DOE/ID-11362

Final Removal Action Report for Test Area North 607A and 607

September 2008

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Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This Final Removal Action Report describes the actions that were taken under the non-time-critical removal action recommended in the *Action Memorandum for Decommissioning of TAN-607A* as evaluated in the *Engineering Evaluation/Cost Analysis (EE/CA) for Decommissioning of TAN-607A* and *Action Memorandum for Decommissioning of TAN-607 Hot Shop Area* as evaluated in the *Engineering Evaluation/Cost Analysis (EE/CA) for Decommissioning of TAN-607 Hot Shop Area*. These removal actions consisted of removing TAN-607A area and TAN-607 Hot Shop aboveground structures and components, removing belowground components, such as sumps, pipes, and trenches, removing certain structural walls to 3 ft below grade, ensuring that materials left in place met the remedial action objectives, filling excavated areas, grading the area, and initiating revegetation.

This work also included final actions taken to implement the remedy for V-tanks area sites as identified in the *Final Record of Decision for Test Area North Operable Unit 1-10* and subsequent Amendments and Explanation of Significant Differences.

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EE/CA	Engineering Evaluation/Cost Analysis
FFA/CO	Federal Facility Agreement and Consent Order
HWMA	Hazardous Waste Management Act
ICDF	Idaho CERCLA Disposal Facility
INL	Idaho National Laboratory
PCB	polychlorinated biphenyl
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
TAN	Test Area North
TSF	Technical Support Facility

Final Removal Action Report for Test Area North 607A and 607

1. INTRODUCTION

1.1 Purpose and Objective

This Final Removal Action Report describes the actions that were taken under the non-time-critical removal actions recommended in the following documents:

- *Action Memorandum for Decommissioning of TAN-607A* (DOE-ID 2006) as evaluated in the *Engineering Evaluation/Cost Analysis (EE/CA) for Decommissioning of TAN-607A* (ICP 2006)

- *Action Memorandum for Decommissioning of TAN-607 Hot Shop Area* (DOE-ID 2007a) as evaluated in the *Engineering Evaluation/Cost Analysis (EE/CA) for Decommissioning of TAN-607 Hot Shop Area* (DOE-ID 2007b).

This report demonstrates that actions taken met, and were consistent with, the remedial action objectives (RAOs) of the *Final Record of Decision for the Test Area North, Operable Unit 1-10* (DOE-ID 1999) and supports the overall remediation goals established through the Federal Facility Agreement and Consent Order (FFA/CO) for Waste Area Group 1 (DOE 1991). Waste Area Group 1 is located at Test Area North (TAN).

1.2 Scope

The scope of the proposed removal actions encompassed the manufacturing and maintenance areas in TAN-607A and all of the TAN-607 Hot Shop Area. The EE/CAs were prepared to assist the Department of Energy Idaho Operations Office (DOE-ID) in identifying the most effective method for decommissioning the structures that had completed their missions. TAN-607A and TAN-607 were located at TAN Technical Support Facility (TSF) within the Idaho National Laboratory (INL) Site. The non-time-critical removal action approach satisfied environmental review requirements and provided for stakeholder involvement, while providing a framework for selecting the decommissioning end states. The non-time-critical removal action approach also established an Administrative Record for documentation of the implemented actions.

1.3 Removal Action Objectives

The RAOs for the TAN-607A and TAN-607 areas, as identified in the applicable Action Memorandums, were as follows: Reduce risk from external radiation exposure to a total excess cancer risk of less than 1 in 10,000 for a hypothetical resident at 2095 and the current and future worker. Per the Operable Unit 1-10 Record of Decision, TAN is expected to be under the control of the government until 2095. In addition, general Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) protectiveness standards at the INL Site are implemented to:

- Prevent future releases to the Snake River Plain Aquifer that may result in migration of contaminants to the aquifer such that drinking water maximum contaminant levels may be exceeded

- Ensure that cumulative excess cancer risks from multiple contaminants of concern remain less than 1 in 10,000 for a hypothetical resident at 2095.

The TAN-607A and -607 removal actions implemented to achieve the RAOs are described in Section 3 of this document.

1.4 Facility Background and Description

Test Area North was established in the 1950s by the U.S. Air Force for the Atomic Energy Commission Aircraft Nuclear Propulsion Program to support nuclear-powered aircraft research. Upon termination of this research, TAN structures were redirected to support a variety of Department of Energy (DOE) research projects. TAN-607A and TAN-607 were constructed from 1955 to 1957. The TAN-607 TSF was separated into functional areas: TAN-607A to the south and the TAN-607 Hot Shop to the north. Figure 1 shows an exterior view of the TAN-607 complex, and Figure 2 shows an interior view. The TAN-607 complex included the hot shop, warm shop, hot cell and annex, storage pool, engine maintenance and large machine shops, high bay assembly shop, chemical cleaning, decontamination room, and office/administrative areas on the second floor (east side of TAN-607A).

Figure 1. TAN-607A and TAN-607 looking northeast.

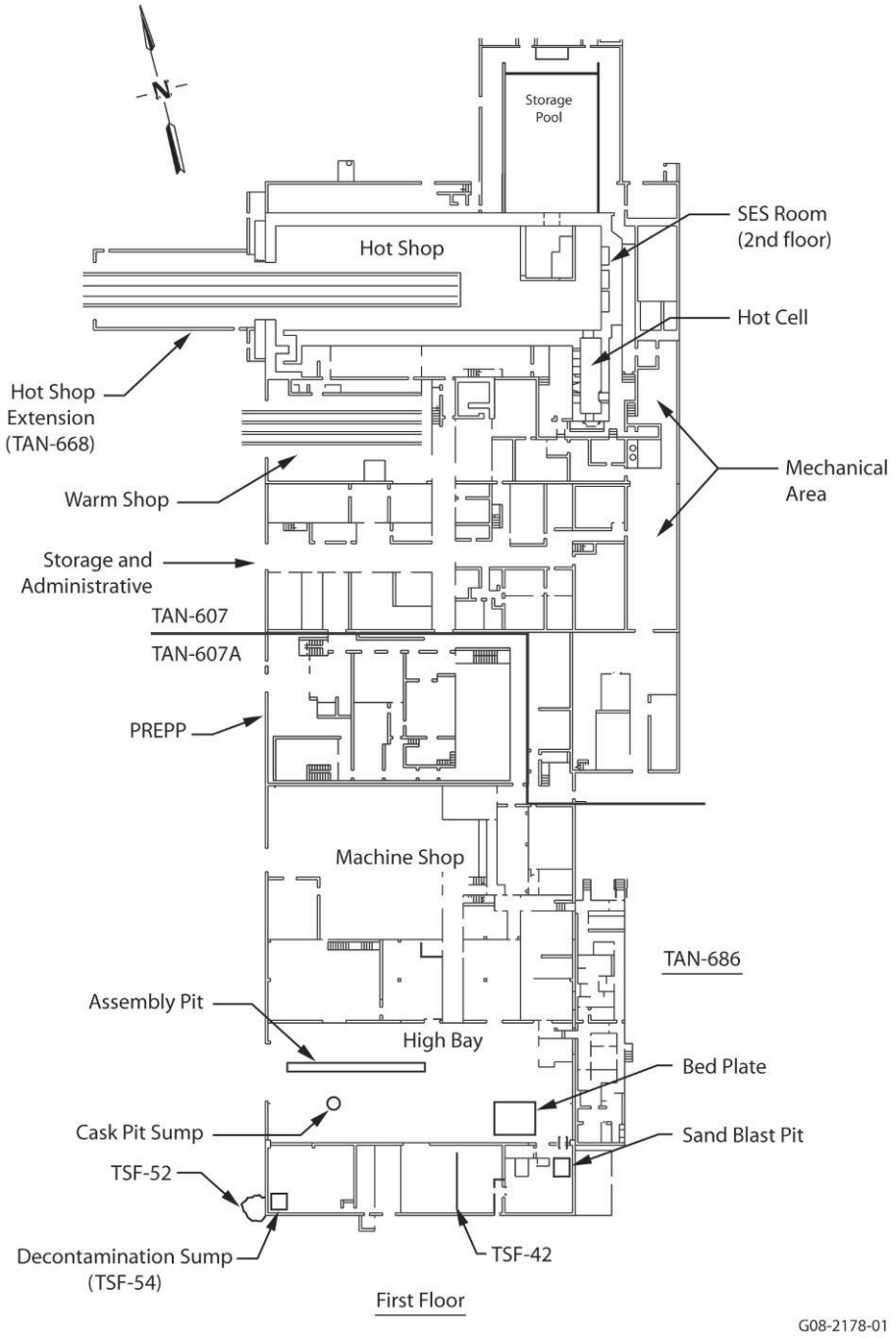

Figure 2. Interior view of TAN-607A and TAN-607.

1.4.1 TAN-607A

The southern portion of TAN-607, referred to as TAN-607A, was an expansion to the original building and was added in 1957. TAN-607A served as the Aircraft Nuclear Propulsion Program's main decontamination center. This area included the engine maintenance and large machine shops, high bay assembly shop, chemical cleaning (decontamination) room, and office/administrative areas on the second floor (east side of TAN-607A). In 1983–84, a portion of the area within TAN-607A was redesigned to support the Process Experimental Pilot Plant Project. The Process Experimental Pilot Plant's mission was to demonstrate a full-scale method for processing transuranic waste into an acceptable form for disposal in the Waste Isolation Pilot Plant (Idaho 2004). However, the Process Experimental Pilot Plant never

treated actual waste and was closed under the Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA) in 2000.

TAN-607A was built on a concrete slab at grade. The only belowgrade portions in TAN-607A were the decontamination room sump, cask pit sump, assembly pit, sand blast pit, and bed plate. Second story portions of TAN-607A included the office/administrative areas and the second floor added to support the Process Experimental Pilot Plant Project.

1.4.2 TAN-607

TAN-607, also known as TSF, was constructed between 1955 and 1957. TAN-607 is the original portion of the TSF and included the hot shop/hot shop extension/special equipment service room, storage pool and vestibule, hot cell, warm shop, and other support areas, including administrative, storage, and mechanical.

The hot shop was a 50- × -165-ft concrete-shielded high bay with a 55-ft ceiling. Large overhead manipulators, three wall-mounted manipulators, and remote handling equipment were located in the bay for radioactive materials operations. The hot shop walls and ceiling were constructed of reinforced concrete. Shielded operating galleries were located at two elevations outside the north and south walls of the hot shop and included viewing windows for remote operations.

The hot shop extension provided a waiting area for trucks and components entering the hot shop and was also used for temporary storage of waste and other materials.

The special equipment service room was an extension of the hot shop on the east side. The special equipment service room floor level was 13 ft above the hot shop floor level and was used for shielded maintenance of the overhead crane and manipulators.

The 24-ft-deep storage pool was used for underwater storage of fissile and radioactive materials. A passageway under the north hot shop wall connected the storage pool to the storage pool vestibule that was located in the hot shop. The water and all spent nuclear fuel items stored in the storage pool were removed before the removal action. The walls and floors of the storage pool and vestibule were cleaned and sealed to control the spread of radiological contamination.

The hot cell, formerly known as the Radioactive Materials Laboratory, was located adjacent to the southeastern corner of the hot shop. The hot cell was a typical hot cell that was used for conventional remote physical and chemical inspections and tests. The hot cell was a 10- × 35- × 20-ft-high cell constructed with 4-ft-thick high-density concrete walls.

The warm shop was originally used as an assembly area for nonradioactive components and complete nuclear systems and functioned as a cold assembly area. When the TAN-607A High Bay Area became operational, the warm shop was then used for assembly and maintenance of low-activity radioactive components, as well as for receiving and staging of contained hot assemblies and components waiting for processing in the hot shop, hot cell, or hot cell annex. The welding shop and carpentry shop were both located in the warm shop.

2. REMOVAL ACTION WORK ACTIVITIES

The actions addressed under this removal action were consistent with the following:

- Alternative 1 described in the *Engineering Evaluation Analysis (EE/CA) for Decommissioning of TAN-607A* (ICP 2006)
- Alternative 3 described in the *Engineering Evaluation/Cost Analysis (EE/CA) for Decommissioning of TAN-607 Hot Shop Area* (DOE-ID 2007b).

