLW	high-level waste
HWS	Hot Waste System
ICP	inductively coupled plasma
ICP-MS	inductively coupled plasma - mass spectrometry

ID	Idaho
INEEL	Idaho National Environmental and Engineering Laboratory
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ITR	Independent Technical Review
IWTS	Integrated Waste Tracking System
LWA	Land Withdrawal Act
MFC	Materials and Fuel Complex
MFP	mixed fission products
mR/h	milliRoentgen per hour
MTR	Materials Test Reactor
nCi/g	nanocurie per gram
NCR	non-conformance report
NDA	nondestructive assay
NRF	Naval Reactors Facility
NWPA	Nuclear Waste Policy Act
ORIGEN	Oak Ridge Isotope Generation
pdf	portable document format
PE Ci	Pu equivalent curies
PTS	Project Tracking System
Pu	plutonium
QA	quality assurance
Rem	Roentgen Equivalent Man
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RH	remote-handled
RML	Radiation Measurements Laboratory
RPD	relative percent difference
RTC	Reactor Technology Complex
RTR	real-time radiography
SAP	Sampling and Analysis Plan
SNF	spent nuclear fuel
SPM	Site Project Manager

Sr	strontium
STR	submarine thermal reactor
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty
TRA	Test Reactor Area
TRU	transuranic
U	uranium
U.S.	United States
VE	visual examination
VCO	voluntary consent order
WC	waste characterization
WCPIP	Waste Characterization Program Implementation Program
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WMC	waste matrix code
WSPF	Waste Stream Profile Form
WWIS	WIPP Waste Information System
Y	yttrium

1.0 EXECUTIVE SUMMARY

This report supports the U.S. Environmental Protection Agency's (EPA's) approval of an additional remote-handled (RH) transuranic (TRU) sludge (S3000) waste stream from the Department of Energy's (DOE) Idaho National Laboratory (INL). Specifically, this approval supports the addition of Waste Stream ID-RTC-S3000.

On February 8, 2010, the Carlsbad Field Office (CBFO) requested that EPA review a proposed Tier 1 (T1) change approving the above waste stream. The Central Characterization Project (CCP) is responsible for characterizing RH wastes at INL using the system of controls, which EPA evaluated during the baseline inspection conducted in July 2006 and approved in January 2007. A summary of EPA's approvals of the INL-CCP RH TRU waste characterization program is included as Attachment A. Because there were no new equipment or processes changes on site at INL to examine, EPA conducted a desktop review of this change in August – September 2010.

Section 5.0 of this report presents the results of the T1 evaluation to add Waste Stream ID-RTC-S3000. EPA did not identify any findings or concerns during this evaluation. No open issues remain relative to this change. EPA did not identify any new T1 or Tier 2 (T2) changes during the course of this evaluation. Table 1 below identifies tiering changes that are applicable to the RH waste at INL. EPA determines that the EPA-approved procedures and processes used by INL-CCP for characterization of Waste Stream ID-RTC-S3000 are adequate. EPA, therefore, approves the addition of four 55-gallon containers[1] from Waste Stream ID-RTC-S3000 to INL-CCP's RH baseline approval as a T1 change. The T1 approval of any additional RH sludge waste streams, requires EPA approval. Also, CBFO and INL-CCP are required to submit a T1 change request and receive EPA approval prior to disposal at the Waste Isolation Pilot Plant (WIPP) of any additional containers belonging to ID-RTC-S3000 that were characterized using a different radiological characterization process and/or with different scaling factors. The addition of containers with the same pedigree and characterized using the same radiological characterization process and scaling factors as the approved waste stream, is a T2 change, as shown in Table 1 below. Minor grammatical changes were made to this table to better summarize the previous INL-CCP RH approvals.

[1] *Containers* is a generic term that 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 November 1, 2010)

RH Process Elements	INL-CCP RH WC Process - T1 Changes	INL-CCP RH Process - T2 Changes[2]
Acceptable Knowledge (AK)	Addition of containers to approved waste streams if new or different radionuclide scaling factors or a different radiological characterization process are required Any new RH waste streams not approved to date 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 updates to AK Summary Reports (AKSRs), Radiological Characterization Reports, and Confirmation Test Plans (e.g., CCP-AK-INL-500, CCP-AK-INL-501, and CCP-AK-INL-502) are approved by CBFO Notification to EPA when changes to AK documentation as a result of Waste Characterization Program Implementation Plan (WCPIP) revisions have been made (e.g., Characterization Reconciliation Reports (CRRs)) Notification to EPA when a Correlation or Surrogate Summary Form is completed for each of the RH containers in this waste stream identified as contact-handled (CH), based upon measured dose rates that present nondestructive assay (NDA) results for assayed containers Notification to EPA once waste stream data package for debris waste stream and any modifications to the Waste Stream Profile Form (WSPF), including the CRR and AKSR, are completed Notification to EPA that the final dose-to-curie (DTC) determination is complete for RH containers 728 through 737, as identified in AK Reference P030 AK accuracy reports (prepared annually, at a minimum) Notification to EPA when additional containers are added to RH TRU debris or sludge waste streams that have been approved to date and the containers were characterized using the same radionuclide scaling factors* Notification to EPA of availability of a revised AKSR and source documents supporting the addition of containers to the approved waste streams* Notification to EPA when Attachment 4 of CCP-TP-005 is generated to reflect the updated AKSR Source Document Reference List Notification of availability of additional discrepancy resolutions pertinent to Waste Stream IN-ID-NRF-153
Radiological Characterization, including DTC	Application of new scaling factors for isotopic determination other than those documented in CCP-AK-INL-501	Notification to EPA upon completion of revisions of CCP-AK-INL-501 or CCP-TP-504 that require CBFO approval

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

RH Process Elements	INL-CCP RH WC Process - T1 Changes	INL-CCP RH Process - T2 Changes[2]
	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 La3Br(Ce) detector observed in July 2010 Any new RH waste stream not approved to date or the addition of containers to an approved waste stream that requires changing the established radionuclide scaling factors or radiological characterization process	Notification to EPA of availability of a revised radiological characterization report, if required for the addition of containers to the approved waste streams* Radiological content data provided in batch data reports (BDRs) for the population of additional containers*
Visual Examination (VE)	VE using audio/video media to characterize additional debris or sludge waste streams other than those approved to date	Notification to EPA upon completion of changes to VE procedure(s) that require CBFO approval Physical content data provided in BDRs for the population of additional containers*
Real-Time Radiography (RTR)	Any new RH debris or sludge waste stream not approved to date 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.
- Notification to EPA is not necessary when document updates 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.

* These marked T2 changes apply when containers are added to any approved INL RH debris and sludge waste streams and are characterized using the same radionuclide scaling factors or radiological characterization process as were used to characterize the original approved waste stream. Unlike the other T2 change submissions done on a quarterly basis, EPA notification is required when the site identifies the need to characterize additional containers belonging to the approved waste stream. In addition, when available, CBFO must submit revised AKSR, new or revised source documents, and radiological, VE/ RTR BDRs, and other pertinent information documenting addition of containers to EPA for review.

2.0 PURPOSE OF TIER 1 EVALUATION

Certain changes to the waste characterization activities after 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 *Code of Federal Regulations* (CFR) 194.8 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. EPA reviews T2 changes on a quarterly basis, and EPA may conduct continued compliance inspections to evaluate implemented T2 changes to verify adequacy.

3.0 PURPOSE OF THIS REPORT

This report presents the results of EPA's evaluation of T1 changes to approve Waste Stream ID-RTC-S3000, containing four 55-gallon containers of RH TRU sludge waste (see Section 5.0, below), as described in CCP-AK-INL-520, Revision 1. This report presents the technical basis and results of EPA's approval decision, conveyed to DOE separately by letter. As discussed previously, EPA will also announce the decision on its website at www.epa.gov/radiation/WIPP, in accordance with 40 CFR 194.8(b)(3).

The DOE documents that EPA reviewed for this evaluation are listed at the end of the report. Any of these documents can be requested from the following:

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

4.0 SCOPE OF THE TIER 1 EVALUATION

This T1 evaluation encompassed the addition of INL RH Waste Stream ID-RTC-S3000, currently described by CBFO and INL-CCP as consisting of four 55-gallon drums.

The evaluation of this waste stream included two waste characterization areas: AK and radiological characterization. Table 2 lists participants in the T1 evaluation.

