

DOE BROOKHAVEN NATIONAL LABORATORY TRU AND LEGACY WASTE DISPOSAL

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ABSTRACT

As part of the removal of legacy waste from the former Hazardous Waste Management Facility (HWMF) at Brookhaven National Laboratory (BNL), several waste streams were identified without a disposal pathway. A concrete High Activity Vault (HAV) was packaged with a mixture of radioactive waste for disposal in 1977. Subsequent to packaging, the HAV was determined to contain transuranic (TRU) waste (> 100 nanocuries per gram) and was unable to be shipped for disposal. The 17,500-pound vault remained at the former HWMF for twenty-six years awaiting a disposal pathway.

The waste contained in the vault included five plutonium-239 foils (Pu-239), miscellaneous cobalt-60 (Co-60) waste with a total activity of 7.6 curies from Brookhaven Linear Isotope Production (BLIP) targets, a 9-curie cesium-137 (Cs-137) source, and other assorted hot waste. Due to the mixture of wastes and the size of the vault, disposal pathways were unavailable. The Waste Isolation Pilot Plant (WIPP) was identified as the only facility where TRU waste can be disposed, and in order to get the waste accepted into WIPP it had to be accepted as "defense-related waste" and packaged according to the WIPP specifications. In June 2003, the U.S. Department of Energy (DOE) issued a defense determination for all Pu-239 sealed sources. This determination provided BNL with several options for disposal of the HAV and its contents.

Four options were identified for disposal of the HAV and its contents: create a type B package large enough and ship the entire vault to a contractor's facility for sorting and storage, until the waste could be received at WIPP; shave the vault down to fit a already existing Type B cask, ship the vault to a contractor's facility for sorting and storage, until the waste could be received into WIPP; open the vault at BNL, sort and repackage the waste, and ship directly to WIPP for disposal; and leave the vault "as-is" in storage in BNL's Waste Management Facility (WMF).

The option chosen for the HAV and its contents was to open the vault at BNL's WMF, remove and sort the contents of the vault, and repackage the waste for disposal. Due to facility constraints at BNL typical HAV vault opening procedures (i.e. diamond wire saw cutting) were not employed and manual demolition was utilized instead. In addition, due to the length of time since the packaging of the vault, and the lack of detail in historical documentation regarding the vault construction, and its contents and their physical state, the vault demolition was considered a high-risk task. All of the contents of the HAV were successfully removed and repackaged in the summer of 2004. Several of the waste items, including the TRU Pu-239 foils are still awaiting further repackaging and disposal.

INTRODUCTION

The former HWMF was used from the 1940s to 1997 for processing, treatment, and storage of BNL's radioactive and hazardous wastes before transport for off-site disposal. During the closure of the former HWMF and the start-up of the new WMF, several waste streams were identified without a disposal pathway. The HAV, identified as the 1-95 vault, was packaged beginning on April 4, 1975 and continued through June 28, 1977. The vault was capped on June 28, 1977 in preparation for disposal. It reportedly contained a mixture of radioactive waste from several different waste generators at BNL. Subsequent to packaging and capping of the 1-95 vault, it was determined to contain transuranic (TRU) waste (> 100 nanocuries per gram) and was unable to be shipped for disposal. The 17,500-pound vault remained in outdoor storage at the former HWMF for twenty-six years awaiting a disposal pathway until it was moved to the WMF in December of 2003 [2,14].

1-95 Vault Contents

The contents of the 1-95 vault, as identified on the Waste Disposal Log Sheets from 1975 through 1977, include the following:

- 9 Ci of Cs-137 from BLIP Targets,
- 500 mCi of Co-60 from 8 Brookhaven Linear Isotope Production (BLIP) targets estimated to be 4.5 inches outer diameter (OD) and 1 inch high,
- 1.7 curies of Co-60 within a 2 inch OD by 30 inches high sealed source container,
- Assorted hot waste (215 mCi) in a 24" by 36" waste container,
- 200 mCi Co-60 waste in a 3" lead drum, and
- Five plutonium-239/240 foils (Pu-239/240) foils [14].

After capping the vault, the five Pu-239/240 foils were identified as TRU waste and the vault was unable to ship for disposal.

