U.S. DEPARTMENT OF ENERGY

ESHID-603803

National Nuclear Security Administration
Los Alamos Field Office
3747 West Jemez Road, A316
Los Alamos, New Mexico 87544
(505) 667-5105/Fax (505) 667-5948

Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400P
Los Alamos, New Mexico 87544
(240) 562-1122

Date: November 29, 2023

Mr. Ricardo Maestas, Acting Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6313

Subject: Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report

Dear Mr. Maestas:

The purpose of this letter is to transmit to the New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB) a report required by the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit (the Permit), EPA ID# NM0890010515. The Permit authorizes the United States Department of Energy (DOE) National Nuclear Security Administration-Los Alamos Field Office (NA-LA); the DOE Environmental Management-Los Alamos Field Office (EM-LA); Triad National Security, LLC (Triad); and Newport News Nuclear BWXT-Los Alamos, LLC (N3B), collectively the Permittees, to manage, store, and treat hazardous waste at LANL.

The report, as required by Permit Section 2.9, *Waste Minimization Program*, is submitted annually to the NMED-HWB by December 1 for the previous fiscal year, ending September 30.

Enclosures 1 and 2 provide the Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report drafted by NA-LA/Triad and EM-LA/N3B, respectively, to satisfy the reporting requirements in Permit Section 2.9. Each enclosure also contains a signed certification from the responsible Co-Permittees.

If you have any questions for Triad or NA-LA, please contact Jason Hill (Triad) at (505) 551-2218, jshill@lanl.gov or Robert Gallegos (NA-LA) at (505) 901-3824, robert.gallegos@nnsa.doe.gov.

If you have any questions for N3B or EM-LA, please contact Christian Maupin (N3B) at (505) 695-4281, christian.maupin@em-la.doe.gov or Arturo Duran (EM-LA) at (575) 373-5966, arturo.duran@em.doe.gov.

Sincerely,

Robert A. Gallegos
Digitally signed by Robert A. Gallegos
Date: 2023.11.29 14:34:58 -07'00'

Robert A. Gallegos
Program Manager
Environmental Permitting and Compliance Programs
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy

Sincerely,


Digitally signed by BRIAN HARCEK
Date: 2023.11.14 15:12:35 -07'00'

Brian Harcek
Acting Co-Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office
U.S. Department of Energy

Enclosures: 1) *Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report, Triad/NA-LA*
2) *Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report, N3B/EM-LA*

Copy w/enclosures:
Laurie King, USEPA/Region 6, Dallas, TX, king.laurie@epa.gov
Rick Shean, NMED, Santa Fe, NM, rick.shean@env.nm.gov
Ricardo Maestas, NMED-HWB, Santa Fe, NM, ricardo.maestas@env.nm.gov
Neelam Dhawan, NMED-HWB, Santa Fe, NM, neelam.dhawan@env.nm.gov
Siona Briley, NMED-HWB, Santa Fe, NM, siona.briley@env.nm.gov
Mitchell Schatz, NMED-HWB, Santa Fe, NM, mitchell.schatz@env.nm.gov
Theodore A. Wyka, NA-LA, theodore.wyka@nnsa.doe.gov
Stephen Hoffman, NA-LA, stephen.hoffman@nnsa.doe.gov
Jason Saenz, NA-LA, jason.saenz@nnsa.doe.gov
Karen E. Armijo, NA-LA, karen.armijo@nnsa.doe.gov
Robert A. Gallegos, NA-LA, robert.gallegos@nnsa.doe.gov
Adrienne L. Nash, NA-LA, adrienne.nash@nnsa.doe.gov
Michael Mikolanis, EM-LA, michael.mikolanis@em.doe.gov
Brian Harcek, EM-LA, brian.harcek@em.doe.gov
Arturo Duran, EM-LA, arturo.duran@em.doe.gov
Cheryl Rodriguez, EM-LA, cheryl.rodriguez@em.doe.gov
Jesse Kahler, EM-LA, jesse.kahler@em.doe.gov
Steven Coleman, Triad, ALDESHQ, scoleman@lanl.gov
Jennifer E. Payne, Triad, ALDESHQ, jpayne@lanl.gov
Jeannette T. Hyatt, Triad, EWP, jhyatt@lanl.gov
Steven L. Story, Triad, EPC-DO, story@lanl.gov
Andie McLaughlin-Kysar, Triad, EPC-DO, andiek@lanl.gov
Deepika Saikrishnan, Triad, EPC-DO, deepika@lanl.gov
Jessica L. Moseley, Triad, EPC-WMP, jmoseley@lanl.gov
Jason S. Hill, Triad, EPC-WMP, jshill@lanl.gov
Cecilia Trujillo, Triad, EPC-WMP, ceciliat@lanl.gov
Bradley Smith, N3B, bradley.smith@em-la.doe.gov
Jeffrey Stevens, N3B, jeffrey.stevens@em-la.doe.gov
Dana Lindsay, N3B, dana.lindsay@em-la.doe.gov
Erik Loechell, N3B, erik.loechell@em-la.doe.gov

Robert Edwards III, N3B, robert.edwards@em-la.doe.gov
Christian Maupin, N3B, christian.maupin@em-la.doe.gov
William Alexander, N3B, william.alexander@em-la.doe.gov
Joshua Torres, N3B, joshua.torres@em-la.doe.gov
rcra-prr@lanl.gov
eshq-dcrm@lanl.gov
locatesteam@lanl.gov
epccorrespondence@lanl.gov
lasomailbox@nnsa.doe.gov
n3brecords@em-la.doe.gov
emla.docs@em.doe.gov
interface@lanl.gov
N3Binterface@em-la.doe.gov

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ENCLOSURE 1

Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report

EPC-DO-23-338
LA-UR-23-32618

U.S. Department of Energy,
National Nuclear Security Administration Los Alamos Field Office, and
Triad National Security, LLC

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LA-UR-23-32618
Approved for public release; distribution is unlimited.
November 2023

Fiscal Year 2023
Los Alamos National Laboratory
Hazardous Waste Minimization Report

Los Alamos
NATIONAL LABORATORY

Prepared for: New Mexico Environment Department

Prepared by: P. Michael Moss, Environmental Professional
Environmental Protection and Compliance-Environmental Stewardship
(EPC-ES)

Editing and Layout by: Tamara Hawman, Communications Specialist
Communications and External Affairs-Technical Editing and Communications
(CEA-TEC)

Cover image: Central Accumulation Area at Technical Area 60, Building 0017.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

STEVEN STORY (Affiliate) Digitally signed by STEVEN STORY (Affiliate) Date: 2023.11.14 21:50:09 -07'00'

11/14/23

Steven L. Story
Division Leader
Environmental Protection and Compliance Division
Triad National Security, LLC
Los Alamos National Laboratory

Date Signed

Robert A. Gallegos Digitally signed by Robert A. Gallegos Date: 2023.11.29 14:35:32 -07'00'

11/28/23

Robert A. Gallegos
Program Manager
Environmental Permitting and Compliance Programs
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy

Date Signed

Contents

Figures

Tables

1 Hazardous Waste Minimization

1.1 Introduction

Waste minimization and pollution prevention (P2) are goals for Los Alamos National Laboratory (LANL or Laboratory) and are included in the operating procedures of Triad National Security, LLC (Triad). The U.S. Department of Energy (DOE) National Nuclear Security Administration-Los Alamos Field Office (NA-LA) and Triad are required to submit an annual hazardous waste minimization report to the New Mexico Environment Department (NMED) in accordance with the LANL Hazardous Waste Facility Permit. This report was prepared pursuant to the requirements of the LANL Hazardous Waste Facility Permit, Section 2.9, Waste Minimization Program, and describes the hazardous waste minimization program for LANL under the management and operations contract for Triad, which is implemented by the Environmental Protection and Compliance Division (EPC) and the Pollution Prevention (P2) Program.

In 2018, Newport News Nuclear BWXT-Los Alamos, LLC (N3B) assumed responsibility as the legacy cleanup contractor for the DOE Environmental Management Los Alamos (EM-LA) office at LANL. This report does not include any descriptions of waste minimization associated with transuranic waste or environmental remediation activities under the legacy cleanup contract.

Triad is responsible for current or new-generation[a] mixed transuranic waste (MTRU) generated at several sites at the Laboratory, such as the Chemistry and Metallurgy Research Facility at Technical Area (TA) 3, known as CMR, and TA-55, including the Plutonium Facility (TA-55 PF-4). Triad is also responsible for new-generation hazardous waste (HAZ) and mixed low-level waste (MLLW) generated at various facilities across the entire LANL complex.

