U.S. DEPARTMENT OF ENERGY

ESHID-603729

National Nuclear Security Administration
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Date: November 21, 2022

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

Subject: 2022 Los Alamos National Laboratory Hazardous Waste Minimization Report, Los Alamos National Laboratory, EPA ID #NM0890010515

Dear Mr. Shean:

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). The Permit authorizes the United States Department of Energy (DOE) and its field offices, the National Nuclear Security Administration, Los Alamos Field Office (NA-LA) and the Environmental Management, Los Alamos Field Office (EM-LA), together with 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 2022 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 questions or comments for Triad concerning this submittal, please contact Karen E. Armijo (NA-LA) at (505) 665-7314 or Patrick L. Padilla (Triad) at (505) 412-0462.

If you have questions or comments for N3B concerning this submittal, please contact Arturo Duran (EM-LA) at (575) 373-5966 or Christian Maupin (N3B) at (505) 695-4281.

Sincerely,

KAREN ARMIJO
Digitally signed by KAREN ARMIJO
Date: 2022.11.18 11:22:28 -07'00'

Karen E. Armijo
Permitting and Compliance Program Manager
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy

Sincerely,

M Lee Bishop
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Date: 2022.11.14 11:24:11 -07'00'

M. Lee Bishop, Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office
U.S. Department of Energy

Enclosures: 1) 2022 Los Alamos National Laboratory Hazardous Waste Minimization Report, Triad/NA-LA
2) 2022 Los Alamos National Laboratory Hazardous Waste Minimization Report, N3B/EM-LA

copy w/enclosures:

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ENCLOSURE 1

2022 Los Alamos National Laboratory Hazardous Waste Minimization Report

Date: 11/21/2022

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

LA-UR-22-31772
Approved for public release; distribution is unlimited.
November 2022

2022 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.

JENNIFER PAYNE (Affiliate) Digitally signed by JENNIFER PAYNE (Affiliate) Date: 2022.11.15 11:24:27 -07'00'

11/15/2022

Jennifer E. Payne
Division Leader
Environmental Protection and Compliance Division
Triad National Security, LLC
Los Alamos National Laboratory

Date Signed

KAREN ARMIJO Digitally signed by KAREN ARMIJO Date: 2022.11.18 11:22:07 -07'00'

11/18/2022

Karen E. Armijo
Permitting and Compliance Program Manager
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 (TRU) 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)-03, 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) 2022 (October 2021–September 2022). Projects, summarized later in this report, targeted minimization of hazardous waste as part of the planning process. In FY 2022, 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 2022, cleanup/closure of the TA-16-0399 Burn Tray and lead-contaminated debris waste from the TA-08 LINATRON Shielding project generated the largest volumes of waste. For MLLW in FY 2022, a significant portion of waste generation was from removal of activated (contaminated with low levels of radiation) lead equipment and bricks used in programmatic operations at the TA-03-0066 SIGMA facility. The Laboratory's waste minimization efforts and analysis of these waste streams are discussed in detail in this report.

LANL generated 58.9 cubic meters (m^3) of MTRU waste in FY 2022. This amount includes containers of debris and homogeneous waste from TA-55 PF-4 operating activities and is represented by the waste stream profiles 50614 and 50609.

Figure 1-1 depicts the total hazardous, MLLW, and MTRU wastes generated in FY 2021 and FY 2022.

[a] New-generation waste refers to Triad hazardous waste, MLLW, or MTRU wastes.

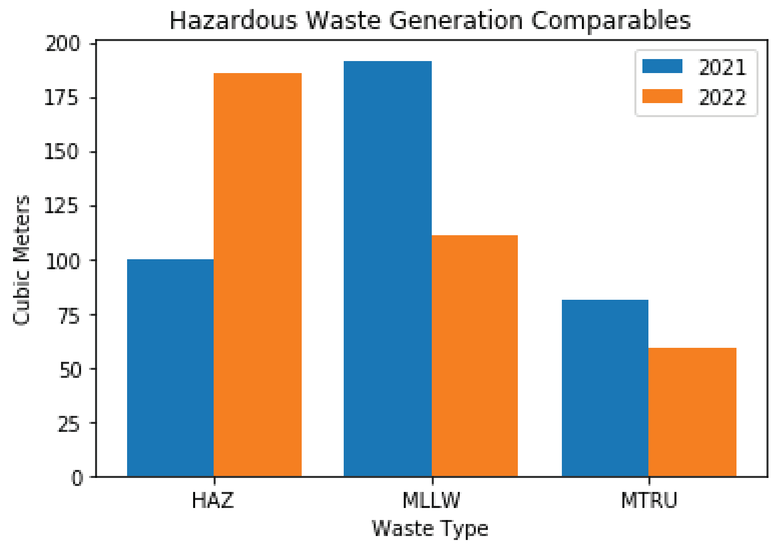

Figure 1-1. Total Hazardous (HAZ), MLLW, and MTRU for Triad in FY 2021 and FY 2022.

