Waste Management and Minimization during Decontamination and Decommissioning (D&D) of the Pluto Disassembly Facility, Nevada Test Site, Nevada, USA - 10340

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ABSTRACT

The Pluto Disassembly Facility, located at the Nevada Test Site in southern Nevada, was constructed in 1960 as part of Project Pluto. The objective of Project Pluto was to design a nuclear reactor that could propel a missile through the atmosphere. Before Project Pluto ended in 1964, two reactors were developed for this purpose: Tory II-A and Tory II-C. The Pluto facility is a 1,858-square-meter (20,000-square-foot) building located inside a radiologically controlled area with several radiologically controlled areas remaining within the building.

Closure activities were performed as set forth in the *Federal Facility Agreement and Consent Order* (FFACO) Streamlined Approach for Environmental Restoration (SAFER) Plan from May 2008 through February 2009. Activities included determining the nature and extent of contaminants of concern (COCs) and potential source material (PSM) (i.e., material that has the potential to cause a release to the environment in the future, such as hazardous fluids that are currently contained); implementing appropriate corrective actions; and properly disposing waste.

The FFACO clean closure of the facility was achieved through the removal of COCs and PSM, including polychlorinated biphenyl (PCB)-contaminated soil, radiologically contaminated (radium-226) soil (and scabbled asphalt), high-efficiency particulate air filters, PCB articles, mercury-containing thermostats and switches, lead plugs and bricks, and other materials. Waste streams generated include industrial waste, asbestos waste, used oil, hazardous waste, universal waste, PCB waste, low-level radioactive waste (LLW), and reusable/recyclable materials. All waste and recyclable materials were managed in accordance with applicable federal and state regulations, U.S. Department of Energy Orders, and the SAFER Plan. The substantial effort expended to reduce waste during closure resulted in approximately 40,823 kg (km) (90,000 pounds) of waste dispositioned for beneficial use.

Demolition of the Pluto facility is expected to generate an additional 4,970 cubic meters (6,500 cubic yards) of expanded debris. To identify the path forward for waste disposal of building debris, a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) survey process is under way. Waste minimization during the demolition phase is also an important goal of the U.S. Department of Energy, National Nuclear

Security Administration Nevada Site Office (NNSA/NSO) for all Environmental Restoration projects

The MARSSIM final radiological status survey is planned for January and February 2010. The historical site assessment and scoping survey are complete. A radiological survey to determine the path forward for waste disposal of demolition debris is being performed. Depending on the outcome of the survey, a cost/benefit analysis will be performed to determine whether to decontaminate the facility for disposal as sanitary waste, or to maintain radiological controls and dispose of the debris as LLW. The survey results will allow NNSA/NSO to dispose the maximum amount of non-porous building material as sanitary waste and minimize the amount that will require disposal as LLW.

The end state of the Pluto facility will be demolition of the building to the pad. Preparation for final demolition of the Pluto facility has begun. Demolition will be completed using funds allocated from the *American Recovery and Reinvestment Act* (ARRA) of 2009.

INTRODUCTION

Corrective Action Unit (CAU) 117, Pluto Disassembly Facility, is located in the southwestern portion of Area 26 of the Nevada Test Site (NTS). It comprises a single corrective action site (CAS), CAS 26-41-01, which consists of the Pluto Disassembly Facility (also known as Building 2201). Closure activities under the *Federal Facility Agreement and Consent Order* (FFACO) [1] and decontamination and decommissioning (D&D) of the facility were designed to support clean closure of CAU 117. The corrective action of clean closure was completed by removal of potential source material (PSM) and contaminated material sufficiently that contaminants of concern (COCs) no longer exist within the CAS as demonstrated by verification sample analytical results. In an effort to support U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Pollution Prevention (P2) objectives, reduce the volume, and minimize the disposal cost of materials generated and dispositioned as hazardous and regulated waste, many materials in Building 2201 were instead recycled via reuse or other beneficial use. As such, 40,823 kilograms (90,000 pounds [lb]) of the total mass of waste generated during closure activities was dispositioned for beneficial use (approximately 35 percent).

