U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Ship Waste Off-Site: the CH-TRU Program

Presentation to the Northern New Mexico Citizens' Advisory Board

November 13, 2024

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EM-LA ENVIRONMENTAL MANAGEMENT
SAFETY ❖ PERFORMANCE ❖ CLEANUP ❖ CLOSURE

N3B Los Alamos

Agenda

- Program Overview
- Transuranic Waste (TRU) Operations
  - Area G Overview
  - Corrugated Metal Pipes (CMP) Retrieval and Size Reduction
  - Pit 9 Retrieval
  - Above-Grade Drum Remediation
  - Characterization and Shipment
- Universal Drum Assay and Segregation System (UDASS) Demonstration Project
- Low-Level Waste Operations
- Pit 8 Feasibility Study

Legacy Cleanup Overview

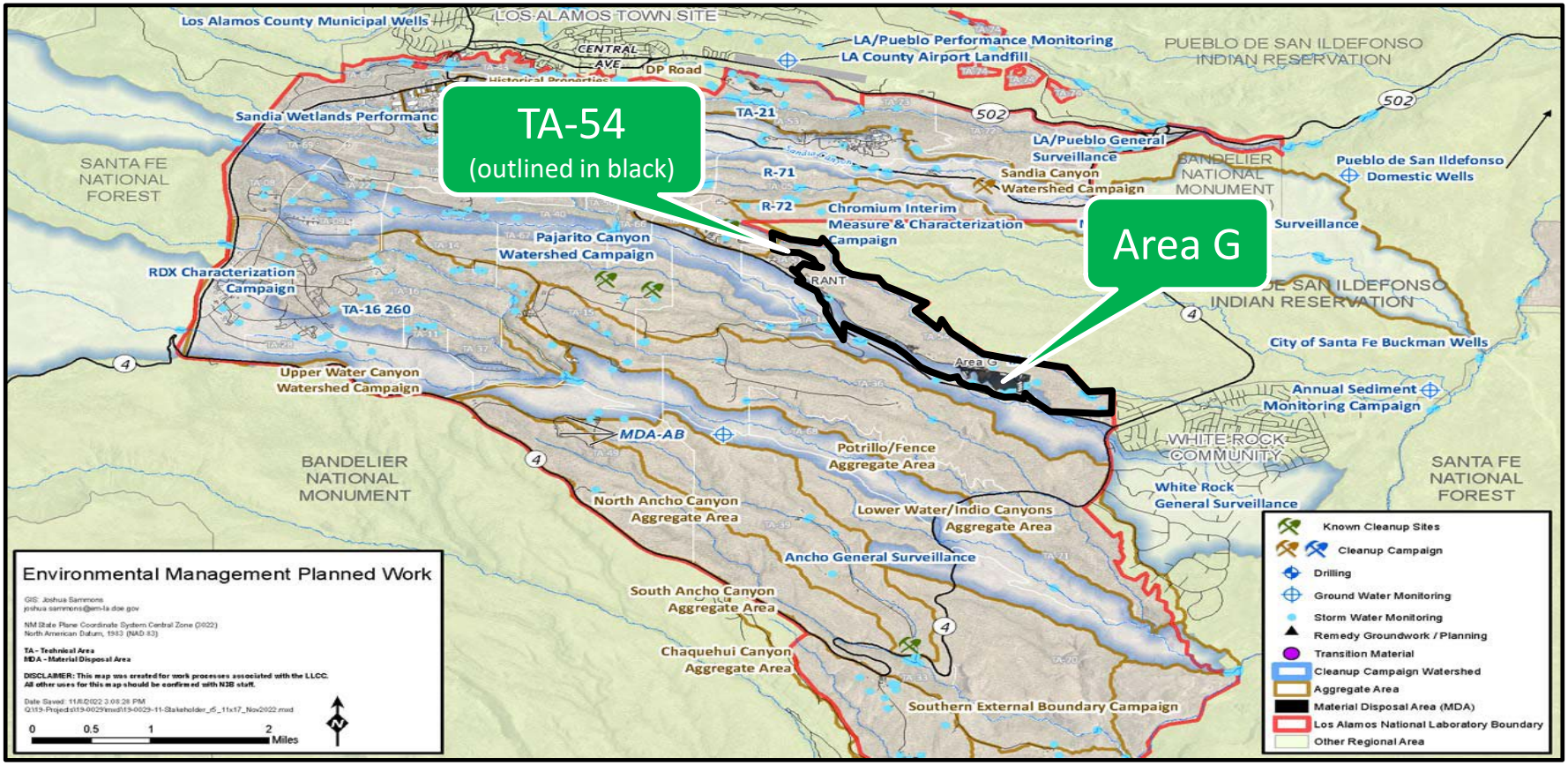
- Groundwater monitoring & remediation
- Surface water management
- Surface/storm water sampling controls