1.2 Purpose and Scope

The purpose of this report is to describe the implementation and maintenance of the waste minimization program at LANL to reduce 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 for FY 2022 and the waste minimization efforts for those wastes. In addition, this report documents FY 2022 waste quantities processed in comparison with FY 2021 and compares the waste minimization efforts applied during those years.

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	Section 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	Sections 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.

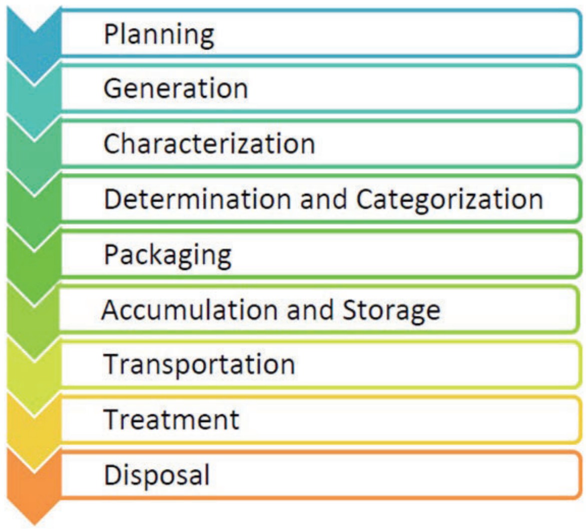

Figure 1-2. P409 Waste Management Process.

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, P2, 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.

LANL staff attended the McCoy VIRTUAL RCRA seminar March 15 through March 17, 2022. Table 2-1 shows attendee details.

Table 2-1. LANL Staff Attendees by Organization to the McCoy VIRTUAL RCRA Seminar

Division	Number of Attendees
U.S. Department of Energy	8
Environmental Protection and Compliance	32
Waste Management	26
Nuclear Process Infrastructure	8
Environment and Waste Programs	1
Office of General Counsel	3
Human Resources	2
Institutional Quality Support Services	1
Total Attendees	**81**

The Laboratory and NA-LA sponsor annual sustainability award competitions, which recognize personnel who implement P2 projects. In FY 2022, the P2 Program managed a LANL environmental awards program that emphasized source reduction of all types of waste. The award winners were recognized by the senior manager from Environment, Safety, Health, Quality, Safeguards, and Security, Bill Mairson, 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 paragraphs describe 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 2022, P2 funds were allocated to the following projects:

- Copper bioleaching to eliminate nitric acid waste for target development used in plasma physics experiments ($75,000)

  Researchers in MST-7 (Engineered Materials) are studying use of a bacteria, *Acidithiobacillus ferrooxidans*, to remove copper deposits on target components formed during assembly. The current process requires use of 35% nitric acid for copper removal that generates a hazardous waste stream represented by waste stream profile 49838. During FY 2022, researchers learned that the media used to grow the bacteria was more effective than the bacteria itself in removing the copper deposits. With P2 funding in FY 2023 earmarked for $100,000, researchers will continue to experiment with the bacteria and bacterial broth to better understand copper removal.

- Dimethylsulfoxide-d6 (DMSO) Solvent Recycle ($35,000)

  Researchers in MPA-11 (Materials Synthesis and Integrated Devices) used P2 funding to complete work on a solvent recycle system for DMSO used in a distillation process. The waste stream is represented by profile 50819. Expectations for project completion will be in quarter one or quarter two of FY 2023. With the system online, there should be greater than a 90% solvent recovery for reuse; benefits include $25,000 in annual cost savings from purchasing less DMSO and reduction in the management burden of this corrosive waste, D002.

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 to 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 Date 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 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 2022 on October 3, 2022.

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 having more than 1,000 ppm of total halogens.

