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REPORT

PERFORMANCE ASSESSMENT AND COMPOSITE ANALYSIS FOR LOS ALAMOS NATIONAL LABORATORY MATERIAL DISPOSAL AREA G

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PERFORMANCE ASSESSMENT AND COMPOSITE ANALYSIS FOR LOS ALAMOS NATIONAL LABORATORY MATERIAL DISPOSAL AREA G

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EXECUTIVE SUMMARY

This report describes the Performance Assessment (PA) and Composite Analysis (CA) for the current solid low-level radioactive waste (LLW) disposal facility at the Los Alamos National Laboratory(LANL), Material Disposal Area (MDA) G. The PA and CA satisfy the following DOE requirement documents:

- DOE Order 5820.2A, Radioactive Waste Management (September 1988);
- "Guidance for a Composite Analysis of the Impact of Interacting Source Terms on the Radiological Protection of the Public from DOE LLW Disposal Facilities" (April 1996);
- "Revised Interim Policy on Regulatory Structure for Low-Level Radioactive Waste Management and Disposal" (July 1996); and
- "Interim Format and Content Guide and Standard Review Plan for U.S. Department of Energy Low-Level Waste Disposal Facility Performance Assessments" (October 1996).

The purpose of the PA is to determine if LLW generated since September 26, 1988 has been, and will continue to be, disposed of at MDA G in a manner that will not result in radiation doses to members of the public that exceed performance objectives specified by the DOE. In a complementary fashion, the CA is used to evaluate options for ensuring that exposures from all waste disposed of at MDA G will not impart doses to future members of the public in excess of specified limits.

MDA G has been used for disposal of the Laboratory's radioactive waste since 1957. The chemical, physical, and radiological characteristics of waste disposed of after September 26, 1988 have been reported and documented in accordance with the requirements of DOE Order 5820.2A. Characteristics of the inventory buried prior to September 25, 1988 are uncertain, although electronic records exist for disposals after 1971. Together, the PA and CA provide a comprehensive evaluation of the potential radiological exposures to future members of the public from past, present, and future disposals at MDA G. Doses are projected beyond 1,000 years after facility closure, which is assumed to occur in 2044. The results are compared with performance objectives provided by the DOE. Radiological doses to future members of the public can result from the release and transport of radioactivity via natural processes affecting the undisturbed disposal site, and from direct intrusion into the waste by humans. The latter can, in principle, be prevented, while the former can be controlled to only a limited extent.

The projection of future doses involves modeling releases of radioactivity from MDA G and transport of that radioactivity in air, water, soil, and biota at locations accessible to future members of the public for a period of at least 1,000 years. This requires an understanding of facility uses and natural processes affecting release and transport and assumptions about human use of the site and its surroundings.

This report first establishes the regulatory framework of the PA and CA, defining the performance objectives and summarizing the general approach followed to demonstrate compliance with those objectives, and then discusses the technical framework of the analysis. The technical framework includes detailed descriptions of the natural and man-made characteristics of the site that relate to its long-term radiological performance, and descriptions of the models used to analyze its long-term performance. Two conditions are evaluated: One considers doses to offsite members of the public following releases of radioactivity from the facility resulting from natural processes, while a second considers doses to individuals who may inadvertently intrude into the waste. Results of the dose projections are evaluated against performance objectives and are interpreted in the context of implications for disposal operations and further investigations.

The performance objectives for the PA are provided in DOE Order 5820.2A and the report "Interim Format and Content Guide and Standard Review Plan for U.S. Department of Energy Low-Level Waste Disposal Facility Performance Assessments." These performance objectives were interpreted as:

- Maximum effective dose equivalent of 25 mrem/yr to any member of the public resulting from external exposure and concentrations of radioactive material released into surface water, groundwater, soil, plants, and animals.
- Maximum effective dose equivalent of 10 mrem/yr to any member of the public from concentrations of radioactive material released to the atmosphere (excluding radon) from Area G and all other facilities at the LANL.

- Maximum flux of radon gas (i.e., ^{220}Rn and ^{222}Rn) from the undisturbed disposal site of 20 pCi/m^2/s (1.9 pCi/ft^2/s).
- Maximum effective dose equivalent of 100 mrem/yr for continuous exposures of individuals who inadvertently intrude into the facility after the loss of active institutional control (100 years).
- Maximum effective dose equivalent of 500 mrem/yr for acute exposures of individuals who inadvertently intrude into the facility after the loss of active institutional control (100 years).
- Maximum effective dose equivalent of 4 mrem/yr to any member of the public from the consumption of drinking water drawn from wells outside of the land-use boundary.

The performance objective for the CA is the DOE primary annual dose limit of 100 mrem effective dose equivalent for members of the public. If the projected dose exceeds 30 mrem/yr, an options analysis must be prepared to consider actions that could be taken to reduce exposures, taking into account the cost of such actions. Compliance with performance objectives is evaluated over a 1,000-year post-closure period.

To model release and transport of radioactivity from MDA G, waste characteristics and natural processes were examined. Most waste disposed of at MDA G is slightly contaminated laboratory trash (e.g., paper, packaging materials, glassware, etc.) and debris from cleanup activities (e.g., building rubble, conduit, soil, etc.). The inventory includes large quantities of tritium, ^{60}Co (in activated metals), and ^{137}Cs (in irradiation sources); special nuclear materials (e.g., ^{239}Pu, ^{241}Am, and ^{235}U); and residues from medical radioisotope separations (e.g., ^{95m}Tc and ^{94}Nb).

The waste inventory for the PA and CA was divided into four segments, each of which was characterized separately according to availability of information. The four segments and the general method of characterization are:

- 1957 - 1970 Inventory: Radionuclide content extrapolated from records from the early 1970s;
- 1971 - September 25, 1988 Inventory: Radionuclide content obtained from electronic database;
- September 26, 1988 - 1995 Inventory: Radionuclide content obtained from electronic database; and

- 1996 - 2044 Inventory: Radionuclide content extrapolated from records between 1990 and 1995.

This segmentation of waste inventory allowed the projected doses associated with separate PA and CA inventories to be evaluated against the applicable performance objectives. The PA addressed waste disposed of only after September 26, 1988, while the CA addresses all waste. When uncertainties arose for any segment of the inventory, a conscious effort was made to err on the side of conservatism and overestimate radionuclide content and potential release rates.

Radioactivity released by the source term processes was assumed to be transported within one or more of the following environmental media:

- Air;
- Surface soil;
- Surface water;
- Groundwater; and
- Vegetation.

Contact with or use of contaminated environmental media was assumed to cause radiation doses as a result of:

- Inhalation of contaminated air;
- Immersion within contaminated air;
- Incidental ingestion of contaminated soil;
- External exposure to contaminated soil;
- Ingestion of contaminated water;
- Consumption of milk and meat from animals that have ingested contaminated water; and
- Consumption of food crops grown in contaminated soils and subject to surface deposition of radioactivity.

The MDA G facility is situated atop a relatively flat narrow mesa named Mesita del Buey, about 30 m (99 ft) above two canyons, Cañada del Buey to the north and Pajarito Canyon to the south. Disposal units are excavated to depths of about 20 m (65 ft), set back a distance of 15 m (50 ft) from the sides of the mesa. The surface of Mesita del Buey is about 275 m (900 ft) above the regional aquifer, which supplies the drinking water for area residents. The climate is semiarid, the ecosystem is Piñon-Juniper woodland. There are natural processes somewhat unique to this setting that have important implications with respect to exposure pathways considered in the PA and CA, including:

- Evaporation at depths within the mesa;
- Slow moisture flux through the mesa;
- Surface water runoff from the mesa into the canyons; and
- Channeled winds within the canyons.

The MDA G inventory includes many waste forms contaminated with a wide variety of radionuclides. Three source term models were developed to account for possible releases. For the purpose of the PA and CA, releases of radioactivity were assumed to result from the following processes:

- Gas-phase diffusion;
- Translocation of radioactive materials by burrowing animals and deep-rooting plants; and
- Aqueous-phase leaching of soluble radionuclides.

A gas-phase diffusion model was used to calculate the time-dependent flux of radionuclides in the inventory that are either characteristically volatile (i.e., krypton and radon) or form gases (i.e., ^{14}C as $^{14}CO_2$) or vapors (i.e., ^3H as ^3H_2O, H^3HO/HTO). A biotic translocation model was used to account for time-dependent surface-soil radionuclide concentrations as a result of burrowing animals excavating waste and plants assimilating radioactivity through roots penetrating waste, then depositing radioactivity on the surface with natural defoliation. Finally, an aqueous-phase release model was developed to simulate dissolution of radioactive materials into water percolating through the disposal units.

Gas-phase releases were transported offsite in air, producing inhalation doses. Surface contamination resulting from biotic intrusion was transported offsite in air and subsequent redeposition and in surface water, resulting in inhalation, ingestion, and external exposures. Aqueous-phase releases were transported vertically downward toward the regional aquifer and laterally toward the sides of Mesita del Buey, generating ingestion, inhalation, and external radiation doses.

Receptor Locations

Maximum offsite radiation doses were calculated at various times and locations consistent with the natural characteristics of the site, assumed facility life-cycle, and assumed future land use. MDA G lies along the LANL boundary, directly adjacent to land in Cañada del Buey owned by the San Ildefonso American Indians, and approximately 2 km (1.3 mi) from the small residential community of White Rock. White Rock is hydrologically downgradient from MDA G, while Cañada del Buey is effectively downwind of the facility. Consequently, potential offsite receptor locations for groundwater and air contamination are relatively close to the facility. The following time periods, land use assumptions, and receptor locations were considered in the PA and CA:

- 1957 - 2044: Operational period during which site access is strictly limited and environmental monitoring prevents offsite releases, causing no offsite doses;
- 2045 - 2046: Closure period during which surface structures are dismantled, disposal units are covered, site access is limited, and environmental releases are monitored;
- 2047 - 2146: Institutional-control period during which access is controlled according to existing boundaries, allowing potential exposures to a receptor in White Rock and within Cañada del Buey; and
- 2147 - 3046: Industrial-use period during which access is controlled over a smaller perimeter around the facility, allowing potential exposures at a receptor location in Pajarito Canyon directly adjacent to the facility.

The following table summarizes the maximum doses calculated over the 1,000-year compliance period for several pathways at various receptor locations and compares them with applicable performance objectives.

Inventory[a]	Analysis	Location	Calculated Peak Dose	Performance Objective
PA	Air Pathway	Cañada del Buey	6.6×10^{-2} mrem/yr	10 mrem/yr[b]

CA	All Pathways	Cañada del Buey	5.5 mrem/yr	30/100 mrem/yr
PA	Groundwater Protection	White Rock Pajarito Canyon	3.5×10^{-5} mrem/yr	4 mrem/yr
PA	All Pathways	White Rock Pajarito Canyon	1.0×10^{-4} mrem/yr	25 mrem/yr
CA	All Pathways	White Rock Pajarito Canyon	7.2×10^{-3} mrem/yr	30/100 mrem/yr
PA	Intruder	MDA G	12 to 30 mrem/yr	100 mrem/yr
PA	Radon Flux	MDA G	0.1 to 3.1 pCi/m^2/s	20 pCi/m^2/s

a. PA includes waste disposed of after September 26, 1988; CA includes all waste

b. Performance objective represents the maximum projected exposure from all releases at LANL.

Projected doses and radon fluxes were small in all cases considered, and well below the applicable performance objectives for the PA and CA. The peak PA dose for the air pathway analysis was a small contribution to the maximum annual dose of 3.5 mrem projected for other facilities at LANL. The projected doses for the CA were less than the 100 mrem/yr primary objective, as well as the 30 mrem/yr limit indicative of the need for an options analysis.

The uncertainties associated with the projected doses, and their impact on the ability of MDA G to comply with the performance objectives, are discussed. Uncertainties in inventory, environmental data, and modeling parameters are considered over a 10,000-year period to provide reasonable assurance that the performance objectives will be achieved. After accounting for the uncertainty in the dose analyses, all performance objectives are still likely to be met.

Analyses and field and experimental data will continue to be refined to support the maintenance of the site Performance Assessment, with an emphasis on reducing important uncertainties in the analysis. Waste Acceptance Criteria, waste characterization requirements, and waste disposal operations will be modified to reflect the results of the PA.

Appendix 2e

RAE-9629/91B-2

RADIOACTIVE WASTE INVENTORY FOR THE TA-54, AREA G PERFORMANCE ASSESSMENT AND COMPOSITE ANALYSIS

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1. INTRODUCTION

The Los Alamos National Laboratory (LANL) generates radioactive waste as a result of various activities. Operational waste is generated at LANL from a wide variety of research and development activities, including nuclear weapons development, energy production, and medical research. Environmental restoration (ER) and decontamination and decommissioning (D&D) waste is generated as contaminated sites and facilities at LANL undergo cleanup or remediation. The majority of this waste is low-level radioactive waste (LLW) and is disposed of at the Technical Area 54 (TA-54), Area G, disposal facility.

U.S. Department of Energy (DOE) Order 5820.2A requires that radioactive waste be managed, treated, stored, and disposed of in a manner that protects public health and safety, and the environment. To comply with this order, DOE field sites must prepare and maintain a site-specific radiological performance assessment for all LLW disposal facilities.

Additionally, in response to Recommendation 94-2 from the Defense Nuclear Facilities Safety Board, DOE has developed a comprehensive approach for ensuring that Environmental Management (EM) activities will not compromise future radiological protection of the public (DOE, 1996). Under this approach, DOE requires that a composite analysis be performed which accounts for the cumulative impact of active and planned LLW disposal facilities and all other sources of radioactive contamination that could interact with active disposal facilities.

This report characterizes the waste that will be included in the next draft of the performance assessment for TA-54, Area G, and in the composite analysis. In terms of the performance assessment, this waste includes all LLW disposed of at Area G since September 26, 1988, and the LLW projected to require disposal over the remainder of the facility's lifetime. The waste inventory for the composite analysis includes all radioactive waste disposed of at Area G since the disposal facility opened in 1957 and the LLW projected to require disposal in the future. Characteristics of the waste addressed by this report include total volume, total activity, and radionuclide-specific activities. These characteristics are provided for several different waste forms and for waste disposed of in pits and shafts at Area G.

Chapter 2 of this report summarizes the types and quantities of radioactive waste that have been disposed of at Area G and discusses the methodology used to characterize the waste. Chapter 3 presents the results of the characterization effort.

2. WASTE CHARACTERIZATION METHODOLOGY

This section describes the waste that has been disposed of at Area G (historic waste) and waste that is expected to require disposal in the future (future waste). It discusses the approaches used to estimate characteristics of this waste in a form useful for conducting the Area G performance assessment and composite analysis.

Different approaches were used to characterize historic waste and future waste because the levels of existing information on these wastes differed. The methods used to characterize the historic waste are discussed in Section 2.1, while the approach for estimating future waste characteristics is described in Section 2.2.

2.1 HISTORIC WASTE

Historic waste, as the term is used here, refers to all waste disposed of at Area G since it opened in 1957 through the end of 1995. Area G first began receiving waste in the second quarter of 1957, when its first disposal pit was placed in service (Rogers, 1977). This pit received only non-routine contaminated waste until January 2, 1959, when it began accepting routine contaminated waste. The first shafts used for radioactive waste disposal at Area G were placed in service in April 1966 (Rogers, 1977).

Although the waste currently disposed of at Area G is restricted to LLW, transuranic (TRU) waste was routinely disposed of at Area G prior to 1971. Since that time, most TRU waste has been segregated from the LLW and retrievably stored. Furthermore, prior to 1986, most of LANL's mixed low-level waste (MLLW) was disposed of at the Area G disposal facility. However, since July 1986, when the EPA affirmed its authority over the regulation of the hazardous component of MLLW, this waste has been stored on site or shipped off site for treatment and disposal.

The waste disposed of at Area G includes operational or routine waste, non-routine waste, and waste from ER and D&D activities at LANL. Operational waste consists of a wide range of materials, including compactible trash (e.g., paper, cardboard, and plastic), rubber, glass, disposable protective clothing, solidified powders and ash, animal tissue, and suspect radioactive waste. Non-routine waste includes classified waste, uranium chips from shops at LANL, and pieces of heavy equipment such as dump trucks (Rogers, 1977). ER and D&D waste generally consists of equipment and scrap metal, building debris, soil, asbestos, and polychlorinated biphenyl (PCB)-contaminated materials. The facility does not accept free liquids for disposal.

Thirty-five pits and almost 200 shafts were used for disposal of LLW at Area G through December 31, 1995. These disposal units and their periods of operation are listed in Table 2-1. The periods of operation listed in the table are based on the first and last dates of waste receipt, as indicated in LANL's LLW disposal database or Rogers (1977).

Four of the 35 disposal pits were still open at the end of 1995. Pit 31 is dedicated to the disposal of asbestos waste and will continue to receive moderate amounts of waste in the future. Pits 37, 38, and 39 are used for the disposal of routine, ER, and D&D waste generated at LANL. Fewer than 20 of the disposal shafts active between April 1966 and December 1995 were active at the end of 1995 (Lopez, 1996). In general, concrete caps have been placed over the closed shafts.

The types and quantities of LLW disposed of at Area G are recorded on shipment manifests and entered into the LANL LLW disposal database on a per-package basis. Disposal records from 1971 through the present day have been maintained in the disposal database. The information contained in the database includes the waste form, the volume and total activity of the waste package, and the radionuclide activities in the waste. While disposal records for waste disposed of prior to 1971 are maintained in logbooks, these data are not included in the LLW disposal database.

As discussed earlier, TRU waste was disposed of at Area G prior to 1971. Since that time, the majority of this waste has been segregated and retrievably stored; small quantities of TRU waste were non-retrievably disposed of in pits and shafts through 1979. The types and quantities of TRU waste placed in storage or disposed of are recorded on shipment

Table 2-1. Operational periods for the disposal pits and shafts at Area G.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
Pits			
1	2nd qtr, 1957	April-61	Closed
2	4th qtr, 1959	July-63	Closed
3	Jun-63	Apr-66	Closed
4	1st qtr, 1966	4th qtr, 1967	Closed
5	Oct-69	Dec-73	Closed
6	1st qtr, 1970	Aug-72	Closed
7	Mar-74	Sep-78	Closed
8	Sep-71	Mar-74	Closed
9	Sep-74	Aug-78	Closed
10	Apr-79	May-80	Closed
12	Jun-72	Nov-75	Closed
13	Nov-76	Sep-77	Closed
16	Jun-72	Jul-75	Closed
17	Aug-72	Mar-74	Closed
18	Feb-78	Oct-79	Closed
19	May-73	Aug-79	Closed
20	Jan-75	Oct-77	Closed
21	Aug-72	Dec-74	Closed
22	Dec-73	Apr-80	Closed
24	Jan-75	Nov-76	Closed
25	Dec-79	Feb-86	Closed
26	Feb-84	Apr-85	Closed
27	May-81	May-86	Closed
28	Jan-81	Feb-86	Closed
29	Mar-83	Oct-86	Closed
30	Oct-88	Jun-90	Closed
31	Sep-90	Present	Active
32	Feb-84	Nov-90	Closed
33	Nov-82	Jul-84	Closed
35	Jun-87	Apr-88	Closed
36	Jun-88	Oct-89	Closed
37	Apr-90	Present	Active
38	Sep-94	Present	Active
39	Aug-93	Present	Active

Table 2-1. Continued.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
Shafts			
1	Apr-66	Jan-67	Closed
2	Apr-66	Jun-67	Closed
3	Apr-66	Nov-67	Closed
4	Apr-67	Jan-68	Closed
5	Jun-67	Jan-68	Closed
6	Jun-67	Mar-68	Closed
7	Jun-67	Sep-68	Closed
8	Apr-68	Jan-69	Closed
9	Jun-68	Apr-69	Closed
10	Feb-69	Aug-69	Closed
11	Jan-67	Oct-92	Closed
12	Jul-66	Mar-70	Closed
13	Sep-66	Mar-90	Closed
14	Sep-67	Sep-69	Closed
15	Nov-69	Jun-70	Closed
16	Nov-69	Nov-69	Closed
17	Mar-70	Dec-74	Closed
18	Jul-70	Apr-79	Closed
19	Oct-71	Apr-74	Closed
20	May-74	Jun-75	Closed
21	Jan-85	Jan-85	Closed
22	Aug-80	May-93	Closed
23	Apr-80	Apr-80	Closed
24	Sep-69	Apr-72	Closed
25	Sep-69	Feb-71	Closed
26	Dec-69	Jun-70	Closed
27	May-70	Aug-70	Closed
28	Jun-70	Jul-70	Closed
29	Jul-70	Jun-71	Closed
30	Jul-70	Feb-85	Closed
31	Sep-70	Feb-71	Closed
32	May-70	Oct-71	Closed
33	Oct-70	Feb-71	Closed
34	Feb-70	Apr-72	Closed
35	Sep-71	Jul-85	Closed
36	Jun-70	Mar-85	Closed
37	Jun-70	Oct-85	Closed
38	Jun-70	Feb-74	Closed

Table 2-1. Continued.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
39	Aug-70	Oct-73	Closed
40	Mar-71	May-71	Closed
41	Mar-71	Aug-72	Closed
42	Mar-71	Oct-72	Closed
43	Jul-71	Aug-72	Closed
44	Aug-71	Aug-72	Closed
45	Sep-71	Aug-72	Closed
46	Apr-72	Aug-72	Closed
47	Apr-72	Jul-72	Closed
48	Jun-72	Sep-72	Closed
49	Apr-72	Sep-72	Closed
50	Jun-74	Apr-76	Closed
51	Mar-75	Oct-75	Closed
52	Sep-75	Jun-76	Closed
53	Nov-75	Mar-76	Closed
54	Jul-76	Dec-76	Closed
55	Dec-76	Jan-77	Closed
56	Jan-77	Feb-77	Closed
57	Feb-77	Mar-77	Closed
58	Jul-72	Sep-73	Closed
59	Jul-72	May-74	Closed
60	Dec-72	Dec-74	Closed
61	Jun-73	Feb-74	Closed
62	Apr-74	Jan-76	Closed
63	Jan-76	Jan-76	Closed
64	Jan-76	Aug-77	Closed
65	Aug-76	Oct-77	Closed
66	May-76	Jul-76	Closed
67	Apr-77	Jun-77	Closed
68	Jun-77	Aug-77	Closed
69	Aug-77	Aug-77	Closed
70	Jan-75	Feb-76	Closed
71	Jan-78	Feb-78	Closed
72	Nov-72	Mar-73	Closed
73	Jan-73	Mar-73	Closed
74	Mar-73	Aug-73	Closed
75	May-73	Sep-73	Closed
76	Oct-73	Apr-74	Closed
77	Jan-74	May-74	Closed

Table 2-1. Continued.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
78	Jun-74	Mar-75	Closed
79	Oct-74	Dec-75	Closed
80	Jun-75	Apr-76	Closed
81	May-75	Jun-76	Closed
82	Feb-78	Apr-78	Closed
83	Feb-78	Apr-78	Closed
84	Mar-78	May-78	Closed
85	May-78	May-78	Closed
86	Sep-77	Oct-77	Closed
87	Oct-77	Nov-77	Closed
88	Nov-77	Nov-77	Closed
89	Dec-77	Jan-78	Closed
90	Jan-78	Jan-78	Closed
91	Sep-77	May-78	Closed
92	Sep-77	Jul-78	Closed
93	Jul-78	Jun-84	Closed
94	Dec-78	Jun-84	Closed
95	Mar-84	Jul-84	Closed
96	May-77	Jan-79	Closed
97	Jul-78	Apr-84	Closed
99	Apr-83	Mar-84	Closed
100	May-83	Jun-83	Closed
101	Sep-80	Jun-81	Closed
102	Jul-82	Aug-83	Closed
103	Dec-81	Jul-82	Closed
104	Oct-82	Dec-82	Closed
105	Jun-82	May-83	Closed
106	Jul-80	Aug-81	Closed
107	Sep-78	Jan-81	Closed
108	Jul-80	May-82	Closed
109	Mar-80	Jul-80	Closed
110	Feb-79	Nov-79	Closed
111	Oct-79	Jun-80	Closed
112	May-78	Oct-79	Closed
114	May-79	Aug-82	Closed
115	Aug-79	Aug-82	Closed
118	Mar-83	Feb-84	Closed
119	Mar-83	Nov-83	Closed
120	Jun-83	Nov-84	Closed

Table 2-1. Continued.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
121	Jul-84	Apr-85	Closed
122	Aug-84	Jun-85	Closed
123	Mar-84	Aug-84	Closed
124	Feb-84	Aug-91	Closed
125	Oct-84	Dec-84	Closed
126	Mar-85	May-87	Closed
127	Feb-85	Nov-85	Closed
128	Oct-85	Jun-86	Closed
129	Jan-86	Mar-86	Closed
130	Jan-86	Aug-87	Closed
131	Jul-87	Jul-95	Active
132	Mar-87	Jan-93	Closed
133	Mar-86	Jan-87	Closed
134	Jun-86	Oct-86	Closed
135	Oct-86	Mar-87	Closed
136	Sep-86	Aug-95	Closed
137	Sep-87	Sep-92	Active
138	Apr-87	Sep-87	Closed
139	Apr-87	Oct-88	Closed
140	Oct-87	Jul-91	Closed
141	Oct-88	Mar-91	Closed
142	Jan-91	Sep-91	Closed
143	Sep-91	Mar-95	Closed
144	Feb-94	Mar-95	Active
147	Sep-91	May-95	Active
148	Oct-91	May-93	Closed
149	Apr-91	Jan-94	Closed
150	May-76	Mar-79	Closed
151	Jul-79	May-86	Closed
152	Apr-80	Apr-83	Closed
153	Apr-83	Apr-84	Closed
154	Apr-84	Sep-86	Closed
155	Aug-88	Apr-89	Closed
156	Dec-86	Sep-87	Closed
157	Sep-87	Jan-88	Closed
158	Sep-89	Aug-93	Active
159	Apr-89	Apr-89	Active
160	Jun-90	Aug-93	Active
161	Aug-93	Jun-94	Active

Table 2-1. Continued.

