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Monitoring Report of the Institute for Energy and Environmental Research on the First Independent Technical Audit of the Los Alamos National Laboratory's Compliance Status With Respect to the Clean Air Act

By Arjun Makhijani and Bernd Franke
11 April 2000

The Institute for Energy and Environmental Research (IEER) has monitored the first Independent Audit of Los Alamos National Laboratory's (LANL's) compliance status with respect to the completeness of the audit and the findings of the audit. IEER has already made its comments on the Independent Technical Audit Team's (ITAT's) partial draft report of May 15, 1998. Since the Final Report of the ITAT is unchanged in its basic analysis and conclusions, we will simply reiterate the points that we made at that time and focus this report on the items that are still outstanding that we expect will be covered in the second audit. (The Final Report refers to the final report of the ITAT Team: Final Report: Independent Audit of Los Alamos National Laboratory for Compliance with the Clean Air Act 40 CFR 61, Subpart H (with Appendices A through I), Neeses, SC: Risk Assessment Corporation, November 1999).

Before going on to particulars as regards substantive issues, it is important to note that the process of the audit has been open and clear. IEER has had access to documents and personnel and has been able during site visits to examine the issues being raised by the audit. The openness of the process has been crucial to IEER's ability to perform its function of monitoring the audit in order to evaluate its completeness and thoroughness. IEER would like to thank the ITAT team, CCNS, DOE, and LANL for the maintenance of the openness that enabled IEER to perform its monitoring of the audit.

The second point to note is that IEER agrees with the decision of the ITAT to release a draft partial report regarding the ITAT's finding of non-compliance so that LANL could take the actions needed to correct the problems that were identified. We understand that this led to a shortage of resources that prevented all the relevant issues from being considered as fully as needed or from being covered at all. We also want to note that the ITAT did request additional resources, but that this request was denied. We expect that these issues will be addressed in the second audit.

Overview

IEER is in general agreement with the findings of the ITAT team on all but one major issue. That issue is related to compliance with the 10 millirem (mrem) per year dose standard, which is the primary standard specified in the 40 CFR 61, Subpart H. The ITAT stated that it was its "considered judgment that the Laboratory did not exceed the 10 mrem per year dose standard prescribed in the regulation." (p. iv, Final Report.)

This statement is insufficiently supported by the work that ITAT did in the first audit. Specifically, such a claim should be based on a quantitative assessment of how likely it is that LANL actually met the standard. In other words, the probability that no individual was exposed to more than 10 mrem should be specified. We understand that this conclusion is a matter of the ITAT's "considered judgment." However, in a matter as fundamental as the primary standard, we are of the opinion that judgment should be backed up by a quantitative uncertainty analysis. This is specially needed in light of the fact that the first audit did not quantitatively address the issue of the flat terrain model. In addition, ITAT did not resolve important questions relating to the location of the Maximally Exposed Individual (MEI) and to doses to transient receptors from discontinuous releases, which are discussed in greater detail below.

In the absence of an uncertainty analysis, it would be accurate to say that while the use of simplified models such as CAP-88, which do not address the above mentioned issues, would indicate compliance, the data available do not allow a scientific analysis of uncertainties to be done. therefore, while the data do not indicate that LANL is out of compliance with the 10 mrem limit, they are insufficient to arrive at a scientifically supportable quantitative conclusion to the effect that it is in compliance. The underlying reason is that no quantitative analysis of the probability of non-compliance can be made. We recommend that the ITAT resolve these issues in the second audit before arriving at a judgment regarding the quantitative compliance with the 10 mrem standard.

Inventories and Usage of Radionuclides

We concur with the ITAT in regard to its conclusion regarding non-compliance on the issue of inventory and usage records and reporting. The ITAT did a thorough job of documenting the deficiencies and making recommendations as to how the job should be approached. We appreciate that LANL began adopting the recommendations of the ITAT during the first audit. In regard to inventories and estimated dose rates, IEER agrees with the ITAT finding that LANL's process for keeping inventories improved during the course of the first audit. However, the suggested frequency and manner of updating inventories is not consonant with the concept that usage, rather than inventory, determines the estimated doses. IEER recommends that the ITAT team make a more explicit recommendation that complete usage data, which should include inventories and all changes in inventories during the year be collected each year for sources for which estimated doses are greater than 0.005 mrem.