- Surface & subsurface investigation & remediation
- Material Disposal Areas (MDAs) remediation
- Disposition of remediation waste

- Above-ground transuranic (TRU) waste
- Below-ground TRU waste
- Low-level waste (LLW) & mixed LLW

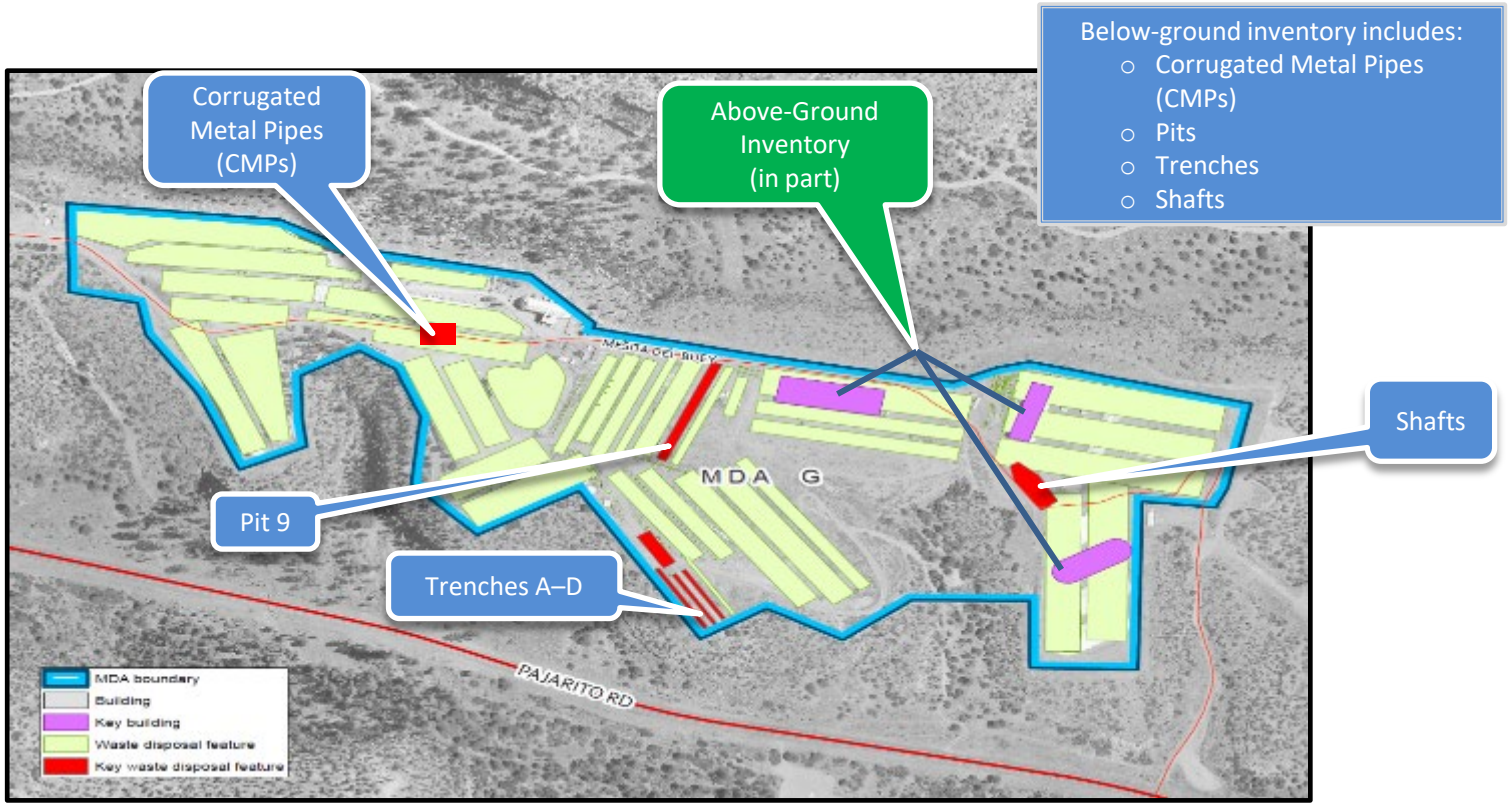
Focus Today: TRU and Low-level Waste Operations

