U.S. DEPARTMENT OF ENERGY

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Date: November 30, 2021

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

Subject: 2021 Hazardous Waste Minimization Reports, Los Alamos National Laboratory, EPA ID #NM0890010515

Dear Mr. Shean:

This letter transmits the 2021 Hazardous Waste Minimization Reports required by the Los Alamos National Laboratory (LANL) Hazardous Waste Facility Permit (the Permit). The Permit authorizes the United States Department of Energy (DOE) National Nuclear Security Administration Los Alamos Field Office (NA-LA) and the Environmental Management Los Alamos Field Office (EM-LA), along 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 enclosed 2021 Hazardous Waste Minimization Reports, as required by Permit Section 2.9, *Waste Minimization Program*, are submitted annually to the New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB) by December 1 for the previous fiscal year ending September 30.

Enclosures 1 and 2 are the 2021 Los Alamos National Laboratory Hazardous Waste Minimization Reports prepared by NA-LA/Triad and EM-LA/N3B, respectively, to satisfy the reporting requirements as outlined in Permit Section 2.9. Each enclosure also contains a signed certification from the responsible Co-Permittees.

If you have questions or comments concerning this submittal for Triad, please contact Karen E. Armijo (NA-LA) at (505) 221-3664 or Kassidy B. Boorman (Triad) at (505) 695-6436.

If you have questions or comments concerning this submittal for N3B, please contact Arturo Duran (EM-LA) at (575) 373-5966 or Emily Day (N3B) at (505) 695-4243.

Sincerely,

Karen E. Armijo Digitally signed by Karen E. Armijo Date: 2021.11.29 16:21:38 -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 Digitally signed by M Lee Bishop Date: 2021.11.11 13:45:28 -07'00'

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

Enclosure(s):

1) 2021 Los Alamos National Laboratory Hazardous Waste Minimization Report (NA-LA/Triad)
2) 2021 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC (EM-LA/N3B)

cc w/enclosures:

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Date: November 30, 2021

Mr. Rick Shean, Chief
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ENCLOSURE 1

2021 Los Alamos National Laboratory Hazardous Waste Minimization Report (NA-LA/Triad)

LA-UR-21-30504

Date: November 30, 2021

November 2021
LA-UR-21-30504
Approved for public release;
Distribution is unlimited.

2021 Los Alamos National Laboratory Hazardous Waste Minimization Report

Author(s): *Environmental Protection and Compliance Division*

Intended for: *New Mexico Environment Department*

Los Alamos
NATIONAL LABORATORY
EST. 1943

Document: 2021 Los Alamos National Laboratory Hazardous Waste Minimization Report

Date: November 2021

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: 2021.11.23 15:07:26 -07'00'

11/23/21

Jennifer E. Payne

Date Signed

Division Leader
Environmental Protection and Compliance
Triad National Security, LLC
Los Alamos National Laboratory
Operator

Karen E. Armijo Digitally signed by Karen E. Armijo Date: 2021.11.29 16:22:06 -07'00'

11/29/21

Karen E. Armijo

Date Signed

Permitting and Compliance Program Manager
National Nuclear Security Administration
Los Alamos Field Office
U.S. Department of Energy
Owner/Operator

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List of Acronyms

CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research facility
DOE	US Department of Energy
EM-LA	US Department of Energy Environmental Management Los Alamos Field Office
EPA	Environmental Protection Agency
EPC	Environmental Protection and Compliance
EPC-ES	Environmental Protection and Compliance-Environmental Stewardship
FY	fiscal year
HAZ	hazardous waste
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LLW	low-level waste
MLLW	mixed low-level waste
MTRU	mixed transuranic waste
m^3	cubic meters
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
NA-LA	U.S. Department of Energy National Nuclear Security Administration Los Alamos Field Office
New Generation	Triad HAZ, MLLW or MTRU wastes
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
OS-OBS	Operations and Business Systems
PF4	Plutonium Facility
PCB	polychlorinated biphenyls
P2	Pollution Prevention
RAM	Resonant Acoustic Mixing
RCRA	Resource Conservation and Recovery Act
Sigma	Sigma Division at TA-03-0066 (basic/applied nuclear research)

SCO	Surface Contaminated Object – not radioactive itself but contains radioactive material on surface
TA	Technical Area
TRU	Transuranic
Triad	Triad National Security, LLC
WCATS	Waste Compliance and Tracking System
WIPP	Waste Isolation Pilot Plant