The trigger for changing from a two-year collection frequency of data to an annual collection frequency should be a change in usage of a sufficient magnitude. The parties using the radionuclides should be required to report sudden increases in usage for sources, so that adequate assessment of the inventory-reporting requirement can be maintained on a current basis by ESH-17.

As noted by the ITAT (p. 32), this needs to go beyond voluntary reporting on the part of users of radionuclides. LANL is in the process of implementing these changes. We look forward to monitoring the way in which the ITAT will assess the implementation of these efforts in the second audit, since not all aspects of the reporting system are as yet in place.

From the exchanges between them presented in questions 4 and 5 in Appendix F of the ITAT report, the EPA and the ITAT seem to have arrived at an impasse as to how to consider the inventory issue (pp. pp. F-3 and F-4, Final report).

According to the ITAT, "auditors should be able to verify the radionuclide inventory from the original data upon which release estimates were made." The EPA responded by stating that its regulations required "maintenance of records that document the source of input parameters, methods used to derive the values of the input parameters, and the procedure used to determine effective dose equivalent" (p. F-3). ITAT stated that it "does not understand the EPA's response." In question 5, ITAT has observed that records of types and amounts of usage of radionuclides must be maintained. The EPA has responded that the section of the regulation quoted, 40 CFR 61.94(b)(2) does not require maintenance of records of quantities used but only a list of radionuclides used. ITAT stated that it "does not understand EPA's response."

Resolution and clarity about these issues is essential during the second audit. Usage affects emissions in the real world. Usage is related to changes in inventories. A lack of clarity on inventory and usage issues has been a basic problem in LANL's lack of compliance and it appears that the EPA shares some of this lack of clarity. IEER is in agreement with the ITAT on this issue and hopes that the discussion below will help move the issue to resolution.

Record-keeping must require both inventory on hand at any time, and changes in that inventory. Changes occur when there are additions by incoming radionuclides or usage resolution from shipments, waste discharges, or emissions. Since air emissions are not being measured from the sources in question, the changes in inventory are crucial in determining usage and hence the input parameters for determination of effective dose equivalent.

Changes in inventory cannot be verified without detailed inventory records that are kept current as regards all usage, incoming materials, outgoing materials and discharges. If waste discharges are estimates, documentation of the procedures used to make these estimates is essential. Hence, IEER concludes that the EPA, by merely reciting the rule regarding the maintenance of these records, has not taken in account the relations of the content of those records to the calculations that must be made to determine compliance. in other words, the EPA does not seem to have taken proper account of the technical requirements of accurately determining input parameters.

Even if we assume that the specific section 40 CFR 61.94(b)(2) does not require the maintenance of records of usage, the record-keeping requirement of Sec 61.95 clearly necessitates such records. Hence to state that usage records are not required, but only lists of radionuclides, is to miss the underlying purposes of the regulation altogether.

Those purposes are (1) accurate assessment of emissions when continuous stack monitoring is not being done and (2) maintenance of records that are complete, current, and accurate enough to allow

for an independent audit. The ITAT is completely correct in its conclusion that an audit is impossible without these records. We also believe that LANL itself cannot assess whether it is in compliance without such records. Hence, in the absence of these records, certification by LANL personnel that LANL is in compliance with the Clean Air Act would be without the requisite scientific foundation.

In sum, in order to determine the input parameters, which relate to usage and changes in inventory, it is necessary for LANL to maintain accurate and current inventory records that include complete information about changes in those records. Without such record keeping an independent audit is virtually impossible. Since the regulation itself requires that documentation should be amenable to an independent audit, IEER concurs with the ITAT in the matter of record keeping as regards inventories and changes in the inventories.

IEER believes that in the absence of the records described, assertion of compliance should not be made by LANL, and if made, should not be accepted as such as EPA. Therefore the EPA should explicitly accept the position of the ITAT on this question. IEER hopes that this discussion has helped clarify the issue.

IEER expects that inventories will be one of the principal items of review for the second audit.

The Location of the Maximally Exposed Individual (MEI)

During the first audit, IEER raised a question in regard to a hypothetical jogger being a potential MEI. The ITAT has accepted this as a legitimate issue and recommended that the EPA should address it. We agree. IEER is of the opinion that so long as this issue remains in scientific and regulatory limbo, the question of compliance will remain there with it. The EPA's answer (p. F-1) that the jogger should be near an office or residence is arbitrary and astonishing. This is a bureaucratic interpretation that is contrary to the spirit of the regulation that is to protect public health. If a jogger should be near a public building, how near should they be? Is not the Los Alamos Library a public building? The EPA interpretation raises more questions that it answers and should be abandoned.