Technical Area (TA) 54 – Site of CH-TRU Projects and Operations



Aerial View of TA-54

Schematic of Area G



LANL Primary Waste Streams (Simplified)

Transuranic (TRU) Waste

- Definition: Materials containing alpha-emitting radionuclides, with half-lives greater than twenty years and atomic numbers greater than 92, in concentrations greater than 100 nanocuries per gram of waste

Low-Level Waste (LLW)

- Contains radioactivity
- Not classified as transuranic (TRU) waste due to radioactivity levels

Mixed LLW (MLLW)

- Contains both hazardous and LLW waste

Non-Radioactive Waste Streams

- Hazardous (a listed hazardous waste or exhibits any of the hazardous characteristics: ignitability, corrosivity, reactivity, or toxicity)
- Industrial
- Regulated non-hazardous
- New Mexico Special Waste

Transuranic Waste at TA-54

Above Ground:

- In containers, stored in domes
- ~2,500 containers

Below Ground:

- Trenches A-D (710 containers)
- Shafts (10)
- Pit 9 (4,079 containers)
- Corrugated Metal Pipes (158)
- 33 Shafts remote-handled TRU

CMP Work Scope: Retrieve, size reduce, package, characterize and ship the waste for permanent disposal

Disposal Site: Waste Isolation Pilot Plant (WIPP), Carlsbad, New Mexico

Above-Ground TRU Waste: Existing Storage

TRU waste drums stored in Dome 232

Corrugated Metal Pipes Retrieval and Size Reduction

Origin of CMPs

- Cemented waste from batch treatment process at TA-21 Radioactive Liquid Waste Treatment Facility (RLWTF) (Building 21-257)
- CMPs were placed in vertical array in Material Disposal Area T at TA-21
- Each CMP is approximately 20 feet long and 30-34 inches in diameter
- The weight of each CMP ranges between 10,000 and 14,000 pounds
- Cement end plugs vary in thickness from 4 to 59 inches, and average about 19 inches
- In 1986, 158 CMPs were retrieved, decontaminated and transported from TA-21 to TA-54, Area G

CMPs were emplaced vertically at TA-21 until 1986

CMP Characteristics

- Americium, plutonium and uranium are present in the CMP waste matrix
- The CMPs are considered transuranic waste (TRU waste) due to the activity levels of americium-241 and plutonium-239
- 97% of the radiological decay activity is from americium which is a decay product of plutonium
- The total estimated dose for the CMP size reduction and packaging scope is 4,376 millirem (mrem). N3B estimates a maximum potential individual dose of 811 mrem and N3B's administrative control level for dose is 2,000 mrem/yr