The end state of the Pluto facility will be demolition of the building to the pad. Preparation for final demolition of the Pluto facility has begun. Demolition will be completed using funds allocated from the *American Recovery and Reinvestment Act* (ARRA) of 2009. The facility is a 1,858-square-meter (20,000-square-foot) building located inside a radiologically controlled area with several radiologically controlled areas remaining within the building. Demolition is expected to generate approximately 4,970 cubic meters (m^3) (6,500 cubic yards [yd^3]) of expanded debris. To identify the path forward for waste disposal of building debris, a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) process, including a final radiological status survey, will be implemented.

BUILDING 2201 FACILITY HISTORY

Construction of Building 2201 began in May 1959 for Project Pluto, approximately four years after the project's initiation by the U.S. Department of Defense. After the building was completed in October 1960, the project was passed to Lawrence Radiation Laboratory (LRL), who managed Project Pluto until its cancellation in 1964. The objective of Project Pluto was to design a nuclear reactor that could propel a missile through the atmosphere at altitudes ranging from sea level to several miles and at velocities up to three times the speed of sound [2]. As a result, the earthbound Tory II-A reactor and its flyable counterpart, the Tory II-C, were developed (Figure 1). The cores of these reactors incorporated several hundred thousand fuel elements consisting of a homogenous mixture of highly enriched uranium dioxide and beryllium oxide [3]. The propulsion system operated on the ramjet principle, in which large quantities of air were ingested, heated by the reactor, and expelled at a high temperature and pressure to provide thrust. Between 1961 and 1964, LRL conducted several tests of the Tory reactors, including four successful power runs with the Tory II-A and two power runs with the Tory II-C [4, 5].

Fig. 1. Tory II-A reactor [6].

Project Pluto was also associated with "Hot Box" tests performed in Building 2201. These tests consisted of using stacks of graphite blocks interspersed with a few oralloy (uranium-235) foils. Air was heated to high temperatures and circulated through the reactor to obtain initial test data. Results from these tests were used to design the Tory II-A reactor [2].

Only the Tory II-A was disassembled in Building 2201 [7]. The Tory II-C reactor was stored in Building 2201 until 1974, when it was moved to the Reactor Maintenance, Assembly, and Disassembly (R-MAD) building for storage [8]. Actual disassembly of the Tory II-C was performed at the Engine Maintenance, Assembly, and Disassembly (E-MAD) building at the NTS in 1976 [7].

Building 2201 was designed specifically to perform remote adjustments, component replacement, and complete disassembly of the Tory II reactor systems. The Main Disassembly Bay (Room 102) housed the Tory II test vehicle when activities dictated that remote handling be used. Disassembly operations were viewed through 1.2-meter (m) (4-foot [ft])-thick leaded-glass observation windows immersed in oil [9]. During disassembly, the reactor core was removed from the railcar (used to transport the reactor to the test pad) with remotely operated manipulators. The heavily shielded postmortem hot cells adjacent to the disassembly bay were used to monitor control rod actuators during Project Pluto. Vaults within each cell were operated with remote manipulators for "fuel elements and classified core parts" [4]. The Cold Assembly Bay (Room 101) was used for storage and assembly of modular components for the reactor test vehicle [9].