The Final Audit Report presents calculations pertaining to the potential of a short term release, an issue raised in IEER memo, dated October 7, 1997. Relative to this example, ITAT states on p. 94: "For the 117 μCi short term release from stack 03002924, the radiation doses to a nearby transient receptor ranged from 0.23 or 0.35 mrem. The probability that these doses would not be exceeded was over 99 percent."

IEER notes that the result of the calculation by ITAT is different from the one presented in the IEER memo in which the conditional probability for doses exceeding 10 mrem was calculated to be 3% for a downwind receptor. IEER suggests reviewing the input data and calculations by ITAT, which are not fully documented in the audit report. Sensitive parameters are the distance of the transient receptor, wind speed, wind direction and stability class as well as the dispersion coefficient for the specific weather condition. The uncertainty of the dispersion coefficient was taken into account in the IEER calculations; it is unclear whether this issue was addressed in ITAT calculations.

IEER notes that the doses calculated by ITAT for the jogger scenario are more than a factor of 100 larger than the dose for the LANL MEI from that source of 0.00169 mrem as reported in the "1995 LANL Radionuclide Air Emissions." This illustrates that the issue of transient receptors is an important one to be addressed. IEER concurs with ITAT in the need to clarify the transient receptor issue. Thus IEER cannot declare the issue of transient receptors to be resolved. To the contrary, the above example demonstrates that there is a significant possibility that CAP-88 modeling of such emissions may not identify those members of the public who are most at risk from such emissions.

IEER expects that the second audit will address the following issues in more detail:

- (a) Which processes and facilities are most likely to result in short term releases?
- (b) How can monitoring be improved to address the issue of short term releases?
- (c) Which modeling assumptions will provide reasonably conservative estimates to transient receptors?

In the matter of MEI and also the location of AIRNET stations, we would like to bring up the issue of lands that are sacred to Native Americans. As IEER understands it, there is sacred Native American land bordering LANL and in LANL. We want to raise the issue of whether this scared land should be considered as the equivalent of a temple or church under the regulation. A related issue is whether temples and churches would fall into the categories of buildings that are covered by the regulation. We believe that the presence of bricks and mortar in a place to define its relevance to members of the public in regard to the protection of health may be an ethnocentric view that may have inadvertently crept into the regulation. The issue of how this matter should be addressed both as regards the MEI and the location of an airnet station should be taken up by ITAT with the concerned Pueblos, NMED, LANL, and EPA as part of the second audit.

We expect that the issues relating to the MEI will be addressed and resolved in the course of the second audit. We hope that the ITAT will continue to engage the EPA and LANL in this matter and also make its own views more explicitly and conclusively known in its second audit report.

Puff Releases

IEER has identified puff (short-term) releases as a significant issue in compliance. There appears to have been a misunderstanding of IEER's point regarding short-term or puff releases (p. F-2). IEER's point is that a dose from such a release must be evaluated according to a model designed explicitly for the purposes. It is self understood that in any case, short-term releases have to be included in the annual total. However, a model that assumes continuous releases cannot properly evaluate short-term releases. Moreover, exposures from short-term releases and continuous releases could affect the same people, under some circumstances, and hence both need to be considered. The methodological issues of adding up estimates from different models need to be evaluated in such a case. This also remains to be accomplished in the second audit.

Complex Terrain and CAP-88

It is evidence that LANL terrain is complex and not flat. The model used for compliance is CAP-88, which assumes flat terrain. IEER identified this as a central issue for ITAT to consider and we are

glad that the ITAT devoted some attention to it and raised it with the EPA (p. F-3). The ITAT and EPA appear to agree with IEER that the issue of complex terrain model is an important one to address. However, this issue has not been resolved either scientifically or as a matter of regulatory interpretation. We were disappointed to note that the EPA merely quoted a 1990 response to the issue.

IEER believes this is one of the evident principal issues regarding compliance that should be resolved in the course of the second audit. CAP-88, which assumes flat terrain, is simply not scientifically appropriate. Since the audit was to evaluate not only regulatory issues but also scientific issues in relation to compliance, we recommend that the ITAT issue a clear and unequivocal statement in this regard as part of the second audit. We expect that this will also provide a motivation to the EPA to resolve this issue more expeditiously. Finally, we hope that it will cause LANL to devote some thinking to what site-specific models might be appropriate and how they might be validated. This would be an appropriate topic of scientific discussion during the second audit.