CMP storage at TA-21

Placement of CMPs at TA-54

- CMPs were placed above Pit 29 in north-central location at Area G
  - It is a retrievable storage area ~40 feet wide and 106 feet long
  - Two rows of CMPs end-to-end, stacked two high
  - Plywood and tarps were placed on top of the CMPs (~ 40 feet x 106 feet)
  - 5-6 feet of soil overburden was placed on the CMP array

In 1986 the CMPs were dug up, cleaned, decontaminated, painted, wrapped in plastic & buried over the east end of Pit 29 above disposed low-level waste

Aerial view of Pit 29 and location of CMP placement

158 CMPs emplaced at TA-54 above Pit 29 in the mid 1980's

Location of CMPs at TA-54

Location of CMP placement at Pit 29, view looking west

Overview of CMP Retrieval Process

1. Remove overburden
2. Build soil/pile bed for CMPs
3. Do continuous radiological & industrial safety monitoring

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1. Retrieve CMP onto IP-1 bag
2. Inspect and address concerns
3. Clean & patch as required

↓

1. Close IP-1 bag
2. Label CMP and bag
3. Retrieve from excavation

↓

1. Load on transport truck
2. Transfer CMP to Pad 10 or Dome 375
3. Secure on pallets for storage
4. Inspect as required

Surrogate CMP in an IP-1 bag being retrieved from excavation using spreader beam and the Telehandler

Scope of Retrieval Operations

- Retrieval of CMPs from the excavation site performed using an excavator
- The IP-1 bag is opened flat and staged to receive the CMP
- Up to eight lifting straps, symmetrical over the length of the CMP, are positioned under the IP-1 bag, to allow lifting the CMP
- The CMP is rolled onto the open IP-1 bag using heavy equipment
- Cleaning, repairs, radiological surveys, and decontamination are performed as required
- The IP-1 bag is closed and the lifting straps connected to the lifting beam attached to a telehandler

CMPs placed into IP-1 bag after removal from above Pit 29 and prior to placement on Pad 10

Scope of Retrieval Operations

- The packaged CMP is loaded, using the telehandler, onto a flatbed truck and transported to the Pad 10 storage area
- The packaged CMP is off-loaded from the truck using a forklift and lifting beam, and transported to the designated storage area on Pad 10
- The packaged CMP is staged on two metal pallets. Two packaged CMPs are staged side-by-side in a single-height array and strapped to the pallets. The staging array allows adequate spacing for inspection
- CMP movements are logged into the Waste Compliance and Tracking System (WCATS) on a "real time" basis

Loading CMP on Truck for Transport to Area G Pad 10

CMP Size Reduction

- Dome 375 PermaCon at TA-54, Area G is a structure designed to prevent release of contamination to the outside environment
- CMP size-reduction activities are performed within Dome 375 PermaCon; these activities include:
  - Receive the transported CMP into Dome 375 and load onto pipe racks
  - Move the CMP from the pipe racks onto the pipe rollers
  - Attach a winch line to the CMP and pull the CMP into Room 123 for size reduction
  - Size-reduce the CMP using the hydraulic shear with debris contained in a catch pan
  - Lift the CMP section with a gantry crane and place it into a SWB
  - Transfer loaded SWB from Room 123 to Room 121
  - Close the SWB and move it outside the PermaCon for interim storage, waste certification, and shipment to WIPP

Gantry Crane for Loading CMPs Onto Pipe Rollers for Size Reduction

- Loading of CMP onto rollers is by gantry crane and hoist
- Working load 10 tons
- Electric hoist with pendant operator
- Same design lifting beam as for retrieval project