2.1 Transition of Federal Facility Agreement and Consent Order Actions to TAN-607A and TAN-607 Removal Actions

In accordance with the Federal Facility Agreement and Consent Order (FFA/CO) (DOE 1991) between DOE-ID, the Idaho Department of Environmental Quality, and the U.S. Environmental Protection Agency, the *Remedial Action Report for the OU 1-10 Sites at Test Area North, WAG 1* (DOE-ID 2008a) was prepared to document completion of remedial actions for Waste Area Group 1, Operable Unit 1-10, Group 1, 2, and 3 sites within TAN at the INL Site. The report summarized actions taken to implement the remedy for each site, as identified in the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999) and the subsequent Amendment and Explanation of Significant Differences (DOE-ID 2004).

The Operable Unit 1-10 Remedial Action Report concluded that the majority of remedial actions for Waste Area Group 1, Group 1, 2, and 3 sites identified in the Record of Decision were completed. However, area conditions and collocated work activities resulted in transitioning remedial actions for a segment of the Group 2 area of contamination to the non-time-critical removal action for the TAN-607 Hot Shop. Specifically, this transition resulted from physical limitations associated with encroachment on the TAN-607 facility, which made specific areas inaccessible for remediation as part of the V-Tank Project. The remaining remedial action was completed in accordance with the Operable Unit 1-10 Remedial Action Report in compliance with the Amendment and Explanation of Significant Differences to the Final Record of Decision for TAN Operable Unit 1-10.

The Operable Unit 1-10 Remedial Action Report identified the boundary between the Group 2 sites, where remediation and confirmation sampling were completed under the V-Tanks Project, and those areas requiring remediation under the TAN-607 Hot Shop non-time-critical removal action. Areas requiring further remediation included parts of TSF-09/18 and TSF-53. Because of ongoing decontamination and dismantlement associated with the TAN-607 Hot Shop, the transitioned scope also included backfilling, final grading, and establishing and implementing institutional controls for the entire remediated V-tanks site. This approach was discussed and later confirmed in the January 11, 2007, agency conference call.

Transition of scope was formalized in the TAN 607 Hot Shop EE/CA (DOE-ID 2007b) and Action Memorandum (DOE-ID 2007a). As identified in these documents, radiologically contaminated debris that meet RAOs (i.e., contaminated with less than 23.3 pCi/g Cs-137) was left in the excavation created from demolishing TAN-607 and the adjacent void remaining after completing Operable Unit 1-10 V-tanks soil remediation (i.e., TSF-09/18, TSF-46/48, and TSF-53 sites). The Action Memorandum also required disposing of radiologically contaminated debris that did not meet RAOs in the Idaho CERCLA Disposal Facility (ICDF) or at an off-site disposal location. Nonradiologically contaminated and nonhazardous waste were disposed of at the TAN Demolition Landfill. Upon completion of demolition, the remaining void was backfilled with inert soil material, graded to meet the natural contour of the area, and seeded to preclude weed infestation or soil erosion.

The scope in the Operable Unit 1-10 Remedial Action Report to be transitioned to the TAN-607 Hot Shop non-time-critical removal action was specifically identified in Appendix D, "Prefinal Inspection Checklists for Operable Unit 1-10, Group Sites." The applicable checklists are Checklist D-1, "Site: TSF-53, TAN-633 Site Remediation" and Checklist D-4, "Sites: TSF-09/18 V-Tank Removal and Site Remediation, and TSF-46/47/48 V-Tank Area New Sites Remediation,." Appendix A contains excerpts from Checklists D-1 and D-4 addressed under the TAN-607 Hot Shop non-time-critical removal action.

2.2 Demolition Activities Associated with Non-Time-Critical Removal Actions

Before the Action Memorandum was approved, deactivation and decontamination were performed in TAN-607A and TAN-607 Hot Shop. These activities began in 2005 under National Environmental Policy Act documentation and facilitated the removal actions. The actions taken before the Action Memorandum was approved included asbestos abatement, decontamination of accessible abovegrade radioactively contaminated structures, and utility isolation. Two HWMA/RCRA interim status units that were located in TAN-607A were closed in 2000. These two interim status units were the Process Experimental Pilot Plant incineration unit and the Process Experimental Pilot Plant waste stabilization unit. In 2005, a third HWMA/RCRA closure in TAN-607A was completed for a sump and associated piping in the decontamination room.

2.2.1 TAN-607A Activities

The Action Memorandum for TAN-607A was approved by the agencies in September 2006 (DOE-ID 2006). The TAN-607A facility contained the Process Experimental Pilot Plant, engine maintenance and large machine shops, high bay assembly shop, chemical cleaning room, decontamination shop, sandblast pit, and office/administrative areas on the second floor (east side of TAN-607A). Demolition activities for TAN-607A were conducted in stages. Appendix B contains pictures of the progression of the removal activities for TAN-607A.

Alternative 1 was the chosen approach for the removal action, as documented in the TAN-607A Action Memorandum. Alternative 1 consisted of removing TAN-607A aboveground structures and components, removing belowground components, such as sumps and trenches, removing structural walls to 3 ft below grade, removing residual radiological and nonradiological contamination, and filling the void to grade with clean solid inert material. In addition, three CERCLA sites (TSF-42, TSF-52, and TSF-54) were to be remediated, if possible. The specific components of Alternative 1 were as follows:

- Isolate utilities from TAN-607 (Hot Shop)
- Remove equipment, ducting, and piping
- Remove any loose contamination or components with fixed contamination
- Remove contaminated piping
- Collapse entire structure and remove debris
- Remove slab and all sumps
- Remediate Sites TSF-42, TSF-52, and TSF-54
- Backfill area with clean soil.

The following paragraphs discuss how each of these activities was addressed.

Utilities were isolated and the majority of equipment, ducting, and piping were removed during the deactivation and decontamination phase. Following deactivation and decontamination, only minor amounts of radiological contamination existed in the decontamination shop and chemical cleaning room. The only nonradiological constituents were in the decontamination shop sump addressed as CERCLA Site TSF-54. The decontamination shop and chemical cleaning room were decontaminated and demolished initially, leaving only a slab. The radiologically contaminated debris was disposed of in ICDF. Nonradiological, nonhazardous debris was disposed of in the TAN Demolition Landfill.

The upper portions of the high bay, machine shop, and the Process Experimental Pilot Plant were sheathed in transite siding. The siding contained nonfriable asbestos and had to be removed piece by piece to ensure that it did not break and become friable. The siding was wrapped with heavy plastic and disposed of in the Central Facilities Area Landfill and TAN Demolition Landfill. After the siding and internal equipment and components were removed, the internal framework structure was demolished. The only areas below grade in TAN-607A were the cask pit sump, sandblast sump, assembly pit, bed plate, and decontamination sump. The decontamination sump was identified as CERCLA Site TSF-54 and is addressed in Section 3.1. The cask pit sump, sandblast sump, bed plate, and assembly pit were removed and backfilled with solid inert material.

After the TAN-607A superstructure was demolished and debris removed, the three CERCLA sites located at the south end of TAN-607A (TSF-42, -52, and -54) were remediated and characterized to ensure they met the RAOs. These three CERCLA sites are addressed in Section 3.1.2. The area was backfilled, contoured, and seeded to establish vegetation to preclude erosion and noxious weed growth.

2.2.2 TAN-607 Hot Shop

The Action Memorandum for TAN-607 was approved by DOE, Environmental Protection Agency, and Idaho Department of Environmental Quality in May 2007 (DOE-ID 2007a). TAN-607 was the original portion of the TSF and included the hot shop/hot shop extension/special equipment service room, storage pool and vestibule, hot cell, warm shop, and other support areas, including administrative, storage, and mechanical. Extensive deactivation and decontamination activities were completed prior to demolition of the TAN-607 Hot Shop Area. Appendix C contains pictures of the progression of the TAN-607 removal activities.

Alternative 3 was the chosen approach for the removal action, as documented in the TAN-607 Action Memorandum. This alternative consisted of demolishing the TAN-607 aboveground structures and components, removing belowground noninert components (e.g., wood products), and removing the radiologically contaminated debris that did not meet RAOs. Radiologically contaminated debris that did meet the RAOs was to be left in the excavation created from demolishing TAN-607 and the adjacent void created by the V-Tanks Soil Removal Project. Radiologically contaminated debris that did not meet the RAOs was to be disposed of in ICDF. Nonradiologically contaminated and nonhazardous waste were to be disposed of at the TAN Demolition Landfill subject to meeting the Waste Acceptance Criteria. If waste did not meet the TAN Demolition Landfill or ICDF Waste Acceptance Criteria, a suitable off-Site disposal location was to be used (e.g., EnergySolutions). Upon completion of demolition, the remaining void was to be backfilled with solid inert material, graded to meet the natural contour of the area, and reseeded. The following paragraphs discuss how each of these activities was addressed for the various areas of the TAN-607 Hot Shop.

The support areas consisted of administrative offices, storage, and mechanical areas. An example of the mechanical area is the equipment room that housed the demineralized water system tanks, air cleaning tanks, and tanks associated with the boiler system. Following deactivation and decontamination, the support areas did not contain radioactive or hazardous components, and these areas were demolished and disposed of in the TAN Demolition Landfill.

The warm shop was originally used as an assembly area for nonradioactive components and complete nuclear systems and functioned as a cold assembly area. When the TAN-607A High Bay Area became operational, the warm shop was then used for assembly and maintenance of low-activity radioactive components, as well as for receiving and staging of contained hot assemblies and components waiting for processing in the hot shop, hot cell, or hot cell annex. A welding shop and carpentry shop were housed in the warm shop prior to demolition. Following deactivation and decontamination, the warm shop did not contain radioactive or hazardous components and was demolished and disposed of in the TAN Demolition Landfill.

The 24-ft-deep storage pool was used to store fissile and radioactive materials underwater. All spent nuclear fuel items that were stored in the storage pool were removed prior to initiation of the removal action. The water had also been removed, and the walls and floors of the storage pool and vestibule were previously cleaned and sealed to control the spread of radiological contamination. Consistent with the chosen alternative as documented in the TAN-607 Hot Shop Action Memorandum, the storage pool walls and floor were removed and disposed of in ICDF. The south wall adjacent to the storage pool vestibule was left in place, but the first few inches of the wall that were radiologically contaminated were removed and disposed of in ICDF. Following removal of the walls and floor, 20 scans were taken of the soil at a depth of approximately 24 ft bgs. These results were incorporated into Engineering Design File (EDF)-6686, "Post Remediation Risk Evaluation and Data Summary Report for TSF-09/18/21, TSF-46/47/48, TSF-53 and Partial TSF-06 Area 1 Soil Remediation Sites." Results of this evaluation and the institutional controls that have been established for this area are discussed in Section 2.3.4.

The hot shop was a 50- × -165-ft concrete-shielded high bay with a 55-ft ceiling and contained manipulators and remote equipment used for handling radioactive materials. Shielded operating galleries were located at two elevations outside the north and south walls of the hot shop. The hot shop extension provided a waiting area for trucks and components entering the hot shop. The special equipment service room was an extension of the hot shop on the east side and was used for shielded maintenance of the overhead crane and manipulators. Following extensive characterization, the hot shop and special equipment service equipment and related materials were removed and disposed of in ICDF. The hot shop extension was removed and disposed of in ICDF. Areas inside the hot shop were decontaminated to predetermined levels. Lead, asbestos and other nonradiological materials were removed and disposed of based on the waste determination documentation. The hot shop was demolished using explosives, and demolition debris that did not meet the RAOs was disposed of in ICDF. As allowed in the TAN-607 Hot Shop EE/CA (DOE-ID 2007b) and Action Memorandum (DOE-ID 2007a), debris that met the RAOs was used as fill material in the excavated area from the V-tanks and TAN-607 storage pool.