1.0 Hazardous Waste Minimization Report

1.1 Introduction

Waste minimization and pollution prevention 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. The following report was prepared pursuant to the requirements of the LANL Hazardous Waste Facility Permit, Section 2.9, *Waste Minimization Program*. This report 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 (EPC) Division 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 Field Office (EM-LA) 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 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 PF4). 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) 2021 (October 2020 – September 2021). Projects, summarized later in this report, targeted minimization of hazardous waste as part of the planning process. In FY 2021, debris from TA-55 and TA-55 PF4 operating activities supporting the plutonium pit mission was a significant component of Triad's MTRU waste. For hazardous waste and MLLW in FY 2021, waste contaminated with lead from clean-out and/or facility upgrade activities generated the larger volumes. The Laboratory's waste minimization efforts and analysis of these waste streams are discussed in detail in this report.

Despite the novel coronavirus pandemic and reduction of on-site work, LANL shipped 59.28 cubic meters (m^3) of MTRU waste to the Waste Isolation Pilot Plant (WIPP) in FY 2021. This includes containers of debris waste from TA-55 and TA-55 PF4 operating activities and are represented by the waste stream profiles: 46633 and 46634.

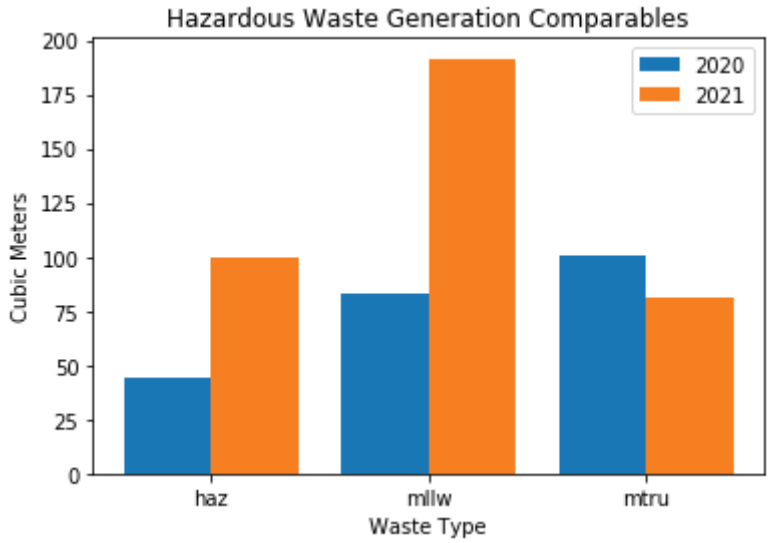

Figure 1. Total Hazardous, MLLW, and MTRU Wastes for Triad in FY 2021 and FY 2020

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 2021 and the waste minimization efforts for those wastes. In addition, this report documents FY 2021 waste quantities processed in comparison with FY 2020 and compares the waste minimization efforts applied during those years.

1.3 Requirements of LANL's Hazardous Waste Facility Permit

As a permitted facility, LANL must fulfill operating permit requirements. According to Title 40, Code of Federal Regulations (40 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 Environmental Protection Agency (EPA).

The list of permit requirements below corresponds with the report sections of this report that address the requirement.

Table 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, 3.4, 5.3
Section 2.9 (4)	Itemized capital expenditures	Sections 2.3, 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, 3.4, 5.3
Section 2.9 (7)	Waste stream flow charts, tables, and analyses	Sections 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3
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*. The figure below provides the flow of the waste management process at LANL.