3.2 Hazardous Waste Minimization Performance

Hazardous waste volumes processed at LANL in FY 2022 and FY 2021 are shown in Table 3-1. The volumes are sorted by the amount of waste that originated in each TA and further sorted for FY 2022 to show the quantity of waste generated from highest to lowest.

Table 3-1. Hazardous Waste Generation by Technical Area in FY 2022 and FY 2021; FY 2022 Ranked by Volume

Technical Area (TA)	FY 2022 Hazardous Waste (m^3)	FY 2021 Hazardous Waste (m^3)
08	53.6	0.23
16	52.11	26.33
03	37.93	34.98
18	17.83	0
09	6.29	2.52
35	5.58	4.08
46	2.44	2.68
53	2.25	11.74
22	2.11	9.85
59	1.29	3.02
48	1.24	0.92
36	1.24	0.74
55	0.56	0.53
03-CMR	0.43	0
64	0.32	0
40	0.22	0.02
43	0.22	0.46
50	0.052	0

51	0.023	0

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 may include equipment, containers, structures, and other items intended for disposal that are considered hazardous (e.g., compressed gas cylinders). Some waste waters that cannot be sent to the sanitary wastewater system or to the high-explosives (HE; hazardous-waste-containing) wastewater treatment plant may 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—can 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 onsite and increase 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 onsite.

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 2022 and FY 2021 Hazardous Waste Generation

The amount of non-remediation hazardous waste generated at LANL in FY 2021 was 100 m^3 compared with 185.9 m^3 of hazardous waste generated in FY 2022. The increase in waste volume is due to cleanup of the TA-16-0399 Burn Tray and lead-contaminated debris waste from the LINATRON project at TA-08. See Table 3-2 and Table 3-3 for waste details by year.

Table 3-2. 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 soil/sand/bricks/ scrap metals/wheels/trays 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 project includes asbestos and lead paint
Various	68.7	37	Consistent with waste streams described in Section 3.3

Table 3-3. FY 2021 Hazardous Waste Generation

Waste Stream Number	Volume (m^3)	% Total	Waste Description
50085	16.65	16.65	Large oven containing lead and beryllium cleaned-out for machining upgrades at TA-03-0039
49779	14.5	14.5	Large kettle containing chromium, lead, and asbestos removed at weapons facility TA-16
48403	8.12	8.12	Demolition debris contaminated with lead paint from dismantlement of military shed at LANSCE[b]
Various	60.69	60.69	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, aerosol cans, and batteries are collected from various sites and brought to TA-60 where empty aerosol cans are punctured, used bulbs are packaged together, and batteries are packaged for recycling. Consolidating these operations at one location is cost effective and maximizes recycling potential. Regarding lead-acid battery recycling, this component of the recycling waste stream 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 2022 and FY 2021

Universal Waste Type	FY 2022	FY 2021
Aerosol cans (m^3)	3.0	2.24
Lamps/Bulbs/Tubes (m^3)	16.7	14.15
Batteries (m^3)	1.28	0.55
Total Volume (m^3)	21.0	16.94
Total Cost	**$6,279**	**$5,067**

[b] Los Alamos Neutron Science Center

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 2022 and FY 2021 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 2022, the P2 Program funded a DMSO solvent recycle project. See Section 2.3 for the project description and waste stream profile number.

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

A team at the TA-16-0260 weapons facility dispositions hazardous HE- contaminated fabrication equipment as metals for recycle as opposed to hazardous waste. During the disassembly process, all detonable quantities of explosives are safely removed. The components are transported as hazardous waste to the TA-16-0388 Flash Pad for treatment. After performing an HE spot test and verifying that the hazardous contaminants are removed, the team coordinates with a metals recycler to dispose of this material. This waste stream is represented by waste profile 51537.

In FY 2022, a team at Experimental Device Engineering and Assembly (E-5) reclassified HE-containing debris materials generated from an assembly facility at TA-16. Before the reclassification, materials such as Kimwipes used in processing were transported to the TA-16-0388 Flash Pad for treatment. However, based on process review, technicians recognized that many of these HE-contaminated debris materials might not contain enough HE to warrant treatment; initial and periodic sampling/analytical testing of possible hazardous constituents confirmed/confirms this recharacterization. Now these debris materials are being managed as a non-hazardous waste, represented by waste profile 51485. Benefits to the institution include $10,000 per year in cost savings from alleviating a waste management burden and 30–60 pounds per year less HE-contaminated debris material being sent to the Flash Pad for treatment.