The hot cell was the final structure above grade to be addressed under the TAN-607 Hot Shop removal action. The hot cell was demolished, and the debris was disposed of in ICDF.

Following removal of the hot shop abovegrade structures, the radiologically contaminated portions of the remaining slab were removed and disposed of in ICDF. Lines in and under the hot shop slab were addressed under the Voluntary Consent Order (Monson 2000). These lines were removed, characterized, treated to meet the RCRA land disposal restriction and Toxic Substances Control Act requirements, and shipped to the Nevada Test Site for disposal.

2.3 Final Status

Actions under the approved Action Memorandum began in September 2006, and all removal actions were successfully completed in June of 2008. Figures 3 and 4 contain before and after pictures of the TAN-607A and TAN-607 Hot Shop areas.

2.3.1 Completion of Removal Actions

As identified in the Action Memorandum, following demolition actions, the TAN-607A and TAN-607 Hot Shop areas (including the void left from the V-tank activities) were backfilled with solid inert material and then graded to match the natural contour of the area. Radiological and land surveys were completed of the final graded area. The radiological survey was completed using a high purity germanium (HPGe) detector with a 78% relative efficiency. Figure 5 shows the final gamma survey results. Figure 6 shows the final land survey area. The final step was to seed the area with a native vegetative cover. The seeding was completed on June 9, 2008.

Figure 3. Aerial view of TAN-607A and TAN-607 Hot Shop prior to demolition.

Figure 4. Aerial view of former location of TAN-607A and TAN-607 Hot Shop.

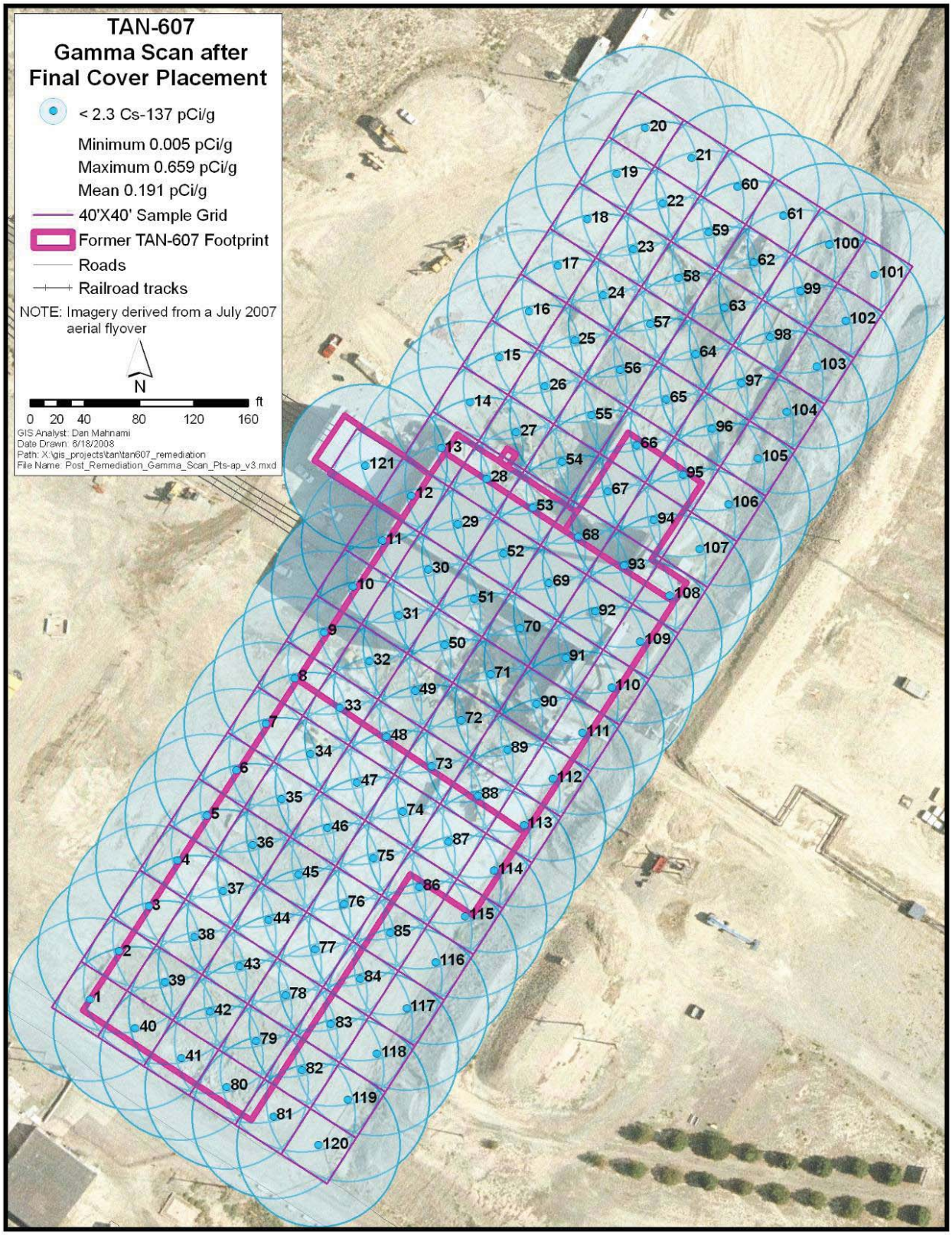

Figure 5. Final gamma scan results after cover placement.

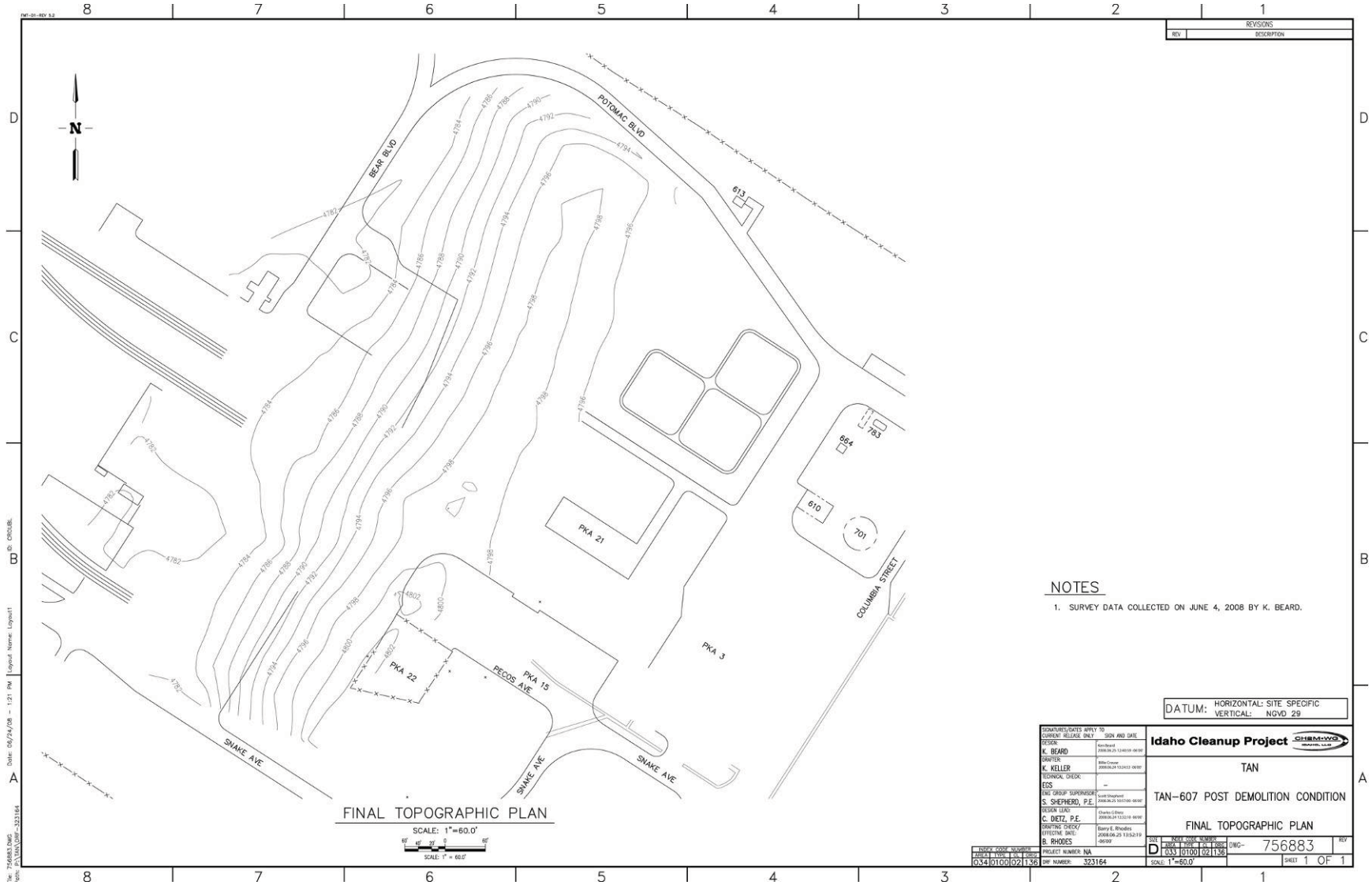

Figure 6. Final land survey of TAN-607A and TAN-607 Hot Shop.

2.3.2 Waste Disposition

The volume of waste dispositioned as part of this non-time-critical removal action is as follows:

- Radiologically contaminated waste dispositioned in ICDF: 23,960 yd^3
- Nonradiological/nonhazardous waste dispositioned in the TAN Demolition Landfill and Idaho Nuclear Technology and Engineering Center CERCLA Demolition Landfill: 23,440 yd^3
- Transite siding dispositioned in TAN and Central Facilities Area Landfills: 5,740 yd^3
- Mixed low-level waste dispositioned off-Site: 520 yd^3
- Nonradioactive friable asbestos waste dispositioned in the Central Facilities Area Landfill: 128 yd^3
- Hazardous waste dispositioned off-Site: 45 yd^3
- Nonradioactive polychlorinated biphenyl (PCB) waste dispositioned off-Site: 13 yd^3.

2.3.3 Cost

Total project cost for demolition activities associated with implementing the TAN-607A and TAN-607 Hot Shop non-time-critical removal actions was $19,885,000.

2.3.4 Institutional Controls

According to the TAN-607A and TAN-607 Hot Shop EE/CAs and Action Memorandums, if new release sites were encountered during the removal action process, the sites would be remediated as part of the removal action or would be indentified as new sites to be addressed under the FFA/CO. No new sites were identified to be remediated under the removal action or to be addressed under the FFA/CO.

As discussed in Section 2.1, the Operable Unit 1-10 Remedial Action Report concluded that the majority of remedial actions for Waste Area Group 1, Groups 1, 2, and 3 sites identified in the Record of Decision was completed. However, area conditions and collocated work activities resulted in transitioning remedial actions for part of the Group 2 area of contamination to the non-time-critical removal action for the TAN-607 Hot Shop. Specifically, this transition resulted from physical limitations associated with encroachment on the TAN-607 facility, which made specific areas inaccessible by V-Tanks Project personnel. The Operable Unit 1-10 Remedial Action Report identified the boundary between the Group 2 site, where remediation and confirmation sampling were completed under the V-Tanks Project, and those areas requiring remediation under the TAN-607 Hot Shop non-time-critical removal action. Areas requiring further remediation included parts of TSF-09/18 and TSF-53. Because of ongoing decontamination and dismantlement associated with the TAN-607 Hot Shop, the transitioned scope also included backfilling, final grading, and establishing and implementing institutional controls for the entire remediated V-tanks site. The combined institutional controls for the remaining Operable Unit 1-10 sites and the residual contamination from the TAN-607 removal action are discussed in the following paragraphs.

Institutional controls are intended to protect human health by preventing exposure to contaminants or hazardous substances, and to protect the environment by preventing migration of contaminants and hazardous substances left in place following remedial actions. This section provides a review of the institutionally controlled areas identified following the completion of the Operable Unit 1-10 remedial actions presented in the *Remedial Action Report for the OU 1-10 Sites at Test Area North, WAG 1*

(DOE-ID 2008a). It also identifies the institutional controls required following the TAN-607 removal action, which also included portions of the Operable Unit 1-10 sites.

