DOCKET NO: A-98-49, II-A4-69

WASTE CHARACTERIZATION INSPECTION REPORT

EPA BASELINE INSPECTION NO. EPA-INL-CCP-RH-6.06-8 OF THE CENTRAL CHARACTERIZATION PROJECT REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM AT THE IDAHO NATIONAL LABORATORY

June 12–16, and August 9 and 29, 2006

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

November 2006

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ATTACHMENTS

1.0 EXECUTIVE SUMMARY

In accordance with 40 CFR 194.8(b), the U.S. Environmental Protection Agency (EPA or the Agency) conducted Baseline Inspection No. EPA-INL-CCP-RH-6.06-8 of the Central Characterization Project's (CCP) waste characterization (WC) program for remote-handled (RH) transuranic (TRU) waste at the U.S. Department of Energy's (DOE) Idaho National Laboratory (INL) located outside of Idaho Falls, Idaho. EPA conducted a baseline inspection of the site's program to characterize RH TRU wastes proposed for disposal in the Waste Isolation Pilot Plant (WIPP). This inspection occurred in three segments:

- On-site inspection at INL on June 12–16, 2006
- Follow-up inspection on August 9, 2006, at DOE's Carlsbad Area Field Office (CBFO), for the purpose of assessing mass spectrometry data used to support one element of the INL RH WC program
- Follow-up inspection at CBFO on August 29, 2006, for the purpose of resolving open issues from the previous two inspections

Additionally, there were ongoing technical discussions during July and August 2006 between members of the EPA inspection team and CBFO technical contractors related to technical aspects of the INL-CCP RH WC program.

Section 8.0 of this report describes the WC elements inspected/discussed between June and August 2006 that resulted in the proposed approval. As a result of our baseline inspection, EPA is proposing to approve the INL-CCP RH WC program based on a demonstration of the site's capabilities, with conditions and limitations discussed in this report, in accordance with 40 CFR 194.8(b).

EPA must verify compliance with 40 CFR 194.24 before waste may be disposed of at the WIPP, as specified in Condition 3 of the Agency's certification of the WIPP's compliance with disposal regulations for TRU radioactive waste (63 *Federal Register* (FR) 27354 and 27405, May 18, 1998). This was the first inspection of RH WC activities conducted by EPA at INL-CCP. EPA Baseline Inspection No. EPA-INL-CCP-RH-6.06-8 was performed in accordance with the provisions of 40 CFR 194.8(b), as issued in a July 16, 2004, FR notice (Vol. 69, No. 136, pp. 42571–42583). The purpose of the INL-CCP RH WC inspection was to evaluate the adequacy of the site's WC programs for one (1) RH debris waste stream to be disposed of at the WIPP. The activities examined during the inspection included the following:

- Acceptable knowledge (AK) for RH retrievably-stored TRU debris waste (S5000)
- Radiological characterization as described in this report for RH retrievably-stored TRU debris waste (S5000)
- Visual examination (VE) for RH retrievably-stored TRU debris waste (S5000)

At the end of the June 2006 inspection, EPA's inspection team identified one finding in the area of VE and six concerns that needed to be addressed by DOE. Two of these concerns were in VE and four in AK. All concerns and findings are documented on EPA Inspection Issue Tracking Forms (see Attachments B.1 through B.8). The EPA inspection team members evaluated all responses for completeness and adequacy, and concluded that each had been resolved satisfactorily. EPA considers all concerns and the finding to be resolved, and there are no open issues resulting from this inspection.

EPA's inspection team determined that INL-CCP's RH WC program activities were technically adequate. EPA is proposing to approve the INL-CCP RH WC program in the configuration observed during this inspection, described in this report and documented in detail in the checklists in Attachment A. The proposed approval includes the following:

(1) The AK process for RH retrievably-stored TRU debris in one waste stream, INL Waste Stream No. ID-ANLE-S5000, Lots 1 through 20, as defined in CCP-AK-INL-500, Revision 2, June 1, 2006

(2) The radiological characterization process using dose-to-curie (DTC) and modeling-derived scaling factors for assigning radionuclide values to one RH waste stream for which the scaling factors are applicable, as described in CCP-AK-INL-501, Revision 1

(3) The VE process used for a total of eight (8) retrievably-stored RH debris waste drums included in three batch data reports (BDRs) – BDR Nos. RHINLVE60001, RHINLVE60002, and RHINLVE60003

Regarding item (3) above, INL-CCP has terminated the use of VE process for this waste until further notice. If INL-CCP decides to use VE in the future, EPA approval is necessary.

EPA is not proposing to approve the WIPP Waste Information System (WWIS) for tracking the waste contents of RH debris wastes. Although the WWIS is currently approved by EPA for tracking contact-handled (CH) waste, this system has not been demonstrated by INL-CCP for its adequacy to track RH waste contents. EPA, therefore, requires that INL-CCP provide WWIS information concerning RH waste content tracking as a Tier 1 (T1) change for EPA inspection. EPA will review the WWIS database populated with actual RH waste content data when the RH modules have been completed. No RH waste can be shipped to the WIPP for disposal until EPA approves the WWIS database. EPA may evaluate the adequacy of the implementation of CCP's WWIS procedure for RH waste during the comment period. However, EPA will not approve WWIS until after the Agency finalizes the proposed approval of CCP's RH waste characterization program at INL.

EPA is not proposing to approve real-time radiography (RTR). INL-CCP did not have an operational RTR unit in place at the time of the inspection. EPA requires that INL-CCP provide notification when RTR is ready for EPA inspection as a T1 change. INL-CCP cannot ship RH waste to the WIPP using RTR as a WC technique until it is approved by EPA.

Any changes to the WC activities from the date of the baseline inspection must be reported to and, if applicable, approved by EPA, according to Table 1. Please note that each T1 and Tier 2 (T2) change listed in Table 1 is followed by a reference to the report section where the technical basis for the T1 or T2 designation is presented.

Table 1. Tiering of RH TRU WC Processes Implemented by INL-CCP (Based on June 12–16 Baseline and August 9 & 29, 2006, Follow-Up Inspections)

RH WC Process Elements	INL-CCP RH WC Process - T1 Changes	INL-CCP RH WC Process - T2 Changes*
Acceptable Knowledge (AK)	Any new waste streams not approved under this baseline; AK (1) Modification of the approved waste stream ID-ANLE-S5000 to include additional containers, i.e., K Cell or other debris wastes; AK (1) & AK (5) 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; AK (6) Load management for any RH waste stream; AK (16)	Updates to CCP-INL-AK-500, CCP-INL-AK-501, and CCP-AK-502 made available when each update is approved; AK (4) Changes to AK documentation as a result of WCPIP revisions**; AK (7) & AK (9) Completed Correlation or Surrogate Summary Form for RH containers in this waste stream identified as CH based upon measured dose rates that present NDA results for assayed containers, including isotopic ratios; AK (10), AK (14) & RC (8.2.2) & (5) Complete waste stream data package for debris waste stream once completed, and any modifications to the WSPF including the CRR and AK Summary; AK (14) AK accuracy report for Lot 16 (or the appropriate lot) wherein individual drum data assessed by INL-CCP (e.g., P030) will be compared against DTC-derived values; all other AK accuracy reports prepared annually at a minimum; AK (15)
Radiological Characterization, including Dose-to-Curie (DTC)	Application of new scaling factors for isotopic determination other than those documented in CCP-AK-INL-501; RC (8.2.2 & 8.2.3) 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***; RC (8.2.2 & 8.2.3) Any new waste stream not approved under this baseline or addition of containers to Waste Stream ID-ANLE-S5000 that requires changing the established radionuclide scaling factors; RC (8.2.3)	Revisions of CCP-AK-INL-501or CCP-TP-504 that require CBFO approval; RC (8.2.2 & 8.2.3)
Visual Examination (VE)	Implementation of VE following this baseline approval; if CCP decides to use VE in the future, EPA approval is necessary	None
Real-Time Radiography (RTR)	Any use of RTR requires EPA approval	None
WIPP Waste Information System (WWIS)	Any use of WWIS requires EPA approval prior to RH waste disposal	None

* Upon receiving EPA approval, 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 WC 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.

EPA will notify the public of the results of its evaluations of proposed Tier 1 (T1) and Tier 2 (T2) changes through the EPA Web site and by sending e-mails to the WIPPNEWS list (see Section 2.0, below, for a brief discussion of tiering). All T1 changes must be submitted for approval before their implementation and will be evaluated by EPA. Upon approval, EPA will post the results of the evaluations through the EPA Web site and the WIPPNEWS list, as described above. EPA will post T2 changes approximately every three months beginning with the date of EPA's approval of the TRU WC program implemented at INL-CCP. EPA expects the first report of INL-CCP's T2 changes approximately three months from the date of EPA's approval of the TRU WC program implemented at INL-CCP.

2.0 PURPOSE OF INSPECTIONS

On May 18, 1998, EPA certified that the WIPP will comply with the radioactive waste disposal regulations at 40 CFR Part 191. In this certification, EPA also included Condition 3, which states that "the Secretary shall not allow shipment of any waste from…any waste generator site other than LANL [Los Alamos National Laboratory] for disposal at the WIPP until the Agency has approved the processes for characterizing those waste streams for shipment using the process set forth in §194.8." The approval process described at 40 CFR 194.8 requires DOE to (1) provide EPA with information on AK[1] for waste streams proposed for disposal at the WIPP, and (2) implement a system of controls used to confirm that the total amount of each waste component that will be emplaced in the WIPP will not exceed limits identified in the WIPP Compliance Certification Application (CCA).

Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004, FR notice, EPA must perform a single baseline inspection of a TRU waste generator site's WC program. The purpose of the baseline inspection is to approve the site's WC 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. An EPA inspection team conducts an on-site inspection to verify that the site's system of controls is technically adequate and properly implemented. Specifically, EPA's inspection team verifies compliance with 40 CFR 194.24(c)(4), which states the following:

> *Any compliance application shall: . . . Provide information which demonstrates that a system of controls has been and will continue to be implemented to confirm that the total amount of each waste component that will be emplaced in the disposal system will not exceed the upper limiting value or fall below the lower limiting value described in the introductory text of paragraph of this section.*[2]

[1] As of the FR notice of July 16, 2004, EPA has replaced the term *process knowledge* with *acceptable knowledge*. Acceptable knowledge refers to any information about the process used to generate waste, material inputs to the process, and the time period during which the wastes were generated, as well as data resulting from the analysis of waste conducted prior to or separate from the waste certification process authorized by an EPA certification decision to show compliance with Condition 3 of the certification decision.

[2] The introductory text of 40 CFR 194.24(c) states, "For each waste component identified and assessed pursuant to [40 CFR 194.24(b)], the Department shall specify the limiting value (expressed as an upper or lower limit of mass, volume, curies, concentration, etc.), and the associated uncertainty (i.e., margin of error) for each limiting value, of the total inventory of such waste proposed for disposal in the disposal system."

The system of controls shall include, but shall not be limited to: measurement; sampling; chain of custody records; record keeping systems; waste loading schemes used; and other documentation.

In other words, the purpose of the baseline inspection is to assess whether DOE sites that characterize TRU waste prior to disposal at the WIPP are capable of characterizing and tracking the waste. By proposing the approval of WC systems and processes at INL-CCP applied to retrievably-stored RH debris waste, EPA confirms that the Agency has evaluated the capabilities of systems and processes implemented by a site to accomplish two tasks: (1) the identification and measurement of waste components (such as plutonium (Pu)) that must be tracked for compliance,[3] and (2) the confirmation that the waste in any given container has been properly identified as belonging to the group of approved waste streams.

Based on the adequacies of the WC processes demonstrated during the baseline inspection, including all conditions and limitations, EPA specifies which subsequent WC program changes or modifications must undergo further EPA inspection or approval under 40 CFR 194.24. This is accomplished by assigning a tier level to each aspect of the characterization program, i.e., T1 and T2 activities. T1 activities have more stringent reporting and EPA notification requirements and require EPA approval prior to implementation. T2 activities are reported to EPA based on the frequency established in the inspection report. DOE may choose to characterize and dispose of the waste from T2 activities at risk while EPA considers the T2 changes. If INL-CCP contemplates a change that is not identified in this report, EPA recommends that the site, in consultation with CBFO, discuss the nature of the change with EPA. This would minimize the possibility of EPA not approving the site-assigned tiers. The rule applying to this baseline inspection can be found in the FR (Vol. 69, No. 136, pp. 42571–42583, July 16, 2004).

Following EPA's approval of WC processes evaluated during the baseline inspection, EPA can conduct additional inspections to evaluate and approve, if necessary, changes to the site's approved WC program under the authority of 40 CFR 194.24(h). Under 40 CFR 194.24, EPA also has the authority to conduct continued compliance inspections to verify that the site continues to use only the approved WC processes to characterize the waste and remains in compliance with all the regulatory requirements.

3.0 PURPOSE OF THIS REPORT

This report documents the basis for EPA's approval decision and explains the results of Baseline Inspection No. EPA-INL-CCP-RH-6.06-8 in terms of findings or concerns. Specifically, this report does the following:

[3] The potential contents of a single waste stream or group of waste streams determine which processes can adequately characterize the waste. For example, if AK suggests that the waste form is heterogeneous, the site should select the matrix-appropriate radiological characterization technique to obtain adequate radionuclide measurements. VE serves to confirm and quantify waste components, such as cellulosics, rubbers, plastics, and metals. Once the nature of the waste has been confirmed, characterization techniques quantify selected radionuclides in the waste. In some cases, a TRU waste generator site may be able to characterize a range of heterogeneous waste streams or only a few. A site's stated limits on the applicability of proposed WC processes govern the scope of EPA's inspection.

- Describes the characterization systems proposed for approval
- Provides objective evidence of the approval basis for all WC systems
- Identifies all relevant limitations and or conditions for each WC system
- Provides objective evidence of outstanding findings or concerns in the form of documentation, as applicable
- Describes any tests or demonstrations completed during the course of the inspection and their relevance to EPA's approval decision

The completed checklists attached to this report in conjunction with the listings in each section reference the documents that the EPA inspection team members reviewed in support of the technical determination. To see or obtain copies of any items identified in the attached checklists, write to the following address:

Quality Assurance Manager
USDOE/Carlsbad Field Office
P.O. Box 3090
Carlsbad, NM 88221

EPA's final approval decision regarding the INL-CCP WC program is conveyed to DOE separately by letter. This information is also available on EPA's Web site at http://www.epa.gov/radiation/WIPP, in accordance with 40 CFR 194.8(b)(3).

4.0 SCOPE OF INSPECTION

The scope of Baseline Inspection No. EPA-INL-CCP-RH-6.06-8 included the technical adequacy of the WC systems in use at INL-CCP to characterize RH TRU wastes. These systems were evaluated with respect to their ability to perform the following:

- Identify and quantify the activities of the 10 WIPP-tracked radionuclides (^{241}Am, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{90}Sr, ^{233}U, ^{234}U, and ^{238}U) using a combination of AK and radiological characterization, including DTC and radionuclide scaling factors derived from modeling
- Assign waste material parameters (WMPs) correctly using VE for RH retrievably-stored debris waste

Specifically, these systems consisted of the following components:

- The AK process that supports retrievably-stored S5000 debris wastes from one (1) RH debris waste stream (INL Waste Stream No. ID-ANLE-S5000, Lots 1 through 20)
- The system of radiological characterization including DTC and the application of radionuclide scaling factors derived by modeling for one (1) RH debris waste stream (INL Waste Stream No. ID-ANLE-S5000)
- VE for retrievably-stored S5000 RH debris wastes

During an inspection, EPA does not approve characterization data; that function is the sole responsibility of the site being evaluated during the inspection, in this case INL-CCP. EPA evaluated the WC processes implemented by the site to characterize RH retrievably-stored debris waste. The evaluation consists of interviewing personnel, observing equipment operations that are controlled through site procedures, and inspecting records related to each of the WC processes within the inspection's scope. An important aspect of this evaluation is the objective evidence that documents the effectiveness of the WC processes. Objective evidence typically takes the form of BDRs for radiological characterization and VE, AK accuracy reports, and VE tapes. During an inspection, EPA typically selects samples of each of these items, based on the number and variety of items that were completed and available for each WC process, consistent with standard auditing techniques. Because the RH TRU characterization program is new, there was initially only one completed BDR for VE and radiological characterization available for the EPA inspection team's evaluation. By the end of the inspection process, INL-CCP had produced two more VE BDRs for a total of three. The EPA inspection team evaluated all of the drums in the three VE packages and the one radiological characterization package. Based on the evaluation of the WC processes in conjunction with the objective evidence, EPA determined the technical adequacy of the WC processes within the inspection's scope.

5.0 INSPECTION-RELATED DEFINITIONS

During the course of an inspection, EPA inspectors may encounter items or activities that require further inquiry for their potential to adversely affect WC and/or isolation within the repository. The two main categories relevant to WC inspections are identified below:

Finding: A determination that a specific item or activity does not conform to 40 CFR 194.24(c)(4). A finding requires a response from CBFO.

Concern: A judgment that a specific item or activity may or may not have a negative effect on compliance and, depending on the magnitude of the issue, may or may not require a response. (Concerns not requiring a response do not have to be addressed prior to program approval.)

6.0 PERSONNEL

6.1 EPA Inspection Team

The members of the EPA WC inspection team are identified in Table 2.

Table 2. EPA Inspection Team Members

Inspection Team Member	Position	Affiliation
Ms. Rajani Joglekar	Inspection Team Leader	U.S. EPA ORIA
Mr. Ed Feltcorn	Inspector	U.S. EPA ORIA
Ms. Connie Walker	Inspector	S. Cohen & Associates, Inc.
Ms. Dorothy Gill	Inspector	S. Cohen & Associates, Inc.
Mr. Patrick Kelly	Inspector	S. Cohen & Associates, Inc.

6.2 Personnel Contacted

EPA and its support personnel conducted interviews with INL-CCP personnel in several disciplines. The personnel contacted represented a sample of the CH TRU WC staff, and they are listed in Table 3, along with their affiliation and technical area.

Table 3. Personnel Contacted During Inspection

Personnel	Affiliation	Area of Expertise
Eric D'Amico	CCP	AK, DTC, SPM
Jene Vance	CCP	AK/DTC; Scaling Factors-MS Data
Lisa Price	CCP	AK, AKE
Larry Porter	CCP	AK, SPM; Scaling Factors-MS Data
Steve Schaffer	CCP	AK, AKE
Kevin Peters	CCP	AK, AKE
Lee Smith	CCP	RTR, SME & Operator
Ed Gulbransen	CCP	DTC, SME
Mark Doherty	CCP/WTS	DTC & Scaling Factors-MS Data
Joe Harvill	CCP/WTS	DTC & Scaling Factors
Keith B. Farmer	CWI	DTC, Nuclear Facility Manager
Ken Pierce	CWI	DTC, Shift Manager
Chris Davis	CWI	DTC, Dose-Rate Operator
Suay Andrews	CWI	DTC, Dose-Rate Operator
Mark Hawker	CWI	DTC, Rad Con Technician
Swami Raman	CCP	VE, Operator/ITR
Tommy Mojica	CCP	Operator/ITR, SME/OJT, VEE
Patrick Boyd	CCP	Operator/ITR
John Hegsted	CCP	Operator/ITR
Susan Smith	CCP	RTR, SME & Operator
Irene Quintana	WTS	SPM
J.R. Stroble	CCP	WWIS, WCO
James Mobley	CCP	VE/VET, VEE
Marcus Steade	CCP	VE/VET, VEE
Buddy Fussell	CCP	VE/VET, VPM
Maurice "Chip" Hatcher	CCP	VE/VET, Operator
Steve Piper	CCP	VE/VET, Operator

During the baseline inspection, INL-CCP provided a list of RH TRU WC personnel from which EPA selected the individuals to be interviewed. The EPA inspectors reviewed the qualifications and training records of these individuals relative to their WC responsibilities. Based on this evaluation, EPA determined that INL-CCP WC personnel responsible for characterizing RH TRU waste and certifying it as TRU waste were qualified and had received adequate training to perform their assigned function. If key WC personnel changes occur, EPA may request qualification and training records of the new individuals identified as key WC personnel. EPA will review these records and may interview the personnel to determine their abilities to produce quality data. This personnel qualification evaluation and review of training records would be the equivalent of the evaluation done by the EPA inspection team on site during this inspection.

7.0 PERFORMANCE OF THE INSPECTION

Site Background and History

INL is located in southeastern Idaho, about 60 miles outside of Idaho Falls, Idaho. The site encompasses approximately 890 square miles. The U.S. government established INL in 1949 as the National Reactor Testing Station, and its original mission was the design, construction, and testing of prototype nuclear reactors. Over the years, site activities have shifted from reactor development to multi-program research, hazardous and radioactive waste management and cleanup, and the development of environmental technologies. In January 1997, the site, then known as the Idaho National Engineering Laboratory (INEL), changed its name to the Idaho National Engineering and Environmental Laboratory (INEEL) to highlight its role in developing waste cleanup and other environmental technologies. In February 2005, the site's name was changed to the Idaho National Laboratory (INL)[4] to better reflect its role in the development of nuclear-related technologies.

The 2004 Compliance Recertification Application[5] states that there are eight (8) individual RH waste streams currently in storage at INL. These wastes originated from a variety of DOE generators, including Argonne National Laboratory-East (ANL-E) and Argonne National Laboratory-West (ANL-W), Battelle Columbus Laboratories, and INL[6]. The wastes are expected to consist primarily of debris, including metal waste, laboratory wastes, Pu-neutron source metallic wastes and heterogeneous debris; one RH sludge waste stream is identified. INL has approximately 202 cubic meters (m^3) of RH TRU waste in storage, and it is projected that no additional RH waste streams will be generated. It is worth noting that the number of actual waste streams may change as a function of the requirements of the WC Program Implementation Plan (WCPIP).

Inspection Process Overview

EPA Inspection No. EPA-INL-CCP-RH-6.06-8 occurred in three segments:

- On-site inspection at INL on June 12–16, 2006
- Follow-up inspection on August 9, 2006, at DOE's CBFO for the purpose of assessing mass spectrometry data used to support one element of the INL-CCP RH WC program
- Follow-up inspection at DOE's CBFO on August 29, 2006, for the purpose of resolving open issues from the above-listed inspections

[4] Documentation cited in this report may bear an identification number from INL, INEEL, or INEL, depending on the document's time of generation. These distinctions are not significant.

[5] Appendix data, Attachment F, Annex J

[6] As a result of the incorporation of the facility formerly known as ANL-W into INL, the facility in Argonne, Illinois, that was formerly known as ANL-E is now called ANL. The ANL-W facility is now called the Materials and Fuel Complex. The terms ANL-E and ANL-W may be used in this report to maintain consistency with specific references.

The inspection had the scope described in Section 4.0, above, for the purpose of determining the site's compliance with 40 CFR 194.24. The inspection was conducted in the following steps:

(1) Obtaining and reviewing site procedures, reports, and other technical information related to RH WC activities at INL-CCP in advance of the inspection

(2) Preparing draft checklists and technical questions specific to WC areas prior to the inspection, as appropriate

(3) Evaluating INL-CCP's implementation of WC processes for adequacy and demonstrating compliance with 40 CFR 194.24 requirements

(4) Participating in several conference calls with CBFO technical support contractors to brief the EPA inspection team members regarding technical details related to the INL-CCP RH WC program

(5) Interacting with CBFO and INL-CCP personnel to arrange inspection logistics

(6) Conducting initial baseline inspection visit at INL-CCP to verify the technical adequacy or qualifications of RH WC personnel, procedures, processes, and equipment by means of interviews, observation, and demonstrations, and recording the results

(7) Making one (1) follow-up visit to CBFO headquarters in Carlsbad, New Mexico, to perform an independent technical evaluation of analytical data used to support the development of radionuclide scaling factors

(8) Making one (1) follow-up visit to CBFO headquarters in Carlsbad, New Mexico, to complete the evaluation of specific RH WC technical aspects

(9) Holding ongoing technical discussions between members of the EPA inspection team and INL-CCP technical support contractors for the purpose of clarifying technical aspects of the RH WC program

(10) Recording all concerns on EPA issue tracking forms, which were completed and provided to CBFO and site personnel as they were generated (see Attachment B)

(11) Communicating all pertinent information with CBFO and INL-CCP personnel on site and in other meetings, as appropriate

(12) Pursuing resolution of all identified issues prior to completion of the inspection and after the inspection by discussions with CBFO and INL-CCP personnel

(13) Conducting entrance, exit, and daily briefings for CBFO and INL-CCP management personnel at INL and CBFO, as appropriate

(14) Preparing the draft inspection report

8.0 TECHNICAL WASTE CHARACTERIZATION AREAS

8.1 Acceptable Knowledge

EPA examined the AK process and associated information to determine whether the INL-CCP RH program demonstrated compliance with 40 CFR 194.8 requirements for RH retrievably-stored debris waste.

Waste Characterization Element Description

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

- Waste stream definition and identification, including radiological content
- Identification of high-level waste, TRU versus non-TRU, spent nuclear fuel
- Role of AK in the characterization methodology (including alternative characterization methods related to AK)
- Compilation of AK documentation and assembly of required information
- Adequacy of WCPIP AK process implementation and AK Summary Report
- AK data traceability
- AK source document sufficiency
- WCPIP interpretation with respect to AK qualification
- Confirmatory Test Plan preparation and plan adequacy
- Characterization Reconciliation Report preparation and report adequacy
- Correlation and Surrogate Summary Form and contact-handled (CH)-RH correlation
- Personnel training
- Traceability of mass spectrometry data used to support radionuclide scaling factors
- Nonconformance reports (NCRs) and AK discrepancy resolution
- AK accuracy
- Implementation of load management
- Identification of the method for determining data quality objectives (DQOs) including those to be attained by AK qualification

The checklist included as Attachment A.1 identifies the objective evidence reviewed by the EPA inspector. AK is used to provide information regarding several aspects of TRU wastes at INL-CCP, including the following:

- Defense waste status
- Material parameters
- Waste stream
- Radionuclide composition
- Waste matrix codes (WMCs)

Documents, Waste Containers, and Batch Data Reports Reviewed

- DOE/WIPP-02-3214, Remote Handled TRU Waste Characterization Program Implementation Plan, Revision 0D, October 30, 2003

- DOE/WIPP-02-3122, Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plan, Revision 5, effective date TBD

- CCP-PO-002, CCP Transuranic Waste Certification Plan, Revision 16, approved May 8, 2006

- CCP-QP-002, CCP Training and Qualification Plan, Revision 20, effective date May 3, 2006

- CCP-AK-INL-500, Central Characterization Project Acceptable Knowledge Summary Report for Remote-Handled Transuranic Debris Waste from Argonne National Laboratory-East Stored at the Idaho National Laboratory, Waste Stream ID-ANLE-S5000, Revision 2, June 1, 2006
- CCP-AK-INL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Remote-Handled Transuranic Debris Waste from Idaho National Laboratory, Revision 1, June 6, 2006
- CCP-AK-INL-502, Central Characterization Project Confirmatory Test Plan for Waste Stream: ID-ANLE-S5000, Revision 0, May 5, 2006
- CCP-AK-INL-502, Central Characterization Project Confirmatory Test Plan for Waste Stream ID-ANLE-S5000, Revision 1, May 31, 2006
- CCP-TP-506, CCP Preparation of the Remote-Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report, Revision 1, effective date May 5, 2006
- Interoffice correspondence (for audit demonstration purposes only), to I. Quintana from A.J. Fisher, Acceptable Knowledge Accuracy Report: Idaho National Laboratory Waste Stream Number ID-ANLE-S5000 Lot 1, June 8, 2006
- EDF-6946, Engineering Design File Project No. 23048, Identification of Additional Fuel Elements/Materials Examined in the Alpha Gamma Hot Cell Facility for ANL-E TRU Waste, Revision ID:0, effective date May 19, 2006
- FUEL PIN data source documents (CD), provided June 2006
- P593, Engineering Design File, Quantifying Special Actinides in RH-TRU Waste from Irradiated Fuel Examined at ANL-E, EDF-2555, Revision 0, December 16, 2002
- P592, Evaluation of Radionuclide contents in RH-TRU Waste Drums 728 through 737 Based on Reported Irradiated Fuel Examination INEEL/EXT-02-00168, Revision 0, September 2003
- Fuel Element Examination Sheets (Fuel Element Examined at Argonne National Laboratory), AG Nos. 421A, 429A
- Drum number list, Waste Stream INL-ANL-E-S5000, provided June 2006
- EDF-6685, Engineering Design File, Project No. 23048, Information on Fuel Elements Examined at the AGHCF[7] at ANL from November 1971 to August 7, 1995, Based on Waste Consolidation Records, Revision ID:0, effective date May 19, 2006
- Characterization Reconciliation Report (CRR), draft, for Waste Stream CRR-INL-AGHCF-S5000-001 and for Waste Stream ID-ANLE-S5000, June 9, 2006
- AK Qualification Card, Kevin Peters, August 6, 2003
- NCR-RHINL-0004-06, Revision 0 (note reason for NCR not provided on sheets)
- Waste Can Inventory Sheets, Can Nos. 105, 107, and 108, March 31, 1993

[7] AGHCF is the Alpha-Gamma Hot Cell Facility at ANL-E.