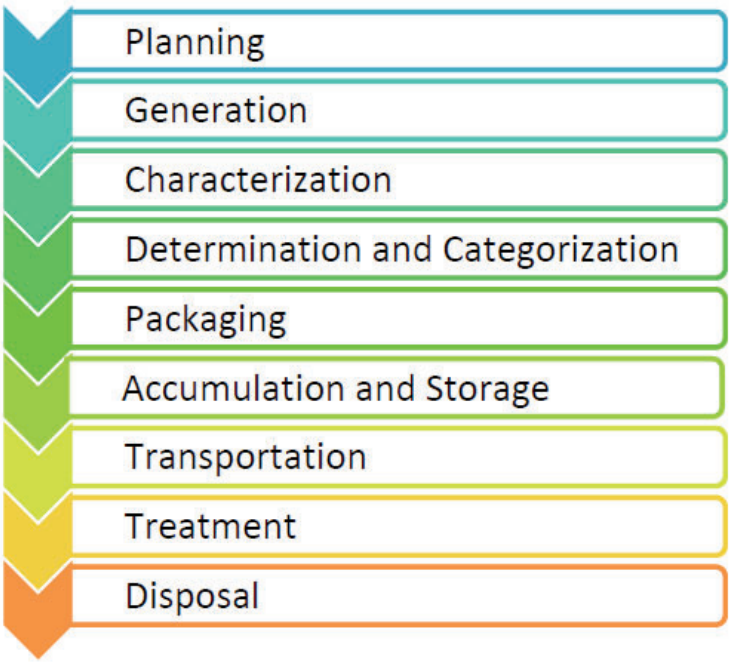

Figure 2. P409 Waste Management Process

2.0 Waste Minimization Elements

2.1 Governing Policy on Environment

LANL's Environmental Governing Policy states:

> *"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, pollution prevention, 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, pollution prevention, sustainability, waste minimization, and source reduction of various waste types.

Training courses that address waste minimization and pollution prevention requirements include:

- General employee training,
- Waste generator overview,
- Radworker II,
- LANL and McCoy RCRA personnel training, and
- Environmental Management System awareness training.

In FY 2021, LANL staff attended McCoy RCRA's Virtual seminar from August 31st to September 2nd. See below for attendee details:

Table 2. LANL Staff Attendee Count by Division to the McCoy RCRA Virtual Seminar

Division	# of Attendees
National Nuclear Security Administration - Los Alamos	10
Environmental Protection and Compliance	39
Waste Management	24
Nuclear Process Infrastructure	5
Total Attendees	**78**

The Laboratory and NA-LA sponsor annual sustainability award competitions. The awards recognize personnel who implement pollution prevention projects. In FY 2021, 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, Michael Hazen, 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 Pollution Prevention 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. Since project ideas come from different sources with 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 following 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 2021, pollution prevention funds were allocated to the following projects:

- New solvent-less nitration methods ($102,000)

  Scientists are experimenting with solid-state chemistry using planetary ball milling to address the hazardous waste generated by traditional concentrated acid wet chemistry for high explosive processes. Research into this method continued in FY 2021 as scale-up can lead to reduced disposal and purchase costs associated with the concentrated acids. In addition, workers in high explosive areas will benefit from being exposed to less hazardous chemicals. After two funding rounds totaling $148,000 from pollution prevention, researchers will look for institutional funds to scale up the planetary ball milling work in FY 2022 and beyond. This work aims to eliminate the following hazardous waste stream profiles: 20759, 24245, 39696, 44239, 44612, 45248, 45710, and 48203.

- Copper bioleaching to eliminate nitric acid waste for target development used in plasma physics experiments ($50,000)

  Researchers 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 generating a hazardous waste stream

represented by waste stream profile: 44204. During FY 2021, researchers learned that the bacteria was effective in removing the copper deposits but damaged the component. With pollution prevention funding in FY 2022 earmarked for $100,000, researchers will experiment with bacterial broths with the hope of copper removal without damage to the component.

- Zero waste formulation and coating ($54,500)

  The Laboratory uses a wet slurry method to formulate explosives to meet the national security mission. This process generates wastes consisting of hazardous solvents and water represented by waste stream profiles: 42360, 46444, and 47370. To address the issue, scientists at LANL are working to use resonant acoustic mixing (RAM) technology to eliminate aqueous waste and capture solvents, essentially creating a zero-waste process. Once the RAM method is online, LANL will benefit from reduced waste disposal and new solvent purchasing costs. Also, due to RAM being a sealed system, workers will be exposed to less hazardous chemicals. In FY 2021, researchers worked on proof of concept with pollution prevention funds. In FY 2022, with funds earmarked for $75,000, work will focus on scale-up of the RAM technology.

2.4 Utilization and Justification for the Use of Hazardous Materials

LANL is a research and development facility that executes thousands of experiments requiring the use of chemicals or materials that may create hazardous waste. Pollution prevention 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 the least toxic chemicals that have the desired characteristics for their particular project using waste process and input alternative analysis.

3.0 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 regarding information about specific wastes is entered into WCATS using waste stream numbers. This report does not include waste quantities generated prior to 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 2021 on Oct. 4, 2021.

