

October 14, 2010

Mr. Robert M. Shaw  
Project Manager, Tank Farm Closure Project  
U.S. Department of Energy, Idaho Operations Office  
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Idaho Falls, ID 83415

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION ONSITE OBSERVATION  
REPORT FOR THE IDAHO NATIONAL LABORATORY IDAHO NUCLEAR  
TECHNOLOGY AND ENGINEERING CENTER TANK FARM FACILITY

Dear Mr. Shaw:

The enclosed document describes the U.S. Nuclear Regulatory Commission's (NRC's) onsite observation activities on August 10, 2010, for monitoring disposal actions taken by the U.S. Department of Energy (DOE) at the Idaho National Laboratory (INL), Idaho Nuclear Technology and Engineering Center Tank Farm Facility (INTEC TFF). This onsite observation was conducted in accordance with the Ronald Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), which requires NRC to monitor disposal actions taken by the DOE for the purpose of assessing compliance with the performance objectives set out in Subpart C of Part 61 of Title 10 of the Code of Federal Regulations.

NRC's onsite observation at INL was primarily focused on the performance objective 10 CFR 61.43. The main focus was to verify DOE's radiation protection and environmental monitoring programs at the INTEC TFF. Because environmental monitoring data provides information to assess performance assessment models, this onsite observation also partially addresses the 10 CFR 61.41 performance objectives. Additional visits will be conducted in the future to assess compliance with these and other performance objectives in 10 CFR Part 61, Subpart C.

If you have any questions or need additional information regarding this report, please call me at 301-415-7319, or call Maurice Heath, Project Manager of my staff, at 301-415-3137.

Sincerely,

**/RA/ G.Suber for D. Skeen**

David Skeen, Deputy Director  
Environmental Protection and Performance  
Assessment Directorate  
Division of Waste Management  
and Environmental Protection  
Office of Federal and State Materials  
and Environmental Management Programs

Enclosure: NRC Observation Report

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**ML102770022**

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**IDAHO NATIONAL LABORATORY IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING  
CENTER TANK FARM FACILITY  
U.S. NUCLEAR REGULATORY COMMISSION ONSITE OBSERVATION REPORT**

**1.0 BACKGROUND:**

The National Defense Authorization Act (NDAA) authorizes U.S. Department of Energy (DOE), in consultation with the U.S. Nuclear Regulatory Commission (NRC), to determine whether certain radioactive waste related to the reprocessing of spent nuclear fuel is not high-level waste, provided certain criteria are met. The NDAA also requires NRC to monitor DOE disposal actions to assess compliance with 10 CFR Part 61, Subpart C, performance objectives for low-level waste.

On September 7, 2005, DOE submitted a draft waste determination for residual waste incidental to reprocessing stored in the Idaho Nuclear Technology and Engineering Center Tank Farm Facility (INTEC TFF) to demonstrate compliance with the NDAA criteria including demonstration of compliance with the performance objectives in 10 CFR Part 61, Subpart C. In its consultation role, the NRC staff reviewed the draft waste determination and concluded that the NDAA criteria could be met for residual waste stored in the INTEC TFF. NRC documented the results of its review in a Technical Evaluation Report (TER) issued in October 2006. DOE issued a final waste determination in November 2006 taking into consideration the assumptions, conclusions, and recommendations documented in NRC's TER.

To carry out its monitoring responsibilities under the NDAA, NRC developed a monitoring plan for the INTEC TFF facility in April 2007 (ML070650066). The NRC conducted two onsite observations in 2007 to observe tank grouting operations (7 of 11 large tanks and 4 smaller tanks) at the INTEC TFF. All open items identified in the first onsite observation conducted in April 2007 (ML071300222) were closed in the August 2007 onsite observation (ML072570173). In August 2008, NRC staff participated in a third onsite observation to observe pipe grouting operations, radiation protection controls, and the environmental sampling program (ML082050071). No findings resulted from the three onsite observations. No significant tank farm closure activities occurred in calendar year 2009; therefore, NRC staff elected to forego an onsite observation. No significant closure activities occurred at the INTEC TFF in calendar year 2010; however given the length of time that had elapsed since the last onsite observation, the NRC staff decided to conduct an onsite observation visit in August 2010. During the visit, NRC staff obtained updates on closure activities and schedules, met with state officials, and collected routine information related to several monitoring factors listed in NRC's monitoring plan for the INTEC TFF (ML070650066), such as radiation protection and environmental monitoring programs.

Enclosure

## **2.0 NRC ONSITE OBSERVATION ACTIVITIES:**

### **2.1 Radiation Protection:**

#### **2.1.1 Observation Scope:**

During this onsite observation visit, the NRC staff engaged in discussions with DOE and DOE contractor staff regarding the radiation protection program and listened to presentations describing the current year activities with radiation protection at the INTEC TFF.