Discrepancies in Measured NEWNET Dose Rates at East Gate with CAP-88 Predictions

In a memo dated April 10, 1998, IEER estimated that the cumulative gamma dose above background at the East Gate station in 1996 was a factor of 2.3 larger than the dose predicted with CAP-88. While the dose was well below 10 mrem, this observation stresses the importance of the impact of terrain and short-term natures of LANSCE releases. IEER concurs with ITAT's conclusion on p. 56 that further evaluation is required and expect that this topic will be addressed during the second audit.

Collection and Analysis of Airborne Particles

IEER agrees with ITAT in that the uncertainty in correcting for self-absorption is relatively large (p.54). However, we believe that ITAT has not made a clear recommendation as to how this uncertainty should be property reflected in reporting the release from the facilities in question. At what degree of uncertainty will the use of mean values for self-absorption make reported releases unreliable? With regard to the issue of dividing the filters, IEER concurs with ITAT that Am-241 and Pu-238 are the most problematic radionuclides due to their high specific activity. However, IEER observes that the ITAT has made no recommendation as to how to properly incorporate this uncertainty in the release estimate for this radionuclides and expects that this topic will be addressed during the second audit.

Diffuse Sources

ITAT has not identified the Magnetized Target Fusion TA-39 experiments as a diffuse emissions site. The neutron generation in the experiments at these sites would give rise to activation products, whose dosimetric consequences need to be evaluated. Explosive testing involves radioactive materials.

Similarly, the second audit should evaluate diffuse emissions from Area G, including the variations in such emissions, which depend on the specific activities at that site.

The ITAT has not discussed the problem of the large unexplained divergence between plutonium in LANL waste as estimated by LANL compared to that estimated by DOE headquarters. LANL assumptions about plutonium in buried waste may lead to mis-estimation of releases from planned operations. Since the amount of plutonium at issue is very large (765 kilograms), this is an issue that the second audit should address with high priority insofar as it might affect diffuse emissions and possibly stack emissions from duct hold-up. (The DOE memorandum detailing differences in inventories of plutonium in waste is attached to this report.)

IEER also identified a number of other issues regarding diffuse emissions in its memorandum of November 19, 1997, which is appended to this report. These issues were not addressed fully in the first audit and we expect that they will be addressed in the second audit.

Depleted uranium experiments are being conducted in TA-15 and TA-36, giving rise to diffuse emissions. Other experiments involving radionuclides are used at firing sites. (Site Wide EIS, DOE/EIS-0238, vol. I,p. 2-73, January 1999.) These diffuse sources should be evaluated in the second audit.

AIRNET Stations

IEER concurs with ITAT's recommendation that stations should be added to the AIRNET network (p.72). The AIRNET system is geared to provide data for offsite locations. However, diffuse sources could also affect transient receptors, for example a jogger. IEER recommends that the ITAT review the scientific adequacy of the AIRNET system data to address doses to transient receptors from diffuse sources.

Neutron Radiation

With regard to neutron radiation, it is the position of ITAT and EPA that neutrons are not covered by the provisions in 40 CFR 61, Subpart H. While it is true that a neutron is not a radionuclide, neutron radiation continues to be a matter of concern at LANL. In light OT ITAT's recommendation regarding public involvement and the public's expressed concern about this issue, the adequacy of neutron monitoring at LANL should be addressed in the second audit.

New Facilities

The Dual-Axis Radiographic Hydrodynamic Test Facility was expected to go into operation at the end of 1999. (January 1999 LANL Site Wide EIS, DOE/EIS-0238, vol. I p.2-73.). Emissions from this new course should be evaluated as part of the audit. A prospective look at planned operations over the current year would be helpful in assessing future compliance. The Site Wide EIS also discusses the Beryllium Technology Facility (DOE/EIS-0238, vol. I, p.2-52), where beryllium as well as uranium graphite fuels are to be fabricated. Since this will be a new potential source of radionuclides, specifically uranium, the ITAT should investigate the schedule as well as the monitoring and estimation protocols that will be needed.

