

**Independent Oversight Review of
Radiation Protection Program
Implementation at the Advanced Mixed
Waste Treatment Project of the Idaho Site**



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**Office of Safety and Emergency Management Evaluations
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Acronyms

| | |
|--------|---|
| AJR | ALARA Job Review |
| ALARA | As Low As Reasonably Achievable |
| AMOW | Approved Method of Work |
| AMWTP | Advanced Mixed Waste Treatment Project |
| ATR | Advanced Test Reactor |
| BEA | Battelle Energy Alliance, LLC |
| CAM | Continuous Air Monitor |
| CBDPP | Chronic Beryllium Disease Prevention Program |
| CFR | Code of Federal Regulations |
| CRAD | Criteria, Review, and Approach Document |
| CWI | CH2M-WG Idaho, LLC |
| DOE | U.S. Department of Energy |
| DOE-ID | DOE Idaho Operations Office |
| dpm | Disintegrations per Minute |
| EDF | Engineering Design File |
| EM | Office of Environmental Management |
| FR | Facility Representative |
| HEPA | High Efficiency Particulate Air |
| HSS | Office of Health, Safety and Security |
| HVAC | Heating, Ventilation, and Air Conditioning |
| ICP | Idaho Cleanup Project |
| IH | Industrial Hygienist |
| INL | Idaho National Laboratory |
| INTEC | Idaho Nuclear Technology and Engineering Center |
| ITG | Idaho Treatment Group, LLC |
| MFC | Materials and Fuels Complex |
| NE | Office of Nuclear Energy |
| OFI | Opportunity for Improvement |
| OSHA | Occupational Safety and Health Administration |
| PAPR | Powered Air Purifying Respirator |
| PPE | Personal Protective Equipment |
| RCT | Radiation Control Technician |
| REC | Research and Education Campus |
| RPP | Radiation Protection Program |
| RWMC | Radioactive Waste Management Complex |
| RWP | Radiological Work Permit |
| TRU | Transuranic |
| ZnS | Zinc Sulfide |

Independent Oversight Review of Radiation Protection Program Implementation at the Advanced Mixed Waste Treatment Project of the Idaho Site

1.0 PURPOSE

This report documents an independent review of activity-level radiation protection program (RPP) implementation at the Advanced Mixed Waste Treatment Project (AMWTP) of the Idaho Site, as conducted by the U.S. Department of Energy (DOE) Office of Enforcement and Oversight (Independent Oversight) within the Office of Health, Safety and Security (HSS). The review was performed by the HSS Office of Safety and Emergency Management Evaluations and was carried out within the broader context of an ongoing program of targeted assessments of RPP implementation across the DOE complex at sites that have hazard category 1, 2, and 3 nuclear facilities. The purpose of this Independent Oversight targeted review effort is to evaluate the flowdown of occupational radiation protection requirements, as expressed in facility-specific RPPs, to work planning, control, and execution processes. Independent Oversight accomplished this review by performing assessments that included activity-level observations.

This targeted review was performed at the Idaho Site from January 28 to 30, 2013. This report discusses the scope, background, methodology, results, conclusions, and opportunities for improvement (OFIs) resulting from this review, as well as items identified for further follow-up by HSS.

2.0 SCOPE

Title 10 Code of Federal Regulations (CFR) Part 835, *Occupational Radiation Protection*, contains the requirements for developing, implementing, and maintaining an RPP. Title 10 CFR 835.101(a), *Radiation protection programs*, states that “A DOE activity shall be conducted in compliance with a documented radiation protection program (RPP) as approved by the DOE.” Each DOE site that works with radiological material has developed an RPP and supporting implementing procedures for radiation control. The AMWTP RPP is documented in PD-RS&C-01, *Idaho Treatment Group, Radiation Protection Program*, and associated procedures and instructions, which cover any DOE activity conducted by the AMWTP contractor, Idaho Treatment Group, LLC (ITG); its subcontractors and suppliers, and any company or individual under formal agreement to perform radiological activities under the AMWTP RPP on behalf of DOE. It encompasses implementation of radiation controls during operation and management of the AMWTP, which was the focus of this assessment. This HSS Independent Oversight targeted review area is intended to assess ITG’s compliance with 10 CFR Part 835 by observing the conduct of work activities involving radiological hazards.