Following Operable Unit 1-10 remedial actions, field sampling identified areas where contamination remains at depths greater than 10 ft bgs. For this deep soil contamination area, the 95% upper confidence limit of the mean was calculated to be 20.42 pCi/g, which is below the 23.3-pCi/g remediation goal identified in the Operable Unit 1-10 Record of Decision. It is, however, above the free release level and therefore requires institutional controls to satisfy commitments made to the agencies following issuance of the Final Record of Decision. Using the 20.42-pCi/g concentration, the calculated institutional control period for the deep contamination is 94.7 years (EDF-6686). Therefore, from September 2007 when the final samples were collected, institutional controls should remain in effect until June 2102. Figure 7 shows the soil contamination levels remaining at the end of the Operable Unit 1-10 remedial activities and delineates the two institutional control populations (shallow and deep).

Following completion of the TAN-607 removal action, final sampling identified minor contamination in the northeastern portion of the TAN-607 pool area at depths greater than 10 ft bgs. The mean CS-137 concentration for samples from the deep portion of the TAN-607 removal action was 19.25 pCi/g, with a 95% upper confidence limit (EDF-6686). This is slightly below the 20.42-pCi/g concentration of residual Cs-137 in the deep soil of the Operable Unit 1-10 excavation. As a result, the two deep institutional control areas were combined. The deep soil excavation areas from TAN-607 are included in the institutional control boundary for the Operable Unit 1-10 deep soil excavation area, without impacting the institutional control period of 94.7 years. Figure 8 shows the boundary of this combined area.

Although the Operable Unit 1-10 remedial actions, completed in 2007, successfully removed soil contamination greater than the remediation goals identified in the Operable Unit 1-10 Record of Decision, Cs-137-contaminated soil remained in the upper 10-ft soil horizon at concentrations greater than the free release level of 2.33 pCi/g. Gamma scan values collected over this area were used to determine a 95% upper confidence limit of 4.75 pCi/g for the shallow contamination area (EDF-6686). Following completion of the Operable Unit 1-10 remedial action and in conjunction with the decontamination and dismantlement of the TAN 607 complex, the location of the TAN-607 pool and the Operable Unit 1-10 excavation area north of the building were utilized during the TAN-607 removal action to dispose of demolition debris at concentrations up to the Operable Unit 1-10 remediation goals. Soil samples and characterization data of the debris in both the shallow and deep excavation areas were evaluated following the TAN-607 removal action. The 95% upper confidence limit from the data collected from the shallow portion of the TAN-607 removal action was 5.05 pCi/g. This is slightly above the 4.75-pCi/g concentration of residual Cs-137 that remained in the shallow portion of the Operable Unit 1-10 excavation. Therefore, the institutional control period for the combined Operable Unit 1-10 and TAN-607 shallow remediation sites was conservatively based on the 5.05-pCi/g concentration and was calculated to be 33.7 years (EDF-6686). Because the TAN-607 removal action debris placement was completed in April 2008, institutional controls for the combined shallow excavation areas should be maintained until January 2042.

In addition to the shallow and deep excavation areas, Cs-137 remains at concentrations above the free release level at the location of the shallow excavation at site TSF-54. The maximum residual Cs-137 concentration at TSF-54 is 4.5 pCi/g. Although this site is not contiguous with the shallow excavation areas, the entire footprint of the TAN-607 building (including site TSF-54) will be administratively included within the shallow excavation area to accommodate implementation of institutional controls. Therefore, the entire footprint will be subject to institutional controls for 33.7 years, or until January 2042 (see Figure 8).

In summary, institutional controls will be implemented at two areas where the residual Cs-137 concentration remains greater than the free release level following the Operable Unit 1-10 remedial action

and the TAN-607 removal action. These areas include a deep contamination area (greater than 10 ft bgs) where institutional controls will be maintained for 94.7 years, and a shallow contamination area (less than 10 ft bgs) where institutional controls will be maintained for 33.7 years.

Institutional controls will include the following:

- Controlling disturbances at the sites, including drilling and excavation into contaminated soil or buried debris by following internal procedures related to soil disturbances and completing a notice of soil disturbance

- Maintaining site boundary information in the Institutional Control Site database (recording site coordinates, maintaining maps)

- Posting warning signs consistent with current signage used at other institutionally controlled sites

- Conducting an annual inspection to address noxious weeds, soil erosion, and that proper site drainage has been maintained; appropriate actions will be taken to address any items identified during the annual inspection.

Additional details are discussed in the *INL Sitewide Institutional Controls and Operations and Maintenance Plan for CERCLA Response Actions* (DOE-ID 2008b).

Figure 7. Soil contamination levels remaining at the end of the Operable Unit 1-10 remedial activities (Source: EDF-6686).

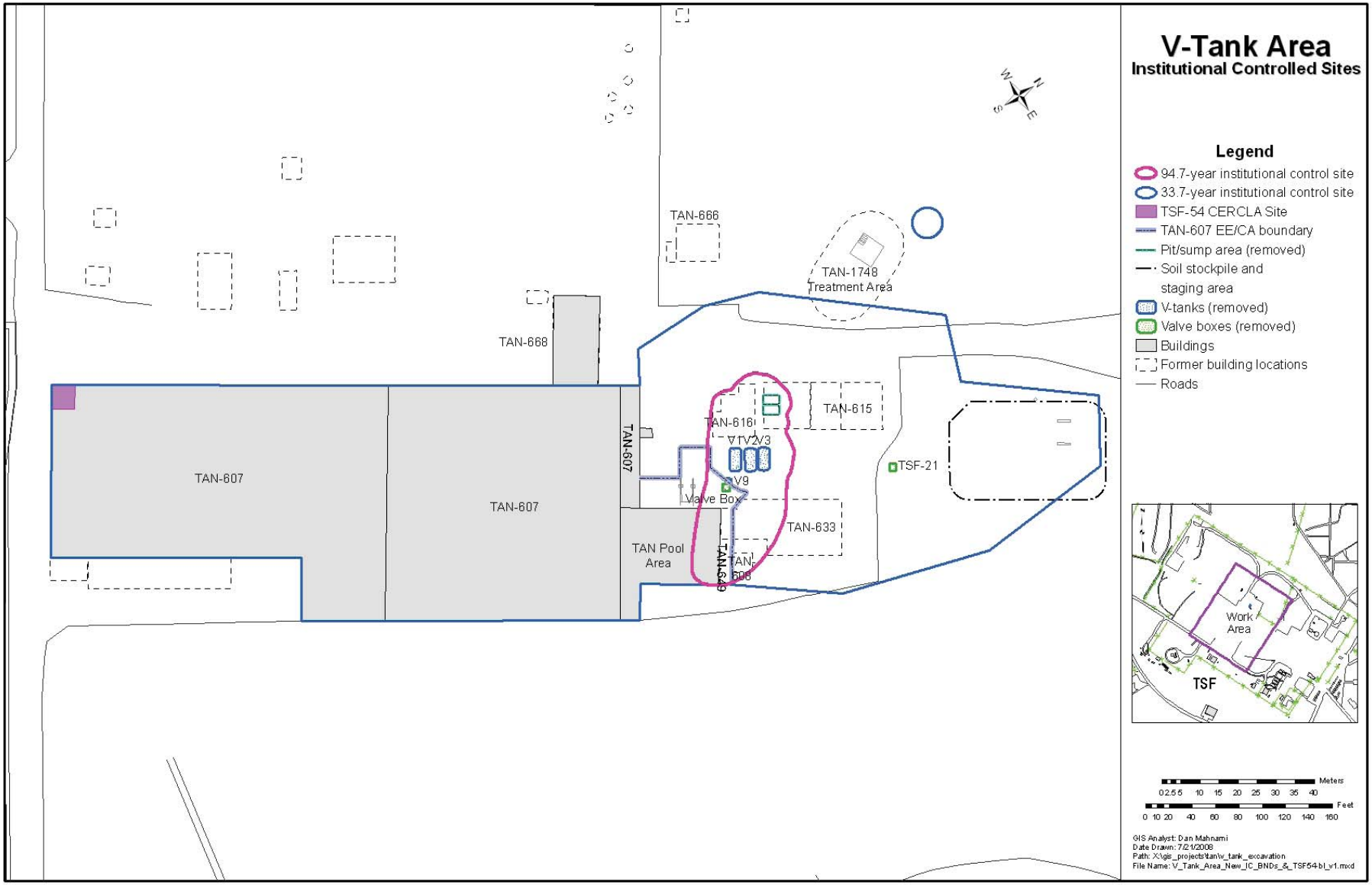

Figure 8. Institutional control sites.

3. ACHIEVING REMOVAL ACTION OBJECTIVES

Implementing this removal action was consistent with the RAOs established in the Operable Unit 1-10 Record of Decision (DOE-ID 1999). As such, the removal action was consistent with and will contribute to the overall closure of TAN under CERCLA (42 USC § 9601 et seq.). The RAO identified in Section 4.2 of the Action Memorandums (DOE-ID 2006, 2007a) was to reduce the risk from external radiation exposure from Cs-137 to a total excess cancer risk of less than 1 in 10,000 for a hypothetical resident 100 years in the future from the year 1995 and the current and future worker. Per the Operable Unit 1-10 Record of Decision, TAN will be under the control of the government until at least 2095. In addition, at the INL Site, the standard for protecting the Snake River Plain Aquifer is to prevent any release that could result in exceedances of the maximum contaminant level and ensure that the site is available for unrestricted use in the future. The RAOs were met as identified in the following subsections.

3.1 TAN-607A

Following deactivation and decontamination activities at TAN-607A, only minor amounts of radiological contamination existed in the decontamination shop and chemical cleaning room. The only known nonradiological constituents were in the decontamination shop sump addressed as CERCLA site TSF-54.

3.1.1 TAN-607A Radiological Contamination

All radiological contamination in the TAN-607A portion of the building was remediated to less than the final remediation goals. The majority of the TAN-607A area measured less than 2.3 pCi/g, except one sample that measured 4.54 pCi/g located approximately 6 feet below grade in the former location of the decontamination room sump.

3.1.2 CERCLA Sites TSF-42, TSF-52, and TSF-54

TSF-42 was the site of a pipe known to be internally radiologically contaminated. The pipe was surrounded by concrete and was located under the floor of Room 161 (the chemical cleaning room) in TAN-607A. Under the FFA/CO process, TSF-42 was identified as a No Action site in 1993; however, the FFA/CO (DOE 1991) indicated the TSF-42 site would be remediated when the TAN-607A facility was decommissioned. The pipe was removed when the slab for the southern portion of TAN-607A was removed. The pipe was intact and was found to be a 3-in.-diameter pipe instead of a 6-in.-diameter pipe as identified in the documentation for TSF-42. After the pipe was removed, visual inspection and radiological surveys of the area indicated that there were no releases to the soil. The pipe was disposed of in ICDF. Therefore TSF-42 was completely remediated under the TAN-607A removal action.

Based on previous characterization activities and removal of other items under deactivation, the known nonradionuclide inventory in TAN-607A was confined to the decontamination room sump in the southwestern portion of the building. The 600-gallon sump was HWMA/RCRA closed under the Voluntary Consent Order in 2005. As part of the HWMA/RCRA closure, soil samples were collected from beneath the TAN-607A decontamination room sump to evaluate the potential for release of contaminants because the integrity of the sump structure could not be confirmed. As part of the HWMA/RCRA closure, the decontamination sump was backfilled, and a cover was placed over the soils. As required in the HWMA/RCRA closure plan for the decontamination room sump, a risk assessment (ICP 2005) was performed to determine if the residual contamination posed an unacceptable risk that requires further actions. The RCRA risk assessment identified an unacceptable risk, and therefore, the area was identified and included in the FFA/CO as TSF-54 for future CERCLA actions. TSF-54 was remediated under the TAN-607A removal action by removing soil down to a depth of at least 12 feet and disposing of the soil in ICDF. Soil in the TSF-54 area was sampled for radiological and nonradiological contamination. Radiological contamination was less than the final remediation goal of 23.3 pCi/g, with

the highest reading of 4.54 pCi/g. Nonradiological contamination at the former TSF-54 site is addressed below.