In brief, 40 CFR §261.3, as 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 processed at LANL in FY 2021 and FY 2020 are shown below and sorted by the amount of waste originating in each TA and further sorted for FY 2021 to show the quantity of waste generated from highest to lowest.

Table 3. Generation of Hazardous Waste by Technical Area during FY 2021 and FY 2020; FY 2021 Ranked by Volume

Technical Area (TA)	FY 2021 Hazardous Waste (m^3)	FY 2020 Hazardous Waste (m^3)
03	34.98	19.64
16	26.33	5.25
53	11.74	0.19
22	9.85	0.21
35	4.08	6.26
59	3.02	0.43
46	2.68	2.96
09	2.52	4.55
60	1.36	0.48
48	0.92	2.51
36	0.74	0.21
55	0.53	0.37
43	0.46	-
69	0.42	-
08	0.23	0.21
15	0.13	1.17
40	0.02	-

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 waste water system or to the high explosives waste water 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 can be recycled. These include aerosol cans, light bulbs, batteries, mercury, and ferric chloride solution.

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

Unused/Unspent Chemicals: The volume of unused and unspent chemicals varies each year. Researchers are encouraged not to buy more of any chemical than they are certain to need for several months to avoid having any unused amount. Researchers are also encouraged to share chemicals among multiple users when possible.

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 are also adopted, where possible, that either require less solvent than before or eliminate the need for solvent altogether. 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 high explosives research, electronics, contaminated equipment, broken leaded glass, firing site debris, ash, and various solid chemical residues from experiments. Metals can also be a hazardous solid waste such as lead.

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 were required in the past.

FY 2021 and FY 2020 Hazardous Waste Generation

The amount of non-remediation hazardous waste generated at LANL in FY 2020 was 44.5 m^3 compared to 100 m^3 of hazardous waste generated in FY 2021. The increase in waste volume is due to large item removal from TA-03-0039 machine shop and a TA-16 weapons facility and the demolition debris from an unwanted shed at TA-53 Los Alamos Neutron Science Center (LANSCE). The machine shop upgrade work at TA-03-39 is ongoing to support Depleted Uranium operations resulting in an expectation of large metal item wastes in the future. Depending upon analysis, those metal items may be hazardous or MLLW. If not, they will be managed as metals for recycle.

Table 4. 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
Various	60.69	60.69	Consistent with waste streams described in **Section 3.3**

Table 5. FY 2020 Hazardous Waste Generation

Waste Stream Number	Volume (m^3)	% Total	Waste Description
48549	4.3	9.7	Hazardous spent solvents + polychlorinated

Waste Stream Number	Volume (m^3)	% Total	Waste Description
			biphenyls (PCB) oil from Sigma Clean-out Project
46773	4.0	9.0	Copper plates contaminated with silver from switch replacement at TA-35 capacitor bank
48461	3.8	8.5	Removal of pipe wrapped in asbestos painted with lead paint at TA-09
Various	32.4	72.8	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. In regards to lead acid battery recycling, this component of the recycling waste stream is managed by the salvage organization at LANL.

Table 6. Universal Waste Recycled at LANL in FY 2021 and FY 2020

Universal Waste Type	FY 2021	FY 2020
Aerosol cans (m^3)	2.24	2.9
Lamps/Bulbs/Tubes (m^3)	14.15	20.89
Batteries (m^3)	0.55	0.882
Total Volume (m^3)	**16.94**	**24.67**
Total Cost	**$5,067**	**$7,379**

Total cost, provided in Table 6, is based on recycle invoice dollar amount and volume of shipment on invoice. For example: the invoice payment is $4,802.35 and the volume of the material on the invoice is 16.0557 m^3. Therefore, the unit cost is $4,802.35 divided by 16.0557 m^3 = $299.1/ m^3. This unit cost number is then multiplied by FY 2021 and FY 2020 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. Some of the recent projects are described below.

- In FY 2018, P2 funding was used to purchase a solvent evaporator to reduce hazardous hexane solvent exhaust which enabled the reuse of captured hexane solvent for one reuse when processing waste water samples. During “in-house” PCB analysis of waste waters, the solvent evaporator reduces consumption of the hazardous hexane solvent per PCB sample processed. The waste stream profiles that represent hazardous wastes from this PCB analysis work are: 45282, 45283, 45286, and 47579. LANL management is currently identifying a funding stream for this PCB analysis of waste waters in FY 2022 and beyond.