Disposal Unit	Month of First Delivery	Month of Last Delivery[a]	Current Status
162	May-95	Sep-95	Active
171	Jun-95	Aug-95	Closed
172	Jul-95	Aug-95	Closed
173	Jul-95	Aug-95	Closed
174	Jun-95	Jul-95	Closed
175	Jul-95	Aug-95	Closed
176	Aug-95	Aug-95	Closed
177	Aug-95	Aug-95	Closed
189	Aug-87	Feb-88	Closed
190	Mar-83	May-84	Closed
191	Oct-84	Dec-86	Closed
192	Feb-84	Sep-87	Closed
196	Aug-89	Aug-93	Active
197	Oct-93	Nov-95	Active
206	Sep-80	Sep-80	Closed
301	Sep-92	Nov-94	Active
307	Feb-92	Aug-94	Active
308	Mar-94	Apr-94	Active
C-1	Sep-80	Sep-80	Closed
C-2	Feb-81	Feb-81	Closed
C-3	Feb-81	Feb-81	Closed
C-4	Feb-81	Feb-81	Closed
C-5	Feb-81	Feb-81	Closed
C-6	Feb-81	Feb-81	Closed
C-7	Feb-81	Feb-81	Closed
C-8	Feb-81	May-82	Closed
C-9	May-82	Sep-84	Closed
C-10	Mar-84	Jul-85	Closed
C-11	Aug-85	Jun-86	Closed
C-12	Jul-86	Oct-90	Closed
C-13	Sep-87	Oct-95	Active
C-14	Nov-92	Nov-92	Active

a. Operational period is current through December 31, 1995.

manifests and entered into the TRU waste database. These detailed records date back to 1971; information about waste disposed of prior to 1971 is maintained in logbooks.

The historic waste inventory for the period spanning 1971 through 1995 was estimated using the data in the LANL LLW disposal database and the TRU waste database. The majority of the Area G inventory for this period was derived from the LLW disposal records. The TRU waste that was non-retrievably disposed of in pits and shafts was added to the LLW inventory to arrive at the total inventory for the period. This TRU waste includes material that was placed in pits 6, 7, 8, 20, and 22 and shafts 17 through 110.

The lack of detailed shipment records for radioactive waste disposed of prior to 1971 required that an alternative means of characterizing this waste be developed. Consequently, the characteristics of a portion of the waste disposed of since 1971 were extrapolated back to the period for which detailed disposal data were unavailable. Specifically, the LLW and TRU waste disposal data for the period of 1971 through 1977 were used to estimate the characteristics of the waste disposed of in pits prior to 1971. Shaft disposal data for 1971 through 1975 were used to characterize the waste disposed of in shafts prior to 1971. The approach taken in selecting these periods is discussed in the following paragraphs.

The period from which disposal data are drawn to estimate the characteristics of the pre-1971 waste strongly influences resulting inventory projections. Thus, the data chosen for the analysis needed to be as representative of the period from 1957 to 1970 as possible. Under ideal conditions, the operations generating waste during the period from which waste characteristics are extrapolated would be identical to the operations generating waste for the period of time for which the waste inventory is being developed. As the period of time from which waste characteristics are extrapolated increases, however, the likelihood of satisfying this condition diminishes. Over time, some operations at LANL are phased out, while new ones begin as the role of LANL evolves. Changes in disposal regulations may also affect the types and quantities of waste undergoing disposal.

With the preceding considerations in mind, the Area G LLW disposal data were examined for the period from 1971 through 1995. The quantities and characteristics of the disposed waste were evaluated to establish LLW disposal patterns and identify any obvious shifts in those patterns. The TRU waste database, which records the types and quantities of TRU waste disposed of or placed in storage at LANL, underwent a similar evaluation to characterize the TRU component of the waste disposed of prior to 1971. Based on these evaluations, the results of which are discussed in Section 3.1, the periods from 1971 to 1977 and from 1971 to 1975 were selected as reasonable periods for characterizing the waste placed in pits and shafts, respectively, prior to 1971.

The 1971 to 1977 pit data and the 1971 to 1975 shaft data were used to develop average annual disposal quantities for Area G prior to 1971. These averages were multiplied by the number of years the facility accepted waste for disposal in the respective disposal units. The average annual pit inventories were multiplied by 12 years because Area G began accepting routine contaminated waste on January 2, 1959; only non-routine waste was disposed of between the facility's opening in 1957 through the end of 1958. The average annual disposal quantities for the shafts were multiplied by 5 years, consistent with the fact that these units began accepting waste in April 1966.

The extrapolation approach used to estimate the pre-1971 inventory implicitly assumes that the waste disposed of between 1971 and 1977 is similar to that disposed of between 1957 and 1970. While this assumption generally is expected to be valid, some of the wastes generated from 1957 to 1970 and 1971 to 1977 are unique to those periods. A comprehensive examination of the disposal data to identify these unique wastes was beyond the scope of this effort; however, former and current LANL personnel familiar with historic operations at LANL were asked to identify wastes that were unique to either the 1957 to 1970 or 1971 to 1977 period. Waste that was unique to the 1957 to 1970 period was added to the inventory estimated using the extrapolation approach. If waste was generated between 1971 and 1977 under conditions that did not occur prior to that period, the material was removed from the 1971 to 1977 data used to estimate the pre-1971 inventory.

The physical and chemical form of the waste disposed of in the pits and shafts plays an important role in how radioactivity is released to the environment from the disposal units and the rate at which these releases occur. For example, surface contamination on glass may be quickly rinsed from the waste as water percolates through the disposal units, whereas radionuclides sorbed to soils or concrete may be released from disposal units gradually over time. Source-term modeling for the performance assessment accounts for releases from surface-contaminated waste, soils, concrete and sludges, and bulk-contaminated waste such as activated metals.

Source-term modeling performed in support of the Area G performance assessment and composite analysis requires that the historic inventory data for each pit and shaft be provided in terms of the waste forms discussed above. Thus, all waste streams that belong to a single waste form were grouped. For example, all waste streams which are expected to be surface-contaminated (e.g., glass, trash, plastic) were combined. Data for these waste streams were summed to determine the total volume, total activity, and radionuclide-specific activities to yield the inventory for surface-contaminated waste for the pits and shafts. Inventories were developed similarly for soil, concrete and sludges, and bulk-contaminated waste.

The development of waste-form-specific inventories required that the waste streams disposed of at Area G be categorized in terms of surface-contaminated waste, soils, concrete and sludges, and bulk-contaminated waste. The categories to which the waste streams were assigned are shown in Table 2-2. Each waste stream was conservatively assumed to be surface-contaminated waste unless there was specific knowledge about the waste and its release characteristics that allowed it to be assigned to one of the other three categories. Waste streams encompassing a variety of waste matrices were assumed to fall into several different waste-form or release categories. For example, waste streams consisting of debris were assumed to include surface-contaminated, soil, and concrete components (shown in Table 2-2).

Separate inventories were developed for all pits except pits 1 through 6. Pits 1 through 6 were active prior to 1971, the first year for which detailed disposal data are available. Consequently, a significant portion of the inventory in these disposal units was based on the extrapolation procedure described above. Given the general nature of this procedure, it was not possible to assign individual inventories to these pits.

The waste placed in the Area G disposal shafts was combined into a single shaft inventory. The sheer number of shafts that have been used for waste disposal, and the scattered distribution of these shafts, complicates the development of separate shaft

Table 2-2. Waste forms for LANL waste streams.

Waste Code	Waste Description	Release Mechanism: Surface-Contaminated Waste	Soils	Concrete/ Sludges	Bulk-Contaminated Waste
10	Graphite Solids	X			
11	Graphite Powder	X			
14	Combustible Decon Waste	X			
15	Cellulosics (paper, wood, etc.)	X			
16	Plastics	X			
17	Rubber Materials	X			
18	Combustible Lab Trash (paper, plastic, rubber)	X			
181	Non-Combustible Lab Trash (glass, metal)	X			
19	Combined Combustible/Non-Combustible Lab Trash	X/50%[a]			50%[a]
20	Hydrocarbon Oil (liquid)	X			
21	Silicon-Based Oil (absorbed, no free liquid)	X			
201	Hydrocarbon Oil (absorbed, no free liquid)	X			
211	Silicon-Based Oil (absorbed, no free liquid)	X			
22	Petroleum-Contaminated Soil		X		
23	Aqueous Solution (absorbed, no free liquid)	X			
24	Cemented/Immobilized Residues/Powders			X	
25	Leached Process Residues	X			
26	Evaporator Bottoms/Salts	X			
28	Chloride Salts	X			
30	PN Equipment	X			
31	Non-PN Equipment	X			
32	PN Oversize Equipment	X			
33	Non-PN Oversize Equipment	X			
35	Combustible Building Debris	X			
36	Non-Combustible Building Debris	50%[b]	25%[b]	25%[b]	
40	Combustible Hot Cell Waste	X/50%[a]			50%[a]
41	Non-Combustible Hot Cell Waste	X/50%[a]			50%[a]
45	Uranium Chips and Turnings in Diesel Fuel	X[c]	X[c]		
46	Skull and Oxide	X			
47	Slag and Porcelain	X			
49	Sanitary Sludge			X	
50	Metal Crucibles, Scrap, Dies	X			

Table 2-2. Continued.

Waste Code	Waste Description	Release Mechanism: Surface-Contaminated Waste	Soils	Concrete/ Sludges	Bulk-Contaminated Waste
51	Precious Metals	X			
52	Scrap Metal	X/50%[a]			50%[a]
53	Lead	X			
55	Filter Media	X			
56	Filter Media Residue	X			
60	Other Combustibles	X			
61	Other Non-Combustibles	X			
62	Molecular Sieves	X			
65	Animal Tissue	X			
68	Asbestos	X			
69	Asbestos-Contaminated Debris	50%[b]	25%[b]	25%[b]	
70	Chemical Waste	X			
71	Beryllium	X			
72	Beryllium-Contaminated Debris	50%[b]	25%[b]	25%[b]	
73	Scintillation Vials	X			
74	Ion Exchange Resins	X			
75	Chemical Treatment Sludge			X	
76	Cement Paste			X	
77	PCB-Contaminated Materials	X			
78	PCB-Contaminated Equipment	X			
79	PCB-Contaminated Soil		X		
791	PCB-Contaminated Concrete			X	
80	Irradiation Sources	X			
801	Irradiation Sources in Lead Shielding	X			
85	Firing Point Residues		X		
90	Radioactively-Contaminated Soil		X		
95	Glass	X			
99	Unidentified Material	X			

a. Release of all radionuclides except mixed activation products (MAP) is assumed to occur via rapid rinse; release of MAP is assumed to occur via rapid rinse (50%) and corrosion (50%).
b. Assumed distribution.
c. Historic waste is assumed to be surface-contaminated; future waste is assigned to the soil waste form based on anticipated waste treatment processes.

inventories. The usefulness of separate shaft inventories in terms of the performance assessment and composite analysis is questionable as well.

A portion of the waste disposed of at Area G is listed in the LLW and TRU waste databases as mixed fission products (MFP) or mixed activation products (MAP). Activity from these wastes was allocated to specific radionuclides as part of the inventory development (Vold, 1995). Allocations of MFP were based on fission product yields for thermal and fast neutrons. All radionuclides with an atomic mass number between 78 and 160 and a half-life of at least one year were included in the calculations. In using these fission product yields, it was conservatively assumed that the yield of a given isotope was the maximum of that provided for thermal and fast neutrons. The radionuclides included in the calculations, their half-lives, and their fission yields are listed in Table 2-3.

In many instances, several isotopes of an element may be generated by fission. The allocation of MFP activity was based on the conservative assumption that the entire yield of isotopes of a given atomic number consisted of the long-lived species listed in Table 2-3. No stable isotopes were assumed to be generated in the fission process. In cases where two long-lived isotopes were generated, it was assumed that the isotopic yield of each isotope was half of the total. The fractional correction terms for each fission product are included in Table 2-3.

The information in Table 2-3 was used to calculate the activity of each radionuclide generated per fission. These calculations were conducted assuming the waste was, on average, 2 years old at the time of disposal. This assumption stemmed from the fact that while some LLW is processed and disposed of at Area G within a year of generation, other waste (e.g., that generated through ER and D&D activities) may be disposed of at the facility several years after it was generated. Thus, because detailed information on the times of generation and disposal of the MFP was not available, the 2-year average age was assumed. The radionuclide activities per fission, decay-corrected for 2 years, are included in Table 2-3. These activities were normalized to determine the fractional radionuclide abundances in MFP waste. These fractional abundances, included in Table 2-3 and shown in Figure 2-1, were multiplied by the total MFP activities to yield the radionuclide activities for this waste.

Table 2-3. Information used to allocate MFP activity.

Radionuclide	Half-Life (yr)	Average Fission Yield/ Mass Number	Correction Term	Activity/ Fission at 2 Years	Fractional Abundance (Activity Basis)
Ag-108m	1.3E+02	2.0E-02	1.0E+00	1.1E-04	2.1E-03
Ba-133	1.0E+01	6.5E-02	1.0E+00	3.8E-03	7.4E-02
Cd-109	1.2E+00	1.0E-02	1.0E+00	1.8E-03	3.6E-02
Cd-113m	1.5E+01	1.0E-02	1.0E+00	4.3E-04	8.5E-03
Ce-144	7.8E-01	6.5E-02	5.0E-01	4.9E-03	9.6E-02
Cs-134	2.1E+00	6.5E-02	1.0E+00	1.1E-02	2.2E-01
Cs-135	2.3E+06	6.5E-02	1.0E+00	2.0E-06	3.8E-07
Cs-137	3.0E+01	6.5E-02	5.0E-01	7.2E-04	1.4E-02
Dy-154	1.0E+06	2.0E-03	5.0E-01	6.9E-10	1.4E-08
Eu-150	3.5E+01	1.0E-02	5.0E-01	9.5E-05	1.9E-03
Eu-152	1.3E+01	5.0E-03	1.0E+00	2.4E-04	4.7E-03
Eu-154	8.6E+00	2.0E-03	5.0E-01	6.9E-05	1.3E-03
Eu-155	4.8E+00	1.0E-03	1.0E+00	1.1E-04	2.1E-03
Gd-148	9.3E+01	2.5E-02	1.0E+00	1.8E-04	3.6E-03
Gd-150	1.8E+06	1.0E-02	5.0E-01	1.9E-09	3.8E-08
I-129	1.6E+07	3.0E-02	1.0E+00	1.3E-09	2.6E-08
Kr-81	2.1E+05	7.0E-03	1.0E+00	2.3E-08	4.5E-07
Kr-85	1.1E+01	2.0E-02	1.0E+00	1.1E-03	2.2E-02
La-137	6.0E+04	6.5E-02	5.0E-01	3.8E-07	7.4E-06
Mo-93	3.0E+03	6.5E-02	5.0E-01	7.5E-06	1.5E-04
Nb-92	2.0E+07	6.5E-02	1.0E+00	2.3E-09	4.4E-08
Nb-94	2.0E+04	6.5E-02	1.0E+00	2.3E-06	4.4E-05
Pd-107	6.5E+06	3.0E-02	1.0E+00	3.2E-09	6.3E-08
Pm-144	1.0E+00	6.5E-02	5.0E-01	5.6E-03	1.1E-01
Pm-146	5.5E+00	5.0E-02	5.0E-01	2.4E-03	4.8E-02
Pm-147	2.6E+00	3.5E-02	1.0E+00	5.5E-03	1.1E-01
Ru-106	1.1E+00	4.5E-02	1.0E+00	7.9E-03	1.6E-01
Sb-125	2.7E+00	2.0E-02	1.0E+00	3.1E-03	6.0E-02
Se-79	6.5E+04	2.0E-04	1.0E+00	2.1E-09	4.2E-08
Sm-146	1.0E+08	5.0E-02	5.0E-01	1.7E-10	3.4E-09
Sm-151	9.3E+01	8.0E-03	1.0E+00	5.9E-05	1.2E-03
Sn-121	5.0E+01	1.5E-02	1.0E+00	2.0E-04	4.0E-03
Sr-90	2.9E+01	6.5E-02	1.0E+00	1.5E-03	2.9E-02
Tb-157	1.6E+02	5.0E-04	1.0E+00	2.2E-06	4.2E-05
Tb-158	1.5E+02	2.0E-04	1.0E+00	9.2E-07	1.8E-05
Tc-97	2.6E+06	6.5E-02	1.0E+00	1.7E-08	3.4E-07
Tc-99	2.1E+05	6.5E-02	1.0E+00	2.1E-07	4.2E-06
Zr-93	9.5E+05	6.5E-02	5.0E-01	2.4E-08	4.7E-07

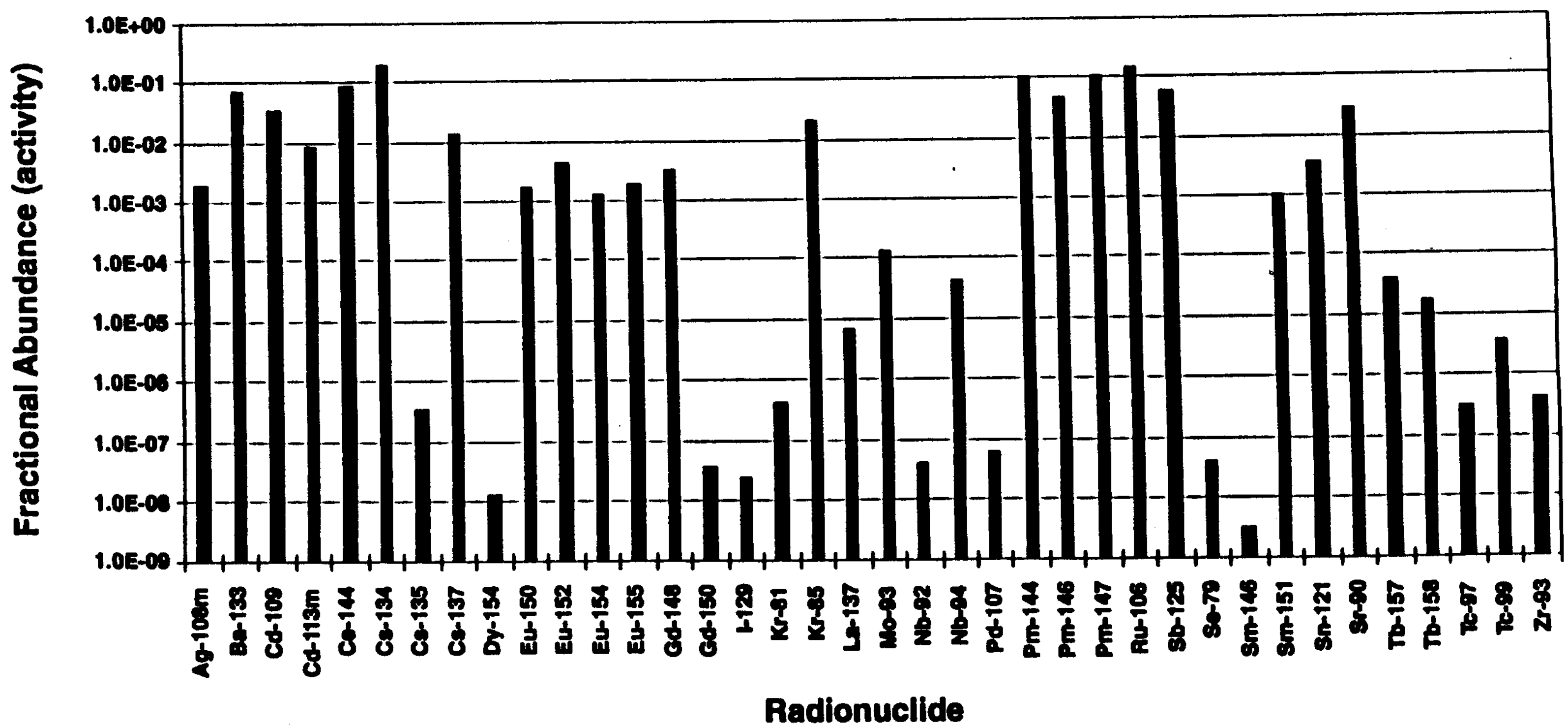

Figure 2-1. Fractional abundances of MFP radionuclides.

A review of the LLW disposal records for Area G indicates that MAP was primarily generated by the Los Alamos Meson Physics Facility (LAMPF), a high-energy accelerator facility (Vold, 1995). Three major waste streams are generated at LAMPF, including trash, targets, and beam-line inserts. The dominant forms of this waste include activated steel, aluminum, and graphite. The radiological characteristics of trash are provided in Table 2-4.

Based on similarities between the trash and the other LLW generated at LAMPF, the fractional abundances listed in Table 2-4 were assumed to apply to all MAP generated at LAMPF (Vold, 1995). The product of the abundances listed in the table and the specific activities of the radionuclides yields the activity of each isotope generated per gram of MAP. Normalizing these activities yields the fractional abundance of each radionuclide on an activity basis (shown in Table 2-4). The activity fractional abundances were multiplied by the total MAP activity to determine the radionuclide-specific activities for that waste.

Several material types have been used in the past to describe the LLW shipped for disposal or the TRU waste placed in storage. Each material type corresponds to specific radionuclide compositions, shown in Table 2-5. These radionuclide abundances were used to develop the Area G inventory projections. Material definitions for PU41, U72, GAMMA, GRALPH, GRBETA, and TRU were unavailable at the time the Area G inventory was prepared; thus, these material types were not included in the inventory projections.

Institutional control over the Area G disposal facility will be maintained for at least 100 years following the end of disposal operations. During this period, persons will be prevented from intruding onto the site for extended periods and measures will be taken to maintain proper facility function. Consequently, it is expected that there will be little or no potential for exposures from radionuclides with short half-lives.

Consistent with the preceding discussion, the Area G inventory was screened to eliminate radionuclides with short half-lives. In general, all radionuclides with half-lives of 5 years or less were removed from the disposal facility inventory. Exceptions include short-lived radionuclides that decay to one or more daughter products with half-lives in excess of 5 years, and radionuclides that are daughters of parents with half-lives in excess of 5 years.

Table 2-4. Information used to allocate MAP activity.

Radionuclide	Mass Fraction[a]	Activity Concentration in MAP (Ci/g)	Fractional Abundance (Activity Basis)
Be-7	3.0E-02	1.1E+04	6.9E-01
Na-22	1.0E-01	6.3E+02	4.1E-02
Mn-54	1.8E-01	1.5E+03	9.5E-02
Co-57	1.2E-01	1.0E+03	6.7E-02
Co-60	4.4E-01	5.0E+02	3.3E-02
Zn-65	1.3E-01	1.1E+03	7.1E-02

a. Source: Roberts (1995).

Table 2-5. Material type allocations for the Area G inventory.

Material Type	Isotopes	Activity Fraction
AM44	Am-241	1.0E+00
AM45	Am-243	1.0E+00
D38	U-234	4.2E-01
	U-235	1.0E-02
	U-236	2.0E-02
	U-238	5.5E-01
GAMMA	—[a]	—[a]
GRALPH	—[a]	—[a]
GRBETA	—[a]	—[a]
PU41	—[a]	—[a]
PU42	Pu-238	6.2E-02
	Pu-239	3.2E-04
	Pu-240	6.5E-03
	Pu-241	9.3E-01
	Pu-242	2.1E-03
	Pu-244	2.0E-09
PU51	Pu-238	7.0E-03
	Pu-239	4.1E-01
	Pu-240	4.9E-02
	Pu-241	5.4E-01
	Pu-242	4.8E-06
PU52	Pu-238	6.1E-03
	Pu-239	2.1E-01
	Pu-240	4.9E-02
	Pu-241	7.4E-01
	Pu-242	2.8E-06
PU53	Pu-238	1.1E-02
	Pu-239	1.2E-01
	Pu-240	4.2E-02
	Pu-241	8.2E-01
	Pu-242	6.1E-06
PU54	Pu-238	8.5E-03
	Pu-239	5.9E-02
	Pu-240	2.8E-02
	Pu-241	9.0E-01
	Pu-242	9.4E-06
PU55	Pu-238	8.9E-03
	Pu-239	4.5E-02
	Pu-240	2.9E-02

Table 2-5. Continued.

Material Type	Isotopes	Activity Fraction
	Pu-241	9.2E-01
	Pu-242	1.0E-05
PU56	Pu-238	8.0E-03
	Pu-239	3.9E-02
	Pu-240	2.9E-02
	Pu-241	9.3E-01
	Pu-242	1.1E-05
PU57	Pu-238	2.7E-02
	Pu-239	1.7E-02
	Pu-240	1.7E-02
	Pu-241	9.4E-01
	Pu-242	2.4E-05
PU83	Pu-238	9.9E-01
	Pu-239	5.0E-04
	Pu-240	1.9E-04
	Pu-241	1.2E-02
	Pu-242	1.4E-07
TH88	Th-232	1.0E+00
U10	U-234	5.0E-01
	U-235	2.2E-02
	U-238	4.7E-01
U11	U-234	2.2E-01
	U-235	5.2E-03
	U-238	7.7E-01
U12	U-234	2.7E-01
	U-235	1.0E-02
	U-238	7.2E-01
U15	U-234	2.9E-01
	U-235	1.3E-02
	U-238	6.9E-01
U18	U-234	4.1E-01
	U-235	2.4E-02
	U-238	5.6E-01
U21	U-234	4.6E-01
	U-235	2.7E-02
	U-238	5.2E-01
U22	U-234	5.1E-01
	U-235	3.1E-02
	U-236	1.6E-03

Table 2-5. Continued.