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United States Government **Department of Energy**

memorandum

DATE: JAN 30 1996

REPLY TO
ATTN OF: Jenny Craig, EM-24

SUBJECT: Plutonium in Waste Inventories

TO: Distribution

The purpose of this memorandum is twofold: (1) to inform you of information to be released at the Secretary's Press Conference as part of the Department's Openness Initiative scheduled for February 6; and (2) to request your assistance in analyzing the causes and recommending corrections for differences between systems that track plutonium inventories. The Department will be releasing a report entitled "Plutonium: The First Fifty Years," which includes an appendix on how much plutonium the Department has in waste. The information for this appendix was taken from the Nuclear Materials Management and Safeguards System (NMMSS) database, and presents a 0.5 metric ton inconsistency between what is considered waste and what is considered "normal operating losses" (NOL). In addition, the waste numbers in NMMSS do not always correspond to waste information in the Office of Environmental Management's Integrated Database and other site-specific sources.

We have been working with your staff on these waste data differences, but realistically these inconsistencies cannot be completely resolved before the Openness Initiative press conference. Therefore, the Secretary has established a working group to study the different accounting methods for plutonium data, to resolve differences from these methods, and to make recommendations on the appropriateness of making changes to how the Department tracks its plutonium inventories.

You should be aware that the news media and public may contact your site with questions about these inconsistencies. The primary difference between waste and NOL as reported in NMMSS is found at Hanford; inconsistencies between waste as reported in NMMSS and waste as tracked by the Environmental Management program are found primarily at five sites: Savannah River Site; Los Alamos National Laboratory; Oak Ridge National Laboratory; Idaho National Engineering Laboratory; and Rocky Flats Environmental Technology Site.

For your information, we have attached:

(1) Table of plutonium waste data from NMMSS that will be released to the public on February 6 (attachment A);

(2) A side-by-side table of the report's data and the Environmental Management data for you to better understand the inconsistencies between NMMSS data and IDB and other site data (attachment B);

(3) A more detailed breakdown of the Environmental Management estimates (attachment C).

We request that you continue to resolve the differences in accounting for how much plutonium in waste is reported at your site. Attachment D presents a list of contacts at the five sites. As the working group is more formally established, you will receive a request for an initial report on the different plutonium waste numbers.

The Department's preliminary explanation for (1) the inconsistency within NMMSS of plutonium waste and NOL; and (2) the inconsistency between waste data in NMMSS and other sources, such as the IDB, is summarized below:

1. Plutonium in "Waste" Estimates Compared with "Normal Operating Losses".

Plutonium that is technically or economically unrecoverable and intentionally sent to waste is referred to as "normal operating losses" (NOL) and is removed from the DOE/DoD plutonium inventory. The plutonium in waste is not subject to the same degree of rigorous safeguards and security as the DOE/DoD plutonium inventory.

- The quantities of plutonium removed from the DOE/DoD inventory and placed in waste as NOL are determined by either direct measurement or estimated based on measured sampling methods and practices -- for example, all liquid wastes are sampled and analyzed prior to being sent to a waste tank. The NMMSS indicates that a total of 3.4 metric tons (MT) of plutonium were sent to waste by way of NOL.

- The method used to estimate plutonium in waste burial sites and tanks was based on extrapolation from direct measurements of the waste -- for example, a small sample of radioactive waste is taken from a waste tank, the amount of plutonium in that sample is analyzed, and the amount of plutonium is estimated by multiplying this small sample times its relative proportion in the larger waste volume. The total amount of plutonium in NMMSS waste accounts is 3.9 MT.

Because the NMMSS was originally designed for safeguards purposes for nuclear materials, there was no need to reconcile the NOL quantities with the later quantities recorded in the NMMSS waste accounts. The 0.5 MT difference in NMMSS between the NOL estimate (3.4 MT) and the "waste" estimate (3.9 MT) is attributable to two primary causes:

(a) Waste inventories are tracked for environmental, safety and health reasons, and are therefore not necessarily calculated like normal operating losses. Waste inventory calculations and normal operating losses both rely on independent measured estimates,

which lead to some degree of uncertainty in each. The normal operating losses are used for safeguards and security purposes and may not include all the information that may be required for waste inventories.