The disassembly bay was supported by a maintenance shop, darkroom, offices, and equipment storage rooms. All controls for Building 2201 operation were located in Room 105 [10]. The Warm & Cold Storage Room (109) was used for repair and maintenance of equipment contaminated with low-activity radiological contaminants and was also intended for low-activity glove-box work [9]. Both the Shower/Change Room (113) and Rad Safety Room (114) were designed as change rooms and check stations for personnel needing access to the hot cell and assembly areas [9]. Before it was converted into a restroom, Room 115 served as a darkroom for quickly developing photograph negatives [9]. Room 116 was originally used to store the many spare parts required for the facility. A small electronics maintenance area was later set up in Room 116. During operation, Rooms 105 and 108 were air conditioned and maintained at a positive pressure so that air flowed into the Main Disassembly Bay (Room 102) and the hot cells (Rooms 104, 106, and 107) when equipment or services were passed through openings at each operating station [9]. These openings were plugged with lead plates or bagged shot when not in use [10]. The ventilation system in Room 102 was exhausted at the west end of the room through roughing and absolute filters before being vented to the atmosphere via the main exhaust stack in Room 103 [9]. In 1998, a portable air-conditioning system was installed by an unidentified "user." This user set up a portable system outside of the building with ducts running through external penetrations in the building that otherwise would have remained closed [10]. Figure 2 shows a floor plan of Building 2201.

The drainage system originating in the disassembly bay and postmortem cell area was designed to collect rinsate from gross decontamination efforts. Information from interviews with former personnel suggests that the septic drainage system was disconnected in 1964 [11].