Table 2. Tier 1 Evaluation Participants

Name	Affiliation & Function
Edward Feltcorn	Lead Inspector, U.S. EPA
Rajani Joglekar	Inspector, U.S. EPA
Connie Walker	Technical Evaluator – AK, SC&A
Kira Darlow	Technical Evaluator – AK, SC&A
Patrick Kelly	Technical Evaluator – Radiological Characterization, SC&A
Amir Mobasheran	Technical Evaluator – Radiological Characterization, SC&A
Scott Smith	Acceptable Knowledge Expert, CCP
Mark Doherty	Acceptable Knowledge Expert, CCP
Irene Quintana	Site Project Manager, INL-CCP, WTS
Jene Vance	Radiological Characterization Subject Matter Expert, CCP
James Holderness	Radiological Characterization Subject Matter Expert, CCP

5.0 EVALUATION OF NEW WASTE STREAM ID-RTC-S3000

The Reactor Technology Complex (RTC), formerly the Test Reactor Area (TRA), is part of INL. Waste Stream ID-RTC-S3000 is composed of RH TRU inorganic sludge waste generated during the remediation and removal of the four Building TRA-630 catch tanks that composed the building's Catch Tank System (CTS). The four catch tanks were put into use in 1952, and waste was generated in 1987 when the tanks were cleaned out and replaced with the current tank vault (TRA-730) and four new tanks (TRA-730-1, -2, -3, and -4). The sludge from three of the TRA-630 tanks was determined to be low-level waste; however, the sludge from Catch Tank 2 was determined to be RH TRU waste. Waste Stream ID-RTC-S3000 consists of approximately 0.4 cubic meters of RH TRU inorganic sludge originating from Catch Tank 2. This waste was initially contained in two 55-gallon drums (TRA-88-21 and TRA-88-22). It was repacked into four 30-gallon drums (TRA-88-21A, TRA-88-21B, TRA-88-22A and TRA-88-22B) that were then placed into 55-gallon-drum overpacks, resulting in a waste stream of four 55-gallon drums. These four drums constitute the scope of this T1 evaluation. The waste is primarily contaminated with fissile materials and mixed fission products (MFP), with the predominant radionuclides by mass being uranium-235 (^{235}U) and uranium-238 (^{238}U). The majority of the drums' gamma activity is from cesium-137 (^{137}Cs), cobalt-60 (^{60}Co), americium-241 (^{241}Am), and europium-154 (^{154}Eu).

40 CFR 194.24(c) states that if AK data are used to quantify parameters, that data must be qualified by an acceptable method, including peer review, confirmatory testing, or demonstration of data acquisition under an equivalent quality assurance (QA) program. The WCPIP also allows the use of a combination of qualification methods, so INL-CCP used a combination of methods to obtain measurement data or to qualify the AK information when defining the isotopic ratios, physical form, and absence of residual liquids associated with this waste stream. Isotopic ratios were determined by sampling and analysis of sludge in the Catch Tank 2 containers. The values were used to derive ^{137}Cs scaling factors that were applied to the four 55-gallon drums. The

radiological sampling and analyses data were not used to "confirm" previous AK data but were implemented as a stand-alone measurement technique to obtain the necessary data for isotopic distribution determinations, scaling factors, and subsequent dose to curie (DTC) measurements. However, visual exam (VE) data were obtained and used to qualify previous AK physical form data. Prohibited items or excess liquids identified by quick screen radiography were remediated.

Documents, Waste Containers, and Batch Data Reports Reviewed

In conducting this T1 inspection, EPA examined the batch data reports (BDRs) presented in Table 3. Other documents reviewed are listed in Attachment B to this report.

Table 3. Batch Data Reports Examined

Drum Number	VE BDR Number	DTC BDR Number	Radiochemistry BDR Number
TRA-88-21A TRA-88-21B	RHINLVE100001	INLRHDTC10009	ALD09029A, ALD09029B, ALD09029G, ALD09029I_R1, ALD09029L, IDRH0904
TRA-88-22A TRA-88-22B	RHINLVE100001	INLRHDTC10009	ALD09029A, ALD09029B, ALD09029G, ALD09029I_R1, ALD09029L, IDRH0904

5.1 Acceptable Knowledge

EPA examined the AK process and associated information to approve the T1 request for RH Waste Stream ID-RTC-S3000.

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
- Sampling Plan and use of AK data
- Identification of high-level waste and spent nuclear fuel
- AK documentation and assembly of required information, including the acceptable knowledge summary report (AKSR) and adequacy of the RH TRU WCPIP AK process implementation
- AK data traceability
- AK source document sufficiency
- WCPIP interpretation, including AK qualification, and Certification Plan/Confirmation Test Plan (CTP) preparation/adequacy
- Waste Stream Profile form (WSPF) and CRR adequacy

- Correlation Surrogate Summary Form (CSSF) and CH-RH correlation
- Personnel training
- Nonconformance reports (NCRs) and AK discrepancy resolution forms
- AK accuracy
- Defense determination
- Load management
- Data Quality Objectives (DQOs) attained through AK qualification or other means

Technical Evaluation

(1) Waste Stream ID-RTC-S3000 was examined with respect to waste stream definition and was found to be adequate.

The WCPIP, Revision 0, 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." EPA evaluated the waste stream against this definition to determine whether the processes and activities associated with waste generation were adequately addressed, and to determine whether the physical, chemical, and radiological composition of the stream was adequately defined.

The processes contributing to sludge deposition in and removal from the CTS are well documented in the AKSR and related source documents. The AKSR states that Waste Stream ID-RTC-S3000 is composed of sludges that originated from the TRA-630 facility CTS. The TRA-630 CTS was used to manage radioactive wastewater from the Materials Test Reactor (MTR) in Building TRA-603, the Radiochemistry Laboratories and the Vent Scrubber (TRA-604), the RTC Hot Cells (TRA-632), the Reactor Services Building (TRA-635), and the laboratories in the Alpha Wing (TRA-661). Wastewater from these areas was routed to the CTS, which in turn discharged to other wastewater treatment facilities based on the wastewater's radioactivity content (C079, P001, P007, P009, P011, P014, P015, P017, P021, P027, P028, P054, P074, P093, P151, P209, U002, U052). The original CTS was composed of four catch tanks (1-4). According to the AKSR (Revision 1) and source documents (e.g., P054), Catch Tanks 1 and 2 collected waste primarily from the reactor drain tank located in TRA-603. Catch Tanks 3 and 4 collected waste from TRA-632, TRA-635, TRA-604, and TRA-661. In 1981, the original TRA-630 CTS Tanks 1 and 2 were reconfigured to accept waste generated only from the RTC Hot Cells, and discharge from the MTR Building was diverted to Catch Tanks 3 and 4. INL-CCP stated that the tanks were controlled by valves to allow any tank to receive wastewater from any of these facilities (P007 and U002), or to transfer the wastewater between the tanks, thus introducing the possibility of cross contamination between the catch tanks (C253).

EPA evaluated radiological data to see if they support the waste stream definition. The AKSR includes radiological data for all catch tanks from the sampling events in 1986, 1999, and 2002. However, these data were not used directly and INL-CCP sampled and analyzed the waste sludge and developed scaling factors from the analytical data. Data from the three catch tank sampling events show relatively good correlation and provide a sufficient understanding of the general radiological composition of Catch Tanks 1-4. The Catch Tank 2 sampling data obtained by INL-CCP provide a good understanding of the radiological composition of the current waste stream.

When taken as a whole, the AKSR, Radiological Characterization Report, Certification Plan, and source document references (e.g., C252) did not present a sufficiently clear picture of the waste stream. Specifically, the AKSR infers that the two original drums in the waste stream originated from Catch Tanks 1–4, but other source documents indicate the two drums originated only from Catch Tank 2 (e.g., C252). However, INL-CCP submitted freeze file[2] changes (C253) to the AKSR that explained the waste stream determination.

INL-CCP originally determined that the waste stream included all 11 drums generated from the clean-out of the CTS in 1987, and the general radiological information presented in the AKSR applies to all 11 containers (e.g., Table 6 in the AKSR). However, INL-CCP later determined that only two of the original 11 drums were RH TRU waste, so the waste stream volume was reduced to these two drums, which were later repackaged into four drums. Also, the drums contained sludge sourced from Catch Tank 2, as discussed in CCP-AK-INL-521 and reference C252. Therefore, this approval is limited to the approximately 0.4 cubic meters of RH TRU inorganic sludge originating from Catch Tank 2 that was initially contained in two 55-gallon drums that have been repackaged into four 55-gallon drums.

Based on the information reviewed and modifications to the AKSR presented in freeze file reference C253, the waste stream has been adequately defined. EPA concluded that the AKSR will be sufficient upon inclusion of the revision and expects a formal revision of the AKSR to be completed prior to INL-CCP's first quarter 2011 submission of T2 changes to EPA for review and concurrence. Notification of changes to the AKSR after integration of the freeze file is a T2 change. Consistent with the approach defined above to make addition of containers with different pedigrees a T1 change, the addition of any containers to the waste stream beyond the four repackaged 55-gallon drums from Catch Tank 2 is a T1 change.