- Waste Package Data Sheet, Drum Nos. 00739 (top can 107, bottom can 105), April 22, 193
- Waste Can Inventory Sheets, Can Nos. 118 and 119, March 26, 1993
- Waste Package Data Sheet, Drum Nos. 00743 (top can 118, bottom can 119), April 30, 1993
- Waste Package Data Sheet, Drum Nos. 00742 (top can 117, bottom can 115), April 30, 1993
- Waste Can Inventory Sheets, Can Nos. 117 and 115, April 30, 1993
- Waste Package Data Sheet, Drum Nos. 00741 (top can 110, bottom can 112), April 23, 1993
- Waste Can Inventory Sheets, Can Nos. 110 and 112, April 2, 1993
- Waste Package Data Sheet, Drum Nos. 00740 (top can 109, bottom can 108), April 23, 1993
- Waste Can Inventory Sheet, Can No. 109, April 2, 1993
- Waste Package Data Sheet, Drum No. 00738 (top can 102, bottom can 104), April 17, 1993
- Waste Can Inventory Sheets, Can Nos.102 and 104, April 1, 1993 (camera was off for No.104)
- DR11, Waste Requisition and Video Discrepancies, June 13, 2006
- DR10, Discrepancy Resolution Regarding the Volume of 7-Gallon Waste Cans, K. Peters, June 6, 2006
- Source Documents Reference List (CCP-TP-005, Revision 17, Attachment 4), June 13, 2006
- Sample/Fuel Element and Other AK Data for Index 293 (see EDF-6685, Revision 11, page 23)
- Data for AG No. 421A, UBA-15, end installation date April 19, 1990
- ICP/EXT-05-0886, Project 23048, ILTSG Drum Retrieval Completion Report, Revision 0, October 2005
- ID-ANLE-S5000, Draft Waste Stream Profile Form for Audit Purposes Only, June 2006
- DTC BDR and related attachments: (1) CCP-TP-504, Revision 2, Attachment 8, SPM Checklist for BDR INL RH DTC 06001; (2) CCP-QP-005, CCP NCR Report RHINL-0500-06, for containers 00745 and 00746 (with container rejected because dose rate less than 10 times background), Revision 10; (3) CCP-TP-504, Revision 2, Attachment 4, BDR Cover Sheet INL RH DTC 06001; Attachment 5, BDR Table of Contents; Attachment 6, BDR Narrative Summary; Attachment 7, ITR Review Checklist; Attachment 1, Measurement Control Reports (various dates); Attachment 2, Individual Container Data Sheets for Containers 771, 70, 73, 739, 743, 738, 742, 744, 747, 740, 741, 745, and 746; Waste Container Dose-to-Curie Conversion Record (same container numbers); (4) NCR-RHINL-0004-06, measured container dose rate not at least 10 times greater than background for Container 00763
- RH TRU Waste Correlation and Surrogate Summary Form for ID-ANLE-S5000, undated and unsigned

- Solid Radioactive Waste Disposal Requisition Date Sheets, various containers, provided June 2006
- C003, Intralaboratory Memorandum to H. Welsh Re: Dimensions of Intermediate TRU Waste Containers, prepared by D. Donahue, September 14, 1989
- P002, Central Characterization Project Acceptable Knowledge Report for Argonne National Laboratory-East Contact Handled TRU Waste Facility Maintenance and Laboratory Operations; CCP-AK-ANLE-001, Revision 11, December 31, 2003
- C024, Intralaboratory Memorandum to W.C. Kettman from L.A. Neimark IPR, Clarification of 00 No. 29 with Regard to Inventory of 8 Inch Storage Holes, December 7, 1993
- C058, Intralaboratory Memorandum to R. Boule from R. Ditch, Re: Needs Prior to Shipment of Nelmarks's TRU-RH Drums to Idaho, March 1, 1990
- C060, Intralaboratory Memorandum to R. Boule from A.C. Smith, Re: Status: Resumption of Shipments of TRU Waste to INEL, March 30, 1990
- C066, Record of Communication between B. Kettman and D. Donahue, Re: AGHCF Operations and Waste Packaging, recorded by J. Whitworth and M. Wyco, August 7, 2001
- C067, Record of Communication with F. Pausche and T. Bray, by J. Whitworth and M. Syco, Re: Calculation of U/Pu Ratios in Waste Containers, August 8, 2001
- C084, Intralaboratory Memorandum to Building 212 Personnel, Re: Disposal of Solid Radioactive Waste, F.P. Marchetti, February 4, 1986
- C108, Correspondence to J.T. Case, USDOE Idaho Field Office from T.L. Clements, TLC-224, 92, Re: Strategy Plan for Long-Term Management and Storage of Remote-Handled (RH) Transuranic (TRU) Waste, November 30, 1992
- C121, Record of Communication with L. Neimark, A. Cohen, and F. Pausche by J. Whitworth and J. Biedscheld, and P. Kuan, R. Bhatt, and S. Kheriche, Re: ACHCF Radiological Characterization of RH-TRU Waste Shipped to INEEL, December 19, 2001
- C330, Memorandum to I. Tray, CBFO from F. Marcinowski, Determination and Findings, Defense Origin of Nuclear Waste, Kerr-McGee Waste, April 15, 2005
- C331, Memorandum to CCP Central Records from K. Peters, Re: Evaluation of Kerr-McGee Production and FFTF History, June 26, 2004
- C332, Memorandum to CCP Central Records from D.B. Becker, Re: Assessment of Waste Material Parameters for Waste Stream ID-ANLE-S5000, January 3, 2006
- C333, Memorandum to CCP central Records from D.B. Becker, Re: Assessment of Waste Material Parameters for Waste Stream AERHDM, January 2006
- C350, Memo to CCP File, DRAFT — Evaluation for Radiological Waste Stream Delineation for Waste Stream ID-ANLE-S5000 (AK Reference C350), K. Peters, September 1, 2006
- C348, Evaluation of Generator Reported Radionuclides for Waste Stream ID-ANLE-S5000, Steve Schafer, INL-CCP, June 30, 2006

- P001, ACHCF Operations Manual, Argonne National Laboratory, IPS-2-00-00, Revision 2, September 10, 1990
- P006, Safety Analysis for Twenty Year Retrievable Storage of Intermediate Gamma Level Transuranic Waste, W.D. Jackson Alpha-Gamma Hot Cell Facility, Argonne National Laboratory, June 1, 1976
- P009, TRU-RH Waste Certification Plan for Waste Management Operations, R.W. Ditch and G. Griggin, J0306-0033-SA, Revisions 2 and 4, November 10, 1986, and April 16, 1991
- P023, Argonne National Laboratory-East Remote Handled Waste, W.M. Hellaeson, EDF-RWMC-759, August 29, 1994
- P030, Radiological Acceptable Knowledge Report for Drums 728 through 737, J. Whitworth, Shaw Environmental Team Lead, INEEL/EXT-02-00527, July 31, 2002
- P032, Procedure for Sorting Remote-Handled TRU Waste (30-Gallon Intermediate-Level Waste), Alpha-Gamma-Hot Cell Facility Irradiation Performance Section Materials and Components Technology Division, January 7, 1987
- P055, [ANL-E] Waste Handling Procedures, C.L. Cheever, Manager, Waste Management Operations, September 18, 1986
- P587, Program Scoping Plan for the Fast Flux Test Facility, A Nuclear Science and Irradiation Services User Facility, PNNL-12245, Revision 1, August 1999
- P590, Methodology to Determine Radioisotope Contents in RH TRU Waste Drums from Irradiated Fuel Examination at ANL-E, INEEL/EXT-02-001 69, Revision 0, September 2003
- P591, Engineering Design File, Estimation of Inventory of Significant Isotopes in RH-TRU Waste Drums 728 through 737, EDF-1979, Revision 1, March 19, 2003
- P592, Evaluation of Radionuclide Contents in RH TRU Waste Drums 728 through 737 Based on Reported Irradiated Fuel Examination, INEL/EXT-02-00168, Revision 0, September 2003
- P593, Engineering Design File, Quantifying Special Actinides in RH-TRU Waste from Irradiated Fuel Examined at ANL-E; EDF-255, Revision 0, December 16, 2002
- P595, Engineering Design File, Verification and Validation of a Portion of ORIGEN2 Code Used for RH-TRU Radiological Characterization, EDF-1980, Revision 0, March 2002
- P596, Peer Review of Proposed Radiological Characterization Methodology for Remote-Handled Transuranic Waste Stored at the Idaho National Engineering and Environmental Laboratory, INEEL/EXT-03-01182, September 2003
- P599, The Defense Programs Origin of Transuranic Waste at Argonne National Laboratory-West, H.F. McFarlane, ANLE-NT-192, November 2001
- U001, AGHFC Position Statement Regarding Defense Versus Non Defense TRU Waste, no author cited, April 7, 2000
- U013, Waste Stream Fissile Content [AGHCF], March 23, 1990
- U015, RH-TRU 1995, Book 5 Drums 798 to 809, no author cited, January 1, 1995

- U022, TH-TRU 1985-1987, Book 3 Drums 617 to 686, no author cited, undated
- U040, Spreadsheet Correlating Number Quota with Quota Title and Number Project, no author cited, July 31, 2002
- U041, Videotape Log Data [Cans 100, 102–187, 217–231, and 234–246], C.L. Schulz, September 15, 2001
- U042, RH-TRU 1976 to 1982, Book 1 [AGHCF], no author cited, undated
- U072, Material Safety Data Sheets, various components, no author cited, undated

Waste Container and Batch Data Reports Reviewed

The BDRs for RH waste containers that were examined are provided in Table 4, below.

Table 4. BDRs Reviewed

Drum Number	VE BDR No.	DTC BDR No.	Waste Lot Number
00738	RH INL VE 06001	INL RH DTC C06001	17
00739	RH INL VE 06001	INL RH DTC C06001	17
00740	RH INL VE 06001	INL RH DTC C06001	17
00742	RH INL VE 06001	INL RH DTC C06001	17
00743	RH INL VE 06001	INL RH DTC C06001	17

Waste Stream ID-ANLE-S5000 has been characterized by AK with respect to almost all of the DQOs, and "confirmatory testing" was performed to confirm AK information. Unlike CH TRU waste, RH containers will not be tested for AK confirmation using a nondestructive assay (NDA) because of workers' health concerns. Instead, the confirmation of AK-reported radiological contents of the RH debris waste containers, TRU waste designation, and activity-related DQOs is performed through the application of the DTC technique in conjunction with AK-based scaling factors that were derived through ORIGEN2.2 modeling. Input parameters to this modeling were not individual drum AK data but rather fuel pins that contributed to radionuclides in various waste drum lots. The data for individual fuel pins were used as input to the ORIGEN2.2 code. The evaluation presented in this section assesses the AK process and related activities necessary to the determination of physical and radiological waste composition. The development of modeling parameters and the determination of scaling factors is addressed in Section 8.2.

Technical Evaluation

(1) Waste Stream ID-ANLE-S5000 was examined with respect to whether the stream is adequately defined.

The WCPIP defines waste stream as "waste material generated from a single process or activity, or as waste with similar physical, chemical, and radiological properties." The waste stream examined, ID-ANLE-S5000, is a debris waste stream generated in the ANL-E hot cell and K cell. The physical and radiological composition of the waste with respect to waste stream definition is evaluated below. At the time of EPA's inspection, EPA found that the definition of waste stream was not fully supported in CCP-AK-INL-500. This was discussed with AK personnel and EPA included this on an EPA Inspection Issue Tracking Form (See Attachment B. of this report for this form). It is discussed below, as well under Item (4).

EPA Concern No. INL-CCP-RH-AK-06-005CR, Revision 1: EPA's concern addressed the lack of clear support for the waste stream's definition. Specifically, the document needs to make a better argument that the wastes generated in the cells were never segregated by fuel pin or generator, so there is no way a specific fuel pin or radionuclide content can be assigned to individual waste containers. Therefore, the radiological characteristics of the fuel pins must be assigned as a whole to the entire population. This assumption must be supported and justified in the AK Summary.

Resolution: In response to EPA's concern, INL CCP revised CCP-AK-INL-500 to state:

> *Waste stream ID-ANLE-S5000 meets the WCPIP waste stream definition….[because] all of the containers in the stream were generated by AGHCF processes that remained relatively unchanged containing the same type of materials in approximately the same relative percentages. As described in Section 5.3, period campaigns were conducted in the ABHCF to prepare shipments of containers to be sent to INL. Waste were generally collected at individual work stations then moved to the waste packaging area in WS5 to be stockpiled until the next packaging campaign. Technicians in WS5 visually examined, sorted, and loaded the waste. Due to these waste management practices, in conjunction with the destructive nature of the examinations performed in the AGHC, further delineation of this waste stream based on radiological contamination is not possible. In addition, the waste stream contains waste materials generated during maintenance and waste management activities that could contain any radiological materials contaminating the cell surfaces and equipment (References C332, C333, C347, P006, P009, P023, U042.*

EPA examined INL CCP's response and each of the cited references. References C332, C333, and C347 address the physical characteristics of the waste, while P006, P009, and U042 address waste packaging and records related to radiological characterization of the waste. P023 addresses chemical components (lead) in the waste.

INL-CCP assessed the characteristics of the waste stream to determine whether the composition of the waste stream generated from 1990–1995 is physically similar (C332, C333). This analysis showed that for the wastes examined, on average the containers consisted of approximately 79% inorganic waste and 21% organic waste (noting that individual containers may be highly variable). Reference C347 is dated 1976 and states that wastes were segregated into combustible and noncombustible material at that time, due to radiolysis concerns, so there is evidence to suggest that procedures required waste separation very early in the program. While no other written references were prepared by INL-CCP that summarize their assessment of pre-1990 waste, INL-CCP presented its analysis in interviews with the EPA inspection team member(s). INL-CCP representatives indicated that prior to 1984, waste form was identified only as "combustible" or "non-combustible", with no other additional descriptors. INL-CCP representatives also indicated that between 1984 and 1990, more detailed descriptions could be found, but upon examination, each data sheet showed that the site identified nearly the same waste contents for each container. Therefore, INL-CCP representatives felt that only post-1990 data were of sufficient detail to support the detailed analysis that was presented in C332 and C333. EPA examined the references provided (e.g., U022) and agrees that available information is not amenable to detailed physical drum content assignment for drums generated prior to 1990. INL-CCP indicated, during interviews, that it had compared the number of containers identified prior to 1984 as being combustible or noncombustible and compared that to the detailed analysis. Pre-1990 containers were approximately 75% noncombustible and 25% combustible, which agreed with INL-CCP's detailed analysis of the post-1990 waste (29% combustible, 71% noncombustible). The WCPIP allows the assumption to be made that all debris waste containers are filled with plastic, so detailed identification of RH WMPs for the purposes of WWIS input is not required. However, according to EPA regulations, assessment and documentation of physical and chemical WMPs are necessary to ensure that the waste stream is appropriately assigned.

Radiological data pertaining to content of waste drums is addressed in several documents, including those referenced by INL-CCP in the response to EPA's comments on the AK procedure as well as EDF-6946 and EDF-6685. EDF-6685, Appendix A, presents the radiological composition (Pu and ^{235}U) for each fuel pin identified by INL-CCP. In general, EPA's examination of EDF-6685 showed that 72% of the identified pins contain both Pu and U, with 28 percent containing only ^{235}U. EPA also examined available data (EDF-6685 and EDF-6946) for each waste lot to ensure that each lot and therefore each drum contained TRU material as identified through AK. EPA's evaluation showed that for Lots 0–20[8], at least one fuel pin containing both Pu and U is associated with each lot, verifying that some level of Pu could be expected in each drum based upon available AK. These documents did not fully address EPA's concerns regarding radiological contents of waste drums reported in AK documents. EPA, therefore, conducted additional interviews with CCP AK personnel to understand and assess how data are used to develop the gross radiological characteristics of the waste and radiological components within the waste and assign the waste stream designation with respect to radiological constituents. These interactions assisted EPA in determining that the waste stream was appropriately assigned and its radiological contents were reported.

To further evaluate whether the waste stream was appropriately assigned from a radiological perspective, EPA examined the AK-identified radionuclide (i.e., Pu and ^{235}U) ratios found in the AK records with EDF-6685 to assess common elements between waste streams. This evaluation showed that the Pu/U ratio for Lots 1–20 varied by two orders of magnitude, i.e., 0.06 to 1.38[9]. INL-CCP identified additional data in EDF-6946 that were not included in the fuel pin and lot assignments presented in EDF-6685. Inclusion of the values from EDF-6946 tightened the $Pu/^{235}U$ distribution such that 21 of the 25 lots and sub-lots examined in EDF-6946 had $Pu/^{235}U$ ratios between 0.4 and 0.85, with three values above 1 (Lots 2, 10, and 16) and one value below 0.1 (Lot 11). The purpose of this analysis was to assess the common elements of the radionuclide content among specific wastes based on available data, and it was not intended as a

[8] In some cases Lots 0-20 were subdivided into Sub-lots, resulting in a total of 25 groupings.

[9] This estimate is based solely on AK Lot Records, not on individual fuel pin data. However, individual fuel pin ratios presented in EDF-6685 show a similar $Pu/^{235}U$ distribution for pins containing both ^{235}U and Pu, i.e., 0.007 to 0.49.

measure of expected waste content. This examination showed that when additional CCP data are taken into account, the waste stream exhibits a similar radiological content.

INL-CCP personnel were interviewed to understand their perspective on AK determination of radiological constituents in each drum as assigned through AK. Additional references (C348 and C350) were provided during the interview to clarify INL-CCP's position. INL-CCP personnel indicated that drum-specific radiological data are available for each container (C348), these data confirm EPA's assessments that AK indicates each drum would contain TRU material, and the Pu/U ratios are equivalent to the ranges identified by EPA. However, INL-CCP also pointed out that the type of radiological data available for each drum is highly variable and that many identify only the ^{235}U and Pu (presumably ^{239}Pu) content. INL-CCP identified several additional fuel pins and other information that may conflict with this AK information on a drum-by-drum basis. EPA agrees that there are uncertainties associated with the historic drum-specific assignments made by ANL-E, but the overall data show that the waste consists of materials that are similar with respect to radiological content. EPA concludes that the available data indicate that the waste stream is appropriately assigned from a radiological perspective. This approval applies only to the waste stream examined during this inspection. Specifically, it applies only to the waste stream as specified in AK documentation for Lots 1–20 that the EPA inspection team reviewed and does not apply to wastes that originated outside of the AGHCF, e.g., K Cell. Any new waste stream(s) or additions or modifications to INL Waste Stream No. ID-ANLE-S5000 Lots 1 through 20 is a T1 change. (See Table 1, where this is included as a T1 change.)

Status of Concern: Based on the information examined, the EPA inspection team determined that the waste stream has been appropriately assigned with respect to physical characteristics. This concern is also addressed under (4), below. Based on the discussions presented above, EPA considers this concern closed.

(2) The identification of high-level waste (HLW), TRU versus low-level waste (LLW), and spent nuclear fuel (SNF) was examined.

CCP-AK-INL-500 indicates that SNF is separate from the RH debris waste that was generated through testing of this fuel and is therefore not included in this waste stream. INL-CCP representatives interviewed indicated that HLW, by definition, is not included in this waste stream. See Item (16), below, for a discussion of load management.

(3) The detailed AK-based drum analysis process introduced in CCP-AK-INL-500 for drums 728–737 was examined.

The WCPIP requires that as much container-specific information as possible be assembled (Attachment A, Section 5.2). While a large quantity of detailed information for wastes has been assembled (much of which is drum or lot specific), INL-CCP did not perform detailed analyses of each item to develop AK-based drum radiological values. INL-CCP, however, did examine and present an analysis performed on a subset of these containers.

The examined references, P030, P590, P591, P592, P593, P594, P595, and P596, document a detailed data assembly and analysis activity designed to assess and assign drum-specific radiological values based on AK and related calculations/modeling. The process also underwent peer review. The analysis was performed in 2002–2003 for a 10-drum population (Drums 728–737) from Lot 16[10], generated from 1990 to 1991. The approach focused first on determination of isotopic values for each drum based solely on the AK record, with modeling and other data manipulation or calculations performed to acquire the additional radiological data required in the WCPIP. Examination of records for these 10 drums was performed to determine actual waste contents provided pre- and post-irradiation fuel element compositions. Ultimately, these efforts resulted in the identification of fuel element compositions (pre- and post-irradiation values) and identification of ^{234}U, ^{235}U, ^{236}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{241}Am, and ^{237}Np. Post-irradiation compositions were sometimes evaluated via computer code (BURNOUT, ORIGEN). The effort resulted in assignment of radionuclide compositions to the 10 examined containers, and several supporting references further document the approach used to generate "actual" radionuclide values based on AK (P590, P591, P592, P593, P594, P595, and P596).

These documents show that detailed analyses of AK data assembled for each drum can be performed to determine, in some detail, the estimated radiological content of each lot, recognizing that the process to develop an accurate and complete picture requires analysis well beyond that performed by the generator site, ANL-E (see item (1), above, and reference C350). This activity is also an alternative approach to characterizing waste based on the AK record that does not use DTC in the manner currently proposed by INL-CCP but instead uses various calculations and modeling efforts to determine values for the individual waste drums. INL-CCP has indicated, and EPA agrees, that this approach is time consuming (e.g., two years for 10 drums alone), and various assumptions and questions may still remain that could bring considerable uncertainty to this approach (see reference C350). This alternative approach has not been used at INL–CCP; therefore, EPA did not evaluate it in depth.

(4) Sufficiency of the AK summary was evaluated, as well as implementation of AK as required in Attachment A of the WCPIP.

Attachment A of the WCPIP specifies that the following be included in AK summaries:

- Executive summary
- Waste stream identification summary
- AK data and information description
- Program information
- Waste stream information
- Qualification of AK information
- Container-specific information

Attachment A mandates that a process to collect and analyze data similar to what is used for CH waste should be followed. Both the content of the AK summary and sufficiency of AK implementation were assessed. Note that based on the EPA requirements, the DQOs will require revision to include identification and quantification of the 10 EPA WIPP-tracked radionuclides

[10] The intent is to reference a discreet number of containers (Drums 728-737) that the EPA inspection team thought were designated as Lot 16, however these containers may in fact have a different lot designation.

in CCP-INL-CCP-AK-500. The AK summary was found to not adequately address several issues, including the data assembly process, and these were combined and recorded on one EPA Inspection Issue Tracking Form. (See Attachment B.4 of this report for this form.) This concern is also discussed under Item (1), above, and is presented below in four parts:

EPA Inspection Concern No. INL-CCP-RH-AK-06-005CR, Part 1, DQO and AK Qualification[11]: Attachment A of the WCPIP requires that for each DQO related to AK, AK personnel must identify the DQO and supporting AK information, justify the assignments/conclusions, reference the AK source documents and applicable pages supporting the assessment, and identify the qualification method in 40 CFR 194.22(b) that will be used to qualify the AK.

Resolution: INL-CCP responded to EPA's concern by revising Chapter 6 of CCP-AK-INL-500, Revision 3, to state that a "combination of methods" will be used to qualify AK information. Table 6 was added which presents the AK qualification method for each DQO. Table 6 shows that there is no qualification method for AK-derived defense determinations, consistent with the WCPIP and the fact that defense determination is based entirely upon AK and may not be qualified by measurement.

Status of Concern: Upon reviewing INL-CCP's response, EPA closed this part of the concern.

EPA Inspection Concern No. INL-CCP-RH-AK-06-005CR, Part 2, Identification of Inundated Drums: EPA's concern was that the AK summary implies that some containers in this population may have been submerged in a few of the vaults. The AK summary states that none of the approximately 70 containers whose videotapes were reviewed during VE were inundated, while others may have been. The discussion does not clearly indicate the total number of drums in the stream, the number of drums suspected of having been inundated, and how the inundated drums will be handled or otherwise managed.

Resolution: INL-CCP responded to EPA's concern by indicating that several drums were either submerged in vaults or showed evidence of having been submerged, thus indicating that there could be water present in these containers. INL-CCP revised the AK summary to state that of the 549 drums in the waste stream, 34 were either retrieved from water in the vault, retrieved from a vault that once contained water, or exhibited evidence that the drums was exposed to water. These 34 will undergo radiography to ensure that the drums have not been inundated with water." EPA expects that INL-CCP will tag and segregate drums in these categories for additional analysis. EPA also expects that radiography will be used to ensure that containers do not include any prohibited items, including liquids.

Status of Concern: EPA will evaluate INL-CCP's confirmation of the absence of water in these 34 drums and other "suspect" drums when EPA inspects the use of radiography for INL-CCP's RH WC program. EPA considers this part of the concern to be closed at this time.

[11] AK *Qualification* is the term used in the WCPIP, Revision 0D. Using DTC, INL-CCP is confirming AK and not qualifying AK in lieu of NDA, a measurement technique used for CH TRU waste.

EPA Inspection Concern No. INL-CCP-RH-AK-06-005CR, Part 3, Documentation of Defense Determination and Waste Stream Justification: Documentation for the waste's defense determination was not included in the records the EPA inspection team evaluated, and these records did not provide information that clearly supported the waste stream definition. Specifically, they did not fully document the basis for INL-CCP's contention that the wastes generated in the cells were never segregated by fuel pin or generator, thus precluding INL-CCP from assigning a specific fuel pin or radionuclide content to individual waste containers. This is of key importance since it supports INL-CCP's approach to assigning the radiological characteristics of the fuel pins to the entire population.

Resolution: In response to EPA's concern, INL-CCP revised the AK summary to include Table 6 listing AK source documents that INL-CCP uses to support the defense determination. As written, CCP-AK-INL-500, Revision 3, implies that many nondefense activities were performed at ANL-E and these activities generated wastes. INL-CCP stated that since some defense activities occurred at ANL-E and the wastes from these activities are commingled with the nondefense waste, all commingled waste is defense related. While CCP-AK-INL-500 does not clearly show that defense-related activities occurred early in the process, INL-CCP representatives pointed out that the defense-related activities were performed in the AGHCF throughout the time that waste was generated in the hot cell.

Status of Concern: Based on the information INL-CCP provided and the subsequent discussion, EPA determined that this part of the concern has been addressed.

EPA Inspection Concern No. INL-CCP-RH-AK-06-005CR, Part 4, Inclusion of Additional Radiological Data: The radiological data presented in the AK summary does not present a good understanding of the overall isotopic distributions that are applied to Waste Stream No. ID-ANLE-S5000 based on AK. While CCP-AK-INL-501 presents how each container is assessed, the AK summary in CCP-AK-INL 500 should still include a general discussion of the overall anticipated distribution on a waste stream basis, particularly since AK is used to address all DQOs. Page 40 presents information for drums from 1990–1995, but more information should be included for the entire waste stream.

Resolution: INL-CCP responded to EPA's concern by modifying CCP-AK-INL-500, Revision 3, Section 5.4.2.1, to include text and Table 5 that summarizes the reported radiological content of waste drums as reported by ANL-E. The text of the AK summary was also revised to state that "…the radionuclides reported by ANL-E varied significantly over the time period of waste shipment to INL, which is reflected in Table 5."

Status of Concern: Based on the information INL-CCP provided and the subsequent discussion, EPA determined that this concern has been addressed. Revisions to CCP-AK-INL-500 shall be provided to EPA as a T2 change as this document is updated to include radiological and other information obtained through verification. (See Table 1, where this is included as a T2 change.)

(5) Data traceability was examined.