CMP Size Reduction

- A Hydraulic Shear System is used for size reduction of the CMPs at Dome 375 PermaCon in TA-54, Area G
  - Hydraulic Power Unit (HPU) is a diesel powered, stand-alone unit
  - Hydraulic system pressure for shear operation is 2,000 psi
  - Shroud enclosure with negative ventilation surrounds shear during cut

Back end of the shearing apparatus

Moving the CMP into position for cutting with the shear

Containerization of Size-Reduced CMP Segments

- Each CMP is segmented with four cuts, making five 4ft-long CMP sections
  - Each section weighs approximately 2,500 pounds
- Each CMP segment is placed in a Standard Waste Box (SWB) for characterization, shipment and disposal
  - Each SWB is fitted with engineered cribbing to restrain the load within the SWB
- The project will generate 790 SWBs for certification

Placement of a cut CMP section into a Standard Waste Box

CMP Process Improvements

Key process improvements have included:

- Re-analysis of Criticality Safety parameters resulted in revision to the Nuclear Criticality Safety Evaluation to allow the use of aqueous fixative for contamination control and the presence of multiple CMPs in the Segmentation process chain.
- Created a new Defined Area for temporary staging of packaged CMP segments in Dome 375. This eliminated a process time delay associated with container movements outside of the dome by allowing the Segmentation team to stage the container in the new Defined Area instead of waiting for the containers to be moved straight from the PermaCon to another Dome, which could be delayed by poor weather.
- Changed process flow path to allow CMPs to be directly moved from the Retrieval Work Area to Dome 375 without having to be staged at Pad 10 in the interim.
- Cross-trained the Material Handling Crew to transport CMPs, so the Retrieval Team could focus on Retrieval activities inside the excavation.

Pit 9 Retrieval and Processing

Historical photo of Pit 9 waste placement

Pit 9 Background

Placement History

- 3,882 metal drums, 191 fiberglass-reinforced plywood (FRP) boxes, and six other containers on an asphalt pad
- Placed from Nov 1974 through Nov 1979
- FRP boxes containing large equipment were stacked along the perimeter of the asphalt pad and drums were stacked in the center of the FRP box array
- Four cells of approximately equal size, with crushed tuff placed between the cells to serve as a firebreak
- After waste was placed into a cell, the entire stack of waste within the cell was covered with plywood, plastic sheeting, and crushed tuff to the original grade of the pit
- Additional cover was placed over the pit

FRP boxes stacked in southwest end of Pit 9

Pit 9 Background

Challenges

- Container integrity unknown
- Drums unvented
- Potential for flammable gases
- Missing or incomplete records for some containers
- Drums require venting and overpack
- WIPP-prohibited items in some containers
- Concerns over the stability of the rock walls for Pit 9 (25 to 30 feet high)
- Pit 9 retrieval and waste processing requires update of safety basis documentation (major modification)

Pressurized drums from a previous LANL retrieval project

Pit 9 Project Scope

- Pit 9 Ventilated Enclosure Design and Build
- Pit 9 Mobile Drum Vent Enclosure Design and Build
- Site Prep Excavation to remove most of overburden and expose part of Pit 9 walls and ramp for inspection
- Upgrades to Dome 375 for High MAR Glovebox, Drum Processing, and FRP processing
- Permitting and Compliance
- Commissioning
- Readiness

"MAR" is Material at Risk, a term referring to above ground radioactive waste or materials. "High MAR" refers to higher activity waste.

Enclosure for retrievals at Advanced Retrieval Project (ARP) at Idaho Cleanup Project

Pit 9 Waste Processing

Planned Dome 375 Upgrades Needed to Process Waste:

- Install compactor for processing of empty overpack drums from Pit 9 and High MAR trench waste
- Modify Cell 3 to integrate High MAR Glovebox waste introduction airlock
- Upgrade ventilation system to support processing of FRPs, compactor, and potential High MAR Glovebox
- Remove CMP Shear from Cell 2 and modify Cell 2 to support the processing of the contents of the FRP
- Modify Cell 1 for introduction of FRP into Cell 1 and removal of FRP cover from around the waste to allow for transfer and processing