- In FY 2021 and funding earmarked for FY 2022, the pollution prevention program is funding the project Zero Waste Formulation and Coating that aims to reduce hazardous wastes from use of solvents. See **Section 2.3** for project description and waste stream profile numbers.

Acids and Bases Reduction

In FY 2020 and FY 2021, the P2 Program funded high explosive scientists to experiment with a planetary ball mill process to avoid traditional concentrated acid wet chemistry. In addition, the P2 Program funded a project related to copper bioleaching that aims to reduce acid waste. See **Section 2.3.**

Hazardous Solid Waste

In FY 2021, a team at the TA-16-260 weapons facility worked to disposition hazardous high explosive contaminated fabrication equipment as metals for recycle as opposed to hazardous waste. During the disassembly process, all detonable quantities of explosives were safely removed. Due to the size of equipment, the craft rigging team frequently assisted in the disassembly process. The components were transported as hazardous waste to the TA-16 burn grounds for treatment at the flash pad. After performing a high explosive spot test and verifying that the hazardous contaminants were removed, the team coordinated with a metals recycler to dispose of this material. The amount of metal recycled was 105,000 pounds, including 1,000 pounds of lead. This waste is represented by waste profile 47281.

Unused/Unspent Chemical Waste Reduction

Unused and unspent chemical waste are waste streams LANL is diligently working to reduce. For example, in FY 2021, LANL lab packed 2,296 items under the unused/unspent chemicals waste profile - 47686. In FY 2020, the number of lab packed items was 1,780. Laboratory packed items tend to be small and are first packaged in small containers and then placed into

large drums in which voids are filled with benign absorbent material. For that reason, this waste stream does not stand out when analyzing waste by volume.

The LANL Chemical Management Program was transferred to the Environmental Stewardship Group (EPC-ES) in TA-00-0795 from Operations and Business Systems (OS-OBS) in order to take a lifecycle management approach to chemicals from pre-purchase screening through efficient use and effective inventory practices to establishing a path to disposal. In FY 2020, the P2 Program devoted significant staff resources to analyze the site-wide Chemical Management Program and overall chemical usage for source reduction opportunities. This effort identified three areas of concern: pre-procurement review of chemicals, chemical ordering practices, and inventory management.

In FY 2021, the Chemical Management Team received a dedicated program budget and grew to six and a half full-time staff and two students. This increase in staffing allowed the team to start engaging with LANL stakeholders at both ends of the chemical lifecycle. Planning efforts are now underway to establish a central area in which to receive and inventory all new chemical containers coming to LANL. On the opposite end of the lifecycle, Chemical Management is working with Waste Management Programs to establish a process to identify and disposition spent and lab-packed containers from the database. These efforts combined will serve to give a more accurate picture of what containers are available at any given time and help reduce over-ordering and disposal of unspent chemicals.

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. This is 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 require innovation to enhance LANL's mission and that will require researcher engagement. Early integration of pollution prevention strategies into program and project design and lifecycle planning is LANL's approach going forward.

4.0 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, there were over 5,000 legacy waste containers at TA-54, Area G (i.e., 2,400 transuranic [TRU] waste containers). The majority of these containers were generated in the 1970's, 1980's, and early 1990's, which, is in some cases, is prior to the enactment of RCRA and in all cases prior to the implementation of a strong waste profiling program at the Laboratory. In the mid 1990's, the Laboratory implemented a requirement that a waste profile be developed for all waste generated to comply with RCRA requirements. 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 WIPP. Triad generated a total of 81.5 m^3 of MTRU in FY 2021 supporting the plutonium pit mission. The generating facilities are TA-55 and TA-55 PF4. Both facilities generated wastes associated with debris (e.g., metals, rags, paper, and plastics) from the following operations within the facility: chloride, metal, nitrite, Plutonium-238, and pyrochemical processes. In FY 2020, Triad generated 101.6 m^3 of MTRU, which included wastes from TA-55, TA-55 PF4, and TA-03 CMR. Triad MTRU waste volumes generated in FY 2021 are provided in Section 4.2 and total 81.5 m^3.

In FY 2020 and FY 2021, shipment of MTRU waste has been coordinated between Triad and N3B in order to create the most efficient use of the available shipment opportunities to the WIPP.

4.2 Waste Stream Analysis

The Tables below lists the MTRU current generation from TA-55, TA-55 PF4, and TA-03 CMR; the Triad facilities responsible for new generation waste. The majority of these wastes are at LANL and awaiting to be shipped to the WIPP.