Prior to the onsite observation, NRC staff also met with officials from the State of Idaho's Department of Environmental Quality (DEQ) to discuss INTEC TFF radiation protection program and the State's oversight and observations.

#### **2.1.2 Observation Results:**

The performance objective in 10 CFR 61.43 for protection of individuals during operations requires that waste disposal activities be carried out such that the radiation protection standards set forth in 10 CFR Part 20 are met and doses are maintained as low as reasonably achievable (ALARA).

During the onsite observation, DOE provided NRC staff with presentations that illustrated the radiation protection program at INTEC TFF. The presentations gave perspective on the activities at INTEC TFF during the tank closure and monitoring operations. DOE's approach to demonstrating protection of individuals during operations is found in 10 CFR Part 835 and relevant DOE orders. DOE's occupational limits are comparable to NRC's 10 CFR Part 20 dose limits of 1 mSv/yr [100 mrem/yr] at the site boundary (or to members of the public granted access to the site) from all pathways and less than 0.1 mSv/yr [10 mrem/yr] dose limit for air emissions at the maximum point of impact at the Idaho National Laboratory (INL) boundary. DOE in 10 CFR Part 835, has occupational dose limits for adults, 50 mSv/yr [5000 mrem/yr] that are also comparable to Part 20.

DOE provided a presentation on exposure rates and results on worker dose calculations associated with the 2009 and 2010 INTEC TFF work. The presentation focused on the Total Effective Dose and Equivalent Dose ALARA goals measured against the actual calculate values. The ALARA goals and actual data were very conservative and well below the 10 CFR Part 20 limits.

Independent of the DOE presentation, the NRC staff also reviewed radiological surveys, bioassay program data and DOE's Annual Site Environmental Reports. The reports provided the staff with information on methodology used to calculate doses to members of the public. DOE has continued to collect data and has provided analysis that demonstrates compliance with radiation protection for workers and members of the public.

#### **2.1.3 Conclusions:**

DOE staff was responsive in answering any NRC questions. After the presentations and discussion with DOE, the NRC staff participated in a site tour. Based on the information

presented by DOE, NRC's review of documentation and site tour; NRC staff is confident that the current radiation protection program at INTEC TFF can meet the performance objectives as stated in 10 CFR 61.43. DOE provided proper documentation to demonstrate that activities were being conducted in a manner that is protective of individuals during operations.

## **2.2 Groundwater Monitoring:**

### **2.2.1 Observation Scope:**

During this onsite observation visit, NRC staff listened to presentations and participated in discussions with DOE and contractor staff regarding ongoing remedial actions and groundwater monitoring activities performed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program at the INTEC TFF.

Prior to the onsite observation, NRC staff also met with officials from the State of Idaho's DEQ to discuss its oversight of the site, specifically its environmental monitoring program.

### **2.2.2 Observation Results:**

State of Idaho DEQ provided presentations on its environmental monitoring program and information about groundwater monitoring data collected at INTEC and the larger INL site. NRC staff periodically review Idaho DEQ quarterly and annual monitoring reports and partially rely on this information and Idaho DEQ's oversight of DOE operations and facility to support its monitoring responsibilities under the NDAA.

DOE provided a presentation on CERCLA remedial actions and groundwater monitoring conducted at the INTEC. While CERCLA monitoring is focused on historical releases and does not exclusively support tank closure, it does provide useful information regarding the hydrogeological system at INTEC and a basis of comparison of INTEC TFF Performance Assessment (PA) modeling results to data. NRC staff has remained cognizant of ongoing CERCLA activities and has reviewed extensive groundwater modeling and data analysis reports over the past several years. NRC evaluation of data and information collected under the CERCLA program are discussed in more detail in its technical evaluation report related to INTEC TFF closure (NRC, 2006) and in periodic (annual) compliance monitoring reports (NRC, 2008; NRC, 2009) that document the results of NRC's consultation and monitoring responsibilities under the NDAA. Technical reviews of environmental data support NRC's Key Monitoring Area (KMA) 3—Hydrological Uncertainties—related to DOE's demonstration of compliance with 10 CFR 61.41, as well as KMA 4 related to DOE's demonstration of compliance with 10 CFR 61.43, "Protection of Individuals During Operations" listed in NRC's monitoring plan for the INTEC TFF (NRC, 2007) developed to help fulfill its responsibilities under the NDAA.

DOE contractors discussed remedial actions conducted under the CERCLA program to reduce recharge sources and drain perched water located underneath the INTEC TFF to ensure that maximum contaminant level goals established under the CERCLA program can be met in the Snake River Plain Aquifer (SRPA) by the year 2095. Recharge controls include reduction or elimination of sources of recharge (e.g., landscape watering and piping leaks), and control of recharge through water collection and diversion (e.g., construction of low permeability asphalt surfaces and diversion of facility runoff to lined ditches that drain to a lined evaporation pond).