For this review, Independent Oversight assessed the documented AMWTP processes for planning radiological work and establishing radiological hazard controls, and then observed work activities to verify the effectiveness of the overall implementation of RPP processes at AMWTP. In particular, Independent Oversight observed work activities at AMWTP Retrieval, Characterization, Storage, and Treatment facilities, which consisted of TRU waste retrieval, maintenance associated with treatment facilities equipment, and walkdowns of characterization and storage facilities. Independent Oversight also interviewed a selection of workers and key personnel responsible for radiation controls.

3.0 METHODOLOGY

This review was guided by HSS Criteria, Review, and Approach Document (CRAD) 45-35, Rev. 1, *Occupational Radiation Protection Program Inspection Criteria, Approach, and Lines of Inquiry*. This targeted review area assesses contractor implementation of RPP radiological work planning and control commitments by observing the conduct of work activities involving radiological hazards. Observed radiological work activities and practices are reviewed against site radiation control implementing procedures, the RPP, and 10 CFR 835, as indicated in HSS CRAD 45-35, Rev. 1.

4.0 BACKGROUND

The Idaho Site is comprised of the Idaho National Laboratory (INL), the Idaho Cleanup Project (ICP), and the AMWTP. The DOE Idaho Operations Office (DOE-ID) provides direction and oversight for the design and operation of the Idaho Site nuclear facilities for the DOE Headquarters Offices of Nuclear Energy (NE) and Environmental Management (EM); with NE being responsible for line management oversight of INL facilities and EM being responsible for line management oversight of ICP and AMWTP facilities. Within DOE-ID, the two line management organizations exercise responsibility for oversight of these nuclear facilities and their activities. The Deputy Manager for Operations Support is responsible for contractor oversight of the NE facilities, and under the Deputy Manager for ICP, oversight of the EM facilities is the responsibility of the Assistant Manager for Nuclear Safety and Performance.

The primary contractors responsible for the management and operation of the INL and ICP facilities are Battelle Energy Alliance, LLC (BEA) and CH2M-WG Idaho, LLC (CWI), respectively. However, AMWTP is operated by a separate contractor, ITG, who began operating the project under the current contract in October 2011. Most of AMWTP is categorized as a hazard category 2 nuclear facility, pursuant to DOE-STD 1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*.

Due to the then-recent and ongoing oversight and improvement activities, the assessment of the AMWTP radiological protection program was deferred when the balance of the site was reviewed by Independent Oversight in September of 2012. This Independent Oversight review is a continuation of the September 2012 effort and addresses the remaining project of the Idaho Site.

5.0 RESULTS

The following sections discuss the observations made by Independent Oversight during this review. After reviewing all applicable documentation for these programs, Independent Oversight focused on activity-level observations as the primary means of assessment. The results of this review are discussed below. Conclusions are summarized in Section 6, opportunities for improvement are listed in Section 7, and items for follow-up are discussed in Section 8.

5.1 DOE-ID Oversight

DOE-ID oversight of the AMWTP contractor performance is conducted in a systematic and appropriate manner. Independent Oversight observed the DOE-ID Facility Representative (FR) for AMWTP while performing operational awareness surveillances during a Contractor Readiness Assessment (C-RA) of a revised waste treatment “drill and drain” procedure being conducted during this review. The scope of the FR surveillances appropriately assessed radiation controls at the time of the Independent Oversight site visit. Independent Oversight also interviewed the FR to gain perspective on the ITG’s implementation of

radiation controls at the AMWTP.

