

**Office of Enterprise Assessments
Assessment of Low-Level Radioactive Waste
Management and Disposal at the
Idaho Site**



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Acronyms

ALLWDF	Active Low-Level Waste Disposal Facility
ATR	Advanced Test Reactor
BEA	Battelle Energy Alliance, LLC
CA	Composite Analysis
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CH	Contact Handled
CRAD	Criteria and Review Approach Document
DAS	Disposal Authorization Statement
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EM	Office of Environmental Management
FR	Facility Representative
FY	Fiscal Year
ICDF	Idaho CERCLA Disposal Facility
ICP	Idaho Cleanup Project
ID	Idaho Operations Office
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTS	Integrated Waste Tracking System
JSA	Job Safety Analysis
LFRG	Low-Level Waste Disposal Facility Federal Review Group
LLW	Low-Level Waste
MCP	Management Control Procedure
NE	Office of Nuclear Energy
NRF	Naval Reactors Facility
OFI	Opportunity for Improvement
P&T	Packaging and Transportation
PA	Performance Assessment
RBA	Radiological Buffer Area
RCRA	Resource Conservation and Recovery Act
RCT	Radiation Control Technician
RH	Remote Handled
RH LLWDF	Remote Handled Low-Level Waste Disposal Facility
ROD	Record of Decision
RTR	Radiographic Transmission Review
RWMB	Radioactive Waste Management Basis
RWMC	Radioactive Waste Management Complex
RWP	Radiological Work Permit
SDA	Subsurface Disposal Area
SME	Subject Matter Expert
TSCA	Toxic Substance Control Act
WAC	Waste Acceptance Criteria
WDDF	Waste Determination and Disposition Form
WGS	Waste Generator Services

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a targeted assessment of low-level radioactive waste management and disposal facilities operations at the Idaho Site. This assessment was part of a DOE-wide set of targeted assessments of radioactive waste management practices, including disposal operations and waste generator and processor operations.

DOE Order 435.1, *Radioactive Waste Management*, and DOE Manual 435.1-1, *Radioactive Waste Management Manual*, establish requirements for waste disposal practices intended to ensure the protection of the environment and the safety and health of workers and the public during current operations and throughout future performance periods. This assessment focused on ongoing disposal operations at the Active Low-Level Waste Disposal Facility and the Idaho Comprehensive Environmental Response, Compensation and Liability Act Disposal Facility, as well as the ongoing activity to complete construction of the Remote Handled Low-Level Waste Disposal Facility.

Battelle Energy Alliance, LLC and Fluor Idaho, LLC, the primary contractors responsible for management and operation of INL and ICP Core respectively, have effectively developed the appropriate waste acceptance criteria, implemented waste certification processes to verify WAC compliance, maintained accurate inventory management and tracking, and performed compliant receipt acceptance processes at their respective sites. Additionally, they are performing the environmental testing, monitoring, and modeling necessary to ensure that dose performance objectives identified in DOE Order 435.1 and Manual 435.1-1 are satisfied. EA observed a few discrepancies in the specificity of a waste tracking procedure and noted that the significance of identified trends in a few environmental samples had not been fully evaluated; however Fluor Idaho, LLC promptly initiated action to address these discrepancies.

The Idaho Operations Office is adequately staffed with properly trained and qualified professionals and is performing the oversight necessary to assess compliance with DOE Order 435.1 and Manual 435.1-1. Although EA noted some confusion in the roles and responsibilities specific to the federal staff responsible for evaluating disposal facility design and operation, the Idaho Operations Office has established and implemented effective oversight processes that evaluate the adequacy and effectiveness of the contractor's radioactive waste management program.

Overall, there is reasonable assurance that radiation doses from facility operations to the workers, current and future members of the public, and the environment are within appropriate limits and that the performance objectives in DOE Order 435.1 and its manual will continue to be satisfied.

No deficiencies or findings were identified.

Office of Enterprise Assessments
Assessment of Low-Level Radioactive Waste Management and Disposal
at the Idaho Site

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a targeted assessment of low-level radioactive waste management and disposal facilities operations at the Idaho Site. This assessment was part of a DOE-wide set of targeted assessments of radioactive waste management practices, including disposal operations and waste generator and processor operations. These targeted assessments evaluate performance at individual facilities, including assessing how these facilities are implementing DOE Order 435.1, *Radioactive Waste Management*, and DOE Manual 435.1-1, *Radioactive Waste Management Manual*.

EA conducted offsite planning in August 2016 and performed onsite data collection during two visits to the site, September 26–30 and October 31 – November 4, 2016.

2.0 SCOPE

This assessment primarily evaluated ongoing disposal operations at the Active Low-Level Waste Disposal Facility (ALLWDF) and disposal operations at the Idaho Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Disposal Facility (ICDF). EA focused on the implementation of, and conformance to, the waste acceptance criteria (WAC), waste certification to verify WAC compliance, inventory management and tracking, and receipt acceptance processes. Additionally, EA assessed the environmental testing, monitoring, and modeling that supports the performance assessment (PA) and the composite analysis (CA) to ensure that dose performance objectives identified in DOE Manual 435.1-1 are satisfied. EA also reviewed preliminary analyses and observed ongoing construction activities for the Remote Handled Low-Level Waste Disposal Facility (RH LLWDF).

3.0 BACKGROUND

The EA independent assessment program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements. EA's assessments specifically evaluate the effectiveness of the performance by DOE and contractor line management in safety, security, and other critical functions, as directed by the Secretary of Energy. The EA independent assessment program is described in, and governed by, DOE Order 227.1A, *Independent Oversight Program*, and EA implements its assessment program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides.

The Idaho Site includes the Idaho National Laboratory (INL) and Idaho Cleanup Project (ICP) Core. The Idaho Operations Office (ID) provides direction and oversight for the design and operation of the Idaho Site nuclear facilities and other site operations for the DOE Office of Nuclear Energy (NE) and Office of Environmental Management (EM). NE is responsible for line management of INL facilities and for general site operations, and EM is responsible for line management of ICP Core facilities. The primary contractors responsible for management and operation of INL and ICP Core are Battelle Energy Alliance, LLC (BEA), and Fluor Idaho, LLC (Fluor Idaho), respectively.

This assessment focused on low-level radioactive waste disposal at the Idaho Site, and evaluated the practices and processes for implementation of DOE Order 435.1 and its associated manual, DOE Manual 435.1-1, by NE and EM at their respective disposal facilities. The two active disposal facilities are ICDF and ALLWDF, which are managed by Fluor Idaho under the EM ICP Core contract. The RH LLWDF disposal facility, managed by BEA under the NE INL contract, is under construction and is scheduled to be completed by fiscal year (FY) 2018. ICDF is located southwest of the Idaho Nuclear Technology and Engineering Center (INTEC); ALLWDF is within the Radioactive Waste Management Complex (RWMC); and RH LLWDF is located southwest of the Advanced Test Reactor (ATR) Complex.

DOE Order 435.1 provides the high-level regulatory requirements and responsibilities for radioactive waste management throughout DOE. DOE Manual 435.1-1 provides specific requirements intended to protect against exposures to radioactive and hazardous wastes, including the short-term hazards to current workers, members of the public, and the environment, and long-term hazards to future potential receptors. EM is evaluating the current order and manual, which were issued in 1999, with minor changes since, and revisions are planned for early 2017. The overall series of EA assessments on this topic are intended to help evaluate the practical implementation of the current DOE Order 435.1 and DOE Manual 435.1-1 and provide information for consideration during the revision process. In addition, notable events, such as the 2014 Waste Isolation Pilot Plant events, have highlighted the need to evaluate the implementation of WAC requirements and impacts on short- and long-term performance of waste disposal facilities across DOE.

4.0 METHODOLOGY

Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms “deficiencies,” “findings,” and “opportunities for improvement” (OFIs) as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for any deficiencies identified as findings.