CERCLA Site TSF-52 was located outside the decontamination room door on the west side of the southwestern corner of TAN-607A. The site was discovered in 2005 while completing the HWMA/RCRA closure activities for the decontamination room. Historical information indicated that there was at least one release from the firewater system in the decontamination room. The firewater system was located next to the overhead door, and the falling water could have easily leaked under the door, resulting in the soil contamination discovered during excavation. The agencies agreed that this release site would be included under the FFA/CO. However, as documented in the TAN-607A Action Memorandum, the site was to be remediated under the removal action because it was adjacent to TAN-607A. TSF-52 was remediated under the TAN-607A removal action by removing soil and disposing of the soil in ICDF. Following soil removal, the soil in the bottom of the excavation was sampled. Radiological contamination was less than the final remediation goal of 23.3 pCi/g, with the highest reading of 1.45 pCi/g.

A nonradiological contamination risk assessment was completed from the TSF-52 and TSF-54 sampling data (ICP 2008). The risk assessment followed a two-step process. The first step screened the soil contamination source term against soil screening levels using *Screening Levels for Chemical Contaminants* (EPA 2008a). The second step performed risk calculations on those contaminants not screened out in the first step. The risk was assessed for a 30-year resident and an industrial worker.

The residential scenario assumed someone would build a house at the site of the removal action in 2095. The scenario assumed a person would live at the site for 30 years, including 6 years of childhood, while being exposed to external radiation and to contamination by ingesting soil, inhaling fugitive dust, and ingesting contaminated fruits and vegetables grown around the house.

The industrial worker scenario assessed an adult worker by assuming exposure occurs during an 8-hour work day, 5 days per week, 50 weeks per year for 25 years. Exposure pathways considered under this scenario are identical to those evaluated for the residential exposures, omitting pathways for ingesting homegrown produce.

For the nonradiological source term, only arsenic and Aroclor-1260 were not screened out and were assessed for risk. The Environmental Protection Agency's acceptable lifetime cancer risk to an individual exposure to carcinogens ranges between 10E-4 and 10E-6. The risk assessment demonstrated that the removal action was effective in ensuring that the remaining nonradiological constituents from these areas do not pose a risk to human health and the environment, with the highest risk calculated to be for an industrial worker from arsenic at 1E-05 and from Aroclor-1260 at 2E-06.

3.2 TAN-607 Hot Shop

As identified in the TAN-607 Action Memorandum, radiological debris that did not meet the RAOs was removed from the area and disposed of in ICDF. In addition, the TAN-607 Action Memorandum allowed that slightly radiologically contaminated structures and debris that met RAOs as defined in the *Record of Decision Amendment for the V-Tanks (TSF-09 and TSF-18) and Explanation of Significant Differences for the PM-2A Tanks (TSF-26) and TSF-06, Area 10, at Test Area North, Operable Unit 1-10* (DOE-ID 2004) would be left in the excavation created from demolition and the void remaining after completing the V-Tanks Soil Removal Project. Extensive radiological monitoring was conducted to ensure that debris left in the excavation met the RAOs.

During final preparations for completion of the demolition of the TAN-607 Hot Shop, a review of potential nonradiological materials that had not been previously removed was completed. Extensive nonradiological characterization, decontamination, and removal had been conducted for the TAN-607 Hot

Shop, which included potential HWMA/RCRA and Toxic Substances Control Act materials. All potential HWMA/RCRA closure issues were addressed through the Voluntary Consent Order. All mercury switches, circuit boards, ballasts, fluorescent tubes, and other nonradiological materials were removed. In addition, approximately 500,000 pounds of accessible lead was removed and sent off-Site for RCRA treatment and disposal.

The TAN-607 Hot Shop EE/CA (DOE-ID 2007b) and Action Memorandum (DOE-ID 2007a) did not address a nonradiological source term because those materials were expected to be completely removed during the deactivation phase. The only nonradiological materials that remained at the TAN-607 Hot Shop prior to final demolition were a small amount of PCB bulk product waste in the upper portion of the paint and approximately 40 kg of incidental lead. Because the incidental paint and lead were at elevations up to 55 feet high, concerns were raised regarding worker safety in removing these materials. The agencies were contacted, and it was determined that this small amount of nonradiological material could be left in the excavation created from demolition of the TAN-607 Hot Shop and the adjacent void remaining after completion of the V-Tanks Soil Removal Project. This decision was based on an evaluation of the potential risk to human health and the environment and the determination that this incidental amount of nonradiological material would not impact meeting the RAOs established for this removal action.

All of the lead bricks, sheeting, shot, and debris were removed from the Hot Shop and sent off-Site for RCRA treatment and disposal. Approximately 40 kg of incidental lead remained, consisting of lead expansion anchors embedded in the 7-foot-thick concrete walls. Past assessments demonstrated that up to 40 kg of lead would not contribute to the risk and would not impact meeting the RAOs. In addition, leaving up to 40 kg of incidental lead was consistent with what was documented in the Engineering Test Reactor, Materials Test Reactor, and Power Burst Facility EE/CAs.

A sensitivity analysis was conducted for the bulk product PCB paint to remain using the assumptions in the TAN-607 Hot Shop EE/CA groundwater model (EDF-7515). The results of the sensitivity analysis indicated that the predicted peak aquifer concentration from the bulk product PCB paint was 3.3E-6 mg/L (3.3E-3 mg/m^3), the time to peak was 6,100 years, and the concentration would be 0.66% of the maximum contaminant level of 0.5 mg/m^3. The PCB sensitivity analysis was conservative because only one paint sample from the Hot Shop was positive for PCBs, and the estimate used for the sensitivity analysis assumed that all of the TAN-607 Hot Shop walls were contaminated to that level. The sensitivity analysis demonstrated that this small amount of bulk product PCB paint would not impact meeting the RAOs. In addition, the final placement of a cover and reseeding meet the substantive requirements for a nonmunicipal landfill and the disposal requirements for bulk product PCB waste under 40 CFR 761.62(c).

3.3 Radiological Surveys Prior to Placement of Final Cover

Gamma surveys were conducted throughout the TAN-607A and TAN-607 Hot Shop removal action process. A high purity germanium (HPGe) detector with a 78% relative efficiency was used to complete the scans. If the area was not radiologically contaminated, portions of the concrete slab were left in place. If the concrete slab was contaminated, it was either cleaned to meet the RAOs or removed. All areas of the former TAN-607A and TAN-607 Hot Shop measured less than 23.3 pCi/g. These results were included in the data used to establish institutional controls in the area and are addressed in Section 2.3.4.

4. LESSONS LEARNED

Throughout the implementation of the removal action, challenges and problems were encountered that were not foreseen during the planning and scheduling phases. The following subsections present some of the issues encountered during the implementation of the removal action and the corrective actions taken to resolve them.

4.1 Demolition of TAN-607

Transporting rubble to the TAN Demolition Landfill by the traditional route was an issue due to the distance and interaction with pedestrian traffic. The issue was resolved by using an alternative route to the TAN Demolition Landfill that was shorter and avoided pedestrian traffic areas.

The exact location of TSF-42 was not known because of discrepancies in the drawings. This issued was resolved when the slab was removed and the pipe was located. Once located, the final removal of the TSF-42 pipe did not pose any problems.

Lines addressed in the Voluntary Consent Order contained elemental mercury and had elevated radiation readings. Although cameras were used to determine the nature of contaminants in the pipes, the mercury was not initially detected. The lines were removed by sealing them on both ends and sizing them over multiple layers of containment and absorbent to reduce potential for spills. Lines were removed, and potential contamination was addressed under the scope of the Voluntary Consent Order.

4.2 Waste Disposition

The radiological technicians' use of a gamma scan resulted in the release of more potentially radiologically contaminated debris than was originally estimated. As a result, the adjacent TAN Demolition Landfill was used for a significant portion of the demolition waste. Using a polymeric barrier system as a lock-down fixative reduced the cost of size reduction and cost and number of waste containers. Using a processor for handling large debris pieces eliminated time consuming hoisting and rigging.

During the removal action, a process was implemented to ship oversized debris and components (such as silo racks, 25-ft structural beams, and large tanks) to ICDF. This process, while still meeting the ICDF waste acceptance criteria, reduced workers' exposure to industrial and radiological hazards because they did not have to reduce the size of the debris and components. This process also decreased the disposal cost and contributed to completing the removal action ahead of schedule. In addition, new waste containers were developed and used, which handled larger capacity loads during the transfer of waste to the disposal facilities.

5. REFERENCES

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Appendix A

Excerpts from Checklists D-1 and D-4 from Test Area North Operable Unit 1-10 Sites Remedial Action Report

Excerpts from Checklist D-1 from Test Area North Operable Unit 1-10 Sites Remedial Action Report

SITE: TSF-53, TAN-633 SITE REMEDIATION

Checklist D-1.

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	The TSF-53, TAN-633 area soil remediation is being performed under the Operable Unit (OU) 1-10 selected remedy for the TSF-09/18 V-tanks. This approach was identified and agreed to by the Agencies in the "New Site Identification Form for TSF-53, TAN-633 Area Soil," approved August 2006. Where the remedy steps below refer to V-tanks piping, they will be applied in the same manner to piping within the TAN-633 area. Due to excavation limitations, a defined area along the south boundary of the TSF-53 site (adjacent to the north wall of the TAN-607 pool), will be addressed under the *Action Memorandum for Decommissioning of TAN-607 Hot Shop Area*, as documented in Agency conference call minutes, 11/30/06. This scope will include soil removal, confirmation sampling, and disposal. Due to ongoing deactivation, decontamination, and decommissioning (D&D) activities in this area, final backfill, grading, and posting of institutional controls for the V-tanks area, including TSF-53 will also be conducted under the TAN-607 non-time-critical remedial action (NTCRA) as documented in the Voluntary Consent Order (VCO) and Idaho Department of Environmental Quality (DEQ) conference call meeting minutes of 2-1-07. Definition of this area is included in this remedial action report. Requirements for completion of specific checklist items by the TAN-607 NTCRA Project are noted below.	Action Memorandum	Implemented as stated.	Yes		See below.

Checklist D-1. (continued).

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
Selected Remedy Summary "Soil and Tank Removal, Chemical Oxidation/Reduction with Stabilization of Tank Contents, and Disposal"						
	(Remedy components listed below are only those applicable to TAN-633 site remediation.)	All requirements below are from the 2004 Record of Decision (ROD) Amendment/ Explanation of Significant Differences (ESD) (DOE-ID 2004)	Summary only. See remainder of checklist for detailed completion statements/records.	NA	NA	
	(9) Excavating contaminated soil: • Excavating contaminated soil that exceeds the final remediation goal (FRG) to a maximum of 3 m (10 ft) below ground surface (bgs) • Excavating additional soil below 3 m (10 ft) bgs to the extent necessary to remove the V-tanks and associated piping.		Implemented as stated.	Yes		Soil was excavated as necessary to gain access to the TAN-607 Pool and was removed to a depth consistent with the existing V-Tank excavation
	(10) Disposing of the contaminated soil at an approved soil repository.		Implemented as stated.	Yes		Minor volume of soil bounding the TAN-607 Pool Area North foundation wall was removed and disposed in the ICDF.
	(11) Performing post-remediation soil sampling to verify FRGs are met to determine the need for institutional controls, and to analyze for additional contaminants if excavation indicates a release of the V-tanks contents. Clarified as follows:		Implemented as stated.	Yes		Following excavation of soil, the area was surveyed to determine if radiological contamination was present.
	(a) For contaminated soil less than 3 m (10 ft) bgs, perform post-remediation sampling to verify FRGs are met.		Implemented as stated.	Yes		All soil above 10 ft BGS was excavated. Debris placed in the void was verified to be less that the FRG of 23.3 pCi/g.