Plutonium 239/240 Foils

The Waste Disposal Log Sheets described the five plutonium foils as being 3 to 5 mils thick, and containing 2.61 grams, 2.74 grams, 4.73 grams, 4.85 grams, and 13 grams of plutonium, respectively, for a total of 27.93 grams. The foils were described to be stored inside individual thin-walled aluminum windows "Kold Welded", which were then placed in six-inch diameter steel storage plates [14]. Correspondence regarding the foils stated that one of the plutonium foils might have ruptured, as evidenced by loose radiological contamination inside one of the 2-gram foil storage containers. Using the weights provided in the shipping forms, the percentage of plutonium-240 was calculated, as shown in Table I below [1].

Table I. Calculation of Percentage of Pu-240 in Plutonium Foils [1]

	Net Weight (grams)	SS Net (grams)	Difference (grams Pu-240)	Percentage of Pu-240
Foil No. 1	4.78	4.73	0.05	1.05%
Foil No. 2	4.90	4.85	0.05	1.02%
Foil No. 3	2.76	2.74	0.02	0.72%
Foil No. 4	2.64	2.61	0.03	1.14%
Foil No. 5	13.00	NA	NA	NA

The activity per gram of TRU nuclides, Pu-239 in this case, was calculated at 208 nanocuries per gram. This calculation was based on the entire weight of the concrete vault of 17,500 pounds (which is conservative as there was other waste streams included in the vault) [1].

A report was produced that documented the origin and use of the foils (“History of Five Plutonium Foils Within Vault 1-95 at Brookhaven National Laboratory” P.W. Grosser Consulting, Inc March 20, 2003)^a. The foils were shipped from Los Alamos Scientific Laboratory (now LANL) to BNL. Four of the foils were received in 1956 and one was received in 1962. BNL scientists and Bell Labs researchers used the foils to perform neutron cross-section studies [1].

1-95 Vault Options for Management

The Waste Isolation Pilot Plant (WIPP) was identified as the only disposal facility for TRU waste, however in order to dispose of the Pu-239 foils at the WIPP facility a defense pedigree must be accepted by the DOE Carlsbad Office. A DOE General Council determination was made in June 2003 that all Pu-239 was considered defense related [13].

A second determination would also have to be made on whether the waste package would be “Contact Handled” or “Remote Handled”. The external dose rate of the 1-95 vault, anticipated to be the package, was well below the Remote Handled level, however the cesium source would far exceed the Remote Handled level if the concrete vault were breached [1,2].

A third decision that had to be made was whether this waste was a mixed waste. BNL believed that the cesium source was stored in a lead storage pig inside the vault. If the WIPP facility was a viable option the waste must be put through the characterization process that is required by the WIPP facility for acceptance. BNL is not an approved WIPP facility generator, and becoming an approved generator is cost prohibited for the volume of waste in question [1,2].

Four options for the management and disposal of this waste were identified and include:

Option I- Ship entire vault: The vault contained enough radioactive material to require a Department of Transportation (DOT) Type B package. This would require a Type B package with a payload capacity of 17,500 pounds, be large enough to fit an 8-foot by 4-foot by 4-foot vault, and be licensed to carry 1.7 curies of Pu-239. Since a Type B Cask fitting these specifications could not be located, consideration was given to constructing a Type B package to fit the vault. This option required the least amount of physical work at BNL but was unachievable due to the potential for mixed waste, the size of the package that is needed, and the lack of a disposal facility to accept the entire vault [2].

Option II- Shave down the vault then ship: This option would have only been chosen if a suitable Type B package or cask is not located for Option 1 and a disposal facility was identified to accept the 1-95 vault and its waste as it was packaged. This option would have required that approximately 10 to 12 inches of concrete be cut from 5 of the 6 planes of the vault. Cutting methods such as a diamond wire cutting or hydro-lazing could have been employed to accurately slice the concrete and still leave a concrete vault with 5 to 7 inch walls for shielding. This option would have still required the use of a Type B package or cask, but the needed payload capacity would be much less. The remaining vault was estimated to be approximately 4,700 pounds. This option was unachievable due

to the potential for mixed waste and the lack of a disposal facility's acceptance of the vault and its waste contents in its entirety [2].

Option III- Open, sort, and repackage waste then ship: Since Option I or II could not be accomplished due to an unsuccessful search for a package or difficulty in meeting receiving facility requirements without opening the vault, opening the vault and repackaging the material would be performed. By opening the vault and segregating the wastes, the TRU material could be separated and packaged for WIPP. The remaining waste items in the vault would be packaged as low-level waste. The Hanford Reservation was identified as the disposal facility for the non-TRU waste material [2].