The evaluation criteria for this targeted assessment were based on selected and applicable sections of DOE Manual 435.1-1. The objectives, criteria, and lines of inquiry for this assessment were drawn from the following sections of EA Criteria and Review Approach Document (CRAD) 31-11, *Low-Level Radioactive Waste Management*:

- 4.1 Radioactive Waste Management Planning and Generic Safety Requirements
- 4.2 Radioactive Waste Identification, Characterization, and Monitoring
- 4.7 Waste Disposal
 - 4.7.1 Disposal Facility Siting and Approval
 - 4.7.2 Disposal Facility Design and Operations
 - 4.7.3 Facility Closure and Post-Closure Surveillance and Maintenance
- 4.8 DOE Oversight

As identified in Section 2.0, Scope, of this report and the EA Assessment Plan for this assessment, *Plan for the Office of Enterprise Assessments Targeted Assessment of Radioactive Waste Disposal Processes at the Idaho Site*, signed September 21, 2016, requirements described in DOE Manual 435.1-1 were considered for this assessment. The Assessment Plan outlined the activities performed for this assessment, including document reviews; onsite observations of operations, maintenance, and monitoring activities; onsite demonstrations of sampling and analysis processes; and personnel interviews. EA reviewed foundational documents, including the radioactive waste management basis (RWMB)

documents; WAC, CA, and PA maintenance plans; closure plans; monitoring plans; and special analysis addendums to the PA. Additional documents reviewed included implementing procedures, monitoring and sample analysis results, waste package characterizations documents, work planning and control documentation, inventory programs, self-assessment reports, and annual updates. EA observed plan-of-the-day and pre-job brief meetings and walked down environmental monitoring locations. EA also observed ongoing work such as grouting preparation and container grouting at ICDF. However, no waste shipments were received or placed into disposal units at ICDF or ALLWDF during the time of the assessment; therefore, EA evaluated shipping and receipt records for the most recent shipments to both ALLWDF and ICDF. EA also interviewed waste generator services (WGS) waste specialists, inventory data system managers, waste disposition and placement staff, environmental monitoring subject matter experts (SMEs), environmental modeling personnel, and facility managers.

The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A listing of key documents reviewed, personnel interviewed, and field observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

5.0 RESULTS

5.1 Radioactive Waste Management Planning

Criteria:

Radioactive Waste Management Basis: Facilities, operations, and activities that generate, handle, process, store, package, transport or dispose of low-level waste (LLW) shall have an RWMB consisting of physical and administrative controls to ensure the protection of workers, the public, and the environment. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.1, Criteria 1)

Training and Qualification of Personnel: Training is provided to all personnel associated with the management of radioactive wastes, including planning, identification, characterization, monitoring, generation, storage, staging, processing, treating, packaging, transportation, and disposal, to ensure they are competent commensurate with their responsibilities for compliance with the requirements of applicable regulations and DOE programs. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.1, Criteria 5)

Quality Assurance Program: All radioactive waste facilities, operations, and activities have a quality assurance program in accordance with applicable regulations and DOE programs. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.1, Criteria 6)

Integrated Safety Management: Appropriate safety management programs and practices, including Radiation Control, Industrial Hygiene, Fire Protection and Emergency Management, Criticality Safety (as applicable), Maintenance, Industrial Safety, Training, and Qualifications, are established and implemented in effective procedures for the assessed radioactive waste management facilities. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.1, Criteria 8)

Records Management: A program is in place to ensure that appropriate records are maintained to demonstrate that radioactive wastes are managed in an environmentally sound manner, and that recordkeeping-related activities are performed in accordance with all applicable DOE, Federal, state, and local requirements. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.1, Criteria 11)

In accordance with DOE Manual 435.1-1, both the RWMC, which includes ALLWDF, and the ICDF have RWMB documents that govern waste management operations at each facility. The RWMB documents appropriately provide reference to and invoke the plans, procedures, and requirements under which the LLW facilities must operate.

Prior to this EA assessment, an internal ID concern was raised regarding the DOE Manual 435.1-1, Chapter I.2.E.1.b, requirement for the RWMB of each radioactive waste facility to be approved. Some DOE facilities have interpreted this requirement to mean that the Field Element Manager must approve each RWMB; however, ID does not explicitly approve an RWMB for ICDF at the Field Element Manager level. The ID interpretation is allowed because the requirement has been determined to not be a substantive requirement, and in accordance with DOE Guide 435.1-1 and other longstanding DOE policy, LLW disposal facilities managed under CERCLA must only demonstrate compliance with the substantive requirements of DOE Manual 435.1-1. The requirement for Field Element Manager approval of the RWMB is considered an administrative requirement, as described in DOE/ID-10956, *Idaho CERCLA Disposal Facility Complex Compliance Demonstration for DOE Order 435.1*, Rev. 2, November 2007, the approved “crosswalk” between CERCLA and DOE Order 435.1 requirements for ICDF. According to the Environmental Protection Agency, administrative requirements are those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation. Substantive requirements are those that pertain directly to actions or conditions in the environment.

EA observed that ICDF RWMB documents receive an ID review and approval, and therefore, the expectation of the DOE Order 435.1 administrative requirement in question is generally satisfied. However, it was not clear during this assessment that all knowledgeable ID staff members were fully aware of who is responsible for reviewing RWMB documents, or aligned with how the process is coordinated. See Section 5.4 for further discussion.

Fluor Idaho has established and implemented programs for training and qualification of personnel in quality assurance, integrated safety management, and records management for the assessed waste management activities through site-wide institutional programs governing these areas. Fluor Idaho implements the programs using high-level program manuals and documents, including: Manual 12, *Training and Qualification*; Manual 13, *Quality Assurance Program*; PDD-1004, *Integrated Safety Management Program*; PRD-111, *Records Management*; and Manual 16A, *Emergency Management*. EA confirmed that each of these training and qualification programs are in place and supported with an appropriate document hierarchy sufficient to meet DOE Manual 435.1-1 requirements. However, the scope of this assessment did not include a comprehensive programmatic review of the site-wide adequacy of these broad programs. EA’s observations related to the implementation of these programs at the radioactive waste management facilities are presented in the remaining sections of this report.

Within the scope of this assessment, the fundamental programmatic and procedural structures for radioactive waste management and planning are in place and properly implemented at the Idaho Site.

5.2 Radioactive Waste Identification, Characterization, and Monitoring

Criteria:

Waste Stream Identification and Characterization: The facility has established processes that ensure hazardous and radioactive waste streams are properly identified and characterized. Waste stream characterization and analysis processes and capabilities are designed and implemented to verify conformance with the WAC. Processes incorporate appropriate levels of documentation and clearly defined data quality objectives and limiting conditions. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.2, Criteria 1)

Waste Acceptance Criteria: Each facility receiving waste for accumulation, storage, or staging; processing, treatment, or repackaging; shipping; or final disposal shall have a defined WAC. (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.2, Criteria 2)

Monitoring to Certify Waste Acceptance Criteria Conformance: Each facility that receives and handles LLW shall have effective analysis, monitoring, and/or inventory records processes to certify that the wastes conform to the WAC, the facility safety basis, and the inventory limits. Measurement, analysis, and process records techniques shall be sufficient to verify all aspects of WAC compliance (radiological, chemical, and physical attributes). (DOE Order 435.1; DOE Manual 435.1-1, Chapters I and IV; CRAD 31-11, Section 4.2, Criteria 3)

DOE/ID-11409, Rev. 1, *Radioactive Waste Management Complex Active Low-Level Waste Disposal Facility Waste Acceptance Criteria*, provides ID acceptance criteria for waste to be received at ALLWDF. The RWMC Subsurface Disposal Area (SDA) accepted mixed (hazardous and radioactive) waste materials from 1952 until late 1983, at which point receipt of Resource Conservation and Recovery Act (RCRA)-regulated mixed waste ceased at the SDA. Contact Handled (CH) LLW (surface dose rate < 200 mR/hour) and Remote Handled (RH) LLW (surface dose rate > 200 mR/hour) receipt continued in the ALLWDF, which is located within the RWMC. At the time of this assessment, ALLWDF no longer receives CH LLW, and RH LLW is received only from a single generator, the Naval Reactors Facility (NRF) at the Idaho Site, which is disposed of in the concrete vaults disposal unit of ALLWDF. The ALLWDF WAC specifically addresses the acceptance of RH LLW in the concrete vaults. No other waste types are addressed or accepted.