5.2 Pre-job Briefing

Pre-job briefings associated with observed radiological work were thorough and adequately tailored (with some exceptions noted below) to the specific work being planned for the day. Pre-job briefings for the Shredder and Heating, Ventilation, and Air Conditioning (HVAC) Pre-Filter replacement work evolutions, and several maintenance tasks (assigned through use of a Permit to Work) were held in the morning before work was performed. These briefings were well attended, and the field work supervisor and Radiological Controls (facility and/or non-facility) line supervision conducted them in a professional and formal manner. Direction on work scope and methods of performance was provided. The field work supervisor also reviewed the applicable hazards, mitigation, and personal protective equipment (PPE) from the Approved Method of Work (AMOW) or Permit to Work and presented other information, including lessons learned applicable to the assigned task. Workers were kept actively engaged during the briefings, as they were frequently queried by the supervisor for responses to postulated events, such as response to continuous air monitor (CAM) or criticality alarms. Additionally, the radiation control supervisor or radiation control technician (RCT) for the job provided a review and reading of the radiation controls information from the AMOW or Permit to Work.

Although the briefings covered the AMOW and/or Permit to Work and a few questions and concerns were raised and thoroughly addressed, the briefings did not address all precautions and limitations contained in AMWTP maintenance instructions for the activities (These procedures are not required to be referenced in the field.). Of particular concern to Independent Oversight, the warnings contained in the maintenance instructions were omitted from the briefings, and there were no mechanisms (such as hold points) in a procedure, radiological work permit (RWP), or similar document to ensure that the radiological surveys required in the maintenance instruction were carried out in the appropriate work sequence step. Additionally, the radiological work authorization and briefing information taken from the AMOW or Permit to Work should, for example, include additional radiological survey and protection requirements contained in the maintenance instruction and task-specific Engineering Design File (EDF), which serves as the official As Low As Reasonably Achievable (ALARA) Job Review (AJR), by including recommended good work practices, lessons learned, and similar information. Including this additional information would more specifically tie the Permits to Work and AMOWs to the requirements for the job. (See OFI-1.)

5.3 Implementation of Radiation Controls when Performing Radiological Work

The observed AMWTP operations were supported by continuous radiological job coverage (either in the work zone, or via video and two way radio communication with workers). RCT staffing was sufficient, and RCTs were observed taking sufficient exposure rate and fixed and removable contamination measurements throughout the work. Donning and doffing practices were performed appropriately, and RCTs assisted each other and workers in donning respiratory protection, bubble suits, lapel samplers, electronic dosimetry, and related radiological PPE required for the work. Training and qualification to RPP requirements were properly verified. The instruments that were used were source-checked and within the required calibration dates. Area air samplers, CAMs, and lapel air samplers were assigned in accordance with the AMOW or Permit to Work. While line supervision or operation shift supervision ensure that workers are up to date on required training and qualifications for the tasks delineated in the AMOW or Permit to Work (i.e., required training, including radiological worker training), radiological bioassay requirements are confirmed by the Radiological Controls organization, and respiratory protection requirements are monitored through the issuing station. This process was deemed cumbersome by the users, and users also acknowledged that the database used to confirm training is confusing and not user friendly. Independent Oversight agrees with the users' characterization of this process. AMWTP

has no automated access control system that integrates training, dosimetry, bioassay, respiratory protection, and radiological work authorization requirements. (See OFI-2.)