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

Waste Stream ID-RTC-S3000 is composed of catch tank sludge that is contaminated by radionuclides from various sources. The contact radiation readings of the catch tanks varied from 150 milliRem per hour (mrem/h) to 2,500 mR/h (C079, C133, P011, P014, P208, P209, P211, and P236). As described above, sludges from each tank were analyzed in 1986 for alpha, gamma and beta radioactivity (Table 5 of the AKSR, C079, C133, P208, P211, P236, U052, U115, U116, and U117). The original CTS tanks were replaced in 1987–1988, and wastes from the replacement tanks were sampled in 1999 and 2002 (P092, P236). INL-CCP compared the data and concluded that the 1986 data and the 1999/2002 data are statistically consistent for Catch

[2] *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.

Tanks 1–4 as a whole, so INL-CCP used the older data to generate the estimated radiological distribution for Waste Stream ID-RTC-S3000 presented in Table 6 of the AKSR. The two predominant radionuclides by weight are ^{235}U and ^{238}U, and the two predominant radionuclides by activity are ^{137}Cs and ^{60}Co. Over 95 percent of the total activity in the waste stream is from ^{137}Cs, ^{60}Co, ^{241}Am, and ^{154}Eu. EPA concludes that the radiological information obtained by sampling the Catch Tank 2 containers reflects the composition of the sampled containers, and additional justification and analysis are required if INL-CCP wishes to consider these to be representative of all catch tank wastes.

The radiological composition of Waste Stream ID-RTC-3000 is adequately presented in the AK record and in INL-CCP sampling and analysis records. Table 6 of the AKSR reflects the overall composition of the sludge in Catch Tanks 1–4, while the radiological information presented in reference C252 and CCP-AK-INL-521, Revision 0, are specific to Catch Tank 2 sludge. Notification of availability of future revisions to CCP-AK-INL-521 is a T2 change, as stated previously in the INL RH baseline inspection report.

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

Waste Stream ID-RTC-S3000 is composed primarily of inorganic sludges from the TRA-630 catch tanks. Sludges were removed from the tanks by spraying water into the tanks and draining the tank slurry into filter socks. The filter socks were then tied off and allowed to drain (C079, C133, P007, P208, P211, P236, and U093). INL-CCP determined that the waste consists predominantly of homogeneous inorganic solids, but it may also contain limited amounts of heterogeneous debris generated during sludge remediation, including cellulosics (e.g., the filter socks themselves, wipes, personal protective equipment), plastics (e.g., hose, rope, sheeting, tape), rubber (e.g., gloves), and glass (e.g., sample bottles). Sorbent was added to the waste when it was originally packaged in 1987 for liquid adsorption (C123, C129, DR004, C133, P208, and P211), and the waste stream was assigned Waste Matrix Code (WMC) S3120, Inorganic Sludges.

INL-CCP estimated the waste material parameter weights for the waste stream based on Fast Scan RTR records (U152) performed in 2008, which showed the drums were composed of a 50-gallon poly container that contained sludge (90–98%) and metal wire (2–8%), with some sorbent. Drum 88-21 contained a glass jar with 2 tablespoons liquid, and drum 88-22 contained one cup of liquid; No-Char was added as a sorbent to the drums prior to repackaging. The drums underwent subsequent VE when the two original drums were repackaged into four separate drums. Examination of the associated BDRs confirmed that the physical composition of the drums corresponds to the description in the AKSR, and the physical composition of the stream is well defined.

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

INL-CCP provided a freeze file modification to the AKSR (C253) that clarified how it determined the waste stream did not contain spent nuclear fuel or high-level waste. This freeze file change states that the WIPP *Land Withdrawal Act* (LWA) prohibits the disposal of spent nuclear fuel and high-level waste as defined by the *Nuclear Waste Policy Act of 1982* (NWPA), which states that spent nuclear fuel is "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing." DOE M 435.1-1, *DOE Radioactive Waste Management Manual*, expands on this definition to clarify 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 requirements of this Order when it is technically infeasible, cost prohibitive, or would increase worker exposure to separate the remaining test specimens from other contaminated material." The NWPA defines high-level waste as "the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation."

INL-CCP concluded that Waste Stream ID-RTC-S3000 consists of materials that originated from test reactors that were operated for research and development (R&D) purposes only. For example, the MTR was a test reactor that operated for R&D only and contributed contamination to Catch Tank 2 sludge directly in the form of contaminated cooling or decontamination water. Further, wastes generated from laboratory or hot cell operations with irradiated fuel or sample materials were also considered to be test samples or to have originated from test reactors that were operated for R&D only. INL-CCP concluded that since the waste stream does not contain irradiated fuel elements withdrawn from a reactor, the waste was not spent nuclear fuel and none of the laboratory, hot cell, and maintenance operations contributing wastewater to the CTS involved reprocessing of constituent elements from reactor fuel. INL-CCP cited several references (C079, C136, C137, C145, P002, P011, P054, P071, P088, and P098) that document the activities of the hot cells, laboratories, reactor use, and tank remediation. Reference C136 is an interview with three INL employees who are familiar with generation of the TRA sludge. The individuals indicated that "[none] of the waste generated from CTS or Hot Waste System (HWS) remediation and removal operations is classified as high-level waste or spent nuclear fuel. No fuel reprocessing was conducted in the facilities with liquid wastewater inputs to the CTS or HWS. The only irradiated fuel processing/handling in RTC facilities consists of fuel pin disassembly and destructive sample preparation and analysis conducted in the RTC Hot Cells facility." INL-CCP concludes that the waste is not spent nuclear fuel, high-level waste, or a waste historically managed as high-level waste, and is eligible for disposal at the WIPP as RH TRU waste. EPA accepts INL-CCP's conclusion.

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

EPA found that CCP-AK-INL-520, Revision 1, did not adequately define the waste stream or address high-level waste and spent nuclear fuel, as discussed above. Specifically, the AKSR did not adequately address the evolution of the four drums that originated from Catch Tank 2 and did not provide sufficient detail about the fuel pin origin, pin testing, and potential generation of spent nuclear fuel and high-level waste. INL-CCP prepared a freeze file modification (C253) that better explained waste flow, as well as why the waste stream now contains only four drums originating from two Catch Tank 2 drums. The freeze file mentioned above also better justifies the spent nuclear fuel and high-level waste exclusions, as required under the LWA. With the proposed modifications, the AKSR is adequate. See item (1), above.

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

The traceability of radiological data from the original drum records through various RTR activities and subsequent repackaging VE was evaluated for the two original Catch Tank 2 drums, as presented below in Table 4. INL-CCP stated there was little original paperwork associated with the original packaging event, even though the catch tanks were sampled in 1986 and abundant data are available that summarize this sampling event (e.g., C079, C133, U052). Documentation presented above shows that drum data are traceable, particularly since 2008 when the drums underwent Quick Scan RTR, repackaging, and VE. Drums were tracked using the site Integrated Waste Tracking System (IWTS) (U175) and are currently tracked in INL-CCP's Project Tracking System (PTS). EPA concluded that data traceability was adequate.

Table 4. Data Traceability for Catch Tank 2 Drums

Drums	Original Drum Tracking Reference	Additional Catch Tank 2 Transfer or Packaging Records Reference	Prescreen or Quick Scan RTR Reference	CCP Radiological Sampling Reference	Repackaging Records Reference	VE BDRs
TRA-88-21	C079 p. 9-11 of pdf, Uniform Hazardous Waste Manifest, 1990	C123, Waste Profile Statement, TRA-88-21, 1990	RH TRU RTR Prescreen for Repackaging/ AK Worksheet, Form 828, Reference U152, 2008	C252, Analysis of Sample Data for RH TRU Waste Stream ID-RTC-S3000, 2010	RH TRU Repackaging Data Sheet--FRM-880s, Reference U201, 2010. Repackaged to generate drums TRA-88-21A and TRA-88-21B	RHINLVE100001, 2010, includes both drums TRA-88-21A and TRA-88-21B
TRA-88-22	C079 p. 9-11 of pdf, Uniform Hazardous Waste Manifest, 1990	C123, Waste Profile Statement, TRA-88-22, 1990	RH TRU RTR Prescreen for Repackaging/ AK Worksheet, Form 828 Reference U152 p. 4, 2008	C252, Analysis of Sample Data for RH TRU Waste Stream ID-RTC-S3000, 2010	RH TRU Repackaging Data Sheet FRM-880s, Reference U201, 2010. Repackaged to generate drums TRA-88-22A and TRA-88-22B	RHINLVE100001, 2010, includes both drums TRA-88-22A and TRA-88-22B

(7) Sufficiency of Acceptable Knowledge support documents and related document tracking was evaluated and found to be adequate.

Examination of Attachment 4; reference lists in CCP-AK-INL-520, Revision 1, and CCP-AK-INL-521, Revision 0; in combination with references provided during the T1 review indicate that references are to be added to the AK record, and other references will be updated. For example, the FRM-880s relevant to repackaging are to be added to the reference list, and reference U152 is to be updated. EPA expects the AKSR and Attachment 4 to be updated to include all relevant references, including any references cited within CCP-AK-INL-521. The AKSR reference list will be updated in conjunction with text modifications [see item (1), above]. Notification of availability of updates to Attachment 4 remains a T2 change, as stated previously in the INL RH baseline inspection report.