DOE/ID-10881 Revision 12, *ICDF Complex Waste Acceptance Criteria*, specifies the chemical and radiological constituent acceptance criteria for waste that will be disposed at ICDF. ICDF was designed to accept CERCLA waste generated at the Idaho Site. Hazardous, mixed, low-level, and Toxic Substance Control Act (TSCA) wastes (i.e., waste containing TSCA-regulated materials such as polychlorinated biphenyls (PCBs), asbestos, and lead-based paint) are also accepted for disposal at ICDF. The ICDF WAC provides acceptance criteria, including quantities of radioactive and/or hazardous constituents allowable in waste streams designated for disposal at ICDF. EA's review of WAC documents for both ALLWDF and ICDF indicates conformance to the requirements of DOE Manual 435.1-1.

The ICP Core WGS program is defined in PDD-1003, *Waste Generator Services Program*. This program was established to provide both ICP Core and non-ICP Core waste generators at the Idaho Site with waste management services, including a streamlined process for the characterization, storage, treatment, and disposal of both newly-generated and legacy wastes. While individual waste generators have a primary responsibility for identifying and characterizing their waste streams, the WGS program interfaces with waste generators to ensure proper waste characterization and certification, and compliance with the applicable disposal facility WAC. PDD-1003 clearly defines both waste generator and WGS personnel roles and responsibilities associated with waste characterization and certification. Fluor Idaho procedures, Management Control Procedure (MCP)-1390, *Waste Generator Services Waste Management*, and MCP-1396, *Waste Generator Services Management of CERCLA Waste for Disposal at ICDF*, further implement the WGS programs for waste characterization and certification, and provide additional specific instructions for waste destined for disposal at ICDF.

A software package called the Integrated Waste Tracking System (IWTS) is integral to waste characterization and disposal at the Idaho Site. IWTS was deployed in 1996 and is currently operated under the ICP Core contract. Idaho Site contractors and subcontractors utilize IWTS to track waste and material through characterization, storage, processing, treatment, shipment, and disposal processes. EA reviewed the use and data outputs from the IWTS system in relation to several shipments of waste disposed at ALLWDF and ICDF. EA found that the IWTS system was effective in managing information

associated with the approved generator waste stream material profiles and container profiles, as well as performance of automated WAC limit checks for individual waste containers and shipments being disposed at ALLWDF and ICDF.

EA reviewed waste characterization and certification efforts undertaken for the most recent shipments to both ICDF and ALLWDF, which included a shipment of contaminated empty cargo containers from the Advanced Mixed Waste Treatment Project to ICDF, and two NRF 55-ton cask shipments to ALLWDF. Consistent with the requirements of MCP-1390, the empty cargo container waste stream was defined by, and characterized under, a specific IWTS material profile, i.e., Waste Profile 7299.R3. This material profile was developed using the structured waste characterization process defined in MCP-1390, including completion of a Waste Determination and Disposition Form (WDDF). EA reviewed the WDDF and found that it included a thorough process knowledge evaluation associated with the generation of the waste, including physical, chemical, and radiological characteristics, as well as a conservative assessment of the possible residual radiological source term inside each container. The WDDF information was appropriately used as a basis for creation and WGS acceptance of the IWTS Material Profile 7299.R3, including the physical, chemical, and radiological parameters and bounding conditions for the waste containers that will ensure WAC compliance. EA determined that the characterization of this waste stream was acceptable and sufficient to meet the requirements of DOE Manual 435.1-1.

Similarly, the NRF 55-ton cask scrap insert waste stream is defined by and characterized under IWTS Material Profile 2534.R1. However, NRF is a special generator that is exempt from DOE Order 435.1 and the ALLWDF WAC requirement to use the ICP Core WGS process for waste characterization. This exemption is because NRF activities are conducted under the authority of the Director, Naval Nuclear Propulsion Program, as described in the “National Security and Military Applications of Nuclear Energy Authorization Act of 1985” (Public Law 98-525). Consistent with MCP-1390, NRF-generated wastes are characterized using an NRF Hazardous Evaluation/Disposition Form, and NRF personnel self-perform the WGS functions of MCP-1390. EA’s review of the NRF waste stream material profile and container profile forms for the two most recent cask shipments disposed at ALLWDF indicated thorough and comprehensive waste characterization data consistent with WAC requirements. EA did not identify any concerns with the NRF waste characterization process.

Overall, EA determined that the WAC established for ALLWDF and ICDF are consistent with DOE Manual 435.1-1 requirements. Further, the Fluor Idaho WGS program provides for adequate waste characterization and certification consistent with WAC requirements, and the data management capabilities of IWTS provide effective records of approved generator waste stream material profiles, container waste profiles and WAC limits checks, facility inventory limits, and individual container disposal records including location tracking within each disposal unit.

5.3 Waste Disposal Operations

5.3.1 Disposal Authorization Statement

Criterion:

Disposal Authorization Statement: A DAS shall be obtained prior to construction of a new LLW disposal facility. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.1, Criteria 4)

In a memorandum dated July 1, 2003, the EM Deputy Assistant Secretary for Technical and Regulatory Support, citing the recommendation from the Low-Level Waste Disposal Facility Federal Review Group (LFRG) review of the ICDF PA and CA, approved a Disposal Authorization Statement (DAS) granting

formal authorization for disposal operations at ICDF. This authorization was granted prior to completing construction of ICDF, and is consistent with requirements and processes in DOE Order 435.1. A revised DAS granting formal authorization for continued disposal at the ICDF was documented in a memorandum dated April 7, 2011.

In a memorandum dated April 28, 2000, the EM Deputy Assistant Secretary for Project Completion, citing the recommendation from an LFRG review of the ALLWDF PA and CA, approved a DAS granting formal authorization for disposal operations at ALLWDF. This authorization is consistent with requirements and processes in DOE Order 435.1. A revised DAS granting formal authorization for continued disposal at the ALLWDF was documented in a memorandum dated January 30, 2008.

5.3.2 Performance Assessment

Criteria:

Performance Assessment: A site-specific radiological PA and CA shall be prepared and maintained. The performance assessment shall include calculations for a 1,000-year period after closure of potential doses to representative future members of the public and potential releases from the facility to provide a reasonable expectation that the performance objectives identified in Manual 435.1-1 IV P (1) are not exceeded as a result of operation and closure of the facility. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.1, Criteria 2)

Performance Assessment: The PA shall be maintained to evaluate changes that could affect the performance, design, and operating bases for the facility. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.2, Criteria 2)

Both the ALLWDF and ICDF are required to prepare Annual Summary Reports determining the continuing adequacy of the PAs and CAs for these facilities in accordance with DOE Manual 435.1-1. The annual summaries address LLW disposal operations and present environmental monitoring results at ALLWDF and ICDF for each FY. They also evaluate changes that could affect the performance, design, and operating bases for the facility. The summaries also include an overview of PA- and CA-related activities for the same period. Based on information presented, EA did not identify any concerns with the Annual Summary Reports for the ALLWDF and ICDF.

ALLWDF

CH LLW disposal operations ended in FY 2008 at the RWMC, but disposal of RH LLW continues in a limited capacity in the concrete vaults. Over the past decade, the volume of RH LLW disposed of was generally less than what was forecast. The RH LLW vault capacity, at present, appears to be sufficient to support projected RH LLW disposals through FY 2020.