Traceability of data was assessed on various levels. Data traceability from the AK record to waste drum or waste lot content was assessed and is addressed herein. Note that there are 617 drums of waste, 549 of which originated in the AGHCF. INL-CCP did not examine the other 68 drums of waste, so they are not included in this waste stream nor are the post-1995 drums, which number 50–100 according to INL-CCP. When INL-CCP adds any of the 68 drums from the pre-1995 time period or those generated since 1995, EPA will review this new information added to the AK for debris waste evaluated during this inspection as a T1 change, as discussed above. (See Table 1, where this is included as a T1 change.)

Because the fuel pins contribute directly to the radionuclide content in waste generated through analysis of these pins, fuel pin data traceability was performed to understand the types of data available for each fuel pin. Data for Index Nos. 297 (AG 421E), 293 (AG 421A Fuel Element UBA-15) and 311 (AG 429A) were chosen for examination of data and traceability, and this information is also included in EDF 6685. Available data for each fuel pin includes: the Fuel Element Summary Sheet for ANL fuel pins prepared by CCP; weight, radiological and other data from the origination site; safeguards and materials management report data; individual pin burn up calculations; and fuel composition by AG or fuel pin number. Data for each fuel pin/index number may not be the same, but CCP has attempted to collect all available data regarding each fuel element and summarized the available information.

AK data traceability for Waste Can Inventory Sheets and Waste Package Data Sheets provided for Drum Nos. 00739, 00740, 00741, 00742 and 00743 was also examined. These sheets present general waste content information and measurement data, but do not provide isotopic information. Radionuclide information is conveyed upon Loss or Gain of Materials forms (SPM-23) and Fuel Element Listings that provide the fuel elements/waste lots and ultimately estimate the Pu and ^{235}U quantities per drum in grams. Note that the AK summary states that once the Pu value per drum was obtained, "…the isotopes ^{239}Pu, ^{240}Pu and ^{241}Pu were calculated by multiplying the total value by a percentage to obtain the grams of each." CCP states that the values from 1990–1995 showed a relatively consistent distribution, and provided reference C348 that summarizes assembled radiological data for each. Several references (e.g., EDF-6685) include drum or lot-specific data. Based on this analysis, the traceability of available information for both fuel pins and drum/waste lot contents was demonstrated.

(6) Sufficiency of AK support documents and related document tracking was evaluated.

An AK Source Document Reference List was prepared using unique identifiers for the different document types following the format used by CCP for CH wastes. The listing provided is based on CCP-TP-005 Revision 17, Attachment 4, and is dated June13, 2006. The listing appears complete, and is easy to understand because it follows the same format that INL-CCP uses for CH waste streams. Several AK support documents were referenced in the text; those references examined to date address the element or issue that is referenced with the AK summary, although applicability does vary. It should be noted that EPA only examines support documentation specific to the technical element being referenced in the AK summary that caused that support reference to be selected for examination. If any information is added to either CCP-AK-INL-500 or CCP-AK-INL-501 that modifies the characterization approach or changes the understanding of radiological or physical content of wastes in the stream as currently defined, this would be considered a T1 change. (See Table 1, where this is included as a T1 change.)

(7) Interpretation of WCPIP, with respect to contents of the Certification Plan and Confirmatory Test Plan was evaluated.

EPA's RH WCPIP Framework approval 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 required. EPA's intent was that the sites present 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 personnel interviewed had different interpretations of some aspects of the WCPIP, and hence different opinions as to what the Certification Plan should contain versus the CTP. EPA understands how this has occurred, as the WCPIP lends itself to different interpretations. EPA learned during the inspection that INL-CCP intends to use AK qualification for every DQO possible, and that they intend to prepare a CTP for each waste stream that describes, in detail, how that waste stream will be characterized including qualification methods (e.g., Peer Review) other than confirmation. EPA noted that "where" the detailed waste stream characterization process is presented should be clarified, and recorded these issues on EPA Inspection Issue Tracking Forms, as discussed below (see Attachments B.5 and B.6, respectively, for these forms). INL-CCP-RH-AK-06-006CR is also discussed under Item (15), below.

EPA Concern Nos. INL-CCP-RH-AK-06-006CR and INL-CCP-RH-AK-06-007CR:
Specifically, EPA's concern in INL-CCP-RH-AK-06-006CR was that INL-CCP representatives stated that AK qualification will always be the approach used to meet DQOs. As such, INL-CCP will always prepare an AK CTP for each waste stream that presents a description of each DWP. The CTP must be revised to indicate that AK qualification is the selected DQO determination methodology for each DQO and to specify the qualification pathway selected, including a detailed discussion of confirmatory methods used. Based on EPA requirements, the DQOs will require revision to include identification and quantification of the 10 WIPP-tracked radionuclides.

EPA concern RH-AK-06-007CR was based on the fact that INL-CCP representatives indicated that AK qualification will be the method by which DQOs will always be addressed. Based on this, EPA expects INL-CCP to examine site documents that discuss the characterization methodologies to ensure that each reflects the requirements presented in the WCPIP when AK qualification is used. For example, the WCPIP requires that [the] certification plan include how the DQOs will be addressed, and EPA indicated that this should include waste stream information. INL-CCP representatives indicated that a CTP will be prepared for each stream and will include this information. Therefore, EPA expects INL-CCP to ensure that this commitment is clearly cited in related documents such that the CTP always fulfills this requirement. Note that based on EPA requirements, the DQOs will require revision to include identification and quantification of the 10 WIPP-tracked radionuclides.

Resolution: INL-CCP responded to EPA's concerns by recognizing the conflicting requirement of providing detailed information in the Certification Plan (per EPA's letter) versus their intent of including this information in a CTP. INL-CCP combined the CTP and Certification Plan (CCP-AL-INL-502, Revision 2), and included in this plan their intent to qualify almost each DQO using AK qualification. Chapter 1 of CCP-AK-INL-502, Revision 2, states that "Acceptable Knowledge will be used to document that each RH TRU waste Data Quality Objective (DQO), with the exception of the payload container based parameters, have been met." Chapter 4 addresses the methodologies for the determination of DQOs. EPA acknowledges that each of the DQOs will be verified through the application of radiological characterization and VE/RTR. Payload container-based parameters such as the Land Withdrawal Act (LWA) limit of 23 curies per liter will also be determined via radiological characterization.

INL-CCP created Revision 17 of CCP-PO-002 to address this modification. These modifications have adequately addressed the requirement to clarify that AK data is the source of all but one DQO, and there are various methods to verify the AK. Note that the document makes a single mention of the QA equivalency determination used to verify ORIGEN2.2 using the LANL mass spectrometry data. The technical aspect of this element was determined to be adequate by EPA (see Section 8.2). CCP-AK-INL-502 has been modified to state that the 10 WIPP-tracked radionuclides are to be identified and reported, but does not specifically state that they will be quantified. The approach discussed in CCP-PO-002 adequately addresses EPA's concern. As CCP adds new waste stream to AK or if the current plan is revised, EPA expects that CCP will prepare or revise the Certification/Confirmation Plan to address each waste stream. Changing the current plan for the approved waste stream is a T1 change. (See Table 1, where this is included as a T1 change.)

Note that the revised Certification Plan, provided in response to EPA's concern, has numerous changes that appear unrelated to this concern; EPA has not reviewed these changes for adequacy at this time. EPA notes that revisions to the WCPIP have been proposed. If implementation of this revised WCPIP results in changes to the CCP documents, EPA expects that INL-CCP will provide revised WC documents to EPA as a T2 change. (See Table 1, where this is included as a T2 change.)

Status of Concern: Based on the above discussions, EPA considers these concerns to be closed at this time.

(8) Content and technical adequacy of the Confirmatory Test Plan was evaluated.

The WCPIP requires the following to be included in the Confirmatory Test Plan (CTP):

- A description of the waste stream or waste stream lots to which the plan applies
- A description of the confirmatory testing proposed, including the percentage of waste containers that will be subject to confirmatory testing
- An explicit description of the waste characterization DQOs and QAOs that will be satisfied with the data being qualified

- A description of the DQOs and QAOs that will not be confirmed with the data being qualified and an explanation of how compliance with those DQOs and QAOs will be demonstrated
- A description of how the tested subpopulation will be representative of the waste stream or waste stream lot

INL-CCP revised the CTP in response to EPA comments (see Item 7, above). The revisions presented the proposed characterization plan for individual waste streams, and now is a combined CTP and Certification Plan. The revised CTP includes the required technical elements presented in the above listing. The requirement identifying the percentage of containers that undergo confirmatory testing is confusing because none of the actual containers at INL will undergo confirmatory testing. Instead, CCP sought to demonstrate that drums containing fuel pins that were assayed by mass spectrometry (MS) at LANL are comparable to the wastes at INL. The MS data would be qualified by the determination of an equivalent QA program, and the 400 pins that were assayed by MS would be considered to have undergone confirmatory testing. Physical form and residual liquid confirmation is achieved through 100 percent VE or, at a later date through radiography. This description is accepted as meeting the requirement presented in bullets 1 and 5, and the technical adequacy of the information and conclusions is addressed in Section 8.2.4.

The revised CTP also addresses DQOs, and has a new section that deals with AK QAOs and application of AK accuracy. See Item 15 for technical evaluation of this information, noting that inclusion of AK accuracy determinations under the DQO for Defense Determinations is inappropriate and the information should be included elsewhere or in a stand-alone section. The adequacy of DTC with respect to addressing related DQOs is addressed in Section 8.2.2.

(9) Content and technical adequacy of the Characterization Reconciliation Report was evaluated.

EPA evaluated CCP-TP-506, Revision 1, *CCP Preparation of the Remote-Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report,* to determine whether this document reflected the assembly of information required in the WCPIP. Additionally, EPA evaluated the Characterization Reconciliation Report (CRR) to see whether this report reflected requirements of CCP-TP-506, to ensure that the CRR addressed requirement elements as specified in the WCPIP, including:

- Specification of applicable site and waste stream
- A listing of each DQO
- Data from the AK record that addresses each DQO
- AK source document references that support/provide the data
- A listing of AK record discrepancy resolutions, if any, that are relevant to each DQO
- Documentation, including specific references, of how the AK data for each DQO were qualified, such as batch data reports, corroborative data, proceedings of a peer review, etc.

- Radiography and/or visual examination summary to document that liquids greater than 1 percent are absent from the waste and to confirm AK concerning the physical properties of the waste
- A summary presentation of radiological measurement data used to meet the DQOs and to confirm AK
- A complete AK summary
- A complete listing of all container identification numbers used to generate the WSPF, cross-referenced to each batch data report
- A listing of AK discrepancies generated by an AK qualification process and the corresponding resolutions
- Signature of the SPM

The example the EPA inspection team examined included all of the above requirements when taken as a whole. The CRR DQO worksheet (Attachment 3 of CCP-TP-506) lacks a listing of the 10 WIPP-tracked radionuclides as part of the DQO assessment process, and these radionuclides need to be specified, quantified, and assessed as part of the CRR. Site representatives declined to specifically address these because the WCPIP does not specifically require this inclusion, but EPA's rule specifies de facto limits for the ten WIPP-tracked radionuclides based on modeled quantities. Therefore, EPA expects that INL-CCP include these radionuclides in the DQO analysis. Provision of the CRR with related changes is a T2 change and it is expected this would be provided with revised Waste Stream Profile Forms (see item (14), below). (See Table 1, where this is included as a Tier 2 change).

(10) Use of a Correlation and Surrogate Summary Form was evaluated.

Completion of a Correlation and Surrogate Summary Form is required when AK information from a related CH waste stream is used in the RH waste characterization process. INL-CCP representative indicated that CH data was not used in this manner. However, a Correlation and Surrogate Summary (CSS) Form was completed to support the use of LANL mass spectrometry data to verify ORIGEN2.2 model which is used to generate INL data. The use of a CSS for this purpose is satisfactory, but does not discuss why the form is required, e.g., in this case to allow use of destructive assay data performed on LANL fuel pins as representative or correlated to similar fuel pins at INL. If containers from this waste stream are ultimately determined to be CH waste and are segregated, NDA will be performed on these wastes. Data from the CH wastes would be available for use and comparison with the isotopic ratios applied to the waste stream under the RH radiological characterization protocol. If this occurs, the use of this information should be documented on a CSS Form. Inclusion of the isotopic ratios obtained from NDA of a CH waste stream that was previously identified as RH waste and is recorded on a CSS Form is a T2 change. (See Table 1, where this is included as a Tier 2 change).

(11) Personnel training was evaluated.

Training records for Kevin Peters (AKE), Steve Schaffer (AKE), Lisa Price (AKE), Larry Porter (SPM), Michael Walantine (SPQAO), and Jene Vance (SME) were evaluated with respect to:

training to the RH TRU WCPIP; non conformance and corrective action processes; the AK procedure presented in Attachment A of the WCPIP; site-specific training relative to the contents of the subject waste stream(s); and determination of radiological contents of individual drums. Each person demonstrated training in the first four areas. With respect to determination of radiological contents of each drum, only Jene Vance's expertise was examined since he assembled and assessed AK data that was used to derive the scaling factors. Although Mr.Vance did not show direct training with respect to this area, his resume showed considerable expertise suitable to demonstrating proficiency.

(12) AK traceability of LANL mass spectrometry information and information/data relationships were examined.

INL-CCP has proposed the use of mass spectrometry data obtained from LANL to verify the output of the ORIGEN2.2 for INL data. INL-CCP argues that the LANL and INL (ANL-E) pins have similar origins, overlapping experimenters, similar if not the same reactor irradiation or sources, and therefore have sufficiently similar radionuclide content, so the use of LANL data for this purpose is appropriate. Of the 506 fuel pins identified, approximately 62% are associated with EBR-II, and the rest are from various reactors, i.e., Unirad and Shippingport. Most fuel pins are from the Fast Breeder Fuel program, although some were also from light water and other reactor types. Specifically, INL-CCP states that: "Mass spectrometry results for a total of 400 fuel pins were located and retrieved. The mass spectrometry measurements were conducted under a QA program which has been evaluated to be equivalent …to NQA-1 and, therefore, these data are acceptable as AK information." INL-CCP also states that "…On the basis of the similarities between the two fuel pin examination programs, the fuel types, the sources of the pre-irradiation fuel composition and burnup information, and the identical reactors for a majority of the fuel pins, the LANL confirmatory sampling is sufficient to satisfy the qualification required for the INL AK information." EPA found that the above statement required additional references to support the assertions and issued an EPA Inspection Issue Tracking Form (see Attachment B.7 for this form). This concern is discussed below.

EPA Concern No. INL-CCP-RH-AK-06-008CR: EPA's concern was that CCP-AK-INL-501 includes several statements, assumptions, and arguments that lacked references to calculations or other information to support the arguments. Without references, it is not possible to verify some of the conclusions in the document. In particular, several other documents (CCP-AK-INL-500, CCP-AK-INL-502, etc.) state that CCP-AK-INL-501 shows that LANL and INL fuel pins had many common elements. The brief discussion on page 33 states that: "On the basis of the similarities between the two fuel pin examination programs, the fuel types, the sources of the pre-irradiation fuel compositions and burnup information, and the identical reactors for a majority of the fuel pins, the LANL confirmatory sampling is sufficient to satisfy the qualification required for the INL AK information." However, the document does not cite references or other detailed information to support this assertion. The document provides charts and other comparisons between pins and INL fuel pins, but the specific INL fuel pin numbers and related data and calculations are not referenced. Table 5-1 presents a summary of sponsors associated with ANL-E and LANL pins, but of the top three sponsors for LANL and ANL-E, only one was common to both. Additional information that better supports the commonalities between the two sites in the text of CCP-AK-INL-501 is necessary, e.g., the 33 calculation packages that support the development and application of ORIGEN2.2. The documentation lacked a strong link between the INL and LANL fuel pins.

Resolution: INL-CCP responded by adding references to the calculation packages, as well as by adding text and a table to Section 5.0 in CCP-AK-INL-501. This information presented experimenters common to LANL and INL, and locations of fuel pins to show that seven of the experiments involved in the fast breeder program were conducted at both ANL-E and LANL. INL-CCP's description however, does not clarify whether these fuel pins also had MS data associated with them.

Status of Concern: The relationship established by CCP for the LANL and INL pins is sufficient. EPA considers this concern to be closed at this time.

INL-CCP found seven different experimenters who shipped fuel pins to both LANL and INL for examination. Two of the seven experimenters sent more than one PIN/AG to each, so a total of nine fuel pins were common to LANL and INL. The fuel pins identified were examined during creation of waste Lots 2, 3, 7A, 7C, and 8B; all but one of the fuel pins were irradiated at EBR-II. Upon interview, it was determined that the above analysis is the most significant traceability identified by INL-CCP between the INL (ANL-E) and LANL fuel pins. While the data do show that there are at least seven individual experimenters common to both sites, it does not show that the LANL MS data were common to pins at both LANL and INL. It is understood that a majority of fuel pins associated with both sites were irradiated at EBR-II, and would therefore have a common isotopic signature. INL-CCP has not directly established that the fuel pins with MS data are representative of LANL fuel pins or a significant population thereof, and that these fuel pins are "equivalent" to or representative of the INL fuel pins (in whole or in part). It should be noted that the MS results are used to verify the ORIGEN2.2 output and are not used as direct input to any of the adjustments or scaling factors for INL RH waste. Therefore, establishment of this relationship in the manner presented by INL-CCP is sufficient, since the MS data are not directly used in the INL calculations other than to verify the model. Note that this analysis does not address the graphic presentation of data representativeness shown in Chapter 5 of AK-INL-CCP-501; evaluation of these presentations is presented in Section 8.3 of this report.

It must also be pointed out that the INL-CCP makes the basic assumption that material from all fuel pins may be present in every waste container. INL-CCP bases analysis presented in AK-INL-CCP-501 upon this assumption, and builds the remainder of the analysis on fuel pin commonalities. EPA's examination showed that each lot contained material from pins that were irradiated by EBR-II and, assuming that EBR-II imparted a common radiological signature, each waste lot has this common thread, thus supporting INL-CCP's contentions regarding common radiological constituents. However, INL-CCP proposes a "waste stream" rather than a "waste container" approach that is applicable only for this RH waste stream.

(13) Non Conformance Reports (NCRs) and Discrepancy Resolution (DR) Forms were examined.

NCR-RHINL-0004-06 is among those provided to EPA to assess documentation of NCRs. Unfortunately, this NCR did not include enough information to determine the reason for the NCR. Discrepancy Resolutions (DR) DR11 and DR10 were also provided for examination. DR11 addresses waste requisition and video discrepancies, while DR10 concerns a discrepancy regarding the volume of a 7-gallon waste can. This information suggests that INL-CCP can adequately prepare NCRs and DRs to document nonconforming items or containers, as well as the types of discrepancies presented for review. EPA was not provided a specific example of an AK-AK discrepancy resolution involving radiological composition of waste, although INL-CCP representatives indicated that drum/lot AK data had been assessed and was not called upon to provide an absolute or qualitative comparison on a drum or lot basis. EPA expects that INL-CCP will include AK-AK discrepancies in the AK record as they are identified.

(14) A waste stream profile form was examined.

An example Waste Stream Profile Form was examined for Waste Stream Number ID-ANLE-S5000. The form included required line items as presented in the WCPIP, Attachment 4; the CRR and RH AK summary are also required for submission to CBFO to allow assessment of the WSPF. EPA understands that this form is abbreviated because it was provided for audit purposes only, and expects that the completed form will include more AK data, checklists, etc. to better present the required information. See comments above pertaining to CRR and AK Summary for additional information. Provision of a completed, final WSPF with all related documentation for this waste stream is a T2 change, as would be any subsequent revisions to this approved WSPF. (See Table 1, where this is included as a Tier 2 change).

(15) AK accuracy was assessed.

AK accuracy was assessed with respect to the required contents as presented in the WCPIP. The WCPIP requires AK accuracy to be assessed in three areas: reassignment of the waste to a different Summary Category Group; reassignment of the waste to a different waste stream; and, stream-specific assessment of radiological parameter accuracy. AK accuracy of the first two parameters was adequately documented for the containers in the lot that were examined. INL-CCP stated that only one radiological DQO, comparison of survey results with AK data that classify the waste as RH, shall be a measure of AK radiological accuracy. However, if INL-CCP uses confirmatory testing for any radiological parameter, EPA expects that the evaluation of AK accuracy for that parameter will be performed. EPA presented this on an EPA Inspection Issue Tracking Form (see Attachment B.5 for this form) and it is discussed in Item (7), above, as well as below.

EPA Concern No. INL-CCP-RH-AK-06-006CR: This concern stated that the CTP includes the proposed approach for assessing [radiological] AK accuracy, which is only the verification that waste is RH as identified by AK. The CTP also assume that the CCP 501 document has established “no significant discrepancies” between AK information and confirmation of modeling/sampling. However, this assumes that the LANL MS data are demonstrated to be applicable, and EPA has not fully assessed CCP-AK-INL-501, which presumably includes this information. Since AK qualification and confirmatory testing are used for all radiological parameters, it would appear that each radiological DQO should be evaluated with respect to how the confirmatory data collected will be assessed as part of AK accuracy (if this is not feasible, a detailed argument should be included). The accuracy report should be revised accordingly.

Resolution: INL-CCP responded by revising CCP-AK-INL-502 to produce Revision 2 that addresses the determination of AK accuracy for the AK-based radiological parameters that are discussed below.

<u>TRU Waste Determination</u>: AK accuracy was determined in two parts. Part 1, isotopic abundance assessment, has already been completed, and CCP-AK-INL-501 states that there are no significant discrepancies between AK information used in the modeling and the qualification of that AK (modeling and sampling). Part 2 of the AK accuracy determination will be accomplished through measurement comparison against AK documentation that shows the waste as being TRU waste. EPA's analysis of this with regard to Part 1 was that pin data and related burnup are used in modeling, and the results of this modeling were verified by LANL MS data. The INL-CCP response does not address how the content of the drums with respect to TRU nuclides as defined by AK will be compared to the ultimate radionuclide content assigned to that drum using DTC/ scaling. However, INL-CCP representatives contend that the AK-identified content is insufficient (see Item 1 above and reference C350), although detailed analysis has been performed on a select waste drum population for which AK Accuracy could be performed. When Lot 16 is characterized, EPA requests that INL-CCP compare AK and DTC results for the purpose of determining AK accuracy and that INL-CCP provide the results of this comparison to EPA with the completed DTC results for all containers as a T2 change. (See Table 1, where this is included as a T2 change). The Part 2 comparison of the reported measured results with the AK information is appropriate, and EPA assumes that this comparison will be undertaken on a per container basis.

<u>RH Waste Determination</u>: INL-CCP stated that AK accuracy will be determined by comparing the actual survey results with AK information identifying the waste as RH wastes. EPA agrees that containers where the external dose rate is less than RH levels because of radioactive decay of the container's contents since collecting AK data should not be considered an actual AK discrepancy, and the AK-classified RH containers that are not currently RH whose status change cannot be attributed to decay alone on the basis of calculations *would* be considered against AK accuracy.

<u>Activity Determination</u>: As with TRU waste determination, the Part 1 response deals with modeling input vs. MS data, not a comparison of the radionuclide content/quantities per drum as identified by AK compared to that assigned by DTC/scaling. AK confirmation and AK record comparison for activity determination will be accomplished in two parts. Part 1, isotopic abundance assessment, has been completed and INL-CCP states that there are no significant discrepancies between AK information used in the modeling and the qualification of that AK (modeling and sampling); this includes the "identification and reporting" of the 10 WIPP-tracked radionuclides. Part 2 is a comparison of the measurement results (curies per liter) with the LWA limit of 23 curies per liter. Containers with greater than 23 curies/liter based on DTC will be

counted against AK accuracy. In the same manner as for TRU waste identification discussed above, EPA's position is that INL-CCP's Part 1 response deals with modeling input from the inventory (i.e., PIN data), compared to MS results after both have been input to ORIGEN2.2. The response does not address comparison of radionuclide content of the waste drums as identified through AK, recognizing that drums contain several different fuel pins that can have different U and Pu contents. The application of DTC/scaling essentially superimposes an overall isotopic distribution on the waste stream, regardless of whether AK has shown individual containers or groups of containers to be dissimilar. INL-CCP representatives have indicated that AK assembled by ANL-E has a number of assumptions associated with it, and is not an accurate representation of lot or drum contents, so an AK-DTC comparison would not be meaningful (reference C350). However, a detailed analysis has been performed on a select waste drum population and that information is useful for comparison purposes to verify the scaling factor approach used by INL-CCP. When Lot 16 is characterized, EPA expects CCP to compare AK and DTC results as part of an assessment of AK Accuracy and provide this to EPA as a Tier 2 change. (See Table 1, where this is included as a T2 change). EPA assumes that Lot 16 represents those containers assessed by ANLE in reference P030 (see item (3), above). If this is not the case, then the lot that corresponds to the INL-evaluated drums must be included in the AK accuracy analysis.

Status of Concern: Based on the discussions described above, EPA considers this concern closed at this time.

An example AK memo was presented, and the memo stated that the comparison between the modeling results using fuel pins and the ORIGEN2.2 and MS data show good agreement. Also please see the commentary above concerning the AK accuracy calculations. To date, only six containers have undergone complete characterization so meaningful accuracy calculations cannot be made. If future reports show accuracies less than 100%, EPA expects the report to address any accuracy issues that arise and how the containers in question have been managed.

(16) Load management was assessed.

The possibility that containers may exhibit less than 100 nCi/g TRU was evaluated. AK data presented in EDF-6685 were evaluated to determine the average Pu drum value, understanding that this value is a gross estimate because additional data presented in EDF 6946 could impact the gram values. As such, the data were assessed only to evaluate the possibility that some containers may ultimately "measure out" less than 100 nCi/g Pu (e.g., drums in Lot 11). Data suggested that INL-CCP may encounter containers that measure less than 100 nCi/g, requiring the implementation of load management. However, INL-CCP representatives also indicated that a container would have to measure less than 10 mR/hr at 1 meter to result in a TRU content less than 100 nCi/g using the scaling factors from CCP-INL-AK-501. At that point, INL-CCP personnel stated that the container would be considered CH and would be segregated for shipment in a different waste stream. Note that the CTP states, "In the rare event that a waste container might be 200 mrem/hr at its surface (and as such, RH waste), but less than 200 mrem/hr at the surface when three such containers are loaded into an RH-72B canister, the canister will still be considered RH waste as defined in the LWA." EPA expects that every container emplaced in the canister will exhibit ≥ 200 mrem/hr prior to loading. If a container has a contact reading of less than 200 mrem/hr, the waste will be considered CH waste and will be removed from the waste stream. When such segregation is not considered and INL-CCP determines that a RH container is to be handled as CH waste, EPA requires notification of the decision to take these actions and the supporting rationale concurrently when the issue is first presented to CBFO. This is a T1 change. (See Table 1, where this is included as a T1 change).

(17) Verification methods for each DQO were assessed.

INL-CCP representatives indicated that all DQOs except for RH waste determination will be met through verification of AK, see item (7), above. INL-CCP indicates that confirmatory testing will be used for each DQO, but also implies that establishment of an equivalent QA program may be used when using the mass spectrometry data to verify the ORIGEN2.2 output. Revision of various INL-CCP documents to clarify that AK qualification will be performed for almost all DQOs is addressed in other parts of this section.

(18) Attainment of DQOs was evaluated.

As a result of the analysis presented in items (1)–(17), 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 (TRU Alpha activity per canister, including quantification and identification of 10 WIPP-tracked radionuclides)
- Residual liquids
- Physical form, including metals and CPR

All of these DQOs, except for RH waste and defense determination, are based on AK that is confirmed through various WCPIP-allowed techniques or variants thereof. RH status is determined through direct dose rate measurement. Defense determination is based on AK alone and cannot be confirmed. As indicated above, EPA required clarification regarding how DQOs would be met and, if done by AK, the specific confirmation pathway. As a result of information provided and EPA's analysis of these data, EPA concludes that CCP has adequately presented how DQOs will be obtained.

Summary of AK Findings and Concerns

The EPA inspection team identified the concerns related to AK that are discussed above. Copies of the EPA Inspection Issue Tracking Forms are provided in Attachments B.4 through B.7. EPA considers all findings and concerns to have been adequately addressed and there are no open finding or concerns related to AK resulting from this inspection.

Proposed AK Baseline Approval

EPA is proposing the approval of the AK process evaluated during this baseline inspection. Specifically, the proposed approval is limited to Waste Stream ID-ANLE-S5000 RH retrievably-stored debris waste, Lots 1 through 20, consistent with the limitations described in CCP-AK-INL-500, Revision 3.