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 the barcodes of chemicals containers for inventory, to transfer ownership and location of chemicals, and 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 onsite 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 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.

4 Mixed Transuranic Waste

4.1 Legacy and Current Mixed Transuranic Waste

MTRU contains hazardous constituents in addition to high levels of radiation. As of FY 2016, more than 5,000 legacy waste containers existed at TA-54, Area G (i.e., 2,400 TRU waste containers). Most of these containers were generated in the 1970s, 1980s, and early 1990s, which—in some cases—is before the enactment of RCRA and in all cases before the implementation of a strong waste-profiling program at the Laboratory. In the mid-1990s, to comply with RCRA requirements, the Laboratory implemented a requirement that a waste profile be developed for all waste generated. EM-LA took ownership of TA-54, Area G, in May 2018, and N3B became responsible for legacy MTRU disposition at that time but did not ship waste in FY 2018.

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 58.9 m^3 of MTRU in FY 2022 in support of the plutonium pit mission. The generating facilities are TA-55, TA-55 PF-4, and TA-03 CMR. Triad generated a total of 81.5 m^3 of MTRU in FY 2021. 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 2022 and FY 2021, 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 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 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
47746	0.21	0.3	TA-55 PF-4	Tritium-contaminated debris waste from Plutonium Facility operations

Table 4-2. FY 2021 MTRU Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
46457, 46633, 46634	16.9	20	TA-55 PF-4	Debris and homogeneous wastes from Plutonium Facility operations
46457, 46633, 46634, 47833	64.6	80	TA-55	Debris and homogeneous wastes from Plutonium Facility operations

4.3 Mixed Transuranic Waste Minimization

To support plutonium pit development, 91 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 is planning to 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, among the 91 MTRU large items, 43 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 49525) in the years to come. Because the cost of implementing an abatement technology is high, no plan exists to eliminate the hazardous component. At the same time, once the other 48 MTRU items that are not lead lined are decontaminated to SCO LLW, they will be classified as LLW, reducing MTRU volumes without increasing MLLW volumes.

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.

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[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.

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-generation waste in FY 2022. In FY 2021, Triad generated 191.5 m^3 of MLLW. The year-over-year decrease is due to less generation by volume at facilities TA-03 CMR and TA-55.

In FY 2022, waste stream 50937 resulted in a high volume of activated lead from clean-out operations at TA-03-0066 SIGMA. Waste stream 50787 represents another clean-out effort from the same facility. The third significant MLLW by volume is waste stream 49534; it represents waste generated from clean-up in Area A at LANSCE. Table 5-1 lists MLLW by location during FY 2022 and FY 2021.

Table 5-1. MLLW Generation by Technical Area in FY 2022 and FY 2021; FY 2022 Ranked by Volume

Technical Area	FY 2022 MLLW (m^3)	FY 2021 MLLW (m^3)
03	59.94	31.9
03-CMR	15.78	55.4
55-PF-4	8.82	13.4
53	8.16	16.4
35	6.72	15.3
08	4.98	0
48	3.46	10.3
16	2.57	15.7
55	0.42	32.92
59	0.13	0.11
50	0.02	0

5.2 Waste Stream Analysis

Table 5-2 and Table 5-3 list current MLLW generated by Triad for FY 2022 and FY 2021.

Table 5-2. 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-out activities of activated lead equipment no longer in use
50787	15.3	14	TA-03-0066 (SIGMA)	Clean-out activities of activated lead bricks no longer in use
49534	8.2	7	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

Table 5-3. FY 2021 MLLW Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
48674	55	28.7	TA-03 CMR	Lead item disposition; used for radioactive shielding and no longer needed in hot cells
49525	27.1	14.2	TA-55	Removal of hazardous lead-lined glove boxes due to facility upgrade project
49667	17.8	9.3	03-0066 (SIGMA)	Clean-out of cadmium and lead anodes from electrochemistry operations
48868	15.3	8.0	TA-35-0213	Glove box, spectrometer, and X-ray unit contaminated with lead and silver solder; used at Rocky Flats and stored at the Laboratory
49367	15.3	8.0	TA-16	Debris material contaminated with lead and mercury from demolishing facilities at weapons site
Various	61	31.8	Triad Facilities	Small-volume MLLW waste streams

5.3 Mixed Low-Level Waste Minimization

An effective method of realizing MLLW minimization during decommissioning operations at nuclear facilities can be the ability to remove 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, can 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.