Option IV-Leave in storage: The fourth option that was identified was to leave the vault "as is" in storage in Building 865 at BNL's WMF. The vault would be stored in a secure, well-protected storage pit. The storage pit is fifteen feet below grade, and made of concrete with a 2-foot thick reinforced concrete cover. Building 865 is an operating Non-Reactor Nuclear Facility Category III facility. The vault would be inspected on a regular basis as required by the facility procedures [2].

After research into Options 1 and 2, it was determined that there was not a disposal site, nor a receiving facility that would accept the vault and its contents in the configuration that it had been packaged in. Option 3 was identified as the best option to manage and dispose of the waste. Option 3 could be completed at BNL, and long-term storage of the plutonium foils could be limited to less than 55-gallon size package. However, the risk and dose associated with Option 3 was high. Option 4, leaving the package in storage and continue to decay the Co-60 and the Cs-137 sources would present less of a risk to the workers [2].

Information was transmitted to different organizations in DOE for assistance with this problematic waste stream. The DOE Brookhaven Group and Chicago Operations Office looked into various options for disposal of this waste. In June 2003, the DOE made a determination that all Pu-239 was "defense-related", which further put WIPP as a viable option for disposal of the plutonium foils [13]. Option 3 was then chosen as the only feasible path forward for the management and disposal of the 1-95 vault.

1-95 Vault Construction

The 1-95 concrete vault was a steel reinforced seventeen-inch concrete disposal vault that was filled with radioactive waste for disposal from 1975 to 1977 (Figure 1). The vault was sealed with high density concrete in 1977 with the intent of sending it to a disposal facility. However, after sealing the vault, the initial pathway for disposal was no longer available due in part to the quantity of plutonium contained within the vault. Once in 1990, an attempt was made to open the vault using an electric jackhammer, but operations quickly ceased as the dose rates increased beyond the facility limits when several inches of concrete were removed. The vault was again concreted over and placed back into storage [15].



Fig. 1. The 1-95 concrete vault located in the Waste Management Facility (WMF).

Packaging of High Activity Concrete Vaults

A typical seventeen-inch HAV contains concrete walls that are 16.5 inches thick. The outer dimensions of a HAV are 8 feet by 4 feet by 4 feet. The inner cavity of the vault is approximately 5 cubic feet. These vaults were typically used for the transport and disposal of high activity radioactive wastes [3].

Once all of the waste has been placed inside the HAV, the inner cavity would normally be void filled with sand. Rebar would then be placed on the top of the inner cavity and finally a concrete cap would be poured in place. No current employees at BNL had knowledge of how this particular vault was closed, so it was assumed that the vault was either closed as mentioned above or perhaps no sand void fill was used and the waste was concreted in place. In addition, the legacy paperwork for the 1-95 did not give very detailed descriptions of how the waste items were placed into the vault. Several of the Waste Disposal Log Sheets referred to lead pigs with no indication of whether or not the items were removed from the lead pigs prior to placing into the vault. On some of the logs it was obvious that the item had been removed from its shielding, because the shielded lead barrel was known to be too large to fit inside the vault. Overall, there was a great deal of uncertainty in the contents of the vault [14,15].

Opening of High Activity Concrete Vaults

The construction and capping of HAVs are done in a manner that does not intend for the vault to be opened after sealing. However, due to problems such as changing disposal facility acceptance criteria, many of these vaults have been opened and repackaged across the country. Since the vault was unable to be shipped to another site without creating a special Type B package, BNL was required to open the vault at its own facility. Most sites that open concrete vaults use a diamond wire saw. The vault is laid on its side and the wire saw is used to remove the top layer to access the waste

within the cavity. This option was not available at BNL due to the facility constraints. BNL was required to perform all work inside of a HEPA ventilated room that would not accommodate large pieces of equipment [15].

As part of the work planning process, the feasibility of using x-ray technology was explored. An industry search was performed, and discussions with BNL scientists were held. BNL has a research group that uses x-ray as part of their non-destructive testing. An empty vault was given to the group to test their capability of "looking" into the vault and identifying the waste items and their locations. Neither the commercial industry nor BNL in-house group were able to penetrate the 34 inches of concrete to provide further information of how and what was packaged in the vault [15].