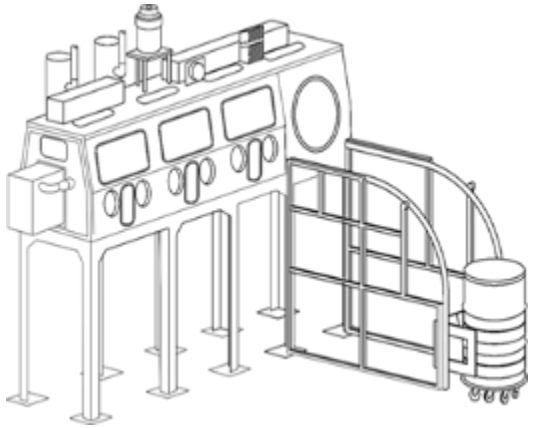
Dome 375 PermaCon

Pit 9 Waste Processing

Process Steps

- Transfer FRP from Pit 9 to 375 in IP-1 bag
- Move and stage FRP in 375 for processing
- Introduce FRP into Cell 1 for de-nesting from IP-1 bag and removal of the FRP cover as secondary waste to expose the waste in the FRP for processing
- Transfer large equipment to Cell 2 for processing
- Inspect waste to characterize and remove prohibited items for handling and processing
- Decontaminate gloveboxes and equipment to disposition as LLW in IP-1 bags or SeaLand Containers

High MAR Glovebox



- Glovebox will be used to process existing waste and Pit 9 & Trenches A-D waste
- Sort & segregate 55-gallon and 85-gallon drums, and then repackage into “daughter” drums
- Glovebox is for drums with higher levels of radionuclides

Oak Ridge glovebox

High MAR Glovebox Steps

- Design / Manufacture / Install Glovebox for processing Pit 9 and High MAR waste drums in dome 375
- Obtain a range of regulatory permits
- Install secondary ventilated containment enclosure around High MAR Glovebox
- Design independent ventilation for High MAR Glovebox or integrate with 375 ventilation with upgrades
- Perform upgrades to 375 PermaCon for drum preparation, de-nesting, and compaction of empty overpack drums
- Process Pit 9 and High MAR Trench drums

Dome 231 Operations: Glovebag and Drill & Drain

Glovebag Operations

- Sort & segregate drums, and then repackage into “daughter” drums

Drill & Drain

- Remove non-compliant liquids from waste containers

TRU Characterization and Shipment

- TRU waste is characterized at Area G by the Central Characterization Project (CCP) prior to approval for shipment to WIPP
  - CCP is run by the WIPP contractor
  - Characterization includes non-destructive assay
- Shipment via Mobile Loading Unit –
  - Outdoors in Area G
- Shipment via LANL's RANT facility –
  - Cooperation with LANL M&O contractor
  - Some shipments contain Legacy (EM) waste and New Gen (recent LANL) waste containers to optimize efficiency in transport and disposal

Mobile Loading Unit

Radioassay and Nondestructive Testing (RANT) facility

Assay: UDASS Demonstration

UDASS:
Universal Drum Assay and Segregation System, developed by ANTECH Corporation

- Used for drums with contaminant levels near TRU standard of 100 nanocuries per gram
- More sensitive and sophisticated than current capabilities, providing a higher-fidelity assay of the drums
- N3B hosted testing of the system for DOE's nationwide Environmental Management (EM) cleanup program