In FY 2022, a team at the TA-08-0023 weapons facility worked to replace the original shielding at the radiography bay's microtron accelerator with encapsulated lead. The stronger, more resilient new shielding will reduce the generation of lead (D008 metal toxics) plus LLW waste (MLLW) represented by waste profile 49973.

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.

6 Acronyms and Abbreviations

Acronym	Definition
CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research Facility
DMSO	dimethylsulfoxide-d6
DOE	(U.S.) Department of Energy
EM-LA	Environmental Management Los Alamos
EPA	(U.S.) Environmental Protection Agency
E-5	Experimental Device Engineering and Assembly (group)
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
MPA-11	Materials Synthesis and Integrated Devices (group)
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
TRU	Transuranic
WCATS	Waste Compliance and Tracking System
WIPP	Waste Isolation Pilot Plant

ENCLOSURE 2

2022 Los Alamos National Laboratory Hazardous Waste Minimization Report

Date: 11/21/2022

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

November 2022
EM2022-0724

2022 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

2021 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."

October 20, 2022

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

Date

M Lee Bishop

Digitally signed by M Lee Bishop
Date: 2022.10.26 15:36:50 -06'00'

M. Lee Bishop, Director
Office of Quality and Regulatory Compliance
U.S. Department of Energy
Environmental Management
Los Alamos Field Office

Date

CONTENTS

Tables

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) 2022.

FY 2022 includes the 12 months from October 1, 2021, through September 30, 2022.

During FY 2022, 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 2022 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 2022 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 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 above ground
- Remediation for waste acceptance criteria compliance of MTRU above ground waste
- Retrieval and processing (size reduction) for disposal of MTRU waste stored below ground
- 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, including below-grade recoverable/remediation wastes
- Decommissioning, demolition, and disposal of facilities

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

The N3B Environmental Remediation 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 Environmental, Safety and Health Program is 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 Contact-Handled Transuranic Waste (CH-TRU) 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 below ground storage at 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 implementation plan for FY 2022 consists of 5 overreaching objectives and 35 supporting targets. The 5 objectives identified in the FY 2022 plan are as follows:

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

Of the 35 supporting targets included in the FY 2022 plan, the following 25 targets are directly associated with N3B's overall waste minimization strategy:

- Objective 1, Target 5 – Issue a revision to N3B-SD400 revised Environmental Management System to reflect telework policy.
- Objective 2, Target 1 – Fully implement the Individual Permit Remote Telemetry Unit network to reduce trips to the field (monitor reduction in field visits pre/post implementation).
- Objective 2, Target 2 – Track battery-recycling shipments for offices and programs.
- Objective 2, Target 3 – Identify opportunity for commercial ice machine purchase to support field activities and minimize bagged ice purchases.
- Objective 2, Target 4 – Approve portable electronic devices for sites in secure areas to eliminate field sampling and inspection paperwork.
- Objective 2, Target 5 – Discontinue per- and polyfluoroalkyl substances (PFAS) sampling at 139 out of 193 locations.
- Objective 2, Target 6 – Discontinue dioxins and furans sampling at 13 locations.
- Objective 2, Target 7 – Reduce volatile organic compound (VOC) and semivolatile organic compound (SVOC) sampling at 28 locations from annual to biennial.
- Objective 2, Target 8 – Reduce 9 converted Westbay sampling locations from quarterly to annual sampling.
- Objective 3, Target 2 –Track use of printer toner and identify opportunities to reduce toner waste in FY 2022, and track recycling of toner boxes.
- Objective 3, Target 3 – Track cost savings/avoidances associated with energy efficiencies for leased facilities.
- Objective 3, Target 4 – Track waste diverted through paper shredding recycling service.
- Objective 3, Target 6 – Fully implement use of Locus Mobile to eliminate field sampling paperwork.