No activities were identified in FY 2015 that changed the assumptions and conclusions of the PA and CA. However, previously identified issues could possibly affect the assumption and conclusions of the PA and CA, and the plan for resolving these previously identified issues is still being developed. Topics that remain to be addressed include the Idaho Site land-use plans, the WAC, future disposals, changes to the disposed waste inventory, interim and final closure plans, and special analysis.

At ALLWDF, the groundwater pathway modeling analysis is supported by validation from site-specific monitoring data. This approach is used to demonstrate one-for-one comparisons of an important set of model calculations with what is actually taking place within the groundwater flow system, and provides a defense for the model assumptions and conclusions.

ICDF

Waste receipts through FY 2015, plus the projected inventory through planned ICDF closure at the end of FY 2018, are less than the inventory assessed in the original PA, DOE/ID-10978. The projected total inventory for four radionuclides, i.e., Cm-243, Nb-93m, Np-237, and U-238, is much less than the limits established through the PA or the CERCLA analysis. Based on this information, ICDF is in compliance with DOE Order 435.1.

Water quality monitoring of the leachate and groundwater monitoring results indicate that ICDF is operating as designed. Operation of the original INTEC percolation ponds has been discontinued, resulting in reduced infiltration of pond water into the shallow vadose zone (i.e., region of soil unsaturated by groundwater) that previously created conditions that formed a zone of isolated groundwater (i.e., perched groundwater) below ICDF. In the vadose zone at ICDF, in areas and at certain depths where the perched groundwater zone is currently “drying up” by draining with a down-gradient, groundwater level monitoring and sampling has been discontinued in some of the wells. (See **OFI-Fluor-1**.)

The monitoring results are consistent with the conceptual model, and ICDF is functioning within the conclusions and expectations of the PA.

RH LLWDF

During the second onsite visit to the Idaho Site, EA assessed the PA, CA, and associated documents for the RH LLWDF. The RH LLWDF is an LLW disposal facility, located near the ATR Complex, currently under construction as part of the INL contract. The assessment included a construction site walkdown, an interview with the PA and CA modelers, presentations by onsite staff, and document reviews. The RH LLWDF is a state-of-the-art facility and will likely be a model for the DOE complex. PA and CA calculations are being incorporated into the facility design process throughout the construction phase.

Overall, for both ALLWDF and ICDF, the basic modeling assumptions and data for both ALLWDF and ICDF are reasonable and supported. Annual summaries include appropriate documentation of inventory and environmental monitoring results, and indicate the performance of the disposal facilities. The PA criteria for both ALLWDF and ICDF are satisfied. As observed, the PA, CA, and associated documentation either meet or are on track to meet the requirements of DOE Order 435.1.

5.3.3 Composite Analysis

Criterion:

[Composite] Assessment: A site-specific radiological [CA] shall be prepared and maintained. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.1, Criteria 2)

Ongoing construction and development for the new RH LLWDF are important to the CAs for both ALLWDF and ICDF. A review of the potential impact of long-term future releases from the RH LLWDF at the ATR Complex was addressed in FY 2015.

A Special Analysis (McCarthy 2014) was completed in FY 2015 that analyzed the projected concentration and radiological dose results from the new RH LLWDF PA for the potential impacts on the ICDF and ALLWDF CAs. Based on the results of the RH LLWDF PA near the ATR Complex,

construction and operations of the new RH LLWDF will not significantly change the results of the ICDF and ALLWDF CAs, and therefore will not change the conclusions of the associated CAs of either facility.

In addition, based on the analysis of concentrations in the aquifer from past releases and simulation studies, future aquifer radionuclide plumes at the Idaho Site are expected to be localized in scale, and the radionuclide concentrations of any commingled plumes will be low enough to not challenge any dose limits. Potential concentrations or doses in the aquifer from the new RH LLWDF sources would have to be much larger than the regulatory limits to significantly contribute to aquifer concentrations or doses from the ICDF or ALLWDF CAs.

From the documentation that was reviewed, EA considers the CA criteria for both the ALLWDF and ICDF to be satisfied.

5.3.4 Hazards Analysis and Control

Criterion:

Hazards Analysis and Control: Hazards associated with the handling, sample, or assay analysis and disposal of waste have been identified, analyzed, and documented. An appropriate set of controls have been identified in the facility safety basis and implementing procedures. Hazard analysis and controls consider normal operations and potential off-normal conditions, such as a container breach, facility fire, or natural phenomenon events. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV)

To help assess hazard analysis and control, EA observed an ongoing waste disposal operation at ICDF, which included the grouting of a previously received waste container. ICDF has a design disposal capacity of 510,000 cubic yards (389,293 cubic meters) and is currently approximately 70% full. This facility was constructed to allow disposal of CERCLA (i.e., LLW and mixed LLW) wastes generated at the Idaho Site.

EA was unable to observe operations at ALLWDF, which was not receiving waste at the time of the assessment. ALLWDF is comprised of 200 concrete vaults, 37 of which are still available for disposal as of September 15, 2016. Each concrete vault is capable of holding two RH waste container cask inserts. The facility and disposal process supports NRF-related disposal shipments using a bottom-discharging shipping cask (e.g., 55-ton cask). EA conducted a walkdown and document review of the two most recent waste placement activities. EA determined that the technical procedures for waste disposal operations adequately govern associated disposal activities, including the scope of work and steps to be performed. These procedures include MCP-3007, *ICP Shipment and Receipt of Hazardous Materials*; TPR-7975, *ICP Waste Container Preparation and Grouting Evolutions*; and TPR-1757, *55-Ton Cask Discharge to RH LLW Concrete-Lined Vaults*. Pre-job briefings were effective in conveying the specific work scopes, associated hazards, and controls. The pre-job briefings for drilling and grouting operations at ICDF included a thorough discussion of responsibilities, precautions and limitations, prerequisites, work instructions, and health and safety requirements contained in the procedure. These briefings also demonstrated good use of reverse briefing techniques, a briefing technique used to enhance worker engagement, where supervisors ask workers to present portions of the briefing materials (e.g., tasks, hazards, or controls). The work supervisors also included elements from recent Human Performance Improvement efforts, such as discussion of error reduction tools, as well as verbally confirming workers' responsibilities and their specific assignments for scheduled activities.

Hazards associated with LLW operations include both non-radiological and radiological hazards. The most prevalent hazards associated with waste disposal activities are non-radiological hazards related to industrial safety, including use of heavy equipment, concrete pumper trucks, cement mixer trucks,

transport vehicular traffic, and rugged terrain. Many of the controls for these hazards are contained in ICDF job safety analyses (JSAs) and procedures (e.g., JSA-2325, *ICDF General Area Access*; JSA-2327, *ICDF Operations*; and TPR-7975). The work planning and control processes implemented at ICDF were consistent with PRD-1501, *Work Control*, and MCP-3003, *Performing Pre-job Briefings and Documenting Feedback*. EA observed appropriately controlled industrial safety hazards during operations, consistent with the institutional procedures. For example, all workers had appropriate personal protective equipment, such as hardhats, safety glasses, safety shoes, and reflective vests. Heavy equipment and grouting operators demonstrated good practices, including verification of support equipment status (e.g., heavy equipment, as well as high-efficiency particulate air (HEPA)-filtered air movers and associated trunk lines), establishment of boundaries to protect against potential noise hazards, radiation control technician (RCT) coverage to conduct requisite surveys, and radiological work permit (RWP) conformance. Conduct of operations and communication was effective. Application of controls included embedding warnings in operational procedures related to hazards identified in the procedure hazard analysis; however, EA noted one exception to this practice in that potential hazards associated with the use of cutting fluids (e.g., MSDS-401, *CIMTAP Paste Compound*) used during container drilling operations were not included in TPR-7975 nor the associated procedure hazard analysis.