Monitoring of perched and saturated groundwater is conducted in part to determine the effectiveness of remedial actions to help ensure protection of human health. NRC staff was provided an opportunity to discuss groundwater monitoring issues identified during its review of DOE's PA for the INTEC TFF (DOE Idaho, 2003) with DOE contractors working on CERCLA-related environmental monitoring programs. DOE contractor staff confirmed Performance Assessment Branch staff understanding of recent CERCLA monitoring results that indicate that only monitoring wells located very close to the Big Lost River (BLR) north of the INTEC facility show a water level response following rare occasions when BLR flow occurs on site. DOE contractors indicated that BLR flow is currently thought to have little impact on perched water further away from the river near INTEC facilities, contrary to initial assumptions. Rather, anthropogenic sources of water are thought to have a much larger affect. DOE contractor staff also presented data on perched and SRPA groundwater sampling at INTEC. NRC staff review of this data indicates that known piping releases from INTEC are in close proximity to the facility with limited lateral movement primarily to the southeast of the facility (NRC, 2008; NRC, 2009) and in some cases potentially to the north of the facility (DOE Idaho, 2004).

The data presented by DOE is consistent with NRC staff's understanding of the recently revised hydrogeological conceptual model of the INTEC TFF based on its review of monitoring and modeling activities conducted under the CERCLA program. However, as documented in NRC staff's TER and monitoring reports (NRC, 2006; NRC, 2008; and NRC, 2009), the monitoring results appear to be inconsistent with DOE PA modeling (DOE Idaho, 2003) predictions that show a very large impact of BLR flow on contaminant flow and transport of future TFF releases. As stated in a response to a follow-up Request for Additional Information (RAI) (DOE Idaho, 2006a), the large lateral extent of the modeled contaminant plume diverted laterally approximately 600 meters to the south of the TFF (see Figure 1 below) is due completely to the pressure gradient that results from the steady-state infiltration boundary condition for the BLR. In this response, DOE goes on to state that the large lateral extent of the contaminant plume is not indicative of perched water. As documented in NRC staff's TER (NRC, 2006), DOE's response to NRC's inquiry regarding the cause of the large lateral spread (DOE Idaho, 2006a) appears inconsistent with explanations provided in the actual PA documentation itself (DOE Idaho, 2003)—DOE's PA indicates that the numerical model predicts contaminant transport around the perched zones and through breaks in the interbeds. In fact, the numerical model results show no perched zones along or near the flow path of the contaminant plume as described in the PA making the relevance of the statement regarding perched water unclear. Additionally, there is no indication from the monitoring data that when BLR flow does occur that contamination could be deflected nearly half a mile laterally to the south of the TFF. Due to the uncertainties in the PA modeling predictions and due to the large amount of credit that appears to have been given to vadose zone performance in DOE's PA model with respect to dilution (approximately four orders of magnitude or a factor of 10,000 as shown in Figure 2 below [see difference in peak concentrations between zones 1 and 2 at the source and zone 4 at the vadose zone "spill-way" provided in DOE, 2006b]), NRC staff continues to recommend that DOE consider new and significant information collected under the CERCLA program in decisions to update its PA or in any future updates to its PA. Additionally, vadose zone transport mechanisms are important as they impact remediation and monitoring. For example, if this phenomena (i.e., large lateral deflection of INTEC TFF releases due to BLR imposed pressure gradients) actually occurs at INTEC or were to occur in the future, it could complicate remediation and monitoring of historical releases or monitoring of future releases that may occur from the INTEC TFF.