Minimization of hazardous waste and tracking of hazardous waste generation continued in fiscal year (FY) 2023 (October 2022–September 2023). Projects, summarized later in this report, targeted minimization of hazardous waste as part of the planning process. In FY 2023, debris and homogeneous wastes from TA-55 PF-4 operating activities that support the plutonium pit mission were a significant component of Triad's MTRU waste. For hazardous waste in FY 2023, a significant waste by volume was lead-contaminated debris from the TA-18 Manhattan Building Restoration Project. For MLLW in FY 2023, waste from mission-critical operations generated the highest volume at TA-48-01. The Laboratory's waste minimization efforts and analysis of waste streams from reoccurring operations[b] are discussed in detail in this report.

Figure 1-1 depicts the total hazardous, MLLW, and MTRU wastes generated in FY 2022 and FY 2023 from reoccurring operations.

[a] New-generation waste refers to Triad hazardous waste, MLLW, or MTRU wastes.
[b] Reoccurring operations includes LANL waste streams and generation amounts by volume that are expected on a year-over-year basis.

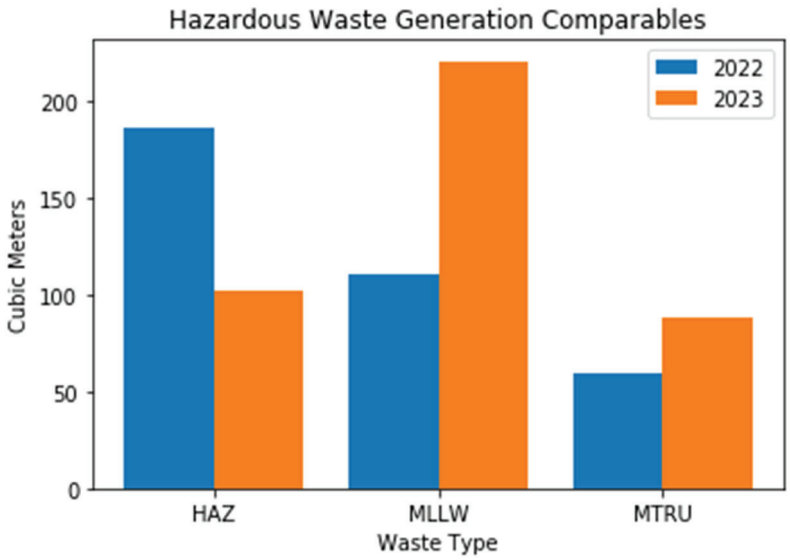

Figure 1-1. Total hazardous (HAZ), MLLW, and MTRU for Triad in FY 2022 and FY 2023.

1.2 Purpose and Scope

The purpose of this report is to describe the implementation and maintenance of the waste minimization program at LANL. This program reduces the volume and toxicity of hazardous wastes generated, thereby minimizing potential threats to human health and the environment. This report discusses the main components of hazardous waste, MTRU, and MLLW from reoccurring operations in FY 2023 and the waste minimization efforts for those wastes. In addition, this report documents FY 2023 waste quantities processed in comparison with FY 2022.

1.3 LANL's Hazardous Waste Facility Permit Requirements

As a permitted facility, LANL must fulfill operating permit requirements. According to Title 40, Code of Federal Regulations (CFR), Section 264.73(b)(9), a certification process is required to demonstrate that LANL has a plan in place to reduce the volumes and toxicity of hazardous waste. LANL certifies its waste minimization program through this written document, which is submitted annually to the NMED in lieu of the U.S. Environmental Protection Agency (EPA).

Table 1-1 lists permit requirements and corresponding report sections of this report that address the requirement.

Table 1-1. LANL Hazardous Waste Facility Permit Section 2.9

Permit Requirement	Topic	Report Section
Section 2.9 (1)	Policy statement	Section 2.1
Section 2.9 (2)	Employee training and incentives	Section 2.2
Section 2.9 (3)	Past and planned source reduction and recycling	Sections 2.3.1, 3.4, 5.3
Section 2.9 (4)	Itemized capital expenditures	Sections 2.3.1, 3.4
Section 2.9 (5)	Barriers to implementation	Sections 3.5, 4.3, 5.4
Section 2.9 (6)	Investigation of additional waste minimization efforts	Sections 2.3.1, 3.4, 5.3

Permit Requirement	Topic	Report Section
Section 2.9 (7)	Waste stream flow charts, tables, and analyses	Sections 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 5.1, 5.2
Section 2.9 (8)	Justification of waste generation	Section 2.4

The governing document for waste management at the Laboratory is P409, *LANL Waste Management*. Figure 1-2 provides the flow of the waste management process at LANL.

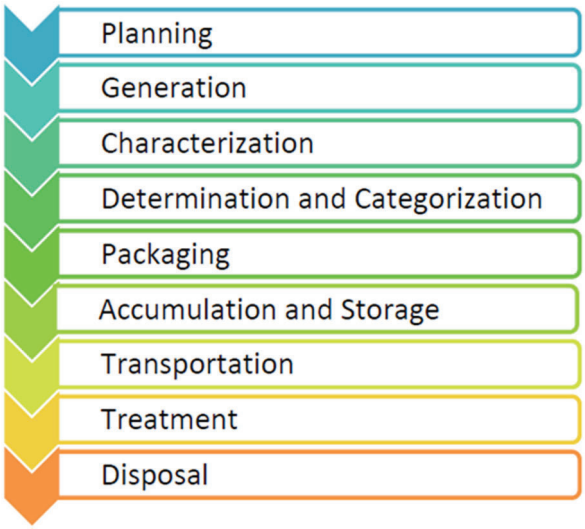

Figure 1-2. P409 Waste Management Process.

2 Waste Minimization Elements

2.1 Governing Policy on Environment

LANL's Environmental Governing Policy states the following:

> We are committed to act as stewards of our environment to achieve our mission in accordance with all applicable environmental requirements. We set continual improvement objectives and targets, measure and document our progress, and share our results with our workforce, sponsors, and public. We reduce our environmental risk through legacy cleanup, P2, and long-term sustainability programs.

Regulatory drivers for waste minimization include the Resource Conservation and Recovery Act (RCRA), the Pollution Prevention Act of 1990, 40 CFR Parts 260–280, and the International Organization for Standardization (ISO) 14001:2015 Standard for Environmental Management Systems implemented at the Laboratory.

2.2 Employee Training and Incentive Programs

Several employee training and incentive programs exist to identify and implement opportunities for recycling, sustainability, waste minimization, and source reduction of various waste types. Training courses that address waste minimization and P2 requirements include

- General Employee Training,
- Waste Generator Overview,
- Radworker II,
- LANL and McCoy RCRA personnel training, and
- Environmental Management System awareness training.

The Laboratory and NA-LA sponsor annual sustainability award competitions, which recognize personnel who implement P2 projects. In FY 2023, the P2 Program managed a LANL environmental awards program that emphasized source reduction of all types of waste. The award winners were recognized by Steven Coleman, a senior manager from Environment, Safety, Health, and Quality, and presented with a certificate and a small cash award, which serve as incentives for participation in future years.

2.3 Investigation of Additional Waste Minimization and P2 Efforts

The Laboratory's P2 Program monitors waste trends and works with other programs to develop process improvement projects. In addition, the P2 Program provides financial analysis support for these projects to better understand the return on investment. Project ideas often come directly from researchers, waste management coordinators, and the P2 Program staff. Because project ideas come from different sources who have different levels of P2 expertise, the program makes support decisions after a comparative ranking using scoring criteria that emphasize source reduction, return on investment, transferability, and waste minimization that support the LANL mission.

Funding for Projects

The following paragraph describes the recent P2 projects and capital funding. P2 projects implemented at the Laboratory address all types of waste and pollutants; however, the list includes projects designed to reduce hazardous waste, MLLW, or MTRU. Projects that address other waste types are not described in this report.

In FY 2023, P2 funds were allocated to the following project:

- Copper bioleaching to eliminate nitric acid waste for target development ($120,000)

  Researchers in MST-7 (Engineered Materials) are studying use of a bacteria to remove copper deposits on target components formed during assembly. The current process requires use of 35 percent nitric acid for copper removal that generates a hazardous waste stream represented by waste stream profile 49838. During FY 2023, researchers had a breakthrough: the bacterial solution removed copper deposits without damaging the component. With P2 funding in FY 2024 earmarked for $115,000, researchers will study process optimization.