- Objective 3, Target 7 – Develop a draft waste minimization clause for procurement contracting template.
- Objective 3, Target 8 – Promote the availability of WebEx options for all N3B meetings to reduce commuting.
- Objective 4, Target 1- Track purchases of Energy Star-compliant equipment and reduce energy use of Information Technology (IT) infrastructure (e.g., Energy Star monitors, ClearCubes and blades, and Cisco Hyperflex and Nutanix clusters).
- Objective 4, Target 3 – Track sustainable contracting through selection of local subcontractors and inclusion of greening clauses.
- Objective 4, Target 4 – Track percentage of workforce on-site vs part/full-time telework.
- Objective 4, Target 5 - Track fleet vehicle usage.
- Objective 4, Target 6 – Approve non-portable electronic devices for sites in secure areas to streamline telemetry and reduce number of inspection site visits.
- Objective 4, Target 7 – Review sediment data for radiological control screening requirements to reduce site visits.
- Objective 5, Target 1 – Minimize low-level waste (LLW) or MLLW through efforts such as: segregating construction and demolition waste from regulated waste (trailer demolition), sampling waste for classification before shipping for disposal.
- Objective 5, Target 2 – Dispose of 400 m^3 of LLW and MLLW.
- Objective 5, Target 3 – Remediate and/or repackage 167 m^3 of legacy transuranic waste.
- Objective 5, Target 4 – Perform land application of purge waters from ground water sampling.

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 met periodically during FY 2022 to track the goals and objectives of the site sustainability plan. The EMS IPT goals and objectives for FY 2022 are provided in Attachment 1.

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-P409-1, "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 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 2022, 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 2022 are still being vetted for an annual report. The EMS annual report will be finalized in the coming weeks.

2.5 Itemized Capital Expenditures

N3B reported no capital expenditures devoted to hazardous waste source reduction and recycling during FY 2022.

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 2022, N3B disposed of 0.776009 m^3 of hazardous waste.

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 from remediation sites and TA-54 are recycled after screening for radioactivity indicates no indication of 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 maintained by N3B, plastics, cardboard, scrap metal and electronic wastes were recycled during FY 2022.

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 that 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 that 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 research, development, nuclear weapons production, and spent nuclear fuel reprocessing. During FY 2022, N3B was responsible for the disposal of legacy MTRU waste 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. and 85-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 legacy, operational 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. However, no MTRU waste minimization program is in place at this time since all MTRU wastes are legacy wastes. The primary functions of the CH-TRU Program are management and shipping of legacy MLLW and MTRU waste.

During FY 2022 N3B disposed of 131 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 the item is 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. This is waste formerly classified as MTRU waste, but based on new nondestructive assay measurements, these wastes are reclassified and disposed of as MLLW. Since this 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 2022, N3B disposed of 144.7279 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 require 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 contaminant releases. Wastes generated include “primary” and “secondary” waste streams.

Primary waste consists of generated 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, or 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, rehabilitation/reconfiguration, and use of purge waters constitute a major potential waste source. This procedure relies on the implementation of an NMED-approved decision tree to land apply groundwater in cases where it is determined to be protective of human health and the environment. Use of this procedure minimizes the amount of purge water that must be managed as wastewater. During FY 2022, N3B land applied 67,026.09 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 a decision tree negotiated with NMED, 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.

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.

During FY 2022, N3B's Middle DP Road project reused approximately 765 yd^3 of excavated soil as backfill within remediated areas**.**

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 2022, 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 2022 Environmental Management System Integrated Project Team Goals and Objectives

<u>N3B Los Alamos Mission:</u>
Manage and execute the LLCC contract **safely, securely, compliantly and efficiently** to the satisfaction of our customers while adhering to disciplined operations principles.

<u>EMS Mission:</u>
Develop a **culture (1)** and **approach (2,3)** to work that reflects N3B's leadership role in monitoring and **protecting (4)** the environment, and **managing (5)** waste in the region around Los Alamos National Laboratory.