The most prevalent radiological hazards associated with ICDF waste disposal operations are radiologically contaminated surfaces and the potential for operators to come into contact with them. For ALLWDF waste disposal operations, the most significant radiological hazards are the high radiation fields associated with some containers that are received and unloaded. EA observed that radiological controls specified in RWPs governing this work were appropriately designed to measure and address either radiological contamination or external dose rate hazards, respectively. At ICDF, EA observed good application of radiological postings, contamination control, ongoing survey performance, and good interaction with RCT coverage during cargo container drilling and grouting activities. The established RWPs to control radiological hazards for operations at ICDF (RWP CWM2016034, *Preparation and Grouting of ICDF Containers*) and ALLWDF (RWP CWM2016023, *55-TON Cask, Bearing Pad, and Vault Work*), in conjunction with procedural controls, provide information on expected radiological conditions for specific work and adequately specify requisite radiological controls.

The ICP Core emergency management program includes emergency response procedures within Manual 16A, *Emergency Management – ICP Emergency Plan/RCRA Contingency Plan*, to address off-normal events, such as fire, spills, releases, and natural phenomenon events, and describe the appropriate response actions to ensure personnel safety. Typical initial response is for the personnel to leave the area, assess conditions, and evaluate measurement, control, and recovery actions. In addition, the RWPs, for both the drilling and grouting observed at ICDF and the cask unloading at ALLWDF, required active air monitoring during waste handling operations (with ICDF required to use a graded approach based on level of contamination present or estimated), and real-time monitoring of direct radiation surveys by RCTs focused on external exposures.

Overall, site-level work planning and control processes for the activities assessed by EA appropriately identified hazards associated with the handling and disposal of radioactive waste at ICDF and ALLWDF.

5.3.5 Waste Acceptance Criteria, Inventory Control, and Receipt Acceptance

Criteria:

Waste Acceptance Criteria and Inventory Control: WAC for receipt of material to the facility are established based on the facility capabilities in conformance to the facility safety basis, hazards analysis, and limitations in the DAS. Processes are established and implemented to ensure inventory controls, WAC conformance, and documentation of wastes container constituents. Facility inventory records are

maintained to accurately reflect receipt, disposal, effluent (leachate or off-gassing) release, and decay transformation of wastes and hazardous materials. Audit and inventory reconciliation processes are implemented. Records archive processes are established to ensure retrievability and traceability to specific waste generators, shipments, and packages. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV)

Receipt Acceptance: A process is established to verify conformance to the WAC. The process may include a review of certification documentation, shipping manifests, periodic sampling, and/or monitoring of received packages or shipments. Transfer for receipt shall not be authorized unless the supplying facility can certify conformance to the WAC. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV)

As discussed in Section 5.2, the ALLWDF and ICDF WAC define the acceptable waste parameters for disposal. Each WAC document considers the relevant waste acceptance parameters including physical, chemical, and/or radiological characteristics; transportation and handling requirements; container packaging requirements; safety basis considerations; worker safety; and long-term waste stability and long-lived isotopic concentrations that impact future receptor doses as analyzed in the PA. The WAC documents also define prohibitions for reactive, energetic, or pyrophoric materials and toxic gases, as well as limitations on void space and free liquids as appropriate for shallow land burial sites.

As previously discussed, the IWTS provides for comprehensive management of all generator waste stream material profile characterization information and waste container profiles for shipments received and disposed. In addition, IWTS supports comprehensive records retrieval with numerous reports that provide for inventory tracking and control, documentation of waste container constituents, physical location tracking in the disposal units, etc. IWTS also provides for automated calculation of limit compliance checks for the ICDF less than hazard category 3 facility inventory limits. Fluor Idaho manages IWTS-related hardcopy and electronic records according to the requirements of MCP-557, *Records Management*, which defines the disposition authority and retention periods in the *INL Records Schedule Matrix*. EA reviewed the matrix and found that the IWTS records retention period is appropriately specified as permanent retention.

Operations procedures govern the process for receipt inspection of waste shipments to ALLWDF and ICDF. MCP-3007 is used by WGS Packaging and Transportation (P&T) personnel for incoming 55-ton cask shipment receipts from NRF. This generic site-wide procedure covers shipment or receipt of any Fluor Idaho managed hazardous waste at the Idaho Site. Incoming 55-ton cask shipments from NRF are received at the main entrance to the RWMC facility where P&T personnel perform U.S. Department of Transportation required visual inspection of the cask and review the shipping documentation. Also at this time, radiological controls personnel perform required radiological confirmatory surveys, including direct radiation measurements and contamination surveys on the exterior of the cask. EA noted that MCP-3007 lacked any specificity with regard to 55-ton cask shipments versus standard hazardous waste shipments. During the course of this EA assessment, Fluor Idaho issued a revision to MCP-3007 to clarify the receipt and inspection process for the 55-ton cask shipments.

Once processed according to MCP-3007, the transport vehicle proceeds to the ALLWDF staging area for further processing by waste operations personnel and placement of the RH waste container into an ALLWDF disposal vault, using TPR-1757. However, neither the receipt inspection process nor TPR-1757 required an independent visual confirmation that the RH waste container inside the shipping cask matched the shipping paperwork, as required by the ALLWDF WAC. The WAC requires that the RH waste container label and container identification number on the waste container top, which is directly traceable to the IWTS container profile, be visible and legible through remote visual verification equipment. Because the RH container is discharged directly from the bottom of the cask into the disposal

vault, visual confirmation of container numbers against shipping papers is not possible upon receipt of the transport vehicle, as is customary with most LLW container shipments. Fluor Idaho has never performed such visual verification to confirm that the actual RH waste container is the same as what is on the shipping paperwork, and Fluor Idaho staff indicated that the WAC requirement may be applicable only for the generator as they load the RH container into the cask. However, Fluor Idaho recognized that there is ambiguity as to whether the requirement is for the generator, or both the generator and the receiver. As a result, Fluor Idaho staff initiated an action to revise TPR-1757 to add a step in the cask discharge procedure to include remote visual verification of the RH container number against the shipping paperwork, prior to releasing the RH container from the cask rigging.

ICDF has a rigorous and well-defined receipt inspection process for ICDF-destined wastes, which is contained in PLN-914, *Waste Tracking Plan for the Idaho CERCLA Disposal Facility Complex*. This document requires that all paperwork is reviewed when a shipment arrives at ICDF. This paperwork includes the IWTS material and container profiles, shipment task, Waste Tracking Forms (WTFs), uniform hazardous waste manifest, Bill of Lading, etc. PLN-914 directs this review to be followed by receipt inspection of shipment contents through a combination of visual inspection and crosscheck against the IWTS shipment task, WTF, and material and container profiles. At a minimum, the waste shipment should be checked against accompanying documentation for the correct material profile number, correct container profile numbers, proper number of containers, correct container weights/volumes, adequacy of shipping documentation, and appropriate marking and labeling of containers. However, MCP-3382, *ICDF Waste Receipt and Tracking*, and the accompanying Form 435.95, *ICDF Waste Tracking Form*, do not provide specific steps to ensure verification of proper number of containers in the shipment, correct container weights/volumes, and appropriate marking and labeling of containers. (See **OFI-Fluor-2.**)

5.3.6 Support Facility and Disposal Cell Design and Operations

Criteria:

Support Facility and Disposal Cell Design and Operations: The following facility requirements and general design criteria, at a minimum, apply:

- *LLW systems and components shall be designed to maintain waste confinement.*
- *Ventilation: Staging, assay, and disposal facilities are designed and maintained with appropriate ventilation controls that consider normal conditions, such as off-gassing, and potentially off-normal situations, such as an energetic event or area fire. Ventilation controls shall prevent deflagration or detonation; protect health and safety of facility workers from acute and chronic exposures; and ensure that airborne effluents are maintained within applicable requirements and guidelines.*
- *Disposal facilities are designed and maintained with appropriate monitoring and controls for personnel exposures to direct radiation, contamination, chemical, and physical hazards, considering both normal and potential off-normal situations.*
- *Disposal facilities are designed and maintained to control contamination or prevent or minimize release of the material during normal operations and during off-normal conditions or emergency events.*
- *Facilities shall include sufficient capacity for controlling site runoff and dewatering of disposal cell operations (i.e., removal, containment, monitoring, and if necessary treatment, and/or effluent release of leachate and contact water).*

- *Disposal facilities and systems are designed, maintained, and managed to conform to applicable National Fire Protection Association code requirements. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.2, Criteria 4)*

The ALLWDF and ICDF disposal units are open and generally uninhabited areas designed to accept waste for permanent disposal and, while not equipped with active ventilation systems or installed real-time radiological monitoring systems, do have engineering features to ensure long-term stability.