Table 7. 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 PF4	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

Table 8. FY 2020 MTRU Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
46457, 46633, 46634	6.04	5.9	TA-55 PF4	Debris and homogeneous wastes from Plutonium Facility Operations
46457, 46458, 46633, 46634,	85.98	84.6	TA-55	Debris and homogeneous wastes

47746, 47833, 47861				from Plutonium Facility Operations
46607	8.7	8.5	TA-03 CMR	New generation waste from clean-out of legacy high explosive containment vessels
48709	0.83	0.8	TA-03 CMR	Debris waste from footprint reduction activities

4.3 Mixed Transuranic Waste Minimization

To support plutonium pit development, 91 large items, such as glove boxes, classified as MTRU (acceptable knowledge from Deactivation and Decommissioning operations - waste stream 49765, Process Status Codes XO, with Group D RCRA hazardous codes) must be removed from TA-55 PF4 and TA-55. However, due to space constraints at WIPP and the difficult task of size reducing glove boxes for transport to the WIPP, LANL management is planning on using decontamination techniques to reduce the radiation levels and reclassify the large items as surface contaminated objects (SCO) low-level waste (LLW). The SCO protocol is an economically viable option for removing oversized MTRU waste items from TA-55 PF4. It 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 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 increasing volumes of that waste type in the years to come, which is represented by waste stream 49525. Since the cost of implementing an abatement technology is high, there is no plan 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 a 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 since 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 increases the number of drums shipped for disposal. It also leads to more debris waste from the repackaging and treatment activities.

Operations at TA-55 PF4 are in the process of implementing waste minimization strategies for the waste currently being generated. These include limitations on material inputs into TA-55

PF4 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 FY 2021, safety protocol requirements, due to the novel coronavirus, interrupted many of these waste minimization efforts.

5.0 Mixed Low-Level Waste

5.1 Current Mixed Low-Level Waste

MLLW contains hazardous constituents in addition to low levels of radiation.

Triad generated 83.71 m^3 of MLLW new generation waste in FY 2020. In FY 2021, Triad generated 191.5 m^3 of MLLW. The significant increase is attributed to four waste profiles described below.

Waste stream 48674 resulted in a high volume of lead resulting from decommissioning operations at TA-03 CMR. As the building is being decommissioned, processes are taken offline and components are decommissioned. The facility decommissioning is a multi-year effort which will result in continued waste generation in FY 2022. Facility upgrades at TA-55 will also continue in FY 2022.

Waste stream 49525 represents disposition of MLLW glove boxes as part of TA-55 upgrades. This waste will continue in future years since 43 MTRU lead-lined glove boxes will be decontaminated to MLLW for removal to support facility upgrades for the plutonium pit mission (see section **4.3** for more details).

Waste stream 49367 represents demolition debris contaminated with lead and mercury from the weapons building TA-16-460. This is a one-time generation as the work is being conducted in phases to minimize the quantity and time requirement for generation of the waste.

Waste stream 49667 represents cadmium contaminated waste from Sigma but is a one-time cadmium waste generation. In FY 2020, clean-out operations at TA-03-0066 Sigma represented a significant portion of MLLW. In FY 2021, cadmium contaminated anodes (49667) were removed, however, waste from Sigma should be slowing down in the future.

MLLW by Location During FY 2021 and FY 2020

Table 9. Generation of MLLW by Technical Area during FY 2021 and FY 2020; FY 2021 Ranked by Volume

Technical Area (TA)	FY 2021 MLLW (m^3)	FY 2020 MLLW (m^3)
03-CMR	55.4	-
55	32.92	18.9

Technical Area (TA)	FY 2021 MLLW (m^3)	FY 2020 MLLW (m^3)
03	**31.9**	**37.48**
53	**16.4**	**0.075**
16	**15.7**	**-**
35	**15.3**	**0.1**
55-PF4	**13.4**	**-**
48	**10.3**	**8.7**
59	**0.11**	**-**

5.2 Waste Stream Analysis

The section describes current MLLW generation for FY 2021 and FY 2020 owned by Triad.