Checklist D-1. (continued).

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	(b) For contaminated soil more than 3 m (10 ft) bgs, perform post-remediation sampling to determine the need for institutional controls.		Implemented as stated.	Yes		Twenty scans were taken of the soil following excavation at a depth of approximately 24 ft BGS. These results were incorporated into EDF-6686, Post Remediation Risk Evaluation and Data Summary Report for TSF-09/18/21, TSF-46/47/48. TSF-53 and Partial TSF-06 Area 1 Soil Remediation Sites. Results of this evaluation indicated a gamma distribution for this new data. The results found that even though four of the 20 Cs- 137 concentrations were above 23.3 pCi/g, the 95% UCL on the mean for Cs-137 within this area was only 19.25 pCi/g. This is slightly below the 20.42 pCi/g concentration of residual Cs-137 in the deep soil excavation area of the OU 1-10 excavation. As a result, the deep soil excavation areas resulting from the TAN-607 NTCRA can be included in the institutional control boundary for OU 1-10 deep soil excavation areas, without needing to modify the previously-established institutional control period of 94.7 yrs.
	(12) Filling the excavated area with clean soil and then contouring and grading to the surrounding elevation.		Implemented as stated.	Yes		As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area. Following backfilling, the area was graded to the surrounding contours.

Checklist D-1. (continued).

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	(13) Establishing and maintaining institutional controls consisting of signs, access controls, and land-use restrictions, depending on the results of post-remediation sampling. Institutional controls will be required if residual contamination precludes unrestricted land use after completion of remedial action. Remediation area will be managed as part of TAN industrial complex. Revegetation for the cover of the TAN-607A and TAN-607 Hot Shop Area was completed as identified in the TAN-607 Hot Shop EE/CA. Noxious weed growth will be monitored as part of Operations and Maintenance (O&M) Plan and controlled by the Long-Term Stewardship (LTS) program.		Implemented as stated.	Yes		Institutional controls will be implemented at two areas where the residual Cs-137 concentration remains in excess of the free release level following the OU 1-10 remedial action and the TAN-607 removal action. These areas include an area of deep contamination (greater than 10 ft bgs) where institutional controls will be necessary for 94.7 years, and a shallow area of contamination (less than 10 ft bgs) where institutional controls will be maintained for 33.7 years. Institutional controls will include controlling disturbances at the sites, including drilling and excavation into contaminated soil or buried debris; maintaining site boundary information in the Institutional Control Site database (recording site coordinates, maintaining maps); and posting warning signs. Additional details will be discussed in the Sitewide Institutional Controls and Operations and Maintenance Plan for CERCLA Response Actions. (DOE/ID-11042) The area was graded to meet the contours of the surrounding area and seeded to control noxious week growth.
Backfill of TAN-633 Area						
B-1	Photograph the excavation area, perform a land survey of the excavation, record the volume of contaminated soil removed from the excavation. (Note: This is not required by the RD/RAWP but provides documentation of completion for future reference.)	NA	Implemented as stated.	NA	NA	Photos and the final land survey have been taken and are included in the TAN-607A and TAN-607 Hot Shop Final Removal Action Report. Volumes of waste dispositioned under the TAN-607A and TAN-607 Hot Shop Final Removal Action Report.
B-2	Backfill excavated areas in approximately 8-in. lifts, compacting between each lift.	RD/RAWP Addendum 2, Section 6.2.18	Implemented as stated.	NA	NA	As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area.
B-3	Regrade the areas to promote drainage away from the area and away from adjacent buildings.	RD/RAWP Addendum 2, Section 6.2.18	Implemented as stated.	NA	NA	Following backfilling, the area was graded to the surrounding contours.

Checklist D-1. (continued).

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
B-5	Photograph and perform land survey of backfilled areas. (Note: This is not required by the RD/RAWP but provides documentation of completion for future reference.)	NA	Implemented as stated.	NA	NA	Photos and the final land survey have been taken and are included in the TAN-607A and TAN-607 Hot Shop Final Removal Action Report.
Final Site Completion and Prefinal Inspection						
D-1	Reestablish site access and institutional controls including CERCLA/radiological area controls and signage, as required and institutional control area signage, as required.	RD/RAWP Addendum 2, Section 6.2.23	Implemented as stated.	NA	NA	Institutional controls will be implemented at two areas where the residual Cs-137 concentration remains in excess of the free release level following the OU 1-10 remedial action and the TAN-607 removal action. These areas include an area of deep contamination (greater than 10 ft bgs) where institutional controls will be necessary for 94.7 years, and a shallow area of contamination (less than 10 ft bgs) where institutional controls will be maintained for 33.7 years. Institutional controls will include controlling disturbances at the sites, including drilling and excavation into contaminated soil or buried debris; maintaining site boundary information in the Institutional Control Site database (recording site coordinates, maintaining maps); and posting warning signs. Additional details will be discussed in the Sitewide Institutional Controls and Operations and Maintenance Plan for CERCLA Response Actions. (DOE/ID-11042) The area was graded to meet the contours of the surrounding area and seeded to control noxious week growth.

Checklist D-1. (continued).

Item No.	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	Pre Final Inspection Part 3 **Site Visit** **(After site backfill and recontouring)**	RD/RAWP Addendum 2, Section 6.2.25	Agency PFI site visit will be conducted under the TAN-607 NTCRA.	Yes	NA	The area was recontoured and seeded under the TAN-607A and TAN-607 hot shop EE/CA and Action Memorandum. DEQ and EPA visited the area several times during the removal action activities. In addition, final photographs of the area following backfill, recontouring, and seeding were reviewed by DEQ and EPA personnel on June 10, 2008, and were sufficient to verify that physical activities have been complete

Excerpts from Checklist D-4 from Test Area North Operable Unit 1-10 Sites Remedial Action Report

SITES: TSF-09/18 V-TANK REMOVAL AND SITE REMEDIATION, AND TSF-46/47/48 V-TANK AREA NEW SITES REMEDIATION

Checklist D-4.

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
Selected Remedy Summary "Soil and Tank Removal, Chemical Oxidation/Reduction with Stabilization of Tank Contents, and Disposal"						
	(Remedy components listed below are only those applicable to V-Tank Removal and Site Remediation.)	All requirements below are from the 2004 ROD Amendment/ESD.	Summary only. See remainder of checklist for detailed completion statements/records.	NA	NA	
	(9) Excavating contaminated soil: • Excavating contaminated soil that exceeds the FRG to a maximum of 3 m (10 ft) below ground surface (bgs) • Excavating additional soil below 3 m (10 ft) bgs to the extent necessary to remove the V-tanks and associated piping. Due to excavation limitations, a defined area along the east boundary of the TSF-09/18 site (adjacent to the west wall of the TAN-607 Pool), will be addressed under the *Action Memorandum for Decommissioning of TAN-607 Hot Shop Area,* (DOE/ID-11322) for Decommissioning of the TAN-607 Hot Shop Area, as documented in the Agency conference call minutes, November 30, 2006. This scope will include soil removal, confirmation sampling, and disposal. Due to ongoing D&D activities in this area, final backfill, grading, and posting of Institutional Controls (ICs) for the V-Tanks Area and V-Tanks Area New Sites site will also be conducted under the TAN-607 NTCRA as documented in the VCO/DEQ conference call meeting minutes of February 1, 2007. Definition of this area is included in this Remedial Action Report (RAR). Requirements for completion of specific Checklist Items by the TAN-607 NTCRA Project are noted below.		Implemented as stated.	Yes		Soil was excavated as necessary to gain access to the TAN-607 Pool and was removed to a depth greater than 10 ft BGS and was consistent with the existing V-Tank excavation.

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	(10) Disposing of the contaminated soil at an approved soil repository.		Implemented as stated.	Yes		Minor volume of soil bounding the TAN-607 Pool Area west foundation wall was removed and disposed in the ICDF.
	(11) Performing post-remediation soil sampling to verify FRGs are met to determine the need for institutional controls, and to analyze for additional contaminants if excavation indicates a release of the V-tanks contents. Clarified as follows:		Implemented as stated.	Yes		Following excavation of soil, the area was surveyed to determine if radiological contamination was present.
	(a) For contaminated soil less than 3m (10 ft) bgs, perform post-remediation sampling to verify FRGs are met.		Implemented as stated.	Yes		All soil above 10 ft BGS was excavated. Debris placed in the void was verified to be less that the FRG of 23.3 pCi/g.
	(b) For contaminated soil more than 3 m (10 ft) bgs, perform post-remediation sampling to determine the need for institutional controls.		Implemented as stated.	Yes		Twenty scans were taken of the soil following excavation at a depth of approximately 24 ft BGS. These results were incorporated into EDF-6686, Post Remediation Risk Evaluation and Data Summary Report for TSF-09/18/21, TSF-46/47/48. TSF-53 and Partial TSF-06 Area 1 Soil Remediation Sites. Results of this evaluation indicated a gamma distribution for this new data. The results found that even though four of the 20 Cs-137 concentrations were above 23.3 pCi/g, the 95% UCL on the mean for Cs-137 within this area was only 19.25 pCi/g. This is slightly below the 20.42 pCi/g concentration of residual Cs-137 in the deep soil excavation area of the OU 1-10 excavation. As a result, the deep soil excavation areas resulting from the TAN-607 NTCRA are combined with the institutional control boundary for OU 1-10 deep soil excavation areas and will be under an institutional control period of 94.7 yrs.
	(12) Filling the excavated area with clean soil and then contouring and grading to the surrounding elevation.		Implemented as stated	Yes		As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area. Following backfilling, the area was contoured and graded to the surrounding contours.

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	(13) Establishing and maintaining institutional controls consisting of signs, access controls, and land-use restrictions, depending on the results of post-remediation sampling. Institutional controls will be required if residual contamination precludes unrestricted land use after completion of remedial action. Remediation area will be managed as part of TAN industrial complex. Revegetation for the cover of the TAN-607A and TAN-607 Hot Shop Area was completed as identified in the TAN-607 Hot Shop EE/CA. Noxious weed growth will be monitored as part of O&M Plan and controlled by the LTS program.		Implemented as stated	Yes		Institutional controls will be implemented at two areas where the residual Cs-137 concentration remains in excess of the free release level following the OU 1-10 remedial action and the TAN-607 removal action. These areas include an area of deep contamination (greater than 10 ft bgs) where institutional controls will be necessary for 94.7 years, and a shallow area of contamination (less than 10 ft bgs) where institutional controls will be maintained for 33.7 years. Institutional controls will include controlling disturbances at the sites, including drilling and excavation into contaminated soil or buried debris; maintaining site boundary information in the Institutional Control Site database (recording site coordinates, maintaining maps); and posting warning signs. Additional details will be discussed in the Sitewide Institutional Controls and Operations and Maintenance Plan for CERCLA Response Actions. (DOE/ID-11042) The area was graded to meet the contours of the surrounding area and seeded to control noxious week growth.
South Site Area Remediation						
Phase 3 Soil Removal Under V-Tanks (Area 8)						
G-1	Conduct planned excavations to support tank removal with continuing excavations until site is visually and radiologically clean. (See Figure 4 for limits to excavation.) Note 1: If the visual examination and radiation survey performed during tank removal did not identify any areas of potential release, then further excavation below elevation 4,764 (phase two excavation limit) may not be required. Note 2: If the visual examination and radiation survey performed during tank removal did	RD/RAWP Addendum 2, Section 6.2.15, Figure 4, and Section 6.2.16	Soil excavation in the footprint of the V-tanks was completed in August 2006 to a depth of approximately 24 ft bgs (elevation 4,759). Excavation of the south side slope was completed in April 2007. ER-018-2007, pages 2 through 7. Per Agency agreement in 11-30-06 conference call, soil excavation for the east side slopes is transferred to	Yes		At part of the TAN-607 Hot Shop EE/CA, soil along the west wall of the TAN-607 Pool was excavated to approximately 24 ft bgs. No areas were identified as requiring additional excavation based on visual examination and radiation surveys.