(8) Interpretation of the Waste Characterization Program Implementation Program, with respect to contents of the Certification Plan and the Confirmatory Test Plan, was evaluated and found to be adequate, including mandatory content and the use of sampling data.

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 CTP when this plan is required as part of the AK qualification process. EPA intended 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.

CCP-AK-INL-522, Revision 1, explains that INL-CCP intended to use a combination of methods to qualify the AK information defining the radionuclide ratios, physical form, and absence of prohibited items associated with this waste stream. CCP-AK-INL-522, Revision 1, states that AK determination of physical form and prohibited items will be qualified using either radiography or VE, which will also be used to determine that packaging DQOs are met. Prescreening with radiography has identified liquids, and some remediation is expected. The DQO for defense determination is met solely through documented AK information compiled and reported using the procedure found in Attachment A of the WCPIP, Revision 0d.

Radiological components and, in particular, establishment of the isotopic distribution, were determined through sampling of sludge data and were not used to confirm existing AK data. Instead, sampling and analysis was a stand-alone effort designed to characterize the two drums that were included in the sampling program. While the AK record includes 1986 sampling and analysis data specific to each of the catch tanks (Table 5 of the AKSR), the data were not collected under an approved QA program, so attempts to use this information were unsuccessful. INL-CCP did not elect to confirm any previous analytical data by sampling and analysis, but instead chose to characterize the two drums without associating these values with the AK record, other than to use AK information to determine the sample population size. The sludge sampling plan (CCP-AK-INL-525, Revision 0 or SAP) was prepared in November 2009, and EPA did not review the plan prior to implementation. The sample process is described in CCP-AK-INL-525, Revision 0. INL-CCP concluded that samples collected were representative of the two Catch Tank 2 drums, and EPA agrees with this determination.

Although not directly referenced in the Certification Plan, results of the sample analyses were summarized and interpreted in reference C252, which presents an extensive evaluation of the analytical data, as discussed in detail in Section 5.2. Reference C252 concluded that sampling was executed in accordance with the SAP, and the samples were representative of the two original drums and provided an adequate basis for the characterization of the waste stream, assuming that the waste stream includes only those two drums. EPA agrees with this determination.

EPA identified several inconsistencies in CCP-AK-INL-522, Revision 1, with respect to how the waste stream was presented and how radiological characterization was to be accomplished. INL-CCP addressed these concerns through freeze file modifications. EPA evaluated the Certification Plan and CTP to determine whether INL-CCP included the specific elements as defined in the WCPIP. When evaluated as a whole, CCP-AK-INL-522, Revision 1; CCP-AK-INL-525, Revision 0; reference C252; CCP-AK-INL-520, Revision 1; the freeze file change (C253); and the supporting source documents indicate that the DQOs, as specified in the WCPIP, have been met. EPA finds that CCP-AK-INL-522 will be sufficient upon inclusion of the revisions and expects a formal revision of this document be completed prior to the INL-CCPs first quarter 2011 submission of T2 changes to EPA for review and concurrence.

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

INL-CCP representatives provided a draft WSPF for inspection purposes only, without the required signatures or attachments. The document was not complete; for example, it did not include all necessary program information. See item (1) above for more information about the waste stream. Because there are inconsistencies between source documents and references about the different catch tank sources for the waste stream, and because the sampling clearly applies to the two drums (repackaged into four) from Catch Tank 2 alone, EPA's approval is limited to containers sourced from Catch Tank 2. Notification of availability of the final WSPF remains a T2 change, as stated previously in the INL RH baseline inspection report.

EPA examined the content of the CRR to ensure that it reflected requirements of CCP-TP-506, *CCP Preparation of the Remote-Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report*. Specifically, EPA evaluated the CRR to determine the completeness and adequacy of its contents, as required in the WCPIP, and found it to be adequate. The CRR addresses only the four containers originating from Catch Tank 2. Notification of availability of a final and/or revised CRR remains a T2 change, as stated previously in the INL RH baseline inspection report.

(10) Use of a Correlation and Surrogate Summary Form was evaluated and 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. INL-CCP indicated that CH data were not used in this manner, so a CSSF was not required for this waste stream.

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

EPA reviewed training records for Scott Smith [AK expert (AKE)], Mike Papp (who authored several source documents), and Hillary Neely (site project manager). Jim Holderness prepared the sampling memorandum, and Jene Vance prepared the Radiological Characterization Report; while both interpreted AK data, their training records were examined as part of EPA's radiological characterization analyses. EPA reviewed the AKE and RH Qualification Cards for Mr. Smith, but neither showed that he has had WCPIP or EPA regulation training. Training records for Ms. Neely and Mr. Papp showed they were trained to the WCPIP and had some on-the-job training with respect to EPA requirements. There is no documentation to indicate that INL-CCP individuals are trained to all EPA requirements, nor that they are trained with respect to radiological characterization aspects, both of which are required in the WCPIP. Since the WCPIP is currently under revision, EPA will examine future training against the modified WCPIP. However, EPA expects to be able to see documentation that all AKEs and other individuals who prepared, edited, contributed to, or signed off on AK-related documents have up-to-date training on the WCPIP and its requirements, as well as related AK procedures.

(12) Non-conformance Reports and Discrepancy Resolution Forms were examined and found to be adequate.

INL-CCP provided three discrepancy resolution (DR) reports. DR002 deals with assignment of *Resource Conservation and Recovery Act* (RCRA) hazardous waste numbers, as does DR003. DR004 addresses the discovery of absorbent on top of waste, which was not included in the AK record. Notification of the availability of additional DR Forms pertinent to this waste stream is a T2 change, as stated previously in the INL RH baseline inspection report.

INL-CCP provided a single example NCR. NCR-RHINL-0200-09 was issued because Container TRA-88-12 had too much absorbent above the waste, so that waste contents could not be reached for RCRA sampling. The BDRs provided did not include any NCRs.

Preparation of NCRs and DR Forms was adequate.

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

The AK accuracy report for Waste Stream ID-RTC-S3000, Lot 1, consists of four RH TRU containers. The AKSR did not include any radiological comparisons based on INL-CCP sampling because INL-CCP chose not to use these data to qualify AK. INL-CCP contends that comparison of AK data against measurement information is not required when the measurement data are not used to confirm AK. While not the intent of the WCPIP, the WCPIP (Revision 0d) uses the term "confirmation" in the AK accuracy section, so EPA will not require revision of the AK accuracy report. However, the WCPIP has been revised, and EPA will examine this document with respect to this interpretation and the intended comparison in forthcoming inspections under the new WCPIP. Any revision of the AK accuracy report remains a T2 change, as stated previously in the INL RH baseline inspection report.

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

The WIPP requires generator sites to use AK to determine that a TRU waste stream meets the definition of TRU defense waste. TRU waste is eligible for disposal at the WIPP if it has been generated in whole or in part by one of the atomic energy defense activities listed in Section 10101(3) of the NWPA. INL-CCP presented references and data that indicate the TRA sludges are contaminated with materials from atomic energy defense activities associated with naval reactors development, materials security and safeguards, and defense R&D activities. For example, the MTR was built solely for testing materials and was used for experiments related to the U.S. Navy, Army, and Air Force. Research performed at RTC-sourced facilities included defense-related Hanford fuel element design and performance (P071, P054). The AKSR lists a number of defense-related experiments performed in buildings, reactors, or laboratories that provided liquid to the catch basins, including Catch Tank 2. These include, but are not limited to, the following:

- Samples for Westinghouse in support of the development, design, and construction of the submarine thermal reactor (STR), later named S1W, a land-based prototype water-cooled reactor power plant suitable for submarine propulsion. The STR was located at the Naval Reactors Facility (NRF) and was the prototype reactor for the *USS Nautilus*.
- Aerojet General Nucleonics-302, related to U.S. Army portable and stationary reactor designs.
- Knolls Atomic Power Laboratory L-42, an experimental loop related to R&D of nuclear propulsion for the U.S. Navy.

The AKSR also states that the RTC Hot Cells provided examination of fuels from a variety of defense-related sources and included fuel examination by methods that generated wastewater. The AKSR does state that later missions of the hot cells during the late 1980s and 1990s were commercial in nature, but activities performed when the cells provided wastewater to the original CTS included defense support activities (P054). Examples of defense-related Hot Cell work include the following:

- Gas-Cooled Reactor Experiment Fuel Specimens Identified in Hot Cell #2 Logbook from May 1961 to January 1963. Work included labeling, etching, hardness testing, and photographing.
- Bettis Atomic Power Laboratory Target Fabrication Line 3&6 16700-510-804. Identified in Hot Cell #2 Logbook from March to April 1978. Work included grinding, sectioning, scanning, polishing, and etching.
- Naval Reactors Facility hot-die-size element 81-1, identified in Hot Cell #2 Logbook from October 1980. Sample identification indicates that the sample came from the Naval Reactor Facility.