Proposed AK Tiers

Based on the inspection and the results discussed above, EPA proposes to assign the following tiers:

T1 AK changes that will require EPA review and approval prior to implementation and apply to any new waste category not evaluated during the baseline inspection include the following:

- Waste streams not approved under this baseline (e.g., solids)
- Expansion of currently approved waste stream, (e.g., addition of K Cell waste and other wastes to the Waste Stream ID-ANLE-S5000 that consists of Lots 1-20), as well as wastes that may be in the current waste stream but are currently not approved
- Implementation of load management for RH debris drums now identified as CH debris as a result of surface dose-rate measurements
- Any change(s) to the following documents that have the potential to affect the characterization process: CCP-AK-INL-500, Revision 2; CCP-AN-INL-501, Revision 1; or CCP-AK-INL-502, Revision 0

T1 changes will be reported and documentation will be submitted when INL-CCP is ready for EPA review. Upon initial review, EPA will inform INL-CCP and CBFO whether a site inspection is necessary. EPA may request additional information, choose to conduct a desktop review, and/or confer with INL-CCP AK personnel. Upon AK evaluation with or without site inspection, EPA will issue a decision. Only upon receiving EPA written approval may INL-CCP dispose of the new waste at the WIPP.

T2 AK changes that do not require EPA approval prior to implementation but require reporting and submitting documentation discussing changes include the following:

- Changes made to AK documents as a result of WCPIP revisions
- Complete waste stream data package (WSPF, CRR) for this waste stream once completed, and any modifications to that WSPF
- Updates to CCP-INL-AK-500, CCP-INL-AK-501 and CCP-INL-AK-502, made available when the update(s) to each update is approved
- AK accuracy report for Lot 16 (or the appropriate Lot) wherein individual drum data assessed by INL (e.g., P030) will be compared against DTC-derived values; all other AK accuracy reports prepared annually at a minimum

- Completed Correlation or Surrogate Summary Forms of any RH containers identified in this waste stream identified as CH based on measured dose rates, presenting NDA results for all assayed containers

Every three months following EPA approval, INL-CCP will provide EPA with information concerning T2 changes. EPA will evaluate these changes and communicate with INL-CCP as to whether the changes raise any concerns and require an INL CCP response, or whether INL-CCP can continue to implement the changes.

8.2 Radiological Characterization

EPA inspected the method by which the required radiological constituents for each waste container were determined. The nature of RH TRU wastes presents considerable difficulty with respect to obtaining meaningful measurement data. Apart from the obvious workers' exposure considerations associated with external radiation fields in excess of 200 mrem/hr, RH TRU waste containers typically contain concentrations of ^{137}Cs that prevent a meaningful isotopic determination in the same manner as is done for CH TRU wastes. At this time, INL-CCP has not proposed to assay RH containers for radiological contents. An alternative approach is the use of a scaling factor, which allows the correlation of an easily measurable gamma emitter such as ^{137}Cs with difficult-to-measure actinides and transuranic radionuclides. This is the essence of INL-CCP's approach to radiological characterization. This method is a complex process and the inspection focused primarily on the following two aspects:

- The application of the Dose-to-Curie (DTC) technique to determine a container's external gamma exposure rate[12] (dose rate) by correlating the measured dose rate to an activity concentration for ^{137}Cs
- Using scaling factors to convert the derived ^{137}Cs activity to activity values for the other 9 of the 10 WIPP-tracked radionuclides, including the uncertainty for each

This section provides an overview of the INL RH radiological characterization process and discusses EPA's evaluation of the adequacy of INL-CCP's radiological characterization program. The checklist in Attachment A.2 identifies the objective evidence that was examined and used to complete the technical assessment for the DTC aspect. Evaluation of the scaling factors was not amenable to a checklist, and this aspect is discussed in the text directly.

8.2.1 Overview of INL Radiological Characterization Program

The radiological characterization aspect of the INL RH WC program that EPA evaluated focused on techniques to characterize containers from a single RH TRU waste stream, ID-ANLE-S5000. This stream consists of debris wastes that were transferred to INL between 1976 and 1995 and were generated at ANL-E in the Alpha Gamma Hot Cell facility (AGHFC) during the

[12] The external exposure rate is a numerical value expressed in units of rem per unit time (typically mrem/hr) that includes the contributions of all radiations, i.e., neutron, gamma, beta and alpha. The formal determination of a container's RH status is documented in mrem/hr, but for the DTC procedure only a photon (gamma) determination is performed and this is referred to informally as a *dose rate*. For consistency, term *dose rate* is used throughout this report.

examination of irradiated and un-irradiated fuel pins from various reactor programs at ANL-W and other DOE and commercial reactors. Based on the nature of the waste materials and the types and quantities of information available, INL-CCP chose the approach of developing a waste characterization protocol that in their opinion was best suited for characterizing the population of all RH TRU waste containers within INL Waste Stream ID-ANLE-S5000. Specifically, a single scaling factor was assigned to fuel pin-related wastes generated from a variety of fuel types, an approach which begs the question whether a single waste stream can contain materials that are so dissimilar with respect to radiological composition. This aspect was discussed in detail during all phases of this inspection and these discussions are reflected in the text that follows.

The actual measurement aspect, formalized in CCP procedures, consists of four simple external gamma readings of each waste container (the average value is used), all of which are attributed to a single photon-emitting radionuclide, ^{137}Cs. From a radiometric perspective, this is a simple task. The complexity of radiological characterization is contained in the development of the DTC approach that transforms each container's measured dose rate into a ^{137}Cs activity value which, in turn, is used in conjunction with scaling factors to produce concentrations for remaining 9 of the 10 WIPP-tracked radionuclides and their corresponding uncertainties. INL-CCP generated the scaling factors using the MCNP5, ORIGEN2.2 and MicroShield computer codes and compared them to mass spectrometry (MS) data that were generated at LANL. Beginning in the 1970's, destructive analyses were performed on 400 fuel pins at LANL to determine the relative abundances of Pu and uranium (U) isotopics along with isotopes of neodymium (^{148}Nd). Neodymium-148 is a fission product that is used to calculate burn-up in fuel and is analogous to the fission product ^{137}Cs. INL-CCP refers to this use of the MS data as *qualifying the ORIGEN2.2 results* with the LANL MS data, and the scaling factors were adjusted as a result of the comparison. In general, MS is an excellent analytical technique and use of the MS data to adjust the isotopic scaling factors provided the opportunity to verify the results of the application of the codes mentioned previously. A technical assessment of the LANL MS data is addressed in Section 8.2.4.

Figure 1 presents a flow chart of the INL-CCP radiological characterization process given in CCP-TP-501, Revision 1. Documentation of the conceptual basis for the DTC approach and development of the scaling factors is documented in 35 calculation packages that are listed in Section 8.2.5, as well as other technical documents, all of which were reviewed as part of this inspection.

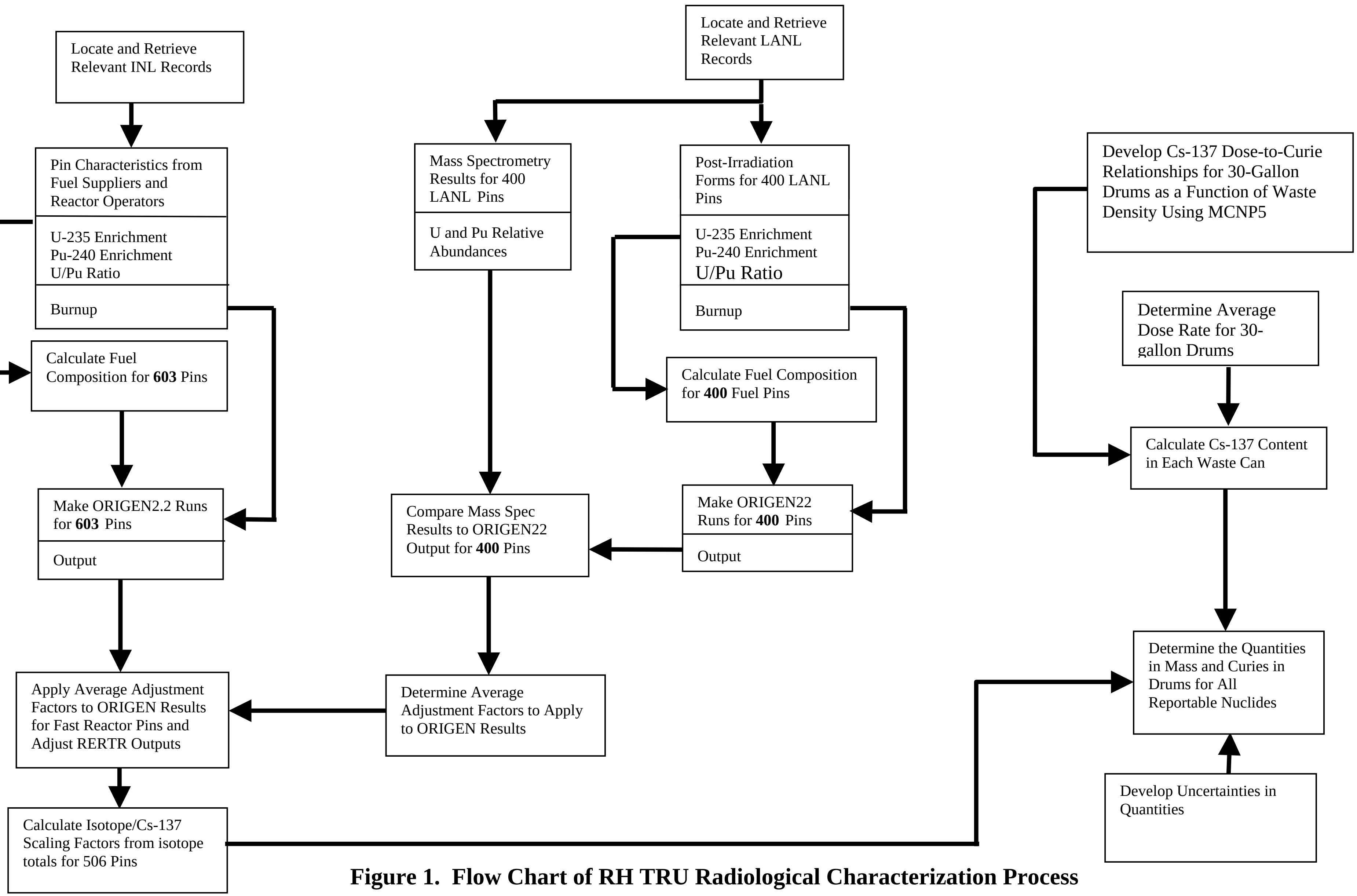

Figure 1. Flow Chart of RH TRU Radiological Characterization Process

8.2.2 Radiological Characterization Element: Dose-to-Curie Procedure

DTC Overview

INL-CCP's approach was based on translating the measurable external gamma radiation from ^{137}Cs into an activity value using the Monte Carlo Neutron-Photon (MCNP) code, as documented in INL-RH-03. All of the measured gamma radiation was attributed to ^{137}Cs, as discussed in LANL-RH-10, INL-RH-09 and INL-RH-08, including contributions from ^{60}Co and other gamma emitting members of the ^{232}U decay series, e.g. ^{228}Ac and ^{208}Tl. Once the container's *measured* gamma dose rate was converted into a ^{137}Cs activity, the other nine WIPP-tracked radionuclides were scaled to the ^{137}Cs activity using a single set of scaling factors that were applied to all waste containers within the Waste Stream ID-ANLE-S5000. An example calculation using the observed dose rate in the DTC procedure is presented in Section 8.2.3, along with a discussion of the development of radionuclide scaling factors.

INL-CCP formalized the ^{137}Cs measurement in the Dose-to-Curie (DTC) procedure, *CCP-TP-504, Dose-to-Curie Survey Procedure for Remote Handled Transuranic Waste, Revision 2*. This procedure was evaluated prior to and during the inspection. The DTC process was evaluated relative to the following:

- Capability of the DTC hardware to adequately determine a container's external gamma exposure (dose) rate
- Technical adequacy of the radiological characterization program's documents, procedures, and controls
- Knowledge and understanding of the personnel involved in the radiological characterization program

The external dose rate determination was done empirically using measurements that took place on-site at INL within the Idaho Chemical Processing Plant, Idaho Nuclear Technology Engineering Center (INTEC), Building No. CCP-659, Rooms 302 and 306, for instruments and operators, respectively. This approach is explained in CCP-AK-INL-501, Revision 1, and is formalized in procedure form in CCP-TP-504, Revision 2, both of which were reviewed for this inspection. The requirements of these two documents were used to formulate a basis by which the EPA inspection team evaluated the DTC process. Additionally, several of the calculation packages listed in Section 8.2.5 supported technical aspects of the DTC approach, and these were reviewed and discussed at length at INL in June and during subsequent telephone conversations between Patrick Kelly and Jene Vance, Jim Holderness, and Mark Doherty that took place throughout the month of July 2006. The purpose of these conversations was to obtain answers to specific technical questions that were not addressed during the INL site visit.

DTC Technical Evaluation

The EPA inspection team evaluated the following aspects:

(1) Instrumentation for making dose rate measurements

The EPA inspection team verified the following:

- There are three (3) ion chamber probes available for use with the RO-7 Ion Chamber: RO-7LD with a full-scale range of 1,999 mR/hr and a resolution of 1 mR/hr (Low Range); RO-7BM, with a full-scale range of 199,900 mR/hr and a resolution of 100 mR/hr (Medium Range); and, RO-7BH with a full-scale range of 199,900,000 mR/hr and a resolution of 10,000 mR/hr (High Range). The calibrations are essentially probe-specific, allowing the probes to be interchanged between ion chamber bodies.
- The Low Range Probe No. 802038 and the Medium Range Probe No. 801254 had been calibrated and were in calibration at the time of the inspection. The High Range probe was not observed in use, INL-CCP personnel stated that it had been neither calibrated nor source checked. INL-CCP personnel stated that there was no intention of using this probe in the foreseeable future.
- The ion chamber used to measure the dose or exposure rate of containers for the DTC method had been calibrated, as evidenced by the calibration due dates on the ion chamber itself and the probes, see previous bullet.
- Instrument calibration was performed by the Battelle Energy Alliance (BEA) Health Physics Instrument Laboratory (HPIL) located at INL and this facility is on the WTS Qualified Suppliers List. Calibration was performed in accordance with HPIL Procedure CW1-240, Revision 2, which was reviewed during the inspection. INL-CCP personnel had a spare RO-7 Ion Chamber that had been calibrated but was not observed in use.
- It was verified that the scale used to weigh the containers has been calibrated and that the scale has been checked daily.
- The battery and performance checks for the instrument used to measure the dose or exposure rate of containers for the DTC method had been performed and documented at least once per day prior to the first measurement of the shift.
- The background rate was measured and recorded. Measurement personnel stated that they would take actions to reduce the background if the measured background radiation levels are greater than one-tenth of the expected container dose or exposure rate, as required by the WCPIP and CCP-TP-504, Revision 1.

(2) Execution of the dose rate measurements

The EPA inspection team verified the following:

- For the waste containers observed (Drum No. 00761), the dose rate was measured four times, each at a distance of 1 meter and the container was rotated on the turntable 90° between each measurement.

- The INL-CCP personnel were working to the approved document, CCP-TP-504, Revision 1, and all measurements were taken at the center line of the drum's height and were lined up to the center height of the active volume of the ion chamber probe.
- The appropriate range probe for the ion chamber was used (Low Dose Probe No. 802038).
- The container, waste stream, and measurement data were entered into the "Waste Container Dose-to-Curie Conversion Record" spreadsheet. Information entered included:
  - Date of the gamma measurements with the RO-7 Ion Chamber and Probe SNs
  - Waste stream designation
  - Container number
  - Container gross weight
  - Estimated can size for Cans #1, #2, #3, as appropriate
  - Estimated fill percentage for Cans #1, #2, #3, as appropriate
  - Four quadrant dose rate measurements
  - Waste material type (e.g., steel, cement, organic)

(3) DTC BDR

The EPA inspection team verified that the one DTC BDR included the following:

- BDR Cover Sheet, Attachment 4
- BDR Table of Contents, Attachment 5
- BDR Narrative Summary, Attachment 6
- ITR Review Checklist, Attachment 7
- Measurement Control Report, Attachment 1
- Container Data Sheet(s), Attachment 2
- Waste Container DTC Conversion Record(s), Attachment 3
- Copies of NCR Nos. RHINL-0505-06, RHINL-0004-06 and RHINL-0501-06
- 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

(4) Meeting quality assurance objectives (QAOs)

The EPA inspection team verified that:

- Precision had been established and maintained within the manufacturer's specifications for the RO-7 Ion Chamber by successful source checks made prior to obtaining dose rate measurements on actual waste containers.
- Accuracy had been established and maintained by operating the instrument within the manufacturer's recommendations.
- Representativeness had been maintained by applying the dose rate measurement to the entire waste container.

- Completeness had been achieved by measuring the dose rate for every container in the BDR, i.e., 100% assay.
- Comparability had been achieved by using standardized instructions to design and implement the DTC protocol, including the dose rate measurements.

(5) RH TRU determination

It was not entirely clear at what point the formal determination regarding a waste container's status would be made relative to the criteria for RH TRU. The EPA inspection team evaluated the two following aspects:

- RH TRU containers must have a contact external dose equivalent rate in excess of 200 mrem/hr:

  The DCT measurements that were observed and are discussed in this section represent only the photon (gamma) contribution to a container's external radiation field. There was a neutron-sensitive instrument (Rem Ball) in the same area as the RO-7 that could be used to provide the necessary information to support a complete determination regarding a waste container's status relative to the 200 mrem/hr criterion. INL-CCP personnel stated that the Rem Ball was used to measure each waste container but the results were used primarily for health physics/ALARA purposes. However, the RH determination is typically made on the basis of the transportation package and is therefore not within the purview of this inspection.

- RH TRU containers must have a concentration of TRU radionuclides greater than 100 nCi/g:

  CCP-TP-504 requires the container's dose rate to be at least a factor of ten greater than background and the lowest reading possible on the RO-7 is 1 mR/hr. This means that the minimum measured dose rate at 1 meter that is required for the proper execution of CCP-TP-504 at the 200 mR/hr criterion is 10 mR/hr, based on a factor of 20 difference between the measured dose rate at 1 meter from the container relative to the reading on contact with the container. The EPA inspection team was concerned that it may not be possible to ensure that a container with a one-meter dose rate of 20 mR/hr did in fact contain greater than 100 nCi/g of TRU radionuclides. As a check, the spreadsheet shown in Figure 3 was used with input values for the 1-meter dose rate of less than 10 mR/hr. For this hypothetical case, the spreadsheet yields a value in excess of 3,000 nCi/g for TRU Alpha Activity, based on the application of the scaling factors encoded in the Excel spreadsheet. This indicates that a container may not qualify as RH based relative to the 200 mR/hr criterion, but it would still qualify as TRU relative to the 100 nCi/g criterion. Of course, it was not clear at this time how containers that showed a contact dose rate of less than 200 mR/hr would be dispositioned, i.e., as CH or RH. If any containers that are currently considered RH from this waste stream are eventually dispositioned as CH TRU, it would be valuable to compare the NDA results for the containers with those generated using the application of DTC and scaling factors that are discussed in this report. Providing this information to EPA would be a Tier 2 change. (See Table 1, where this is included as a Tier 2 change). See Section 8.1 (11) for a more detailed discussion of this issue.

The EPA inspection team did not have any technical concerns or issues with the execution of the DTC methodology observed at INL-CCP during this inspection, or with the method's technical basis and documentation based on the objective evidence that was reviewed.

8.2.3 Radiological Characterization Element: Scaling Factor Development

Scaling Factor Overview

As shown in the 33 calculation packages listed in Section 8.2.5, this was a complex task that incorporated information from ANL-E, ANL-W, INL and LANL, including the following:

- Fuel pin type and characteristics from fuel suppliers and reactor operators
- ^{235}U enrichment
- ^{240}Pu enrichment (for mixed oxide fuels) and burnup
- U/Pu ratios (for mixed oxide fuels)
- Examination of 603 fuel pins examined at ANL-E
- Mass spectrometry results for destructive assay (DA) of 400 fuel pins (See Section 8.2.5)
- Other records related to AGHCF activities, names of experimenters, etc.

The scaling factors were incorporated in a drum characterization spreadsheet that required the following input:

- Drum gross weight in kilograms (kg)
- Identification of the can sizes (5-, 7- or 10-gallon) and number of cans in the drum
- Estimates of the can fill heights in percent
- Dose rate measurements at four quadrant points in mR/hr

The drum's gross weight is calculated as:

Gross drum weight – (drum weight + packaging materials + can weights) **(1)**

The weight values used for the various drum items are listed in Table 5.

Table 5. Weights of Items Used to Calculate Waste Weight and Density

Items	Weight, kg
30-gallon drum	16.36
Polyethylene liner	3.61
Plastic Pouch	1.73
Cardboard Sleeve	1.41
Plastic Lid	0.39
Total Minus Cans	23.5
7-gallon drum	2.84
5-gallon drum	2.26
10-gallon drum	3.42

The container's apparent weight density in g/ cm^3 is calculated as:

$$\text{Net Waste Weight} / (\text{can \#1 } \%H_{fill} + \text{can \#2 } \%H_{fill} + \text{can \#3 } \%H_{fill}) \qquad \textbf{(2)}$$

Where the net waste weight is in units of grams and can fill volume is given by

$$C_{size} * \%H_{fill} * 3785 \text{ cm}^3/\text{gal} \qquad \textbf{(3)}$$

Where:

C_{size} = can size in gallons

$\%H_{fill}$ = estimated fill height of each can in percent, expressed as a decimal

The input of the spreadsheet is shown in Figure 2 with hypothetical dose rates values that average 450 mR/hr, an assumed drum configuration of two 7-gallon cans each 100% full, an assumed net weight of 46.5 kg, and an apparent weight density. The drum's ^{137}Cs content is derived as follows:

$$^{137}\text{Cs Activity in Ci} = \text{dose rate} / (11.91 * X^2 - 82.126 * X + 194.64) \qquad \textbf{(4)}$$

Where:

X = apparent waste density, g/cm^3

A	B	C	D	E	F	G	H	
Operating Procedure			CCP-TP-504	Rev. 2				8
Date of Survey			6/1/2006					9
Waste Stream Designation			ID-ANLE-S5000					10
Container Number								11
Container Gross Weight			70	Kg				12
Waste Cans		Can #1	Can #2	Can #3				13
Can Sizes		7	7	0	gallons			14
Estimate Fill Percentages		100	100	78.5	%			15
Container Net Weight			46.5	Kg				16
Measured Container Dose Rate								17
	Quadrant #1		300	mR/hr				18
	Quadrant #2		500	mR/hr				19
	Quadrant #3		600	mR/hr				20
	Quadrant #4		400	mR/hr				21
Calculated Average Dose Rate			450	mR/hr				22
Waste Material Type					(organic, steel, cement)			

Figure 2. EXCEL™ (Version 2002, Release 10) Spreadsheet "DTC Spreadsheet.xls"

Equation (4) is taken from INL-RH-03, pages 6 –7, and is based on a total of eight (8) MCNP cases that were run with the waste material density varying from 0.0 g/cm^3 to 1.4 g/cm^3 in intervals of 0.2 g/cm^3, a range that spans the expected range of waste densities in INL drums. The results of the eight runs are presented in Table 6, below, and were used to generate a second-order polynomial curve to fit the data, shown in Figure 3.

Table 6. Waste Density Versus Observed Dose Rate

Waste Density	Dose Rate mR/hr
0.0	193.993
0.2	179.322
0.4	164.203
0.6	149.743
0.8	136.207
1.0	124.006
1.2	112.991
1.4	103.45

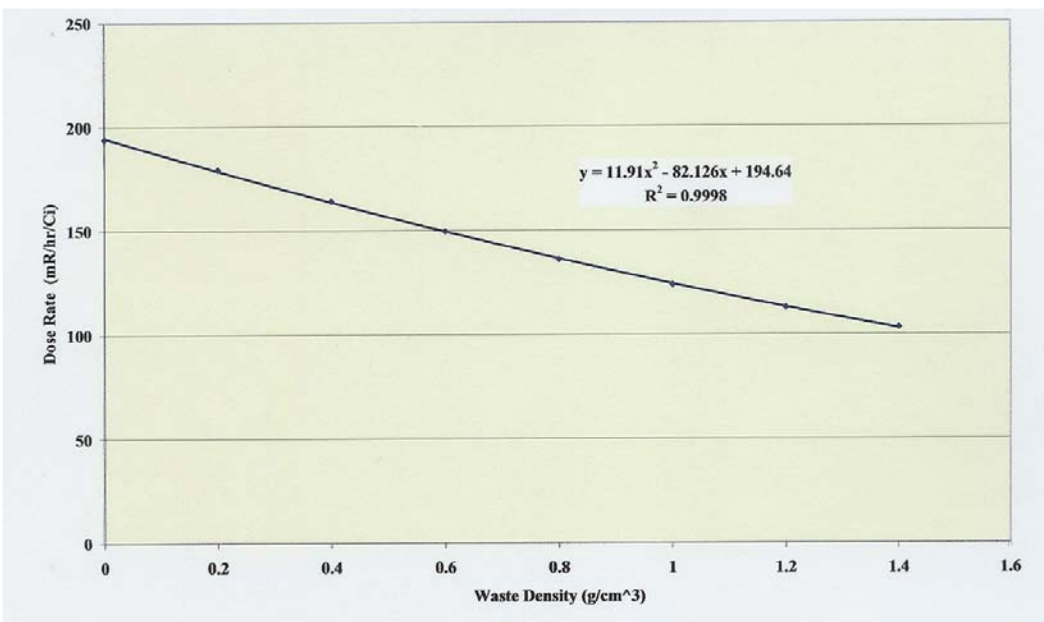

Figure 3. MCNP Input – Observed Dose Rate As a Function of Waste Density

Calculation of the ^{137}Cs activity for a container allows the further 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, ^{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 (FGE)
- Pu Equivalent Curies (PE Ci)
- Decay heat in Watts

The constants and other values required for these calculations were taken from the appropriate sources (CH WAC and TRAMPAC) and were spot-checked for accuracy. These were found to be accurate and they are summarized in Table 7. The results of these calculations are shown in Table 8 using the hypothetical dose rate input from Figure 2. The values listed in the Activity and Mass columns are the actual data that would be reported on the container's assay sheet to be included in the radiological characterization BDR. Note that the scaling factors are the same for all containers; the sample-specific variables are the container's measured dose rate and density, as shown in Equation 5, taken from INL-RH-05, page 5, and duplicated below:

$$^{137}\text{Cs Activity in Ci} = \text{dose rate} / (11.91 * X^2 - 82.126 * X + 194.64) \qquad \textbf{(5)}$$

At a hypothetical value of zero density (X = 0), this equation becomes essentially a bare-source calculation; at higher densities, the effects of the waste's self-shielding are evident.