2.4 Utilization and Justification for the Use of Hazardous Materials

LANL is a research and development facility that executes thousands of experiments that require the use of chemicals or materials that might create hazardous waste. P2 and waste minimization requirements for waste generators include source reduction and material substitution techniques through process improvements and best management practices. However, customer requirements, project specifications, validated protocols, or the nature of the research may demand the use of specific chemicals that are hazardous.

To encourage the use of nontoxic or less hazardous substitutes whenever possible, the P2 Program staff help LANL workers identify—using waste process and input alternative analysis—the least toxic chemicals that have the desired characteristics for their particular project.

3 Hazardous Waste

3.1 Introduction

The reported annual hazardous waste quantity is based on the total amount of waste by volume and accumulation start dates of wastes within the FY recorded in LANL's Waste Compliance and Tracking System (WCATS) database. A query about specific wastes is entered into WCATS using waste stream profile numbers. This report does not include waste quantities generated before onsite treatment, which is why waste quantities do not match those reported in LANL's biennial report. Additionally, this report uses FY data, whereas the biennial report uses calendar year data. The WCATS data used in this report was collected for FY 2023 on October 2, 2023.

In brief, 40 CFR §261.3 (adopted by the NMED as 20.4.1.200 New Mexico Administrative Code) defines hazardous waste as any solid waste that

- is not specifically excluded from the regulations as hazardous waste;
- is listed in the regulations as a hazardous waste;
- exhibits any of the defined characteristics of hazardous waste (i.e., ignitability, corrosiveness, reactivity, or toxicity);
- is a mixture of solid and hazardous wastes; or
- is a used oil that has more than 1,000 ppm of total halogens.

3.2 Hazardous Waste Minimization Performance

Hazardous waste volumes processed at LANL in FY 2023 and FY 2022 are shown in Table 3-1. The volumes are sorted by the amount of waste that originated in each TA and then further sorted for FY 2023 to show the quantity of waste generated from highest to lowest.

Table 3-1. Hazardous Waste Generation by Technical Area in FY 2023 and FY 2022; FY 2023 Ranked by Volume

Technical Area (TA)	FY 2023 Hazardous Waste (m^3)	FY 2022 Hazardous Waste (m^3)
16	765.5*	52.11
18	30.6	17.83
03	28.6	37.93

Technical Area (TA)	FY 2023 Hazardous Waste (m^3)	FY 2022 Hazardous Waste (m^3)
35	5.9	5.58
09	5.6	6.29
08	5.5	53.6
50	4.9	0.052
64	4.9	0.32
53	4.0	2.25
46	3.2	2.44
22	2.4	2.11
59	1.8	1.29
48	1.6	1.24
43	0.7	0.22
60	0.5	-
55	0.5	0.56
39	0.2	-
72	0.2	-
68	0.1	-
40	0.1	0.22
15	0.1	-

* See Section 3.6 for explanation of this high-volume waste generation from TA-16 (not from reoccurring operations).

3.3 Waste Stream Analysis

Commonly generated hazardous waste includes many types of research chemicals, solvents, acids, bases, carcinogens, compressed gases, metals, and other solid waste contaminated with hazardous material. Hazardous waste could include equipment, containers, structures, and other items intended for disposal that are considered hazardous (e.g., compressed gas cylinders). Some waste waters that may not be sent to the sanitary wastewater system or to the high-explosives (HE; hazardous-waste-containing) waste water treatment plant could also qualify as hazardous waste. After material is declared a waste, the hazardous waste is characterized, labeled, and collected in appropriate storage areas. The waste is ultimately shipped to offsite RCRA hazardous waste treatment, storage, and disposal facilities for final treatment or disposal. Some hazardous wastes—aerosol cans, light bulbs, batteries, mercury, and ferric chloride solution—may be recycled.

The largest non-recyclable hazardous waste streams are described in this section. HE waste is treated onsite and is excluded from the analysis.

Unused/Unspent Chemicals: The volume of unused and unspent chemicals varies each year. New chemical tracking technology at LANL will prevent unnecessary chemicals from coming on site and increasing utilization of chemicals already in inventory.

Solvents: EPA-listed and characteristic solvents and solvent-water mixtures are used widely in research, maintenance, and production operations, especially for cleaning and extraction. Nontoxic replacements for solvents are used whenever possible. New procedures that either require less solvent than before or

eliminate the need for solvent altogether are also adopted where possible; however, solvents are still required for many procedures, and solvents persist as a large component of the hazardous waste stream.

Acids and Bases: A variety of strong acids and bases are routinely used in research, testing, and production operations. Over the past decade, the overall volume of hazardous acid and base waste has been reduced mainly by using new procedures that require less acid or base, by recycling acids onsite for internal reuse, and by reusing spent acids and bases as part of established neutralization procedures on site.

Hazardous Solids: This waste stream includes inert barium simulants used in HE research, electronics, contaminated equipment, broken leaded glass, firing-site debris, ash, and various solid chemical residues from experiments. Metals such as lead can also be a hazardous solid waste.

Hazardous Liquids: This waste stream is primarily aqueous, neutral liquids that are generated from a variety of analytical chemistry procedures. This waste stream also includes aqueous waste from chemical synthesis, spent photochemicals, electroplating solutions, refrigerant oil, and ethylene glycol.

Laboratory Trash and Spill Cleanup: Laboratory trash consists mostly of paper towels, pipettes, personal protective equipment, and disposable lab supplies. Rags are used for cleaning parts, equipment, and various spills. Equipment improvements have reduced the number of oil spills from heavy equipment, and new cleaning technologies have eliminated some processes where manual cleaning with rags was required in the past.

FY 2023 and FY 2022 Hazardous Waste Generation

The amount of non-remediation hazardous waste generated at LANL in FY 2022 was 185.9 m^3 compared with 102.3 m^3 of hazardous waste generated in FY 2023 (for reoccurring operations). The significant components of hazardous waste for FY 23 come from a building restoration effort and draining of diesel fuel from tanks. See Table 3-2 and Table 3-3.

Table 3-3 for waste details by year.

Table 3-2. FY 2023 Hazardous Waste Generation

Waste Stream Number	Volume (m^3)	% Total	Waste Description
51217	30.6	29.9	Waste generated from the TA-18 Manhattan Building Restoration Project; debris material contaminated with lead and asbestos
53577	4.92	4.8	Diesel (containing benzene) drained from compressor fuel tank at TA-50
53578	4.92	4.8	Diesel (containing benzene) drained from underground tank at TA-64
Various	61.9	60.5	Consistent with waste streams described in Section 3.3

Table 3-3. FY 2022 Hazardous Waste Generation

Waste Stream Number	Volume (m^3)	% Total	Waste Description
50503	50.97	27.4	TA-16-399 Burn Tray Closure waste; includes mostly soil and sand and small amounts of other debris with D005 hazardous contamination
51613	50.91	27.3	Lead-contaminated debris material from TA-08 LINATRON shielding project
51217	15.29	8.2	Waste generated from the TA-18 Manhattan Building Restoration Project
Various	68.7	37	Consistent with waste streams described in Section 3.3

3.4 Hazardous Waste Minimization and Operational Funding

Starting in FY 2011, special recycling operations were established in TA-60-86 at LANL. Spent bulbs and batteries are collected from various sites and brought to TA-60, where used bulbs are packaged together, and batteries are packaged for recycling. Consolidating these operations at one location is cost effective and maximizes recycling potential. Lead-acid battery recycling is managed by the salvage organization at LANL. Table 3-4 lists the waste volumes by year.

Table 3-4. Universal Waste Recycled at LANL in FY 2023 and FY 2022

Universal Waste Type	FY 2023	FY 2022
Lamps/Bulbs/Tubes (m^3)	44.25	16.7
Batteries (m^3)	0.984	1.28
Total Volume (m^3)	45.234	17.98
Total Cost	$13,529.50	$5,377.80

Total cost is based on the recycle invoice dollar amount and the volume of shipment on each invoice. For example, the invoice payment is $4,802.35, and the volume of the material on the invoice is 16.0557 m^3. The unit cost of $4,802.35 is divided by 16.0557 m^3, equaling $299.10/$m^3$. This unit cost number is then multiplied by FY 2023 and FY 2022 total volume (m^3), resulting in the total cost for each year.

Solvent Waste Reduction and Recycling

At LANL, many projects are implemented to reduce the use of solvents because they are a common component of the hazardous waste stream. In 2023, the Aging and Lifetimes Program funded a project in MST-7 to reduce organic solvent wastes generated from polymer infiltration, a process that is gaining national interest with scale-up implications. The principal investigator completed an optimization study to determine the minimal amount of solution needed without compromising the final product. This hazardous waste reduction effort is represented by waste stream 49072.