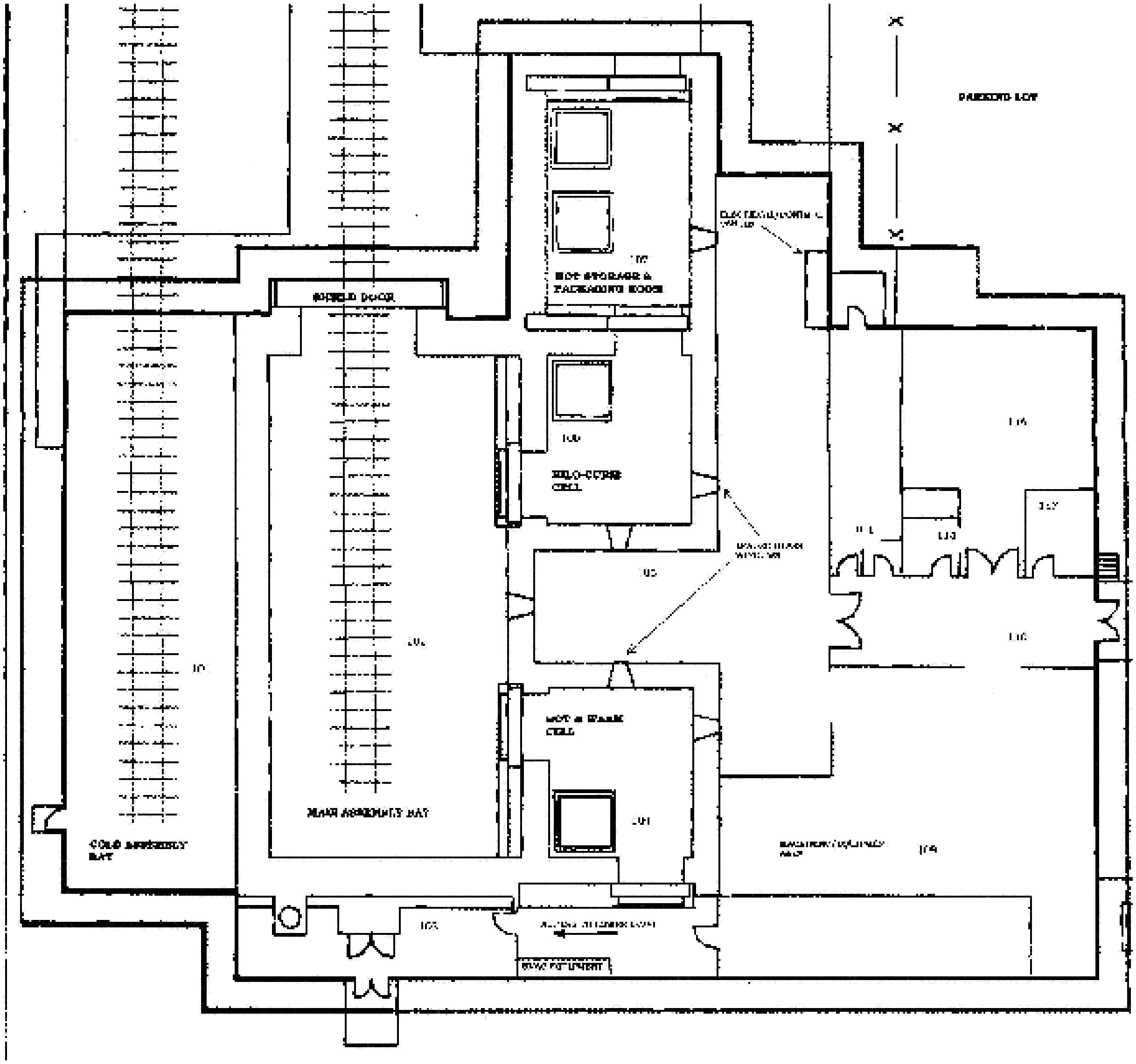

Fig. 2. Building 2201 floor plan [13].

After Project Pluto was cancelled, Building 2201 was used for the Fuel Repackaging Operations Project conducted between 1971 and 1972 [12]. During this period, fuel elements from the Tory II reactors were removed from their original containers and placed in 6-liter (L) containers that were then sealed, cleaned, and removed from the hot cells (Rooms 104, 106, and 107) of Building 2201. The containers were temporarily stored in the machine shop area of Building 2201 until they were taken to the decontamination pad in Area 6 for storage or potential future use [12]. The packaged fuel elements were eventually shipped to the Idaho National Engineering Laboratory [4].

Starting in 1972, Building 2201 was used for a series of classified experiments [7]. In the late 1970s and early 1980s, the Rooms 101 and 102 High Bays were modified to house the Hydrogen Content Test Facility (HCTF). The primary purpose of the HCTF was to simulate large dry holes for calibration of core logging instrumentation. The HCTF equipment consisted of a series of aluminum cells, each containing a different combination of water content and density. The cells contain sand, aluminum oxide, glass marbles, and varying water moisture content. The HCTF equipment will be dismantled and dispositioned during the demolition of Building 2201.

As of 1986, Sandia National Laboratories (SNL) was using portions of Building 2201 to conduct weapons-related nondestructive testing of fast-acting closure systems [10]. Since 1996, SNL has performed activities in Building 2201 associated with non-nuclear rocket launching and other classified projects. Due to their sensitive nature, specific information on experiments conducted by SNL inside Building 2201 is not readily available [14]. In 1998, an unidentified "user" used Building 2201 for additional classified activities [10].

CLOSURE ACTIVITIES OBJECTIVE

The objective of the closure activities for CAU 117 was designed to support closure in place or clean closure. The corrective action of clean closure was completed by removal of PSM and contaminated material sufficiently that COCs were reduced or removed to levels that do not pose a risk. Closure activities used to achieve clean closure included the following:

- Performing radiological and visual surveys to identify biased sampling locations.
- Collecting soil samples to determine whether COCs are present in environmental media.
- Collecting step-out samples to define the lateral and vertical extent of COCs.
- Removing polychlorinated biphenyl (PCB)-contaminated and radiologically contaminated (radium-226) soil.
- Collecting samples of materials to determine whether PSM exists.
- Removing assumed PSMs (without sampling) including:
    - Lead-shielding and other lead-containing items, including leaded-glass windows, lead plugs, lead bricks, and lead-acid batteries
    - Mercury-containing items, including thermostats, thermometers, and mercury-vapor bulbs
    - Fluorescent and sodium-vapor bulbs
    - PCB-containing items, including ballasts and capacitors
- Grouting fluid system lines from and to the building as well as all floor and surface drains to eliminate pathways to the environment.
- Collecting waste management samples.
- Characterizing and disposing of investigation-derived waste streams and remediation waste streams
- Collecting quality control samples.
- Documenting Notice of Completion and closure of CAU 117.