Activity Determination

In order to properly plan the opening and repackaging of the HAV, dose estimates were made. With all the uncertainty involved, a conservative approach was used. The vault had two "Hot Spots" measured on the outside; one was on one of the long sides and the other on the top. The "Hot Spots" were not directly in line with each other, but were close enough that it was projected that they could have been from the same source. Using the original activities from the historical vault paperwork, the two main sources were decay corrected. The resulting activities were 4.8 Curie (Ci) and 0.14 Ci for Cs-137 and Co-60 respectively. These activities were the starting point for determining potential worker exposure once the concrete shielding was removed [4].

Using the commercial Microshield Code the decay corrected activities were input along with the concrete shielding configuration to try to simulate the dose rate that was measured on the outside of the vault. The dose rate measured on the side of the vault was 0.4 mR/hr at contact. The dose rate on top was 4.0 mR/hr at contact. It was decided to model the side of the vault as opposed to the top, because the top was previously opened and the concrete patch on top did not appear to be adequate. The initial MircoShield dose rate was calculated to be 97 mR/hr using these activities. The calculated dose rate was 2 orders of magnitude higher than the measured dose rate, which meant that the initial activities were overstated or perhaps the source was in additional shielding. Regardless of what caused the discrepancy, in order to be conservative and plan for the worst case the decay corrected activities were used to determine unshielded dose rates and plan for worker exposures [5].

Work Plan

The work plan involved workers using a concrete drill and an electric jackhammer to remove the concrete and rebar above the waste cavity. Before work commenced on this project, all workers that were going to be used for this project were trained on the equipment they were going to use. This training included time to practice using the equipment. After the technicians were used to the feel of the equipment, they dressed out in the Personal Protective Equipment that they were going to use in the vault opening and practiced some more. All work was performed inside of a HEPA ventilated room. A series of holes were drilled into the top of the vault just outside of where the rebar was anticipated to be. It was thought that this would enable the workers to chip away at larger sections of concrete containing rebar and remove it all together. Another series of holes were drilled across the middle of the top to allow for starting points and cracking with the jackhammer. One of the holes was drilled directly over the "Hot Spot" on the top to determine streaming dose rates and confirm the initial dose estimates. Workers began to remove the concrete until they reached the anticipated

second course of rebar approximately 12-13 inches down from the top. The radiological work controls specified in the Radiation Work Permit (RWP) would not be instituted until the second course of rebar was uncovered or the general area dose rates were greater than 80 mR/hr. Although the workers were not bound by any radiological control measures at this point, personal protective equipment (PPE) was worn to protect them from the non-radiological hazards such as silica dust and noise. After several hours of vault demolition, the 12-inch mark on the vault was reached however no rebar was found. The lack of rebar in the top of the vault made it easier for the technicians to reach the vault cavity [3,4].

Radiological Concerns and Controls

Based on additional MicroShield calculations using the decay corrected activities for the Cs-137, it was determined that after the concrete was removed the workers could potentially be exposed to up to 19 R/hr at one foot. The workers were instructed that if the dose rates in the area where they were not drilling exceeded 100 mR/hr at one foot, they would use lead blankets to cover the area until it was deemed necessary to work in that area again. The Radiological Control Technician (RCT) using an extendable probe instrument, the Teletector 6112B and an Eberline RO-20 Ion Chamber monitored area exposure rates very closely. After the drill hole was made over the "Hot Spot", a streaming survey was performed and a dose rate of 10mR/hr was measured at the hole. This small increase in dose rate gave some assurance that there was not going to be the extremely high dose rates that were predicted during the planning [4,5,6,7].

During the demolition of the cap, a void space was breached and the drill dropped down past the 12-13 inch mark on the drill bit. Work was immediately stopped and a loose contamination survey performed. No detectable activity above background was found on the drill bit or smears taken of the hole. It was at this point that it was decided to institute all radiological controls specified on the RWP. Workers were required to wear a double set of coveralls, gloves, personal lapel air samplers, and a respirator because of the potential for high levels of contamination inside the vault. In addition, workers were required to have submitted pre-job urine bioassay samples for Pu-239 and have had a pre-job whole body count. The workers wore a Siemens EPD-2 Alarming Dosimeter that was set to alarm at an exposure rate of 800 mrem/hr or greater and a dose of 50 mrem [3,4,8].