Material Type	Isotopes	Activity Fraction
	U-238	4.6E-01
U23	U-234	5.7E-01
	U-235	3.5E-02
	U-236	4.1E-03
	U-238	3.9E-01
U24	U-234	6.3E-01
	U-235	3.8E-02
	U-236	6.1E-03
	U-238	3.3E-01
U25	U-234	6.8E-01
	U-235	4.1E-02
	U-236	7.7E-03
	U-238	2.7E-01
U29	U-234	7.7E-01
	U-235	4.4E-02
	U-236	9.5E-03
	U-238	1.8E-01
U31	U-234	8.0E-01
	U-235	4.4E-02
	U-236	1.0E-02
	U-238	1.5E-01
U32	U-234	8.6E-01
	U-235	4.4E-02
	U-236	1.0E-02
	U-238	8.4E-02
U33	U-234	9.1E-01
	U-235	4.1E-02
	U-236	9.1E-03
	U-238	3.6E-02
U34	U-234	9.4E-01
	U-235	3.7E-02
	U-236	7.5E-03
	U-238	1.5E-02
U35	U-234	9.5E-01
	U-235	3.5E-02
	U-236	6.5E-03
	U-238	8.2E-03
U36	U-234	9.6E-01
	U-235	3.3E-02

Table 2-5. Continued.

Material Type	Isotopes	Activity Fraction
	U-236	5.2E-03
	U-238	3.0E-03
U37	U-234	9.6E-01
	U-235	3.1E-02
	U-236	4.3E-03
	U-238	7.0E-04
U38	U-234	9.7E-01
	U-235	3.0E-02
	U-236	4.1E-03
	U-238	2.8E-04
U39	U-234	9.7E-01
	U-235	3.0E-02
	U-236	4.0E-03
	U-238	7.2E-05
U70	U-233	1.0E+00
U72	—[a]	—[a]
U81	U-234	5.1E-01
	U-235	2.2E-02
	U-238	4.7E-01

a. Material type definitions were unavailable and were not included in the inventory projections.

2.2 FUTURE WASTE

Several types of LLW are expected to require disposal at Area G in the future. These include operational waste from ongoing activities at LANL, waste generated from ER and D&D projects, and residues generated from MLLW treatment. The following sections briefly describe these types of waste and discuss the methods used to project future Area G inventories of each. Section 2.2.1 addresses operational waste, Section 2.2.2 discusses ER and D&D waste, and Section 2.2.3 considers residues generated from MLLW treatment processes. Section 2.2.4 discusses the approach used to estimate the entire future inventory for Area G.

2.2.1 Operational LLW

A large portion of the waste disposed of at Area G in the past has resulted from normal operations at the various Technical Areas (TAs) at LANL. This waste is diverse, reflecting the wide array of activities conducted at LANL. In general, operational waste requiring disposal at Area G in the future is expected to resemble that disposed of since 1990. Exceptions will arise, however, as LANL's mission evolves in response to changing research needs and levels of funding.

To estimate the effect that changes in LANL's operations may have upon operational waste characteristics, it is necessary to identify the major generators of waste at LANL and evaluate the potential for operational changes at these facilities. Toward this end, screening calculations were conducted to determine the major generators of LLW at LANL between 1990 and 1995. These screening calculations were based on the total volume, total activity, and radionuclide-specific activities shipped for disposal during this period. TAs whose waste shipments comprised 95 percent of the total volume of waste disposed of at Area G in one or more years were identified as major generators of waste. A similar screen was conducted on the basis of the total activity of waste disposed of between 1990 and 1995. All screening calculations were based on the total amount of LLW disposed of at Area G; no distinction was made between waste buried in pits and waste disposed of in shafts.

Screening calculations based on the total activity of LLW shipped for disposal may overlook TAs that ship waste with low total activities but relatively high activities of specific radionuclides. To avoid this potential oversight, the waste disposal database also was screened with respect to radionuclide-specific activities. TAs whose waste shipments comprised 95 percent of the total radionuclide-specific activity disposed of at Area G in one or more years between 1990 and 1995 also were identified as major generators of LLW. Once again, screening calculations were based on the total amount of LLW disposed of in pits and shafts.

Activities conducted at LANL are grouped according to function within TAs. In general, several buildings or facilities exist within each TA, most of which generate specific types and quantities of waste. The screening procedures used to identify major generators were conducted on the basis of TAs, rather than the individual buildings or facilities within each TA.

Once the major generators of LLW at LANL were identified, estimates of future levels of activity at each were developed. Program and division managers for the TAs were asked to identify operations that generated LLW in the past but are no longer active, and those that have generated LLW in the past and are expected to continue doing so in the foreseeable future. Managers also were asked to identify operations that are expected to begin in the foreseeable future and generate LLW. Finally, personnel familiar with the overall operations of LANL were questioned about future activities at the various TAs. Adjustments to the operational waste inventory were made based on the responses to these interviews.

The projected operational LLW inventory was developed based on the assumption that the waste generated in the future by the TAs identified as major generators would resemble that disposed of at Area G between 1990 and 1995. Specifically, waste data for this period were analyzed to estimate average annual total volumes, activities, and radionuclide activities for each TA. Separate projections were developed for waste disposed of in pits and shafts. The estimates developed for the TAs were summed to yield the total annual averages for all LLW disposed of in pits and all waste placed in shafts. These average waste characteristics were assumed to remain constant over the remainder of the Area G disposal facility's lifetime.

Using historic disposal data to project future generation rates of high-activity tritium waste from LANL tritium operations is inappropriate. The disposal of waste with high tritium activities was discontinued approximately 6 years ago to allow the adequacy of the packaging for this waste to be evaluated. While this evaluation has been completed, the majority of the tritium waste backlog has not been shipped for disposal because the feasibility of recovering the tritium from the waste is being assessed. Most waste that did not contain high activities of tritium was shipped to Area G on a regular basis over the last 6 years.

Given the unique circumstances surrounding the tritium waste, a combination of approaches was used to estimate future disposal activities and volumes for this radionuclide. Disposal data for the period spanning 1990 to 1995 were used to project future tritium disposal rates for operations that continued to ship waste for disposal during this time frame. The quantities of high-activity tritium waste currently in storage were estimated from data supplied by the waste generators (Carlson, 1996; Martinez, 1996). Future waste generation rates of the high-activity tritium waste were estimated using generator-supplied information (Myers, 1996).

A portion of the 1990 to 1995 LLW data used to project future operational waste inventories represents waste generated during ER and D&D activities. Because projections of LLW generated by ER and D&D activities were developed separately, the ER and D&D waste represented in the database was removed to avoid double-counting this waste in the total Area G inventory. While it is extremely difficult to extract all records for ER and D&D LLW from the database, it is reasonable to assume that certain waste codes or streams are generated almost exclusively as a result of cleanup activities. Thus, for the Area G inventory, 11 waste streams were assumed to represent ER and D&D waste. These waste streams, listed in Table 2-6, were excluded from the calculations of future operational waste inventories.

2.2.2 ER and D&D LLW

Waste generated from ER and D&D activities at LANL generally consists of soil, concrete, asphalt, metals, polyvinyl chloride (PVC) piping, and demolition debris. Several sites or facilities are scheduled to undergo ER or D&D in the foreseeable future. The waste

Table 2-6. Waste streams assumed to be generated from ER and D&D activities.

Petroleum-Contaminated Soil
Combustible Building Debris
Non-Combustible Building Debris
Asbestos
Asbestos-Contaminated Debris
Beryllium-Contaminated Debris
PCB-Contaminated Materials
PCB-Contaminated Equipment
PCB-Contaminated Soil
PCB-Contaminated Concrete
Radioactively Contaminated Soil

generated by these activities is expected to include MLLW, hazardous waste, and LLW. Waste volume projections developed for the low-level component of the ER and D&D waste by the ER Project Office (Maassen, 1996) were used for the Area G inventory projections.

The Chemistry and Metallurgy Research (CMR) facility at LANL is undergoing an upgrade to bring it into compliance with DOE Orders. The waste generated during the upgrade was included in the ER and D&D portion of the future inventory. Primary components of the waste include wiring, conduit, electrical panels, and other electrical equipment. An attempt is being made to recycle items such as copper wiring; waste that cannot be recycled will be disposed of at Area G. Volume projections for the CMR upgrade waste provided by Kennicott (1996) were used in the Area G inventory projections.

ERM/Golder (1995) developed estimates of the MLLW inventory for ER waste at LANL. These estimates were based on information on potential release sites contained in the most recent Operable Unit Resource Conservation and Recovery Act (RCRA) Facility Investigation, interviews with former Operable Unit Project Leaders or other knowledgeable team members that were used to refine information contained in the work plans, and data from the Facility for Information Management, Analysis, and Display (FIMAD) database. The first two sources of information were used to determine potential MLLW sites, while the FIMAD database was used to identify waste constituents, concentrations, and activities.

The radiological characteristics of the LLW to be generated by ER and D&D activities have not been developed. Thus, to estimate the contribution of this waste to the Area G inventory, it was assumed that the radionuclide concentrations developed by ERM/Golder (1995) for the mixed ER waste apply to the ER and D&D LLW as well. The projected ER and D&D waste inventory was allocated among the four waste forms used in the source-term modeling analysis. Because detailed information on the forms of the ER and D&D waste and the proportion of each was not available, it was assumed that 50 percent of the LLW generated by these activities was surface-contaminated waste. The remaining waste was assumed to consist of equal proportions of contaminated soils and concrete.

The radiological characteristics of waste from the future CMR Upgrade waste are largely unknown. Thus, it was assumed that the CMR upgrade waste had the same radionuclide concentrations as the ER LLW discussed above. The entire inventory associated with the CMR upgrade waste was assigned to the surface-contaminated waste form, consistent with the nature of the waste generated from the upgrade.

2.2.3 MLLW Residues

A variety of MLLW streams are in storage or are generated at LANL. These wastes exist as solids, liquids, or compressed gases. The solid waste includes oxidizers, reactive metals, contaminated debris and scrap metal, firing site debris, process residuals, contaminated lead shielding, decontamination waste and debris, and dewatered treatment sludges. Liquid and compressed gas waste includes gas cylinders, ignitable liquids, acids, caustics, reactive liquids, analytical laboratory waste, spent solvents, contaminated wastewaters, metals, photographic fixer solutions, and chemical products. The majority of the MLLW is radiologically contaminated with plutonium or uranium.

Prior to 1986, most of the MLLW generated at LANL was disposed of at the Area G disposal facility. However, since July 1986, when the EPA affirmed its authority over the regulation of the hazardous component of MLLW, this waste has been stored. Since 1988, all containers of MLLW have been tracked in accordance with RCRA recordkeeping requirements.

The RCRA Land Disposal Restriction (LDR) requires DOE sites to treat hazardous waste (including the hazardous component of MLLW) to certain standards before disposal. Storage of hazardous waste or MLLW is generally prohibited if the waste does not meet these LDR requirements. The Federal Facilities Compliance Act (FFCA), signed on October 6, 1992, requires DOE to prepare plans for developing the required treatment capacity for MLLW stored or generated at each of its sites.

In compliance with the FFCA, LANL issued a Draft Site Treatment Plan (STP) that discusses the preferred options for treating MLLW stored or generated at the site (LANL, 1995). Treatment options were identified for a number of waste streams, several of which may result in the generation of LLW (i.e., waste without any hazardous components). The fiscal year 1995 update of this report has been issued in draft form (LANL, 1996). The MLLW streams discussed in the LANL STP Update are listed in Table 2-7 with their

Table 2-7. MLLW streams, treatment options, and inventories.[a]

Waste Stream	Preferred Treatment Option	Volume in Storage as of 9/30/94 (m^3)	Annual Generation Rate (m^3/yr)
Aqueous Wastes:			
Organic Waste	CAI[b]/Evaporative Oxidation	1.7E+00	1.0E-01
Heavy Metal Waste	Chemical Plating	1.9E+00	2.0E-01
Cyanides, Nitrates, Chromates, and Arsenates	Chemical Plating	1.3E-01	2.0E-03
Biochemical Laboratory Waste	TBD[c]	1.3E+00	1.0E-01
Bulk Oils	CAI[b]/Hydrothermal Processing	3.8E+00	6.0E-01
Compressed Gases:			
Gases Requiring Scrubbing	Caustic, Acid, or Water Scrubbing	3.5E-01	2.0E-02
Gases Requiring Oxidation	Gas Oxidation	8.0E-02	2.0E-02
Other Compressed Gases	TBD[c]	1.3E+00	4.0E-01
Corrosive Solutions	Chemical Plating	1.4E+00	1.0E-01
Debris:			
Noncombustible	Macroencapsulation	5.6E+00	6.0E-01
Combustible	CAI[b]/ Macroencapsulation	1.4E+01	3.0E-01
Dewatered Treatment Sludge	Reclassify as LLW	2.7E+02	—
Inorganic Solid Oxidizers	Hydrothermal Processing	2.0E-01	1.0E-02

Table 2-7. Continued.

Waste Stream	Preferred Treatment Option	Volume in Storage as of 9/30/94 (m^3)	Annual Generation Rate (m^3/yr)
IPA Waste	Commercial Thermal Treatment	1.6E+01	3.0E-03
Lead Wastes:			
Surface-Contaminated Lead	Decontamination	5.6E+01	2.5E+00
Activated/Inseparable Lead	Macroencapsulation	1.6E+01	2.0E-01
Lead Requiring Sorting	Sort Based on Treatment	1.0E+01	0.0E+00
Lead Blankets	Commercial Stabilization	7.4E-01	4.0E-02
Other Lead Waste	TBD[c]	5.1E+01	2.0E+00
Mercury Wastes:			
Elemental Mercury	Amalgamation	5.0E-01	1.0E-02
Other Mercury Waste	TBD[c]	1.8E+01	5.1E+00
Nonradioactive/Suspect Waste	Sort, Survey, and Decontaminate	1.4E+01	1.9E+00
Organic Liquids:			
Halogenated	CAI[b]/Hydrothermal Processing	1.7E+01	1.1E+00
Non-Halogenated	CAI[b]/Hydrothermal Processing	1.4E+01	2.0E+00
PCB Waste with RCRA Components	CAI[b]/Hydrothermal Processing	7.4E-01	4.0E-02
Scintillation Fluids	Commercial Thermal Treatment	2.5E+00	8.0E-01

Table 2-7. Continued.

Waste Stream	Preferred Treatment Option	Volume in Storage as of 9/30/94 (m^3)	Annual Generation Rate (m^3/yr)
Soils:			
Contaminated with Heavy Metals	Commercial stabilization	1.1E+01	4.0E-01
Combustible, Contaminated with Organics	CAI[b]/Thermal Desorption	2.8E+01	1.4E+00
ER Soils	Commercial stabilization	3.9E+01	1.3E+01
Non-Combustible, Contaminated with Organics	Thermal Desorption	7.8E+00	1.6E+00
Water-Reactive Waste	Controlled Reaction with Water	6.0E+00	4.0E-02
Totals	—	6.1E+02	3.5E+01

a. Source: LANL, 1996.
b. CAI = controlled-air incineration.
c. TBD = to be determined.

estimated inventories and the quantities of waste projected to be generated between fiscal years 1996 and 2000.

While treatment options continue to be developed for the MLLW streams at LANL, the preferred option for dealing with these wastes is to treat and dispose of them off site. This option is made possible by the increased availability of commercial treatment and disposal capacity and the development of treatment facilities at other DOE sites. Under this preferred option, LANL would continue to develop mobile treatment units only after it determines that no offsite alternatives exist for treating and disposing of the residues.

The quantity of LLW generated by the treatment of MLLW and requiring disposal at Area G is expected to be small, assuming the preferred option of using offsite treatment and disposal facilities is implemented. Consequently, this waste was not included in the Area G inventory projections.

A waste stream that is currently being stored as mixed waste and which is not included in Table 2-7 is uranium chips and turnings. This waste is currently being stored in diesel fuel in 0.1-m^3 drums placed in 0.2-m^3 overpacks. Additional chips and turnings are expected to be generated on a regular basis in the future. Current plans call for treating this waste, stabilizing it in a clay matrix, and disposing of it in Area G. Consequently, this waste must be accounted for in the projected inventory.

Projections of future uranium chip waste inventories were based on the quantities of waste currently in storage and estimates of future levels of activity in the LANL shops that generate the material. Volumes and activities of the waste in storage were taken from the storage database for the waste stream (Brazenger, 1996). Quantities of waste expected to be generated in the future were provided by Hodges (1996a, 1996b). The waste activity was allocated among the various uranium isotopes using the allocation factors for the material type D-38 (shown in Table 2-5).

2.2.4 Total Future Inventory

The total amount of LLW that will be disposed of at Area G will be a function of the rate at which waste is generated and the disposal capacity of the disposal facility. Sections 2.2.1 through 2.2.3 discuss the projected rates of LLW generation. This section discusses the disposal capacity of the Area G disposal facility.

The LLW disposal facility at Area G is quickly approaching its capacity. The waste disposal capacity remaining at the end of fiscal year 1995 was approximately 23,000 m^3. An additional pit has been excavated within the area already reserved for disposal, and current plans call for excavating one more. With these additional pits, the disposal facility is expected to be able to accommodate routine, ER, and D&D LLW into the early part of fiscal year 2001.

An Environmental Assessment (EA) for the expansion of the Area G LLW disposal facility was prepared in January 1994 (LANL, 1994). The EA identified a proposed action and several alternatives for dealing with the impending shortage of disposal capacity. The proposed action called for the expansion of Area G and modifications in waste management and disposal practices. Under the proposed action, disposal operations would expand to approximately 28 additional hectares on Mesita del Buey, increasing disposal capacity by approximately 600,000 m^3. Later plans called for expanding the disposal facility by only 2 ha. The increase in disposal capacity due to expansion would be complemented by the permitting and operation of a 200-ton supercompactor.

The LANL Site-Wide Environmental Impact Statement (SWEIS), currently in preparation, examines a number of options regarding the level of future operations at LANL. If implemented, these alternatives would influence the quantities of waste generated and, hence, the disposal demands placed on Area G. Therefore, while construction of the compactor has proceeded, expansion plans at Area G have been postponed until the SWEIS is completed in fiscal year 1997.

At the time the inventory projections were developed, it was unclear whether the Area G disposal facility would be expanded to accept more LLW and, if so, to what extent expansion would be pursued. Thus, to maximize the utility of the Area G performance assessment for future LLW disposal operations at the LANL, it was assumed that the disposal facility will continue to accept waste through the year 2044. This operational period was chosen because it is expected to be amenable to all future LLW disposal needs at LANL.

In summary, the total projected inventory for the Area G performance assessment and composite analysis was calculated based on the assumption that the facility will remain operational through 2044. The annual operational waste projections for pits and shafts were multiplied by 49, the number of years between 1996 and 2044, to account for the total inventory of waste placed in these units. All ER and D&D LLW projected to require disposal was assumed to be buried at Area G because the activities responsible for this waste are expected to be completed well before the year 2044.

3. AREA G INVENTORY PROJECTIONS

This chapter presents the Area G inventory projections developed using the methodology described in Chapter 2. Characteristics of historic waste (disposed of between 1957 and the end of 1995) are discussed in Section 3.1. Future LLW projections are provided in Section 3.2.

3.1 HISTORIC WASTE

This section presents the historic Area G inventory in terms of three waste disposal periods: (1) the period from the opening of the Area G disposal facility through 1970, (2) the period from the beginning of 1971 through September 25, 1988, and (3) the period from September 26, 1988, through the end of 1995. Separate inventories were prepared for these periods for two reasons. First, as discussed in Section 2.1, the amount of detailed data available for characterizing the historic waste differs dramatically between the pre-1971 and 1971 to 1995 periods. Maintaining the identities of the pre-1971 and 1971 to 1995 inventories permits evaluation of the uncertainties inherent in each inventory. Second, DOE Order 5820.2A applies to waste disposed of on or after September 26, 1988. Consequently, separate inventories (i.e., waste disposed of through September 25, 1988, and waste disposed of thereafter) must be developed to demonstrate compliance with the Order.

Section 3.1.1 characterizes the waste disposed of from the time the Area G disposal facility began accepting waste through 1970. Sections 3.1.2 and 3.1.3 present the inventories for the periods from 1971 to September 25, 1988, and September 26, 1988, to 1995, respectively.

3.1.1 Pre-1971 Inventory

As discussed in Section 2.1, data from the LANL LLW disposal and TRU waste databases were used to characterize the waste disposed of at Area G prior to 1971. The periods from which data were drawn to characterize this waste are 1971 through 1977 for the disposal pits and 1971 through 1975 for the shafts. These periods were chosen based on evaluations of the disposal and storage patterns between 1971 and 1995 and changes in disposal practices at LANL during this period. The results of these evaluations are discussed in the following paragraphs.

The volumes and activities of LLW disposed of at Area G between 1971 and 1995 are shown in Figures 3-1 and 3-2, respectively, for the disposal pits and shafts. Pit and shaft disposal volumes ranged over an order of magnitude during this period; the majority of the waste, on a volume basis, was placed in the pits. Disposal activities between 1971 and 1995 were much more variable, ranging over several orders of magnitude. The disposal shafts received most of the activity disposed of at Area G.

The sensitivity of the pre-1971 waste characteristics to the amount of data used in making these estimates was evaluated as an aid in selecting a suitable period for extrapolation. Average annual disposal volumes and activities were calculated for pits and shafts for each year from 1971 to 1995. These averages were based on the disposal data for all preceding years (i.e., from 1971 through the year in question). For example, the annual averages for 1973 were based on disposal data for 1971 through 1973, while the averages for 1980 took into account data for 1971 through 1980. Standard deviations were also calculated for the subset of data used to determine annual averages. The results of these calculations are shown in Figures 3-3 and 3-4 for LLW disposal volumes and activities, respectively.

Figure 3-3 shows that the average annual volumes of LLW disposed of in pits at Area G are relatively constant, regardless of the length of time over which the average is calculated (Figure 3-3). Between 1972 and 1975, the average volume of waste disposed of increases from about 4,000 m^3 to 6,000 m^3, and remains at that level until 1982. The gradual decline in average disposal volume after 1982 reflects the downward trend in waste disposal volumes seen in Figure 3-1. This decline is moderated by the increasingly greater number of years included in the calculations of average volume. The average shaft disposal

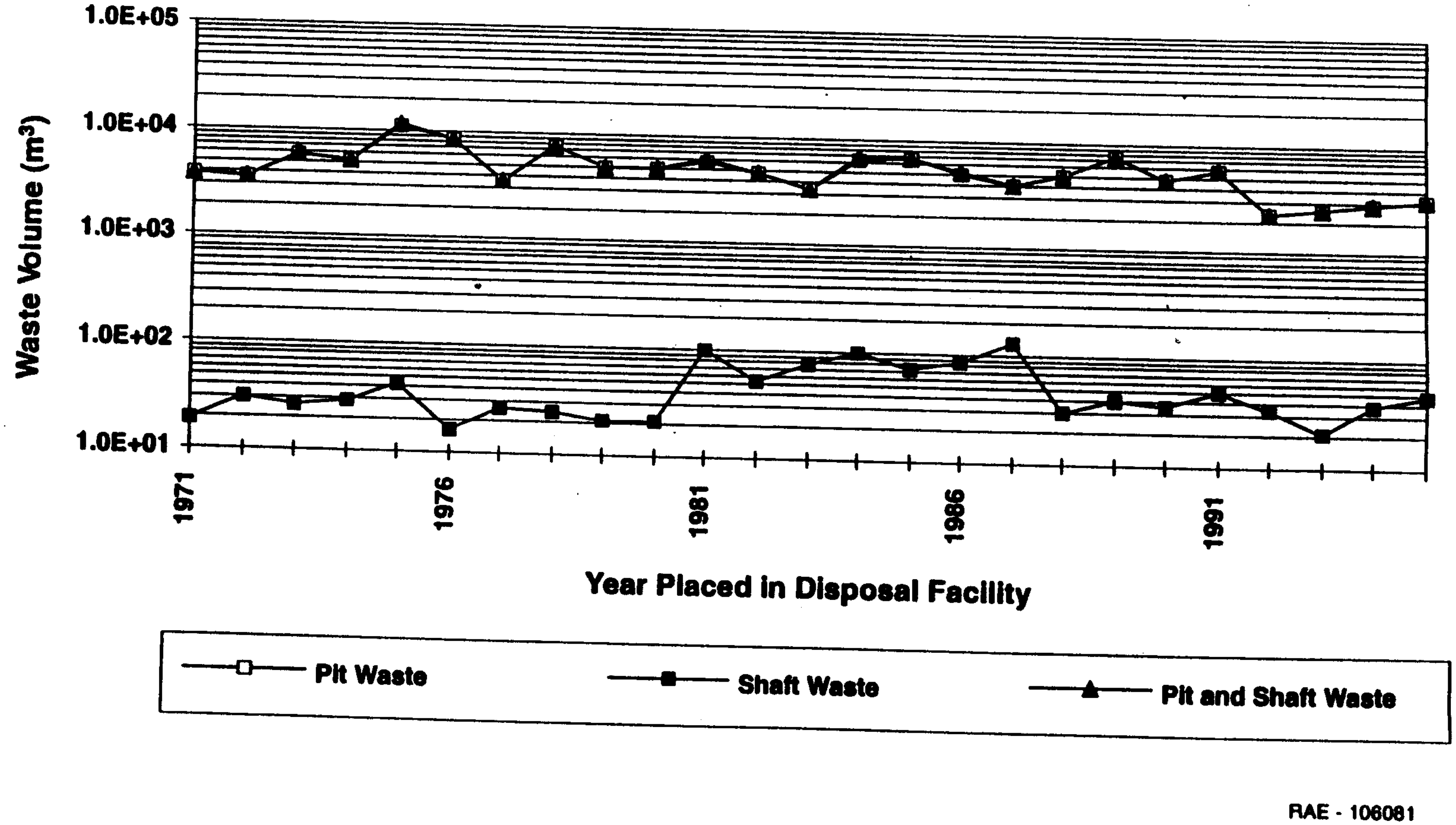

Figure 3-1. Historic LLW volumes in pit and shaft waste.

