

From Art & Barb
3/21/97
3:10pm



Sandia National Laboratories

Operated for the U.S. Department of

Energy by

Sandia Corporation

Albuquerque, New Mexico

87185-1147

date: March 20, 1997

to: G. K. Laskar, MS-0184, DOE/KAO

from: W. B. Cox, MS-1147 (6581); B. Botsford, MS-1044 (7577); B. Forbes, MS-1094 (7525)

subject: Mixed Waste Landfill Classified Area Pits 35 and 36

Mixed Waste Landfill classified area pits 35 and 36 contain 4 stainless steel canisters. These canisters are 9 inches in diameter and 20 feet long and were used in TA 5 in the mid-1980s for experiments involving oxide nuclear reactor fuels. Oxide fuels were placed in these canisters and the nested configuration was placed next to the core of the ACRR. The core generated temperatures of 2500°K which vaporized or melted the fuels. The canisters were then removed from the core and disassembled to study the source term of a simulated meltdown of nuclear reactor fuels. The fuels were removed from the canisters before disposal but the canisters became activated during the tests due to neutron capture.

The Mixed Waste Landfill has been proposed for NFA under the SNL/NM *Hazardous and Solid Waste Amendment (HSWA)* permit process. Pits 35 and 36 need to be backfilled to move the HSWA process along towards completion. *The outstanding issue is whether or not the canisters should be removed from the waste pits and managed as waste. If the decision is made to require SNL to remove the canisters from the pit and manage them as waste the following key waste management issues complicate the situation and need to be considered:*

1. Based on interviews with TA 5 personnel, there may hazardous constituents in the canisters. Each canister would have to be dismantled, sampled and analyzed by TCLP methods for suspected hazardous constituents. It will be very difficult to obtain representative samples for analysis. The required sampling of the canisters will be very difficult, and the necessary handling to obtain the sample will result in personnel radiation exposure to the sampling personnel, which violating ALARA. If metallic sodium is present, as suspected by TA 5 personnel, sampling could be very dangerous as a result of this metal's reactivity.

21
6

✓

(21)

2. Upon removal from the pit a 90-day clock begins. This clock begins because the waste volume exceeds 55-gallons and is suspected to be mixed waste. The canisters would then have to be sampled, the samples need to be analyzed, the waste must be containerized and moved to a permitted facility within 90 days of removal from the pits. Complete characterization will be required before movement into a mixed waste unit for storage pursuant to the FFCO. If the waste is determined to be mixed waste, there is no currently available disposal option due to the high concentration of radioactive material in the waste. The only option at this time is long term storage at a SNL Mixed Waste Unit. Significant sampling and analysis will be required in order to characterize this waste even for disposal as LLW at NTS as there is little process knowledge; there have been no controls since it was generated, and it is being removed from a Mixed Waste Landfill. There will need to be thorough sampling and investigation to ensure that no hazardous material is present in the waste.

3. Custom designed shielded storage containers will need to be developed and built to safely contain this waste and maintain radiation levels at an acceptable level while in storage awaiting disposition. The design of such container would be expensive and time consuming.

4. Should the waste be found to be Mixed Waste and since no viable disposal option is available, this waste will have to be added to the SNL/NM Site Treatment Plan. SNL/NM is working diligently to avoid the need for additions to the Site Treatment Plan since inclusion in this plan has a very high associated cost. Waste of this type will result in continuation of a Site Treatment Plan for an indefinite time. Removal from the Site Treatment Plan would only be accomplished if new disposal options become available in the future.

The following factors support the position to leave the canisters in the pits and cover the pits:

The estimated exposure rate reduction that would occur by backfilling the pits with clean soil backfill would be below 0.02 mR/hr, as required in DOE Order 5400.5. The supporting calculations below are based on actual exposure rates in and around Pit 35 with the following assumptions:

Co-60 is the nuclide of concern with a point source of 0.5 Ci located in the center of the bottom of the pit. An unshielded exposure rate of 1.2 R/hr approximately 14 feet below the ground surface and 35 mR/hr at the ground surface is currently observed.

Calculations were made with MicroShield v. 4.00, assuming the shielding material was made up of 14 feet of SiO₂ sand (50 wt% Si/50 wt% O) with a density of 1.5 g/cc and a 2 inch air gap above ground surface. Clean soils at the Mixed Waste Landfill contain other elements (Na, K, Ca, Fe, Mn, Mg) that will make backfill soils more dense, providing more conservative shielding.

The estimated exposure rate in air, based on the above assumptions, and accounting for buildup, is 6 x 10⁻¹² mR/hr, two inches above ground surface (printout attached). Measured exposure rates obtained at ground surface show a decrease to background levels at approximately six feet from the edge of the pit (as measured in the northerly

direction). Background at the Mixed Waste landfill is 10 to 15 μ R/hr.

Since Pit 35 has an unshielded exposure rate of 35 mR/hr at ground surface, it is considered to represent the worst-case exposure scenario. Pit 36 has an unshielded exposure rate of 6 mR/hr at ground surface due Co-60, Cs-137, and Na-22. For this reason, calculations indicate that backfilling the pits with clean soil would reduce exposure rates at ground surface to less than 0.02 mR/hr.

Based on the above considerations, we recommend that Pits 35 and 36 be backfilled with clean soil and the canisters remain in the pits along with the other waste items in the landfill.