Closure of CAU 117 also addressed potential best management practices and waste management activities that were completed in order to place Building 2201 in a safe interim configuration for future demolition. The following activities were completed during the corrective action investigation closure activities:

- Site preparation activities (e.g., securing bi-parting door, performing hantavirus cleanup)
- Asbestos identification and abatement
- Removal of potential source materials and readily removable wastes including:
  - Unused asbestos-containing high-efficiency particulate air (HEPA) filters
  - A pre-filter frame located in Room 104
  - Abandoned HEPA vacuums located within the facility
  - Radiologically contaminated flooring materials
  - Abandoned excess chemicals (e.g., industrial cleaners, oxidizers, algicides) located throughout the facility
  - Used lubricants, oils, detergents, and other fluids from various equipment/systems
  - Mineral oil from shielding windows
  - Domestic and process water

Waste streams generated during closure activities included industrial waste, asbestos waste, used oil, *Resource Conservation and Recovery Act* (RCRA) hazardous waste, RCRA universal waste, PCB waste, low-level radioactive waste (LLW), and reused/recycled wastes. All wastes and recyclable materials were managed in accordance with applicable state and federal regulations, and DOE Orders.

DEMOLITION OBJECTIVE

To meet the objective of waste minimization of building demolition debris, a MARSSIM process, including a final radiological status survey, will be performed on Building 2201. The historical site assessment and scoping survey are complete. A radiological survey to determine the path forward for waste disposal of demolition debris will be performed during January and February 2010. Depending on the outcome of the survey, a cost/benefit analysis will be performed to determine whether to decontaminate the facility for disposal as sanitary waste, or to maintain radiological controls and dispose of the debris as LLW. The survey results will allow NNSA/NSO to dispose the maximum amount of non-porous building material as sanitary waste and minimize the amount that will require disposal as LLW.

WASTE MANAGEMENT

In an effort to support NNSA/NSO P2 objectives, reduce the volume, and minimize the disposal cost of materials generated and dispositioned as hazardous and regulated waste, many materials in Building 2201 were instead recycled via reuse or other beneficial use. Additionally, in order to comply with DOE’s moratorium on the release of potentially contaminated metals (which prohibits the release of these items and materials to commercial facilities), items were segregated into two categories:

1. Items (e.g., circuit boards) known to have never been within radiologically controlled areas, which were released to commercial facilities for recycle, and
2. Items such as lead solids (radiologically contaminated, and known or suspected to have been within radiologically controlled areas), which were recycled for reuse but will remain within the DOE system.

The NNSA/NSO P2 program uses the concepts of waste minimization and affirmative procurement in all aspects of the management, execution, and planning of work. The NNSA/NSO and its subcontractors are committed to operating in a manner that protects and restores the environment and promotes efficient use of natural resources, reduces waste generation at the source, encourages procurement of recycled products, and promotes the reuse and recycling of materials to the greatest extent that is technically feasible and practical. As such, 40,823 kg (90,000 lb) of the total mass of waste generated during closure activities were dispositioned for beneficial use (approximately 35 percent).

Used oil

Approximately 140 L (37 gallons [gal]) of used oil was generated during draining of overhead cranes, manipulators, pump and motor reservoirs, and miscellaneous air oil reservoirs. The oil was drained from each of the reservoirs, composited, and sampled. Upon review of the data, the oil was determined not to be radiologically impacted or RCRA hazardous and was managed in accordance with used oil regulations. Field-screening results indicated the presence of chlorinated hydrocarbons within acceptable limits for recycling. The used oil was shipped to an offsite vendor for recycling/recovery.