Table 10. 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 per 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

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
				facilities at weapons site
Various	61	31.8	Triad Facilities	Small volume MLLW waste streams

Table 11. FY 2020 MLLW Waste Stream Analysis

Waste Stream Number	Volume (m^3)	Percent Total	Generating Facility	Waste Description
48698	17.8	21.3	TA-46	Waste from demolition activities
47301	15.3	18.2	TA-03-0066 (Sigma)	Equipment removal waste for electrochemistry operations upgrade
47464, 48427	10.0	11.9	TA-03-0066 (Sigma)	P Area clean-out operations
Various	40.61	48.6	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 containing materials that meet the definition of hazardous waste from the equipment in which the components were 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 of as LLW. While this method is not quantified at this time, it is estimated to have reduced MLLW generation at TA-03 CMR by approximately one-third over the last year.

ENCLOSURE 2

2021 Hazardous Waste Minimization at Los Alamos National Laboratory for Newport News Nuclear BWXT-Los Alamos, LLC (EM-LA/N3B)

Date: NOV 3 0 2021

November 2021
EM2021-0718

2021 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."

10/21/2021

Joseph Murdock, Program Manager
Environment, Safety and Health
Newport News Nuclear BWXT-Los Alamos, LLC

Date

M Lee Bishop Digitally signed by M Lee Bishop
Date: 2021.10.27 14:29:59 -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

Attachments

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) 2021.

FY 2021 includes the 12 months from October 1, 2020, through September 30, 2021.

During FY 2021, 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 2021 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 2021 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 aboveground
- Remediation for waste acceptance criteria compliance of MTRU above ground waste
- 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.

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 2021 consists of 5 overreaching goals and 23 supporting objectives. The 5 goals identified in the FY 2021 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 23 objectives included in the FY 2021 plan, the following 12 objectives are directly associated with N3B's overall waste minimization strategy:

- Goal 1, Objective 5 – Revise N3B System Description – Environmental Management System (SD400) to reflect telework policy.
- Goal 2, Objective 1 – Fully implement the Individual Permit Remote Telemetry Unit network to reduce trips to the field (monitor reduction in field visits pre/post implementation).
- Goal 2, Objective 2 – Track battery-recycling shipments for offices and programs.
- Goal 3, Objective 1 – Place recycling centers for paper, cardboard, plastic, and aluminum cans in administrative buildings at Technical Area 54 (TA-54).
- Goal 3, Objective 2 – Track use of printer toner and identify opportunities to reduce toner waste in FY 2021, and track recycling of toner boxes.
- Goal 3, Objective 3 – Track cost savings/avoidances associated with energy efficiencies for leased facilities.
- Goal 4, Objective 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).
- Goal 4, Objective 5 – Track fleet vehicle usage.
- Goal 4, Objective 6 – Track greenhouse gas reduction directly attributable to reduced commuting due to telework.
- Goal 5, Objective 1 – Minimize low-level waste (LLW) or MLLW through efforts such as segregating construction and demolition waste from regulated waste (trailer demolition) and sampling waste for classification before shipping for disposal (e.g., dome fabric).
- Goal 5, Objective 3 – Remediate and repackage 262 m^3 of transuranic waste performance-based incentive (PBI) 21-001.
- Goal 5, Objective 4 – Perform land application of purge waters from groundwater sampling PBI 21-006.

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 remotely during FY 2021 to track the goals and objectives of the site sustainability plan. The EMS IPT goals and objectives for FY 2021 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 2021, N3B utilized its EMS to define hazardous waste minimization and pollution prevention goals. N3B fully met 8 of the 12 FY 2021 objectives associated with waste reduction. N3B made progress with the remaining 4 waste reduction objectives; however, completion of these tasks was hindered by the COVID-19 pandemic-related work restrictions in place throughout much of FY 2021. Objectives not fully met by N3B include the following:

- Goal 1, Objective 5 – Revise SD400 to reflect N3B's telework policy. This procedure is currently being revised to incorporate N3B's telework policy.
- Goal 2, Objective 2 – Track use of printer toner and identify opportunities to reduce toner waste in FY 2021 and track recycling of toner boxes.
- Goal 3, Objective 3 – Track cost savings/avoidances associated with energy efficiencies for leased facilities.
- Goal 4, Objective 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).

2.5 Itemized Capital Expenditures

N3B reported no capital expenditures devoted to hazardous waste source reduction and recycling during FY 2021.

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 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 2021, N3B disposed of 0.85 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, fluorescent lamps, and batteries, 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.