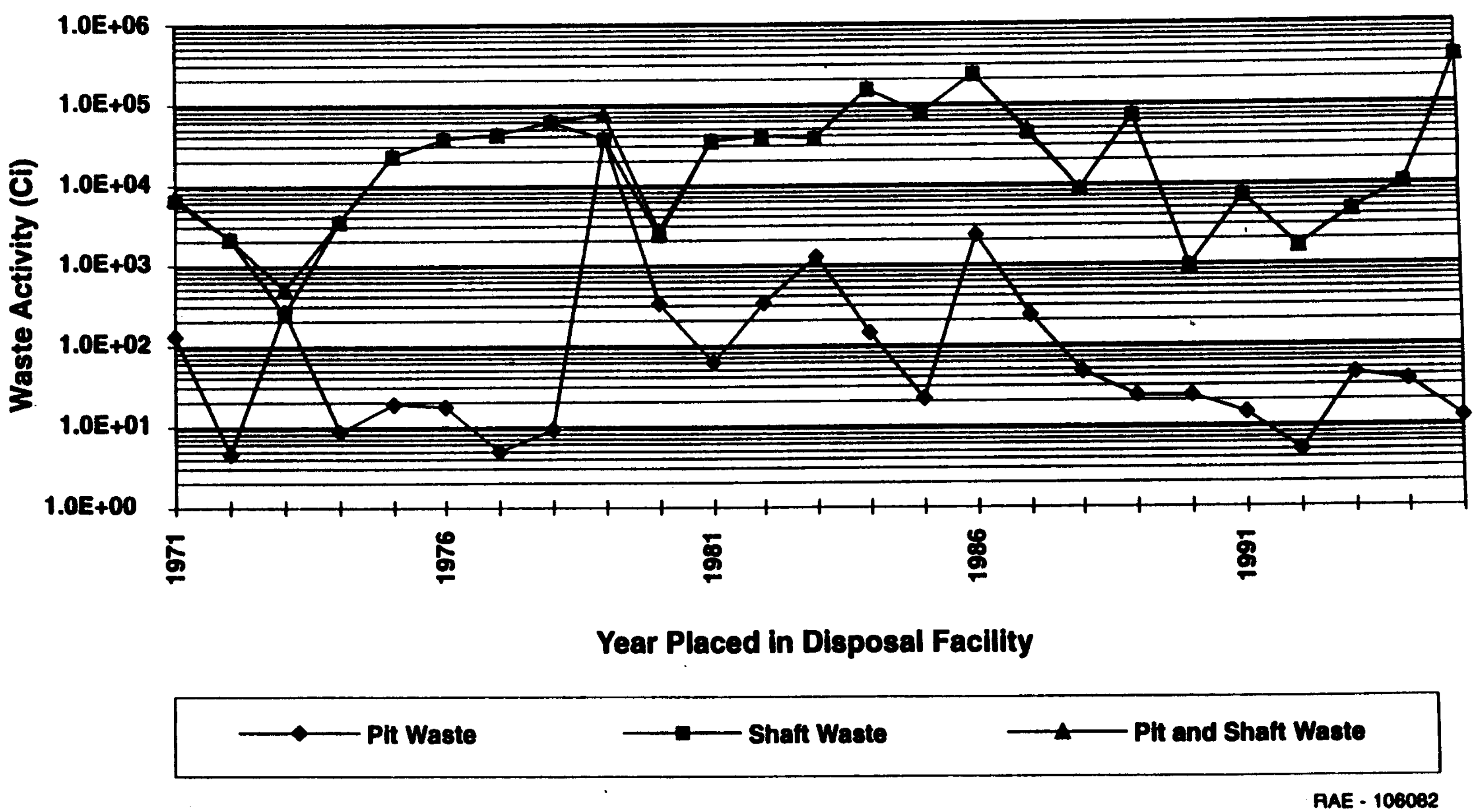

Figure 3-2. Historic LLW activities in pit and shaft waste.

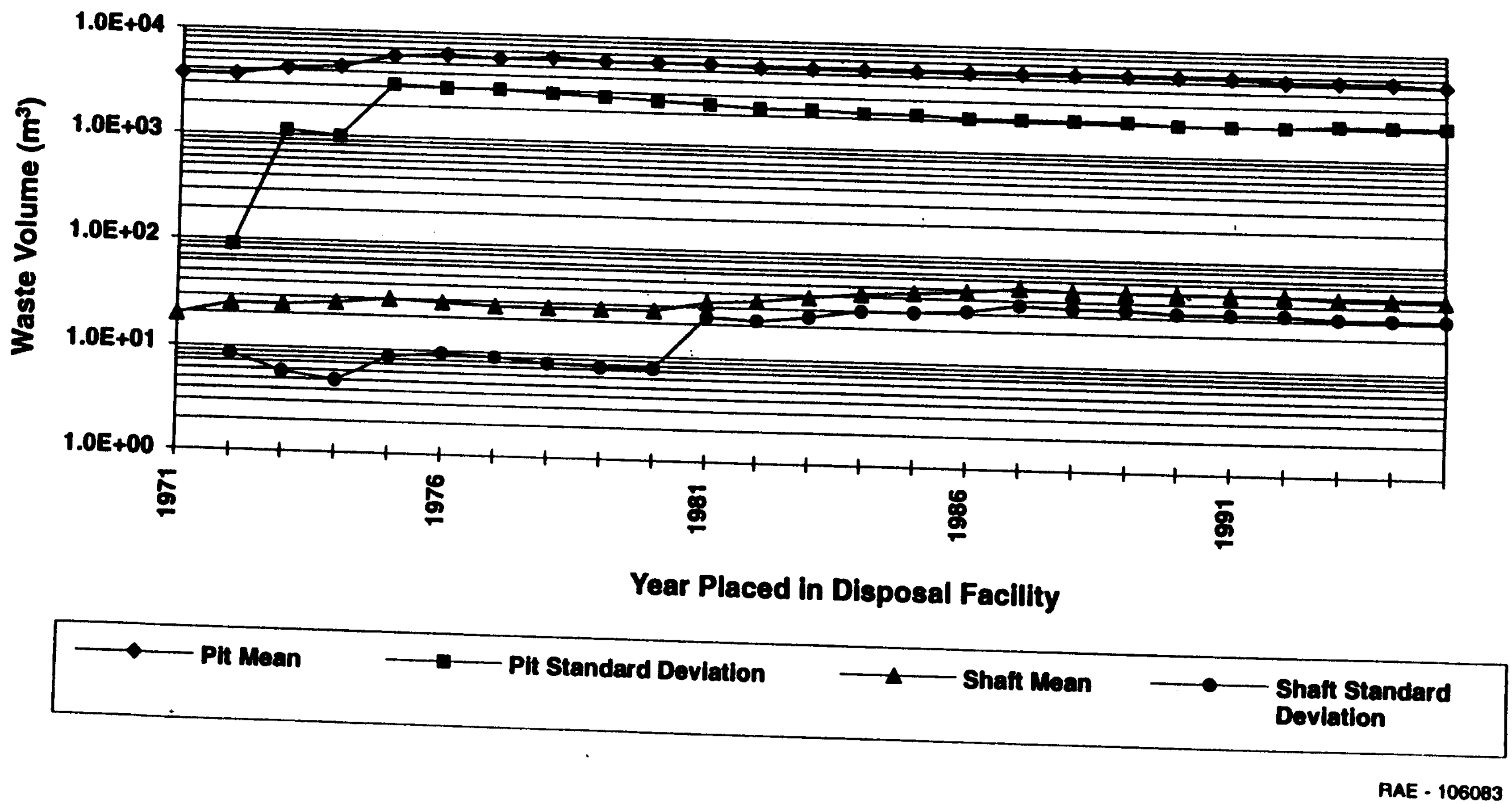

Figure 3-3. Mean and standard deviation of LLW pit and shaft disposal volumes.

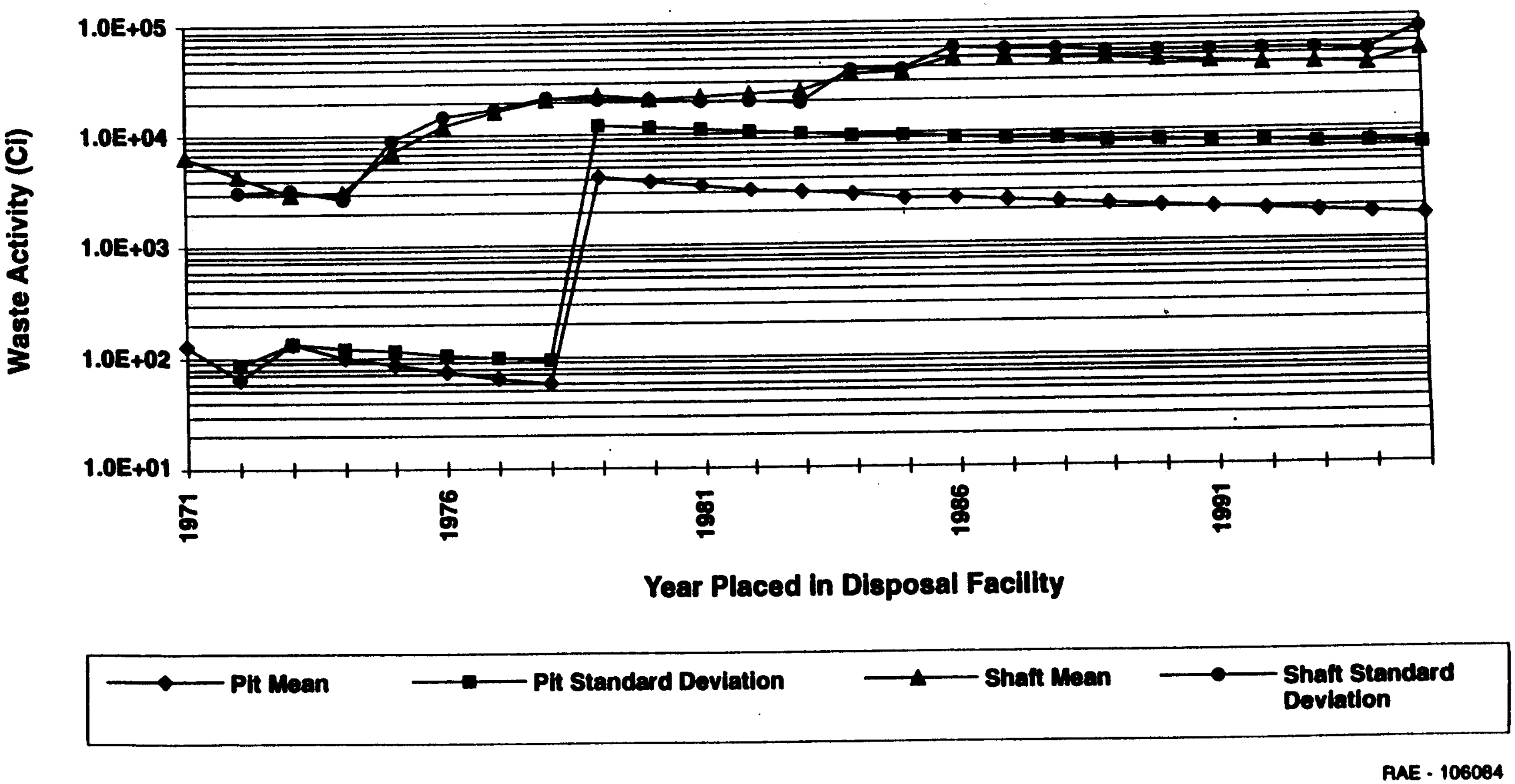

Figure 3-4. Mean and standard deviation of LLW pit and shaft activities.

volume is relatively constant until 1981, at which point a gradual increase begins. This increase corresponds to the elevated rates of disposal occurring from 1981 to 1987 (Figure 3-1).

Figure 3-4 shows that the average annual activity of LLW disposed of in pits remains relatively constant between 1971 and 1978, but increases sharply in 1979 due to the disposal of large activities of H-3, Co-60, Sr-89, and MAP. The average activities decline slowly thereafter as disposal activities return to more normal levels (see Figure 3-2). The effect of waste disposal in 1979 on the average activities, however, is evident for the remainder of the 1971 to 1995 period. Average shaft activities rise almost an order of magnitude as the period under consideration extends from 1974 to 1978. The average remains relatively constant until about 1983, at which point it rises gradually.

The volumes and activities of TRU waste disposed of or placed in storage at Area G between 1971 and 1995 are shown in Figure 3-5. As shown, waste volumes range over about an order of magnitude during the period; activities range over almost three orders of magnitude. The average volumes of TRU waste disposed of or placed in storage increase in the early and late 1970s (see Figure 3-6), remaining relatively constant thereafter. Average TRU waste activities rise dramatically through 1974 and remain relatively constant thereafter (Figure 3-7).

Based on the data presented above and other considerations, the period from 1971 through 1977 was chosen for estimating the pre-1971 waste characteristics for waste placed in disposal pits. The starting point of 1971 was chosen because LANL's operations during that year most closely resemble those that generated waste prior to that time. The quantity of TRU waste placed in storage, and the radionuclide concentrations in the waste, increase substantially in the late 1970s and early 1980s. Consequently, use of a longer extrapolation period would increase the divergence between the extrapolated TRU waste inventory and the actual waste disposed of prior to 1971. The 1971 to 1977 extrapolation period is advantageous in that it excludes a number of unique waste streams associated with D&D and startup activities at LANL, including the decommissioning of the TA-21 plutonium facilities and the startup of TA-55. This period also generally predates a number of changes in disposal operations at Area G, including the implementation of waste compaction in 1977 and the end of MLLW disposal in the mid-1980s.

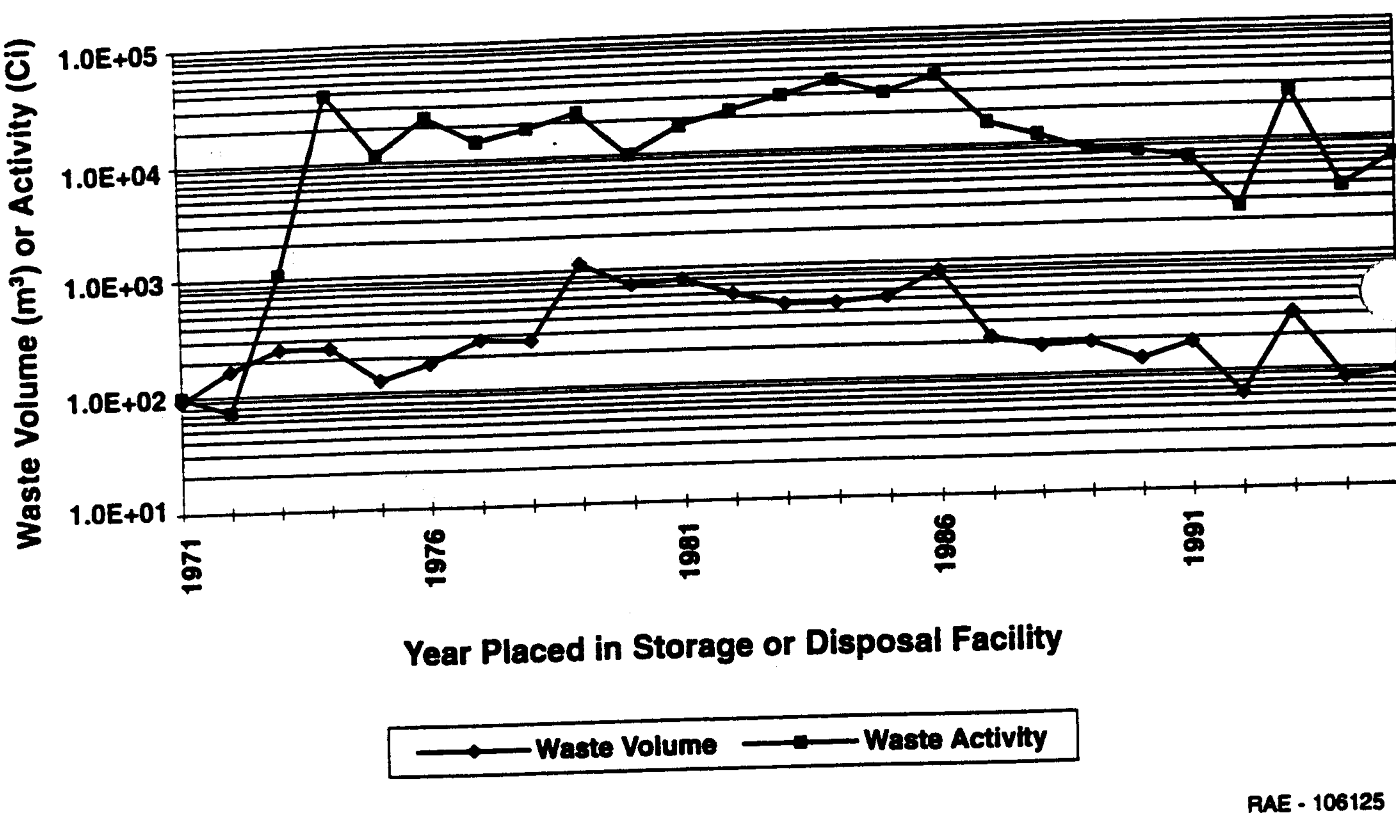

Figure 3-5. Historic TRU waste volumes and activities.

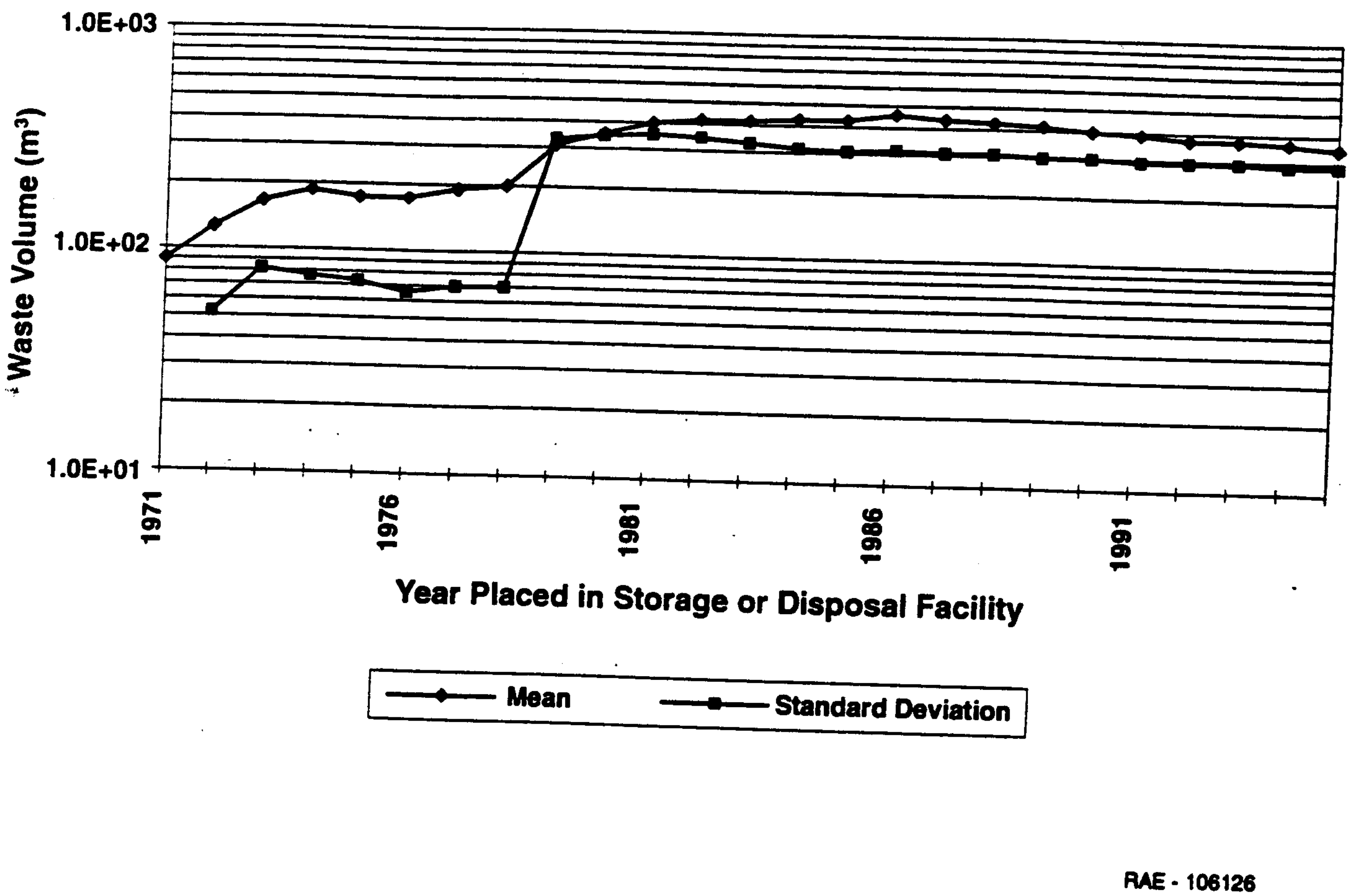

Figure 3-6. Mean and standard deviation of historic TRU waste volumes.

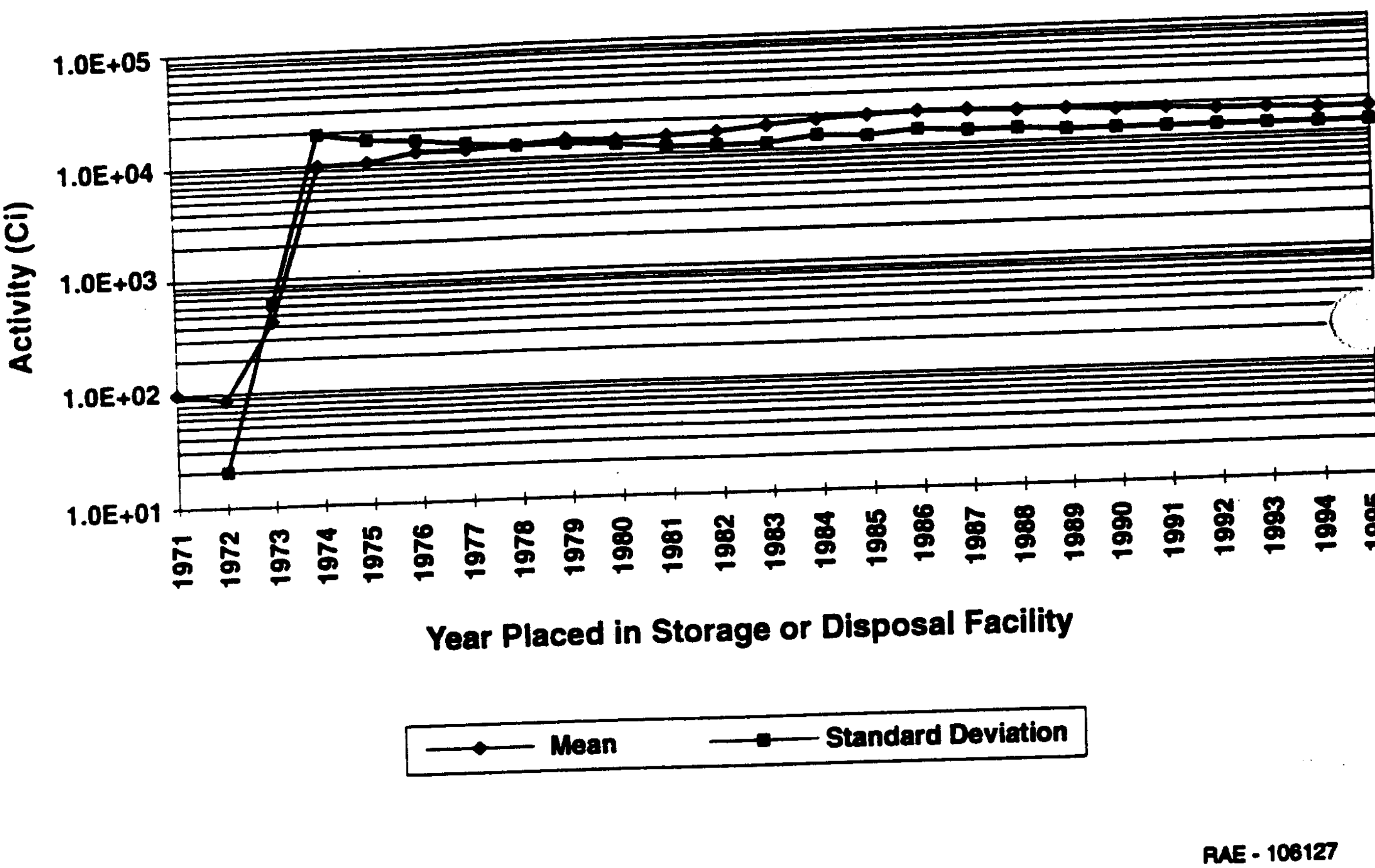

Figure 3-7. Mean and standard deviation of historic TRU waste activities.

A five-year period extending from 1971 through 1975 was used for characterizing the pre-1971 waste placed in shafts. In general, the characteristics and quantities of waste disposed of in shafts between 1971 and 1975 are expected to resemble those of the waste placed in the shafts from 1966 to 1970 (Warren, 1996). Ending the extrapolation period in 1975 appears prudent because it excludes the much higher disposal rates observed in 1976 and subsequent years.