EPC-CP (Compliance Programs) is scaling up PCB (polychlorinated biphenyls) analysis of LANL waste waters for outfall monitoring. Using a new extractor and evaporator, the LANL technologist modernized the chemical analysis process used for the samples. Through these upgrades, the spent solvent hazardous waste stream 52885 will be minimized.

Acids and Bases Reduction

The P2 Program is funding a project related to copper bioleaching that aims to reduce acid waste. See Section 2.3 for more information on this research project.

Hazardous Solid Waste

Weapons scientists in Q-5 (High Explosives Science and Technology) collaborated with waste management personnel to reclassify a hazardous waste generated from the synthesis of diaminoazoxyfurazan (DAAF), a mission-critical operation. Due to the high-explosives nature of DAAF synthesis, acceptable knowledge determined the waste stream to be hazardous; however, based on due diligence with the waste characterization effort, the waste was reclassified as a non-hazardous waste (represented by waste profile 51253). According to waste management personnel, 155 containers (57,955 pounds) of this waste were removed from the Laboratory.

Unused/Unspent Chemical Waste Reduction

The Chemical Management Program, established in 2020, works to optimize purchase of hazardous chemicals and support proper chemical inventory practices site wide. In 2021, Chemical Management staff introduced updated barcode scanners to simplify compliance with the annual inventory requirements. Employees scan chemical container barcodes to conduct inventory, to transfer ownership and location of chemicals, and to document when chemicals are disposed. The new system also prevents duplicate scans from being uploaded into the database, which limits the possibility of errors during upload. Through the introduction of new inventory technology, Chemical Management is making it easier for LANL staff to track their chemicals. Tracking will help prevent unnecessary chemicals from coming on site and increase utilization of chemicals already in the inventory, thereby reducing LANL's unused/unspent chemical waste stream 52017.

3.5 Barriers to Hazardous Waste Minimization

LANL has a long history of successful hazardous waste minimization. However, the next stage of waste minimization will require more research, investment, and time to accomplish than in past efforts because the remaining hazardous wastes—if they can be minimized—will require changes to core processes rather than to support processes, which is always a difficult undertaking in a research and laboratory environment. In the future, every waste minimization project will be unique and will require innovation to enhance LANL's mission, which will require researcher engagement. Early integration of P2 strategies into program and project design and lifecycle planning is LANL's approach going forward.

3.6 Special Clean-Out Project

Hazardous waste stream profile 50503 represents cleanup operations of the TA-16-399 Burn Tray and generated 764.5 m^3 of soil, sand, brick, and metal waste during FY 23; the remaining small volume amount associated with TA-16 is from reoccurring operations. The high-volume generation amount is not representative of reoccurring operations at LANL and therefore not included in Figure 1-1 or in Section 3.3. Although waste may be generated from waste profile 50503 in future years, the generation amount is expected to be much lower by volume than 764.5 m^3 on an annual basis and will no longer be necessary after completion of closure activities at the unit.

4 Mixed Transuranic Waste

4.1 Legacy and Current Mixed Transuranic Waste

MTRU contains hazardous constituents in addition to high levels of radiation. Triad is a current generator of MTRU waste that must ultimately be shipped to the Waste Isolation Pilot Plant (WIPP). Triad generated a total of 88.7 m^3 of MTRU in FY 2023 in support of the plutonium pit mission; MTRU totaled 58.9 m^3 in FY 22 from generating facilities at TA-55, TA-55 PF-4, and TA-03 CMR. The generation of MTRU is consistent with homogeneous and debris wastes generated from chloride, metal, nitrate, plutonium-238, and pyrochemical plutonium pit mission operations.

In FY 2023 and FY 2022, shipment of MTRU waste was coordinated between Triad and N3B to create the most efficient use of the available shipment opportunities to WIPP.

4.2 Waste Stream Analysis

Table 4-1 and Table 4-2 list the significant MTRU current generation from TA-55, TA-55 PF-4, and TA-03 CMR—the Triad facilities responsible for new-generation waste. Most of these wastes are located at LANL, awaiting shipment to WIPP.

Table 4-1. FY 2023 MTRU Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
50614	37.9	43.0	TA-55 PF-4	Debris wastes from Plutonium Facility operations; wastes include filters, glass, graphite, rubber gloves, metals, plastic, and resins
50609	28.5	32.1	TA-55 PF-4	Homogeneous inorganic wastes from Plutonium Facility operations; wastes include ash, ceramics, leached solids, oxides, precipitates, salts, and sludges
50467	18.3	20.6	TA-55 PF-4	Debris wastes from Plutonium Facility operations; wastes include filters, glass, graphite, rubber gloves, metals, plastic, and resins
Various	4.0	4.3	TA-55, TA-55 PF-4, and TA-03 CMR	Small-volume MTRU waste generation from reoccurring operations

Table 4-2. FY 2022 MTRU Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
50614, 50467, 47833	37.1	63	TA-55 PF-4	Debris wastes from Plutonium Facility operations; wastes include filters, glass, graphite, rubber gloves, metals, plastic, and resins
50609	20.6	35	TA-55 PF-4	Homogeneous inorganic wastes from Plutonium Facility operations; wastes include ash, ceramics, leached solids, oxides, precipitates, salts, and sludges
48709	1.04	1.8	TA-03 CMR	Debris waste from footprint-reduction activities at CMR facilities

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
47746	0.21	0.3	TA-55 PF-4	Tritium-contaminated debris waste from Plutonium Facility operations

4.3 Mixed Transuranic Waste Minimization

To support plutonium pit development, large items (such as glove boxes classified as MTRU[c]) must be removed from TA-55 PF-4 and TA-55. However, due to space constraints at WIPP and the difficult task of size-reducing glove boxes for transport to WIPP, LANL management will use decontamination techniques to reduce the radiation levels and reclassify the large items as surface-contaminated object[d] (SCO) low-level waste (LLW). The SCO protocol is an economically viable option for removing oversized MTRU waste items from TA-55 PF-4. This protocol verifies reclassification of MTRU to SCO LLW, allowing the oversized waste to be shipped to a commercial disposal facility without additional size reduction. By applying the SCO protocol to the MTRU waste items, the volume of MTRU is significantly reduced; however, 43 MTRU large items are lead lined. Due to this D008 characteristic, once decontaminated to SCO LLW, these items will be disposed of as MLLW, which will increase volumes of that waste type (represented by waste stream 52164).

4.4 Barriers to Mixed Transuranic Waste Minimization

A majority of MTRU waste located at the Laboratory consists of legacy waste and falls under the responsibility of N3B and EM-LA. This waste type is already generated and cannot be minimized in an efficient and cost-effective manner. In fact, legacy waste disposal often involves increasing waste volumes because historical parent containers require repackaging and waste treatment into daughter containers (e.g., one container can turn into two or three containers) to compliantly dispose of the waste. This practice increases the number of drums shipped for disposal and also leads to generation of more debris waste from the repackaging and treatment activities.

Operations at TA-55 PF-4 are working to implement waste minimization strategies for the waste currently being generated. These strategies include limitations on material inputs into TA-55 PF-4 and glove boxes and implementation of purchasing and inventory controls on tools, materials, and chemicals introduced into glove boxes. Other strategies include purchasing longer-life-span materials and avoiding disposal of serviceable instruments such as balances and ovens. In addition, plutonium pit development process changes are underway to reduce MTRU generation, but those changes are in the early research phase.

5 Mixed Low-Level Waste

5.1 Current Mixed Low-Level Waste

MLLW contains hazardous constituents in addition to low levels of radiation; the term “activated” describes materials that contain low levels of radiation. Triad generated 111.0 m^3 of MLLW new-

[c] Acceptable knowledge from deactivation and decommissioning operations; waste stream 49765, Process Status Codes XO, with Group D RCRA hazardous codes

[d] A surface-contaminated object is not radioactive itself but contains radioactive material on its surface.

generation waste in FY 2022. In FY 2023, Triad generated 220.8 m^3 of MLLW. The year-over-year increase is due to waste generation associated with mission-critical operations at TA-48 and TA-55.

In FY 2023, waste stream 51123 resulted in a high volume of MLLW generated from mission-critical operations at TA-48-01; another high-volume waste stream is 53173—removal of legacy equipment from TA-03-0102. Table 5-1 lists MLLW by location during FY 2023 and FY 2022.