In the early 1970s, sites began reporting details of plutonium in waste for the first time in NMMSS. At most sites the estimates of the amount of plutonium estimated to be in "waste" were based on direct measurement of waste and provided confirmation of the NOL estimates of waste. In the case of Hanford, however, the 1974 estimate indicated 0.4 MT more plutonium in waste than in normal operating losses. This difference could be either: (i) an accounting error at the site, such as reporting plutonium already included in the normal operating losses; or (ii) additional plutonium not captured by the normal operating losses tracking system, and therefore likely reported as "inventory differences." While site records do not allow the Department to determine the source of this inconsistency at this time, the Department has performed additional analysis supporting the higher estimate of plutonium in waste and, using this higher estimate, has determined that there are no imminent health, safety, or environmental risks. Since 1974, the normal operating losses and waste inventories have tracked very closely.

(b) Waste includes off-site sources, including plutonium waste from the Navy and from licensed commercial facilities. Most commercial waste came from two facilities that fabricated fuel for reactors: the Nuclear Fuel Services at Erwin, Tennessee, and Cimarron Corporation at Cresent, Oklahoma. Normal operating losses include only waste generated from on-site production. Since 1974, the remaining 0.1 MT inconsistency tracks closely to wastes received from sources outside of the Department.

(2) "Waste" Estimates in the NMMSS System Compared to Other "Waste" Inventories.

In addition to the difference between waste and normal operating losses within NMMSS, the amount of plutonium waste in this report may not reflect the amount of waste reported in other Departmental sources, such as the Integrated Database (IDB) or site-specific waste tracking systems. Two primary reasons for these apparent inconsistencies include: (1) the NMMSS waste data reflect only fissile plutonium inventories (i.e., Pu-239), while other sources include all isotopes of plutonium; and (2) the IDB does not differentiate between waste that requires nuclear material safeguards, and therefore is still recorded as part of the inventory, and waste that is physically sent to a waste burial site. Because of different intended uses of these databases, differing quantities of plutonium in waste can arise.

As stated earlier, the Department's working group will examine these issues and make recommendations on the appropriateness of integrating the various inventory systems or developing a new tracking system for all forms of plutonium.

If you have any questions, please contact Jenny Craig at (202) 586-8106 in the Office of Planning, Policy and Budget (EM-24). For specific information on the Environmental Management estimates of plutonium waste inventories, please contact Matt Zenkowich,

Office of Waste Management (EM-35) at (301) 903-7126; for information on estimates of other plutonium inventories managed by EM-funded activities and facilities, please contact Rick Martinez, Office of Nuclear Materials and Facilities Stabilization (EM-65) at (301) 903-4484; and for questions on the data in the report "Plutonium: The First Fifty Years," please contact Len Myers, Office of Defense Programs, at (301) 903-5366.

Richard J. Guimond, Admiral
Assistant Surgeon General, USPHS
Principal Deputy Assistant Secretary
for Environmental Management

Everet H. Beckner
Principal Deputy Assistant Secretary
for Defense Programs

Attachments

ATTACHMENT A : "50 YEARS OF PLUTONIUM" APPENDIX

Table 16. DOE Plutonium In Waste Inventory

Location	kg Pu	Description
Savannah River Site Burial Ground	193	Solid waste stored in containers. Waste consists of many forms when packaged - nitrates, fluorides, oxides, and oxalates. Over time, the oxidizing conditions force the chemistry of the metals to their most stable form. At this time, the primary form of material in the containers is an oxide or a complex form involving oxygen.
	382	Liquid waste in high level waste tanks. This material will eventually be converted to a glass form for long term storage.
Los Alamos National Laboratory Burial Ground	610	Solid waste in various forms.
Nevada Test Site Burial Ground	16	Solid waste received from Rocky Flats Plant and Pantex Plant is stored in retrievable land burial or in above ground containers.
Argonne National Laboratory-West	2	Plutonium embedded in irradiated reactor test loops and reactor blanket assemblies stored in dry storage tubes underground.
Hanford Site	455	High level waste in the tank farms.
	875	Solid waste in the burial grounds.
	192	Low level waste in cribs, trenches and ponds.
Oak Ridge National Laboratory	41	Particulate waste, as sediment in a settling basin, dry solids and oxides in above and below surface burial grounds, and solution and sludge in storage tanks.
Idaho, Waste Management	1,026	Solid waste in drums and boxes received primarily from Rocky Flats Plant is stored in above ground pads covered with earthen berms.
Idaho, Idaho Chemical Processing Plant Waste Farm	8	Solutions stored in tank farms.
	72	Calcined waste stored in bins.
Rocky Flats - Awaiting Disposition	47	Solid waste packaged in drums and crates awaiting shipment to a burial site.
Total	3,919	