Table 7. Constants Used in Scaling Factor Development

Radionuclide	Specific Activity (Ci/g)	FGE/g	PE-Ci/Ci	Watts/g
U-233	9.76E-03	9.00E-01	3.90	2.84E-04
U-234	6.32E-03	0.00E+00	0.00	1.82E-04
U-235	2.19E-06	6.43E-01	0.00	6.04E-08
U-238	3.40E-07	0.00E+00	0.00	8.62E-09
Pu-238	1.73E+01	1.13E-01	1.10	5.73E-01
Pu-239	6.29E-02	1.00E+00	1.00	1.95E-03
Pu-240	2.30E-01	2.25E-02	1.00	7.16E-03
Pu-241	1.04E+02	2.25E+00	51.00	3.31E-03
Pu-242	3.97E-03	7.50E-03	1.10	1.17E-04
Am-241	3.47E+00	1.87E-02	1.00	1.16E-01
Cs-137	8.80E+01	0.00E+00	0.00	9.74E-02
Ba-137m	5.38E+08	0.00E+00	0.00	2.12E+06
Sr-90	1.38E+02	0.00E+00	0.00	1.60E-01
Y-90	5.44E+05	0.00E+00	0.00	3.01E+03

Table 8. Summary of Reportable Values Using Hypothetical Input

Radionuclide	Curie Scaling Factors	Activity (Ci)	Mass Grams	FGE	PE-Ci	Watts
U-233	1.65E-04	5.35E-04	5.48E-02	4.94E-02	1.37E-04	1.56E-05
U-234	2.98E-04	9.68E-04	1.53E-01	0.00E+00	0.00E+00	2.79E-05
U-235	1.05E-05	3.43E-05	1.56E+01	1.01E+01	0.00E+00	9.45E-07
U-238	1.77E-06	5.74E-06	1.69E+01	0.00E+00	0.00E+00	1.46E-07
Pu-238	2.54E-02	8.24E-02	4.76E-03	5.38E-04	7.49E-02	2.73E-03
Pu-239	9.19E-02	2.99E-01	4.75E+00	4.75E+00	2.99E-01	9.26E-03
Pu-240	4.84E-02	1.57E-01	6.83E-01	1.54E-02	1.57E-01	4.89E-03
Pu-241	7.26E-01	2.36E+00	2.27E-02	5.11E-02	4.63E-02	7.51E-05
Pu-242	1.52E-05	4.96E-05	1.25E-02	9.36E-05	4.51E-05	1.46E-06
Am-241	4.46E-02	1.45E-01	4.18E-02	7.81E-04	1.45E-01	4.85E-03
Cs-137	1.00E+00	3.25E+00	3.69E-02	0.00E+00	0.00E+00	3.60E-03
Ba-137m	9.46E-01	3.07E+00	5.72E-09	0.00E+00	0.00E+00	1.21E-02
Sr-90	7.41E-01	2.41E+00	1.74E-02	0.00E+00	0.00E+00	2.79E-03
Y-90	7.41E-01	2.41E+00	4.42E-06	0.00E+00	0.00E+00	1.33E-02
Totals		1.42E+01	3.83E+01	1.49E+01	7.22E-01	5.37E-02

<u>Scaling Factor Technical Evaluation</u>

The technical basis and degree to which the scaling factors are representative of the RH TRU wastes for which INL-CCP requested approval were evaluated during this inspection. The following elements were evaluated and verified:

(1) Waste stream definition

This inspection focused on a group of wastes that INL-CCP stated were contained in a single waste stream, which included fuel pins that were dissimilar with respect to their radionuclide content. Specifically, they consisted of three fuel types:

- U, low enriched U (LEU), and highly enriched U (HEU)
- U and Pu
- Thorium

The following definition is taken from page 12 of the WCPIP:

> *A waste stream is defined as waste material generated from a single process or from an activity, which is similar in material, physical form and radiological constituents. Only those containers that can be related to a particular waste stream will be contained in that waste stream.*

In light of the apparent differences among the three fuel types listed above, the consolidation of these drums in a single waste stream bears investigation. The radionuclide profiles of the three fuel types are clearly different; however, following irradiation these fuel types have a common, salient characteristic, i.e., the presence of fission and activation products. Of these, ^{137}Cs is the main interest due to its physical half-life (~30.2 years) and high transition probability photon emission at 662 keV. There are other fission and activation products but these are not an issue to this approach because they have short physical half-lives and have decayed or, more importantly, their contribution is insignificant relative to ^{137}Cs. In a sense, one could consider that these materials have been treated by their exposure to the intense neutron field produced during irradiation (fission). The materials' characteristics that have bearing on DTC have been reduced to a common element, i.e., the predominance of ^{137}Cs, after irradiation and the differences of the fuel's pre-irradiation composition do not affect the radiological characterization process. The EPA inspection team concluded that the assignment of all containers to a single waste stream was technically justified and technically supportable.

(2) Technical aspects and derivation of scaling factors

The EPA inspection team evaluated the following aspects:

- Activity values that are used are derived from modeling and statistical metrics that support their use and the statistical metrics include mean and standard deviation values for each measured radionuclide.
- Isotopic activity values are normalized to the major radionuclide(s) responsible for the external container dose rate, i.e., ^{137}Cs.
- The calculated results used to develop the factors and convert the measured dose rate to radionuclide activity levels.
- The expected dose rates at a distance of 1 meter from the outer surface of the waste container, at the mid-height of the container, have been calculated as a function of the waste's activity, and the calculation accounts appropriately for container properties i.e., fill height or (apparent) density, waste type, shielding effects of the container and/or liner wall.
- Calculations supporting the scaling factors are performed using appropriate shielding analysis techniques, i.e., MCNP5 and Microshield 7.00.
- Computer programs (ORIGEN2.2) used for calculations of the activities of the WIPP-tracked radionuclides account for the following:
    - The beginning conditions of the fuel used to produce the TRU isotopes
    - Exposure of fuel to neutron fields in a nuclear reactor (fission)
    - Change in radionuclides following irradiation
    - Reactor neutron energy spectrum is known or calculated in order to determine the effective cross-sections of radionuclides leading to the creation of WIPP-tracked radionuclides
    - Appropriate cross-sections are used or generated for each reactor condition
    - Fuel exposure history is used to calculate isotope generation and depletion

(3) Documentation of technical aspects

Development of the scaling factors is documented in thirty-three (33) calculation packages that were prepared by Jene Vance and Jim Holderness (see Section 8.2.5). These packages address a variety of aspects, including:

- Verification of MCNP5, Microshield 7.00 and ORIGEN2.2
- Evaluation of all potential contributors to a container's dose rate, specifically ^{60}Co and other gamma emitting members of the ^{232}U decay series, e.g., ^{228}Ac and ^{208}Tl
- U and Pu relationship in the fuel pins from which the wastes originated
- The nature and history of the fuel pins, reactor cross-sections and operating histories
- Potential sources of uncertainty, discussed below

The EPA inspection team members reviewed a subset of these packages in detail and discussed them with the documents' authors and Mark Doherty. During these discussions, several aspects were probed in detail and several modifications to the calculation packages were made in response to the EPA inspection team's concerns. All potential concerns were resolved and, apart from minor discrepancies with respect to specific documentation details, the calculation packages were found to be technically adequate.

(4) Evaluation of Total Measurement Uncertainty (TMU)

The development of TMU for ID-ANLE-S5000 is based on the propagation of uncertainties present in all aspects of the determination of the radiological constituents of RH TRU waste. The TMU determination included the contributions of:

- Drum weight measurement
- Measurement uncertainty of ^{137}Cs
- MCNP5 issues
- MicroShield issues
- Other gamma emitters
- Individual pins to the total
- Specific pins in a single drum
- Burnup history
- Reported burnup
- Internal code issues
- Contributions from unirradiated pins
- Modeling

There was a technical concern regarding TMU with respect to the appropriateness of the statistical model, i.e., that all components of the uncertainty were statistically independent and could therefore be added in quadrature. Since the radionuclide values are derived from the ^{137}Cs dose rate that is measured, this aspect cannot be considered independent and its contribution must be treated differently, i.e., it cannot be added using the square root of the sum of the squares. The TMU is expected to increase when the correct approach is taken and in fact the corrected calculation in INL-RH-06, Revision 1 shows a TMU that is approximately 1.5 times greater than the original, incorrect TMU value. The CTAC Technical Specialist identified the issue as well and INL-CCP acknowledged that the TMU equation required modification. As a result, INL-CCP issued Non Conformance Report (NCR) No. RH-INL-0501-06. This also resulted in the reissuing of BDR No. INLRHDTC-06001 and the calculation package

INLRHDTC-06001 that provides the technical support for the calculation of TMU. The EPA inspection team reviewed the reissued BDR and the calculation package and determined that both had been appropriately corrected. The EPA inspection team reviewed the applicability of the reissued procedure to the INL RH waste stream and determined that it was technically appropriate. The EPA inspection team did not have any open technical issues or concerns relative to the development and application of radionuclide scaling factors based on the objective evidence reviewed during this inspection.

8.2.4 Radiological Characterization Element: Evaluation of Mass Spectrometry Data to Support ORIGEN2.2

The purpose of the ORIGEN2.2 modeling was to develop technically based scaling factors to allow a waste container's measured dose rate to be transformed into activity values for each of the 10 WIPP-tracked radionuclides, including uncertainty. While this exercise was based essentially on modeling, there was a verification/validation of the ORIGEN2.2 output performed using data from 400 fuel pins that were sampled and assayed using mass spectrometry. The use of mass spectrometry (MS) data in support of ORIGEN2.2 derived scaling factors had been assessed on August 9, 2006, in Carlsbad, New Mexico. The INL-CCP and CBFO/CTAC representatives in attendance are listed in Table 3. The MS data and information EPA assessed had been located, identified, and compiled by INL-CCP's AK personnel and ranged in date from 1970 through 1984. As expected, the information gathered did not constitute a complete and continuous record. However, EPA determined that there was sufficient information and data available to make a determination with regard to the technical adequacy of the MS data for the stated purpose.

Analytical Methods

The ultimate purpose of the procedures and analytical data reviewed was to establish the burnup rate for the fuel pins. Two processes were used to generate the data required to make this calculation. A spiked and a separate unspiked aliquot of the dissolved fuel pin were analyzed; the spiked results provided the atom percent fission in the U and Pu fuel and the unspiked results determined the isotopic compositions of U and Pu in the fuel. These two results were used to calculate the burnup rate. Although ORIGEN input consisted of the isotopic data only, the entire process used for burnup determinations was included in the review because generation of the spiked and unspiked data was part of the same process. Figure 4 is an example of a typical LASL burnup result sheet titled "Burnup Results for Irradiated Fuel."

Sample Number	WARD W8-37	WARD 8-57	WARD W31-20
LASD Job Number	1226-L	1227-L	1228-H
Total U Atoms*	8.171E16	1.222E17	1.952E17
Total Pu Atoms*	2.447E16	3.770E16	4.864E16
Nd-148 Atoms*	2.025E14	3.142E14	1.996E14
Isotopic Distributions			
U, Atom % 233	-	-	-
234	.673	.664	.868
235	61.12	61.01	77.81
236	2.04	2.03	1.25
238	36.17	36.29	20.08
Pu, Atom % 238	.139	.215	.052
239	88.62	88.57	90.06
240	10.50	10.48	9.24
241	.672	.670	.592
242	.068	.068	.058
Burnup, Atom % Fission **	10.24	10.52	4.67

* All three elements determined on the same sample aliquot.
** Calculated using Nd-148 fission yield data reported in ENDF VB.
Fission yield value used = 0.0167_2, 0.0167_0

Remarks: ____

____

____

Analyst: HJK, CB, PGA, MEO, JA, RMA Date: 3/17/82 Group Leader: ____________

Figure 4. Los Alamos Scientific Laboratory Group CMB-1 Burnup Results For Irradiated Fuel, Reproduced From Original Data Sheet Provided by Jene Vance, Original Was Initialed By RMA and Displayed the Initials of the Group Leader

By reviewing quarterly reports, analytical result sheets, and logbooks, it was determined that the following procedures were used to control the preparation and analysis of fuel pin samples for the purpose of establishing the isotopic ratios of U and Pu:

- **ANC-DE-1-HC-3 "The Dissolution of Irradiated Materials":** This was used to prepare the fuel pins for analysis. Revision 2, Section 3.1 of this procedure, dated August 22, 1973, required SRM[13] U-500 (U) be used to prepare calibration standards for the mass spectrometer. Section 3.2 required at least one sample of SRM 946 (Pu) be processed by this procedure every five days. The procedure required control charts to be maintained of the 239/240 atom ratio data. Control charts were not located by CCP and this was the only revision of this procedure found.
- **ANC-DE-1-MS-2 "Determination of Atom Percent Fission in Uranium and Plutonium Fuel":** This used the triple spike technique. Two (2) revisions of this procedure were located, Revision 2 dated August 22, 1973, and Revision 3 dated March

[13] SRM is Standard Reference Material.

24, 1976. The procedure required the use of SRM U-500 (U), SRM 960 (Pu) and SRM 950 (Pu) and referenced procedure ANC-DE-1-HC-3 for sample preparation. SRMs were required to be analyzed every five (5) days and for control charts of the 239/240 atom ratio data to be maintained. Control charts were not available for review. Five (5) or more mass spectra were recorded for each sample (Section 4.5.3) in Revision 2 of the procedure but this requirement was reduced to three (3) or more spectra in Revision 3. Acceptance criteria for quality control (QC) samples were provided in Section 3.1, as well as corrective action to be implemented if the SRM failed to meet acceptance criteria. Section 4.5.5 provides the calculations used to determine the burnup and the atom % fission.

- **ANC-DE-1-MS-3 "Determination of the Isotopic Compositions of Uranium and Plutonium":** This was used to analyze unspiked aliquots of the fuel pin solutions by mass spectrometry to determine the isotopic compositions of U and Pu. Revision 3 of this procedure dated August 22, 1973, and Revision 4 dated April 13, 1981 were available for review. SRMs U-500 (U) and 946 (Pu) were required to be analyzed every five (5) days and control charts maintained. Acceptance limits were specified as were corrective actions to be taken if the standard results were outside of those limits. The procedure listed the reagents used and the storage conditions required for those reagents. Instructions for introducing the samples into the MS system were provided and Section 4.5.4 required at least five (5) mass spectra to be recorded for each sample. Review of the available raw data demonstrated that the minimum number of spectra requirement was met. Although Section 4.5.5 states that atom percent abundances of the U and Pu isotopes are calculated, the procedure does not provide the calculation used.
- **Quarterly Reports:** Many reports were recovered by INL-CCP for the period of interest (1972–1984) and some of them contain useful but limited information for this assessment. The following information was used to help EPA make a determination with regard to the acceptability of the mass spectrometry data used for ORIGEN input:
  - Progress Report, LA-5067-PR, April 1 to June 30, 1972, page 9: "The quality assurance procedures written… include: Dissolution of Irradiated Material and Determination of Atom Percent Fission in Uranium and Plutonium Fuel." It is assumed that these two procedures were ANC-DE-1-MS-2 and ANC-DE-1-HC-3, although the report did not specifically identify the methods as such.
  - Progress Report, LA-5390-PR, April 1 through June 30, 1973, page 1: "Characterization of unirradiated and irradiated fuels by analytical chemistry will continue and additional methods will be modified and mechanized for hot cell application. …"
  - Page 39: Development of Burnup Method Using Conventional Low-Cost Apparatus. "Mass spectrometry is the most reliable technique for determining nuclear fuel burnup using the triple spike technique." The triple spike technique was used to generate the "spiked" data used in the burnup calculation.
  - Progress Report, LA-9372-PR, January 1 – March 31, 1982, page 3: "Chemical separation of uranium, plutonium, and neodymium…. followed by mass spectrometric…. measurement currently is used to determine burnup".

- Progress Report, LA-9959-PR, July 1 – October 31, 1983, page 2, III Analytical Chemistry: Reports that 15 fuel samples were dissolved for burnup analysis by mass spectrometry.

The above information demonstrates that analytical procedures that were developed early in the project continued to be used throughout the period of interest (see Section 1-3 in Analytical Methods).

Accuracy

Records of replicate analyses of isotopic SRMs were available from March 26,1979. SRMs U-005 (U) and 947 (Pu) were analyzed five (5) times, one set of samples was subjected to chemical separation and one set of samples was not. The average and standard deviation (SD) of the results were calculated and the results are provided below in Tables 9a and 9b for the unseparated and separated aliquots for DRM U-005, respectively, and 10a and 10b for unseparated and separated aliquots for SRM Pu 947, respectively. These results demonstrate acceptable precision (PRD ≤ 3.3%) and accuracy (Recovery ≤ 103.4%) of the analytical method ANC-DE-1-MS-3 for U and Pu isotopes.

Table 9a. SRM U-005 Analytical Results, Unseparated Aliquots

Analysis Date	Certified ^{234}U 0.00218	Certified ^{235}U 0.4895	Certified ^{236}U 0.00466	Certified ^{238}U 99.503$_7$
3/15/79	0.0024	0.4923	0.0050	99.5002
3/16/79	0.0024	0.4922	0.0051	99.5004
3/16/79	0.0022	0.4913	0.0050	99.5016
3/16/79	0.0022	0.4907	0.0050	99.5020
3/16/79	0.0022	0.4912	0.0049	99.5018
SD	0.00011	0.00069	0.00007	0.00084
Average	0.00228	0.49154	0.0050	99.50120
% Recovery	**104.6**	**100.4**	**107.3**	**99.998**
RPD	**4.5**	**0.41**	**7.04**	**<0.01**

Table 9b. SRM U-005 Analytical Results, Separated Aliquots

Analysis Date	Certified ^{234}U 0.00218	Certified ^{234}U 0.00218	Certified ^{236}U 0.00466	Certified ^{238}U 99.503$_7$
3/19/79	0.0024	0.4924	0.0052	99.4999
3/19/79	0.0024	0.4928	0.0051	99.4997
3/19/79	0.0022	0.4911	0.0050	99.5016
3/19/79	0.0024	0.4932	0.0050	99.4993
3/19/79	0.0025	0.4918	0.0054	99.5003
SD	0.00011	0.00083	0.00017	0.00088
Average	0.00238	0.49226	0.00514	99.50016
% Recovery	**109.2**	**100.6**	**110.3**	**99.997**
RPD	**8.8**	**0.56**	**<0.1**	**<0.1**

Table 10a. SRM Pu 947 Analytical Results, Unseparated Aliquots

Analysis Date	Certified $^{238/239}$Pu 0.003688	Certified $^{240/239}$Pu 0.241461	Certified $^{242/239}$Pu 0.015594
3/14/79	0.003735	0.241545	0.015577
3/14/79	0.003726	0.241487	0.015611
3/14/79	0.003723	0.241474	0.015589
3/15/79	0.003743	0.241521	0.015586
3/15/79	0.003723	0.241497	0.015581
SD	0.000009	0.000028	0.000013
Average	0.003730	0.241505	0.015589
% Recovery	**101.1**	**100.0**	**99.97**
RPD	**1.1**	**<0.1**	**<0.1**

Table 10b. SRM Pu 947Analytical Results, Separated Aliquots

Analysis Date	Certified $^{238/239}$Pu 0.003688	Certified $^{240/239}$Pu 0.241461	Certified $^{242/239}$Pu 0.015594
Date	**Pu 238/239**	**Pu 240/239**	**Pu 242/239**
3/16/79	0.003760	0.24124	0.015546
3/16/79	0.003812	0.241310	0.015611
3/16/79	0.003949	0.241444	0.015614
3/16/79	0.003780	0.241492	0.015587
3/16/79	0.003772	241296	0.015589
SD	0.000078	0.000107	0.000027
Average	0.003815	0.241356	0.015589
% Recovery	**103.4**	**100.0**	**100.0**
RPD	**3.3**	**<0.1**	**<0.1**

RPD = $(C_1-C_2) / (C_1+C_2/2) \times 100$

Precision

Only two (2) samples with duplicate analyses that were analyzed on March 20, 1980 were located, fuel pins WARD-W33-27 and WARD-W32-20. The results for U and Pu radionuclides are provided in Tables 11a and 11b below:

Table 11a. Analytical Results, Replicate Analysis

Radioisotope	WARD-W33-27 Atom %	WARD-W33-27, Atom %,	RPD
U-233	<0.001	<0.001	**0.00**
U-234	0.868	0.871	**0.35**
U-235	77.59	77.52	**0.10**
U-236	1.34	1.34	**0.00**
U-238	20.20	20.27	**0.35**
Pu -238	0.037	0.036	**2.74**
Pu-239	89.92	89.90	**<0.1**
Pu-240	9.30	9.33	**0.16**
Pu-241	0.670	0.670	**0.00**
Pu-242	0.070	0.070	**0.00**

Table 11b. Analytical Results, Replicate Analysis

Radioisotope	SRM WARD-W32-20 Atom %	SRM WARD-W32-20 Atom %	RPD
U-233	<0.001	<0.001	**0.00**
U-234	0.851	0.864	**1.52**
U-235	78.37	78.36	**<0.01**
U-236	0.891	0.904	**1.45**
U-238	19.89	19.87	**0.20**
Pu -238	0.037	0.031	**17.64***
Pu-239	90.40	90.37	**<0.01**
Pu-240	8.86	8.90	**0.45**
Pu-241	0.641	0.633	**1.26**
Pu-242	0.062	0.060	**3.28**

$RPD = (C_1-C_2) / (C_1+C_2/2) \times 100$

* This value was excluded from consideration because it appears to be an outlier.

The acceptability of the precision of the above measurements is adequately demonstrated by the calculated RPD values that range from 0.00 to 3.28%. Replicates for SRMs U-005 and Pu 947 were analyzed and demonstrated acceptable precision for the analytical method used. The results of these replicate measurements are presented in Tables 9a, 9b, 10a, and 10b above.

Bias

Bias in analytical methods is typically assessed from blank results, but the results of analytical standards may also be used. Based on reviewing the available logbooks and analytical methods, EPA Inspectors realized that blanks were not analyzed for this project, which complicates the evaluation of bias. However, the lack of bias in the analytical method is also demonstrated by the percent recoveries obtained for SRMs U-005 and Pu 947, as shown in Tables 9a and 9b and 10a and 10b, above.

Blind Sample Analysis (Performance Evaluation)

SRM standards were analyzed on a routine basis for this program, as well as performance evaluation samples that were made by ANL and supplied to LANL as QC samples. Analytical data, original data, and original calculations were available for five (5) samples of this type, BU-1-77, BU-1-78, BU-1-79, BU-3-112 and BU-3-113 that were analyzed on May 1, 1979, and are shown in Table 12, below. Although the result data sheet does not unambiguously identify these as performance evaluation samples, the result sheet for BU-1-80 and BU-2-95, analyzed on February 28, 1979 and July 16,1979, respectively, was titled "Analysis of ANL Synthetic Burnup Standard." It is reasonable to infer that these other "BU-1-xx" samples were part of this QC program. The expected burnup value for these QC samples was provided in the records reviewed. Using the original data shown in Table 13, J. Vance made an independent calculation of the burnup values. As the data used for ORIGEN input is part of the burnup calculation, it is reasonable to assume that the RPD for the isotopic abundances did not exceed the burnup RPD provided in Table 12. These results demonstrate that LANL analyzed the QC samples with acceptable accuracy (recovery $\leq$107%) and precision (RPD $\leq$6.76%).

Table 12. Available LASL Quality Control Samples

QC Sample	LANL Observed	ANL Known	% Recovery	RPD
BU-1-77	2.13	2.0	106.5	4.90
BU-1-78	2.19	2.0	109.5	6.67
BU-1-79	2.13	2.0	106.5	4.90
BU-1-112	4.25	4.0	106.3	6.06
BU-1-113	4.28	4.0	107.0	6.76

RPD = $(C_1\text{-}C_2) / (C_1\text{+}C_2/2)$ x 100

Standards

The Certificates of Analysis for some of the standards used in method ANC-DE-1-MS-3 were available for review. Only two of the SRMs listed below were identified as having been assayed, U-005 and Pu 947 as discussed above and shown in Tables 9a and 9b, and 10a and 10b, above. The other SRMs for which we examined objective evidence of the SRM's certified values are listed below:

U SRMs: U-500, U-0002, U-005, U-010U-015, U-020, U-030, U-050, U-100, U-150, U-200, U-350, U-500, U-750, U-800, U-850, and U-900

Pu SRMs: 946, 947, and 948

Table 13. Mass Spectrometry Calculations for Fuel Pin WARD-W8-37, LANL-1226-L

The data in light green are provided in the worksheets attached to the burnup results sheet. The numbers in yellow are the calculated numbers that can be checked against the corresponding values on the worksheets.

Nd-148 Yield	0.01672
Grams Spike	1.03809
Atoms of U-233/g	3.9989E+16
Atoms of Pu-242/g	1.2440E+16
Atoms of Nd-150	9.5302E+13

These data are from attached data sheets for fuel pin 1226-L for WARD-W8-37

Uranium Data

		Unspiked	Spiked
1	U-233	0	33.688
	U-234	0.673	0.446
	U-235	61.116	40.528
	U-236	2.04	1.352
	U-238	36.172	23.986

These data are from attached data sheets for fuel pin1226-L for WARD-W8-37

2 U-233 Spiked Sample Corrected for U-233 from Sample

U-233csx 33.688

3 Uranium Sensitivity Factor

SF(u) 1.2323E+15

4 Total Atoms of Uranium in Sample

U 8.17132E+16 **OK**

5 Uranium Percent of Sample Computed from Spiked Sample Data Correction

(F)u 1.508022681

	Spike Corrected	
U-233	0	**OK**
U-234	0.673	**OK**
U-235	61.117	**OK**
U-236	2.039	**OK**
U-238	36.171	**OK**

Pu Data

		Unspiked	Spiked
1	Pu-238	0.139	0.091
	Pu-239	88.624	58.013

These data are from attached data sheets for

Table 13. Mass Spectrometry Calculations for Fuel Pin WARD-W8-37, LANL-1226-L

			fuel pin 1226-L for WARD-W8-37
Pu-240	10.497	6.872	
Pu-241	0.672	0.44	
Pu-242	0.068	34.585	

2 Pu-242 of Spiked Sample Corrected for Pu-242 from Sample

Pu-242
csx 34.54048741

3 Pu Sensitivity Factor

(SF)pu 3.7388E+14

4 Total Atoms of Pu in Sample

(Pu) 2.44737E+16 **OK**

5 Pu Atom Percent of Sample Computed from Spiked Sample Data Corrected for Spike

(F)pu 1.527661848

	Spike Corrected	
Pu-238	0.139	**OK**
Pu-239	88.624	**OK**
Pu-240	10.498	**OK**
Pu-241	0.672	**OK**
Pu-242	0.068	**OK**

Neodymium Data

		Unspiked	Spiked	
1	Nd-142	0	0.978	
	Nd-143	1	1	
				These data are from attached data sheets for
	Nd-144	1	1	fuel pin 1226-L for WARD-W8-37
	Nd-145	1	1	
	Nd-146	1	1	
	Nd-148	1	49.927	
	Nd-150	0.484	48.329	

2 Nd-150 of Spiked Sample Corrected for Nd-150 from Sample

(Nd-150)s 24.28067528

3 Apparent Natural Nd Contamination Based on Mass 142

(142)c 0.708484504
3a 0.708484504

Table 13. Mass Spectrometry Calculations for Fuel Pin WARD-W8-37, LANL-1226-L

4 Correction of Unspiked Data

	Unspiked
Nd-142	0
Nd-143	1
Nd-144	1
Nd-145	1
Nd-146	1
Nd-148	1
Nd-150	0.484

5 Correction of Spiked Data

(142)c	0.708484504

Nd-142	0.269515496
Nd-143	0.681961306
Nd-144	0.376746182
Nd-145	0.783062045
Nd-146	0.549970643
Nd-148	49.77722638
Nd-150	48.18213116

4 Nd-150 of Spiked Sample Corrected for Nd-150 from Sample and Corrected for Natural Nd Contamination

(Nd-150)cs	24.20593877

5 Neodymium Sensitivity Factor

(SF)nd	4.0871E+12

6 Atoms of Nd Isotopes in Sample

Nd-142		
Nd-143	Not calculated for burnup determination	
Nd-144		
Nd-145		
Nd-146		
Nd-148	2.02465E+14	**OK**
Nd-150		

7 Burnup Using Nd-148

F	1.21092E+16	**OK**
Burnup	10.236%	**OK**

Conclusion

EPA has determined that there is sufficient information and data available to demonstrate that the isotopic data used to verify the ORIGEN2.2 output were technically sound. Based on the objective evidence evaluated during the inspection, the data were generated by an analytical system with acceptable accuracy, precision, and bias to support its use in supporting the radionuclide scaling factors derived using ORIGEN2.2 for INL-CCP RH TRU wastes.