The AKSR concludes that as a result of the inherent commingling of materials originating from the numerous defense activities, segregation of non-defense wastes stream is not possible. Therefore, Waste Stream ID-RTC-S3000 is eligible for disposal at the WIPP as a commingled defense waste stream generated "in part" by atomic energy defense activities. EPA accepts these arguments.

(15) Load management was assessed and determined not to apply to this waste stream.

INL-CCP indicated that load management will not be performed for this waste stream. Implementation of load management remains a T1 change, as stated previously in the INL RH baseline inspection report.

(16) Attainment of Data Quality Objectives (DQO) through Acceptable Knowledge qualification was evaluated and found to be adequate.

As a result of the analysis presented in items (1)-(15) above, EPA was able to assess how each 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-520, Revision 1; CCP-AK-INL-521, Revision 0; CCP-AK-INL-562, Revision 1; and the supporting source documents presented in Attachment B of this report indicate that the DQOs, as specified in the WCPIP, have been met.

Summary of Results

Findings or Concerns

The EPA Inspection Team did not identify any findings or concerns relative to Waste Stream ID-RTC-S3000, which was the subject of this T1 change evaluation.

Tiering Changes

Based on this evaluation, there are no changes to the AK T1 and T2 designations identified during the Baseline Inspection and subsequent T1 evaluations.

Conclusions

Based on the results of this evaluation, EPA is approving the T1 request for Waste Stream ID-RTC-S3000, with the limitations discussed previously.

5.2 Radiological Characterization

EPA examined the radiological characterization process and associated information to determine whether INL-CCP demonstrated compliance with 40 CFR 194.8 for RH Waste Stream ID-RTC-S3000.

Radiological Characterization Overview

The approach to the characterization of the ID-RTC-S3000 waste drums is DTC in conjunction with radionuclide-specific scaling factors, a technique that EPA has observed and approved at several RH TRU sites previously. However, the absence of detailed information on the materials examined and the potential for the separation of ^{137}Cs in wastewater prevented the development of ^{137}Cs-based scaling factors using ORIGEN as has been done for other wastes. Specifically, there was a potential depletion of ^{137}Cs because of its greater solubility relative to the other reportable radionuclides, considering that water was used in removing the sludge from the tanks. Instead, sample collection and analysis were the only viable methods and the radionuclides of interest in each sample were identified and quantified by radiochemistry and mass spectrometry. A single set of ^{137}Cs-based scaling factors was developed for the radiological characterization of the waste stream.

An overview of the radiological characterization process used for the ID-RTC-S3000 waste is provided in Figure 1, below, which is the enhanced version of the flow diagram provided in Figure 2-1 of CCP-AK-INL-521, Revision 0.

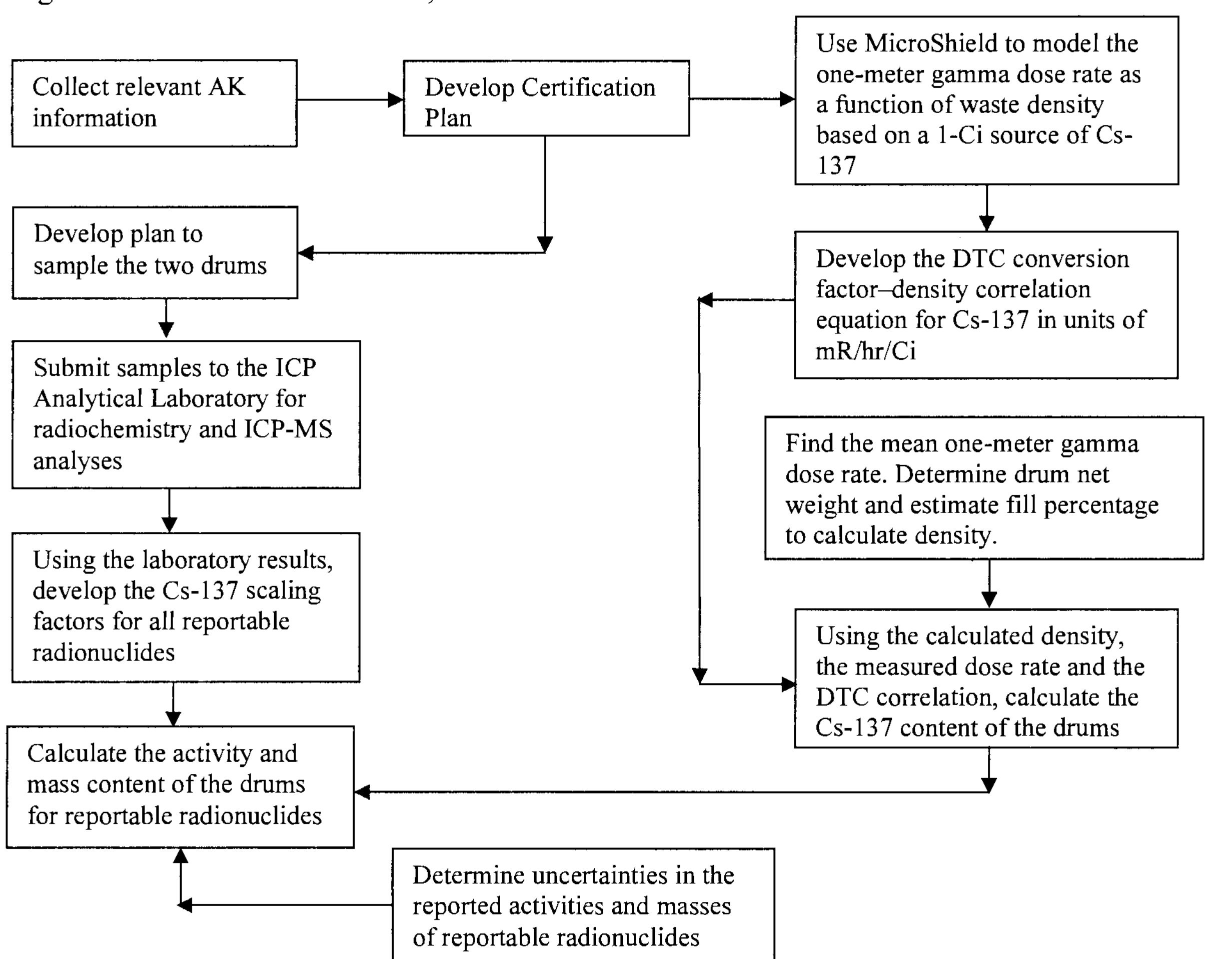

Figure 1. Flow Diagram of the Radiological Characterization Process, Waste Stream ID-RTC-S3000

Documents Reviewed

To support this T1 evaluation, EPA examined the documents related to the INL-CCP RH TRU radiological characterization program listed in Attachment B to this report.

Technical Evaluation

EPA evaluated the characterization method used for the TRA RH TRU sludge waste for technical adequacy, 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. During this T1 evaluation, EPA examined the following elements of the INL-CCP radiological characterization program:

(1) The EPA inspection team evaluated the sampling method applied to obtain samples from the existing two 55-gallon drums containing the inorganic sludge waste and found them to be adequate.

Five grab samples (including one "co-located sample") were collected from the two drums. Two primary samples were taken from drum TRA-88-22, a "co-located" sample from drum TRA-88-22, and two more primary samples from drum TRA-88-21. The physical condition of the waste and the sampling method employed (collecting two scoops of sludge from each drum) resulted in representative samples from the sludge waste. The sampling and the analysis of sample data are explained in a memorandum from J. Holderness to Irene Quintana, dated February 21, 2010, as listed in Attachment B to this report. The sampling analysis results were used to determine the ^{137}Cs-based scaling factors for the five samples. The scaling factors correlate a waste drum's measurable ^{137}Cs gamma dose and waste density to quantify specific radionuclides in each of the four repackaged waste drums. These activities are documented in the sample-specific calculation packages listed in Attachment B. The development of the ^{137}Cs-based scaling factors was supported by the following sources of information:

- Radiochemistry and mass spectrometry measurements made on all of the samples
- Scaling factors obtained from the sampling results

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

- Activity in curies (Ci) and mass in grams (g) for each of the 10 WIPP-tracked radionuclides (i.e., ^{137}Cs, ^{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

- Plutonium equivalent curies (PE Ci)
- Decay heat in watts
- Fissile gram equivalent (FGE)

The constants and other values required for these calculations were taken from the appropriate sources (Reference 13 in CCP-AK-INL-521, Rev 0) and were spot-checked for accuracy. Individual shielding calculations were performed using MicroShield® with the 1-curie source of ^{137}Cs uniformly distributed throughout a 55-gallon waste drum, using the geometry of a 30-gallon drum inside of a 55-gallon drum that will be used for packaging the RH TRU sludge waste, for a range of waste densities from 0.2 g/cm^3 to 1.8 g/cm^3 in increments of 0.2 g/cm^3. The results were then used to derive a DTC correlation as a function of density for ^{137}Cs, as shown in CCP-AK-INL-521, Revision 0, Figure 5-1. The actual DTC calculations are performed using an Excel spreadsheet where the input includes the following:

- Container identification number
- Dose rate measurement date
- Container gross weight
- Estimated 30-gallon drum fill height in percent
- Four external dose rate measurements

There were no concerns regarding the correlation of waste records for the four 55-gallon drums constituting Waste Stream ID-RTC-S3000.