5.3.1 Other Observed Weaknesses

When observing specific AMWTP work evolutions, Independent Oversight observed a few clear weaknesses in the processes, planning, and/or execution of radiological work. Generally, these are areas where there has been insufficient rigor directed to the application of some radiological requirements. The following are examples of potentially ineffective application of controls observed by Independent Oversight:

- Radiological Work Authorization at AMWTP is provided through either AMOW or Permit to Work concurrence from the Radiological Control organization. While these mechanisms meet regulatory requirements, both internal (by ITG) and external assessments (e.g., by DOE-ID and the Defense Nuclear Facilities Safety Board) have identified opportunities for improvement for this process. The current process refers to external documents, such as EDFs and radiation controls integrated into procedures for the respective work group, but extracting and incorporating the specific requirements would improve the likelihood that workers would refer to them as needed. Also, the Permit to Work and AMOW formats are not easy for workers to review and, because of the format of the forms, cannot accommodate some important items, such as radiological hold points. ITG is currently in the process of migrating to an RWP process; Independent Oversight, similar to ITG and others, views this migration as a valid opportunity for improvement. (See OFI-3.)
- Observation of an HVAC Pre-Filter Replacement work evolution raised the concern that some of the AMWTP waste streams may contain both radiological and beryllium hazards. During this activity, it was noted that some equipment – primarily the HEPA vacuum, but other equipment and/or waste containers as well – was identified as containing a potential beryllium contamination hazard, while other equipment to be used during the work assignment, was not. While Industrial Hygienist (IH) coverage is not required for this type of work activity, IHs are to be notified if the Radiological Control organization discovers alpha contamination greater than 20 disintegrations per minute (dpm); it is not specified whether or not this limit refers to removable or fixed contamination. Independent Oversight noted that a ratio of potential beryllium contamination to detected alpha contamination is used as a trigger to notify the IH. This ratio had previously been established and is in use at AMWTP, though the documented technical basis was not referenced. Based on interviews, Independent Oversight found that the 20 dpm alpha contamination criterion applies to removable contamination; however, the hand-held zinc sulfide (ZnS)-based “Electra” survey probe instruments that are used have a minimum detectable activity of 200 dpm or greater. Consequently, because contamination detected by hand-held equipment during the conduct of work may be cleaned to less than detectable levels and subsequently swiped and counted to be less than 20 dpm alpha, the IH may not be notified on a beryllium hazard. Thus, the concentration of beryllium contained in the PPE used, radiological waste generated, and equipment used for the work may be greater than desired; and therefore, in this case beryllium may not be controlled as intended. (See OFI-4.)
- Observation of maintenance work associated with Work Order (WO) 440292 to investigate a waste conveyor malfunction raised a concern related to monitoring of workers’ stay times by both line supervision and RCTs providing job coverage. This activity was conducted by two individuals in bubble suits with airline respirators and rescue bottles as required by the Permit to Work. During the pre-job briefing and subsequent donning of PPE, workers were informed of a work/rest regime of 45 minutes work to 15 minutes rest. It was stated in the pre-job briefing that times would be monitored by the supervisor and the RCTs at the access point and by the Safety Representative assisting the workers. However, as the actual conduct of the work progressed, the workers were observed

conducting activities, such as traversing the area, removing debris, and inspecting equipment, which included crouching down in PPE. Given the conditions, these activities (i.e., diverse physical exertions in PPE) could be considered strenuous and require routine rest periods. Workers' entry times are written on the back of the bubble suit head covering in large, clearly visible black marker. Additionally, all video monitors used to view workers indicate time and date in the lower right hand portion of the screen. At 46 minutes into the assignment, the work supervisor gave the workers an additional task, at which time Independent Oversight indicated to the escort (the Radiological Controls Manager) that the time requirement had been exceeded. This individual brought this deviation to the attention of the work supervisor, who promptly recalled the workers. In addition, the manager notified the area radiation control program supervisor that there was a problem with the time tracking being conducted by the RCTs. (See OFI-5.)

6.0 CONCLUSIONS

Independent Oversight determined that DOE-ID oversight of AMWTP radiological work activities was appropriately rigorous, and relied upon significant in the field FR engagement. In addition, Independent Oversight found that AMWTP radiation control practices were, in general, adequately covered by written work authorizations that define required radiation controls. Pre-job briefings, with some exceptions, were formal and comprehensive, and the level of RCT job coverage was appropriate for the work being performed.