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
	identify any areas of potential release, then further excavation will be performed to remove the soil in the area of release. Per Figure 4, "Excavate until visually and radiologically clean (less than 100 cpm above surrounding soils). Mitigating factors may limit extended excavations. (See Note 1.)" Note 3: Per Figure 4, Note 1, "Further excavation decision is an engineering judgment as well as a risk management decision. Excavate further if equipment with sufficient reach is readily available and further excavation would not jeopardize building foundations."		TSF-53, TAN-633 Area. Per Agency agreement in November 30, 2006 conference call, soil excavation along west wall of the TAN-607 Pool was transferred to the TAN-607 NTCRA and has been implemented as stated..			

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
Phase 3 Surface Soil South Site Area (Areas 7 and 13)						
J-3	Perform confirmation sampling wide area screen in accordance with the FSP to determine if the Cs-137 concentration is less than 23.3 pCi/g in the top 10 ft of soil bgs. Perform wide area gamma scan per FSP Section 4.1.4 and Table 3-1, Item 5.	RD/RAWP Addendum 2, Section 6.2.15, Figure 4, and Section 6.2.16 FSP, Section 4.1.4, Figure 4-1, Table 3-1 (Item 5)	Wide area gamma scans were performed in August 2005 with results below the FRG. Further wide area gamma scans were performed 12-6-06 with results below the FRG. These results covered all of the area except for a small portion in the southeast corner where assessment of VCO subunit 1 piping was still underway. The Agencies provided concurrence with the gamma scan results on 12-18 and 12-19-06. Gamma scans were completed for the V-Tanks and New Sites Area in July 2007 following minor soils removal from Areas 8 and 3. A comprehensive gamma scan for the entire area was compiled and presented to the Agencies for approval in August 2007. Approval was granted, closing out the Part 2 PFI for the V-Tanks and New Sites Areas as documented in the August 30, 2007 Agency conference call.	Yes		The small strip of soil along the west wall of the TAN-607 Pool Area was transitioned to the TAN-607 NTCRA for remediation. See description under item 11. b) above for results of the gamma scan for these areas.
Backfill of Middle Site Areas						
N-2	Backfill excavated areas in approximately 8-in. lifts, compacting between each lift.	RD/RAWP Addendum 2, Section 6.2.18	Completed 11-16-06. The southern edge of the middle area was intentionally left open to be utilized by the TAN-607 NTCRA.	Yes		As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area. Following backfilling, the area was graded to the surrounding contours.
N-3	Regrade the areas to promote drainage away from the area and away from adjacent buildings	RD/RAWP Addendum 2, Section 6.2.18	Completed 11-16-06. The southern edge of the middle area was intentionally left open to be utilized by the TAN-607 NTCRA.	Yes		As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area. Following backfilling, the area was graded to the surrounding contours.

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
Backfill of North Site Areas						
R-2	Backfill excavated areas in approximately 8-in. lifts, compacting between each lift.	RD/RAWP Addendum 2, Section 6.2.18	Completed 11-16-06.	Yes		As allowed in the Action Memorandum for the TAN-607 Hot Shop, debris that met the FRG was used as fill material for the excavated area. Following backfilling, the area was graded to the surrounding contours.
R-5	Photograph and perform land survey of backfilled areas. (Note: This is not required by the RD/RAWP but provides documentation of completion for future reference.)	NA	Completed in November 2006 for those areas backfilled under the WAG-1 Project. However, with on-going activities in the area, final topographic information of the post remediation site restoration will be conducted by the TAN-607 NTCRA.	Yes		Photos and the final land survey have been taken and are included in the TAN-607A and TAN-607 Hot Shop Final Removal Action Report.
Risk Assessment and Final Site Completion						
Risk Assessment						
Final Site Completion and Prefinal Inspection						
T-1	Reestablish site access and institutional controls including CERCLA/radiological area controls and signage, as required, and institutional control area signage, as required.	RD/RAWP Addendum 2, Section 6.2.23	Implemented as stated.	NA		Institutional controls will be implemented at two areas where the residual Cs-137 concentration remains in excess of the free release level following the OU 1-10 remedial action and the TAN-607 removal action. These areas include an area of deep contamination (greater than 10 ft bgs) where institutional controls will be necessary for 94.7 years, and a shallow area of contamination (less than 10 ft bgs) where institutional controls will be maintained for 33.7 years. Institutional controls will include controlling disturbances at the sites, including drilling and excavation into contaminated soil or buried debris; maintaining site boundary information in the Institutional Control Site database (recording site coordinates, maintaining maps); and posting warning signs. Additional details will be discussed in the Sitewide Institutional Controls and Operations and Maintenance Plan for CERCLA Response Actions. (DOE/ID-11042)

Checklist D-4. (continued).

Item No	Inspection Item	Requirement Reference	Completion Statement and/or Record	Satisfactory		Inspection Comments
				Yes	No	
						The area was graded to meet the contours of the surrounding area and seeded to control noxious week growth.
	Pre Final Inspection Part 3 **Site Visit** **(After site backfill and recontouring)**	RD/RAWP Addendum 2, Section 6.2.25	An Agency PFI site visit was conducted on January 17, 2007. DEQ representative (M. Clough) represented both the DEQ and EPA. DOE was also represented. At that time small portions of the south area required additional soil removal and the final wide area gamma scans. Excavation areas to be utilized under the TAN-607 NTCRA remained open. The middle and northern portions of the V-Tanks Area were backfilled and contoured to direct run-off from the open excavations. Following completion of the NTCRA scope, backfill will be completed and the entire area recontoured for comprehensive run-off control.	Yes	NA	The area was recontoured and seeded under the TAN-607A and TAN-607 hot shop EE/CA and Action Memorandum. DEQ and EPA visited the area several times during the removal action activities. In addition, final photographs of the area following backfill, recontouring and seeding were reviewed by DEQ and EPA personnel on June 10, 2008 and were sufficient to verify that physical activities have been complete.

Appendix B

Photographs of TAN-607A Demolition Progress

Appendix B

Photographs of TAN-607A Demolition Progress

Figure B-1. TAN-607A looking northwest - early stages of demolition.

Figure B-2. TAN-607A – demolition of southeastern corner.

Figure B-3. Demolition of TAN-607A decontamination room.

Figure B-4. Southern portion of TAN-607A demolished.

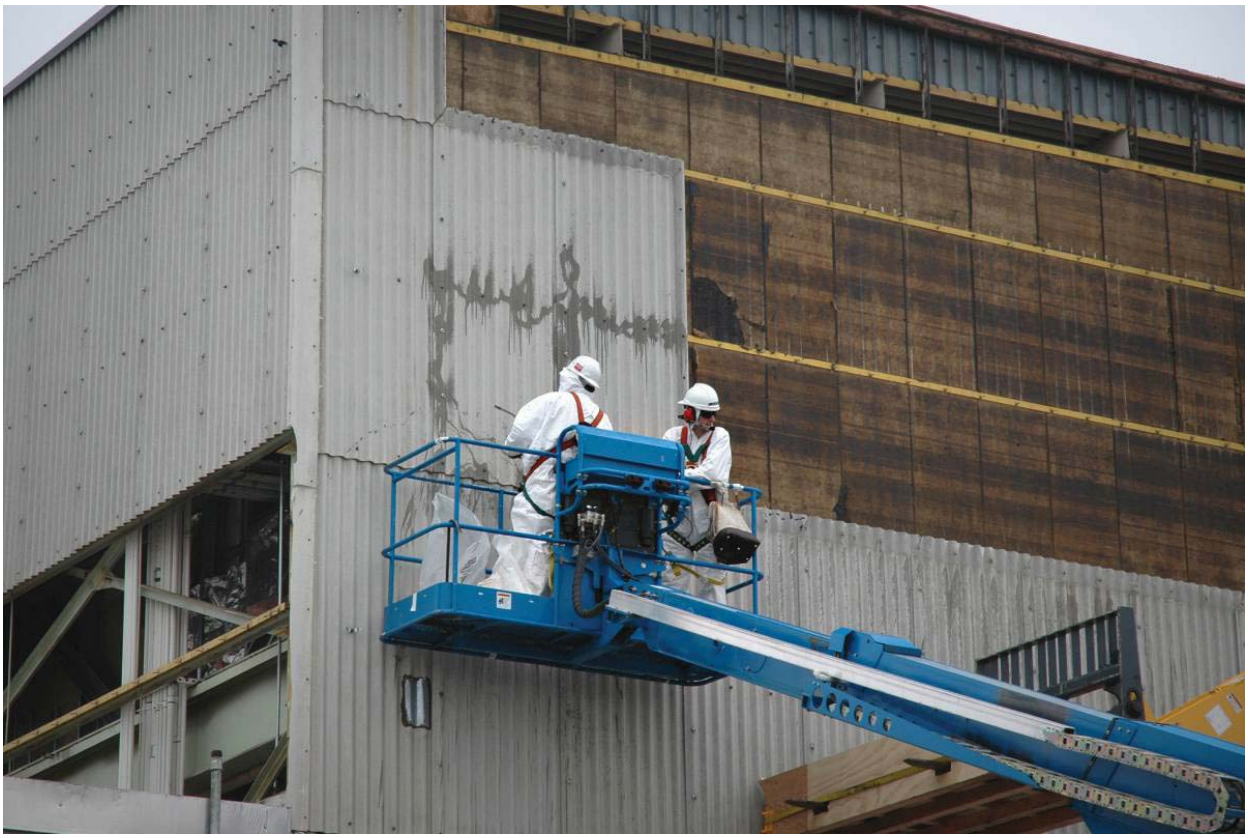

Figure B-5. Removal of transite siding from TAN-607A.

Figure B-6. Wrapped transite siding.

Figure B-7. TAN-607A looking southeast.

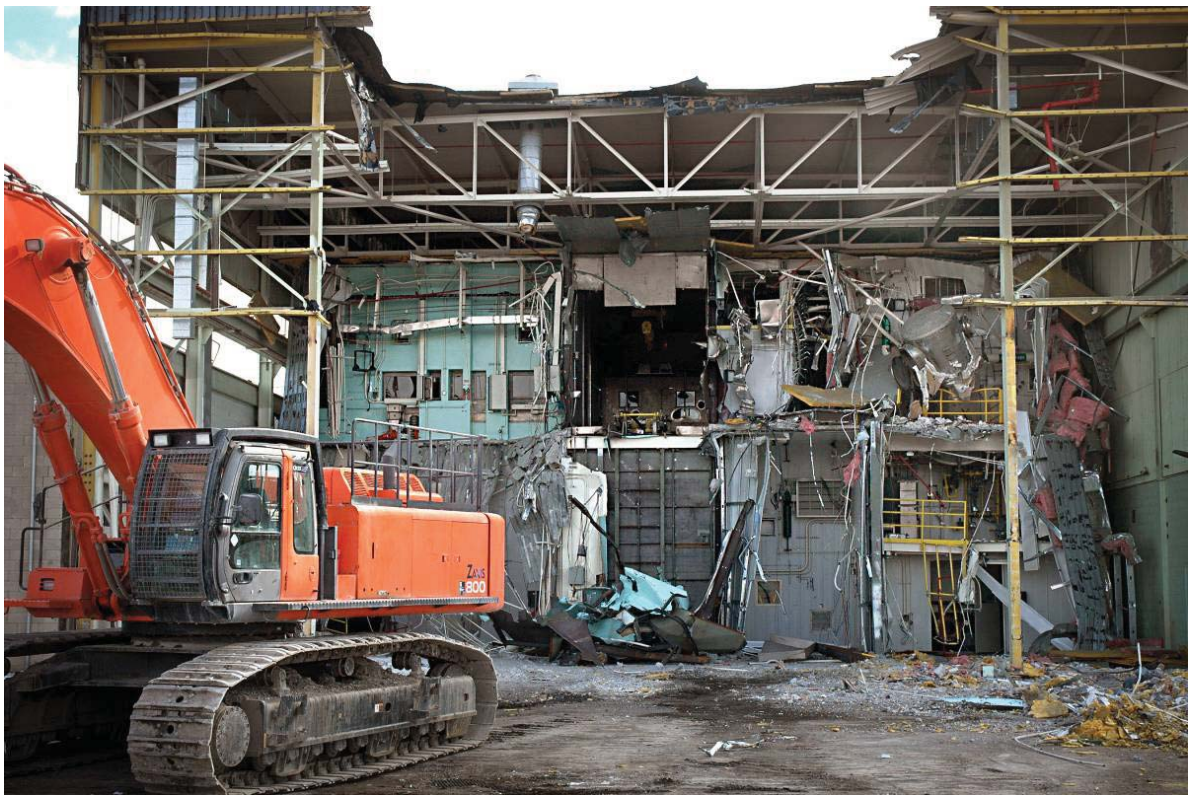

Figure B-8. Internal demolition of the Process Experimental Pilot Plant.