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

EPA evaluated the following aspects:

- Activity values were derived from statistical metrics using the mean and standard deviation values for each radionuclide
- Adequacy of the number of samples for the homogeneous waste
- 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.), when needed, 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 for the Waste Stream ID-RTC-S3000)
- Potential contributions of the short-lived radionuclides to the total measured dose rate
- Compliance with the INL-CCP procedure for dose measurements (CCP-TP-504, Revision 9)
- Activity and uncertainty values determined for the 10 WIPP-tracked radionuclides

- The determination of the contribution of all radionuclides to the radiological hazard[3]

Table 5 shows the radionuclide-specific scaling factors developed for Waste Stream ID-RTC-S3000, taken from INL-RH-106.

Table 5. Radionuclide-Specific Scaling Factors

Radionuclide	^{137}Cs-Based DTC Scaling Factor
^{233}U	6.82E-05
^{234}U	1.96E-04
^{235}U	1.24E-05
^{238}U	2.69E-05
^{238}Pu	8.19E-03
^{239}Pu	5.42E-03
^{240}Pu	3.94E-03
^{241}Pu	9.68E-02
^{242}Pu	5.98E-06
^{241}Am	2.06E-02
^{137}Cs	1.00E+00
^{137m}Ba	9.46E-01
^{90}Sr	4.23E-01
^{90}Y	4.23E-01

There are no issues related to the technical adequacy or documentation of radionuclide scaling factors for Waste Stream ID-RTC-S3000.

(3) The technical basis of the DTC correlation and its documentation were evaluated and both aspects were acceptable.

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 Waste Stream ID-RTC-S300 contained in INL-RH-106 and Table 5, above). There were no issues related to the DTC correlation and its documentation for Waste Stream ID-RTC-S3000.

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

CCP-AK-INL-521 is the main document that describes the radiological characterization process that INL-CCP used for Waste Stream ID-RTC-S3000. This document is supported by a series of six calculation packages that had been prepared and reviewed initially by Jene Vance and Jim Holderness, listed in Attachment 1 to CCP-AK-INL-521. EPA found that the calculation packages cited above adequately supported the activities upon which the radiological

[3] 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.

characterization of the four drums in Waste Stream ID-RTC-S3000 was based. There were no issues related to the documentation of technical aspects of the INL-CCP radiological characterization approach for the four drums in Waste Stream ID-RTC-S3000.

(5) The laboratory radiochemical and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) analyses were evaluated for technical adequacy and were acceptable to support the development of radionuclide scaling factors.

The sampling was executed in accordance with the sampling and analysis plan (SAP) and provided sufficient information to use as the basis for deriving scaling factors for all reportable radionuclides. The sample results indicate that the only contributors to the gamma dose rate are ^{137}Cs, ^{60}Co, ^{154}Eu, and ^{155}Eu, while the only significant contributor is ^{137}Cs. The scaling factors derived from the sample data exhibit relatively small variations that can be represented equally well with the assumption of a normal or lognormal distribution. There is very little drum-to-drum variation, and a single set of scaling factors can be used to characterize the four containers from this waste stream. The number of samples taken was sufficient to meet the performance criterion that the uncertainty in the sample mean scaling factor should be less than or equal to a factor of two, evaluated at the one standard deviation level. With the exception of ^{241}Pu and the "co-located" sample, all of the objectives of the SAP have been met. The accuracy QA objective was not met for ^{241}Pu since ^{241}Pu is not a TRU radionuclide, and the reported results can be used without significantly affecting the radiological characterization. The "co-located" sample, required by CBFO, did not meet the specified criterion that scaling factors should agree to within $\pm$25%. While this is not a problem for the radiological characterization effort since these samples could hardly be expected to be true duplicates, the SAP states that an NCR should be issued. Precision was assessed via the comparison of laboratory duplicates and scaling factors using the relative percent difference (RPD), defined as the difference between two values divided by one-half their sum. There are no concerns regarding the technical adequacy of the sample analytical results to support the development of radionuclide scaling factors for the four drums in Waste Stream ID-RTC-S3000.

(6) The technical basis of the Dose-To-Curie (DTC) correlation and its documentation were evaluated and found to be adequate.

The DTC determinations for all four drums are documented in a single DTC BDR, INLRHDTC1009, 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 appropriate radionuclide scaling factors that were developed for the four drums in Waste Stream ID-RTC-S3000). EPA technical personnel verified that the DTC BDR included the following:

- BDR Cover Sheet, Attachment 4
- BDR Table of Contents, Attachment 5
- BDR Narrative Summary, Attachment 6
- Independent Technical review (ITR) Review Checklist, Attachment 7
- Measurement Control Report, Attachment 1
- Container Data Sheets, Attachment 2

- Waste Container DTC Conversion Records, Attachment 3, with four dose rate measurements and their average, date of measurements and container weights
- Evidence of the current version of CCP-TP-504, Revision 9
- Evidence of signatures by the ITR and a site project manager (SPM)
- Type of waste in each container, cement
- 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 the four drums in Waste Stream ID-RTC-S3000.

(7) Remote-handled and Transuranic determinations were assessed and found to be adequate.

EPA examined the determinations that these containers meet the definitions of TRU waste and RH waste based on DTC BDR INLRHDTC10009. Both the RH and TRU determinations are parts of the actual DTC measurements that are performed at the INTEC Facility at INL, which were not assessed directly during this T1 evaluation. EPA did verify that no aspects of the DTC process had changed significantly from what EPA had observed during the baseline inspection. The results for these four containers as documented in DTC BDR INLRHDTC10009 indicated the following:

- All four containers were clearly TRU (i.e., contained more than 100 nanocuries per gram (nCi/g) of TRU radionuclides).
- All four containers were clearly RH (i.e., had an external contact dose rate greater than 200 mRem/hr)[4].

There were no technical or documentation-related concerns regarding the TRU and RH determinations for the four drums in Waste Stream ID-RTC-S3000.

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

The development of TMU for Waste Stream ID-RTC-S3000 is based on the propagation of uncertainties present in all aspects of the determination of the radiological constituents of RH TRU waste. Because of the commonness of ^{137}Cs activity determination to all of the radionuclides, a statistical dependency is introduced for parameters that are summations over multiple radionuclides, e.g., TRU determination. For these cases, instead of combining in quadrature that is considered for statistical independence, the statistical dependency is explicitly considered. The TMU determination included contributions of the following:

[4] The measured external gamma dose rates for the four containers in mR/hr were 40, 73, 55, and 29 at one meter. When multiplied by 18 to apoproximate the contact dose rates, all clearly exceed 200 mR/hr based solely on the gamma readings. Roentgens (R) and Rems (rem) are units of radiation exposure and dose equivalent, respectively. Although they represent different quantities, by convention they are often considered equivalent. In this report, these terms are used interchangeably, which is a conservative approach to assigning dose equivalent in rem.

- ^{137}Cs DTC correlation – including waste density determination (drum weight measurement, tare weight measurement, fill percentage estimation), MicroShield® modeling, and MicroShield® code uncertainties
- ^{137}Cs activity measurement – including measurement uncertainty associated with dose rate measurement at one meter and uncertainty due to the contributions of other gamma emitters to the dose rate
- Scaling factor – including sample data measurement uncertainty
- Uncertainty in the mean scaling factor
- Drum-to-drum variations in the scaling factor

A general treatment of TMU for this waste stream is presented in CCP-AK-INL-521, Revision 0, and Calculation Package INL-RH-105, Revision 0, *Uncertainty Analysis for INL Sludge Waste.* The principal contributors to the TMU, which was calculated by quadrature, were the ^{137}Cs activity uncertainty and the total scaling factor uncertainty; the latter, also calculated in quadrature, having its main contributors as the uncertainties in mean scaling factor and drum-to-drum variability. There were no concerns regarding the technical derivation and documentation of TMU for Waste Stream ID-RTC-S3000. Table 6, below, provides the TMU and its components at a density of 0.6 g/cm^3.