ICDF is an engineered CERCLA landfill-type disposal facility located southwest of INTEC. Design features include a double composite liner system with leak detection, a leachate collection recovery system (primary and secondary leak detection and recovery systems), and a two-cell evaporation pond (~2 million gallons each). At ICDF, waste stabilization activities include containers that are required to be at least 95% full, the addition of grout to waste containers to avoid potential void spaces (this activity was observed by EA and sufficiently met procedural requirements), the integration of debris into compacted soil matrix, and the grouting of void spaces between placed waste containers. Furthermore, Fluor Idaho maintains ongoing operations to monitor and ensure that compaction of soils meets a minimum of 90% compaction. ALLWDF consists of 200 concrete vaults with shield plugs and permanent markings, as required by site procedures. Each concrete vault is designed to hold two cask liner inserts, i.e., two RH waste containers after having been removed from the shipping cask. As of September 15, 2016, there were 37 empty vaults remaining for disposals. As discussed in Section 5.3.7 of this report, Fluor Idaho conducts routine environmental monitoring and sampling to detect any potential migration of contamination from the disposal units.

Fluor Idaho posts active disposal areas as controlled areas and radiological buffer areas (RBAs). Depending on the waste handling operations, these areas may be temporarily up-posted to radiological areas (i.e., radiation areas, high radiation areas, and/or contamination areas). For example, radiation area and high radiation area postings are present during ALLWDF RH transuranic waste cask discharges to the disposal vaults. In addition, during some ICDF waste placement and treatment operations, contamination area postings are necessary, as was the case for ICDF waste treatment operations that EA observed during this assessment. However, personnel entry into the posted contamination areas was not necessary for the grouting preparations or grouting activities observed by EA, because physical contact with the contaminated waste was not necessary. Temporary contamination area postings are removed upon completion of work, once active placement of compacted, “clean,” cover-over ICDF soils and debris has been completed, as required by ICDF operations procedures.

EA observed RCTs conducting job coverage and routine area radiological and contamination surveys in accordance with RWPs and operational procedures to verify and document the radiological conditions. Contamination surveys included drilling components and the grout delivery hose outlet (i.e., pumper truck), checking of workers’ hands throughout drilling and grouting operations, and surveys of workers’ hands and shoes after completion of waste placement. Fluor Idaho exercised active radiological control during all operations and appropriately performed active air monitoring during waste handling operations, including when remotely handling and disposing of fully containerized LLW such as RH waste containers at ALLWDF. Also, since all disposal cell areas are posted and controlled as RBAs, meaning that no radiological contamination is expected, individuals exiting these areas are required to undergo a minimum of a hand and foot frisk upon exit. Requirements for air sampling and hand and foot surveys when exiting active disposal areas are conservative and appropriate measures, which are not currently required at some other DOE disposal sites.

5.3.7 Environmental Monitoring

Criteria:

Monitoring Plan: A preliminary monitoring plan for an LLW disposal facility shall be prepared and submitted to Headquarters for review with the PA and CA. Plans shall be implemented to ensure sufficient monitoring of groundwater, surface water, gaseous or particulate effluent releases, and ambient radiation conditions to evaluate conformance to the PA and CA objectives. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.1, Criteria 3)

Monitoring: Capabilities and procedures shall be implemented to ensure sufficient monitoring of ground, surface, leachate, or contact water; gaseous or particulate effluent releases; and ambient radiation conditions to evaluate conformance to the PA. The monitoring plan shall be updated within one year following issuance of the DAS to incorporate and implement conditions specified in the DAS and address changes identified during operations. Plans will be reviewed and updated whenever changes in conditions or operations are identified. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.2, Criteria 7)

EA assessment of groundwater monitoring plans and the last 3 years of monitoring results for ALLWDF and ICDF found that the sample request and analysis process comprehensively included all significant waste constituents. Sampling frequency, distribution of locations, and sampling depths provide a generally comprehensive network adequate for the natural conditions present at and around these facilities.

ALLWDF

The PA and CA environmental monitoring program focuses on environmental monitoring inside and outside of the ALLWDF boundary (between approximately 10 to 100 meters away from the facility) to comply with the requirements of DOE Order 435.1. The program includes a monitoring network with instruments within the ALLWDF vadose zone beneath the SDA and aquifer in the vicinity of the RWMC. The purpose of the PA and CA environmental monitoring program is to ensure appropriate monitoring data is acquired to evaluate the likelihood that the assumptions used for the PA and CA are reasonable and conservative.

Observed soil and water concentrations from lysimeters installed within the vadose zone were used to quantitatively compare to the CA model results. The comparison indicates that the model results are generally conservative. However, the Tc-99 and uranium concentrations show an increasing upward trend based on plots of predicted versus observed concentrations reported in RPT-1457, *Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at RWMC FY 2015*. The report states, “Tc-99 and uranium concentrations will be carefully observed through future sampling events.” Although the PA environmental monitoring program has successfully detected the onset of upward trending concentrations, Fluor Idaho has not fully evaluated the significance of these results. (See **OFI-Fluor-3**.)

Observed groundwater concentrations from wells installed near the surface disposal area were used to compare to CA results and aquifer action levels. The concentrations calculated with the CA model are conservative relative to concentrations measured in the aquifer. In addition, all aquifer monitoring site data was below aquifer maximum contaminant levels. The aquifer monitoring results indicate that the PA and CA conclusions are conservative and adequate.

ICDF

During FY 2015, the total leachate pumped from the primary and secondary leak detection and recovery systems was 384 gallons. Leachate volumes from the primary and secondary recovery systems are compared to the action leakage rate of approximately 500,000 gallons per year. Monitoring at ICDF indicates that the leachate reaching the recovery systems is more than 1,000 times below the action leakage rate and indicates that leakage from the landfill was insignificant through the end of FY 2015.

The ICDF groundwater detection monitoring network consists of one monitoring well that is up-gradient and five monitoring wells that are down-gradient of the landfill and evaporation pond. The monitoring program was established to meet the substantive requirements of 40 CFR 264.97, *General ground-water monitoring requirements*, and 40 CFR 264.98, *Detection monitoring program*, which are applicable requirements under CERCLA.

The groundwater monitoring results, together with the ICDF leachate recovery system data, provide the water balance and chemical monitoring required to conclude that ICDF is functioning within the performance envelope, and confirm the adequacy of the PA.

All current monitoring data indicate that the ALLWDF and ICDF are performing within expectations of the model and parameter assumptions for the facilities.

5.3.8 Closure Plan Development and Maintenance

Criteria:

Closure Plan: The disposal facility design and operation must be consistent with the disposal facility closure plan and lead to disposal facility closure that provides a reasonable expectation that performance objectives will be met. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.2, Criteria 6)

Closure Plan Development and Maintenance: A preliminary closure plan shall be developed and submitted to Headquarters for review with the PA and CA. The closure plan shall be updated following issuance of the DAS to incorporate conditions specified in the DAS. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.3, Criteria 1)

Prompt Closure Processes: Closure of a disposal facility shall occur within a five-year period after it is filled to capacity, or after the facility is otherwise determined to be no longer needed. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.3, Criteria 2)

Institutional Controls and Monitoring: Monitoring plans shall be implemented to support verification of performance objectives during a period of post-closure administrative control. (DOE Order 435.1; DOE Manual 435.1-1, Chapter IV; CRAD 31-11, Section 4.7.3, Criteria 4)

An essential aspect of operating a disposal facility is to ensure that, after the waste is in place, it will not require additional treatment, relocation, or significant long-term maintenance to satisfy the performance objectives for safety of the public and environment. Multiple sections of DOE Manual 435.1-1 reiterate the need for disposal facility siting, design, operations, and waste forms to achieve long-term stability, minimize slumping, and minimize the need for long-term maintenance.