Figure B-9. Roof section demolition at Process Experimental Pilot Plant.

B-10. Mezzanine girder demolition.

Figure B-11. High bay.

Figure B-12. High bay demolition.

Figure B-13. Machine shop demolition.

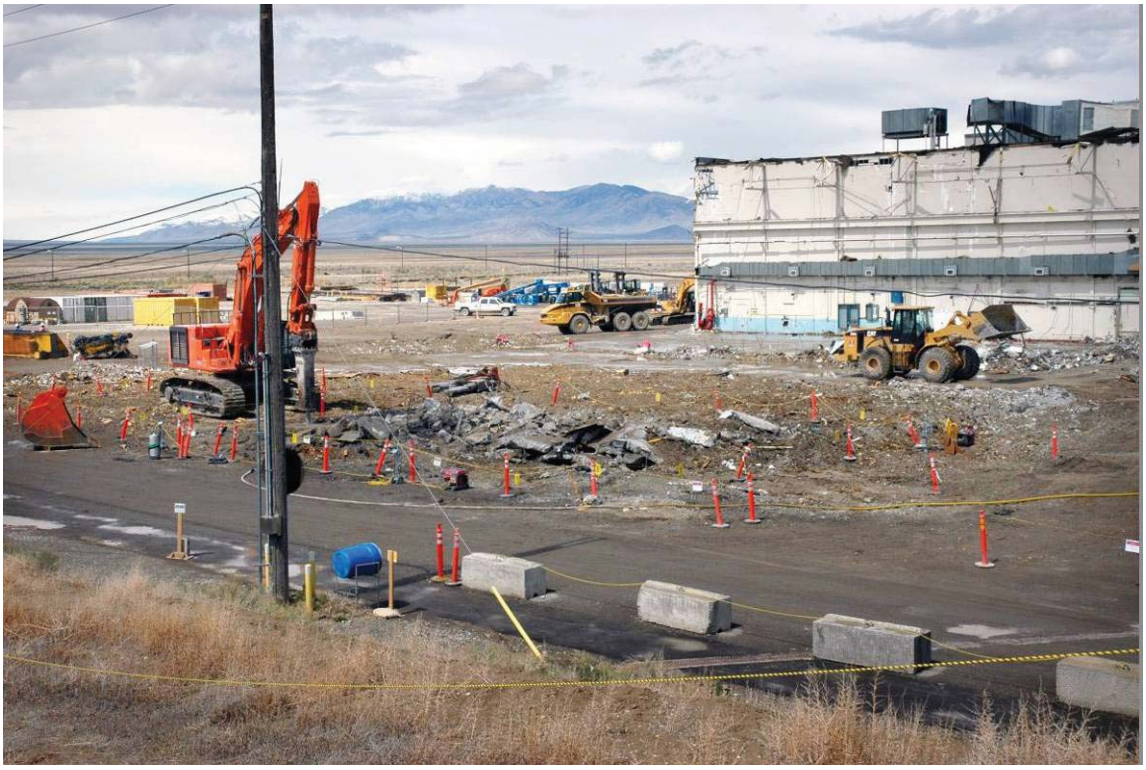

Figure B-14. TAN-607A demolition up to southern wall of TAN-607 storage and administration areas.

Figure B-15. Cask pit removal.

Figure B-16. TSF-52 soil remediation activities to ensure soils meet final remediation goals.

Figure B-17. Soil remediation activities in the former decontamination shop (TSF-54).

Appendix C

Photographs of TAN-607 Hot Shop Demolition Progress

Appendix C

Photographs of TAN-607 Hot Shop Demolition Progress

Figure C-1. Initial demolition of TAN-607 mechanical and administrative areas.

Figure C-2. Demolition of warm shop.

Figure C-3. Demolition of north operating gallery adjacent to hot shop.

Figure C-4. Demolition of south operating gallery adjacent to hot shop.

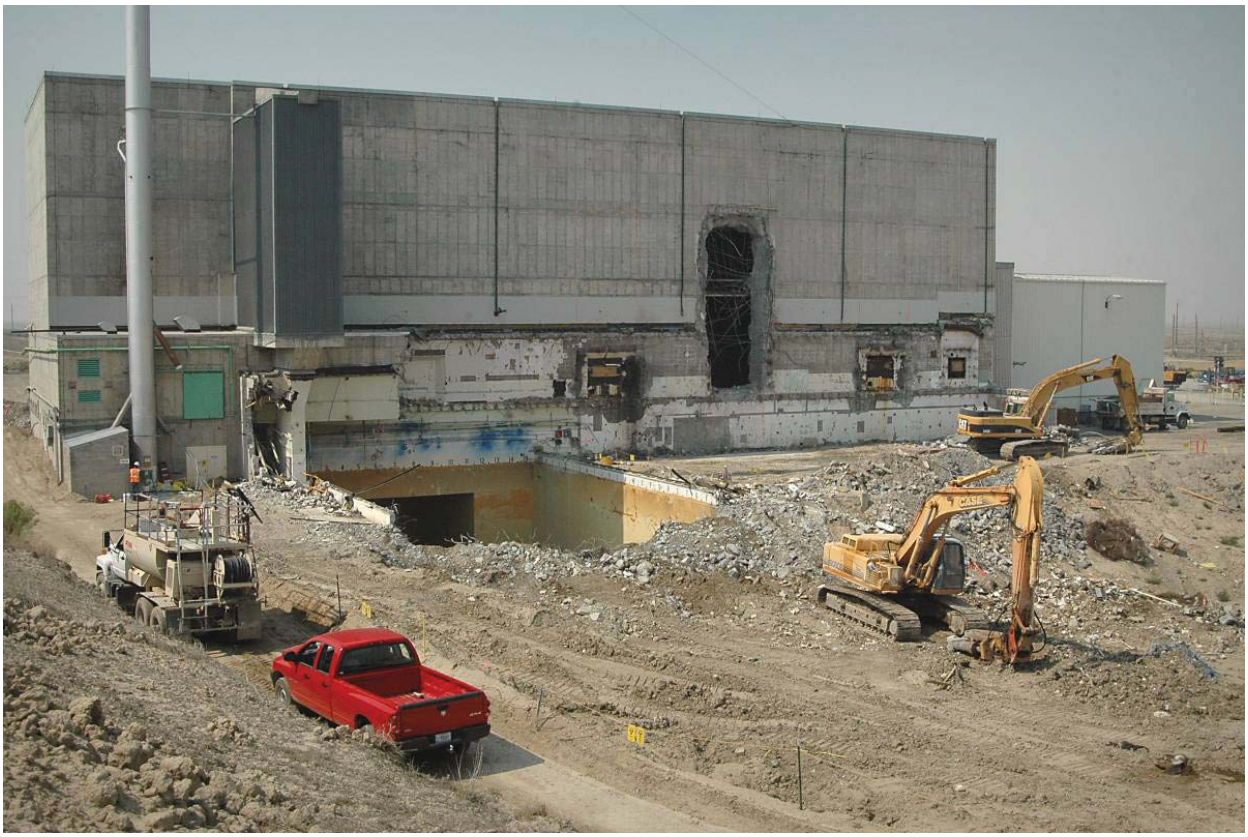

Figure C-5. Hot shop looking south with storage pool in foreground.

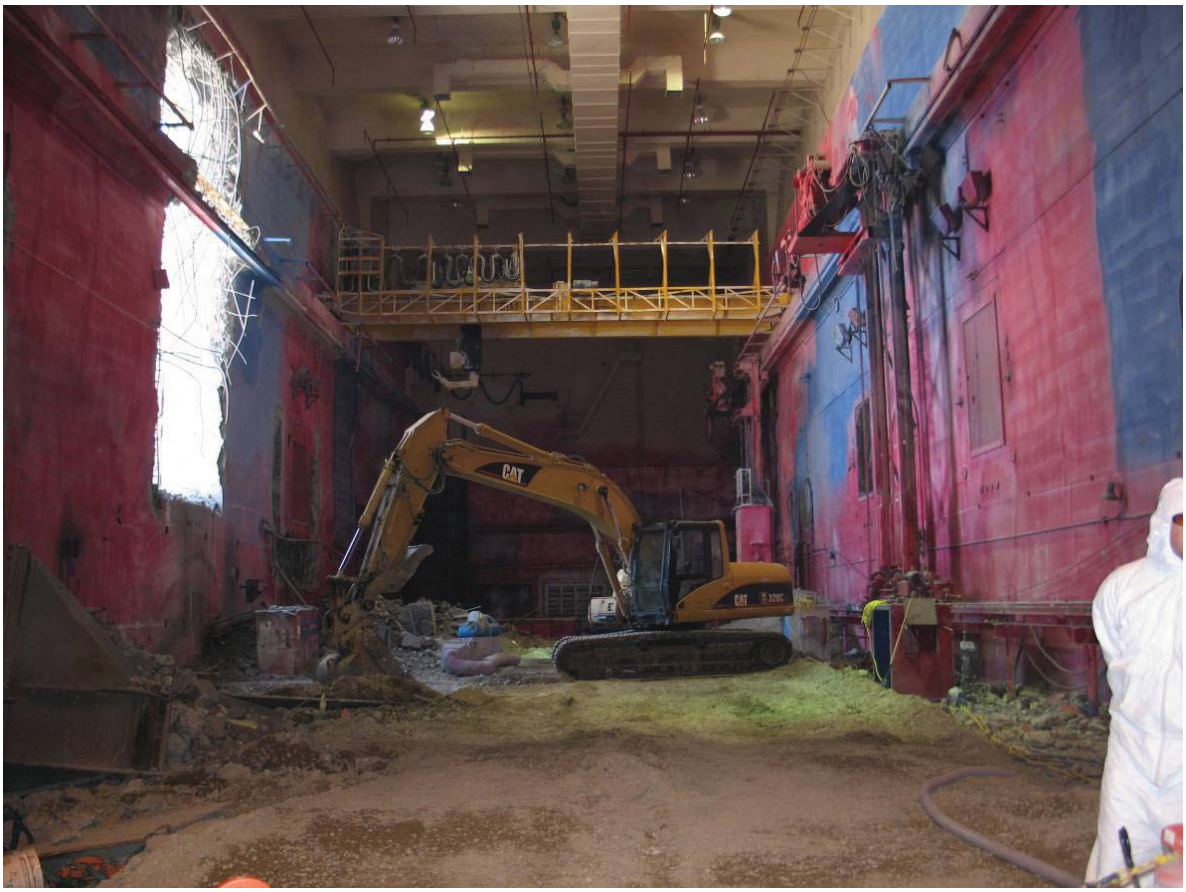

Figure C-6. Demolition inside hot shop.

Figure C-7. Hot shop looking southwest.

Figure C-8. Hot shop after test blasts.

Figure C-9. Hot shop ready for explosive demolition.

Figure C-10. Hot shop demolition.

Figure C-11. Former location of storage pool looking south (hot cell in background).

Figure C-12. Hot shop debris removal (hot cell on right).

Figure C-13. Sizing of hot shop piping.

Figure C-14. Hot cell demolition.

Figure C-15. Final debris removal and grading of area.

Figure C-16. Final grading of TAN-607A and TAN-607 Hot Shop.

Figure C-17. Final seeding of TAN-607A and TAN-607 Hot Shop.