Results

Work with the jackhammer proceeded and after approximately 1 hour workers reported that they had uncovered the top of a waste container that appeared to have a pipe nipple running down the center of it. The dose rate on this item was 40 mR/hr at contact. The item was located close to where the original "Hot Spot" on the top of the vault was. It was at this point that it was fairly certain that there was no rebar, no sand void-fill and that the waste appeared to have been concreted in place. Workers used the jackhammer and a smaller chisel attachment on the drill to free the first item, which did not appear to fit any of the waste descriptions from the historical Waste Disposal Logs. The item was bagged and placed into a shielded container. Dose rates were 150 mR/hr at contact and 40 mR/hr at one foot. The waste item was transported to a low background area within the WMF. A High Purity Germanium Detector (HPGe) System, with Genie 2000 and ISOCS (In-situ Object Counting System) Software was utilized to collect and analyze the gamma spectrum. The spectrum was analyzed and it was determined that this item was a Co-60 source. The item was placed into a shielded container for future disposal [3,4,9,14].

RCT's performed surveys of the void where the waste item was removed, the dose rates were 50 mR/hr at the plane of the opening. Loose surface contamination smears measured 5000 dpm/100 cm² (beta/gamma) and no detectable alpha contamination. Workers observed some residual water in the void and believed it may have come from the drilling operation, which utilized water for dust control. It was later determined that the patch that was put on top of the vault when it was last attempted to be opened had allowed water to enter and collect at the bottom of the vault [3,4,15].

Workers continued removing concrete both in search of the plutonium foils and to remove all of the waste items from the vault. Several waste items were removed from the void where the Co-60 pipe nipple was. These items were determined to be radioisotope production targets and their associated wastes, and had dose rates that ranged from 1-2 mR/hr up to 80 mR/hr at contact. These items were removed, bagged and a gamma spectrum collected for characterization. More concrete was removed in the general area of the "Hot Spot" on top of the vault. As the concrete was removed, the general area dose rates began increasing and were about 100 mR/hr at one foot when a second source container was uncovered. This item fit the description in the Waste Disposal Log as a "two inch diameter by thirty inch long sealed source container", containing 1.7 Curies of Co-60. As the item was removed, the bottom portion of the tube measured 2 R/hr at contact and 200 mR/hr at one foot. The item was quickly bagged and placed into a shielded container. A gamma spectrum was collected and analyzed for this item. The item was confirmed to be a Co-60 source with an activity lower than the original reported [3,4,14].

With a larger void, workers were able to free more waste items that all appeared to be radioisotope production targets and their associated wastes. While sifting through some of the items, workers found what appeared to be a thin foil like material similar to Mylar. The foil material was collected and put into a bag. The foil was surveyed and the dose rates were <0.2 mR/hr at contact. Using a Ludlum 3 with a GM Probe, 10,000 dpm/probe was measured through the bag on the foils. The area was surveyed for alpha contamination using smears and a Tennelec Alpha/Beta Smear Counter. Though no detectable alpha contamination was found, it was thought that these were the plutonium foils, and that they had been removed from their aluminum holders. A gamma spectrum was collected and analyzed for the foils; the only radionuclide identified was uranium-235. This item did not appear on any of the Waste Disposal Logs, but we were relatively certain that this was not the plutonium due to the absence of the americium-241 peak in the gamma spectrum. The foil waste was placed in a separate container for additional analysis prior to disposal. Several more items are removed from the vault including some empty lead pigs and lead bricks [3,4,10,11,14].

It is at this point that the historical data is more carefully examined along with the gamma spectrum analysis data from the items removed to determine if something was missed. As it turns out, the 9.0 Ci Cs-137 source is listed on a Waste Disposal Log with the description "BLIP Targets, ~ 8 Targets". A majority of the radioisotope production waste has cesium-134 (Cs-134) in it. All of the waste has low levels of Cs-137 in it but at contamination levels compared to the Cs-134. Proton irradiation of a cesium chloride target does not produce Cs-137, but does produce Cs-134. It was determined that there was a transcription error in the historical Waste Disposal Log, and that it should have been originally 9 Ci of Cs-134 and not Cs-137. With a 2-year half-life, the Cs-134 would have decayed to approximately 1.0×10^{-3} Curies. This corresponds to the activity within the radioisotope production waste removed from the vault [3,4,14].