Objective 1. Establish a culture of sustainability among N3B employees and subcontractors	**Objective 2**. Reduce waste from field activities	**Objective 3**. Reduce waste from office and remote work support activities	**Objective 4**. Reduce energy consumption, greenhouse gas emissions, and natural resource consumption	**Objective 5**. Manage and remove waste in support of lab operations and legacy waste remediation
Target 1 – Continue EMS/Sustainability message for N3B distribution *Responsible Groups: EPS, EMS IPT*	Target 1 – Fully implement the Individual Permit Remote Telemetry Unit network to reduce trips to the field (monitor reduction in field visits pre/post implementation) Tracking for 2022? *Responsible Group: Surface Water*	Target 1 – Track changes in N3B leased facilities footprint *Responsible Group: Facilities*	Target 1 – Track purchases of Energy Star compliant equipment and reduce energy use of IT infrastructure (e.g. Energy Star monitors, ClearCubes and blades, and Cisco Hyperflex and Nutanix clusters). *Responsible Group: IT*	Target 1 – Minimize LLW or LL Mixed waste through efforts such as: segregating construction & demolition waste from regulated waste (trailer demolition), sampling waste for classification before shipping for disposal (e.g. dome fabric). *Responsible Group: CH-TRU and ER Programs*
Target 2 – Solicit best practices from employees on central home sustainability efforts similar to N3B volunteer tracking (N3B Sus email responses) *Responsible Group: EMS IPT*	Target 2 – Track battery-recycling shipments for offices and programs. *Responsible Group: CH-TRU*	Target 2 – Track use of printer toner and identify opportunities to reduce toner waste in FY2022. Toner recycle boxes – tracking *Responsible Group: IT*	Target 2 – Monitor energy costs in server storage rooms and changes due to use or modification of infrastructure. *Responsible Group: IT*	Target 2 – Disposition M/LLW (400m3) *Responsible Group: CH-TRU*
Target 3 – Implement "Green is Clean" program for CH-TRU employees. *Responsible Group: CH-TRU*	Target 3 – Identify opportunity for commercial ice machine purchase to support field activities and bag ice purchases. *Responsible Group: Acquisitions Management*	Target 3 – Track cost savings/avoidances associated with energy efficiencies for leased facilities. *Responsible Group: Facilities*	Target 3 – Track sustainable contracting through selection of local subcontractors and inclusion of greening clauses. *Responsible Group: Acquisitions Management*	Target 3 – Remediate and/or repackage legacy Transuranic Waste (167m3) *Responsible Group: CH-TRU*
Target 4 – Assist with coordination and outreach of earth day activities *Responsible Group: EMS IPT*	Target 4 – Approve Portable Electronic Devices (PEDs) for sites in secure areas (50+ locations) to eliminate field sampling and inspection paperwork. *Responsible Group: Surface Water*	Target 4 – Track waste diverted through paper shredding recycling service *Responsible Group: EMS IPT*	Target 4 – Track percentage of workforce on-site vs part/full-time telework *Responsible Group: EMS IPT*	Target 4 – Perform land application of purge waters from ground water sampling *Responsible Group: Ground Water*
Target 5 – Issue revised SD400 *Responsible Group: EPS*	Target 5 – Discontinue PFAS sampling at 139 out of 193 locations. *Responsible Group: Ground Water*	Target 5 – Track office printing and paper usage *Responsible Group: IT*	Target 5 – Track fleet vehicle usage *Responsible Group: Fleet management*	
Target 6 – Issue Pollinator Protection Plan *Responsible Group: EPS*	Target 6 – Discontinue dioxins and furans sampling at 13 locations. *Responsible Group: Ground Water*	Target 6 – Fully implement use of Locus Mobile to eliminate field sampling paperwork *Responsible Group: Surface Water*	Target 6 – Approve Non-Portable Electronic Devices (NPEDs) for sites in secure areas (50+ locations) to streamline telemetry and reduce number of inspection site visits. *Responsible Group: Surface Water*	
Target 7 – Develop sustainability training for purchase requests *Responsible Group: EMS IPT*	Target 7 – Reduce VOC and SVOC sampling at 28 locations from annual to biennial (once every two years). *Responsible Group: Ground Water*	Target 7 – Develop a draft waste minimization clause for procurement contracting template *Responsible Group: Acquisitions Management*	Target 7 – Review sediment data for radiological control screening requirements to reduce number of site visits. *Responsible Group: Surface Water*	
	Target 8 – Reduce 9 converted Westbay sampling locations from quarterly to annual sampling. *Responsible Group: Ground Water*	Target 8 – Promote the availability of WebEx option for all N3B meetings to reduce commuting *Responsible Group: Acquisitions Management*	Target 8 – Develop waste minimization question for the PPRR *Responsible Group: EPS*	

Vice President and Executive Officer:

Joseph A. Legare
Digitally signed by Joseph A. Legare
Date: 2022.03.23 07:14:29 -06'00'

Signature Date