8.2.5 Documents, Waste Containers, and Batch Data Reports Reviewed

The list of documents provided below includes all documents related to the INL-CCP RH radiological characterization program that were evaluated to support this inspection:

- CPP-PO-002, CCP Transuranic Waste Certification Plan, Revision 16
- CCP-AK-INL-500, Central Characterization Project Acceptable Knowledge Summary Report for Remote-Handled Transuranic Debris Waste from Argonne National Laboratory-East Stored at the Idaho National Laboratory, Revision 2
- CCP-AK-INL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Remote Handled Transuranic Debris Waste from Idaho National Laboratory, Revision 0
- CCP-AK-INL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Remote Handled Transuranic Debris Waste from Idaho National Laboratory, Revision 1, June 6, 2006
- CP-AK-INL-502, Central Characterization Project Confirmatory Test Plan for Waste Stream: ID-ANLE-S5000, Revision 0
- CCP-TP-504, Dose-to-Curie Survey Procedure for Remote-Handled Transuranic Waste, Revision 2
- CCP-TP-506, CCP Preparation of the Remote–Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report, Revision 1
- Information on Fuel Elements Examined at the AGHCF at ANL from November 1971 to August 7, 1995, Based on Waste Consolidation Records; Project No. 23048, EDF-6695, Revision 0, Effective Date May 19, 2006
- Identification of Additional Fuel Elements/Materials Examined in the Alpha-Gamma Hot Cell Facility for ANL-E TRU Waste; Project No. 23048, EDF-6946, Revision 0, Effective Date May 19, 2006
- Neutron and Gamma-Ray Dose Conversion Factors from 1 Meter to Contact for Argonne National Laboratory-East Remote Handled Transuranic Waste; Project No.32-48, EDF-7069, Revision 0, Effective Date June 08, 2006
- INL Batch Data Report No. INL-RH-DTC 06001: Twenty nine (29) drums
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-01, Fuel Composition Calculations

- Calculation Package Supporting Scaling Factor Derivation: INL-RH-02, Scaling Factor Development
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-03, U and Pu Isotopic Relationships in Fuel
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-03, Dose-to-Curie Derivations for Cs-137 in 30-Gallon Drums
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-04, MCNP5 Sensitivity Studies
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-05, Mass Spectrometry Results Input Check Calculation
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-05, Cs-137 Dose-to-Curie Uncertainty
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-06, Drum Characterization, DTC and Related Calculations for Drum Characterization
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-06, Drum Characterization, DTC and Related Calculations for Drum Characterization, Revision 1
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-07, Uncertainty Analysis for Drums
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-08, Evaluation of Isotope Contribution to the Total Radiological Hazard
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-09, ORIGEN2.2 Verification Check
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-09, Dose-to-Curie for Cs-137 and Co-60, Shielded and Unshielded
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-08, Microshield 7.00 Verification
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-18, MCNP5 Code Verification Check
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-09, ORIGEN2.2 Verification
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-15, ORIGEN2.2 Data Extraction
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-14, ORIGEN2.2 Input Generation
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-10, Fission Product Contribution to Total Dose Rate
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-11, RERTR Adjustment Factor Development

- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-12, Evaluation of PotentialCs-137 Migration
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-12, Disposition of Identified Radioactive Materials from AGHCF
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-13, Modification of ORIGEN2.2 Input Files for Specific Fuel Pins
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-13, Evaluation of One-Step Irradiation Input to ORIGEN2.2
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-14, Co-60 Dose Rate Contribution
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-14, ORIGEN2.2 Input Generation
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-15, Burnup Estimates for Thorium Pins
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-15, ORIGEN2.2 Output Data Extraction
- Calculation Package Supporting Scaling Factor Derivation: INL-RH-16, Scaling Factor Sensitivity Study
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-16, Mass Spectrometry Comparison to ORIGEN2.2 Results
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-18, MCNP5 Verification Check
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-29, Sensitivity of ORIGEN2.2 to Other Fast Reactor Cross Sections
- Calculation Package Supporting Scaling Factor Derivation: LANL-RH-30, Evaluation of Reactor Operating History
- MS Exhibit 1: Typical MS result sheet
- MS Exhibit 2: Manual calculation of burn-up rate from data generated for fuel pin WARD-W8-37, LASL Job Number 1226-L (Courtesy of Jene Vance)
- ANC-DE-1-HC-3 “The Dissolution of Irradiated Materials,” Revision 2, Sections 3.1, 3.2, August 22, 1973.
- ANC-DE-1-MS-2 “Determination of Atom Percent Fission in Uranium and Plutonium Fuel,” Revision 2, August 22, 1973 and Revision 3, March 24, 1976. (Section 4.5.3; 4.5.5).
- ANC-DE-1-MS-3 “Determination of the Isotopic Compositions of Uranium and Plutonium,” Revision 3, August 22, 1973, and Revision 4, April 13, 1981. (Sections 4.5.4, 4.5.5).
- Quarterly Reports:
    - Progress Report, LA-5067-PR, April 1 to June 30, 1972
    - Progress Report, LA-5390-PR, April 1 through June 30, 1973

- Page 39: Development of Burnup Method Using Conventional Low-Cost Apparatus.
- Progress Report, LA-9372-PR, January 1 – March 31, 1982
- Progress Report, LA-9959-PR, July 1 – October 31, 1983, page 2, III Analytical Chemistry

Summary of Radiological Characterization Findings and Concerns - DTC and Scaling Factor Development

The EPA inspection team did not identify any concerns or findings relative to DTC or the development of radionuclide scaling factors as part of the radiological characterization technique evaluated during this inspection. There are no open issues related to radiological characterization resulting from this inspection.

Proposed Radiological Characterization Baseline Approval

The baseline conditions that the EPA inspection team evaluated during this baseline inspection consist of the following two techniques used jointly for containers of RH TRU in one (1) waste stream, ID-ANLE-S5000:

- The determination of the 10 WIPP-tracked radionuclides based on the DTC procedure presented in CCP-TP-504
- The application of radionuclide scaling factors derived as documented in CCP-AK-INL-501 and supported by the 33 calculation packages referenced in Section 8.2.5

Radiological Characterization Tiers

Based on the inspection and the results discussed above, EPA proposes the following tiers:

Tier 1 Radiological Characterization changes that require EPA review and approval prior to implementation are the following:

- Substantive modification of the DTC procedure[14]
- Addition of containers to Waste Stream ID-ANLE-S5000 that require a change to the established radionuclide scaling factors
- Addition of a new waste stream
- The use of an alternate characterization technique other than DTC and the application of established radionuclide scaling factors

Tier 1 changes will be reported and documentation will be submitted when INL-CCP is ready for EPA review. In case of T1 NDA changes, EPA will inform INL-CCP and CBFO whether a site inspection is necessary. EPA may request additional information, choose to conduct a desktop

[14] *Substantive modification* refers to the use of an inherently different type of measurement instrument or the use of the high range probe described for INL-CCP-504, since both of these would constitute a WC component not previously evaluated by EPA.

review, and/or confer with INL-CCP personnel. Upon evaluation (with or without site inspection), EPA will issue an approval letter and only upon receiving the EPA approval can INL-CCP continue to use the equipment affected by the change.

Tier 2 Radiological Characterization changes that do not require EPA approval prior to implementation but require reporting and submitting documentation discussing the changes include the following:

- Changes made to CCP-INL-AK-501, Revision 2, or CCP-TP-504, Revision 2

Every three months following EPA approval, INL-CCP will provide EPA with information concerning T2 changes. EPA will evaluate these changes and communicate with INL-CCP as to whether the changes raise any concerns and require an INL-CCP response, or whether INL-CCP can continue to implement the changes.

8.3 Visual Examination

Waste Characterization Element Description

The VE process for RH waste consists of reviewing existing audio/visual recordings that were made at the time of packaging for the purpose of generating VE data. Using CCP-TP-500, Revision 2, *Remote-Handled Waste Visual Examination*, two VE operators identified and documented the waste contents of the containers examined by this process. VE determines the following aspects of RH TRU Waste Characterization:

- Confirmation that the waste matches the waste stream description given in AK
- Description of the container contents including waste material parameters (WMP)
- Confirmation of the presence or absence of residual liquid that exceeds one percent of the volume of the waste container

Documents Reviewed

The following documents, procedures and other pieces of objective evidence were reviewed to assess whether VE operations follow the appropriate approved procedures and meet VE requirements:

- CCP-TP-500, Revision 1, *Remote-Handled Waste Visual Examination*, April 27, 2006
- CCP-TP-500, Revision 2, *Remote-Handled Waste Visual Examination*, June 19, 2006
- CCP-QP-002, Revision 20, *Training and Qualification Plan*, May 3, 2006
- Remote-Handled TRU Waste Characterization Program Implementation Plan, Revision 0D, October 30, 2003
- VE Batch Data Report (BDR) RHINLVE60001, consisting of 19 containers, 17 of which were subject to a CCP Non Conformance Report (NCR)

- VE BDR RHINLVE60002, consisting of 19 containers, 17 of which were subject to a CCP NCR
- VE BDR RHINLVE60003, consisting of 20 containers, 17 of which were subjected to a CCP NCR
- Audio/visual recording for BDRs RHINLVE60001, RHINLVE60002, and RHINLVE60003 The following records were reviewed:
- Visual Examination Operator/ITR/TS/FQAO
- Qualification Card for one (1) VEE
- List of qualified VE personnel
- List of currently qualified VE personnel
- Qualification cards for three (3) Visual Examination Operators
- Comprehensive examination for VE Operators
- AK Summary training material
- Daily Production Report, dated 6/13/06
- List of exempted software
- Review of CY 2000 Retrieved RH-TRU Drums for Water (report)

Technical Evaluation

During the inspection, the technical elements of the VE process were evaluated using the checklist contained in Attachment A.2. These areas are summarized below. Please note that during the on-site inspection, EPA Issue No. INL-CCP-RH-VE-06-001F was originally designated as a finding and EPA Issue No. INL-CCP-RH-VE-06-003CR was designated as a concern requiring a response. Following discussions after the conclusion of the inspection, EPA changed the status of each concern, which produced the concern INL-CCP-RH-VE-06-001CR (formerly INL-CCP-RH-VE-06-001F) and the finding INL-CCP-RH-VE-06-003F (formerly INL-CCP-RH-VE-06-003CR). This is discussed in the sections below.

(1) Overall procedural technical adequacy and implementation

The visual examination procedure is documented in CCP-TP-500 and was written to provide instructions to VE personnel when they perform actual VE. EPA identified a concern with this process that was recorded on EPA Issue Inspection Issue Tracking Form (see Attachment B.2 for this form). The concern is discussed below.

EPA Concern No. INL-CCP-RH-VE-06-002CR: For the RH waste containers processed to generate BDR RHINLVE60001 at the time of the inspection, VE consisted of reviewing existing VE audio/visual recordings. During this process VE operators had to “interpret” the instructions in the VE procedure to adjust them to what they were actually doing.

Resolution: In response to EPA's concern, INL-CCP revised the procedure to include instructions for performing VE by reviewing the audio/visual recordings, and INL-CCP VE personnel generated BDRs RHINLVE60002 and RHINLVE60003 using the revised procedure, both of which were available during the follow-up inspection.

Status of Concern: EPA considers this concern to be closed at this time.

(2) Characterization of WMPs and prohibited items were evaluated.

EPA did not observe the RH VE process during the initial on-site inspection. The data sheets contained in BDR RHINLVE60001 were reviewed in conjunction with the audio/visual recordings to ensure consistency between the visual and written records. Upon inspection of these records, EPA generated an EPA Issue Inspection Issue Tracking Form (see Attachment B.3 for this form) to address the issue discussed below, as well as in Item (3):

EPA Finding No. INL-CCP-RH-VE-06-003F: EPA's review determined that all waste items in the containers were not recorded on the data sheets, resulting in incomplete inventories for the RH containers.

Resolution: In response to EPA's concern, INL-CCP provided additional training to the VE operators and VEE during the initial on-site inspection.

Status of Concern: EPA considered this finding to be closed.

The presence or absence of prohibited items and confirmation that the waste matched the waste stream description given in the AK were determined and documented as required. During the follow-up inspection, EPA reviewed the audio/visual recordings and data sheets for selected containers in BDR RHINLVE60003. During this review, a VE operator explained the process and how decisions were made with regard to identification of WMPs. EPA identified a concern that was captured on an EPA Inspection Issue Tracing Form (see Attachment B.8 for this form) that is discussed below.

EPA Concern No. INL-CCP-RH-VE-009C: EPA determined that although INL-CCP had provided additional training to VE operators, the original inventories recorded for containers in BDR RHINLVE60003 were still incomplete. INL-CCP had identified this issue prior to EPA's follow-up inspection and had revised the container inventories as needed. Additionally, when the ITR reviewed and approved this data package, he did not identify that the QAO for representativeness for all three of the containers that were not subject to a INL-CCP NCR was not met. This concern also impacted the documentation of VE activities and is also discussed under Item (3), below.

Resolution: INL-CCP was not required to provide a formal response to EPA's concern but INL-CCP provided additional training to the VE personnel.

Status of Concern: EPA considers this concern closed.

(3) Documentation of VE activities was examined

During the initial on-site inspection, EPA reviewed data package RHINLVE60001 to verify that the VE data were documented correctly and completely. EPA generated an EPA Inspection Issue Tracking Form (see Attachment B.8 for this form) to capture the issue discussed below.

EPA Finding No. INL-CCP-RH-VE-06-003F, Revision 2: EPA determined that the VE data was incomplete. Operators were not recording all waste items identified in containers, and hence the waste can inventories were incomplete. This concern also impacted the characterization of WMPs and prohibited items and is also discussed in Item (2), above.

Resolution: INL-CCP prepared a briefing addressing this issue and presented it to VE operators during the initial on-site inspection. At the follow-up inspection, EPA reviewed an additional two BDRs, RHINLVE60002 and RHINLVE60003.

Status of Concern: EPA considered this concern to be closed. However, the concern discussed below is related.

EPA Concern No. INL-CCP-RH-VE-06-009C: Although RHINLVE60003 was generated after the additional training, the original data sheets did not contain a complete inventory of waste items. INL-CCP had identified this issue prior to EPA's follow-up inspection and had revised the container inventories. EPA generated an EPA Issue Inspection Issue Tracking Form to capture this issue (see Attachment B.8 for a copy of this form). Completed data generation and project level review checklists were included in the data package that was reviewed. The VEE who performed the ITR review on BDR RHINLVE60003 failed to recognize that all data were not being recorded which was included in Concern No. INL-CCP-RH-VE-06-009C.

Resolution: Concern No. INL-CCP-RH-VE-06-009C did not require a formal response from INL-CCP.

Status of Concern: EPA considers this concern closed.

(4) Training for VE personnel was examined

The site maintains a list of qualified individuals, which is used to ensure that all training is current. During the inspection, the qualification packages for the three RH VE operators were reviewed and found to document adequate training for VE personnel. Upon examination of the qualification packages, EPA generated an EPA Inspection Issue Tracking Form (see Attachment B.1 for a copy of this form) to capture the issue discussed below.

EPA Concern No. INL-CCP-RH-VE-06-001CR: In accordance with the requirements of the WCPIP and CCP-TP-500, VE operators are only considered to be qualified when they have completed the required on-the-job training (OJT) and passed a written examination with a grade of 80% or better. At the time the BDR RHINLVE60001 was generated, the operators had not taken the comprehensive examination and were not therefore qualified to perform the VE event according to the WCPIP and CCP-TP-500.

Resolution: In response to EPA's issue, INL-CCP's RH VE expert reviewed the data in RHINLVE60001 and determined that data quality was not affected. VE operators took and passed the required examination prior to generation of BDRs RHINLVE60002 and RHINLVE60003, both of which were reviewed during the follow-up segment of this inspection.

Status of Concern: EPA considers this concern closed.

Summary of VE Findings and Concerns

The EPA inspection team identified the findings and concerns related to VE that are discussed above. Copies of the EPA Inspection Issue Tracking Forms are provided in Attachments B.1 through B.3, and B.8. EPA considers all findings and concerns to have been adequately addressed, and there are no open findings or concerns related to VE resulting from this inspection.

Proposed VE Baseline Approval

The VE system for RH waste that the EPA inspection team evaluated during this baseline inspection consisted of the following:

- Trained personnel: VE operators, VEE
- Approved and controlled operating procedures CCP-TP-500, Revision 2; CCP-QP-002, Revision 20
- VE records and supporting data: Visual Examination Data Forms, CCP-TP-500 review checklists, and three (3) VE BDRs
- INL RH S5000 Debris Waste Stream ID-ANLE-S5000

Based on the results of this inspection, EPA proposes this process of VE by review of existing audio/visual recordings for approval for S5000 waste. The VE process EPA evaluated as part of this inspection is based on the three (3) VE BDRs INL-CCP has generated that were reviewed by EPA. INL-CCP has informed EPA that INL-CCP will no longer use the VE process to evaluate RH waste container contents at INL.

Proposed VE Tiers

None. EPA is not proposing any tiers for the VE process EPA evaluated as the part of the baseline inspection. INL-CCP informed EPA that as of August 2006, it has discontinued the use of VE for the purpose of confirming AK for RH debris waste retrievably-stored at INL. At such time that INL-CCP resumes conducting VE for RH wastes, EPA must be notified and an EPA inspection and approval are necessary.

8.4 Real Time Radiography

The technical area of Real Time Radiography (RTR) was not evaluated during this inspection. If INL-CCP wishes to use RTR to characterize RH TRU wastes, EPA approval (separate from what is contained in this report) is required.

8.5 WIPP Waste Information System

The technical area of WWIS was not evaluated during this inspection. Prior to INL-CCP using the WWIS to characterize RH TRU wastes, EPA approval separate from what is contained in this report is required.

9.0 RESPONSE TO COMMENTS

This section is reserved for public comments.

10.0 SUMMARY OF RESULTS

10.1 EPA Findings and Concerns

The findings and concerns issues identified during the inspection as well as INL-CCP's responses are discussed in the preceding sections of this report. Copies of the EPA Inspection Issue Tracking Forms that capture these issues are included in Attachment B. INL-CCP responded to all EPA findings and concerns that required a response prior to the inspection closeout on site as well subsequent to the inspection. The EPA inspection team members evaluated all responses for completeness and adequacy, and concluded that each EPA issue requiring a response had been resolved satisfactorily. No EPA issues remain open at this time.

10.2 Conclusions

EPA's inspection team determined that INL-CCP's RH WC program activities were technically adequate. EPA is proposing to approve the INL-CCP-RH WC program in the configuration observed during this inspection, described in this report, and documented in detail in the checklists in Attachment A. The proposed approval includes the following:

- The AK process for RH retrievably-stored TRU debris in one waste stream, Waste Stream No. ID-ANLE-S5000, Lots 1 through 20, as defined in CCP-AK-INL-500, Revision 2, June 1, 2006
- The radiological characterization process using DTC and modeling-derived scaling factors for assigning radionuclide values to one RH waste stream for which the scaling factors are applicable, as described in CCP-AK-INL-501, Revision 1
- The VE process for retrievably-stored RH debris waste. INL-CCP will not be using the VE process discussed in this report to confirm the AK-based physical and chemical characteristics data for RH debris waste. Hence, the proposed approval is limited to the RH debris waste containers evaluated until the end of August 2006

EPA is not proposing for approval the WWIS for tracking of waste contents of RH debris wastes. The system was not functional at the time of the inspection. EPA, however, requires that INL-CCP provide WWIS information concerning RH waste contents tracking as a Tier 1 change for EPA inspection. EPA will review the WWIS database populated with actual RH waste content data when the RH modules have been completed. No RH waste can be shipped to WIPP for disposal until EPA approves the WWIS database.

EPA is not proposing for approval Real Time Radiography (RTR). INL-CCP did not have an operational RTR unit in place at the time of the inspection. EPA requires that INL-CCP provide notification when RTR is ready for EPA inspection as a Tier 1 change. INL-CCP cannot ship RH waste to WIPP using RTR as a WC technique until it is inspected and approved by EPA.

Any changes to the WC activities from the date of the baseline inspection must be reported to and, if applicable, approved by EPA, according to Table 14.

Table 14. Tiering of RH TRU WC Processes Implemented by INL-CCP
(Based on June 12–16 Baseline and August 9 & 29, 2006, Follow-Up Inspections)

RH WC Process Elements	INL-CCP RH WC Process - T1 Changes	INL-CCP RH WC Process - T2 Changes*
Acceptable Knowledge (AK)	Any new waste streams not approved under this baseline; AK (1) Modification of the approved waste stream ID-ANLE-S5000 to include additional containers, i.e., K Cell or other debris wastes; AK (1) & AK (5) 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; AK (6) Load management for any RH waste stream; AK (16)	Updates to CCP-INL-AK-500, CCP-INL-AK-501, and CCP-AK-502 made available when each update is approved; AK (4) Changes to AK documentation as a result of WCPIP revisions**; AK (7) & AK (9) Completed Correlation or Surrogate Summary Form for RH containers in this waste stream identified as CH based upon measured dose rates that present NDA results for assayed containers, including isotopic ratios; AK (10), AK (14) & RC (8.2.2) & (5) Complete waste stream data package for debris waste stream once completed, and any modifications to the WSPF including the CRR and AK Summary; AK (14) AK accuracy report for Lot 16 (or the appropriate lot) wherein individual drum data assessed by INL-CCP (e.g., P030) will be compared against DTC-derived values; all other AK accuracy reports prepared annually at a minimum; AK (15)
Radiological Characterization, including Dose-to-Curie (DTC)	Application of new scaling factors for isotopic determination other than those documented in CCP-AK-INL-501; RC (8.2.2 & 8.2.3) 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***; RC (8.2.2 & 8.2.3) Any new waste stream not approved under this baseline or addition of containers to Waste Stream ID-ANLE-S5000 that requires changing the established radionuclide scaling factors; RC (8.2.3)	Revisions of CCP-AK-INL-501or CCP-TP-504 that require CBFO approval; RC (8.2.2 & 8.2.3)
Visual Examination (VE)	Implementation of VE following this baseline approval; if CCP decides to use VE in the future, EPA approval is necessary	None
Real-Time Radiography (RTR)	Any use of RTR requires EPA approval	None
WIPP Waste Information System (WWIS)	Any use of WWIS requires EPA approval prior to RH waste disposal	None

* Upon receiving EPA approval, 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 WC 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.

11.0 REFERENCES

U.S. Department of Energy, Carlsbad Area Field Office, "Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (CH-WAC)," Revision 3, DOE/WIPP-02-3122, Carlsbad, New Mexico, April 25, 2005.

New Mexico Environment Department, Waste Isolation Pilot Plant Hazardous Waste Facility Permit, NM48901 139088-TSDF, Santa Fe, New Mexico, 1989.

U.S. Environmental Protection Agency, "Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the Disposal Regulations: Certification Decision; Final Rule," *Federal Register*, Vol. 63, No. 95, May 18, 1998, pp. 27354, 27405.

U.S. Code of Federal Regulations, *Title 40*, *Protection of Environment*, Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes."

U.S. Code of Federal Regulations, *Title 40*, *Protection of Environment*, Part 194, "Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations."

U.S. Department of Energy, Carlsbad Area Field Office, "Remote Handled TRU Waste Characterization Program Implementation Plan", DOE/WIPP-02-3214, Revision 0D, Carlsbad, New Mexico, October 30, 2003.

U.S. Department of Energy, Title 40 CFR Part 191, Compliance Certification Application for the Waste Isolation Pilot Plant, DOE/CAO 1996-2184, Carlsbad, New Mexico, 1996.

U.S. Department of Energy, Title 40 CFR Part 191, SUBPART D AND C, Compliance Recertification Application 2004, DOE/WIPP/2004-3231.

U.S. Department of Energy, Carlsbad Area Field Office, "Quality Assurance Program Description (QAPD)", DOE/CBFO-94-1012, Revision 7, Carlsbad, New Mexico, July 2005.

U.S. Nuclear Regulatory Commission, "Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)."

Attachments A.1 through A.3

ATTACHMENT A.1: ACCEPTABLE KNOWLEDGE (AK) RH CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Implementation of Characterization Methods to Satisfy DQOs (WCPIP Section 4.2)			
How are the following DQOs being addressed—any of these that AK is used to determine must be qualified/verified as per section 4.3, except for the first bullet (defense): • Defense determination • TRU waste determination • RH waste determination • Activity determination (total and activity per canister) • Residual Liquids • Physical Form • Metals • Cellulosics, Plastics, Rubber	WCPIP Rev.0D, Section 4.2; CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price; Mark Doherty; Examination of objective evidence.	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500 Rev.1-3; CCP-AK-INL-501 Rev 1, CCP-AK-INL-502 Rev. 0, CCP-TP-506 Rev. 2, CRR for wste stream ID-ANLE-S5000, AK Accuracy Report, WSPF, CRR. Addition of a DQO requiring identification/quantification of the EPA 10 radionuclides is required to comport with EPA regulations. Further, the CTP, Certification Plan, and other documents did not clearly indicate the process by which DQOs would be achieved as determined during interviews: verification (qualification) of AK in all instances. Note that EPA expects revisions to any and all of the above listed documents in response to changes to the WCPIP. EPA expects these documents to be provided to EPA if WCPIP related revisions occur.
Qualification/Verification of AK Data (WCPIP Section 4.3)			
Is AK Qualification/verification required because characterization information exists that was generated prior to an established QA Program?	WCPIP Rev. D, Section 4.3, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price; Mark Doherty, examination of objective evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-502 Rev.0; CCP-AK-INL-500 Revs 1-3 All wastes are retrievably stored and were generated prior to an established EPA approved QA program.
a. If yes, what Qualification approach is used and for which characterization data (e.g. Peer Review,	WCPIP Rev. D, Section 4.3, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price;	Examples of objective evidence obtained include but are not limited to:

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Confirmatory Testing, Equivalent QA)		Kevin Peters, Lisa Price; examination of objective evidence	CCP-AK-INL-502 Rev.0; CCP-AK-INL-500
b. If Peer Review performed, does it follow requirements presented in Section 4.3.1 of the PIP?	WCPIP Rev. D, Section 4.3, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-502 Rev.0; CCP-AK-INL-500 Revs. 1-3, P596 Peer Review performed but was not submitted as qualification/verification method; Peer Review included in AK record.
c.If Confirmatory Testing is performed, does it follow requirements presented in Section 4.3.3 of the PIP and which methods are used? • 100 percent VE at time of packaging • 10-10-all • Representative sample collection to confirm isotopic distribution • 100% NDA • DA • DTC • Other as described in a Confirmatory Testing Plan: - VE by review of a percentage of audio/video tapes - Analysis of representative samples for radiological data - VE/radiography of a subpopulation of waste	WCPIP Rev. D, Section 4.3, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-502; CCP-AK-INL-500; AK Tracking Spreadsheet, CCP-AK-501, DTC conversion Records, CRR-, BDRs for 00738, 00739, 00740, 00742, 00743 CCP is to perform DTC and examination of all VE tapes/records for each container. CTP described process including required contents of PIP including DQO and QAO identification (see checklist discussion below).

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
- Qualification of existing radiological sampling and analytical info via modeling (e.g. ORIGEN) • Did the generator submit a confirmatory test plan as described in Section 4.3.3 of the PIP? If so, has CBFO audited and approved the process? Did it contain the following and was it adequate: - Description of the waste stream or waste stream lots to which the plan applies - Explicit description of DQOs and QAOs that will be satisfied with the data being qualified - Description of DQOs and QAOs that will NOT be confirmed with the data being qualified and an explanation of how compliance with those DQOs and QAOs will be demonstrated - Description of the confirmatory testing proposed, including the percentage of waste containers subject to confirmatory testing - Description of how the tested subpopulations will be representative of the waste stream or waste stream lot - Quantitative acceptance criteria for determining that the AK information in question can be qualified as characterization data.			
GENERAL CHECKLIST QUESTIONS			
Is the scope of the waste for which approval is sought defined? What is it?	WCPIP Rev.0D, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500; CCP-AK-INL-502. Approval sought for single waste stream

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
			ID-ANLE-S5000. It does not include other wastes (e.g.K cell) discussed in the AK Summary but currently not included in the identified waste stream. Changes to the stream to include these new wastes would require EPA notification as would addition of any new waste streams Further, changes to AK documents CCP-AK-INL-500 and 501 that affect the characterization process require EPA notification and approval.
Is the waste TRU by definition as presented in the LWA? (P.L.102-579)	WCPIP Rev. 0D, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price; review of objective evidence.	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501, TRU WAC, P002, U015, U022, U040, U072, U041, U042. CCP does not intend to load manage this stream, but if this is performed EPA notification is required. This includes the inclusion of CH containers in the stream that were originally identified as RH, but determined to be CH based on measurements.
Are any wastes considered (or previously considered HLW? HLW are prohibited. (P.L.102-579) Are any wastes considered (or previously considered) Spent Nuclear Fuel? (P.L.102-579)	WCPIP Rev. D, CCP-P0-002, Rev. 17.	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price; review of objective evidence.	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501; P593, P592, C121, C332, P001, P002, P023, P032, P055, U013
Personnel and Training			
Who are the AK Personnel? Upon interview, do they perform the duties presented in Attachment A, Section 3?	WCPIP Rev. D Attachment A; CCP-P0-002, Rev. 17.; CCP-QP-001, Rev. 20	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price,	Examples of objective evidence obtained include but are not limited to:

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Who is the Site Project Manager (SPM)? ? Upon interview, do they perform the duties presented in Attachment A, Section 3? Who is the Site Project Quality Assurance Officer (SPQAO)? ? Upon interview, do they perform the duties presented in Attachment A, Section 3? Are the above trained in the following: • The RH TRU WCPIP • Non conformance and corrective action processes • The AK Procedure presented in Attachment A of the PIP • Site-specific training relative to the contents of the site's waste streams • Determining radiological contents of individual containers	20	Larry Porter, A.J. Fisher; Jene Vance (SME); review of objective evidence.	Qualification cards and training records for Kevin Peters, Steve Schafer, and Jene Vance. During interview, ascertained that personnel were knowledgeable in areas required by the WCPIP.
Compiling AK Documentation and Defining the Waste Stream(s)			
AK documentation must be compiled. What documents have been compiled? Are they among the following: • Published documents/controlled databases • Unpublished data • Internal procedures and notes (log books, correspondence, etc) • Engineering Documents • Mission Statements • Other	WCPIP Rev. D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501, Source Documents Reference List for AERHDM. Dozens of examples of Correspondence (C), Published (P), and Unpublished (U) documents were provided by CCP that included various databases, internal procedures/notes, engineering documents, mission statements, Safety Analysis Reports, etc.