Table 6. Total Measurement Uncertainty and Its Components at a Density of 0.6 g/cm^3

Radionuclide	^{137}Cs Activity Uncertainty	Total Scaling Factor Uncertainty	Total Uncertainty
^{233}U	27.2%	7.5%	28.2%
^{234}U	27.2%	3.9%	27.5%
^{235}U	27.2%	4.1%	27.5%
^{238}U	27.2%	2.1%	27.3%
^{238}Pu	27.2%	3.5%	27.4%
^{239}Pu	27.2%	8.1%	28.4%
^{240}Pu	27.2%	6.8%	28.1%
^{241}Pu	27.2%	10.4%	29.1%
^{242}Pu	27.2%	5.0%	27.7%
^{241}Am	27.2%	7.2%	28.1%
^{90}Sr	27.2%	9.6%	28.9%
^{137}Cs	27.2%	0.0%	27.2%

6.0 SUMMARY OF RESULTS

Findings and Concerns

The EPA inspection team did not identify any findings or concerns during this T1 evaluation. No open issues remain relative to this T1 change.

Tiering Changes

Based on this evaluation, there are no changes to the AK T1 and T2 designations identified during the Baseline Inspection and subsequent T1 evaluations.

7.0 CONCLUSIONS

During this T1 change evaluation, EPA examined the addition of Waste Stream ID-RTC-S3000, containing four 55-gallon containers of sludge waste. Based on the results of this evaluation, EPA is approving the inclusion of this waste stream with the limitations discussed above. Table 1 above identifies the tiering changes addressing RH waste streams and/or summary category categories at INL.

ATTACHMENT A

APPROVAL SUMMARY FOR INL-CCP REMOTE-HANDLED 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 Visual Examination	January 2007	A-98-49; II-A4-75
Tier 1 Change – Approval of Real Time Radiography	February 2007	A-98-49; II-A4-80
Tier 1 Change – Approval of K Cell Wastes	January 2008	A-98-49; II-A4-97
Tier 1 Change – Approval of High Range Gamma Probe for DTC	April 2008	A-98-49; II-A4-98
Tier 1 Change – Approval of Visual Examination Technique	September 2009	A-98-49; II-A4-118
Tier 1 Change – Addition of Twelve Containers to Waste Stream ID-ANLE-S5000 and Addition of Waste Stream ID-HFEF-S5400-RH	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
Tier 1 Change – Addition of Lot 1B to Waste Stream ID-HFEF-S5400-RH	August 2010	A-98-49; II-A4-131
Tier 1 Change – Approval of Waste Stream IN-ID-NRF-153	October 2010	A-98-49; II-A4-136

ATTACHMENT B

LISTING OF DOCUMENTS REVIEWED FOR THIS EVALUATION

CCP-AK-INL-520, Central Characterization Project Acceptable Knowledge Summary Report for Stored Remote-Handled Transuranic Sludge Waste Reactor Technology Complex at the Idaho National Laboratory, Waste Stream ID-RTC-S3000 Revision 1, February 24, 2010

DOE/WIPP-02-3214, Remote-Handled TRU Waste Characterization Program Implementation Plan, Carlsbad, New Mexico, U.S. DOE Carlsbad
2. CCP-TP-005, CCP Acceptable Knowledge Documentation, Carlsbad, Revision 0d, 2004

CCP-AK-INL-521, Revision Number 0, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Waste From Idaho National Laboratory's Test Reactor Area Catch Tank Sludge Waste, May 12, 2010

CCP-AK-INL-522, Revision Number 1, CCP RH TRU Waste Certification Plan for 40 CFR 194 Compliance and Confirmation Test Plans for INL Waste Stream ID-RTC-S3000 , Carlsbad, New Mexico, Washington TRU Solutions, LLC, May 21, 2010

CCP-AK-INL-525, Revision Number 0, Central Characterization Project Sampling and Analysis Plan for Remote-Handled Transuranic Sludge Waste from Reactor Technology Complex at the Idaho National Laboratory, November 20, 2009

CCP-TP-005 Revision 18, Attachments 1, 4, 5, 6, 8, and 10, provided on July 20, 2010

NCR No. NCR-RHINL-0200-09 Revision 1, Lot No. 1, Container Nos. TRA 88-12, TRA 88-22, TRA 88-32, TRA 88-11, TRA 88-31, TRA 88-43; Container TRA 88-12 has too much absorbent above the waste to reach the waste contents to sample, June 25, 2009

Draft Waste Stream Profile Form for Waste Stream ID-RTC-S3000, provided September 13, 2010

Characterization Reconciliation Report for Waste Stream ID-RTC-S3000, provided September 13, 2010

Interoffice Correspondence, from C.M. Gomez to M. Sensibaugh, Acceptable Knowledge Accuracy Report: Transuranic Sludge Waste from Reactor Technology Complex at the Idaho National Laboratory Waste Stream Number ID-RDC-S3000, Lot 1, dated April 15, 2010, and revision provided September 8, 2010

Qualification Cards for Hillary Neely, Scott Smith, and Mike Papp, provided September 1-13, 2010.

PTS Print Outs containers 8821A/B, 8822A/B and AK Tracking Spreadsheet, provided September 13, 2010

EDF-7692, Isotopic Scaling Parameters for the Reactor Technology Complex Catch Tank Sludge Waste, February 8, 2008

C079 Interoffice Correspondence to C. D. Brooks, re: Disposal of MTR Hot Catch Tanks DES-32-86, D. E. Sheldon, November 20, 1986

C089 Letter to Brent Satterthwaite, re: Fissile Material Loading for TRA Hot Cell Waste Including EPICORE Waste JCM-11-99, John C. Martin, November 29, 1999

C090 Letter to Darris J. Bright, re: MAC Isotopes Waste Characterization WSB-17-97, W. Skeen Blair, November 17, 1997

C091 Interdepartmental Communication to S. W. Blair, re: RML Gamma-Ray Analysis of MACI Hot Cell Waste Box 4'x4'x4' RKM-002-97, R. K. Murray, August 27, 1997

C094 Letter to Dr. W. R. Young, re: EPICOR-II Liner TRU Analysis KCS-63-84, K. C. Sumpter, March 23, 1984

C095 Interoffice Correspondence to J. G. Dineen, re: EPICOR-II NRC Waste Classification Calculations for Liner #27 SEM-11-90, S. E. MacLeod, April 2, 1990

C104 Letter to John W. McConnell, re: Resin Analysis Results MDA-27-84, M. D. Anderson, March 22, 1984

C105 Interoffice Memorandum to J. A. Van Vliet, re: Request for RRWAC Exemption for Disposition of TRA Hot Cell Waste RRP-99-15, R. R. Piscitella, December 2, 1999

C106 Letter to J. D. Griffin and M. S. Litus, re: Pollution Prevention/Waste Minimization Proposal MEP-28-98, M. E. Patrick, February 12, 1998

C123 Transuranic Waste Profile Statement Approval DRW-01-90, D. R. Wilkinson, January 4, 1990

C129 TRA Waste Sludge Excluded from FMCA Requirements DES-09-88, D. E. Sheldon, March 18, 1988

C133 TRA – MTR, No Author, undated

C136 Interview of Kirk Winterholler, Brett Welty, and Doug Collins of the RTC VCO Project conducted by Mike Papp and Scott Smith, "TRA-630 Catch Tank System and TRA-613 Hot Waste System," Mike Papp and Scott Smith, February 20 and 21, 2007

C137 Interview of John Baker, RTC Radiological Laboratories, re: Alpha and Radiochemistry Laboratory Operations with attachments: 1) e-mails between John D. Baker, Vince E. Daniel, Mike Papp, and Scott Smith re: Chemicals; and 2) selected pages from C138 Sludge letter NA, Jim Schoen, undated

C138 Calculation of Individual and Total Radionuclide Masses for Waste Stream # ID-RTC-S3000, Jim Schoen, September 4, 2007

C145 Interview with Richard S. Cain (RTC Hot Cell Facility), Tony Jones (Hot Cell Operator), John C. Martin (DOE Idaho), Steven K. McClaskey (CWI WGS), and Todd Morris (Manipulator Operator), re: RTC Hot Cell Facility Operations, Scott Smith and Mike Papp, July 26, 2007
C155 Interview with Mike Huyck, re: Management of Sodium Bonding and Target Materials NA, Mike Papp, September 27, 2007

C252 Memorandum to Irene Quintana from J.Holderness, Analysis of Sample Data for RH TRU Waste Stream ID-RTC-S3000, February 21, 2010

C253 Freeze File Changes, CCP-AK-INL 520 and 522, provided September 23, 2010
DR004 Waste Stream ID-RTC-S3000, Absorbent in Sludge Drums, Scott Smith, January 5, 2010

P001 Hazards Evaluation of Proposed Site for ETR-II (now designated ATR) IDO-16623 D. R. deBoisblanc, R. J. Nertney, L. H. Jones, August 18,1960