Table 5-1. MLLW Generation by Technical Area in FY 2023 and FY 2022; FY 2023 Ranked by Volume

Technical Area	FY 2023 MLLW (m^3)	FY 2022 MLLW (m^3)
03-CMR	124.1*	15.8
03	46.4	59.94
55	41.1	0.42
53	38.2	8.16
48	36	3.46
41	15.3	-
35	4.6	6.72
50	3.8	0.02
36	2.54	-
60	2.54	-
55-PF-4	2.5	8.8
16	0.8	2.6
54	0.42	-
59	0.22	0.132
8	-	5.0

*See Section 5.5 for explanation of this high-volume waste stream generated from TA-03 CMR (not from reoccurring operations).

5.2 Waste Stream Analysis

Table 5-2 and Table 5-3 list the significant MLLW generated by Triad for FY 2023 and FY 2022.

Table 5-2. FY 2023 MLLW Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
51123	35.4	16	TA-48-01	Activated lead materials generated from housekeeping, maintenance, processing, and research and development activities
53173	30.6	14	TA-03-0102	Baghouse system contaminated with radioactive and hazardous constituents from legacy machining operations
52954	17.8	8	TA-53 (LANSCE*)	Clean-up of activated electrical equipment and contaminated lead materials in Area A to make room for new experiments
52320	15.3	7	TA-41	Debris generated from Demolition of the Ice House; contaminated with mercury and lead
49525	13.6	6.2	TA-55	Lead-lined glove box disposition

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
Various	107.9	48.8	Triad Facilities	Small-volume MLLW waste streams

* Los Alamos Neutron Science Center

Table 5-3. FY 2022 MLLW Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
50937	30.6	27.5	TA-03-0066 (SIGMA*)	Clean-up activities of activated lead equipment no longer in use
50787	15.3	14.0	TA-03-0066 (SIGMA)	Clean-up activities of activated lead bricks no longer in use
49534	8.2	7.0	TA-53 (LANSCE)	Clean-up of activated electrical equipment and contaminated lead materials in Area A to make room for new experiments
Various	57	51	Triad Facilities	Small-volume MLLW waste streams

* Sigma Division at TA-03-0066 (basic/applied nuclear research)

5.3 Mixed Low-Level Waste Minimization

An effective method of realizing MLLW minimization during decommissioning operations at nuclear facilities can be removing electronic components that contain materials that meet the definition of hazardous waste from the equipment in which the components are contained. The components are then tested for radiological contamination and, when determined to be free of radiological contamination, may be recycled through the universal waste process. Items from analytical equipment, overhead lights, switches, and electronic equipment can be disassembled; and batteries, circuit boards, capacitors, and power supplies can be recycled while the surrounding material can be disposed as LLW. Although this method is not quantified at this time, it is estimated to have reduced MLLW generation at TA-03 CMR.

The closure of the TA-21 facility from 2011 generated two mobile lab trailers. Acceptable knowledge indicated that these trailers were radioactive with hazardous constituents (MLLW); however, through due diligence efforts, waste management personnel and radiological control technicians removed the radioactive portions of the trailers and managed those as a MLLW; the remaining non-radioactive/non-hazardous components were sent through salvage operations. This effort reduced disposal costs from $128,000 to $20,160 and reduced the amount of MLLW generated from 1,080 cubic feet to 180 cubic feet, minimizing waste profile 52194.

5.4 Barriers to Mixed Low-Level Waste Minimization

In many instances, MLLW minimization is difficult to implement because it requires procedural changes. This process can take multiple years because safety for personnel and efficacy of a new process must be ensured. Because certain processes are already in place, the waste minimization change might not be cost effective.

5.5 Special Clean-Out Project

The high-volume MLLW waste stream 52537 represents close-out operations of the CMR facility and generated 97.6 m^3 of waste during FY 23; the remaining 26.5 m^3 amount by volume from CMR is

associated with reoccurring operations. To prepare for shutdown of the facility and support of the Plutonium Pit Mission, items were removed from CMR rooms and dispositioned. The high-volume generation amount of 97.6 m^3 is not representative of reoccurring operations at LANL and therefore not included in Figure 1-1 or in Section 5.2. CMR shutdown operations will generate waste in future years, but the generation amount is expected to be lower by volume than 97.6 m^3 on an annual basis.

6 Acronyms and Abbreviations

Acronym	Definition
CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research Facility
DAAF	diaminoazoxyfurazan
DOE	(U.S.) Department of Energy
EM-LA	Environmental Management Los Alamos
EPA	(U.S.) Environmental Protection Agency
FY	fiscal year
HAZ	hazardous waste
HE	high explosives (and hazardous-waste-containing materials)
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LLW	low-level waste
MLLW	mixed low-level waste
MST-7	Engineered Materials (group)
MTRU	mixed transuranic waste
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
NA-LA	DOE/National Nuclear Security Administration-Los Alamos Field Office
NMED	New Mexico Environment Department
P2	Pollution Prevention (Program); also pollution prevention
PF-4	Plutonium Facility (TA-55-0004)
RCRA	Resource Conservation and Recovery Act
SCO	surface-contaminated object
SIGMA	Sigma Division at TA-03-0066 (basic/applied nuclear research)
TA	Technical Area
WCATS	Waste Compliance and Tracking System
WIPP	Waste Isolation Pilot Plant

ENCLOSURE 2

Fiscal Year 2023 Los Alamos National Laboratory Hazardous Waste Minimization Report

U.S. Department of Energy,
Environmental Management Los Alamos Field Office, and
Newport New Nuclear BWXT-Los Alamos, LLC

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November 2023
EM2023-0746

Fiscal Year 2023 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC

Los Alamos National Laboratory Hazardous Waste Facility Permit

CERTIFICATION

NEWPORT NEWS NUCLEAR BWXT-LOS ALAMOS, LLC

Fiscal Year 2023 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC

CERTIFICATION STATEMENT OF AUTHORIZATION

In accordance with the New Mexico Administrative Code Title 20, Chapter 4, Part 1 (incorporating the Code of Federal Regulations, Title 40 CFR § 270.11):

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Robert E. Edwards III — October 26, 2023

Robert Edwards III, Acting Program Manager
Environment, Safety, Health and Quality
Newport News Nuclear BWXT-Los Alamos, LLC

Date

Digitally signed by BRIAN HARCEK
Date: 2023.10.31 11:45:55 -06'00'

Brian Harcek, Acting Co-Director
Office of Quality and Regulatory Compliance
U.S. Department of Energy
Environmental Management
Los Alamos Field Office

Date

CONTENTS

Table

Attachment

1.0 INTRODUCTION

Newport News Nuclear BWXT-Los Alamos, LLC (N3B) is the contractor selected by the U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office (EM-LA) to implement the Los Alamos Legacy Cleanup Contract (LLCC). Work conducted under the LLCC includes implementation of the Los Alamos National Laboratory (LANL or the Laboratory) Hazardous Waste Facility Permit issued to DOE; Triad National Security, LLC; and N3B, collectively the Permittees. This report has been prepared in accordance with Part 2.9 of the LANL Hazardous Waste Facility Permit to describe the N3B Hazardous Waste Minimization Program and to detail N3B's waste reduction achievements for fiscal year (FY) 2023.

FY 2023 includes the 12 months from October 1, 2022, through September 30, 2023.

During FY 2023, N3B conducted hazardous waste minimization and pollution prevention efforts in conjunction with investigative and remedial efforts and disposition of stored legacy wastes. Through this work, N3B shipped hazardous waste, mixed transuranic (MTRU) waste, mixed low-level waste (MLLW), and remediation waste off-site. N3B's FY 2023 accomplishments and analysis of the waste streams are discussed in the following sections.

1.1 Background

The 1990 Pollution Prevention Act changed the focus of environmental policy from "end-of-pipe" regulation to source reduction and waste generation minimization. Under the provisions of the Resource Conservation and Recovery Act (RCRA), and in compliance with the Pollution Prevention Act of 1990 and other institutional requirements for treatment, storage, and disposal of wastes, all waste generators must certify that they have a waste minimization program in place.

Specific DOE pollution prevention requirements are found in DOE Order 436.1, "Departmental Sustainability." The order contains goals for reduction of greenhouse gas emissions and conservation of energy and water and places a strong emphasis on pollution prevention and sustainable acquisition. DOE Order 436.1 requirements are executed through N3B's Environmental Management System (EMS).

1.2 Purpose and Scope

This report describes the measures N3B implemented throughout FY 2023 to reduce the volume and toxicity of waste generated in conjunction with its work scope. This report also describes the barriers to implementing waste reduction efforts.