The data used for estimating the pre-1971 pit and shaft inventories were examined to identify, to the extent possible, non-routine or special case waste. Based on this analysis, the following wastes were eliminated from the LLW and TRU waste data used to estimate the pre-1971 inventory.

- All waste generated at TA-53, the LAMPF. This waste was excluded because the LAMPF began operations in June 1972.
- LLW and small amounts of TRU waste generated from townsite (TA-1) cleanup activities in the mid-1970s. This waste was excluded because similar activities did not occur prior to 1971.
- LLW generated from the removal of the acid sewer system in 1977. This waste was excluded because similar activities did not occur prior to 1971.
- High-activity Pu-238 and U-233 waste generated at TA-21 and stored in trenches A through C. The Pu-238 waste was shipped to the Savannah River Site (SRS) for disposal prior to 1974. When the SRS stopped accepting the waste, it was retrievably stored in trenches at Area G. LANL did not receive approval to dispose of the U-233 waste until after 1971. Because these wastes were retrievably stored, they were excluded from the estimates of the pre-1971 inventory.

The estimated quantities of waste disposed of at Area G prior to 1971 are listed in Table 3-1 for pits and shafts. Separate inventories are listed for waste projections that were based on LLW disposal records and for waste derived from the TRU waste database. While Pits 5 and 6 received waste prior to and following the start of 1971, the greatest volume of waste was buried before 1971. For convenience, all of the waste placed in these units is included in the pre-1971 inventory. The data listed in Table 3-1 include the waste inventory developed using the extrapolation method and the waste for which disposal records exist.

Table 3-1. Total pre-1971 inventory volume and activity projections.

Disposal Unit/Waste Form	LLW Volume (m^3)	LLW Activity (Ci)	TRU Waste Volume (m^3)	TRU Waste Activity (Ci)	All Waste Volume (m^3)	All Waste Activity (Ci)
Pit Waste						
Surface-Contaminated Waste	4.0E+04	7.4E+02	1.7E+03	1.5E+04	4.2E+04	1.6E+04
Soils	6.0E+03	1.9E+01	1.1E+01	3.7E+01	6.1E+03	3.9E+01
Concrete and Sludges	4.5E+03	4.1E+02	3.0E+03	2.4E+03	7.5E+03	2.8E+03
Bulk-Contaminated Waste	1.1E+01	7.8E-02			1.1E+01	7.8E-02
	50 1511		4711		55 1611	
Shaft Waste						
Surface-Contaminated Waste	1.4E+02	3.5E+04	1.2E+00	8.3E+02	1.5E+02	3.6E+04
Soils	2.1E-02	—[a]			2.1E-02	0.0E+00
Concrete and Sludges	4.4E-01	—[a]			4.4E-01	0.0E+00
Bulk-Contaminated Waste	5.3E-01	5.5E+01			5.3E-01	5.5E+01

a. All disposal activities listed in the data used to project pre-1971 inventories were zero.

2700
830
3630

140,991
1.2
142,191

Radionuclide-specific inventories are listed in Tables 3-2 and 3-3 for pits and shafts, respectively, for the four waste forms discussed earlier. The waste volumes listed in the tables represent the quantity of waste contaminated with each radionuclide. Because several radionuclides may occur in a single waste package, the sum of these volumes is greater than the total volume of waste disposed of in the pits and shafts.

The radionuclide activities listed in Tables 3-2 and 3-3 represent as-disposed activities and include contributions from MAP, MFP, and the material types discussed in Section 2.1. The radionuclides listed have half-lives greater than 5 years or have parents or daughters with half-lives greater than 5 years. The radionuclides eliminated from the inventory projections based on half-life are listed in Appendix A.

Limited quantities of waste listed in the TRU waste database were disposed of non-retrievably in Pit 6. Table 3-4 lists the total volume, total activity, and radionuclide-specific inventories for the waste in this pit. This information is included in the data presented in Tables 3-1 through 3-3.

Using 1971 to 1977 waste data to infer the quantities and characteristics of the waste placed in Area G prior to 1971 overlooks waste that was not disposed of during the extrapolation period. It is practically impossible to identify all unique disposal events at Area G before 1971. However, Warren (1980) has identified several such events that involved large quantities of specific radionuclides and which were not captured by the extrapolation process. These events are summarized in Table 3-5.

Based on the information presented in Table 3-5, waste data were added to the extrapolation-based inventory projections. The waste form, total volume, total activity, and radiological characteristics of the waste represented by these additions are listed in Table 3-6 and are included in Tables 3-1 through 3-3. These additions were based on a number of assumptions. The sludge generated between 1952 and 1967 was assumed to be disposed of at Areas C and G in equal amounts because the Area G pits did not receive routine operational waste until the late 1950s. The 585 equivalent grams of Pu indicated for this waste were not included because it was unclear as to how to interpret this entry. All of the cement paste disposed of between 1959 and 1968 was assumed to be placed in pits at Area G,

Table 3-2. Pre-1971 radionuclide inventory projections for Area G pits.

Waste Form/Radionuclide	LLW Volume (m^3)	LLW Activity (Ci)	TRU Waste Volume (m^3)	TRU Waste Activity (Ci)	All Waste Volume (m^3)	All Waste Activity (Ci)
Surface-Contaminated Waste						
Ac-227	1.8E+00	1.2E-01	1.9E-01	7.4E-01	2.0E+00	8.6E-01
Ag-108m	3.1E+03	1.6E-03	2.5E+01	2.1E+00	3.2E+03	2.1E+00
Am-241			1.8E+01	4.4E+01	1.8E+01	4.4E+01
Ba-133	3.1E+03	5.7E-02	2.5E+01	7.6E+01	3.2E+03	7.6E+01
Cd-113m	3.1E+03	6.5E-03	2.5E+01	8.7E+00	3.2E+03	8.7E+00
Cf-249	9.7E-01	7.0E-04	3.6E-01	1.7E-03	1.3E+00	2.4E-03
Cf-251			1.5E-01	2.7E-03	1.5E-01	2.7E-03
Cf-252	4.9E-01	1.5E-02			4.9E-01	1.5E-02
Cm-244			3.6E-01	1.7E-03	3.6E-01	1.7E-03
Co-60	7.8E+02	8.7E-03			7.8E+02	8.7E-03
Cs-135	3.1E+03	2.9E-07	2.5E+01	3.9E-04	3.2E+03	4.0E-04
Cs-137	3.2E+03	2.7E-01	2.5E+01	1.4E+01	3.2E+03	1.5E+01
Dy-154	3.1E+03	1.0E-08	2.5E+01	1.4E-05	3.2E+03	1.4E-05
Eu-152	3.1E+03	3.6E-03	2.5E+01	4.8E+00	3.2E+03	4.8E+00
Eu-154	3.1E+03	1.0E-03	2.5E+01	1.4E+00	3.2E+03	1.4E+00
Gd-148	3.1E+03	2.8E-03	2.5E+01	3.7E+00	3.2E+03	3.7E+00
Gd-150	3.1E+03	2.9E-08	2.5E+01	3.9E-05	3.2E+03	3.9E-05
H-3	1.5E+03	2.7E+00			1.5E+03	2.7E+00
I-129	3.1E+03	2.0E-08	2.5E+01	2.6E-05	3.2E+03	2.6E-05
Kr-81	3.1E+03	3.5E-07	2.5E+01	4.7E-04	3.2E+03	4.7E-04
Kr-85	3.1E+03	1.9E-02	2.5E+01	2.3E+01	3.2E+03	2.3E+01
La-137	3.1E+03	5.7E-06	2.5E+01	7.6E-03	3.2E+03	7.6E-03
Mo-93	3.1E+03	1.1E-04	2.5E+01	1.5E-01	3.2E+03	1.5E-01
Nb-92	3.1E+03	3.4E-08	2.5E+01	4.5E-05	3.2E+03	4.5E-05
Nb-94	3.1E+03	3.4E-05	2.5E+01	4.5E-02	3.2E+03	4.5E-02
Np-237			5.5E-01	3.9E-03	5.5E-01	3.9E-03
Pd-107	3.1E+03	4.8E-08	2.5E+01	6.4E-05	3.2E+03	6.5E-05
Pu-238	8.2E+03	7.1E+02	1.2E+03	3.5E+03	9.5E+03	4.2E+03
Pu-239	1.9E+04	1.1E+00	1.4E+03	1.8E+03	2.0E+04	1.8E+03
Pu-240	1.1E+03	3.0E-03	6.2E+02	4.5E+02	1.7E+03	4.5E+02
Pu-241	1.1E+03	4.6E-02	6.2E+02	8.1E+03	1.7E+03	8.1E+03
Pu-242	1.1E+03	1.8E-07	6.2E+02	4.9E-02	1.7E+03	4.9E-02
Se-79	3.1E+03	3.2E-08	2.5E+01	4.3E-05	3.2E+03	4.3E-05
Sm-146	3.1E+03	2.6E-09	2.5E+01	3.5E-06	3.2E+03	3.5E-06
Sm-147	3.1E+03	2.0E-12	2.5E+01	2.7E-09	3.2E+03	2.7E-09
Sm-151	3.1E+03	8.8E-04	2.5E+01	1.2E+00	3.2E+03	1.2E+00
Sr-90	3.1E+03	3.1E-01	2.5E+01	3.0E+01	3.2E+03	3.0E+01
Tb-157	3.1E+03	3.2E-05	2.5E+01	4.3E-02	3.2E+03	4.3E-02
Tb-158	3.1E+03	1.4E-05	2.5E+01	1.9E-02	3.2E+03	1.9E-02
Tc-97	3.1E+03	2.6E-07	2.5E+01	3.5E-04	3.2E+03	3.5E-04
Tc-99	3.1E+03	3.2E-06	2.5E+01	4.3E-03	3.2E+03	4.3E-03
Th-230	1.9E-02	1.6E+01			1.9E-02	1.6E+01
Th-232	5.4E+00	1.7E-03			5.4E+00	1.7E-03

Table 3-2. Continued.

Waste Form/Radionuclide	LLW Volume (m^3)	LLW Activity (Ci)	TRU Waste Volume (m^3)	TRU Waste Activity (Ci)	All Waste Volume (m^3)	All Waste Activity (Ci)
U-234	7.3E+01	2.2E+00			7.3E+01	2.2E+00
U-235	1.8E+04	4.6E-01	1.3E+02	1.9E-04	1.8E+04	4.6E-01
U-236	1.0E+01	9.6E-05			1.0E+01	9.6E-05
U-238	1.3E+04	9.3E+00			1.3E+04	9.3E+00
Zr-93	3.1E+03	3.6E-07	2.5E+01	4.8E-04	3.2E+03	4.8E-04
Soil						
Co-60	1.9E-01	2.8E-04			1.9E-01	2.8E-04
Pu-238	2.4E+03	3.1E-01			2.4E+03	3.1E-01
Pu-239	4.2E+03	3.4E-02	4.5E+00	3.7E+01	4.2E+03	3.7E+01
Th-232	4.9E-03	1.9E-04			4.9E-03	1.9E-04
U-234	5.7E-01	4.2E-01			5.7E-01	4.2E-01
U-235	2.4E+03	1.7E-02			2.4E+03	1.7E-02
U-238	1.3E+03	1.1E+00			1.3E+03	1.1E+00
Concrete and Sludges						
Am-241	1.3E+03	7.2E-01	2.6E+03	2.2E+03	3.9E+03	2.2E+03
Co-60	1.9E-01	2.8E-04			1.9E-01	2.8E-04
Pu-238	2.6E+03	4.0E+02	1.9E+02	1.7E+02	2.8E+03	5.7E+02
Pu-239	4.3E+03	4.5E+00	3.0E+03	7.5E+01	7.3E+03	8.0E+01
U-233			2.5E+03	6.2E+00	2.5E+03	6.2E+00
U-235	1.9E+03	3.4E-03	4.9E+01	8.4E-05	2.0E+03	3.5E-03
Bulk-Contaminated Waste						
Co-60	1.1E+01	2.6E-03			1.1E+01	2.6E-03

G Am-241
Co-60
Cs-137
H3
Pu-238
Pu-239
Sr-90
U-235

P U-235
Pu-238
Pu-239
H-3
Am-241

alt bkg @ concentrat

Table 3-3. Pre-1971 radionuclide inventory projections for Area G shafts.

Waste Form/Radionuclide	LLW Volume (m^3)	LLW Activity (Ci)	TRU Waste Volume (m^3)	TRU Waste Activity (Ci)	All Waste Volume (m^3)	All Waste Activity (Ci)
Surface-Contaminated Waste						
Ag-108m	8.8E+00	1.9E+00	1.0E+00	1.6E+00	9.8E+00	3.5E+00
Am-241	2.0E+00	3.4E-08			2.0E+00	3.4E-08
Ba-133	8.8E+00	6.7E+01	1.0E+00	5.7E+01	9.8E+00	1.2E+02
C-14	3.4E-01	1.0E-02			3.4E-01	1.0E-02
Cd-113m	8.8E+00	7.7E+00	1.0E+00	6.5E+00	9.8E+00	1.4E+01
Cf-252	2.3E-01	5.5E+01			2.3E-01	5.5E+01
Cm-244	3.8E-01	1.9E-01			3.8E-01	1.9E-01
Co-60	4.4E+00	1.2E+01			4.4E+00	1.2E+01
Cs-135	8.8E+00	3.5E-04	1.0E+00	2.9E-04	9.8E+00	6.4E-04
Cs-137	9.2E+00	1.3E+01	1.0E+00	1.1E+01	1.0E+01	2.3E+01
Dy-154	8.8E+00	1.2E-05	1.0E+00	1.0E-05	9.8E+00	2.3E-05
Eu-152	8.8E+00	4.3E+00	1.0E+00	3.6E+00	9.8E+00	7.8E+00
Eu-154	8.8E+00	1.2E+00	1.0E+00	1.0E+00	9.8E+00	2.2E+00
Gd-148	8.8E+00	3.3E+00	1.0E+00	2.7E+00	9.8E+00	6.0E+00
Gd-150	8.8E+00	3.4E-05	1.0E+00	2.9E-05	9.8E+00	6.3E-05
H-3	4.5E+01	3.4E+04			4.5E+01	3.4E+04
I-129	8.8E+00	2.3E-05	1.0E+00	1.9E-05	9.8E+00	4.3E-05
Kr-81	8.8E+00	4.1E-04	1.0E+00	3.5E-04	9.8E+00	7.6E-04
Kr-85	8.8E+00	2.0E+01	1.0E+00	1.7E+01	9.8E+00	3.7E+01
La-137	8.8E+00	6.7E-03	1.0E+00	5.6E-03	9.8E+00	1.2E-02
Mo-93	8.8E+00	1.3E-01	1.0E+00	1.1E-01	9.8E+00	2.5E-01
Nb-92	8.8E+00	4.0E-05	1.0E+00	3.4E-05	9.8E+00	7.4E-05
Nb-94	8.8E+00	4.0E-02	1.0E+00	3.4E-02	9.8E+00	7.4E-02
Np-237	4.6E-02	7.1E-05			4.6E-02	7.1E-05
Pd-107	8.8E+00	5.7E-05	1.0E+00	4.8E-05	9.8E+00	1.0E-04
Pu-238	1.4E+01	7.9E-01	1.9E-02	3.0E-01	1.4E+01	1.1E+00
Pu-239	4.8E+01	1.3E+00	1.2E+00	4.9E+01	4.9E+01	5.0E+01
Pu-240			3.8E-03	1.0E+00	3.8E-03	1.0E+00
Pu-241	2.8E-03	7.3E-01	3.8E-03	1.5E+01	6.6E-03	1.6E+01
Pu-242			3.8E-03	5.8E-05	3.8E-03	5.8E-05
Se-79	8.8E+00	3.8E-05	1.0E+00	3.2E-05	9.8E+00	7.0E-05
Sm-146	8.8E+00	3.1E-06	1.0E+00	2.6E-06	9.8E+00	5.7E-06
Sm-147	8.8E+00	2.4E-09	1.0E+00	2.0E-09	9.8E+00	4.5E-09
Sm-151	8.8E+00	1.0E+00	1.0E+00	8.8E-01	9.8E+00	1.9E+00
Sr-90	8.8E+00	2.6E+01	1.0E+00	2.2E+01	9.8E+00	4.8E+01
Tb-157	8.8E+00	3.8E-02	1.0E+00	3.2E-02	9.8E+00	7.0E-02
Tb-158	8.8E+00	1.6E-02	1.0E+00	1.4E-02	9.8E+00	3.0E-02
Tc-97	8.8E+00	3.1E-04	1.0E+00	2.6E-04	9.8E+00	5.7E-04
Tc-99	8.8E+00	3.8E-03	1.0E+00	3.2E-03	9.8E+00	6.9E-03
Th-232	2.7E-01	1.1E-02			2.7E-01	1.1E-02
U-232	3.8E-03	2.1E-01			3.8E-03	2.1E-01
U-233	3.6E-01	4.0E+00			3.6E-01	4.0E+00
U-234	2.9E+00	2.9E-02	1.1E-02	2.1E-02	2.9E+00	4.9E-02

Table 3-3. Continued.

Waste Form/Radionuclide	LLW Volume (m^3)	LLW Activity (Ci)	TRU Waste Volume (m^3)	TRU Waste Activity (Ci)	All Waste Volume (m^3)	All Waste Activity (Ci)
U-235	5.3E+01	5.0E-03	8.9E-01	3.0E-03	5.4E+01	8.0E-03
U-236	6.3E-01	8.8E-05	1.1E-02	8.9E-05	6.4E-01	1.8E-04
U-238	4.2E+01	4.4E+00	1.1E-02	6.0E-06	4.2E+01	4.4E+00
Zr-93	8.8E+00	4.2E-04	1.0E+00	3.6E-04	9.8E+00	7.8E-04
Bulk-Contaminated Waste						
Co-60	5.3E-01	1.8E+00			5.3E-01	1.8E+00

Table 3-4. Quantities and radiological characteristics of TRU waste that was non-retrievably disposed of in Pit 6.

Waste Parameter	Disposal Volume (m^3)	Disposal Activity (Ci)
Waste Form Totals		
Surface-Contaminated Waste		
Soils		
Concrete and Sludges	1.9E+01	6.0E+01
Bulk-Contaminated Waste		
Radionuclide-Specific Inventories		
Pu-238	1.9E+01	5.7E+01
Pu-239	1.9E+01	3.6E+00

Table 3-5. Area G disposal events that are not fully captured by the extrapolation process.

Date of Disposal	Disposal Area	Disposal Units	Quantities of Disposed Radionuclides (g) Pu	Am-241	U-233	Other	Comments
1952-1967	C, G	Pits	3.4E+02			585 equivalent g Pu	Over 3,000 55-gal drums containing weapons-grade Pu disposed of as sludge; generated by the TA-21 treatment plant
1959-1968	C, G	Pits	7.4E+02	6.6E+02	6.5E+02		Approximately 11,800 55-gal drums of weapons-grade material disposed of as cement paste
1951-1963	C, G	Pits	N/A[a]	N/A[a]	N/A[a]		Sludge in 55-gal drums from TA-45 treatment plant
1960	G	Pit 1	6.0E+02				Approximately 30 to 40 30-gal drums containing sand from TA-21 decontamination activities

a. N/A indicates that data were unavailable.

Table 3-6. Additions to the extrapolation-based waste inventory projections for the pre-1971 period.

Waste	Waste Form	Total Volume (m^3)	Total Activity (Ci)	Radionuclide	Radionuclide Activity (Ci)
1952-1967 Sludge	Concrete/Sludge	3.1E+02	1.0E+01	Pu-239	1.0E+01
1959-1968 Cement Paste	Concrete/Sludge	2.5E+03	2.2E+03	Am-241	2.1E+03
				Pu-239	4.5E+01
				U-233	6.2E+00
1960 Soil	Soil	4.5E+00	3.7E+01	Pu-239	3.7E+01

although small quantities of it were probably placed in Area C pits. Finally, all Pu inventories listed in Table 3-5 were assumed to be Pu-239 (Warren, 1996).

3.1.2 1971 to September 25, 1988, Inventory

Twenty-five pits and over 140 shafts were used to dispose of LLW at Area G between 1971 and September 25, 1988. The total volumes and activities of LLW placed in these disposal units during this period are listed in Table 3-7 for the four waste forms described earlier. Individual totals are reported for each pit, while inventories are summed over the shafts.

As discussed in Section 3.1.1, the waste disposed of in Pits 5 and 6 is included in the pre-1971 disposal period for convenience. While these pits received waste prior to and following 1971, the greatest volume of material was buried before 1971. In addition, one shipment of waste was placed in Pit 32 after September 25, 1988. For simplicity, this shipment is included in the waste data presented in this section. Pit 36 and several shafts were used prior to September 26, 1988, and following that date. The data presented in Table 3-7 include the waste that was disposed of in those units through September 25, 1988.

Pit 9 was used for the disposal of LLW and retrievable storage of TRU waste. Although retrieval of the TRU waste will likely entail removal of the LLW as well, the latter is expected to be placed back into a disposal unit at Area G. Consequently, the LLW disposed of in Pit G is maintained in the inventory.

Radionuclide-specific inventories are listed in Tables 3-8 and 3-9 for the pits and shafts, respectively, for the four waste forms discussed earlier. Inventories are provided for each pit, but are summed over all of the shaft disposal units. The volumes provided in the tables are the quantities of waste contaminated with each radionuclide. Because several radionuclides may occur in a single waste package, the sum of these waste package volumes is greater than the total volume of waste disposed of in the pits and shafts. The listed activities include contributions from MAP, MFP, and the material types discussed in Section 2.1.

Table 3-7. Pit and shaft waste volumes and activities disposed of from 1971 to September 25, 1988.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)		Total Disposal Activity (Ci)
Pit 7			
Surface-Contaminated Waste	2.0E+03	2034	1.4E-01
Soils	1.0E+03	1017	2.0E-01
Concrete and Sludges	2.6E+02	264	2.0E+01
Bulk-Contaminated Waste	2.9E+00	29	2.6E-02
	3263	3322	
Pit 8			
Surface-Contaminated Waste	7.7E+02		3.3E-05
Soils	2.8E+02		0.0E+00
Concrete and Sludges	7.8E+02		2.1E+01
Bulk-Contaminated Waste	0.0E+00		0.0E+00
Pit 9			
Surface-Contaminated Waste	4.8E+00		1.2E+00
Soils	0.0E+00		0.0E+00
Concrete and Sludges	0.0E+00		0.0E+00
Bulk-Contaminated Waste	0.0E+00		0.0E+00
Pit 10			
Surface-Contaminated Waste	2.5E+03		6.4E+03
Soils	4.1E+02		1.5E+00
Concrete and Sludges	2.1E+02		1.3E+00
Bulk-Contaminated Waste	1.1E+01		3.8E+02
Pit 12			
Surface-Contaminated Waste	6.4E+02		8.3E-03
Soils	9.3E+02		0.0E+00
Concrete and Sludges	2.4E+02		3.4E-01
Bulk-Contaminated Waste	0.0E+00		0.0E+00
Pit 13			
Surface-Contaminated Waste	1.2E+03		1.7E+00
Soils	2.8E+02		4.2E-01
Concrete and Sludges	4.9E+01		4.3E-06
Bulk-Contaminated Waste	8.9E+00		1.5E-02

Table 3-7. Continued.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pit 16		
Surface-Contaminated Waste	1.6E+03	1.8E+00
Soils	8.9E+01	3.4E-02
Concrete and Sludges	1.6E+00	0.0E+00
Bulk-Contaminated Waste	3.7E+00	4.4E-02
Pit 17		
Surface-Contaminated Waste	3.1E+03	7.0E-02
Soils	3.5E+02	0.0E+00
Concrete and Sludges	3.6E+02	0.0E+00
Bulk-Contaminated Waste	0.0E+00	0.0E+00
Pit 18		
Surface-Contaminated Waste	6.6E+03	3.0E+04
Soils	2.3E+03	6.4E-01
Concrete and Sludges	6.3E+02	2.5E+00
Bulk-Contaminated Waste	1.7E+01	2.1E+00
Pit 19		
Surface-Contaminated Waste	5.3E+01	3.0E-01
Soils	9.0E-01	0.0E+00
Concrete and Sludges	9.0E-01	0.0E+00
Bulk-Contaminated Waste	0.0E+00	0.0E+00
Pit 20		
Surface-Contaminated Waste	1.2E+03	1.4E+00
Soils	1.0E+04	0.0E+00
Concrete and Sludges	2.0E+02	4.9E+00
Bulk-Contaminated Waste	0.0E+00	0.0E+00
Pit 21		
Surface-Contaminated Waste	2.5E+03	5.5E-01
Soils	2.4E+02	0.0E+00
Concrete and Sludges	2.1E+01	0.0E+00
Bulk-Contaminated Waste	0.0E+00	0.0E+00

Table 3-7. Continued.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pit 22		
Surface-Contaminated Waste	1.3E+03	6.0E+02
Soils	1.4E+03	1.8E-01
Concrete and Sludges	1.5E+02	1.0E+00
Bulk-Contaminated Waste	1.8E+01	1.6E-01
Pit 24		
Surface-Contaminated Waste	1.5E+03	1.4E+01
Soils	4.1E+03	2.8E-01
Concrete and Sludges	1.1E+01	5.0E-03
Bulk-Contaminated Waste	3.5E+01	3.7E-01
Pit 25		
Surface-Contaminated Waste	3.8E+03	3.7E+02
Soils	5.4E+02	3.2E-01
Concrete and Sludges	1.9E+02	0.0E+00
Bulk-Contaminated Waste	3.0E+01	6.3E-01
Pit 26		
Surface-Contaminated Waste	2.1E+03	4.9E+01
Soils	1.0E+03	1.9E+00
Concrete and Sludges	5.8E+02	1.7E+01
Bulk-Contaminated Waste	6.2E+01	4.8E+01
Pit 27		
Surface-Contaminated Waste	3.2E+03	1.6E+02
Soils	2.7E+03	9.9E-01
Concrete and Sludges	2.1E+02	6.4E-03
Bulk-Contaminated Waste	2.7E+01	2.6E+01
Pit 28		
Surface-Contaminated Waste	2.0E+03	1.3E+03
Soils	1.4E+03	5.9E-01
Concrete and Sludges	2.6E+02	1.1E-01
Bulk-Contaminated Waste	1.6E+01	6.5E+01