ALLWDF

ALLWDF is scheduled to be closed in three stages: interim closure, final closure, and long-term management. The facility operations management is slated to implement the first stage, interim closure, which includes placement of a thick layer of soil over the waste packages. This soil cover is planned to be maintained by operations management to address subsidence, drainage, and other operational and safety concerns. The second and third stages, final closure and long-term management, respectively, are required to be implemented through the CERCLA process, as specified in the 2008 record of decision (ROD), DOE/ID-11359, *DOE-ID, 2008, Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14*.

RH LLW from the NRF continues to be disposed of in concrete vaults at ALLWDF. After a concrete vault is filled, interim closure includes the placement of a 4-foot (1.2-meter) thick reinforced concrete plug over the vault. The seams between adjacent plug caps of filled vaults are sealed with acrylic caulk at the surface of the vault array, and a silicone sealant is placed at the interface between the vault plug and the vault wall to inhibit moisture infiltration into the vault. After disposal ceases, an interim soil cover, at least 3-feet (0.9 meters) thick, is slated to be placed over the vault array.

Final closure of ALLWDF is required to be implemented through the CERCLA process, as specified in the 2008 ROD, DOE/ID-11359. The conceptual design described in DOE/ID-11482, *Operable Unit 7-13/14 Phase 3 Remedial Design Work Plan*, differs from the pre-conceptual cover described in DOE/ID-11359; however, the performance objectives remain the same. The refined concept is a monolithic soil cover, whereas the pre-conceptual cover described in DOE/ID-11359 included an underlying coarse rock layer. The PA does not simulate the details of the cover design; therefore, this change does not impact other PA and CA assumptions and therefore will not change the conclusions.

Planned active and passive institutional controls include access restrictions, restrictions on groundwater use (e.g., well-drilling), restrictions on land use (e.g., limit to industrial applications), and physical security. Following construction of the final cover, long-term surveillance, maintenance, monitoring, and institutional controls are slated to be implemented to enforce land-use and groundwater-use restrictions and to ensure that the completed final cover effectively meets all remedial action objectives. DOE plans to maintain control of the site indefinitely, and land use is planned to be restricted. Five-year reviews are required under CERCLA to assess the effectiveness of the remedy.

ALLWDF design and operation are consistent with the disposal facility closure plan, providing a reasonable expectation that performance objectives will be met.

ICDF

ICDF is also scheduled to be closed in three stages: interim closure, final closure, and institutional control. Interim closure is conducted in the first stage, as waste is placed in the landfill. The second stage, final closure, is planned as specified in the 1999 ROD, DOE/ID-10660, *DOE-ID, 1999, Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13*, and includes emplacement of a final cover over the entire landfill. The third stage, institutional control, is specified in DOE/ID-10660.

Interim closure is conducted according to ERD-ER-286, *ICDF Waste Placement Plan*. Following waste placement, operational and soil cover fixatives are applied over contaminated material. A 2-foot (0.6 meter) thick clean soil fill cover is installed over each final operational lift to provide clean access to the working face and to provide a final interim cover. The interim cover is maintained to address drainage and other operational and safety concerns in accordance with DOE/ID-10660.

The final cover is designed to minimize long-term infiltration. The cover system is designed to vary from approximately 28 to 54 feet (8.5 to 16.5 meters) above ground surface. The sides of the cover system are designed to slope 2.5 feet to 1 foot (0.8 to 0.3 meters) and be covered with approximately 2 feet (0.6 meters) of basalt riprap (5 to 12-inch diameter). The final state of ICDF is designed to be a 54-foot (16.5-meter) high mound with steep side slopes with a width and length of approximately 1,000 feet (305 meters). The cover system is designed to meet the remedial action objectives to minimize infiltration, maximize run-off, and protect against inadvertent intrusion.

Following construction of the final cover surface barrier, long-term institutional controls, maintenance, and monitoring is planned as specified in DOE/ID-10660, to enforce land-use restrictions and ensure the final cover meets performance objectives. DOE plans to maintain control of the site with land-use restrictions and five-year reviews are planned to assess the effectiveness of the remedy.

ICDF design and operation are consistent with the disposal facility closure plan, providing a reasonable expectation that performance objectives will be met.

5.4 DOE Oversight

Criteria:

Site Office Oversight Program: Oversight processes are tailored according to the effectiveness of contractor assurance systems, the hazards at the site activity, and the degree of risk, giving additional emphasis to potentially high consequence activities. (DOE Order 226.1b section 4.b(5))

Facility Representatives: Facility Representatives (FR) provide effective routine operational awareness to determine that the contractor is operating DOE facilities in a safe manner. (DOE Order 226.1b and DOE STD-1063-2006)

Safety System and Safety Management Program Oversight: The DOE field element has established and implemented effective processes using Safety System Oversight and Subject Matter Experts in formal assessments and routine operational awareness activities to apply engineering and/or discipline specific expertise in its oversight of the assigned safety systems, to monitor performance of the contractor's cognizant system engineer programs, and to provide assessment and oversight of the safety basis, and associated safety management programs. (DOE Order 226.1b and DOE Order 426.1 appendix D)

Reports, Notifications, and Approvals: DOE Field Offices submit reports to and request approvals from the Office of Environmental Management or other line management in coordination with the Low-Level Waste Disposal Facility Federal Review Group as required. This may include RWMB documents, initial and revised Disposal Authorization Statements, annual Performance Assessment and Composite Analysis reports, and annual activity reports. (DOE Manual 435.1-1 Chapter 1 and Chapter 4)

For the NE-owned RH LLWDF currently under construction, oversight of safety is slated to be coordinated under the ID Deputy Manager for Operations Support. However, until construction is complete, day-to-day oversight of RH LLWDF is coordinated under the leadership of the ID Assistant Manager for Programs and Facilities. When operations begin, three division directors subordinate to the ID Deputy Manager for Operations Support are slated to work together to plan schedules and execute oversight activities for the facilities. These subordinate division directors include the Operational Performance Assurance Director, who manages the FR and safety system oversight programs; the Quality & Safety Director, who manages SMEs; and the Environment and Sustainability Director, who manages the Environmental Compliance and Environmental Resource groups.

The Deputy Manager for ICP Core leads all oversight of the EM-owned ALLWDF and ICDF, and safety oversight is coordinated by supporting assistant managers. The Assistant Manager for Waste Disposition leads the organizations that have the primary responsibility for oversight of ALLWDF and ICDF. However, the Assistant Manager for Nuclear & Safety Performance leads the safety performance, nuclear safety, and FR teams that are responsible for regularly monitoring performance at the two facilities in the field.

ID prepares an oversight plan annually, as directed by 03.PD.04, *Contract Oversight*, and in accordance with 03.WI.04.01, *Oversight Planning and Scheduling*. Oversight activities and reviews are conducted in accordance with 03.WI.04.02, *Conduct of Oversight Activities*. Due to the low level of activity currently ongoing at ICDF and ALLWDF, there have been very few recent assessment activities conducted by ID. Nevertheless, EA was provided examples of the latest ID assessments of ICDF operations and activities: AST-EM-1.29.2015-80107, *ICDF CERCLA Landfill Inspections*; AST-EM-3.12.2015-86334, *Assessment of ICDF Regulatory Compliance*; and AST-EM-3.26.2015-63521, *Evaluation of ICDF Placement Compaction*. Each assessment report was appropriately critical and provided good detail of observations and analysis made by the SME.