P002 Operating Manual – MTR Hot Cell PTR-293, H. T. Watanab,e April 10, 1958

P007 Materials Testing Reactor Operating Manual, Volume III, Contaminated Air Effluent and Water Disposal Systems CI #1064, R. J. Ambrosek and A. L. Kologi, October 1, 1967

P009 Engineering Design File, Voluntary Consent Order Tank System TRA-004 – TRA Hot Waste Management System Characterization, EDF-5160, D. P. Collins and M. D. Clark, May 16, 2005

P011 HWMA/RCRA Tank System Closure Plan for the Test Reactor Area Catch Tank System (TRA-630), Voluntary Consent Order Action Plan VCO-5.8.d DOE/ID-10823
Idaho National Engineering and Environmental Laboratory Voluntary Consent Order Program, March 2005

P014 System Identification for the Test Reactor Area Catch Tank System (TRA-630), Voluntary Consent Order Action Plan VCO-5.8.d INEEL/EXT- 2000-0801, Idaho National Engineering and Environmental Laboratory Voluntary Consent Order Program, March 2005

P015 Engineering Design File, Voluntary Consent Order Tank Systems Characterization for TRA-007 – TRA/MTR Warm Waste System and TRA-010 – TRA Warm Waste Treatment System EDF-2749, June 10, 2004

P017 Engineering Design File, Voluntary Consent Order Tank System TRA-011 – TRA Retention Basin System Characterization EDF-1996, D. P. Collins and M. D. Clark, April 20, 2005

P021 Voluntary Consent Order SITE-TANK-005 System Identification, TRA Hot Waste Management System (TRA-004), Book 3-TRA, Volume I INEEL/EXT- 2000-00037 Idaho National Engineering and Environmental Laboratory Voluntary Consent Order Service Team, March 2005

P027 Voluntary Consent Order SITE-TANK-005 System Identification, TRA Warm Waste Treatment System (TRA-010), Book 3-TRA, Volume I INEEL/EXT- 2000-00037, Idaho National Engineering and Environmental Laboratory Voluntary Consent Order Program September 2001

P028 Voluntary Consent Order SITE-TANK-005 System Identification TRA Retention Basin System (TRA-011), Book 3-TRA, Volume I INEEL/EXT- 2000-00037, Idaho National Engineering and Environmental Laboratory Voluntary Consent Order Program, June 2003

P054 Defense-Related Waste Determination for Legacy Transuranic Waste at the Idaho National Laboratory Test Reactor Area Warm and Hot Waste Systems ICP/EXT-04-00729, Idaho Completion Project April 2005

P055 ETR Hazards Survey for WAPD M-13 Experiment IDO-16503 R. L. Gump, undated

P056 ETR Operations Branch Progress Report for Cycle No. 88, March 13, 1967 – April 24, 1967 IN-1092, E. H. Smith, et al., June 12, 1967

P071 National Reactor Testing Station, U.S. Atomic Energy Commission NA, U.S. Atomic Energy Commission, July 1967

P074 TRA-730 Catch Tanks and Hot Cell Effluent Collection Project Plan NA, J. L Sherick, December, 1997

P088 NMEO South Operating and Maintenance Manual General Facility, 1.1.1 – TRA Hot Cell Facility NA, Not Given, July 14, 1986

P092 LMITCO Internal Procedure, Radiation Measurements Laboratory (RML) Gamma-Ray Analysis of TRA-730 Materials Test Reactor (MTR) Catch Tanks EMS-086-98 INEEL/INT-99- 00190, T. C. Sorensen and J. W. Rogers, February 1999

P093 Health and Safety Plan for the HWMA/RCRA Closure of the Test Reactor Area Catch Tank System (TRA-630) INEEL/EXT- 01-00720, M. F. Nielsen, D. H. Hovis, and K. D. Sessions, June 2001

P098 Test Reactor Area's Maintenance Implementation Plan as Required by DOE

Order 4330.4A, undated

P113 NMEO South Operating and Maintenance Manual General Facility Information, 1.1.1 – TRA Hot Cell Facility, Jay N. Davis, July 14, 1986

P115 Operation and Maintenance Manual, TRA Hot Cell Facility Description, February 2, 1981

P151 Engineering Design File, TRA Rad Waste System Modifications AEDL-619, Ed Anderson, May 15, 1997

P154 TRA-632 Hot Cell 1 Radionuclide Source Inventory as of August 2003, EDF-4064, J. L. Lopez, September 2, 2003

P159 Hazard Assessment Document Activity-Specific Hazard Categorization Hazard Categorization for the TRA Hot Cell Waste Boxes, HAD-126, S. L. Silberman, September 2001

P208 MTR Hot Catch Tank Cleanup Procedure, September 29, 1987

P209 Amended System Identification for the Test Reactor Area Catch Tank System (TRA-630), Voluntary Consent Order Action Plan VCO-5.8.d ICP/EXT-04-00320, Idaho Completion Project, November 2004

P211 TRA Standard Maintenance Procedure, MTR Hot Catch Tank Cleanup 2.1.16, Not Given, November 20, 1987

P234 Evaluation of Closure Options for the Transuranic-Contaminated Components Associated with the TRA-630 Catch Tank System, Voluntary Consent Order Action Plan VCO-5.8.d RPT-351, Idaho Cleanup Project, March 2007

P236 Engineering Design File, Isotopic Scaling Parameters for the Reactor Technology Complex Catch Tank Sludge Waste EDF-7692, Yale D. Harker, February 8, 2008

U002 TRA Outer Area Operating and Maintenance Manual OMM-7.11, ATR Operations Branch Manager, November 8, 1979–1982

U032 EG&G Idaho, Inc. Experiment Log NA, D. Conley, October 6, 1980 to October 27, 1980

U043 TRA Hot Cell Facility Business Plan, Strategy for Continued Operations, undated

U046 Radiation Measurements Laboratory (RML) Gamma-Ray Spectrometry Summary Report, 2x2x2 Combustible Box NA, Not Given, August 20, 1997

U047 Hot Cell Epicor Waste Characterization, undated

U052 Tank History, undated

U060 Waste Minimization, Pat Stephens, 1993

U064 Mission Need Document for the TRA Lab Effluent Project NA, Bill Richardson and Lannie Workman, March 25, 1998 and May 19, 1998

U073 USQ Safety Evaluation, Lead Retrieval from TRA Waste Vault 01-USQ-SAR- 103-005E, J. B. Walker, undated

U076 Incident Report, Idaho Nuclear Corporation, BNW P-7-2 Fission Break INC-69-2, Ralph E. Fearnow, December 22, 1968

U093 An Environmental Evaluation for the Test Reactor Area Catch Tank Upgrade, Environmental Sciences, Earth and Life Sciences Branch, October 1984

U115 MTR Catch Tank Transuranic Waste Data, W. Kanady, January 4, 1990

U116 Alpha Analysis of Sludge from MTR Storage Tanks, C. W. Sill, September 12, 1986

U117 Packet of documents concerning the sludge in the MTR Catch Tanks NA, August 15, 1986 to January 4, 1990 (not inclusive)

CCP-AK-INL-521, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Remote-Handled Transuranic Debris Waste From Idaho National Laboratory's Test Reactor Area Catch Tank System, Revision 0, May 12, 2010

CCP-AK-INL-520, Central Characterization Project Acceptable Knowledge Summary Report for Stored Remote-Handled Transuranic Sludge Waste From Reactor Technology Complex at the Idaho National Laboratory, Waste Stream: ID-RTC-S3000, Revision 1, February 24, 2010

U240, CCP Calculation Package – Radiochemistry & Gamma Spectrometry Data Input Check, Revision 0, INL-RH-101, Jene Vance, April 09, 2010

U241, CCP Calculation Package – Cs-137 Scaling Factor Development, Revision 0, INL-RH-102, Jene Vance, April 09, 2010

U242, CCP Calculation Package – Determination of INL TRA Sludge Reportable Radionuclides, Revision 0, INL-RH-103, Jene Vance, April 09, 2010

U243, CCP Calculation Package – INL Cs-137 Dose-to-Curie Correlation- TRA Sludge, Revision 0, INL-RH-104, Jene Vance, April 09, 2010

U244, CCP Calculation Package – Uncertainty Analysis for INL Sludge Waste, Revision 0, INL-RH-105, Jim Holderness, April 09, 2010

U245, CCP Calculation Package – DTC Spreadsheet INL Sludge Waste, Revision 0, INL-RH-106, Jim Holderness, April 09, 2010

DTC BDR No. INLRHDTC10009, dated June 7, 2010, containing DTC results for containers IDIRTRA8821A, IDIRTRA8821B, IDIRTRA8822B and IDIRTRA8822B

Analysis of Sample Data for RH TRU Waste Stream ID-RTC-S3000, memorandum from J. Holderness to Irene Quintana dated February 21, 2010