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Documentation is among the data used to define the waste stream. Has the waste stream been adequately defined as per the definition of waste stream as presented in the WCPIP: Waste stream is a waste material generated from a single process or from an activity which is similar in material, physical form and radiological constituents.			Analysis Reports, etc. The waste stream, as defined in CCK-AK-INL-500 was not adequately defined, although Revision 3 provided post inspection was revised to better define the waste stream. EPA's examination of data, independent from CCP, showed that the waste stream was adequately defined as presented in the AK Summary.
Does additional documentation used to characterize waste and delineate the waste stream include the following: • Previous NDA, radiochemistry, dosimetry, and non destructive examination data • Waste generating procedures • Physical, chemical and radionuclide inputs to the process • Time period that the process took place • Facilities involved • Types of waste generated (waste material parameters) • Process descriptions and flow diagrams • Packaging logs and video tapes • MSDS • Procurement records • Administrative/Process controls used as the basis for the absence of residual liquids • Container-specific information (AK data, i.e. waste container input forms, etc).	WCPIP Rev. D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Jene Vance (SME) , Mark Doherty. Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501, Source Documents Reference List; P593, P592, EDF6685, EDF6946, BDRs 00738, 739, 740, 742, 743, C121, C350, C348, P030, P032, P590, U015, U022, U040, U072, U041, U042; Correlation Surrogate Summary Form. Note that the CRR did not correlate CH-RH wastes.

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Were correlations made between CH and RH TRU Waste operations at a site including related CH waste characterization data? If so, are correlations documented on a Correlation and Surrogate Summary Form and is this form adequate and included in the AK Summary?			
Were correlations and similarities with the RH TRU waste operations at other generator/storage sites made, including characterization information for that RH TRU waste stream? If so, are the correlations documented on the Correlation and Surrogate Summary Form and is this form adequate and included in the AK Summary?	WCPIP Rev. D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501, CCP-AK-INL-500, CCP-AK-INL-501, Correlation/Surrogate Summary Form, P593, P592, P030, P590-595 (general information on stream) If containers from this stream are found to be CH rather than RH, then NDA of the drums would occur and the isotopic data would be presented on a Correlation and Surrogate Summary Form that must be provided to EPA.
Has an AK Source Document Reference list been assembled for each AK Summary/waste stream, and have references been assigned unique identifier (Attachment 2 of the Attachment A of the PIP)	WCPIP Rev. D Attachment A	Interview of AKEs/SPM including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, Source Document Reference List. Reference list is complete and easy to follow.
Have Source Document Summaries been developed per Attachment 5 and are these adequate? Do they identify data limitations?	WCPIP Rev. 0D Attachment A	Review of Source Document Summaries	Examples of objective evidence obtained include but are not limited to: See all Source Documents (C), (P), and (U) provided (e.g. C121, P593, U015 etc). Each source document has a source document summary attached to the front of the reference that summarizes document contents and provides a location for

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
			documenting data limitations.
AK-AK Discrepancy Resolution			
How are AK-AK discrepancy resolutions documented and does the documentation: • Identify the affected waste stream(s) • Identify all relevant AK source documents • State the nature of the discrepancy Has there been an instance where an AK AK discrepancy cannot be resolved or if the resolution results in a failure of a DQO? If so, the waste cannot be shipped to WIPP without further evaluation.	WCPIP Rev. 0D Attachment A	Interview of AKEs/SPM including Steve Schafer, Kevin Peters, Lisa Price, Larry Porter, Mark Doherty. Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: No AK-AK radiological DRs provided; EPA expects these to be included in the AK record as they are identified. DR010, and DR011 show ability of CCP to document and resolve discrepancy resolutions. No examples of major issues identified thus far.
Characterization of the Waste – DQO Assessment Preparation of the AK Summary Report			
What DQOs are assigned by AK? How are each to be qualified/verified (peer review, confirmation, equivalent QA program) • Defense determination • TRU waste determination • RH waste determination • Activity determination (total and activity per canister) • Residual Liquids • Physical Form • Metals • Cellulosics, Plastics, Rubber For each DQO related to AK, AK personnel must identify the DQO, supporting AK information, justify the assignments/conclusions, reference the AK Source	WCPIP Rev. 0D Section 4	Interview of AKEs/SPM including Steve Schafer, Kevin Peters, Lisa Price, Larry Porter, Mark Doherty. Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500; CCP-AK-INL-502. AK Summary did not adequately address DQOs; Rev. 2 was changed to include this information. Further, the CTP (discussed below) did not clearly state the process by which DQOs would be attained, including the relationship of qualification/verification to AK. Revisions to the CTP (CCP-AK-INL-502) were offered to address the issues.

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Documents and applicable pages supporting the assessment, method of 40 CFR 194.22(b) will be qualified			
Have applicable DQOs been addressed as follows: • Has adequate review of AK information been performed to determine whether the waste was generated by defense activities or is commingled with RH TRU waste generated by defense activities. This determination will be established by the AK data compiled. • Review the AK Information to determine the nuclear properties of the waste stream. The nuclear properties relevant to RH TRU waste include: TRU activity of the waste stream greater than 100 nCi/g of waste. Is this TRU waste? Will load management take place? • What information is included in the AK Record and AK Summary to demonstrate that the waste is RH waste? Dose equivalent rate equal to or greater than 200 mrem/hr and less than 1,000 rem/hr at the surface of the payload container. • Does the AK Record adequately present, support and report activity of the 10 required radionuclides (TRU isotopes ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, and ^{241}Am; and non-TRU isotopes ^{137}Cs, ^{90}Sr, ^{233}U, ^{234}U, and ^{238}U). Further, Does AK provide information to determine the total activity in each canister. Must be less than 23 curies per liter • Are AK records used to calculate, compute, or otherwise derive the total activity and/or TRU activity of the waste and the records? If so, were they qualified by peer review, confirmation, or equivalent QA (see relevant checklists/analyses	WCPIP Rev. 0D Section 4	Interview of AKEs/SPM including Steve Schafer, Kevin Peters, Lisa Price, Mark Doherty, Larry Porter. Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-502, CCP-AK-INL-501 Rev 0, CCP-AK-INL-502 Rev. 0, CCP-TP-506 Rev. 2, CRR for ID-ANLE-S5000, U001, P599, C331, C330, U015, EDF6685, EDF6946, C350, C348, P030, P032, P002, U015, U022, U040, U072, U041, U042, P593, P592, C121, P001, P002, P023, P032, P055, U013. P030, P590-595. AK record includes defense determination supporting documents. AK record includes data that support TRU and RH designation of waste noting that the RH determination is will be made through measurement rather than the AK record. Data pertaining to the EPA 10 radionuclides is present in the AK record, and INL did a separate radiological analysis based solely on AK for a select container group (apparently Lot 16). Because DTC was not performed for these containers, a comparison of the AK for Lot 16 vs. the DTC could not be performed. Note that confirmation is used for all verification except for the defense determination. WMPs identified via waste disposal records and can be used to assess waste stream assignments; examination of VE tapes/records is performed separate from the AK effort.

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
for these elements, if performed). Were data collected under an EPA approved program? If so, the records alone may be used to satisfy DQOs; otherwise, the above characterization objectives must be met by collecting additional data during packaging, etc. Was data collected, that would be considered AK collected under an EPA qualified program, assembled and used? If so, what was it and how was it used? (e.g., identification of SCG for use in DTC, etc.) • Has AK been used to compile information regarding the waste stream waste material parameters to provide a detailed description of the waste stream in accordance with the format of the AK Summary Report? • Has AK information been used to to determine the absence of residual liquids. This review may include waste packaging procedures and other documented administrative controls, such as training records, that identify control of residual liquids. It may also include previous waste characterization data or information from waste-container-specific packaging logs. The criterion in the DQO is that residual liquids must be less than 1 percent by volume of the waste container.			EPA expects the AK record to include information pertaining to waste storage that would identify whether any residual liquids due to post container inundation or management might have occurred. The AK Summary was revised to include this information for this INL RH waste stream. Also, load management is not planned, but would require direct notification of EPA if it was done. Also, EPA expects and AK Accuracy report will be prepared specific to Lot 16 comparing DTC and AK data for this lot (see AK Accuracy discussion, below).
AK Summary Report Preparation			
Has an AK Summary been prepared and does it follow the format specified in Attachment 1. The report shall include the following: • Program and waste stream narrative • Sections as defined in the WCPIP. • Detailed description of the waste stream including information on, for example, specific	WCPIP Rev. 0D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501. The AK Summary Report CCP-AK-INL-500 includes required sections. However, the report initially did not include adequate radiological information, noting that CCP revised the report and included this

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Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
waste matrix materials and fill volumes. • The report shall address all of the DQOs as noted in previous steps with appropriate justifications and references in the text.			revised the report and included this information in Revision 3. Also, the radiological report CCP-AK-INL-501 did not include sufficient references for statements made therein, and did not adequately address or link the LANL Mss spec data with the INL use/reliance on said data. CCP submitted a revision to CCP-AK-INL-501 (Rev.1). to address these issues. CCL-AK-INL 500 and 501 are important to the characterization process, so EPA must be notified of changes to the documents that might imipac the characterization process. changes to both 500 and 501 could impact this process.
Have the following documents been completed in addition to the AK Summary; are they available for EPA review and are they technically adequate? • AK Waste Summary Report, • AK Source Document Reference List, • Correlation and Surrogate Summary Form, • AK discrepancy resolution documentation and the • AK source document summaries	WCPIP Rev. 0D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500; AK Source Document Reference List, Correlation and Surrogate Summary Form, DR010, DR011. Source Document Summaries are placed on each correspondence (C), published (P), and unpublished (U) document.
Have all of these been provided to the SPM for review as required in Section 6.7 of the WCPIP Attachment A? Did the AK personnel recommend how the SPM should assess and qualify the information? (6.8)	WCPIP Rev. 0D Attachment A	Interview of AKEs including Steve Schafer, Kevin Peters, Lisa Price, Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: Characterization Reconciliation Report and Waste Stream Profile form, CCP-AK-INL-500 and 501, Correlation and Surrogate Summary Form, DRs as cited above. . Interview with SPM indicated he had all information cited in Section 6.7 available

ATTACHMENT A.1: ACCEPTABLE KNOWLEDGE (AK) RH CHECKLIST

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Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
			for review. It was not determined that AK personnel recommend how the SPM assess data, as the SPM did so independently.
Reconciling Compiled AK Information			
Has the SPM Reviewed the AK Summary Report, AK Source Document Reference List, Correlation and Surrogate Summary Forms, the referenced source document summaries, if applicable, batch data reports from any confirmatory activities such as VE or NDA and, if applicable, supplemental data collected during repackaging using an approved technique, to determine if the AK record is reconciled and is adequate to characterize the waste stream or waste stream lot and satisfy the relevant DQOs?	WCPIP Rev. 0D Attachment A	Interview of Larry Porter; review of the AK Summary Report, Correlation and Surrogate Summary forms, BDRs and other supporting verification activities.	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500; CCP-AK-INL-502, AK Source Document Reference List, Correlation and Surrogate Summary Forms; source document summaries (as included for each source document provided), BDRs for drums 00738, 739, 740, 742, 743.
Discrepancies between the AK record and confirmatory test results identified during this reconciliation process must be resolved and documented. What is the AK-measurement discrepancy resolution process employed and is it satisfactory? Does it involve reevaluation of the AK record, reassignment of waste stream parameters and a revision to the AK Summary Report.	WCPIP Rev. 0D Attachment A	Interview of AKEs/SPM including Steve Schafer, Kevin Peters, Lisa Price, Mark Doherty, and Larry Porter. Review of AK Summary and AK Source Document Reference List; examination of selected Objective Evidence	Examples of objective evidence obtained include but are not limited to: WSPF, CRR. No discrepancies between the AK Record and the confirmatory test results were found. However, ANLE performed a detailed analysis of the stream based on AK using a similar process as that used by CCP. Comparison of results will bolster use of the waste stream scaling factor assuming that the results are comparable. Provision of an AK Accuracy report comparing radiological and physical AK for these drums (presumably Lot 16) and DTC/VE results is required.
AK Accuracy			
Has the SQAO, consistent with the requirements of Section 4.1.1.2 of the WCPIP, reviewed the AK Summary Report, confirmatory test data and identified AK discrepancies, and prepared an AK Accuracy Report. This report will identify the percentage of containers that have	WCPIP Rev. 0D Attachment A	Interview of A.J.Fisher; examination of AK Accuracy report.	Examples of objective evidence obtained include but are not limited to: AK Accuracy Report for initial containers, waste stream ID-ANLE-S5000. .

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
report will identify the percentage of containers that have been assigned to another SCG as well as radiological issue.			Provision of an AK Accuracy report comparing radiological and physical AK for these drums (presumably Lot 16) and DTC/VE results is required. Provision of all other AK Accuracy reports prepared in the future is also required.
How did the SQAO determine what is to be considered a “significant” radiological discrepancy and is this determination technically sufficient and adequate?	WCPIP Rev. 0D Attachment A	Interview of A.J.Fisher; examination of AK Accuracy report.	Examples of objective evidence obtained include but are not limited to: AK Accuracy Report; CCP-AK-INL-502. CCP committed to freeze file changes to CCP-AK-INL-502 and CCP-AK-INL-500 that both address why comparison of AK and DTC data, with respect to accuracy, is not appropriate. CCP-AK-INL-502 was also revised to clarify how the mass spectrometry data are used in the comparison process.
Has the AK Accuracy report been updated annually? Even if the report is only updated annually, will they continually assess AK Accuracy?	WCPIP Rev. 0D Attachment A	Interview of A.J.Fisher; examination of AK Accuracy report.	Examples of objective evidence obtained include but are not limited to: AK Accuracy Report. CCP, in the past, has performed AK Accuracy on a lot basis. Provision of AK Accuracy reports to EPA as prepared, is required.
Has the AK Accuracy fallen below 90%? If so, the site shall document this as a significant condition adverse to quality as defined by the CBFO QAPD. The site shall notify the CBFO of this condition and implement appropriate corrective actions before proceeding with further characterization activities on the affected waste stream(s).	WCPIP Rev. 0D Attachment A	Interview of A.J.Fisher; examination of AK Accuracy report.	Examples of objective evidence obtained include but are not limited to: Accuracy reports, as revised to address WCPIP and EPA concerns is required, but it is anticipated that these revisions will not show that the accuracy has fallen below 90%.
Preparation of the CRR			
Has the SPM reviewed the qualified AK characterization	WCPIP Rev. 0D Attachment A; CP-	Review of the CRR for	Examples of objective evidence obtained

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information and the corresponding required DQOs and documented this review in an RH TRU waste AK Characterization Reconciliation Report (CRR)? . At a minimum the CRR shall include: • Specification of applicable site and waste stream. • A listing of each DQO • Data from the AK record that addresses each DQO • AK source document references that support/provide the data • A listing of AK record discrepancy resolutions, if any, that are relevant to each DQO • Documentation, including specific references, of how the AK data for each DQO were • Qualified, such as batch data reports, corroborative data, proceedings of a peer review, etc. • Radiography and/or visual examination summary to document that liquids greater than 1 • Percent are absent from the waste and to confirm AK concerning the physical properties of the waste • A summary presentation of radiological measurement data used to meet the DQOs and to confirm AK • A complete AK summary • A complete listing of all container identification numbers used to generate the WSPF, cross-	TP-506 Rev. 2	select ANLE RH waste stream; Interview of Larry Porter, SPM	include but are not limited to: WSPF and CRR; BDRs for containers 00738, 739, 740, 742, 743. CRR shall be revised to include WCPIP revisions that recognize identification of EPA 10 nuclides as a DQO. The CRR included information required by the WCPIP Attachment A.

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
referenced to each batch data report. • A listing of AK discrepancies generated by an AK qualification process and the corresponding resolutions • Signature of the SPM			
Has the SPM verified that the applicable QAOs (accuracy, completeness, representativeness, and comparability) associated with the AK process have been met.	WCPIP Rev. 0D Attachment A; CCP-TP-506 Rev. 2	Review of the CRR for select ANLE RH waste stream; Interview of Larry Porter, SPM	Examples of objective evidence obtained include but are not limited to: WSPF, CRR. Applicable QAOs have been included on the CRR.
Preparation of the Waste Stream Profile Form			
Has the SPM completed the Waste Stream Profile Form (WSPF) (Attachment 4) based on AK characterization and confirmation results and other relevant characterization data? Is the form complete and adequate/accurate?	WCPIP Rev. 0D Attachment A	Review of the WSPF and related attachments; interview of Larry Porter, SPM	Examples of objective evidence obtained include but are not limited to: Draft WSPF and related attachments (AK Summary and CRR). See comments pertaining to the AK Summary and CRR. Note that the WSPF was a draft version prepared for audit purposes only; EPA must be provided the final version of the WSPF once it is completed and approved, including all related attachments.
Have the WSPF, the RH AK Summary Report and the Characterization Reconciliation Report, resulting from waste characterization activities, been transmitted to the Department of Energy Carlsbad Field Office (DOE/CBFO)? Only RH TRU waste that is characterized in accordance with the EPA requirements and WCPIP will be accepted for disposal at the WIPP.	WCPIP Rev. 0D Attachment A	Review of the WSPF and related attachments; interview of Larry Porter, SPM	Examples of objective evidence obtained include but are not limited to: Draft WSPF, CRR, AK Summary for CCP-AK-INL-500. Only draft version were available at the inspection; EPA must be provided the final version of the WSPF and related attachments once completed and approved.

ATTACHMENT A.1: ACCEPTABLE KNOWLEDGE (AK) RH CHECKLIST

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Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
Records			
Have the following records been generated and what is the disposition of these records? • AK Summary Report (Attachment 1) • AK Source Document Reference List (Attachment 2) • Correlation and Surrogate Summary Form (Attachment 3) • Waste Stream Profile Form (Attachment 4) • AK Source Document Summary (Attachment 5) • Characterization Reconciliation Report • AK Source Documents • AK Training Records • AK Discrepancy Resolution Documentation • AK Accuracy Report	WCPIP Rev. 0D Attachment A	Interview of AKEs Kevin Peters, Steve Schafer, Lisa Price, Sheila Pearcy; examination of required references as listed (objective evidence)	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-500, CCP-AK-INL-501, AK Source Document Reference List, Correlation and Surrogate Summary Form, draft WSPF including the CRR, requested C, U, and P source documents, training records for K.Peters and S.Schafer, DR010, DR011, AK Accuracy Report (current containers waste stream). Ms.Pearcy verified that all documents are included at the CCP Files in Carlsbad, NM.
Confirmatory Test Plan			
	WCPIP Rev. 0D Attachment A	Interview of AKEs Kevin Peters, Steve Schafer, and Mark Doherty, and examination of objective evidence.	Examples of objective evidence obtained include but are not limited to: CCP-AK-INL-502. The CTP examined during the inspection was not clear regarding the specific characterization approach to be used with respect to the use of AK, and it was not clear that the approach used by CCP (CTP containing the EPA required explanation of characterization approach) adequately reflected EPA's requirement that the Certification Plan document this information. CCP revised the CTP to more

Required Technical Elements	Procedure Location/Adequacy	Verification of Activity	Objective Evidence/Adequacy
			clearly state the approach, and retitled the document to be both a CTP and Cert Plan. EPA expects CCP to submit a document that clearly, completely, and precisely presents the proposed characterization process for each RH waste stream, regardless of the document selected to present this information.

ATTACHMENT A.2: RH RADIOLOGICAL CHARACTERIZATION CHECKLIST: DOSE-TO-CURIE

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Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
Technical Documents/Procedures					
Identify all INL-CCP documents that provide technical information relative to performing and documenting the implementation of the DTC method, including operational procedures, and indicate the current revision of each.	Y	DOE/WIPP-02-3124, Revision 0D	All INL-CCP documents were reviewed before, during or directly following this inspection. The correct revisions for each are noted in Objective Evidence in the cell to the left in this row.	Y	Documents include: CCP-TP-504, Revision 3; CCP-AK-INL-500, Revision 2; CCP-AK-INL-501, Revision 0; and, 36 Calculation packages prepared by J. Vance & J. Holderness cited in Section 8.3
Dose-To-Curie Instruments					
Verify the following: • Specifications for the instruments used for dose rate measurements of RH TRU waste containers are provided in INL-CCP documents • Performance and measurement control criteria for dose rate instruments have been specified and integrated in INL-CCP operating procedure(s) • The instruments used to make dose rate measurements of RH containers are identified • The instrument identified in previous bullet have been appropriately calibrated • The scale used to weigh the containers has been calibrated and that the scale has been checked each operational day	Y	CCP-TP-504, revision 3, Section 4.1	These technical aspects were verified by examination during the inspection	Y	CCP-TP-504, Revision 3; CCP-AK-INL-501, Revision 0; INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums total) that contains copies of Attachment 1, *Measurement Control Report*, Attachment 2, *Container Data Sheet*, from CCP-TP-504 and Attachment 3, *Waste Container Dose-to-Curie Conversion Record*, from CCP-TP-504, Revision 3, for each container in the BDR that was assayed
Verify that the instruments used for dose rate measurements of RH TRU containers are properly calibrated to provide data that are consistent with those used in the calculation of the radionuclide-specific activity.	Y	CCP-TP-504, Revision 3, Section 4.1	Calibration sheets for the ion chambers used were examined.	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums total)

ATTACHMENT A.2: RH RADIOLOGICAL CHARACTERIZATION CHECKLIST: DOSE-TO-CURIE

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Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
Verify that the position of the detector relative to the waste container and any intervening shielding is consistent with that used in the calculation of the expected radiation dose.	Y	CCP-TP-504, revision 3, Section 4.1	Detector position relative to the waste container and shielding is addressed appropriately.	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums)

ATTACHMENT A.2: RH RADIOLOGICAL CHARACTERIZATION CHECKLIST: DOSE-TO-CURIE (DTC)

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Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
General Technical Requirements					
DTC must provide information to support the reporting of quantitative values and uncertainties for ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{241}Am, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr and ^{137}Cs.	Y	DOE/WIPP-02-3124, Revision 0D, Attachment C, Section 8.0	Quantitative values and uncertainties for ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{241}Am, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, and ^{137}Cs are reported.	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums total)
Verify that a waste container is classified as RH TRU only if the dose equivalent rate at the exterior of the surface of the container is between 200 mrem/hr and 1000 rem/hr and the concentration of alpha emitting TRU radionuclides is greater than 100 nCi/g waste.	Y	DOE/WIPP-02-3124, Revision 0D, Attachment C, Section 12.0	All containers in RH TRU waste stream ID ANLES5000 meet the criteria for TRU (concentration of alpha emitting TRU radionuclides greater than 100 nCi/g waste) and RH (dose equivalent rate at the exterior of the surface of the container between 200 and 1000 rem/hr)	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001
Assess the technical adequacy of the calculations involving the application of scaling factors and/or correlation techniques.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 7.0	The technical adequacy of the calculations involving the application of scaling factors and/or correlation techniques is addressed in Section 8.3.	Y	See Section 8.3 of this report, also INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07
Measurements: Dose Rate and Background					
Verify the following: • Dose rates are measured four (4) times at a detector-to-container distance of 1 meter, with the container rotated 90° between each of the four measurements • The appropriate ion chamber and probe are used • The radiation field is measured at least two locations about the container at the mid-height of the container and a distance of one-meter from the surface of the container.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 7.0	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 examined for this inspection documented technically appropriate collection of container-specific dose rate data.	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001, copies of Attachment 1, *Measurement Control Report* and Attachment 3, *Waste Container Dose-to-Curie Conversion Record*, from CCP-TP-504, Revision 3

ATTACHMENT A.2: RH RADIOLOGICAL CHARACTERIZATION CHECKLIST: DOSE-TO-CURIE (DTC)

EPA Inspection No.: EPA-INL-CCP-RH-6.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
Verify that the background rate is measured and recorded and that actions are taken to reduce the background if the measured background radiation levels are greater than one-tenth of the expected container rate.	Y	CCP-TP-504, Revision 3, Section 4.1	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 examined for this inspection documented technically appropriate background measurement data.	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001, copies of Attachment 2, *Container Data Sheet*, from CCP-TP-504, Revision 3
Measurement Documentation					
Verify that container number, waste stream identifier and all pertinent container-specific measurement data are entered into the "Waste Container Dose-to-Curie Conversion Record" spreadsheet, including: • Date of the gamma measurements • Waste Stream Designation • Container Number • Container Gross Weight • Estimated Can Size for Cans #1, #2, #3 • Estimated Fill Percentage for Cans #1, #2, #3 • Four (4) quadrant dose rates • Average of four (4) dose measurements • Expected container dose rate • Waste Material Type (matrix)	Y	DOE/WIPP-02-3124, Revision 0D; CCP-TP-504, Section 4.2	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 examined for this inspection contained all required documentation	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001, copies of Attachment 2, *Container Data Sheet* and Attachment 3, *Waste Container Dose-to-Curie Conversion Record*, from CCP-TP-504, Revision 3
Verify that DTC BDR INL-RH-DTC 06001 contains the following items: • Batch Data Report Cover Sheet, Attachment 4 • Batch Data Report Table of Contents, Attachment 5 • Batch Data Report Narrative Summary, Attachment 6 • ITR Review Checklist, Attachment 7	Y	CCP-TP-504, Revision 3, Section 4.3	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 contained all required elements	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums)

EPA Inspection No.: EPA-INL-CCP-RH-6.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
• Measurement Control Report, Attachment 1 • Container Data Sheet(s), Attachment 2 • Waste Container Dose-to-Curie Conversion Record(s), Attachment 3 • Copy of NCRs, if applicable • Evidence of a review by an ITR and SPM, as appropriate.					
Verify that records generated in support of DTC are available for inspection. Records include the following, at a minimum: • Site specific procedures developed to implement the DTC method • Technical basis for the determination of the waste stream's "Standard Mix", shielding calculations for waste containers • Technical basis for determination of radionuclide scaling factors • TMU technical support documents	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 15.0	All records related to DTC were available for this inspection on-site at INL and in CBFO Headquarters in Carlsbad, NM	Y	INL-CCP DTC Batch Data Report No. INL-RH-DTC 06001 (29 drums)

ATTACHMENT A.2: RH RADIOLOGICAL CHARACTERIZATION CHECKLIST: DOSE-TO-CURIE (DTC)

EPA Inspection No.: EPA-INL-CCP-RH-6.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
Technical Basis					
Verify the following: • Results of sampling and calculation form the basis for the development of radionuclide scaling factors used to convert measured dose rates to radionuclide-specific activities • Dose rates are measured at a distance of one meter from the outer surface of the waste container at the mid-height of the container • Calculations appropriately present the relationship between a container's measured dose rate and the waste's activity • Calculations account for all relevant container properties, specifically fill height (apparent density), waste type (matrix) and attenuation (shielding) of the container and/or liner wall • Calculations are performed using technically appropriate shielding analysis techniques	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 7.0; CCP-AK-INL-501, Revision 0; CCP-TP-504, Revision 3, Section 4.3	These technical aspects were examined before, during and following this inspection in consultation with CTAC technical personnel.	Y	CCP-AK-INL-501, Revision 0; INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07; INL-RH-09; INL-RH-10; INL-RH-12
Verify that waste containers contain only matrices for which the DTC methodology has been established. Verify that the type of waste (waste matrix) in each container is recorded along with the height of the waste in the container.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 5.0	RH waste cans contain metals (steel), concrete, or organics with a minimum of mixing of dissimilar types of materials. Fill heights are specified for all containers, i.e., less than 25% full, 25% to 66% full, 66% to 90% full, more than 90% full).	Y	INL-CCP DTC BDR No. INL-RH-DTC 06001 (29 drums); DTC Spreadsheets contained in BDR
Verify that all DTC-related calculations have been subjected to a technical review and that	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C,	With minor exceptions, all calculation packages contain evidence of a	Y	Examination of the 36 calculation packages that supported the