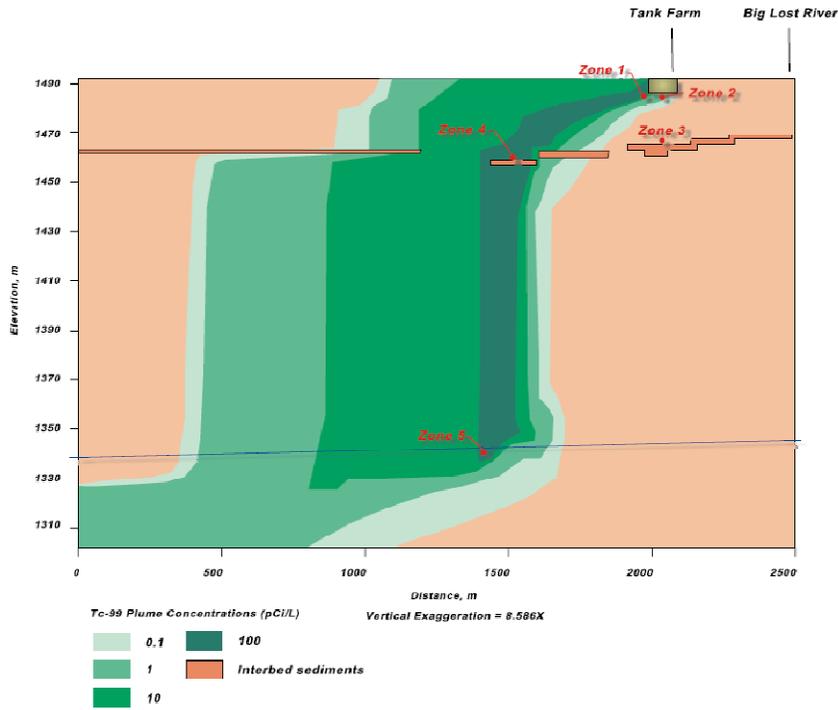


Figure 1-Techneium plume emanating from the INTEC TFF diverted laterally approximately 600 m to the south. Locations near the source (zones 1 and 2), at the modeled “spill-way” (zone 4) and at the water table (zone 5) are also depicted. See Figure 2 below for technetium concentrations at these locations through time (DOE, 2006b).

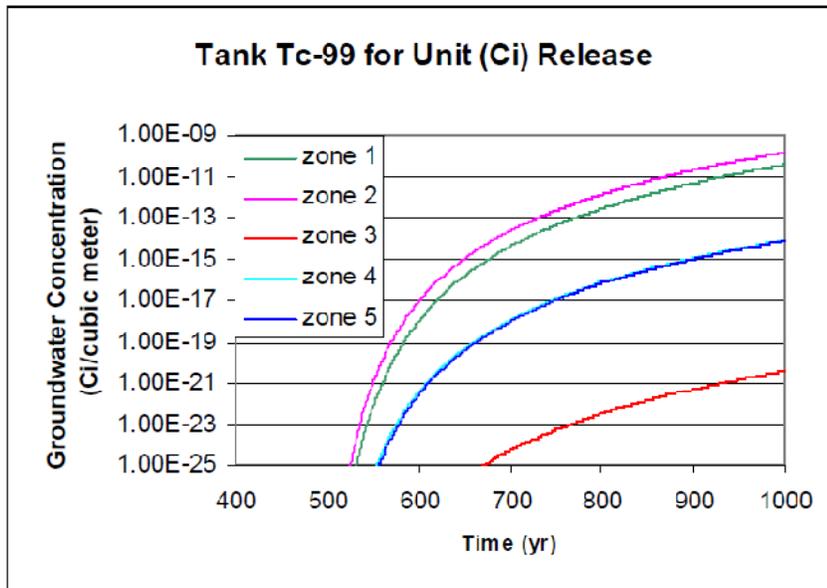


Figure 2-Techneium concentrations at zone locations 1 through 5 versus time (DOE, 2006b).

In fact, DOE indicated that it is in the process of determining whether its PA model needs to be updated. Given the risk significance of the groundwater model and additional CERCLA data that has come to light since development of the PA, NRC staff specifically recommended that DOE update its PA documentation (through an errata sheet or other textual revision) to clarify the cause of the lateral spreading of the contaminant plume and its risk significance as documented in responses to NRC RAIs (see DOE Idaho, 2006a and DOE Idaho, 2006b). NRC staff also recommended that DOE consider data and modeling conducted under the CERCLA program that has resulted in a revised hydrogeological conceptual model for the INTEC in determining whether to conduct additional modeling in an update to its PA.

### **2.2.3 Conclusions and Follow-up Actions:**

NRC and DOE staff discussed monitoring conducted under the CERCLA program for the INTEC facility. NRC staff made two recommendations for DOE to consider in its decision to update the PA. NRC staff recommended that the PA reflect the results of simulations performed and additional documentation generated during the NDAA consultation process to answer NRC staff inquiry regarding the cause and performance impact of the significant lateral spread of the contaminant plume emanating from the TFF to the south (e.g., caused by pressure gradient from BLR seepage and resulted in up to a factor of 10,000 decrease in contaminant concentrations emanating from the tank farm facility for relatively mobile [non-sorbing] constituents such as Tc-99 and I-129). NRC staff also recommended that DOE consider (in its decision to update the PA) recent data collected under the CERCLA program that appears to be inconsistent with the DOE PA modeling results with respect to the impact of BLR flow on contaminant fate and transport at the INTEC TFF. NRC staff recommends that DOE should consider the new information in the next update to its PA maintenance plan.

### **3.0 PARTICIPANTS:**

#### NRC Observation Team

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Heath, Maurice  
Suber, Gregory

#### Idaho Department of Environmental Quality

LaRue, Bruce

#### Partial List of DOE Representatives

Shaw, Robert (Mark)  
Butterworth, Steve  
Forbes, Jeff  
Gray, Douglas  
Harris, Trent  
Long, Jeff

#### **4.0 REFERENCES:**

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