A total of 2,146 L (567 gal) of mineral oil was drained from the six leaded-glass shielding windows located within Building 2201 (Figure 3). Each of the windows contained approximately 360 L (95 gal) each of the mineral oil. The mineral oil is an optical grade mineral oil used to fill the voids between the leaded-glass slabs in the window assembly. The oil also has gamma- and neutron-shielding ability. The mineral oil also minimizes surface reflection of the individual glass components, increases the index of refraction, increases the light transmission, and acts as a dielectric against potential dielectric discharge. The mineral oil was sampled and determined not to be radiologically impacted or RCRA hazardous. The mineral oil was transferred to a commercial offsite vendor for recycle via re-refining.

Fig. 3 – Draining leaded-glass windows at the Pluto facility.

Mercury-containing items

Approximately 84 kg (185 lb) of mercury-containing items was collected at CAU 117. The mercury-containing items consisted of thermometers and thermostats found throughout Building 2201. All mercury-containing items were packaged into a 38-L (10-gal) drum and managed in a satellite accumulation area. Although required to be managed as hazardous waste, the mercury will be recovered for reuse by a commercial mercury retort facility.

RCRA Universal Wastes

Two types of RCRA universal waste streams were collected and managed during closure activities at CAU 117. The universal wastes generated at CAU 117 that were managed for recycle reclamation in lieu of management as hazardous waste included lead-acid batteries and electric lighting lamps. Approximately one dozen lead-acid batteries were collected from Building 2201. The batteries were primarily associated with emergency lighting systems located inside the building. The batteries were surveyed and released for management and recycling. Several types of lighting were used within Building 2201, including fluorescent, mercury-vapor, sodium-vapor, and incandescent lamps. Fluorescent, mercury-vapor, and sodium-vapor lamps were managed as universal waste. Incandescent bulbs were segregated and disposed as industrial waste. Approximately 2 m^3 (70 cubic feet [ft^3]) or 45 kg (100 lb) of universal waste lamps were surveyed for radiological release and transferred to the onsite Universal Waste Collection Center for sorting, accumulation, and eventual shipment to an offsite recycler.

Lead and other RCRA metals

Lead shielding and leaded glass is typically removed and managed as hazardous waste due to its characteristic of toxicity in accordance with 40 *Code of Federal Regulations* 261.24 [15]. Six leaded-glass radiation-shielding window assemblies, weighing 4,990 to 5,900 kg (11,000 to 13,000 lb) each, were removed from the hot cells (Rooms 104, 106, and 107) in Building 2201. While the glass material within the windows contains naturally occurring radioactive material, no contamination was found on these windows or on the cavities in which they were installed. The window assemblies were drained of mineral oil before removal, as noted above. The windows were transferred to Fermilab near Chicago, Illinois, for reuse.

More than 9,500 kg (21,000 lb) of elemental lead, primarily lead shield plugs, was removed from within the building. The lead shielding was segregated for radiological survey, characterization, and potential release. Lead shielding with painted surfaces was managed as potentially radiologically contaminated; lead shielding without painted surfaces could be adequately surveyed and confirmed free of radiological contamination. The lead shielding was packaged and transported to an offsite vendor in Oak Ridge, Tennessee, for recycle and reuse within the DOE and U.S. Nuclear Regulatory Commission-licensed community only, as radiation-shielding material.

Approximately 0.75 m^3 (1 yd^3) or 90 kg (200 lb) of computer components and equipment was found abandoned in Building 2201. Many of the components were manufactured with lead, silver, and other metals that, if disposed as waste, would require characterization and management as RCRA-hazardous. The collected components were surveyed and released as nonradioactively contaminated, and transferred for evaluation for reuse or other materials reclamation.

A compressed gas cylinder labeled as “Freon R-22” was found in the basement of Building 2201. The gas cylinder was surveyed for radiological contamination and released for final disposition. The Freon will be reused for other refrigeration/cooling purposes on the NTS.