1.3 Operating Permit Requirements

Section 2.9 of the LANL Hazardous Waste Facility Permit (Permit) requires that a waste minimization program be in place and that a certified progress report be submitted annually to the New Mexico Environment Department (NMED). The Permit requirements listed in Table 1.3-1 correspond with the section(s) of this report that address each requirement.

Table 1.3-1
Crosswalk of Permit Requirements and Corresponding Report Section

Permit Requirement	Item	Report Section
Section 2.9 (1)	Policy Statement	Section 2.1
Section 2.9 (2)	Employee Training and Incentives	Section 2.2
Section 2.9 (3)	Past and Planned Source Reduction and Recycling	Sections 2.4, 3.3, 4.3, 5.3, 6.3, and 6.4
Section 2.9 (4)	Itemized Capital Expenditures	Section 2.5
Section 2.9 (5)	Barriers to Implementation	Sections 3.4, 4.4, 5.4, and 6.5
Section 2.9 (6)	Investigation of Additional Waste Minimization Efforts	Section 2.4
Section 2.9 (7)	Waste Stream Flow Charts, Tables, and Analysis	Sections 3.2, 4.2, 5.2, and 6.2
Section 2.9 (8)	Justification of Waste Generation	Section 2.3

1.4 N3B Organizational Structure and Staff Responsibilities

N3B's work scope involves the following major elements:

- Ongoing disposition of legacy MTRU/MLLW waste stored aboveground
- Remediation for waste acceptance criteria compliance of MTRU aboveground waste
- Retrieval and processing (size reduction) for disposal of MTRU waste stored belowground
- Monitoring and protection of ground and surface water
- Investigation and evaluation of groundwater contaminant plumes, including documented plumes of hexavalent chromium and high explosives
- Campaign investigations and remediation of soils
- Decommissioning, demolition, and disposal of facilities

N3B's organizational structure allows for the efficient implementation of this work scope.

The N3B Environmental Remediation (ER) Program has responsibility for the investigation and cleanup of legacy-contaminated sites in compliance with the 2016 Compliance Order on Consent (Consent Order).

The N3B ER Program is also responsible for management and tracking of the EMS, including N3B's Pollution Prevention Program. The EMS establishes (1) institutional waste minimization and pollution prevention objectives and (2) environmental action plans that contain waste minimization, pollution prevention, and other environmental improvement actions.

N3B's CH-TRU (Contact-Handled Transuranic [Waste]) Program provides all N3B waste packaging, transporting, and disposal services. In addition, CH-TRU is responsible for the retrieval, processing, and disposal of 158 corrugated metal pipes, which are located in belowground storage at Technical Area 54 (TA-54), above Pit 29.

All of N3B's programs share responsibility for waste minimization and implementation of the Pollution Prevention Program.

2.0 WASTE MINIMIZATION PROGRAM ELEMENTS

2.1 Governing Policy on Environment

N3B EMS policy N3B-SD400, "Environmental Management System," addresses the Pollution Prevention and Site Sustainability Programs. As required by DOE Order 436.1, "Departmental Sustainability," the EMS provides the framework for integration of sustainability and pollution prevention goals into N3B's work scope. In support of this effort, N3B's EMS Integrated Project Team (IPT) develops an implementation plan each year for management approval that identifies site-sustainability goals and underlying objectives or targets that support those goals. The EMS IPT is composed of professionals from across N3B functional areas who work to ensure that the environmental objectives, goals, and initiatives identified in the annual plan are integrated throughout N3B's work scope. This group meets periodically to track the objectives and targets of the site sustainability plan. The implementation plan for FY 2023 consists of 4 overreaching objectives and 24 supporting targets (Attachment 1). The 4 objectives identified in the FY 2023 plan are as follows:

1. Establish a culture of sustainability among N3B employees and subcontractors.
2. Reduce volume and toxicity of waste from field, office, and remote work support activities.
3. Reduce energy consumption, greenhouse gas emissions, and natural resource consumption.
4. Manage and remove waste in support of Laboratory operations and legacy waste remediation.

Of the 24 supporting targets included in the FY 2023 plan, the following are identified as directly associated with N3B's overall waste minimization strategy:

- Objective 1, Target 5: Promote sustainable contracting through the continued inclusion of sustainability clauses in all eligible contracts.
- Objective 2, Target 1 (paraphrased): Land-apply all well purge water that meets applicable criteria defined by the NMED-approved "Decision Tree for the Land Application of Groundwater" (November 2016).
- Objective 2, Target 2 (paraphrased): Require that projects subject to the N3B internal project review process include information to detail how waste volume and toxicity associated with the project will be minimized.
- Objective 4, Target 2: Remediate and/or repackage 171 m^3 of legacy transuranic waste.
- Objective 4, Target 3 (paraphrased): Maximize the shipment of waste from LANL to the Waste Isolation Pilot Plant (WIPP) for final disposal.
- Objective 2, Target 3: Track electronics end-of-life dispositioning (e.g., donated, recycled, landfill)
- Objective 4, Target 6 (paraphrased): Complete Consent Order milestones defined in Appendix B of the Consent Order for FY 2023.

2.2 Employee Training and Incentive Programs

N3B employee training is used to promote waste recycling and source reduction. Available training courses include the EMS biennial awareness training (N3B-TS-RS-0003) and training associated with N3B-P409-0, "N3B Waste Management" (Course # 23263, Waste Generation Overview-Live; Course # 21464, Waste Generation Overview Refresher; Course # 8504, WCATS: Waste Documentation). Through the promotion of pollution prevention and waste minimization and ongoing calls

for increased efficiency from N3B management, employees and subcontractors are continually encouraged to seek project modifications that minimize environmental impact and waste generation.

2.3 Hazardous Materials Use and Justification

In conjunction with the implementation of N3B's work scope, the primary source of hazardous waste generation is repackaging and shipping of Federal Facility Compliance Order (FFCO) site treatment plan (STP) wastes for final off-site disposition. Other sources of hazardous waste generation include various investigation, remediation, and monitoring efforts, as well as limited, ongoing facility operations. The use of hazardous materials and generation of new hazardous wastes in conjunction with the implementation of N3B's work scope is actively minimized through the N3B project planning and review process defined in N3B-P351, Revision 4, "Project Planning and Regulatory Review." This procedure requires consideration of waste generation and regulatory implications in the early planning phase of each new project. Additionally, N3B routinely considers waste reduction and sustainability as part of its procurement process. Through these and other programs, use of hazardous materials and minimization of waste generation is a prime consideration for every project implemented by N3B.

2.4 Investigation of Additional Hazardous Waste Minimization and Pollution Prevention Efforts

In FY 2023, N3B utilized its EMS to define hazardous waste minimization and pollution prevention goals. While N3B made progress with waste reduction targets, the specific achievements during FY 2023 are still being vetted for an annual report. The EMS annual report will be finalized by the end of calendar year 2023 and submitted to N3B management.

2.5 Itemized Capital Expenditures

N3B reported no capital expenditures devoted to hazardous waste source reduction and recycling during FY 2023.

3.0 HAZARDOUS WASTE

3.1 Introduction

Non-legacy hazardous wastes most commonly generated by N3B include solvents; metals; soil, demolition debris, and other solid waste contaminated with hazardous waste constituents or expired/off-specification hazardous material; and contaminated wastewater.

3.2 Waste Stream Analysis

Wastes are generated from all of N3B's operations, including administrative activities; waste management programs; decommissioning, demolition, and disposal operations; ongoing facility operations and maintenance; and remedial and investigation efforts. After a material is declared a waste, it is evaluated and if determined to be hazardous waste, is characterized, labeled, and collected in appropriate storage areas. Hazardous wastes are ultimately shipped to appropriate off-site treatment, storage, and disposal facilities for final treatment and/or disposal. The majority of hazardous waste managed and disposed of by N3B is legacy and environmental remediation waste.

During FY 2023, N3B disposed of 11.18 m^3 of hazardous waste. The volume of hazardous waste generated during FY 2023 represents a significant increase from FY 2022, when N3B disposed of

0.776009 m^3 of hazardous waste. This difference is attributable to a significant increase in remedial and investigation efforts conducted by N3B during the reporting period.