Table 3-7. Continued.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pit 29		
Surface-Contaminated Waste	4.2E+03	2.3E+03
Soils	2.9E+03	3.3E+00
Concrete and Sludges	4.8E+02	2.9E+00
Bulk-Contaminated Waste	1.8E+02	3.7E+00
Pit 32		
Surface-Contaminated Waste	3.0E+03	1.4E+02
Soils	1.3E+03	1.0E+01
Concrete and Sludges	3.1E+02	7.0E+00
Bulk-Contaminated Waste	1.6E+02	4.1E+00
Pit 33		
Surface-Contaminated Waste	4.8E+03	3.8E+01
Soils	1.1E+03	7.0E-01
Concrete and Sludges	6.0E+02	1.3E+00
Bulk-Contaminated Waste	1.1E+02	1.3E+01
Pit 35		
Surface-Contaminated Waste	1.9E+03	7.4E+01
Soils	6.6E+02	5.6E-01
Concrete and Sludges	1.8E+02	1.6E+00
Bulk-Contaminated Waste	1.1E+02	4.0E+00
Pit 36		
Surface-Contaminated Waste	2.1E+03	3.5E+01
Soils	5.2E+02	6.6E-02
Concrete and Sludges	1.7E+02	5.7E-01
Bulk-Contaminated Waste	9.4E+01	1.4E+00
		4.1E+04
Shafts		
Surface-Contaminated Waste	7.7E+02	8.2E+05
Soils	2.2E+01	1.0E+02
Concrete and Sludges	7.1E-01	1.0E+02
Bulk-Contaminated Waste	1.2E+02	6.7E+03

Table 3-8. Pit radionuclide inventories for 1971 through September 25, 1988.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 7								
Ag-108m	4.0E+02	9.7E-05						
Am-241					1.2E+02	1.3E-01		
Ba-133	4.0E+02	3.5E-03						
Cd-113m	4.0E+02	4.0E-04						
Cf-252	2.8E-01	8.6E-03					2.9E+00	8.6E-04
Co-60	2.6E+01	9.3E-04						
Cs-135	4.0E+02	1.8E-08						
Cs-137	4.0E+02	6.6E-04						
Dy-154	4.0E+02	6.4E-10						
Eu-152	4.0E+02	2.2E-04						
Eu-154	4.0E+02	6.3E-05						
Gd-148	4.0E+02	1.7E-04						
Gd-150	4.0E+02	1.8E-09						
I-129	4.0E+02	1.2E-09						
Kr-81	4.0E+02	2.1E-08						
Kr-85	4.0E+02	1.1E-03						
La-137	4.0E+02	3.5E-07						
Mo-93	4.0E+02	6.9E-06						
Nb-92	4.0E+02	2.1E-09						
Nb-94	4.0E+02	2.1E-06						
Pd-107	4.0E+02	3.0E-09						
Pu-238	1.3E+03	4.7E-02	9.8E+02	1.8E-01	2.4E+02	2.0E+01		
Pu-239	1.9E+03	5.3E-03	1.0E+03	2.0E-02	2.6E+02	4.0E-01		
Pu-240	2.2E+02	1.2E-04						
Pu-241	2.2E+02	1.7E-03						
Pu-242	2.2E+02	6.7E-09						
Se-79	4.0E+02	2.0E-09						
Sm-146	4.0E+02	1.6E-10						
Sm-147	4.0E+02	1.2E-13						
Sm-151	4.0E+02	5.4E-05						
Sr-90	4.0E+02	1.4E-03						
Tb-157	4.0E+02	2.0E-06						
Tb-158	4.0E+02	8.5E-07						
Tc-97	4.0E+02	1.6E-08						
Tc-99	4.0E+02	2.0E-07						
U-235	9.9E+02	8.6E-05			1.9E+02	1.6E-03		
Zr-93	4.0E+02	2.2E-08						
Pit 8								
Am-241					3.1E+02	9.8E-01		
Th-232	1.4E+00	3.3E-05			—			
Pu-238					7.7E+02	1.6E+01		
Pu-239					7.7E+02	3.5E+00		

Table 3-8. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 9								
Ag-108m	7.6E-03	2.1E-03						
Ba-133	7.6E-03	7.4E-02						
Cd-113m	7.6E-03	8.5E-03						
Cs-135	7.6E-03	3.8E-07						
Cs-137	7.6E-03	1.4E-02						
Dy-154	7.6E-03	1.4E-08						
Eu-152	7.6E-03	4.7E-03						
Eu-154	7.6E-03	1.3E-03						
Gd-148	7.6E-03	3.6E-03						
Gd-150	7.6E-03	3.8E-08						
I-129	7.6E-03	2.6E-08						
Kr-81	7.6E-03	4.5E-07						
Kr-85	7.6E-03	2.2E-02						
La-137	7.6E-03	7.4E-06						
Mo-93	7.6E-03	1.5E-04						
Nb-92	7.6E-03	4.4E-08						
Nb-94	7.6E-03	4.4E-05						
Pd-107	7.6E-03	6.3E-08						
Pu-238	4.8E+00	1.8E-01						
Se-79	7.6E-03	4.2E-08						
Sm-146	7.6E-03	3.4E-09						
Sm-147	7.6E-03	2.7E-02						
Sm-151	7.6E-03	1.2E-03						
Sr-90	7.6E-03	2.9E-02						
Tb-157	7.6E-03	4.2E-05						
Tb-158	7.6E-03	1.8E-05						
Tc-97	7.6E-03	3.4E-07						
Tc-99	7.6E-03	4.2E-06						
Zr-93	7.6E-03	4.7E-07						
Pit 10								
Ag-108m	2.4E+02	1.1E-04						
Am-241	6.2E+01	1.0E-03						
Ba-133	2.4E+02	3.8E-03						
C-14	2.0E+00	9.0E-07						
Cd-113m	2.4E+02	4.3E-04						
Cf-252	2.8E-02	8.0E-06						
Co-60	5.6E+01	1.2E+01	6.2E-01	9.9E-06			1.1E+01	1.2E+01
Cs-135	2.4E+02	2.0E-08						
Cs-137	5.7E+02	2.2E-03	6.2E+01	5.1E-07	1.4E+01	5.0E-07		
Dy-154	2.4E+02	6.9E-10						
Eu-152	2.4E+02	2.4E-04						
Eu-154	2.4E+02	6.8E-05						
Gd-148	2.4E+02	1.8E-04						
Gd-150	2.4E+02	1.9E-09						
H-3	1.4E+02	6.1E+03	1.5E+01	1.3E+00	1.6E+01	1.3E+00		

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
I-129	2.4E+02	1.3E-09						
Kr-81	2.4E+02	2.3E-08						
Kr-85	2.4E+02	1.1E-03						
La-137	2.4E+02	3.8E-07						
Mo-93	2.4E+02	7.5E-06						
Nb-92	2.4E+02	2.3E-09						
Nb-94	2.4E+02	2.3E-06						
Pd-107	2.4E+02	3.2E-09						
Pu-238	4.6E+02	2.3E-02						
Pu-239	1.4E+03	5.5E-02	2.6E+02	5.0E-07	1.8E+02	5.0E-07		
Pu-240	1.4E+02	6.3E-04						
Pu-241	1.4E+02	9.5E-03						
Pu-242	1.4E+02	3.6E-08						
Ra-226	2.1E-01	9.9E-02						
Se-79	2.4E+02	2.1E-09						
Sm-146	2.4E+02	1.7E-10						
Sm-147	2.4E+02	1.4E-13						
Sm-151	2.4E+02	5.9E-05						
Sr-90	5.8E+02	2.1E-01	6.4E+01	5.1E-07	2.4E+01	5.0E-07		
Tb-157	2.4E+02	2.1E-06						
Tb-158	2.4E+02	9.2E-07						
Tc-97	2.4E+02	1.7E-08						
Tc-99	2.4E+02	2.1E-07						
Th-232	1.8E+00	4.4E-04						
U-233	1.0E+00	1.9E-05						
U-234	6.8E-01	7.2E-02	1.4E-02	7.0E-03				
U-235	6.9E+02	1.1E-02	1.4E-02	2.7E-04				
U236	2.1E-01	6.3E-08						
U-238	4.5E+02	1.5E+00	1.0E+02	2.1E-01				
Zr-93	2.4E+02	2.4E-08						
Pit 12								
Ag-108m	2.2E+01	1.7E-05						
Ba-133	2.2E+01	5.9E-04						
Cd-113m	2.2E+01	6.8E-05						
Cs-135	2.2E+01	3.1E-09						
Cs-137	2.2E+01	1.1E-04						
Dy-154	2.2E+01	1.1E-10						
Eu-152	2.2E+01	3.8E-05						
Eu-154	2.2E+01	1.1E-05						
Gd-148	2.2E+01	2.9E-05						
Gd-150	2.2E+01	3.0E-10						
I-129	2.2E+01	2.0E-10						
Kr-81	2.2E+01	3.6E-09						
Kr-85	2.2E+01	1.8E-04						
La-137	2.2E+01	5.9E-08						
Mo-93	2.2E+01	1.2E-06						

Table 3-8. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
Nb-92	2.2E+01	3.5E-10						
Nb-94	2.2E+01	3.5E-07						
Pd-107	2.2E+01	5.0E-10						
Pu-238	1.6E+02	5.6E-05			6.7E+01	2.7E-01		
Pu-239	2.3E+01	4.4E-05			2.4E+02	7.1E-02		
Pu-240	2.3E+01	1.0E-05						
Pu-241	2.3E+01	1.5E-04						
Pu-242	2.3E+01	5.9E-10						
Se-79	2.2E+01	3.3E-10						
Sm-146	2.2E+01	2.7E-11						
Sm-147	2.2E+01	2.1E-14						
Sm-151	2.2E+01	9.2E-06						
Sr-90	2.2E+01	2.3E-04						
Tb-157	2.2E+01	3.4E-07						
Tb-158	2.2E+01	1.4E-07						
Tc-97	2.2E+01	2.7E-09						
Tc-99	2.2E+01	3.3E-08						
Zr-93	2.2E+01	3.7E-09						
Pit 13								
Ag-108m	7.1E+01	3.1E-05						
Ba-133	7.1E+01	1.1E-03						
Cd-113m	7.1E+01	1.3E-04						
Co-60	7.4E+01	6.7E-04	1.1E+00	1.4E-07	1.1E+00	1.4E-07	8.9E+00	5.0E-04
Cs-135	7.1E+01	5.8E-09						
Cs-137	7.1E+01	2.1E-04						
Dy-154	7.1E+01	2.0E-10						
Eu-152	7.1E+01	7.1E-05						
Eu-154	7.1E+01	2.0E-05						
Gd-148	7.1E+01	5.4E-05						
Gd-150	7.1E+01	5.7E-10						
H-3	8.3E+00	5.0E-01						
I-129	7.1E+01	3.8E-10						
Kr-81	7.1E+01	6.8E-09						
Kr-85	7.1E+01	3.3E-04						
La-137	7.1E+01	1.1E-07						
Nb-92	7.1E+01	6.6E-10						
Mo-93	7.1E+01	2.2E-06						
Nb-92	7.1E+01	6.6E-10						
Nb-94	7.1E+01	6.6E-07						
Pd-107	7.1E+01	9.4E-10						
Se-79	7.1E+01	6.3E-10						
Sm-146	7.1E+01	5.1E-11						
Sm-147	7.1E+01	4.0E-14						
Sm-151	7.1E+01	1.7E-05						
Sr-90	7.1E+01	4.4E-04						
Tb-157	7.1E+01	6.3E-07						

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
Tb-158	7.1E+01	2.7E-07						
Tc-97	7.1E+01	5.1E-09						
Tc-99	7.1E+01	6.2E-08						
U-234	3.3E+00	9.9E-03	2.8E-02	1.1E-01				
U-235	6.8E+02	3.8E-04	8.0E+01	4.4E-03	3.7E+01	2.5E-10		
U-238	4.6E+02	1.2E+00	1.8E+02	3.0E-01				
Zr-93	7.1E+01	7.0E-09						
Pit 16							3.7E+00	1.4E-03
Co-60	1.3E+01	2.6E-03						
Th-232	1.7E+00	6.5E-04						
U-234	1.1E+01	3.7E-01	2.8E-01	1.7E-02				
U-235	5.7E+02	5.4E-02	2.8E-01	7.4E-04				
U-236	3.8E+00	5.3E-05						
U-238	1.5E+03	1.3E+00	2.8E-01	1.6E-02				
Pit 17								
Ac-227	1.0E+00	7.0E-02						
Pit 18								
Ag-108m	2.9E+02	2.5E-03						
Am-241	1.0E+02	2.7E-04	9.6E+00	2.0E-03	1.3E+02	3.3E-01		
Ba-133	2.9E+02	8.9E-02						
C-14	4.4E+00	2.0E-06						
Cd-113m	2.9E+02	1.0E-02						
Co-60	6.3E+01	1.1E+03	1.5E+00	1.7E-07	3.0E-02	1.7E-07	1.7E+01	7.0E-02
Cs-135	2.9E+02	4.6E-07						
Cs-137	2.9E+02	1.7E-02						
Dy-154	2.9E+02	1.6E-08						
Eu-152	2.9E+02	5.6E-03						
Eu-154	2.9E+02	1.6E-03						
Gd-148	2.9E+02	4.3E-03						
Gd-150	2.9E+02	4.5E-08						
H-3	8.3E+01	1.0E+01	7.3E+00	2.8E-07	7.3E+00	2.8E-07		
I-129	2.9E+02	3.1E-08						
Kr-81	2.9E+02	5.4E-07						
Kr-85	2.9E+02	2.7E-02						
La-137	2.9E+02	8.8E-06						
Mo-93	2.9E+02	1.8E-04						
Nb-92	2.9E+02	5.3E-08						
Nb-94	2.9E+02	5.3E-05						
Pd-107	2.9E+02	7.5E-08						
Pu-238	1.5E+03	1.4E-03	5.5E+01	1.3E-08	1.6E+02	1.2E+00		
Pu-239	3.1E+03	3.1E-02	1.6E+03	6.1E-03	3.1E+02	9.7E-01		
Pu-240	6.3E+02	2.0E-03						
Pu-241	6.3E+02	3.1E-02						
Pu-242	6.3E+02	1.2E-07						

Table 3-8. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Se-79	2.9E+02	5.0E-08						
Sm-146	2.9E+02	4.1E-09						
Sm-147	2.9E+02	3.2E-12						
Sm-151	2.9E+02	1.4E-03						
Sr-90	2.9E+02	1.1E+00						
Tb-157	2.9E+02	5.1E-05						
Tb-158	2.9E+02	2.2E-05						
Tc-97	2.9E+02	4.1E-07						
Tc-99	2.9E+02	5.0E-06						
Th-232	6.4E+00	8.7E-04						
U-234	5.0E+00	9.7E-02	3.4E-02	5.8E-02				
U-235	1.1E+03	1.3E-02	6.6E+01	2.2E-03	1.8E+02	2.5E-10		
U-236	2.3E+00	5.3E-06						
U-238	7.6E+02	1.8E+00	1.5E+02	5.8E-01				
Zr-93	2.9E+02	5.6E-07						
Pit 19								
Ag-108m	3.4E-02	6.2E-04						
Ba-133	3.4E-02	2.2E-02						
Cd-113m	3.4E-02	2.5E-03						
Cs-135	3.4E-02	1.2E-07						
Cs-137	3.4E-02	4.2E-03						
Dy-154	3.4E-02	4.1E-09						
Eu-152	3.4E-02	1.4E-03						
Eu-154	3.4E-02	4.0E-04						
Gd-148	3.4E-02	1.1E-03						
Gd-150	3.4E-02	1.1E-08						
I-129	3.4E-02	7.7E-09						
Kr-81	3.4E-02	1.4E-07						
Kr-85	3.4E-02	6.7E-03						
La-137	3.4E-02	2.2E-06						
Mo-93	3.4E-02	4.4E-05						
Nb-92	3.4E-02	1.3E-08						
Nb-94	3.4E-02	1.3E-05						
Pd-107	3.4E-02	1.9E-08						
Se-79	3.4E-02	1.3E-08						
Sm-146	3.4E-02	1.0E-09						
Sm-147	3.4E-02	8.0E-13						
Sm-151	3.4E-02	3.5E-04						
Sr-90	3.4E-02	8.7E-03						
Tb-157	3.4E-02	1.3E-05						
Tb-158	3.4E-02	5.4E-06						
Tc-97	3.4E-02	1.0E-07						
Tc-99	3.4E-02	1.2E-06						
Zr-93	3.4E-02	1.4E-07						

Table 3-8. Continued.

Radionuclide	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 20								
Ag-108m	2.2E+02	1.3E-04						
Am-241					1.9E+02	1.0E-01		
Ba-133	2.2E+02	4.8E-03						
Cd-113m	2.2E+02	5.5E-04						
Cf-249	5.7E-01	4.1E-04						
Cf-251	8.5E-02	1.6E-03						
Cs-135	2.2E+02	2.5E-08						
Cs-137	2.2E+02	9.1E-04						
Dy-154	2.2E+02	8.8E-10						
Eu-152	2.2E+02	3.1E-04						
Eu-154	2.2E+02	8.7E-05						
Gd-148	2.2E+02	2.3E-04						
Gd-150	2.2E+02	2.5E-09						
H-3	1.7E+01	6.0E-01						
I-129	2.2E+02	1.7E-09						
Kr-81	2.2E+02	2.9E-08						
Kr-85	2.2E+02	1.4E-03						
La-137	2.2E+02	4.8E-07						
Mo-93	2.2E+02	9.6E-06						
Nb-92	2.2E+02	2.9E-09						
Nb-94	2.2E+02	2.9E-06						
Pd-107	2.2E+02	4.1E-09						
Pu-238	7.9E+02	1.2E-01			2.0E+02	4.2E+00		
Pu-239	1.2E+03	6.5E-01			2.0E+02	5.8E-01		
Pu-240	2.9E+02	5.6E-04						
Pu-241	2.9E+02	8.5E-03						
Pu-242	2.9E+02	3.3E-08						
Se-79	2.2E+02	2.7E-09						
Sm-146	2.2E+02	2.2E-10						
Sm-147	2.2E+02	1.7E-13						
Sm-151	2.2E+02	7.5E-05						
Sr-90	2.2E+02	1.9E-03						
Tb-157	2.2E+02	2.7E-06						
Tb-158	2.2E+02	1.2E-06						
Tc-97	2.2E+02	2.2E-08						
Tc-99	2.2E+02	2.7E-07						
U-235					1.9E+02	4.7E-04		
Zr-93	2.2E+02	3.0E-08						
Pit 21								
U-234	1.8E+00	1.0E-01						
U-235	2.0E+03	1.7E-01						
U-238	2.1E+03	2.7E-01						

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
Pit 22								
Ag-108m	1.1E+02	1.2E+00						
Am-241	2.1E-01	3.4E-03			8.0E+01	1.7E-01		
Ba-133	1.1E+02	4.5E+01						
Cd-113m	1.1E+02	5.1E+00						
Co-60	2.4E+01	5.3E-03					1.8E+01	5.3E-03
Cs-135	1.1E+02	2.3E-04						
Cs-137	1.1E+02	8.4E+00						
Dy-154	1.1E+02	8.2E-06						
Eu-152	1.1E+02	2.8E+00						
Eu-154	1.1E+02	8.0E-01						
Gd-148	1.1E+02	2.2E+00						
Gd-150	1.1E+02	2.3E-05						
H-3	1.8E+01	5.0E-05						
I-129	1.1E+02	1.5E-05						
Kr-81	1.1E+02	2.7E-04						
Kr-85	1.1E+02	1.3E+01						
La-137	1.1E+02	4.4E-03						
Mo-93	1.1E+02	8.8E-02						
Nb-92	1.1E+02	2.7E-05						
Nb-94	1.1E+02	2.7E-02						
Pd-107	1.1E+02	3.8E-05						
Pu-238	2.9E+02	6.4E-03			8.4E+01	4.5E-01		
Pu-239	8.4E+02	9.4E-01			1.4E+02	4.1E-01		
Pu-240	9.6E+01	1.2E-03						
Pu-241	9.6E+01	1.9E-02						
Pu-242	9.6E+01	7.2E-08						
Se-79	1.1E+02	2.5E-05						
Sm-146	1.1E+02	2.0E-06						
Sm-147	1.1E+02	1.6E-09						
Sm-151	1.1E+02	6.9E-01						
Sr-90	1.1E+02	1.7E+01						
Tb-157	1.1E+02	2.5E-02						
Tb-158	1.1E+02	1.1E-02						
Tc-97	1.1E+02	2.0E-04						
Tc-99	1.1E+02	2.5E-03						
U-234			1.7E-02	4.9E-02				
U-235	4.3E+02	5.6E-04	1.7E-02	1.9E-03				
U-238	3.1E+02	4.7E-01	2.9E+01	1.3E-01				
Zr-93	1.1E+02	2.8E-04						
Pit 24								
Co-60	8.1E+01	1.7E-02	1.1E-01	1.7E-04	1.1E-01	1.7E-04	3.5E+01	1.2E-02
Cs-137	7.6E-01	1.5E-01						
H-3	3.0E+01	5.0E-01						
Sr-90	7.6E-01	1.7E-01						
Th-230	1.1E-02	9.5E+00						

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Th-232	5.7E-02	3.3E-04	2.8E-03	1.1E-04				
U-234	2.7E+01	7.8E-01	8.5E-03	6.7E-02				
U-235	6.6E+02	3.2E-02	8.5E-03	2.6E-03				
U-236	2.2E+00	3.1E-06						
U-238	1.0E+03	2.2E+00	4.1E+03	2.0E-01				
Pit 25								
Ag-108m	3.5E+02	2.5E-03						
Am-241	1.7E+02	3.1E-03						
Ba-133	3.5E+02	8.9E-02						
Cd-113m	3.5E+02	1.0E-02						
Co-60	2.3E+02	1.2E+02					3.0E+01	2.1E-02
Cs-135	3.5E+02	4.6E-07						
Cs-137	6.9E+02	2.0E+02	7.1E+00	1.0E-09				
Dy-154	3.5E+02	1.6E-08						
Eu-152	3.5E+02	5.6E-03						
Eu-154	3.5E+02	1.6E-03						
Gd-148	3.5E+02	4.3E-03						
Gd-150	3.5E+02	4.5E-08						
H-3	9.9E+01	5.0E+01						
I-129	3.5E+02	3.1E-08						
Kr-81	3.5E+02	5.4E-07						
Kr-85	3.5E+02	2.7E-02						
La-137	3.5E+02	8.8E-06						
Mo-93	3.5E+02	1.8E-04						
Nb-92	3.5E+02	5.3E-08						
Nb-94	3.5E+02	5.3E-05						
Pd-107	3.5E+02	7.5E-08						
Pu-238	7.3E+02	1.6E-03						
Pu-239	2.2E+03	5.5E-02						
Pu-240	2.0E+02	4.6E-04						
Pu-241	2.0E+02	7.0E-03						
Pu-242	2.0E+02	2.7E-08						
Se-79	3.5E+02	5.0E-08						
Sm-146	3.5E+02	4.1E-09						
Sm-147	3.5E+02	3.2E-12						
Sm-151	3.5E+02	1.4E-03						
Sr-90	7.5E+02	4.2E-02	1.6E+01	4.0E-03				
Tb-157	3.5E+02	5.1E-05						
Tb-158	3.5E+02	2.2E-05						
Tc-97	3.5E+02	4.1E-07						
Tc-99	3.5E+02	5.0E-06						
U-234			2.5E-02	2.8E-02				
U-235	9.4E+02	9.9E-03	7.1E+01	1.1E-03				
U-238	8.0E+02	1.0E+00	5.6E+01	2.8E-01				
Zr-93	3.5E+02	5.6E-07						

Table 3-8. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 26								
Ag-108m					1.9E+02	1.2E-03		
Am-241	1.6E+02	8.2E-04			2.0E+02	1.4E+01		
Ba-133					1.9E+02	4.2E-02		
Cd-113m					1.9E+02	4.8E-03		
Ce-144					1.9E+02	5.4E-02		
Co-60	9.7E+01	2.6E+00					6.2E+01	1.6E+00
Cs-135					1.9E+02	2.2E-07		
Cs-137					1.9E+02	7.9E-03		
Dy-154					1.9E+02	7.7E-09		
Eu-152					1.9E+02	2.7E-03		
Eu-154					1.9E+02	7.6E-04		
Gd-148					1.9E+02	2.0E-03		
Gd-150					1.9E+02	2.1E-08		
H-3	1.1E+02	3.0E-03						
I-129					1.9E+02	1.4E-08		
Kr-81					1.9E+02	2.6E-07		
Kr-85					1.9E+02	1.3E-02		
La-137					1.9E+02	4.2E-06		
Mo-93					1.9E+02	8.3E-05		
Nb-92					1.9E+02	2.5E-08		
Nb-94					1.9E+02	2.5E-05		
Pd-107					1.9E+02	3.6E-08		
Pu-238	2.5E+02	3.4E-03	4.6E+01	7.6E-02	2.0E+02	7.4E-01		
Pu-239	8.8E+02	1.7E-02	2.0E+02	1.6E+00	3.0E+02	1.1E+00		
Pu-240	1.1E+02	8.2E-04	2.1E+01	1.3E-02				
Pu-241	1.1E+02	1.2E-02	2.1E+01	2.0E-01				
Pu-242	1.1E+02	4.7E-08	2.1E+01	7.4E-07				
Se-79					1.9E+02	2.4E-08		
Sm-146					1.9E+02	1.9E-09		
Sm-147					1.9E+02	1.5E-12		
Sm-151					1.9E+02	6.5E-04		
Sr-90	2.1E+02	8.2E-03	5.4E+02	9.3E-02	2.6E+02	1.8E-02		
Tb-157					1.9E+02	2.4E-05		
Tb-158					1.9E+02	1.0E-05		
Tc-97					1.9E+02	1.9E-07		
Tc-99					1.9E+02	2.4E-06		
U-235	5.8E+02	1.5E-01			2.3E+02	7.5E-04		
U-238	3.3E+02	1.1E-01	1.3E+02	1.2E-03				
Zr-93					1.9E+02	2.6E-07		
Pit 27								
Ag-108m	3.7E+02	4.2E-05	1.3E+02	2.3E-05	9.8E+00	1.6E-08		
Am-241	2.0E+02	8.4E-08	3.7E+01	8.5E-06	1.1E+01	2.3E-09		
Ba-133	3.7E+02	1.5E-03	1.3E+02	8.2E-04	9.8E+00	5.8E-07		
Cd-113m	3.7E+02	1.7E-04	1.3E+02	9.4E-05	9.8E+00	6.5E-08		
Co-60	1.1E+02	1.8E+00					2.7E+01	8.4E-01

Table 3-8. Continued.