Substantial cooperation takes place between ID oversight organizations. For example, SME resources are shared by both the Quality & Safety Division, which covers NE facilities, and Nuclear Safety & Performance, which is responsible for EM facilities. Also, in addition to conducting their own assessments, Waste Disposition staff regularly coordinate operational awareness activities with FRs. Per 03.WI.04.02, FRs share responsibility for evaluating the contractor assurance systems for operations. However, through interviews, EA observed that the roles and responsibilities assigned to Waste Disposition staff are not universally understood. When asked, there was uncertainty expressed about who was responsible for reviewing each of the RWMB documents for a given facility. In part, this uncertainty may be attributed to recent turnover of staff and management in the group, but as indicated in Section 5.1, not all staff were aligned regarding how document reviews should be conducted. (See **OFI-ID-1**.)

EA reviewed documentation for the last five annual report submissions to the LFRG for ALLWDF and ICDF. In recent years, there has been some delay with respect to LFRG review and response to the annual update submittals from the sites, and some modifications to the submission due dates because of LFRG reorganizations and personnel changes, but in general, ID submissions are timely and up to date.

Within the scope of this assessment, EA determined that ID has established and implemented effective oversight processes that evaluate the adequacy and effectiveness of the contractor's radioactive waste management program.

6.0 FINDINGS

EA identified no findings during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified some OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory.

Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

- OFI-Fluor-1** Consider evaluating the use of deep vadose zone moisture content measurement techniques, in the vicinity of ICDF, to provide additional site-specific data to address future environmental concerns. Measurements utilizing neutron probe or similar borehole logging technology in “dry” boreholes/wells may provide additional site data to support unsaturated assumptions in the future.
- OFI-Fluor-2** Consider revising MCP-3382 and accompanying Form 435.95 to include steps to verify, at a minimum, proper number of containers in the shipment, correct container weights/volumes, and appropriate marking and labeling of containers.
- OFI-Fluor-3** Consider further evaluation of rising trends in vadose zone monitoring concentrations from the RWMC. In particular, focused attention could be placed on the onset of upward trends in Tc-99 and uranium, as pointed out in the 2015 Annual PA and CA Review.
- OFI-ID-1** Consider collaborating with current ID Waste Disposition staff to develop a roles and responsibilities guide that clarifies the review and approval process for radioactive waste facility design and analysis documents comprised by the RWMB.

Appendix A Supplemental Information

Onsite Dates of Assessment:

Scoping: September 25-30, 2016

Data collection: October 31 – November 4, 2016

Office of Enterprise Assessments (EA) Management

Glenn S. Podonsky, Director, Office of Enterprise Assessments

William A. Eckroade, Deputy Director, Office of Enterprise Assessments

Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments

William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments

C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments

Patricia Williams, Director, Office of Worker Safety and Health Assessments

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Michael A. Kilpatrick

EA Site Lead for the Idaho Site

Aleem Boatright

EA Reviewers

Aleem Boatright – Lead

Joseph Lischinsky

Mario Vigliani

Thomas Naymik

Appendix B

Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- DOE/ID-11359, Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14, Rev. 0, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Environmental Quality, October 2008.
- DOE/ID-11482, Operable Unit 7-13/14 Phase 3 Remedial Design Work Plan, Rev. 0, Meagher, Brandt G. and K. Jean Holdren, U.S. Department of Energy Idaho Operations Office, November 2013.
- DOE/ID-10660, Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13, Rev. 0. Idaho National Engineering and Environmental Laboratory, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Agency, Region 10; Idaho Department of Health and Welfare, Division of Environmental Quality, Idaho Falls, Idaho, October 1999.
- EDF-ER-286, ICDF Waste Placement Plan, Rev.5, Idaho Cleanup Project, Idaho National Laboratory, May 2008.
- RPT-1220, Special Analysis of Remote-Handled Low-Level Waste Facility near the ATR Complex—Potential for Source Term Interactions with Current Composite Analyses at the INL Site, Rev. 0, McCarthy, J.M., Idaho Cleanup Project, November 2014.
- PRD-1501, Work Control
- Manual 16A, Emergency Management – ICP Emergency Plan/RCRA Contingency Plan
- Manual 12, Training and Qualification
- Manual 13, Quality Assurance Program
- PRD-111, Records Management
- MCP-557, Records Management
- DOE/ID-10881 Revision 12, ICDF Complex Waste Acceptance Criteria
- DOE/ID-11409, Rev. 1, Radioactive Waste Management Complex Active Low-Level Waste Disposal Facility Waste Acceptance Criteria
- PDD-1003, Waste Generator Services Program
- MCP-1390, Waste Generator Services Waste Management
- MCP-1396, Waste Generator Services Management of CERCLA Waste for Disposal at ICDF
- MCP-3007, ICP Shipment and Receipt of Hazardous Materials
- TPR-7975, ICP Waste Container Preparation and Grouting Evolutions
- TPR-1757, 55-Ton Cask Discharge to RH LLW Concrete-Lined Vaults
- MCP-3003, Performing Pre-job Briefings and Documenting Feedback
- JSA-2325, ICDF General Area Access
- JSA-2327, ICDF Operations
- RWP CWM2016034, Preparation and Grouting of ICDF Containers
- RWP CWM2016023, 55-TON Cask, Bearing Pad, and Vault Work
- PLN- 914, Waste Tracking Plan for the Idaho CERCLA Disposal Facility Complex
- MCP-3382, ICDF Waste Receipt and Tracking
- DOE/ID-10956, Idaho CERCLA Disposal Facility Complex Compliance Demonstration for DOE Order 435.1, Rev. 2
- AST-EM-1.29.2015-80107, ICDF CERCLA Landfill Inspections
- AST-EM-3.12.2015-86334, Assessment of ICDF Regulatory Compliance
- AST-EM-3.26.2015-63521, Evaluation of ICDF Placement Compaction

Interviews

- ID Assistant Manager for Waste Disposition
- ID Waste Disposition Staff (5)
- ID Idaho Facilities and Management Division Staff (3)
- ID Facility Representative
- ICDF and RWMC/ALLWDF, Operations Personnel
- ICDF and RWMC/ALLWDF, Shift Managers
- ICDF, Radiation Control Technician
- ICDF, Radiation Control Supervisor
- Fluor Idaho Waste Generator Services Specialists
- ICDF and RWMC/ALLWDF, Operations Managers and Supervisors
- Fluor Idaho Training and Technical Qualifications Manager
- Fluor Idaho IWTS SMEs
- Fluor Idaho Waste Characterization Specialist
- Fluor Idaho Packing and Transportation Specialist
- Groundwater Sampling Technicians (RWMC)
- Groundwater Sampling Scientists (RWMC)
- PA and CA Modelers (ICDF and RWMC)
- Database Manager
- PA and CA Modeler (RH LLWDF) near the ATR Complex
- Design Engineer (RH LLWDF)
- Managers and Construction Engineers (RH LLWDF)
- Design Engineer (ICDF and RWMC)

Observations

- Walk down former INTEC Disposal Well
- Walk down former INTEC Evaporation Ponds
- Walk down current INTEC Evaporation Ponds and Monitoring Stations/Wells
- New Remote Handled Low-Level Waste Disposal Facility (RH LLWDF) near the ATR Complex
- Big Lost River Channel
- Walk down Spreading Area Southwest of RWMC
- Groundwater Sampling (Monitoring Well M1S) at the RWMC
- Walk downs of most RWMC and ICDF Area Monitoring Stations/Wells
- ICDF Waste Container Drilling and Grouting Operations
- ICDF Plan of the Day (POD) and Shift Turnover Meetings
- ICDF Pre-job briefings for Waste Container Drilling and Grouting
- Walk down ICDF Waste Disposal Areas
- Walk down active RWMC/ALLWDF Disposal Areas