3.3 Hazardous Waste Minimization

All N3B projects are subject to N3B-P351, Revision 4, "Project Planning and Regulatory Review," before approval for implementation. During project planning, waste characterization strategy forms are developed for the project and reviewed by waste management coordinators for the dual purpose of minimizing waste generation and considering methods or products with a lower environmental impact. In addition, through the planning process, subject matter experts identify opportunities for waste minimization, substitution, and hazardous waste best management practices. Ongoing processes routinely implemented by N3B also incorporate waste minimization and consideration of environmental impacts. For example, N3B's procurement process requires consideration of sustainability and waste generation in the contractual process. As N3B has matured as an organization, hazardous waste minimization has been further incorporated into policies and procedures.

Universal wastes, including mercury-containing equipment and fluorescent lamps, are recycled on a company-wide basis. However, as office and workspaces are leased by N3B, wastes generated by these facilities (e.g., fluorescent lamps, etc.) are managed by others. Scrap metal produced from N3B operations is recycled only after radiological sampling/screening is performed to determine the presence/absence of radiological contamination. Wherever possible, N3B uses recyclable lubricating fluids for equipment, such as highly refined mineral oil in place of more hazardous hydraulic fluids. Used oil generated by N3B operations is routinely recycled.

Although specific weights or volumes of materials were not tracked by N3B, plastics, cardboard, and scrap metal were recycled during FY 2023.

3.4 Barriers to Hazardous Waste Minimization

Barriers to hazardous waste minimization at N3B include limited availability of appropriate nonhazardous products, a limited pool of vendors or service providers, and a lack of options for on-site treatment of radioactively contaminated materials.

4.0 MIXED TRANSURANIC WASTE

4.1 Introduction

MTRU waste is RCRA hazardous waste that contains more than 100 nCi of alpha-emitting transuranic (TRU) isotopes per gram of waste. TRU isotopes have an atomic number higher than 92 and half-lives that exceed 20 yr. TRU waste does not include (1) high-level waste; (2) waste which DOE has determined, with the concurrence of the U.S. Environmental Protection Agency, does not need the degree of isolation required by 40 Code of Federal Regulations (CFR) 191; or (3) waste which the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.

MTRU waste is generated from the management and disposal of legacy waste that was produced from research, development, nuclear weapons production, and spent nuclear fuel reprocessing. During FY 2023, N3B was responsible for the disposal of legacy MTRU waste managed at TA-54 but did not generate new MTRU waste. MTRU waste is disposed of at the Waste Isolation Pilot Plant (WIPP), a geologic repository near Carlsbad, New Mexico.

MTRU waste can include solidified liquids, cemented residues, combustible materials, noncombustible materials, and non-actinide metals. MTRU solid waste is packaged for disposal in metal 55-gal. drums, standard waste box containers, or oversized containers and is then stored on-site before certification for transport and disposal at WIPP.

Standards for packaging waste for acceptance at WIPP change periodically. When this occurs, stored containers of MTRU waste require repackaging to conform to the new standards. Shipment of repackaged MTRU waste accounts for the majority of MTRU waste shipped from N3B to WIPP.

4.2 Waste Stream Analysis

MTRU wastes located at TA-54 include legacy wastes that are listed in the FFCO STP for ultimate disposal. No new MTRU wastes are deliberately generated except through routine management of existing MTRU wastes (such as repackaging to meet new requirements) or environmental remediation wastes, as explained in section 6.0 of this report.

4.3 MTRU Waste Minimization

The N3B CH-TRU Program, which manages and ships mostly legacy MLLW and MTRU wastes, has implemented several activities to reduce the amount of hazardous waste generated from ongoing operational activities. N3B minimizes MTRU waste by carefully segregating non-MTRU waste from the MTRU waste stream. The primary functions of the CH-TRU Program are management and shipping of legacy MLLW and MTRU waste.

During FY 2023 N3B disposed of 107.19 m^3 of MTRU waste.

4.4 Barriers to MTRU Waste Minimization

In order to protect human health and the environment, the MTRU waste packaging requirements defined by WIPP are very stringent, which makes minimization of these wastes difficult. There are radiological wattage and dose limits that cannot be exceeded, and a very small volume of MTRU waste may have a high wattage. Containers sent to WIPP are 55 gal. or larger in capacity.

5.0 MIXED LOW-LEVEL WASTE

5.1 Introduction

For waste to be considered MLLW, it must contain both hazardous and radioactive waste but not be classified as high-level waste, TRU waste, spent nuclear fuel, or byproduct materials such as uranium or thorium mill tailings. Test specimens of fissionable material irradiated only for research and development (i.e., not for the production of power or plutonium) may be classified as LLW provided the activity of TRU waste elements is less than 100 nCi/g.

Most of the routine MLLW comes from stockpile stewardship; remediation activities; reclassification of MTRU waste; and decommissioning, demolition, and disposal activities. Most of the non-routine waste is generated by abnormal events such as spills in legacy-contaminated areas. Typical MLLW includes contaminated debris, waste gloveboxes, legacy chemicals, mercury-cleanup waste, electronics, copper solder joints, and used oil.

5.2 Waste Stream Analysis

Materials and equipment are introduced into a radiologically controlled area as needed to accomplish specific work. In the course of operations, materials may become externally contaminated or become activated, thus becoming MLLW when no longer needed.

If MLLW is generated, it is transferred to a satellite accumulation area or central accumulation area (CAA) after generation. Whenever possible, MLLW materials are surveyed to confirm the radiological contamination levels. If decontamination will eliminate the radiological or the hazardous component, materials are decontaminated to prevent them from becoming MLLW.

MLLW is managed in accordance with all appropriate waste management and U.S. Department of Transportation requirements. It may be shipped to and stored at an on-site CAA or permitted storage facility before transport to off-site commercial or DOE-operated permitted treatment, storage, or disposal facilities.

Reclassification. Waste formerly classified as MTRU waste may be reclassified and disposed of as MLLW based on new nondestructive assay measurements. Since this reclassified waste is already generated, there are no opportunities to minimize this component of the MLLW stream.

Lead Debris. This waste stream could include copper pipes with lead solder, lead-contaminated equipment, brass contaminated with lead, sheets, rags, circuit boards, cathode ray tubes, or personal protective equipment (PPE) contaminated with lead from maintenance activities. This waste stream is generated primarily from remediation campaigns, and volumes of this waste stream are expected to decrease as remediation efforts progress.

Trash and Maintenance. This waste stream consists of PPE, dry painting debris, paper towels, and rags and could also include unwanted equipment that was removed during remediation campaigns.

During FY 2023, N3B disposed of 79.46 m^3 of MLLW.

5.3 MLLW Minimization

MLLW will be generated by cleanup activities and repackaging efforts. The volume of MLLW from these efforts varies significantly from year to year and often cannot be substantially minimized. It is therefore useful to examine the routine fraction of the MLLW waste stream separately to identify good waste minimization opportunities.

5.4 Barriers to MLLW Minimization

Packaging requirements at final disposition locations are often barriers to MLLW minimization. Containers sent for final disposition will have a 55-gal. or greater capacity, often with very small volumes of waste inside the overpacks, and the majority of internal volume is empty space.

6.0 REMEDIATION WASTE

6.1 Introduction

The mission of N3B’s corrective action activities is to investigate and remediate potential releases of contaminants as necessary to protect human health and the environment. These activities are implemented to comply with Consent Order requirements.

Through the implementation of this mission, large volumes of waste are typically generated. Because these activities involve investigating and, as necessary, conducting corrective actions at historically contaminated sites, source reduction and material substitution are difficult to control and these wastes often entail special handling, treatment, storage, and disposal requirements. Because of the investigative nature of this work, the volume of waste is often difficult to anticipate. The corrective action process, therefore, includes the responsibility and challenge of minimizing the risk posed by contaminated sites while also minimizing the amount of waste that will require subsequent management or disposal. Three factors make minimization desirable: the high cost of waste management; the limited capacity for on-site or off-site waste treatment, storage, and/or disposal; and reduction of the associated liability.

6.2 Waste Stream Analysis

The following sections summarize the waste that may be generated by corrective actions associated with the investigation and remediation of legacy contaminant releases. Wastes generated include “primary” and “secondary” waste streams.

Primary waste consists of generated legacy contaminated material or environmental media that was present as a result of past DOE activities before any containment or restoration activities. Primary waste includes contaminated building debris and soil from investigations and remedial activities.

Secondary waste streams consist of materials used in the investigative or remedial process and may include investigation-derived waste (IDW) such as PPE, sampling waste, drill cuttings, or treatment residues such as spent resins or activated carbon from groundwater treatment; wastes resulting from storage or handling operations; or additives used to stabilize waste. Primary and secondary waste streams generated as a result of investigative and remedial actions may be hazardous waste, nonhazardous waste, or MLLW.