Other wastes

Industrial wastes were characterized based upon radiological surveys, site characterization data, and process knowledge. Industrial wastes generated at CAU 117 consisted of bulk construction debris, aqueous liquids, drummed powdered material found in the wood shed, bulk soil, and asbestos-containing material. Approximately 45 m^3 (60 yd^3) of bulk debris-type industrial waste was generated during closure activities at CAU 117 and disposed at the Area 9 U10c Landfill. Bulk materials consisted of:

- Personal protective equipment (PPE)
- Building debris (e.g., drywall, acoustic ceiling tiles, wood)
- Disposable sampling equipment
- Plastic sheeting

- Empty containers and drums
- Vegetation
- Other debris such as wood, boxes, etc.

All utility systems within Building 2201 were opened, drained to the greatest extent possible, and verified empty. The water supply for Building 2201 was provided via the water tower located approximately 53 m (175 ft) northeast of Building 2201. The water tower is approximately 30 m (100 ft) tall with a capacity of 113,500 L (30,000 gal). The water tower provided a potable water supply to support facility operations. The main supply line to the building was disconnected, and the water tower verified empty.

Twenty-one drums containing approximately 3,400 L (900 gal) of aqueous liquids were generated during tapping and draining activities of potable and process water systems at CAU 117. Liquids generated during tapping and draining activities were segregated into two categories: nonradiologically contaminated and potentially radiologically contaminated. The potential radiologically contaminated systems included the process water, facility air sampling, and high vacuum systems due to the potential to contain radiological contamination. The nonradiologically contaminated systems included the domestic hot and cold water systems, and the distilled water systems. Composite samples were collected from each category of collected liquid. Upon review of the data, both categories of liquids were determined to be nonradiologically impacted and non-RCRA regulated waste. The aqueous liquids were disposed via evaporation at the Area 23 Lagoon on the NTS, and the emptied drums were disposed at the NTS Area 9 U10C Landfill.

Thirty-one drums containing approximately 3,500 L (930 gal) of an unidentified material were discovered within the facility. Each of the drums was opened and inspected. The drums contained a white, powdery material. A composite sample was taken, and the drums were determined to be nonradiologically impacted and non-RCRA regulated. The drums and contents were transported to the NTS Area 9 U10c Landfill for disposal.

Approximately 42 m^3 (55 yd^3) of soil and 1.8 m^3 (2.4 yd^3) of concrete were excavated and removed from the south side of Building 2201. The soil surrounding a small cooling tower on the southwest corner of the building contained total Aroclor at levels ranging from 0.74 milligrams per kilogram (mg/kg) to 8.3 mg/kg, which are less than PCB regulatory limits. The soil was excavated and loaded into bulk end dumps and roll-off containers, and transported to the NTS Area 9 U10C Landfill for disposal as non-PCB-regulated industrial waste.

Three bulk loads containing a total of 31 m^3 (41 yd^3) of asbestos-containing material (including insulation, HEPA filters, wall-board, PPE, and floor tile) were generated during asbestos abatement and post-abatement activities. Additionally, several cartons of new unused box-type asbestos-containing HEPA filters were discovered in the basement. All industrial asbestos-containing waste generated at CAU 117 was transported to and disposed at the NTS Area 23 Landfill.

Several items containing RCRA hazardous constituents were generated during closure activities at CAU 117. These wastes include waste chemicals, circuit boards, contents of discarded HEPA vacuums, and mercury-containing items. The following waste streams were characterized as RCRA-hazardous, and nonradioactive for disposal:

- Waste and excess chemicals identified at the CAU 117 site were collected and managed within a RCRA satellite accumulation area. The chemicals collected included drain-cleaning solvents, fluorinated heat transfer liquid, industrial cleaning compounds, lubricants, algicide tablets, and an unknown brown putty-like material. All of the chemicals were of small volume, and the characterization sample consumed the entire volume with the exception of the brown putty-like material. The putty material was characterized as nonradiologically contaminated; however, it failed the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit for lead and therefore was declared a hazardous waste for disposal. The waste [approximately 30 L (8 gal)] was packaged into a 38-L (10-gal) drum.
- Printed circuit boards were removed from equipment and electrical panels located within Building 2201, and characterized and managed as RCRA hazardous waste due to the lead and silver content. The items were surveyed and determined to be nonradioactive for disposal. One 38-L (10-gal) drum of circuit boards was collected and managed in a satellite accumulation area at CAU 117.
- Four abandoned HEPA vacuums were found within Building 2201. The contents of each of the vacuums were sampled to determine proper characterization and disposition. The results indicated that two of the vacuums had contents with RCRA constituents requiring management as hazardous waste. One vacuum failed the TCLP for arsenic; the other failed for cadmium. The contents and filters from these two vacuums were removed, packaged into a 38-L (10-gal) drum, and dispositioned as RCRA regulated waste. All four vacuum canisters, including the nonhazardous contents of the remaining two vacuums, were surveyed and determined to be nonradiologically contaminated and disposed as industrial waste at the Area 9 U10c Landfill via roll-off container 117A92.
- One 208-L (55-gal) drum containing approximately 57 L (15 gal) of rinsate water from coring activities associated with the vault investigation was generated, sampled, and characterized. The analytical data indicated the rinsate water was not radiologically contaminated; however, it failed the TCLP for chromium. The source of the chromium was most likely from the metal core bits used for drilling through the approximate 1-m (3-ft)-thick concrete lids. The drum was transferred from CAU 117 to National Security Technologies, LLC (NSTec) pending final offsite treatment and disposal as a hazardous waste.

The following waste streams were characterized as nonradioactive, PCB-contaminated waste for disposal and were transferred to the appropriate TSCA-permitted treatment and disposal facility:

- Polychlorinated biphenyl-containing ballasts and capacitors associated with lighting fixtures throughout the facility were removed and collected. All ballasts and capacitors were surveyed and released as nonradiologically contaminated. Two 208-L (55-gal) drums containing nonleaking small PCB-containing capacitors and ballasts were collected and managed as PCB waste. The drums were transferred to NSTec for onsite management, offsite shipment, and final disposal at a commercial offsite vendor in Beatty, Nevada.
- One PCB-containing capacitor was found to be leaking (assumed to be PCB liquids) and was packaged into a 38-L (10-gal) drum. The drum was transferred to NSTec for management in a PCB storage area until offsite shipment for treatment and disposal via TSCA-permitted incineration.

The following LLWs were generated during closure activities at CAU 117:

- Two B-25 containers of LLW consisting of radioactive-contaminated soil, PPE and sampling supplies, and pre-filter frame assemblies from the HEPA ventilation system at Building 2201. The waste [approximately 5 m^3 (180 ft^3)] was shipped to the Area 5 Radioactive Waste Management Complex (RWMC) in March 2009 for disposal.
- Two B-25 containers of asbestos-contaminated LLW consisting of tools, plastic, and used HEPA ventilation system filters. The waste [approximately 5 m^3 (180 ft^3)] was shipped to the Area 5 RWMC in March 2009 for disposal.

CONCLUSION

With detailed planning and strict waste handling processes, especially segregation processes of various materials, it was possible to isolate numerous types of materials and consider several paths forward for each “material” stream. The paths forward that were considered included recycling and reusing options as well as the option to dispose of the material as waste. To dispose of the materials as waste would have been very costly because the heaviest materials (leaded-glass windows and contaminated lead bricks) would have been disposed as hazardous or mixed low-level waste and would have required treatment to meet waste acceptance standards for the disposal facility. The DOE also avoided the expense of purchasing new leaded-glass windows for Fermilab near Chicago, Illinois. In addition, the ongoing MARSSIM survey process will allow NNSA/NSO to dispose the maximum amount of non-porous building debris as sanitary waste and minimize the amount that will require disposal as LLW. As demonstrated by this project, waste minimization and pollution prevention saves taxpayer money and is better for the environment.

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