Radionuclide	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Cs-135	3.7E+02	7.9E-09	1.3E+02	4.3E-09	9.8E+00	3.0E-12		
Cs-137	4.8E+02	2.9E-04	1.3E+02	1.6E-04	9.8E+00	1.1E-07		
Dy-154	3.7E+02	2.8E-10	1.3E+02	1.5E-10	9.8E+00	1.1E-13		
Eu-152	3.7E+02	9.6E-05	1.3E+02	5.2E-05	9.8E+00	3.6E-08		
Eu-154	3.7E+02	2.7E-05	1.3E+02	1.5E-05	9.8E+00	1.0E-08		
Gd-148	3.7E+02	7.4E-05	1.3E+02	4.0E-05	9.8E+00	2.8E-08		
Gd-150	3.7E+02	7.7E-10	1.3E+02	4.2E-10	9.8E+00	2.9E-13		
H-3	4.8E+01	1.1E+02	4.2E-01	5.0E-04	3.8E+01	5.0E-04		
I-129	3.7E+02	5.2E-10	1.3E+02	2.8E-10	9.8E+00	2.0E-13		
Kr-81	3.7E+02	9.3E-09	1.3E+02	5.0E-09	9.8E+00	3.5E-12		
Kr-85	3.7E+02	4.6E-04	1.3E+02	2.5E-04	9.8E+00	1.7E-07		
La-137	3.7E+02	1.5E-07	1.3E+02	8.2E-08	9.8E+00	5.7E-11		
Mo-93	3.7E+02	3.0E-06	1.3E+02	1.6E-06	9.8E+00	1.1E-09		
Nb-92	3.7E+02	9.0E-10	1.3E+02	4.9E-10	9.8E+00	3.4E-13		
Nb-94	3.7E+02	9.0E-07	1.3E+02	4.9E-07	9.8E+00	3.4E-10		
Pd-107	3.7E+02	1.3E-09	1.3E+02	7.0E-10	9.8E+00	4.9E-13		
Pu-238	7.0E+02	4.9E-02	3.8E+01	6.9E-04	3.5E+00	4.3E-04		
Pu-239	1.4E+03	2.0E-02	1.8E+03	5.5E-01	8.7E+01	1.2E-02		
Pu-240	2.3E+02	6.7E-04						
Pu-241	2.3E+02	1.0E-02						
Pu-242	2.3E+02	3.9E-08						
Ra-226	1.5E+00	9.7E-02						
Se-79	3.7E+02	8.6E-10	1.3E+02	4.6E-10	9.8E+00	3.2E-13		
Si-32	9.1E+01	1.0E-03						
Sm-146	3.7E+02	7.0E-11	1.3E+02	3.8E-11	9.8E+00	2.6E-14		
Sm-147	3.7E+02	5.5E-14	1.3E+02	3.0E-14	9.8E+00	2.1E-17		
Sm-151	3.7E+02	2.4E-05	1.3E+02	1.3E-05	9.8E+00	8.9E-09		
Sr-90	4.9E+02	9.6E-04	5.7E+02	2.0E-03	1.2E+01	3.5E-04		
Tb-157	3.7E+02	8.6E-07	1.3E+02	4.7E-07	9.8E+00	3.3E-10		
Tb-158	3.7E+02	3.7E-07	1.3E+02	2.0E-07	9.8E+00	1.4E-10		
Tc-97	3.7E+02	7.0E-09	1.3E+02	3.8E-09	9.8E+00	2.6E-12		
Tc-99	3.7E+02	8.5E-08	1.3E+02	4.6E-08	9.8E+00	3.2E-11		
U-234	1.9E+01	1.9E-03	1.7E-02	4.5E-02				
U-235	1.1E+03	6.1E-03	6.2E+01	1.8E-03				
U-236	1.9E+01	9.5E-06						
U-238	5.7E+02	4.8E-01	1.8E+02	3.8E-01				
Zr-93	3.7E+02	9.5E-09	1.3E+02	5.2E-09	9.8E+00	3.6E-12		
Pit 28								
Am-241			3.0E+02	3.0E-06				
Co-60	6.2E+01	2.2E+00					1.6E+01	2.2E+00
H-3	9.8E+01	1.2E+03						
Pu-238	3.9E+02	1.7E-01	3.2E+02	7.5E-02	3.0E+01	7.5E-02		
Pu-239	9.9E+02	1.4E-01	1.2E+03	6.7E-02	1.6E+02	3.9E-02		
Pu-240	1.5E+02	6.2E-04						
Pu-241	1.5E+02	9.4E-03						
Pu-242	1.5E+02	3.6E-08						

Table 3-8. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Th-232	5.1E-01	2.3E-02						
U-235	5.4E+02	8.0E-03						
U-238	3.8E+02	6.6E-02	3.4E+01	4.5E-01				
Pit 29								
Ag-108m	4.0E+02	3.6E-02			2.0E+01	3.5E-07		
Am-241	3.4E+02	6.3E-04	1.3E+02	1.2E+00	7.8E+01	2.0E+00		
Ba-133	4.0E+02	1.3E+00			2.0E+01	1.3E-05		
C-14	2.9E+00	2.1E-01						
Cd-113m	4.0E+02	1.5E-01			2.0E+01	1.4E-06		
Co-60	2.4E+02	1.0E-01	2.2E+02	1.6E-03	1.3E+01	1.7E-05	1.8E+02	1.2E-01
Cs-135	4.0E+02	6.6E-06			2.0E+01	6.5E-11		
Cs-137	5.4E+02	8.8E+02	5.5E+02	4.4E-03	4.2E+01	2.9E-03		
Dy-154	4.0E+02	2.3E-07			2.0E+01	2.3E-12		
Eu-152	4.0E+02	8.1E-02			2.0E+01	8.0E-07		
Eu-154	4.0E+02	2.3E-02			2.0E+01	2.3E-07		
Gd-148	4.0E+02	6.2E-02			2.0E+01	6.1E-07		
Gd-150	4.0E+02	6.5E-07			2.0E+01	6.4E-12		
H-3	2.1E+02	5.8E-01						
I-129	4.0E+02	4.4E-07			2.0E+01	4.3E-12		
Kr-81	4.0E+02	7.8E-06			2.0E+01	7.7E-11		
Kr-85	4.0E+02	3.8E-01			2.0E+01	3.8E-06		
La-137	4.0E+02	1.3E-04			2.0E+01	1.2E-09		
Mo-93	4.0E+02	2.5E-03			2.0E+01	2.5E-08		
Nb-92	4.0E+02	7.6E-07			2.0E+01	7.5E-12		
Nb-94	4.0E+02	7.6E-04			2.0E+01	7.5E-09		
Np-237	1.5E+01	7.1E-07						
Pd-107	4.0E+02	1.1E-06			2.0E+01	1.1E-11		
Pu-238	1.0E+03	5.6E-02	2.7E+02	1.1E+00	1.5E+02	3.5E-01		
Pu-239	2.1E+03	2.3E-01	6.1E+02	3.8E-03	1.9E+02	4.9E-01		
Pu-240	5.8E+02	3.5E-02	7.4E+01	1.7E-03	7.4E+01	1.7E-03		
Pu-241	5.9E+02	5.6E-01	7.4E+01	5.4E-02	7.4E+01	5.4E-02		
Pu-242	5.8E+02	2.6E-06	7.4E+01	5.6E-07	7.4E+01	5.6E-07		
Se-79	4.0E+02	7.2E-07			2.0E+01	7.1E-12		
Sm-146	4.0E+02	5.8E-08			2.0E+01	5.8E-13		
Sm-147	4.0E+02	4.5E-11			2.0E+01	4.5E-16		
Sm-151	4.0E+02	2.0E-02			2.0E+01	1.9E-07		
Sr-90	5.3E+02	1.4E+03	4.2E+02	8.9E-02	2.0E+01	4.9E-06		
Tb-157	4.0E+02	7.2E-04			2.0E+01	7.1E-09		
Tb-158	4.0E+02	3.1E-04			2.0E+01	3.0E-09		
Tc-97	4.0E+02	5.8E-06			2.0E+01	5.8E-11		
Tc-99	4.0E+02	7.1E-05			2.0E+01	7.0E-10		
Th-232	1.9E-03	4.9E-05						
U-233	3.5E+00	1.9E-02						
U-234	4.0E+01	3.9E-02						
U-235	7.8E+02	2.4E-01			5.9E+01	5.3E-03		
U-236	4.0E+01	4.5E-05						

Table 3-8. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
U-238	9.8E+02	1.4E-01	7.3E+02	7.8E-01	1.7E+01	6.3E-05		
Zr-93	4.0E+02	8.0E-06			2.0E+01	7.9E-11		
Pit 32								
Ag-108m	2.9E+02	4.4E-03						
Am-241	2.0E+02	6.0E-02	9.9E+00	3.0E-03	1.3E+02	2.1E+00		
Ba-133	2.9E+02	1.6E-01						
C-14	3.2E+00	1.5E-06						
Cd-113m	2.9E+02	1.8E-02						
Co-60	3.0E+02	2.0E-01	4.1E+00	3.3E-01	3.6E+00	3.3E-05	1.6E+02	1.3E-01
Cs-135	2.9E+02	8.2E-07						
Cs-137	3.0E+02	3.5E-02	3.4E+02	2.1E-03				
Dy-154	2.9E+02	2.9E-08						
Eu-152	2.9E+02	1.0E-02						
Eu-154	2.9E+02	2.9E-03						
Gd-148	2.9E+02	7.7E-03						
Gd-150	2.9E+02	8.1E-08						
H-3	2.0E+02	1.5E+00						
I-129	2.9E+02	5.5E-08						
Kr-81	2.9E+02	9.7E-07						
Kr-85	2.9E+02	4.8E-02						
La-137	2.9E+02	1.6E-05						
Mo-93	2.9E+02	3.1E-04						
Nb-92	2.9E+02	9.5E-08						
Nb-94	2.9E+02	9.5E-05						
Pd-107	2.9E+02	1.3E-07						
Pu-238	7.3E+02	2.2E-02	9.2E+01	1.5E-04	2.1E+02	1.5E+00		
Pu-239	1.5E+03	1.3E-01	3.9E+02	7.3E-02	2.3E+02	3.4E+00		
Pu-240	5.0E+02	6.8E-03	8.6E+01	7.4E-04	7.8E+01	7.2E-04		
Pu-241	5.0E+02	1.1E-01	7.8E+01	1.3E-02	7.8E+01	1.3E-02		
Pu-242	5.0E+02	4.7E-07	7.8E+01	8.1E-08	7.8E+01	8.1E-08		
Ra-226	1.3E-01	1.0E-05						
Se-79	2.9E+02	8.9E-08						
Sm-146	2.9E+02	7.3E-09						
Sm-147	2.9E+02	5.7E-12						
Sm-151	2.9E+02	2.5E-03						
Sr-90	2.9E+02	6.3E-02	2.6E-01	3.1E-04	5.7E-02	2.8E-04		
Tb-157	2.9E+02	9.0E-05						
Tb-158	2.9E+02	3.9E-05						
Tc-97	2.9E+02	7.3E-07						
Tc-99	2.9E+02	8.9E-06						
Th-230	4.2E-02	2.6E-09						
Th-232	1.4E-01	1.0E-09						
U-234	6.4E+01	2.1E-02						
U-235	4.6E+02	3.5E-03			5.1E+00	3.2E-05		
U-236	6.4E+01	6.8E-05						

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
	Waste Form							
U-238	6.1E+02	4.1E-01	2.4E+02	3.4E-03				
Zr-93	2.9E+02	1.0E-06						
Pit 33								
Ag-108m	4.8E+02	2.6E-02						
Am-241	4.3E+02	9.5E-01			9.8E+01	9.7E-01		
Ba-133	4.8E+02	9.3E-01						
C-14	1.2E+01	1.5E-02						
Cd-113m	4.8E+02	1.1E-01						
Co-60	2.2E+02	5.9E-01	1.1E+00	8.3E-06	1.1E+00	8.3E-06	1.1E+02	4.4E-01
Cs-135	4.8E+02	4.8E-06						
Cs-137	4.8E+02	1.6E+00	1.5E+00	5.0E-07				
Dy-154	4.8E+02	1.7E-07						
Eu-152	4.8E+02	5.9E-02						
Eu-154	4.8E+02	1.7E-02						
Gd-148	4.8E+02	4.5E-02						
Gd-150	4.8E+02	4.7E-07						
H-3	3.0E+02	4.0E+00	3.2E+01	5.9E-03	1.5E+02	2.6E-03		
I-129	4.8E+02	3.2E-07						
Kr-81	4.8E+02	5.7E-06						
Kr-85	4.8E+02	2.8E-01						
La-137	4.8E+02	9.2E-05						
Mo-93	4.8E+02	1.8E-03						
Nb-92	4.8E+02	5.5E-07						
Nb-94	4.8E+02	5.5E-04						
Pd-107	4.8E+02	7.8E-07						
Pu-238	8.9E+02	1.7E-02	3.6E+01	6.0E-06	1.1E+02	4.4E-02		
Pu-239	1.9E+03	1.4E+00	2.6E+02	5.4E-01	1.7E+02	2.5E-01		
Pu-240	3.5E+02	5.5E-03						
Pu-241	3.5E+02	8.4E-02						
Pu-242	3.5E+02	3.2E-07						
Se-79	4.8E+02	5.2E-07						
Sm-146	4.8E+02	4.2E-08						
Sm-147	4.8E+02	3.2E-11						
Sm-151	4.8E+02	1.4E-02						
Sr-90	4.8E+02	4.9E-01	2.5E+00	1.2E-05				
Tb-157	4.8E+02	5.3E-04						
Tb-158	4.8E+02	2.2E-04						
Tc-97	4.8E+02	4.2E-06						
Tc-99	4.8E+02	5.2E-05						
Th-232	2.3E-02	2.6E-03						
U-234	4.8E+02		5.7E-03	6.3E-04				
U-235	1.5E+03	1.1E-02	6.9E+01	2.5E-05	7.0E+01	1.3E-05		
U-238	9.9E+02	6.2E-01	5.4E+02	1.5E-01	2.2E+01	2.0E-05		
Zr-93	4.8E+02	5.8E-06						

Table 3-8. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Pit 35								
Ag-108m	1.4E+02	1.8E-02						
Am-241	1.1E+02	7.5E-05			2.8E+01	4.3E-01		
Ba-133	1.4E+02	6.4E-01						
Cd-113m	1.4E+02	7.3E-02						
Co-60	2.8E+02	2.1E+00	3.5E+01	6.6E-05	1.6E+01	8.3E-09	1.1E+02	1.3E-01
Cs-135	1.4E+02	3.3E-06						
Cs-137	1.4E+02	1.2E-01						
Dy-154	1.4E+02	1.2E-07						
Eu-152	1.4E+02	4.1E-02						
Eu-154	1.4E+02	1.2E-02						
Gd-148	1.4E+02	3.1E-02						
Gd-150	1.4E+02	3.2E-07						
H-3	8.1E+01	1.2E+00						
I-129	1.4E+02	2.2E-07						
Kr-81	1.4E+02	3.9E-06						
Kr-85	1.4E+02	1.9E-01						
La-137	1.4E+02	6.3E-05						
Mo-93	1.4E+02	1.3E-03						
Nb-92	1.4E+02	3.8E-07						
Nb-94	1.4E+02	3.8E-04						
Pd-107	1.4E+02	5.4E-07						
Pu-238	5.9E+02	4.3E-04	9.4E+01	2.8E-03	2.9E+01	3.1E-01		
Pu-239	9.7E+02	3.3E-02	9.4E+01	9.6E-02	4.8E+01	9.1E-01		
Pu-240	3.8E+02	2.4E-03	9.4E+01	2.2E-02				
Pu-241	3.8E+02	3.7E-02	9.4E+01	3.4E-01				
Pu-242	3.8E+02	1.4E-07	9.4E+01	1.3E-06				
Se-79	1.4E+02	3.6E-07						
Si-32	7.3E+00	1.0E-08						
Sm-146	1.4E+02	2.9E-08						
Sm-147	1.4E+02	2.3E-11						
Sm-151	1.4E+02	9.9E-03						
Sr-90	1.4E+02	2.5E-01						
Tb-157	1.4E+02	3.6E-04						
Tb-158	1.4E+02	1.6E-04						
Tc-97	1.4E+02	2.9E-06						
Tc-99	1.4E+02	3.6E-05						
U-235	3.5E+02	1.2E-03						
U-238	3.1E+02	5.7E-02	4.7E+02	1.0E-01				
Zr-93	1.4E+02	4.0E-06						
Pit 36								
Ag-108m	1.5E+02	2.5E-03						
Am-241	5.8E+01	8.7E-05			1.9E+01	1.3E-01		
Ba-133	1.5E+02	9.1E-02						
Cd-113m	1.5E+02	1.0E-02						
Co-60	5.2E+02	8.7E-02					9.4E+01	4.7E-02

Table 3-8. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Cs-135	1.5E+02	4.7E-07						
Cs-137	1.6E+02	1.9E-02						
Dy-154	1.5E+02	1.7E-08						
Eu-152	1.5E+02	5.8E-03						
Eu-154	1.5E+02	1.6E-03						
Gd-148	1.5E+02	4.4E-03						
Gd-150	1.5E+02	4.6E-08						
H-3	6.6E+01	3.0E+01						
I-129	1.5E+02	3.1E-08						
Kr-81	1.5E+02	5.6E-07						
Kr-85	1.5E+02	2.7E-02						
La-137	1.5E+02	9.0E-06						
Mo-93	1.5E+02	1.8E-04						
Nb-92	1.5E+02	5.4E-08						
Nb-94	1.5E+02	6.2E-05						
Pd-107	1.5E+02	7.7E-08						
Pu-238	5.5E+02	2.6E-02	5.2E+01	4.0E-04	5.3E+01	6.1E-02		
Pu-239	9.3E+02	8.4E-02	1.1E+02	1.4E-02	7.1E+01	3.8E-01		
Pu-240	4.2E+02	1.7E-02	5.2E+01	3.2E-03				
Pu-241	4.2E+02	2.5E-01	5.2E+01	4.8E-02				
Pu-242	4.2E+02	9.6E-07	5.2E+01	8.0E-06				
Se-79	1.5E+02	5.1E-08						
Sm-146	1.5E+02	4.2E-09						
Sm-147	1.5E+02	3.2E-12						
Sm-151	1.5E+02	1.4E-03						
Sr-90	1.5E+02	3.6E-02						
Tb-157	1.5E+02	5.2E-05						
Tb-158	1.5E+02	2.2E-05						
Tc-97	1.5E+02	4.2E-07						
Tc-99	1.5E+02	5.1E-06						
U-234	2.3E+00	7.9E-04						
U-235	4.3E+02	4.8E-02	1.4E+01	5.7E-07	1.9E+01	5.7E-07		
U-236	2.3E+00	3.4E-06						
U-238	3.0E+02	3.1E-03	1.1E+02	1.5E-06	1.1E+01	2.9E-07		
Zr-93	1.5E+02	5.7E-07						

Table 3-9. Shaft radionuclide inventories for 1971 through September 25, 1988.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ag-108m	2.6E+01	1.5E+01						
Am-241	4.6E+00	4.0E-02						
Am-243	2.6E-02	1.1E-05						
Ba-133	2.6E+01	5.5E+02						
C14	5.8E+00	1.1E+00						
Cd-113m	2.6E+01	6.3E+01						
Cf-252	3.3E-01	5.5E+01						
Cm-244	3.9E-01	1.9E-01						
Co-60	1.5E+02	3.0E+03					1.2E+02	2.2E+02
Cs-135	2.6E+01	2.8E-03						
Cs-137	2.7E+01	1.5E+02						
Dy-154	2.6E+01	1.0E-04						
Eu-152	2.6E+01	3.5E+01						
Eu-154	2.6E+01	9.9E+00						
Gd-148	2.6E+01	2.7E+01						
Gd-150	2.6E+01	2.8E-04						
H-3	1.4E+02	8.0E+05	1.1E-01	1.0E+02	5.3E-01	1.0E+02		
Hf-182	2.8E-02	3.1E+01						
I-129	2.6E+01	1.9E-04						
Kr-81	2.6E+01	3.4E-03						
Kr-85	2.9E+01	1.7E+02						
La-137	2.6E+01	5.5E-02						
Mo-93	2.6E+01	1.1E+00						
Nb-92	2.6E+01	3.3E-04						
Nb-94	2.6E+01	3.3E-01						
Ni-63	3.8E+00	4.3E-03						
Np-237	9.2E-02	7.8E-05						
Pd-107	2.6E+01	4.7E-04						
Pu-238	1.2E+02	1.4E+00						
Pu-239	1.6E+02	9.8E+01						
Pu-240	1.3E+01	3.7E+00						
Pu-241	1.3E+01	5.6E+01						
Pu-242	1.3E+01	2.1E-04						
Pu-244	1.9E+00	0.0E+00						
Ra-226	1.4E+00	2.5E+00						
Se-79	2.6E+01	3.1E-04						
Sm-146	2.6E+01	2.5E-05						
Sm-147	2.8E+01	2.0E-08						
Sm-151	2.6E+01	8.5E+00						
Sr-90	2.7E+01	2.2E+02						
Tb-157	2.6E+01	3.1E-01						
Tb-158	2.6E+01	1.3E-01						
Tc-97	2.6E+01	2.5E-03						
Tc-99	2.6E+01	3.1E-02						
Th-232	1.2E+01	1.9E-02						
U-232	3.8E-03	2.1E-01						

Table 3-9. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
U-233	4.1E-01	4.0E+00						
U-234	2.5E+01	4.7E-01	6.2E+00	2.8E-02				
U-235	9.9E+01	9.9E-01	6.2E+00	1.1E-03				
U-236	7.6E-01	1.9E-04						
U-238	1.6E+02	1.1E+01	8.0E+00	1.8E-01				
Zr-93	2.6E+01	3.5E-03						

TRU waste was non-retrievably disposed of in Pits 6, 7, 8, 20, and 22 and several shafts at Area G between 1971 and 1979. Table 3-10 lists the total volumes and activities of this waste (excluding waste placed in Pit 6) for the four waste forms. Radionuclide-specific inventories for the waste are listed in Table 3-11. In each case, individual totals are reported for the affected pits, while inventory data are summed over the shafts. These TRU waste data are included in Tables 3-7 through 3-9.

The activities listed in Tables 3-8 and 3-9 are the as-disposed activities for radionuclides with half-lives greater than 5 years or radionuclides with parents or daughters with half-lives greater than 5 years. The radionuclides eliminated from the inventory projections based on half-life are listed in Appendix A.

3.1.3 September 26, 1988, to 1995 Inventory

Seven pits and approximately 40 shafts were used for disposal of waste between September 26, 1988, and the end of 1995. The total volumes and activities of LLW placed in these units during this period are listed in Table 3-12. Inventories for the four waste forms are reported for each disposal pit, while inventories are summed over the shafts. As discussed earlier, all but one shipment of waste was placed in Pit 32 prior to September 26, 1988. The entire inventory for this unit is included in the 1971 to September 25, 1988, period (Section 3.1.2). The inventories listed for Pit 36 and the shafts include only the waste that was disposed of on or following September 26, 1988.

Radionuclide inventories for the waste disposed of between September 26, 1988, and the end of 1995 are listed in Tables 3-13 and 3-14 for pits and shafts, respectively. Separate inventories are listed for the pits used during this period, while shaft inventories are summed over all of the individual units. The volumes listed in these tables represent the quantities of waste contaminated with the respective radionuclides. Because several radionuclides may occur in a single waste package, the sum of the volumes is greater than the total volume of waste disposed of in the pits and shafts. The listed activities include contributions from MAP, MFP, and the material types discussed in Section 2.1.