ATTACHMENT B

INCONSISTENCIES IN THE AMOUNT OF PLUTONIUM IN WASTE (KG OF PU SHOULD BE REPORTED AS OF SEPTEMBER 1994)

SITE	"50 Years" Report	IDB/other EM sources	Why difference in accounting?
Savannah River Site (1) Solid waste in containers	193.00	184.50	Report table may include #3 in this category, which would make difference of 1.7 kg.
(2) Liquid HLW in tanks	382.00	774.60	SRS waste management agrees with higher number.
(3) Buried TRU		6.80	Might be included under #1.
Los Alamos NL Solid waste in various forms	610.00	1,375.30	EM number includes 1,323.7 in stored TRU and 51.6 in buried waste. AL waste management agrees with higher number. Is full difference due to what is still managed under safeguards and security?
Nevada Test Site Solid waste	16.00	13.00	
Argonne NL - West Pu embedded in irradiated reactor test loops and rector blanket assemblies stored in dry storage tubes underground.	2.00		Maybe this amount was reported for Idaho?
Argonne NL - East Pu in stored TRU		0.57	Not mentioned in report table.
Hanford Site (1) HLW in tanks	455.00	455.00	No difference
(2) Solid waste in burial grounds *and in storage*	875.00	875.00	No difference.
(3) Waste in cribs, trenches, ponds	192.00	192.00	No difference.
Oak Ridge NL (1) Particulate waste, as sediment in a settling basin, dry solids and oxides in above and below surface burial grounds, and solution and sludge in storage tanks.	41.00		Same category as #2?
(2) Pu stored in TRU		21.82	Same category as #1?
Idaho NEL (1) Solid waste	1,026.00	1,051.00	Does EM number include 2 kgs. reported under Argonne West?

SITE	"50 Years" Report	IDB/other EM sources	Why difference in accounting?
(2) High-level waste (in tanks and calcined)	80.00	80.00	No difference.
Rocky Flats Solid waste ("awaiting shipment to a burial site")	47.00	191.91	RF waste management agrees with higher number. Is full difference due to Pu still managed under safeguards and security?
WVDP High-level waste		0.50	Not mentioned in report table
Lawrence Livermore Pu in stored TRU		2.63	Not mentioned in report table
TOTAL WASTE	3,919.00	5,224.63	

Note: Sites with less than .5 kg not included: Lawrence Berkeley NL, Paducah, Pantex, ETEC, and Mound.

ATTACHMENT C

ENVIRONMENTAL MANAGEMENT ESTIMATES OF PLUTONIUM (Pu) IN WASTE AS OF SEPTEMBER 1994 (a)

Site	Pu in High Level Waste (kg)	Pu in Stored Transuranic Waste (kg) (b)	Pu in Buried Waste (kg) (c)	Pu in Soils (e.g., cribs) (kg)	Total Pu in Waste (kg)
Argonne -East		0.57			0.57
Argonne -West					
Hanford	455.00	515.00 (d)	360.00 (d)	192.00 (d)	1,522.00
Idaho Nat'l Eng. Lab.	80.00 (f)	694.00	357.00 (e)		1,131.00
Lawrence Livermore NL		2.81			2.81
Los Alamos NL		1,323.70	51.60	0.12	1,375.42
Nevada Test Site		7.26	5.73		12.99
Oak Ridge NL		21.82			21.82
Rocky Flats		191.91			191.91
Savannah River Site	774.60	184.50(g)	6.80 (g)		965.90
West Valley	0.50	<0.01			0.51
TOTAL	1,310.10	2,941.58	781.13	192.12	5,224.93

(a) All information from Integrated Database (IDB) Report Revision 11 (Sept. '95) except as noted. This table does not include sites with less than 0.5 kg of Pu in waste: ETEC, Lawrence Berkeley NL, Mound, Paducah, and Pantex. It also does not include "materials in inventory" that have not been declared waste but that are not longer needed for their original purposes.
(b) Post-1970 transuranic (TRU) waste in storage, both contact-handled and remote-handled.
(c) Pre-1970 buried TRU waste.
(d) Richland Operations Office, Solid Waste Information Tracking System.
(e) IDB Report Revision 8 (Oct. 1992).
(f) Idaho National Engineering Laboratory (INEL).
(g) Savannah River Site communication (1/96).