6.3 Remediation Waste Minimization

Waste minimization and pollution prevention are incorporated into N3B standard operating procedures that govern the planning and implementation of field activities. Techniques used to reduce investigation-related waste streams include the following:

Land Application of Groundwater. Well drilling, development, sampling, and rehabilitation/reconfiguration activities all generate a significant volume of potential wastewater. However, a procedure implementing the NMED-approved “Decision Tree for the Land Application of Groundwater” (November 2016) in cases where land application is determined to be protective of human health and the environment allows for the minimization of purge water that must be managed as wastewater. During FY 2023, N3B land-applied 76,753 gal. of groundwater using this procedure.

Land Application of Drill Cuttings. Drill cuttings constitute a major potential source of solid waste generation. This procedure, which incorporates the NMED-approved “Decision Tree for the Land Application of Drill Cuttings” (April 2016), allows drill cuttings to be land-applied if this will be protective of human health and the environment. These drill cuttings do not have to be managed or disposed of as waste. In addition, land-applied drill cuttings can be beneficially reused as part of drill site restoration. N3B did not land-apply drill cuttings using this procedure during FY 2023.

EMS Integration into N3B and Subcontractor Remediation Activities. N3B considers sustainability and waste generation as part of the contractual process. Full implementation of this process will enhance N3B and subcontractor awareness of waste minimization requirements and opportunities.

Sorting, Decontamination, and Segregation. Segregation of contaminated and uncontaminated soils is actively conducted so that uncontaminated soils can be reused as fill and unnecessary disposal costs are minimized. This practice is easily implemented at sites where contaminated subsurface soils and structures are overlain by uncontaminated soils. During excavation to remove the contaminated soils and structures, the uncontaminated overburden is typically segregated and staged on plastic apart from contaminated materials. Any man-made debris that was present in the excavated material is removed and dispositioned at an appropriate disposal facility.

Following removal of contaminated soils and structures, segregated materials are tested to verify residential soil screening levels are met. Material that meets this standard is typically used as backfill for the excavation. This practice minimizes the amount of contaminated soil that must be disposed of as waste and the amount of backfill that must be imported from off-site.

Material that does not meet applicable soil screening levels or screening action levels, or which is determined to be LLW or hazardous waste, is managed as waste.

Risk Assessment. Risk assessments are routinely conducted for corrective action projects to evaluate the human health and ecological risk associated with a site. The results of the risk assessment may be used by NMED to determine whether corrective measures are needed at a site to protect human health and the environment. The risk assessment may demonstrate that it is adequately protective to leave waste or contaminated media in place, thus avoiding the generation of waste. Properly designed land-use agreements and risk-based cleanup strategies can provide flexibility to select remedial actions or other technical activities that may avoid or reduce the need to excavate or conduct other actions that typically generate high volumes of remediation waste.

Equipment and Material Reuse. The reuse of equipment and materials such as plastic gloves, sampling scoops, plastic sheeting, and PPE after proper decontamination to prevent cross-contamination can provide waste reduction and cost savings.

An unspecified amount of cardboard, scrap metal, poly tanks, and other materials from N3B operations, including field and sampling activities conducted during FY 2023, was transferred to the Los Alamos County Transfer Station for recycling.

6.4 Pollution Prevention Planning

The potential to incorporate additional pollution prevention practices into future activities will be evaluated annually as part of the EMS planning efforts. This report will be used during the EMS annual management assessment to continue integration efforts across the organization and align environmental protection and sustainability goals. Further actions related to pollution prevention will be incorporated into the EMS as they are identified. Waste generation, management, and disposition processes are being developed to minimize waste generation and maximize pollution prevention. Specific actions and approaches that will be incorporated into planned corrective action projects include

- segregation and recycle or reuse of uncontaminated materials,
- continued use of land application of drill cuttings and fluids,
- waste avoidance,
- reuse and recycling of equipment and materials,
- increase in the use of sustainable acquisition strategies, and
- risk-based cleanup strategies.

In addition, pursuant to the January 2012 Framework Agreement, DOE and NMED have agreed to increase the efficiency of cleanup activities while maintaining protection of human health and the environment. These increased efficiencies should result in a reduction in sampling activities for future investigations and a commensurate reduction in IDW generation.

To help improve the implementation of waste minimization activities, N3B ensures communication of environmental and waste minimization concerns to project participants through N3B-P351, Revision 4, "Project Planning and Regulatory Review." Waste minimization opportunities are and will continue to be integrated into routine project communications to increase awareness of waste minimization and promote the sharing of lessons learned.

6.5 Barriers to Remediation Waste Minimization

The single largest potential source of waste generated by corrective actions is the removal of buried waste or contaminated soil during the implementation of corrective measures. This approach has the potential to generate thousands of cubic meters of waste. In evaluating corrective measure alternatives, corrective action program and project leaders generally give preference to alternatives that avoid generating large volumes of waste, provided they are protective of human health and the environment. The consideration of other factors by external stakeholders, however, may result in the selection of an alternative that generates more waste than the recommended alternative.

Attachment 1

Fiscal Year 2023 Environmental Management System
Integrated Project Team Objectives and Targets

Objective 1. Establish a culture of sustainability among N3B employees and subcontractors	Objective 2. Reduce volume and toxicity of waste from field, office, and remote work support activities	Objective 3. Reduce energy consumption, greenhouse gas emissions, and natural resource consumption	Objective 4. Manage and remove waste in support of lab operations and legacy waste remediation
Target 1 – Continue EMS/Sustainability message for N3B distribution *Responsible Group: Environmental Programs/Services*	Target 1 – Perform land application of qualifying purge waters from ground water sampling *Responsible Group: Ground Water*	Target 1 – Track purchases of electronics (e.g., servers, computers, displays, copiers, printers, mobile phones, etc.) and their Energy Star or EPEAT certifications *Responsible Group: Acquisition Management; Information Technology*	Target 1 – Disposition 600 containers of mixed low level waste (MLLW) *Responsible Group: CH-TRU*
Target 2 – Solicit sustainability best practices from employees *Responsible Group: Environmental Programs/Services*	Target 2 – Add an inquiry to the PPRR asking the project to detail how they will reduce the volume and toxicity of waste generated by the project. *Responsible Group: Environmental Programs/Services*	Target 2 – Track fleet vehicle usage *Responsible Group: Safeguards, Security & Facilities*	Target 2 – Remediate and/or repackage legacy transuranic (TRU) waste (171m^3) *Responsible Group: CH-TRU*
Target 3 – Promote opportunities for N3B employees to participate in Earth Day volunteer events. *Responsible Group: Environmental Programs/Services*	Target 3 – Track electronics end of life dispositioning (e.g., donated, recycled, landfill) *Responsible Group: Safeguards, Security & Facilities*	Target 3 – Track air travel *Responsible Group: Business Services*	Target 3 – Characterize waste and execute waste isolation pilot plant (WIPP) shipments *Responsible Group: CH-TRU*
Target 4 – Complete management assessment of N3B-SD400, Environmental Management System *Responsible Group: Environmental Programs/Services*	Target 4 – Track the number of computers set to default to duplex printing *Responsible Group: Information Technology*	Target 4 – Track privately owned vehicle (POV) usage *Responsible Group: Business Services*	Target 4 – Initiate corrugated metal pipe (CMP) size reduction *Responsible Group: CH-TRU*
Target 5 – Promote sustainable contracting through the continued inclusion of sustainability clauses in all eligible contracts *Responsible Group: Acquisitions Management*	Target 5 – Develop internal website instructing employees how to dispose of office-generated waste *Responsible Group: Environmental Programs/Services*	Target 5 – Track non-fleet vehicles and equipment vehicle usage (e.g., heavy machinery, generators, etc.) *Responsible Group: Maintenance & Work Control; CH-TRU*	Target 5 – Characterize Building 257 and the industrial waste lines at TA-21 *Responsible Group: Environmental Remediation*
		Target 6 – Track the percentage of electronic devices using power management (e.g., sleep, standby, hibernate) *Responsible Group: Information Technology*	Target 6 – Completion of Compliance Order on Consent Appendix B FY 2023 Milestones *Responsible Group: Environmental Remediation*
		Target 7 – Track fugitives emissions and refrigerants usage *Responsible Group: Safeguards, Security & Facilities*	
		Target 8 – Track employee commute methods (i.e., modes and frequencies) *Responsible Group: Environmental Programs/Services*	

N3B President and General Manager:

Bradley Smith

October 26, 2023
Date