Required Technical Elements	Y/N	Location	Verification of Activity	Y/N	Objective Evidence
all technical review comments and their resolutions are documented.		Section 14.0	technical review.		development of radionuclide scaling factors prepared by J. Vance & J. Holderness, see Section 8.3
Verify that the ratio of actual measured dose rate to the calculated dose rate is used to calculate a scaling factor that is applied to the "Standard Mix" or subset thereof, that was used to estimate individual radionuclide activities.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 11.0; CCP-TP-504, Revision 3, Section 4.2	The "Standard Mix" was not used to generate scaling factors for this waste stream. The technical documentation of the scaling factor development supports the use of dose rate measurements.	Y	CCP-AK-INL-501, Revision 0; INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07
Total Measurement Uncertainty (TMU)					
Verify that a method for estimating total measurement uncertainty (TMU) has been developed and documented for RH TRU waste stream ID ANLES5000.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 13.0	This checklist addresses the aspects of TMU attributable to DTC. The aspects of TMU related to the development and application of radionuclide scaling factors are addressed in Section 8.3.	Y	CCP-AK-INL-501, Revision 0; INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07
TMU is based upon the propagation of uncertainties present in all aspects of radiological characterization, including DTC.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 13.0	TMU includes the contributions of all applicable aspects of the DTC process	Y	CCP-AK-INL-501, Revision 0; INL-RH-02; INL-RH-05; INL-RH-06
Verify that the approach for TMU determination incorporates the contributions of all applicable components of DTC, including: • Measured sample isotopic activities • Relative uncertainties associated with each measured radionuclide • Measurement of the container's dose rate • Determination of waste mass • Modeling errors or biases.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 13.0	TMU includes the contributions of all applicable aspects of the DTC process	Y	CCP-AK-INL-501, Revision 0; INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07
Verify that the TMU approach has been formally submitted to CBFO for review and approval.	Y	DOE/WIPP-02-3214, Revision 0D, Attachment C, Section 13.0	The TMU approach was evaluated by the CTAC Technical Specialist (D. Stuenkel) during this inspection.	Y	INL-RH-02; INL-RH-03; INL-RH-05; INL-RH-06; INL-RH-07

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
RHVE-1 Site procedures identify required training and qualifications for RHVE personnel.	WCPIP, Revision 0D, s. 4.1.2.2 CCP-QP-002, Revision 20	• OJT training for operators, including: identification of summary category groups, WMPs, packaging configurations, and residual liquids • Formal training elements include: project requirements, container identification and labeling, applicable state and federal regulations • Site-specific instructions waste generating practices and expected packaging configurations	Y	CCP uses Qualification Cards to document training of personnel. The training procedure included all requirements of the WCPIP for training of RH VE operators. CCP provided documented evidence that operators had been trained on the AK summary for the waste stream being processed. On some of the reviewed training certificates the incorrect waste stream number was documented. CCP corrected this error during the inspection. Objective evidence: 1. Qualification cards for VE operators.
RHVE-2 Operator qualification and re-qualification requirements are described	WCPIP, Revision 0D, s. 4.1.2.2 CCP-QP-002, Revision 20, s. 4.2.5	• To become qualified the RHVE operator must pass a comprehensive written test based on training objectives with a minimum score of 80% • Demonstrate capability in the presence of the site VEE during OJT • RHVE operators re-qualified every 2 years based on continued satisfactory performance • Unsatisfactory performance – failed to identify prohibited item during OJT of score of less than 80% on exam	N	CCP had only generated one (1) Batch Data Report (BDR) that had been through project level review. At the time that the BDR was generated the operators had not taken the requirement written examination. EPA generated the finding below to address this issue: INL-CCP-RH-VE-06-001F, Rev 1: The three VE operators (Swami Raman, William Boyd and John Hegsted) completed their OJT training requirements on 2/22/06 but did not take the required written test until 4/10/06. These operators were not qualified to perform VE between these two dates but they performed VE on containers in BDR RHINLVE060001 during this time period. CCP initiated CAR-RHINL-0001-06 in response to this occurrence. However, the corrective action implemented did not include review of the subject VE data to ensure that data quality had not been negatively affected. BDR RHINLVE060001 is the only completed BDR that CCP can use to demonstrate the RH VE process. Objective evidence: 1. BDR # RHINLVE60001

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
RHVE-3 Each site has a designated VE expert (VEE)	WCPIP, Revision 0D, s. 4.1.2.2 CCP-PO-001, Revision 12	• VEE designation is documented • VEE has knowledge of the RH TRU waste being characterized • Responsible for overall direction and implementation of VE at the facility • **Certification Plan** specifies the selection, qualification, and training requirements of VEE	Y	VEE training and designation were reviewed during the on-site inspection. Objective evidence: 1. Qualification Card for VEE
RHVE-4	CCP-TP-509, Revision 0, s. 4.4	• Operators review AK Tracking Spreadsheet to verify that correct containers examined • Rejected containers are placed in a shielded container with a CCP Hold Tag attached • Provide container processing information to SPM/VPM	Y	CCP intends to use two (2) operators to generate VE data for RH containers. The operators will review existing audio/video tapes and complete the required data sheets from their observation of the recorded VE event. Operators have access to the AK for the waste stream on the CCP ftp site. CCP had only generated one (1) Batch Data Report (BDR) that had been reviewed at project level. EPA did not observe the VE process during the inspection. Objective evidence: 1. BDR # RHINLVE60001
RHVE-5 Procedures and technical guidance documents provide complete instructions for performing RHVE.	WCPIP, Revision 0D, s. 4.1.2, 4.1.2.1, 4.3.3 CCP-TP-500, Revision 1, s. 4.0, Attachment 1	Procedures are sufficiently detailed to enable the operator to determine if a waste container meets the criteria of '194.24 with regard to identifying applicable parameters with waste limits • All existing VE tapes will be reviewed and the VE data will be documented • Existing waste container packaging records will be qualified by VE or RTR • 100% of containers will be subject to VE	N	CCP-TP-500 was written based on the assumption that CCP would be performing actual VE. CCP decided not to write a procedure for watching video tapes. EPA generated concern INL-CCP-RH-VE-06-002CR to address this issue. Weight for 30 gallon containers is contained in an operator aid. Weight of cans given to 2 decimal places and therefore WMP weights also in 2 decimal places. CCP uses a spreadsheet "RH VE Analysis", software version 0.xls to ensure that the WMP weights total the net weight of the container. This software is not controlled because the data will not be used for certification.

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
		at the time of packaging • Waste Stream Description and WMC verified • Presence/absence of prohibited items		will not be used for certification. EPA reviewed the video recordings and associated data sheets for containers in BDR # RHINLVE60001. The presence/absence of prohibited items was determined and the WMC was confirmed. However, operators did not make complete inventories of the waste as required. EPA generated the concern INL-CCP-RH-VE-06-003CR, Rev.1 to address this issue. CCP provided EPA with the following information about the waste stream being examined: • There are 549 drums in waste stream, 70 of which have video tapes recording the original VE event. • 15 of the drums were located in a flooded vault and will be examined by RTR. • 36 drums had been looked at prior to the inspection. CCP does have some original paperwork for the containers but the PIP does not allow the use of this. • None of the 70 drums that will be examined by VE were in flooded vaults. • Started video taping the VE in 1990. • CCP are buying a new RTR unit (anticipated to be available in July 2006) to examine the remaining drums in the waste stream. ANL-E waste: 48 drums ± 50 drum content volume still in hot cells and needs to be packaged. Use spreadsheet to total weights: RH VE analysis, software version 0.xls. Software not controlled but exempted because data will not be used for certification. INL-CCP-RH-VE-06-003CR, Rev.1: There does not appear to be a consistent protocol for entering items on the VE data forms, Attachment 1 of CCP-TP-500. For example, waste can 161 in container No. 00761 contained both Kleenex and

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
				cardboard that were not entered in the item description section of Attachment 1. For waste can # 149 in container No. 00748 cardboard and Kleenex were clearly called out over 5 times each but were not entered in the item description of Attachment 1. However, for this same waste can a single piece of wood was called out and entered into Attachment 1 as was a single marking pen. The operators interviewed were unable to provide the rationale for the discussions regarding what items were/were not recorded on the VE data form. The reported inventory for waste cans is therefore incomplete. Resolution: A briefing was prepared and given to VE operators addressing this issue during the on-site inspection. INL-CCP-RH-VE-06-002CR: Procedure CCP-TP-500, Remote-Handled Waste Visual Examination, Revision 1 contains instructions for performing and documenting a visual examination (VE) event. However, the VE performed in support of the RH program does not involve actual VE but consists of operators viewing previously generated VE audio/visual recordings. The operators complete a data form documenting the items and WMPs seen in the audio/visual recording. CCP has not generated a standard operating procedure for this process. Objective evidence: BDR # RHINLVE60001
RHVE-6	CCP-TP-500, s. 2.4.2	• Corrective actions are taken when necessary • When are NCRs necessary ?	Y	Glass bottles form part of the inorganic portion of the wastes stream contents. Some bottles are capped, brown bottles and contents cannot be seen. These drums were NCR'd as required. NCRs are listed on the BDR Table of Contents and are reviewed to ensure that they are complete.

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
				Objective evidence: 1. BDR # RHINLVE60001
RHVE-7 Site procedure(s) require data generation and project level reviews of Batch Data Reports (BDRs).	WCPIP s. 4.1.2.1 CCP-TP-500, Revision 1, ITR: s. 4.3.5-4.3.8, Attachment 2 SPM: s. 4.4, Attachment 3	• ITR review Attachment 2 • SPM review Attachment 3	Y	The generation level and project level review checklists were reviewed in the one (1) BDR available. Objective evidence: 1. BDR # RHINLVE60001
RHVE- 8	CCP-TP-500, Revision 1, s. 5.0	• Lifetime/QA records – Attachments 1-5, Copy of NCRs • QA/nonpermanent records – VHS tape or DVD (primary and backup)	Y	When CCP reviews an original tape, personnel responsible for records makes 2 copies from the original VHS. Objective evidence: 1. BDR # RHINLVE60001
RHVE-9 Quality Assurance Objectives are defined and met	WCPIP, Revision 0D, s. 4.1.2.3	QOAs are defined for: Precision – maintained by reconciling any discrepancies between 2 operators (or operator and ITR) with regard to physical form of waste, absence of residual liquid Accuracy – maintained by requiring operators to pass a comprehensive test with a score of 80% and demonstrated satisfactory performance for initial qualification and re-	N	At the time of the inspection CCP could not demonstrate that the QAOs for accuracy, representativeness, and comparability had been met (see inspection issues INL-CCP-RH-VE-06-003CR, Rev.1 and INL-CCP-RH-VE-06-001F, Rev 1). Objective evidence: 1. Qualification cards for VE operators. 2. BDR # RHINLVE60001

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
		qualification Representativeness – Contents placed in container will be described on the data forms Completeness – Relevant waste information must be collected and documented on a videotape and/or data form or other unalterable media Comparability – ensured by site meeting training requirements and complying with the minimum standards used to implement VE		
RHVE-10 VE as a method to qualify AK data	WCPIP, Revision 0D, s. 4.3, 4.3.3	If VE is used as a qualification method for AK all of the requirements in section 4.3 and 4.3.3 are met: • Quality and reliability of the measurement control program under which the data were generated (QC samples included in the VE process) • Extent to which the data demonstrate the properties of interest (VE process generates data for <u>all</u> items in containers) • Qualification of personnel generating data (training records for personnel on tapes performing the original VE event) • Technical adequacy of the procedures used to generate the original data (copies of original procedures)	N	• CCP uses 2 operators to generate VE data. • The VE events (original video recording and data sheets) reviewed during the inspection did not record all of the items identified in the containers (INL-CCP-RH-VE-06-003CR, Rev.1) • The two operators that generated the completed BDR # RHINLVE60001 were not qualified when they generated the VE data (INL-CCP-RH-VE-06-001F). • The procedure CCP-TP-500 did not contain instructions for performing VE by review of original video tapes (INL-CCP-RH-VE-06-002CR)
RHVE-11 Confirmatory testing plan for use	WCPIP, Revision	1. description of waste stream or waste stream lots to which the plan applies	NA	See AK checklist.

ATTACHMENT A.3: VISUAL EXAMINATION (VE) CHECKLIST

EPA Inspection No.: EPA-INL-CCP-RH-06.06-8 **Inspection Date: June 12–16 and August 29, 2006**

Establishment of Required Technical Elements in Procedures	Y/N Location	Execution of Procedures	Y/N	Objective Evidence/Comment
of VE data to qualify AK	0D, s. 4.3.3 CCP-AK-INL-502, Revision 0	2. explicit description of the waste characterization DQOs and QAOs that will be satisfied with the data being qualified 3. description of the confirmatory testing proposed and the %age of waste containers that will be tested 4. description of how the tested subpopulation will be representative of the waste stream or waste stream lot 5. quantitative acceptance criteria for determining that the AK information in question can be qualified as characterization information		

Information Included in CCP-INL RH VE BDR

Required Testing Batch Content	Present Y or N	Required Testing Batch Content	Present Y or N	Required Testing Batch Content	Present Y or N
Table of Contents	Y	Date of measurement	Y	Testing batch number	Y
Test facility name	Y	SGC	Y	Batch report date	Y
Container or sample numbers in batch	Y	Prohibited items	Y	QC documentation	NA
Procedure used	Y	Testing report sheet for each container	Y	Copies or reference to NCRs	Y
Operator signature and date	Y	Data review checklists	Y	ITR signature and date	Y
Signature release by SPM or designee					

Attachments B.1 through B.8

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH 06.06-8	**Issue Number:** INL-CCP-RH-VE-06-001CR, Rev 2 **Date:** 6-13-06
Inspector: Dorothy E. Gill **Attachments?** ☐ YES ☒ NO	**Sample Size:** AK NDA Memos **Population size (if known):** three (3)

A. Description of Issue: The three VE operators (Swami Raman, William Boyd and John Hegsted) completed their OJT training requirements on 2/22/06 but did not take the required written test until 4/10/06. These operators were not qualified to perform VE between these two dates but they performed VE on containers in BDR RHINLVE060001 during this time period. CCP initiated CAR-RHINL-0001-06 in response to this occurrence. However, the corrective action implemented did not include review of the subject VE data to ensure that data quality had not been negatively affected. BDR RHINLVE060001 is the only completed BDR that CCP can use to demonstrate the RH VE process.

B. Regulatory Reference: 40 CFR 194.24 (c),

C. Site requirement(s): CCP-QP-002, Revision 20

D. Discussed with:

Site Personnel: Larry Porter, Rebecca Walker, Cindi Becker
DOE/CTAC Personnel: Wayne Ledford, Porf Martinez
Other Personnel: NA

E. Additional Comments: Before implementing this procedure at other CCP sites the impact of this concern should be evaluated for inadequacies.

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: 07/05/06

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH 06.06-8	**Issue Number:** INL-CCP-RH-VE-06-002CR **Date:** 06-13-06
Inspector: Dorothy E. Gill **Attachments?** ☐ YES ☒ NO	**Sample Size:** 1 procedure **Population size (if known):** 1 procedure

A. Description of Issue: Procedure CCP-TP-500, Remote-Handled Waste Visual Examination, Revision 1 contains instructions for performing and documenting a visual examination (VE) event. However, the VE performed in support of the RH program does not involve actual VE but consists of operators viewing previously generated VE audio/visual recordings. The operators complete a data form documenting the items and WMPs seen in the audio/visual recording. CCP has not generated a standard operating procedure for this process.

B. Regulatory Reference: 40 CFR 194.24 (c)

C. Site requirement(s): CCP-TP-500, Revision 1

D. Discussed with:

Site Personnel: Larry Porter, Tommy Mojica
DOE/CTAC Personnel: Wayne Ledford, Porf Martinez
Other Personnel: NA

E. Additional Comments: Before implementing this procedure at other CCP sites the impact of this concern should be evaluated for inadequacies.

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: 07/05/06

*****DRAFT*****

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH 06.06-8	**Issue Number:** INL-CCP-RH-VE-06-003F, Rev.2 **Date:** 6-13-06
Inspector: Dorothy E. Gill **Attachments?** ☐ YES ☒ NO	**Sample Size:** 4 **Population size (if known):** <70

A. Description of Issue: There does not appear to be a consistent protocol for entering items on the VE data forms, Attachment 1 of CCP-TP-500. For example, waste can 161 in container No. 00761 contained both Kleenex and cardboard that were not entered in the item description section of Attachment 1. For waste can # 149 in container No. 00748 cardboard and Kleenex were clearly called out over 5 times each but were not entered in the item description of Attachment 1. However, for this same waste can a single piece of wood was called out and entered into Attachment 1 as was a single marking pen. The operators interviewed were unable to provide the rationale for the discussions regarding what items were/were not recorded on the VE data form. The reported inventory for waste cans is therefore incomplete

B. Regulatory Reference: 40 CFR 194.24 (c)

C. Site requirement(s): CCP-TP-500, Revision 1

D. Discussed with:

Site Personnel: Larry Porter, Tommy Mojica
DOE/CTAC Personnel: Wayne Ledford, Porf Martinez
Other Personnel: NA

E. Additional Comments: Before implementing this procedure at other CCP sites the impact should be evaluated for inadequacies.

F. Site Response Information:

Site Response Required? ☒YES ☐ NO
Site Response Due Date: 07/05/06

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH 06.06-8	**Issue Number:** INL-CCP-RH-VE-06-003F, Rev.2 **Date:** 6-13-06
Inspection No. EPA-INL-CCP-RH-06.06-8	**Issue Number:** INL-CCP-RH-AK-06-005CR, Rev. 1 **Date:** 06-15-06
Inspector: Connie Walker **Attachments?** ☐ YES ☒ NO	**Sample Size:** Waste Stream ID-ANLE-S5000 and all other INL RH streams **Population size (if known):** above waste streams

Description of Issue: CCP has indicated that AK will be used to determine all DQOs that must be assessed as specified in the WCPIP (e.g., Sections 2.2 and 4.2). The WCPIP, Attachment A, requires that for each DQO related to AK, AK personnel must identify the DQO and supporting AK information, justify the assignments/conclusions, reference the AK Source Documents and applicable pages supporting the assessment, and identify the qualification method in 40 CFR 194.22(b) that will be used to qualify the AK. This requirement is not adequately reflected in CCP-INL-AK-500. Revise the AK Summary CCP-INL-AK-500 to address the above requirement, including revision of Chapter 6, entitled "Qualification of AK Information". Note that based on the EPA requirements, the DQOs will require revision to include identification and quantification of the 10 EPA WIPP tracked radionuclides in CCP-INL-CCP-AK-500. This AK Summary must be revised to address the following:

- The AK Summary implies that some of the containers in the population may have been submerged in a few of the vaults. The AK Summary states that none of the population of approximately 70 containers that have videotapes being reviewed as a VE exercise were inundated, while others may have been. The discussion should be modified to clearly indicate the total number of drums in the stream, number of drums suspected of having been inundated, and how the inundated drums will be handled or otherwise managed.
- Documentation for the waste's defense determination should be included.
- The definition of waste stream should be clearly supported. Specifically, the document needs to make a better argument that the wastes generated in the cells were never segregated by pin or generator, so there is no way a specific pin/radionuclide content can be assigned to waste containers. Therefore, the radiological characteristics of the pins must be assigned as a whole to the entire population. This assumption must be supported and justified.
- The radiological data presented in the AK Summary does not provide a good understanding of the overall isotopic distributions being applied to the waste stream based on AK. While CCP-AK-INL-501 presents how each container is assessed, the AK Summary CCP-AK-INL-500 should still include a general discussion of the overall anticipated distribution on a waste stream basis, particularly since AK is being used to address all DQOs. Page 40 presents information for drums from 1990-1995, but more information should be included for the entire waste stream.

B. Regulatory Reference: WCPIP, Attachment A; 40 CFR 194.24(c)(3), 40 CFR 194.22

C. Site requirement(s): WCPIP, Attachment A (no site-specific AK procedure prepared).

D. Discussed with:
Site Personnel: Steve Schafer, Kevin Peters, Mark Doherty, Eric D'Amico, Lisa Price
DOE/CTAC Personnel: Dick Blauvelt
Other Personnel:

E. Additional Comments:

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: prior to the next CCP RH inspection

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH-06.06-8	**Issue Number:** INL-CCP-RH-AK-06-006CR, Rev. 1 **Date:** 06-15-06
Inspector: Connie Walker **Attachments?** ☐ YES ☒ NO	**Sample Size:** Waste Stream ID-ANLE-S5000 and all other INL RH streams **Population size (if known):** see above waste streams

A. Description of Issue: CCP representatives stated that AK Qualification will always be the approach used to meet DQOs. As such, CCP will always prepare an AK Confirmatory Test Plan (CTP) for each waste stream that presents a description of the proposed characterization plan for the waste stream and which will include how characterization will be accomplished for each DQO. The CTP CCP-AK-INL-502 must be revised to indicate, for each DQO, that AK qualification is the selected DQO determination methodology, and to specify the qualification pathway selected included detailed discussion of confirmatory methods used. Also, note that based on EPA requirements, the DQOs will require revision to include identification and quantification of the EPA 10 radionuclides. Also, the CTP includes the proposed approach for assessing AK Accuracy, which is only the verification that waste is RH as identified by AK. The CTP also assumes that the 501 has established "no significant discrepancies" between AK information and confirmation of modeling/sampling. However, this assumes that the LANL Mass spec data are demonstrated applicable, and EPA has not fully assessed CCP-AK-INL-501 which presumably includes this information. Further, since AK Qualification and confirmatory testing is used for all radiological parameters, it would appear that each radiological DQO should be evaluated with respect to how the confirmatory data collected will be assessed as part of AK Accuracy (if this is not possible for some reason, a detailed argument should be included). The EPA Accuracy report should be revised accordingly.

B. Regulatory Reference: 40 CFR 194.24(c)(3), 40 CFR 194.22, WCPIP

C. Site requirement(s): CCP-TP-002, Rev. 16

D. Discussed with:

Site Personnel: Steve Schafer, Kevin Peters, Lisa Price, Mark Doherty, Eric d'Amico

DOE/CTAC Personnel: Dick Blauvelt

Other Personnel:

E. Additional Comments: None

F. Site Response Information:

Site Response Required? ☒ YES ☐NO

Site Response Due Date: prior to the next CCP RH inspection

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH-06.06-8	**Issue Number:** INL-CCP-RH-AK-06-007CR, Rev. 1 **Date:** 06-15-06
Inspector: Connie Walker **Attachments?** ☐ YES ☒ NO	**Sample Size:** Waste Stream ID-ANLE-S5000 and all other INL RH streams **Population size (if known):** see above waste streams

A. Description of Issue: CCP representatives have indicated that AK Qualification will be the method by which DQOs will always be addressed. Based on this, CCP must examine site documents that discuss the characterization methodologies to ensure that each reflect the requirements presented in the WCPIP when AK Qualification is used. For example, the WCPIP requires that Certification Plan include how the DQOs will be addressed, and EPA indicated that this should include stream information. CCP representatives have indicated that the Confirmatory Test Plan will be prepared for each stream and will include this information. Therefore, CCP should revisit documentation to ensure that this commitment is clearly cited in related documents to ensure that the CTP always fulfills this requirement. Note that based on EPA requirements, the DQOs will require revision to include identification and quantification of the EPA 10 radionuclides.

B. Regulatory Reference: 40 CFR 194.24(c)(3), 40 CFR 194.22, WCPIP

C. Site requirement(s): CCP-TP-002, Rev. 16; CCP-AK-INL-500; CCP-AK-INL-502; & CCP-TP-506

D. Discussed with:

Site Personnel: Steve Schafer, Kevin Peters, Lisa Price, Mark Doherty, Eric d'Amico
DOE/CTAC Personnel: Dick Blauvelt
Other Personnel:

E. Additional Comments: None

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: prior to the next CCP RH inspection

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH-06.06-8	**Issue Number:** INL-CCP-RH-AK-06-008CR, Rev. 1 **Date:** 06-15-06
Inspector: Connie Walker **Attachments?** ☐ YES ☒ NO	**Sample Size:** Waste Stream ID-ANLE-S5000 and all other INL RH streams **Population size (if known):** see above waste streams

A. Description of Issue: CCP-AK-INL-501 includes several statements, assumptions, and arguments without references to calculations or other information to support the arguments. Without references, it is not possible to verify conclusionary statements in the document. In particular, several other documents (CCP-AK-INL-500, CCP-AK-INL-502, etc) state that CCP-AK-INL-501 show that LANL and INL fuel pins had many common elements. The brief discussion on page 33 states that: "On the basis of the similarities between the two fuel pin examination programs, the fuel types, the sources of the pre-irradiation fuel composition and burnup information, and the identical reactors for a majority of the fuel pins, the LANL confirmatory sampling is sufficient to satisfy the qualification required for the INL AK information." However, the document does not cite references or other detailed information to support this assertion. The document provides charts and other comparisons between Pins and INL pins, but the specific INL pin numbers and related data and calculations are not referenced. Table 5-1 presents a summary of sponsors associated with ANL-E and LANL pins, but of the top three sponsors for LANL and ANL-E, only one was common to both. Additional information that better supports the commonalities between the two sites in the text of CCP-AK-INL-501 is necessary. The 28 calculational packages that support ORIGEN2.2 should be included and/or referenced. The link between the INL and LANL fuel pins should be better documented and/or supported. Note that EPA has not concluded their review of input parameters to the ORIGEN2.2 code, so no issues associated with input data are provided.

B. Regulatory Reference: 40 CFR 194.24(c)(3), 40 CFR 194.22, WCPIP

C. Site requirement(s): WCPIP

D. Discussed with:

Site Personnel: Steve Schafer, Kevin Peters, Lisa Price, Mark Doherty, Eric d'Amico
DOE/CTAC Personnel: Dick Blauvelt
Other Personnel:

E. Additional Comments: None

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: prior to the next CCP RH inspection

DRAFT

Upon further analysis, the EPA issue presented here may be included in the EPA Inspection Report as an EPA Finding or Concern and can be the basis for EPA approval/disapproval

Inspection No. EPA-INL-CCP-RH-06.06-8	**Issue Number:** EPA-INL-CCP-RH-06-009C **Date: 8/29/06**
Inspector: Dorothy E. Gill **Attachments?** ☐ YES ☒ NO	**Sample Size: 1 BDR** **Population size (if known):** 3

Description of Issue: CCP responded to EPA's Concern Number INL-CCP-RH-VE-06-003CR, Revision 1 by providing additional training for VE operators and VEE/SME on 6/15/06, Visual Examination Briefing to Clarify the Recording of Description of Container Contents on VE Data Forms. During this inspection, EPA evaluated the implementation of this response. Upon review, EPA verified that CCP had provided additional training regarding how to inventory drum contents such that the DQOs for completeness and representativeness are met. Since generating the original data package (RHINLVE060001), INL CCP has: tested and qualified VE operators and completed two more data packages (RHINLVE060002 and RHINLVE060003). However, EPA review of data package RHINLVE060003 indicates that further improvements are necessary. Based on the CCP SPM's (Larry Porter) review of this BDR, he determined that operators were not generating container inventories as required by training provided on 6/15/06. When the ITR reviewed and approved this BDR to verify that all QAOs had been met, the ITR did not identify that the QAO for representativeness for all three of the containers in the BDR was not met.

B. Regulatory Reference: 40 CFR, Part 194.22, b, (3)

C. Site requirement(s): WCPIP, Revision 1, Section 4.2.3

D. Discussed with: Larry Porter, Irene Quintana

E. Does this concern adversely affect the isolation of TRU waste? ☐ YES ☒ NO
Does this concern affect TRU waste that the site is approved to characterize? ☐ YES ☒ NO

F. Additional Comments: EPA may examine additional VE BDRs at a later date.

G. Site Response Required? ☐ YES ☒ NO
Site Response Due Date: NA