Prior to starting work on the third day, the project manager and a RCT began discussing the size and shape of a BLIP Target as compared to the plutonium foil aluminum holders. As it turns out, a BLIP Target measures 4.5-inch diameter by 1.0 inch high and the plutonium foil holders measure 6.0-inch diameter by 5/8 inches high, slightly larger than a BLIP Target. The RCT remembered a bag of what he thought were oversized BLIP Targets. The bag was retrieved and opened inside the ventilated enclosure and the 5 disks inside were laid out in a tray. Much of the original labels were still intact on the disks and it was confirmed that these were the five plutonium foil holders (Figure 2) [3,14,15].



Fig. 2. Plutonium foils inside of aluminum holders.

The foil holders were surveyed and bagged individually. There was no loose surface contamination on the outside of the holders and the one that was opened was also surveyed on the inside with no contamination detected. The foil holders measured 40-60 mR/hr at contact and up to 5 mR/hr at one foot. A gamma spectrum was collected and analyzed for the foils. The predominant radionuclide identified was americium-241, indicative of plutonium-240/241 decay. The foils were then removed from their holders and placed into small Ziploc storage bags (Figure 3). This work is done inside of a glovebag inside of a fume hood. The foils and the inside of the glovebag were surveyed and contamination was found. The activity measured inside of the glovebag was 300,000 dpm/100 cm² alpha. The foils in Ziploc bags are decontaminated and bagged one more time before placing them into a Type B container, where they are currently stored at the WMF [3,4].



Fig. 3. Plutonium-239 foil removed from the steel holders and individually wrapped in a plastic bag.

The remaining waste was removed from the inner cavity of the vault. The empty vault is shown in Figure 4. All concrete debris and miscellaneous non-source items removed from the vault were placed into a B-12 Industrial Package for disposal. All tools and equipment were decontaminated and removed from the ventilated enclosure for future re-use. The empty vault was wrapped in plastic, removed from the ventilated enclosure and placed into an Intermodal container for disposal [3,12].



Fig. 4. All waste items excavated and removed from the vault.

CONCLUSION

Dose Results

The estimated individual dose for this project was 100 mrem and the collective dose estimate was 400 mrem based on the calculations made previously. The actual individual dose by self-reading dosimeter was 26 mrem and the collective for the RWP was 44 mrem. This lower than expected dose was due in part to the fact that the anticipated 9 Ci Cs-137 source was not present and the highest dose rate on a Co-60 source was 2 R/hr at contact. In addition, the concrete removal proceeded much faster than estimated and there was no rebar present. The workers also were taken out of respirators after the Pu-239 foils were removed and no additional contamination was found that warranted the use of respiratory protection. This allowed the workers to work faster and more freely when removing the higher activity sources inside the vault. Air samples taken during the project did not detect any airborne radioactivity [4].

While these vaults were not intended to be reopened after sealing with concrete, it is possible to do. As performed at other facilities, a diamond wire saw is the preferred method for cutting the vault open, the manual technique of using powered hand tools can be employed. It is very important that the technicians know how to use the tools and it is not a learning experience working on a potentially high contamination item. The difficulty with this technique comes into play when there is a potential for high contamination and high dose rates. Controlling the spread of contamination and excessive exposure can only be accomplished with engineering controls and ALARA principles.

Current Status of Waste Disposal from the 1-95 Vault

Currently, the five Pu-239 foils are stored in individually wrapped Ziploc bags in a Type B container. A verbal agreement has been made with the Off-Site Source Recovery Project (OSRP) to accept these foils from BNL for eventual disposal at the WIPP facility. The foils were scheduled to be transferred to the OSRP's ownership in the fall of 2004, however due to the shutdown of LANL in the summer of 2004, the OSRP was not able to receive the foils. Since LANL is back in full-operation mode it is anticipated that the foils will be transferred in January 2005 [15].

The two Co-60 sources that were removed from the 1-95 vault were inspected and disassembled. It was determined that both items were not sources, but activated steel components. The activated items were placed inside of lead lined drums with other high activity items from a BNL accelerator. These items, lead drums and all, will be disposed of at Envirocare of Utah in the coming months by macro-encapsulation.

The remainder of the waste removed from the vault, including the empty vault itself, was disposed of as low-level radioactive waste and/or mixed waste (i.e., lead bricks) at Envirocare of Utah. Since the 1-95 vault and its contents fall under the Environmental Management Directorate's (EMD) legacy waste project, and BNL's EMD is scheduled for completion at the end of fiscal year 2005, it is crucial that the Pu-239 foils that currently remain at BNL are disposed of within the next seven months.

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