However, radiation control implementation was found to have opportunities for improvement, particularly in the areas of access control, radiological work authorization, beryllium work planning (including interrelated radiological contamination control), and monitoring of workers' stay times.

7.0 OPPORTUNITIES FOR IMPROVEMENT

During the review, Independent Oversight identified several opportunities for improvement (OFIs). The DOE-ID oversight process identifies issues as concerns, findings, or observations. An observation represents a "situation that is presently in conformance with requirements but has the potential for future problems, deficiencies, failures, or adverse conditions, etc., based upon the assessor's judgment." A finding is a "failure to perform a specified action contrary to specific requirements" and can be based on requirements that "range from laws to contractor facility level procedures that if left unchecked could result in an adverse condition or outcome." Observations closely approximate OFIs, which, according to Independent Oversight protocols, are "suggestions offered by the Independent Oversight appraisal team that may assist line management in identifying options and potential solutions to various issues identified during the conduct of the appraisal." The OFIs from this Independent Oversight review are provided to DOE-ID for evaluation and follow-up in accordance with site procedures and processes to accept, reject, or modify as appropriate.

OFI-1 Consider strengthening Pre-job Briefings by taking the following actions:

- Discussing warnings contained in the maintenance instructions,
- Developing mechanisms to ensure that the radiological surveys required in the maintenance instruction are carried out in the appropriate work sequence step (e.g., hold points contained in a procedure, RWP, etc.),
- Augmenting the radiological work authorization and briefing information taken from the AMOW or Permit to Work to better tie it to radiological survey and protection requirements in the maintenance instruction and task-specific EDFs, which serve as the official AJR, by including recommended good work practices, lessons learned, and similar information.

- OFI-2 Consider improving access control processes at AMWTP. One specific action to consider is the automation of existing processes to integrate training, dosimetry, bioassay, respiratory protection and radiological work authorization requirements.
- OFI-3 Consider improving the Radiological Work Authorization process at AMWTP. Specific actions to consider include:
- Extracting specific information from EDFs or radiation controls integrated into procedures, which can more readily be utilized by the respective work group, and incorporate into existing Radiological Work Authorizations.
 - Expanding the format of the AMOW and Permit to Work (field size) to allow for the input of additional important information and to facilitate workers' review of Permit to Works or AMOWs.
 - Including additional items, such as radiological hold points.
 - Completing the ITG migration to an RWP process.
- OFI-4 Consider conducting an extent-of-condition review of AMWTP's implementation of the Chronic Beryllium Disease Prevention Program (CBDPP), and beryllium hazard controls. Specific actions to consider include:
- Reviewing the status of beryllium hazard warning labels on equipment (primarily HEPA vacuum, but other equipment and/or waste containers as well).
 - Evaluating the effectiveness of the current practice of having the Radiological Control organization notify IH following discovery of alpha contamination greater than 20 dpm as the method for determining the presence of beryllium.
 - Determining the suitability of the hand-held ZnS-based "Electra" survey probe instruments to detect alpha contamination at a level low enough to provide adequate beryllium control.
 - Determining whether work may result in a cumulative concentration of beryllium contained in the PPE used, radiological waste generated, and equipment used for the work, which is higher than acceptable.
- OFI-5 Consider improving the AMWTP implementation of controls to maintain work/rest regimes. Specific actions to consider include:
- Reinforcing the responsibilities of work supervisors and the RCTs who provide job coverage (either in the work zone or at access control points) for tracking stay times.
 - Implementing "time clock" monitoring by operations or adding an elapsed-time field on the video monitoring system.

8.0 FOLLOW-UP ITEMS

Independent Oversight will continue to follow up periodically on AMWTP radiation control implementation, including the effectiveness of pre-job briefings, access control, Radiological Work Authorization, implementation of CBDPP, and monitoring and enforcement of work/rest regimes.

Appendix A Supplemental Information

Dates of Review

Onsite Review: January 28-30, 2013

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