During FY 2021, N3B recycled the following materials:

- Plastic 15,917 lb
- Cardboard 8,444 lb
- Scrap Metal 7,605 lb

- E-waste 2,116 lb
- Batteries 0.8 m^3

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 2021, 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 2021 N3B disposed of 216.10 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, and often the containers have very small volumes of waste inside the overpacks, with the majority of the internal volume being empty space.

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 2021, N3B disposed of 92.2 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 RCRA-regulated 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 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. Using this procedure, 79,066 gal. of water was land-applied during FY 2021.

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. During FY 2021, no drill cuttings were land-applied.

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 2021, no excavated soil was used as fill within remediated areas. Currently, N3B's Middle DP Road project is awaiting analytical results of excavated overburden soils totaling approximately 700 yd^3. If appropriate criteria are met, this material may be reused and included in FY 2022 totals.

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.

A total of 34,083 lb of cardboard, scrap metal, poly tanks, and other materials from N3B operations, including field and sampling activities conducted during FY 2021, 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 2021 Environmental Management System
Integrated Project Team Goals and Objectives

N3B Los Alamos Mission:

Manage and execute the LLCC contract **safely, securely, compliantly and efficiently** to the satisfaction of our customers while adhering to disciplined operations principles.

EMS Mission:

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.

Goal 1. Establish a culture of sustainability among N3B employees and subcontractors	**Goal 2**. Reduce waste from field activities	**Goal 3**. Reduce waste from office and remote work support activities	**Goal 4**. Reduce energy consumption, greenhouse gas (GHG) emissions, and natural resource consumption	**Goal 5**. Manage and remove waste in support of lab operations and legacy waste remediation
Objective 1 – Develop a regular EMS/Sustainability message for N3B distribution *Responsible Groups: EPS, EMS IPT*	Objective 1 – Fully implement the Individual Permit Remote Telemetry Unit network to reduce trips to the field (monitor reduction in field visits pre/post implementation) *Responsible Group: Surface Water*	Objective 1 – Place recycling centers for paper, cardboard, plastic, and aluminum cans in administrative buildings at TA-54. *Responsible Group: CH-TRU*	Objective 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*	Objective 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*
Objective 2 – Solicit best practices from employees on central home sustainability efforts similar to N3B volunteer tracking *Responsible Group: EMS IPT*	Objective 2 – Track battery-recycling shipments for offices and programs. *Responsible Group: CH-TRU*	Objective 2 – Track use of printer toner and identify opportunities to reduce toner waste in FY2021. Toner recycle boxes – tracking *Responsible Group: IT*	Objective 2 – Monitor energy costs in server storage rooms to produce a baseline from which to track future improvements. To compare to baseline *Responsible Group: IT*	Objective 2 – Meet CH-TRU MLLW Remediate 87 cu meters PBI 21-003 and ship 384 cu meters PBI 21-002. *Responsible Group: CH-TRU*
Objective 3 – Implement "Green is Clean" program for CH-TRU employees. *Responsible Group: CH-TRU*		Objective 3 – Track cost savings/avoidances associated with energy efficiencies for leased facilities. *Responsible Group: Facilities*	Objective 3 – Track sustainable contracting through selection of local subcontractors and inclusion of greening clauses. *Responsible Group: Acquisitions Management*	Objective 3 – Remediate and repackage 262 cu meters of Transuranic waste PBI 21-001 *Responsible Group: CH-TRU*
Objective 4 – Organize a remote Earth Day (e.g. digital tours, at home activities, etc.). *Responsible Group: EMS IPT*		Objective 4 – Conduct feasibility study for potential composting and/or glass-recycling programs for N3B. *Responsible Group: EMS IPT*	Objective 4 – Install water filter system at 1200 Trinity Dr. *Responsible Group: Facilities*	Objective 4 – Perform land application of purge waters from ground water sampling PBI 21-006 *Responsible Group: CH-TRU*
Objective 5 – Revise SD400 to reflect telework policy *Responsible Group: EPS*		Objective 5 – Track printing and paper usage *Responsible Group: IT*	Objective 5 – Track fleet vehicle usage *Responsible Group: Fleet management*	
		Objective 6 – Track savings for reduction of N3B leased facilities footprint *Responsible Group: Facilities*	Objective 6 – Track GHG reduction directly attributable to reduced commuting during telework *Responsible Group: EMS IPT*	

Vice President and Executive Officer:

Joseph A. Legare

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Date: 2021.02.01 15:51:48 -07'00'

Signature Date