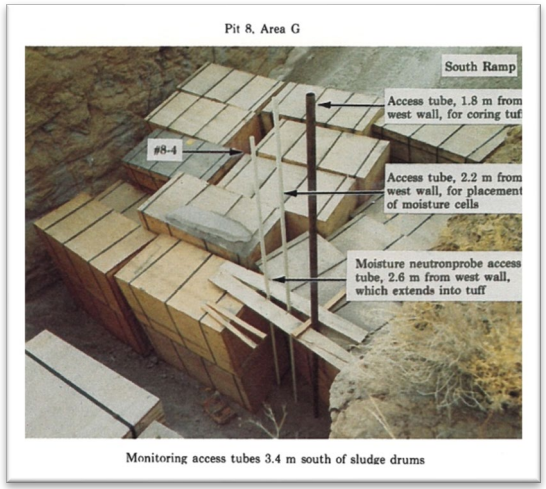
Low-Level Waste/Mixed LLW

There were 1,883 containers of LLW/MLLW at contract start in FY18. Less than 100 of those containers remain in inventory.

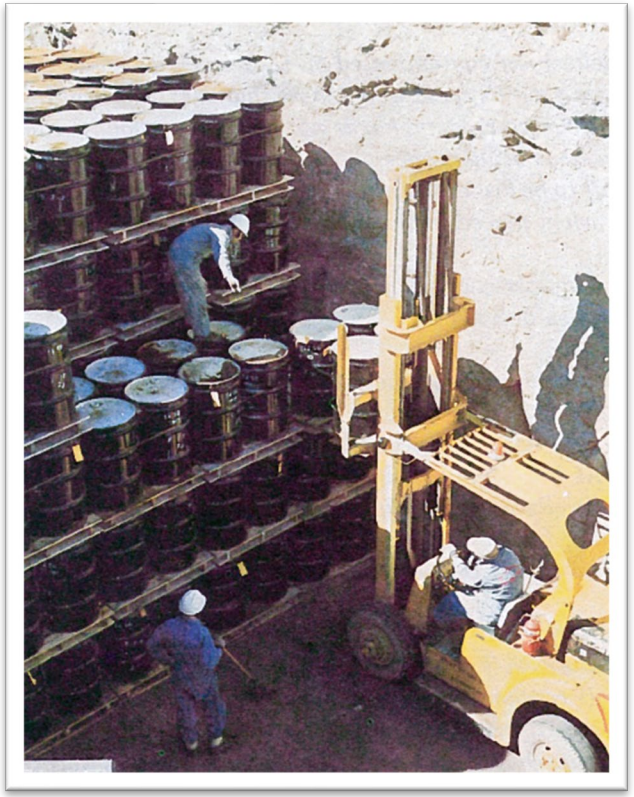
Additional LLW is generated during current TA-54 and Environmental Remediation activities sitewide.

Pit 8 Feasibility Study

- Feasibility Study of proposed environmental cleanup procedure relating to the waste in Pit 8 at Area G
- Pit 8 operated from 1971 to 1974
  - Adjacent to Pit 9
  - Volume of waste 2,311 cubic yards
  - Waste is sludge contained in 55-gal drums
  - Not included in planned removal from Pit 9 due to designation as “non-retrievable TRU” waste



“Non-retrievable TRU” in Pit 8, and moisture monitoring probes



Handling of sludge drums during disposal at Area G

Pit 8 Feasibility Study

Two phases –

- Phase 1 (begins in FY2025)
  - Historical documentation review
  - Non-intrusive geophysical evaluations
  - Draft Feasibility Study that evaluates one or more alternative options and addresses the following factors:
    - Technical feasibility
    - Possible hazards and risks to human health and environment
    - Economic costs and benefits
    - Timeframe for performing procedure
- Phase 2 (anticipated to begin in FY2028)
  - Physical sampling of soil in and under Pit 9 following removal of waste there
  - Physical sampling of soil surrounding Pit 8
  - Public meeting to present Draft Feasibility Study
  - 90-day public comment period following public meeting
  - Final Feasibility Study published

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Questions

ENVIRONMENTAL MANAGEMENT
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Produced by Los Alamos Legacy Cleanup Contractor, N3B Los Alamos
on behalf of DOE's Environmental Management Los Alamos Field Office

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