Table 3-10. **Quantities of TRU waste that was non-retrievably disposed of between 1971 and September 25, 1988.**

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pit 7		
Surface-Contaminated Waste		
Soils		
Concrete and Sludges	1.9E+00	6.6E-02
Bulk-Contaminated Waste		
Pit 8		
Surface-Contaminated Waste		
Soils		
Concrete and Sludges	5.8E+01	7.1E+00
Bulk-Contaminated Waste		
Pit 20		
Surface-Contaminated Waste	8.5E-02	1.6E-03
Soils		
Concrete and Sludges		
Bulk-Contaminated Waste		
Pit 22		
Surface-Contaminated Waste	1.1E+01	6.0E+02
Soils		
Concrete and Sludges		
Bulk-Contaminated Waste		
Shafts		
Surface-Contaminated Waste	4.4E+00	2.8E+03
Soils		
Concrete and Sludges		
Bulk-Contaminated Waste	75,385	7407

607.1676

17437
607
7407
21451
607
20844

Table 3-11. Radionuclide inventories in TRU waste that was non-retrievably disposed of between 1971 and September 25, 1988.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 7								
Pu-238					1.9E+00	6.2E-02		
Pu-239					1.9E+00	3.8E-03		
U-235					1.9E+00	4.9E-05		
Pit 8								
Am-241					4.2E+01	9.3E-01		
Pu-238					5.5E+01	3.6E+00		
Pu-239					5.8E+01	2.6E+00		
Pit 20								
Cf-251	8.5E-02	1.6E-03						
Pit 22								
Ag-108m	1.1E+01	1.2E+00						
Am-241	2.1E-01	3.4E-03						
Ba-133	1.1E+01	4.5E+01						
Cd-113m	1.1E+01	5.1E+00						
Cs-135	1.1E+01	2.3E-04						
Cs-137	1.1E+01	8.4E+00						
Dy-154	1.1E+01	8.2E-06						
Eu-152	1.1E+01	2.8E+00						
Eu-154	1.1E+01	8.0E-01						
Gd-148	1.1E+01	2.2E+00						
Gd-150	1.1E+01	2.3E-05						
I-129	1.1E+01	1.5E-05						
Kr-81	1.1E+01	2.7E-04						
Kr-85	1.1E+01	1.3E+01						
La-137	1.1E+01	4.4E-03						
Mo-93	1.1E+01	8.8E-02						
Nb-92	1.1E+01	2.7E-05						
Nb-94	1.1E+01	2.7E-02						
Pd-107	1.1E+01	3.8E-05						
Pu-239	1.1E+01	9.3E-01						
Se-79	1.1E+01	2.5E-05						
Sm-146	1.1E+01	2.0E-06						
Sm-147	1.1E+01	1.6E-09						
Sm-151	1.1E+01	6.9E-01						
Sr-90	1.1E+01	1.7E+01						
Tb-157	1.1E+01	2.5E-02						
Tb-158	1.1E+01	1.1E-02						
Tc-97	1.1E+01	2.0E-04						
Tc-99	1.1E+01	2.5E-03						
U-235	1.1E+01	9.6E-05						
Zr-93	1.1E+01	2.8E-04						

Table 3-11. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Shafts								
Ag-108m	2.0E+00	5.4E+00						
Am-241	2.8E-02	3.4E-03						
Ba-133	2.0E+00	1.9E+02						
Cd-113m	2.0E+00	2.2E+01						
Cm-244	1.9E-03	2.3E-04						
Cs-135	2.0E+00	1.0E-03						
Cs-137	2.0E+00	3.7E+01						
Dy-154	2.0E+00	3.6E-05						
Eu-152	2.0E+00	1.2E+01						
Eu-154	2.0E+00	3.5E+00						
Gd-148	2.0E+00	9.4E+00						
Gd-150	2.0E+00	9.9E-05						
H-3	1.1E+00	0.0E+00						
I-129	2.0E+00	6.7E-05						
Kr-81	2.0E+00	1.2E-03						
Kr-85	2.0E+00	5.8E+01						
La-137	2.0E+00	1.9E-02						
Mo-93	2.0E+00	3.8E-01						
Nb-92	2.0E+00	1.2E-04						
Nb-94	2.0E+00	1.2E-01						
Np-237	4.5E-02	7.1E-06						
Pd-107	2.0E+00	1.6E-04						
Pu-238	2.1E+00	6.3E-01						
Pu-239	4.3E+00	9.7E+01						
Pu-240	1.9E+00	3.7E+00						
Pu-241	1.9E+00	5.6E+01						
Pu-242	1.9E+00	2.1E-04						
Pu-244	1.9E+00	0.0E+00						
Se-79	2.0E+00	1.1E-04						
Sm-146	2.0E+00	8.9E-06						
Sm-147	2.0E+00	7.0E-09						
Sm-151	2.0E+00	3.0E+00						
Sr-90	2.0E+00	7.6E+01						
Tb-157	2.0E+00	1.1E-01						
Tb-158	2.0E+00	4.7E-02						
Tc-97	2.0E+00	8.9E-04						
Tc-99	2.0E+00	1.1E-02						
U-233	4.5E-02	9.6E-04						
U-234	6.8E-02	2.1E-02						
U-235	1.9E+00	5.1E-03						
U-236	1.1E-02	8.9E-05						
U-238	1.1E-01	2.1E-03						
Zr-93	2.0E+00	1.2E-03						

Table 3-12. Pit and shaft waste volumes and activities disposed of from September 26, 1988, to 1995.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pit 30		
Surface-Contaminated Waste	7.5E+03	3.1E+01
Soils	1.7E+03	2.3E+00
Concrete and Sludges	3.7E+02	6.9E-01
Bulk-Contaminated Waste	5.7E+02	2.9E+00
Pit 31		
Surface-Contaminated Waste	2.6E+02	6.6E-02
Soils	1.1E+02	3.3E-02
Concrete and Sludges	1.1E+02	3.3E-02
Bulk-Contaminated Waste	0.0E+00	0.0E+00
Pit 36		
Surface-Contaminated Waste	7.0E+02	1.3E+00
Soils	2.5E+02	1.5E-01
Concrete and Sludges	5.9E+01	1.5E-01
Bulk-Contaminated Waste	3.4E+01	3.9E-01
Pit 37		
Surface-Contaminated Waste	1.2E+04	7.1E+01
Soils	2.1E+03	3.3E+00
Concrete and Sludges	3.9E+02	1.7E+00
Bulk-Contaminated Waste	3.8E+02	3.8E+00
Pit 38		
Surface-Contaminated Waste	8.1E+02	2.8E+01
Soils	1.0E+02	3.8E-02
Concrete and Sludges	1.1E+02	2.2E+00
Bulk-Contaminated Waste	0.0E+00	0.0E+00
Pit 39		
Surface-Contaminated Waste	1.5E+03	1.6E+00
Soils	4.4E+02	1.3E-02
Concrete and Sludges	1.9E+02	6.4E-01
Bulk-Contaminated Waste	0.0E+00	0.0E+00

Table 3-12. Continued.

Disposal Unit/Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Shafts		
Surface-Contaminated Waste	2.1E+02	4.5E+05
Soils	1.3E+01	2.7E-07
Concrete and Sludges	2.6E+01	4.2E-01
Bulk-Contaminated Waste	2.8E+01	2.8E+03

Table 3-13. Pit radionuclide inventories for September 26, 1988, through 1995.

Radionuclide	Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
Pit 30								
Ag-108m	6.9E+02	3.5E-02	4.3E+01	2.4E-06	1.9E+01	1.6E-06		
Am-241	6.6E+02	7.7E-03	1.6E+01	2.6E-07	4.6E+00	2.6E-07		
Ba-133	6.9E+02	1.3E+00	4.3E+01	8.8E-05	1.9E+01	5.8E-05		
C-14	2.9E+01	2.0E-09						
Cd-113m	6.9E+02	1.4E-01	4.3E+01	1.0E-05	1.9E+01	6.6E-06	5.7E+02	9.6E-02
Co-60	1.9E+03	5.5E-01	2.2E+02	1.8E-01	1.2E+02	1.8E-01		
Cs-135	6.9E+02	6.5E-06	4.3E+01	4.5E-10	1.9E+01	3.0E-10		
Cs-137	1.1E+03	1.1E+00	1.8E+02	4.1E-01	1.5E+02	4.1E-01		
Dy-154	6.9E+02	2.3E-07	4.3E+01	1.6E-11	1.9E+01	1.1E-11		
Eu-152	6.9E+02	8.0E-02	4.3E+01	5.5E-06	1.9E+01	3.7E-06		
Eu-154	6.9E+02	2.3E-02	4.3E+01	1.6E-06	1.9E+01	1.0E-06		
Gd-148	6.9E+02	6.1E-02	4.3E+01	4.2E-06	1.9E+01	2.8E-06		
Gd-150	6.9E+02	6.4E-07	4.3E+01	4.4E-11	1.9E+01	2.9E-11		
H-3	2.1E+02	8.6E-01	4.0E+00	7.2E-04				
I-129	6.9E+02	4.3E-07	4.3E+01	3.0E-11	1.9E+01	2.0E-11		
Kr-81	6.9E+02	7.7E-06	4.3E+01	5.3E-10	1.9E+01	3.5E-10		
Kr-85	6.9E+02	4.2E-01	4.3E+01	2.6E-05	1.9E+01	1.7E-05		
La-137	6.9E+02	1.2E-04	4.3E+01	8.7E-09	1.9E+01	5.7E-09		
Mo-93	6.9E+02	2.5E-03	4.3E+01	1.7E-07	1.9E+01	1.1E-07		
Nb-92	6.9E+02	7.5E-07	4.3E+01	5.2E-11	1.9E+01	3.4E-11		
Nb-94	6.9E+02	7.5E-04	4.3E+01	5.2E-08	1.9E+01	3.4E-08		
Ni-63	8.5E-02	1.0E-05						
Pd-107	6.9E+02	1.1E-06	4.3E+01	7.4E-11	1.9E+01	4.9E-11		
Pu-238	8.6E+02	3.6E-03	2.5E+02	1.6E+00				
Pu-239	3.0E+03	2.6E-01	1.0E+02	2.7E-03	7.6E+01	2.7E-03		
Pu-240	6.7E+02	2.9E-02						
Pu-241	6.7E+02	4.3E-01						
Pu-242	6.7E+02	1.7E-06						
Ra-226	1.3E+01	1.0E-03						
Se-79	6.9E+02	7.1E-07	4.3E+01	4.9E-11	1.9E+01	3.3E-11		
Si-32	5.6E+01	2.1E+00						
Sm-146	6.9E+02	5.8E-08	4.3E+01	4.0E-12	1.9E+01	2.7E-12		
Sm-147	6.9E+02	4.5E-11	4.3E+01	3.2E-15	1.9E+01	2.1E-15		
Sm-151	6.9E+02	1.9E-02	4.3E+01	1.4E-06	1.9E+01	9.0E-07		
Sr-90	7.4E+02	5.6E-01	5.6E+01	3.3E-02	3.2E+01	3.3E-02		
Tb-157	6.9E+02	7.1E-04	4.3E+01	5.0E-08	1.9E+01	3.3E-08		
Tb-158	6.9E+02	3.1E-04	4.3E+01	2.1E-08	1.9E+01	1.4E-08		
Tc-97	6.9E+02	5.8E-06	4.3E+01	4.0E-10	1.9E+01	2.7E-10		
Tc-99	6.9E+02	7.0E-05	4.3E+01	4.9E-09	1.9E+01	3.2E-09		
Th-232	3.5E+00	3.7E-02						
U-234	1.1E+01	2.9E-02						
U-235	1.3E+03	4.1E-01	6.6E+01	5.5E-02	5.4E+01	5.5E-02		
U-236	2.8E-02	1.2E-04						
U-238	1.2E+03	3.5E+00	2.0E+02	3.5E-03	1.5E+01	2.5E-03		
Zr-93	6.9E+02	7.9E-06	4.3E+01	5.5E-10	1.9E+01	3.6E-10		

Table 3-13. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Pit 31								
Ag-108m	7.5E+01	2.0E-08	3.7E+01	9.8E-09	3.7E+01	9.8E-09		
Ba-133	7.5E+01	7.1E-07	3.7E+01	3.5E-07	3.7E+01	3.5E-07		
C-14	3.3E+00	3.4E-09	1.6E+00	1.7E-09	1.6E+00	1.7E-09		
Cd-113m	7.5E+01	8.0E-08	3.7E+01	4.0E-08	3.7E+01	4.0E-08		
Co-60	3.1E+00	1.7E-09	1.6E+00	8.3E-10	1.6E+00	8.3E-10		
Cs-135	7.5E+01	3.7E-12	3.7E+01	1.8E-12	3.7E+01	1.8E-12		
Cs-137	8.4E+01	1.4E-07	4.2E+01	6.8E-08	4.2E+01	6.8E-08		
Dy-154	7.5E+01	1.3E-13	3.7E+01	6.5E-14	3.7E+01	6.5E-14		
Eu-152	7.5E+01	4.5E-08	3.7E+01	2.2E-08	3.7E+01	2.2E-08		
Eu-154	7.5E+01	1.3E-08	3.7E+01	6.4E-09	3.7E+01	6.4E-09		
Gd-148	7.5E+01	3.4E-08	3.7E+01	1.7E-08	3.7E+01	1.7E-08		
Gd-150	7.5E+01	3.6E-13	3.7E+01	1.8E-13	3.7E+01	1.8E-13		
H-3	9.5E+00	1.1E-09	4.3E+00	5.5E-10	4.3E+00	5.5E-10		
I-129	7.5E+01	2.4E-13	3.7E+01	1.2E-13	3.7E+01	1.2E-13		
Kr-81	7.5E+01	4.3E-12	3.7E+01	2.2E-12	3.7E+01	2.2E-12		
Kr-85	7.5E+01	2.1E-07	3.7E+01	1.1E-07	3.7E+01	1.1E-07		
La-137	7.5E+01	7.0E-11	3.7E+01	3.5E-11	3.7E+01	3.5E-11		
Mo-93	7.5E+01	1.4E-09	3.7E+01	7.0E-10	3.7E+01	7.0E-10		
Nb-92	7.5E+01	4.2E-13	3.7E+01	2.1E-13	3.7E+01	2.1E-13		
Nb-94	7.5E+01	4.2E-10	3.7E+01	2.1E-10	3.7E+01	2.1E-10		
Pd-107	7.5E+01	6.0E-13	3.7E+01	3.0E-13	3.7E+01	3.0E-13		
Pu-239	7.1E+01	6.5E-02	2.2E+01	3.3E-02	2.2E+01	3.3E-02		
Se-79	7.5E+01	4.0E-13	3.7E+01	2.0E-13	3.7E+01	2.0E-13		
Sm-146	7.5E+01	3.2E-14	3.7E+01	1.6E-14	3.7E+01	1.6E-14		
Sm-147	7.5E+01	2.5E-17	3.7E+01	1.3E-17	3.7E+01	1.3E-17		
Sm-151	7.5E+01	1.1E-08	3.7E+01	5.5E-09	3.7E+01	5.5E-09		
Sr-90	8.4E+01	6.9E-06	4.2E+01	3.4E-06	4.2E+01	3.4E-06		
Tb-157	7.5E+01	4.0E-10	3.7E+01	2.0E-10	3.7E+01	2.0E-10		
Tb-158	7.5E+01	1.7E-10	3.7E+01	8.6E-11	3.7E+01	8.6E-11		
Tc-97	7.5E+01	3.2E-12	3.7E+01	1.6E-12	3.7E+01	1.6E-12		
Tc-99	8.3E+01	2.0E-09	4.2E+01	1.0E-09	4.2E+01	1.0E-09		
Th-232	7.5E+00	4.0E-07	3.7E+00	2.0E-07	3.7E+00	2.0E-07		
U-234	4.7E+01	3.0E-06	2.4E+01	1.5E-06	2.4E+01	1.5E-06		
U-235	1.5E+02	2.6E-04	5.8E+01	1.3E-04	5.8E+01	1.3E-04		
U-238	2.1E+01	2.5E-04	1.0E+01	1.3E-04	1.0E+01	1.3E-04		
Zr-93	7.5E+01	4.4E-12	3.7E+01	2.2E-12	3.7E+01	2.2E-12		
Pit 36								
Ag-108m	5.7E+00	2.1E-05						
Am-241	2.8E+01	1.2E-04						
Ba-133	5.7E+00	7.4E-04						
Cd-113m	5.7E+00	8.5E-05						
Co-60	1.3E+02	1.9E-01	3.4E+01	7.5E-02	3.4E+01	7.5E-02	2.1E+00	1.3E-02
Cs-135	5.7E+00	3.8E-09						
Cs-137	7.4E+01	1.5E-01	3.4E+01	7.5E-02	3.4E+01	7.5E-02		
Dy-154	5.7E+00	1.4E-10						

Table 3-13. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Eu-152	7.8E+00	4.7E-05						
Eu-154	5.7E+00	1.3E-05						
Eu-152	5.7E+00	2.9E-02						
Gd-148	5.7E+00	3.6E-05						
Gd-150	5.7E+00	3.8E-10						
H-3	3.7E+01	2.9E-01						
I-129	5.7E+00	2.6E-10						
Kr-81	5.7E+00	4.5E-09						
Kr-85	5.7E+00	2.2E-04						
La-137	5.7E+00	7.4E-08						
Mo-93	5.7E+00	1.5E-06						
Nb-92	5.7E+01	4.4E-10						
Nb-94	5.7E+00	4.4E-07						
Pd-107	5.7E+00	6.3E-10						
Pu-238	5.3E+01	2.7E-04						
Pu-239	4.0E+02	1.3E-02						
Pu-240	3.0E+01	2.1E-03						
Pu-241	3.0E+01	3.2E-02						
Pu-242	3.0E+01	1.2E-07						
Se-79	5.7E+00	4.2E-10						
Si-32	9.4E+00	2.0E-09						
Sm-146	5.7E+00	3.4E-11						
Sm-147	5.7E+00	2.7E-14						
Sm-151	5.7E+00	1.2E-05						
Sr-90	5.7E+00	2.9E-04						
Tb-157	5.7E+00	4.2E-07						
Tb-158	5.7E+00	1.8E-07						
Tc-97	5.7E+00	3.4E-09						
Tc-99	5.7E+00	4.2E-08						
U-235	1.5E+02	4.2E-09						
U-238	8.3E+01	6.5E-02						
Zr-93	5.7E+00	4.7E-09						
Pit 37								
Ag-108m	9.4E+02	1.1E-03	6.0E+02	9.3E-07	1.5E+01	1.0E-12		
Al-26	2.8E-02	3.8E-08						
Am-241	1.8E+03	1.1E-01	3.9E+02	2.8E-03	7.3E+01	1.8E-01		
Am-243	2.5E+01	2.5E-05	1.5E+00	2.4E-07	1.5E+00	2.4E-07		
Ba-133	1.0E+03	4.1E-02	6.0E+02	3.3E-05	1.5E+01	3.7E-11		
Bi-207	7.4E-01	2.0E-05						
Bk-247	1.4E+01	5.4E-08						
C-14	2.0E+02	1.7E-02	7.4E+00	3.9E-05	7.1E+00	3.9E-05		
Cd-113m	9.4E+02	4.5E-03	6.0E+02	3.8E-06	1.5E+01	4.2E-12		
Cf-252	1.4E-01	1.4E-05						
Cl-36	1.4E-01	3.7E-04						
Co-60	1.8E+03	6.9E+00	5.2E+01	5.0E-03	2.6E+01	4.8E-05	3.8E+02	1.2E-01
Cs-135	9.4E+02	2.1E-07	6.0E+02	1.7E-10	1.5E+01	1.9E-16		

Table 3-13. Continued.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Cs-137	1.3E+03	1.6E-01	6.9E+02	9.8E-02	5.3E+01	1.5E-04		
Dy-154	9.4E+02	7.3E-09	6.0E+02	6.1E-12	1.5E+01	6.8E-18		
Eu-152	9.4E+02	2.5E-03	6.0E+02	2.4E-06	1.6E+01	5.0E-09		
Eu-154	9.4E+02	7.2E-04	6.0E+02	6.0E-07	1.5E+01	6.7E-13		
Gd-148	9.4E+02	1.9E-03	6.0E+02	1.6E-06	1.5E+01	1.8E-12		
Gd-150	9.4E+02	2.0E-08	6.0E+02	1.7E-11	1.5E+01	1.9E-17		
H-3	7.6E+02	9.5E+00	2.0E+02	2.8E+00	1.7E+01	1.3E-07		
Hf-182	1.8E+01	6.3E-03						
Ho-163	1.3E+01	3.5E-03						
I-129	9.4E+02	1.4E-08	6.0E+02	1.1E-11	1.5E+01	1.3E-17		
Kr-81	9.4E+02	2.4E-07	6.0E+02	2.0E-10	1.5E+01	2.3E-16		
Kr-85	9.4E+02	1.2E-02	6.0E+02	1.0E-05	1.5E+01	1.1E-11		
La-137	9.4E+02	3.9E-06	6.0E+02	3.3E-09	1.5E+01	3.7E-15		
Mo-93	9.4E+02	7.9E-05	6.0E+02	6.6E-08	1.5E+01	7.4E-14		
Nb-92	9.4E+02	2.4E-08	6.0E+02	2.0E-11	1.5E+01	2.2E-17		
Nb-94	9.4E+02	2.5E-02	6.0E+02	2.0E-08	1.5E+01	2.2E-14		
Ni-59	1.0E+01	3.6E-03						
Ni-63	1.4E-01	1.5E-04						
Np-237	3.3E+01	1.1E-05	1.7E+00	3.5E-08	1.7E+00	3.5E-08		
Pa-231	1.3E+01	9.0E-09						
Pb-210	2.5E+00	9.6E-03						
Pd-107	9.4E+02	3.4E-08	6.0E+02	2.8E-11	1.5E+01	3.1E-17		
Pm-145	1.8E+01	5.7E-04						
Pu-238	2.7E+03	3.5E-02	4.2E+02	4.4E-04	7.6E+01	1.0E+00		
Pu-239	5.9E+03	1.2E+00	4.2E+02	1.5E-01	8.8E+01	4.0E-01		
Pu-240	2.0E+03	2.2E-01	5.6E+00	1.0E-05	1.1E+00	6.3E-14		
Pu-241	2.0E+03	3.4E+00	1.1E+00	1.6E-07	1.1E+00	9.5E-13		
Pu-242	1.9E+03	1.2E-05	1.1E+00	3.6E-18	1.1E+00	3.6E-18		
Ra-226	6.7E+00	2.3E-02	2.3E-01	2.0E-06				
Se-79	9.4E+02	2.2E-08	6.0E+02	1.9E-11	1.5E+01	2.1E-17		
Si-32	2.4E+02	1.2E-02						
Sm-146	9.4E+02	1.8E-09	6.0E+02	1.5E-12	1.5E+01	1.7E-18		
Sm-147	9.6E+02	1.5E-12	6.0E+02	1.2E-15	1.5E+01	1.3E-21		
Sm-151	9.4E+02	6.2E-04	6.0E+02	5.2E-07	1.5E+01	5.8E-13		
Sr-90	1.1E+03	5.2E-02	6.2E+02	1.7E-04	2.9E+01	1.0E-04		
Tb-157	9.4E+02	2.3E-05	6.0E+02	1.9E-08	1.5E+01	2.1E-14		
Tb-158	9.4E+02	9.6E-06	6.0E+02	8.1E-09	1.5E+01	9.0E-15		
Tc-97	9.4E+02	1.8E-07	6.0E+02	1.5E-10	1.5E+01	1.7E-16		
Tc-99	1.1E+03	3.2E-03	6.1E+02	2.6E-06	1.7E+01	1.8E-08		
Th-229	1.3E+01	3.9E-05	1.7E-01	5.2E-07	1.7E-01	5.2E-07		
Th-230	1.5E+01	4.3E-07	1.4E+00	2.9E-09				
Th-232	1.4E+02	4.1E-04	3.6E+00	4.4E-09	3.5E+00	2.5E-10		
Ti-44	7.0E+00	3.0E-04						
U-232	2.0E-01	2.0E-10						
U-233	7.4E+00	1.3E-03	2.0E+00	2.8E-04	2.0E+00	2.8E-04		
U-234	1.3E+03	2.5E-01	6.4E+02	4.1E-03	3.6E+01	1.1E-03		
U-235	4.7E+03	2.8E-01	7.1E+02	1.8E-03	1.7E+02	7.4E-04		

Table 3-13. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
U-236	1.3E+02	7.2E-04	2.3E+02	4.2E-06	8.9E+00	3.1E-06		
U-238	2.4E+03	6.8E-01	1.0E+03	1.5E-01	1.4E+02	2.1E-02		
Zr-93	9.4E+02	2.5E-07	6.0E+02	2.1E-10	1.5E+01	2.3E-16		
Pit 38								
Am-241	8.0E+01	9.0E-03	1.9E+01	3.5E-04	5.1E+01	3.8E-01		
Am-243	1.8E+01	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
Bk-247	1.0E+01	1.0E-09						
Co-60	8.1E+01	2.4E+00	7.3E+00	1.4E-03	6.9E+00	1.4E-03		
Cs-135	2.7E+00	4.5E-07						
Cs-137	1.3E+02	5.5E-02	3.4E+01	2.1E-03	1.1E+01	2.1E-03		
Eu-152	1.0E+01	2.8E-07	1.7E-01	6.2E-09				
H-3	3.0E+01	5.0E+00	7.3E+00	8.6E-04	7.0E+00	6.4E-01		
Hf-182	2.5E+01	6.8E-05						
K-40			2.0E-01	5.1E-06				
Kr-85	2.8E-03	7.4E-04						
Nb-94	1.3E+00	6.0E-08	6.7E-01	3.0E-08	6.7E-01	3.0E-08		
Ni-59	2.4E+00	4.5E-03	3.8E-01	1.4E-03	3.8E-01	1.4E-03		
Np-237	7.6E+00	3.1E-11						
Pu-238	9.9E+01	3.4E-03	4.8E+01	2.3E-04	5.8E+01	7.7E-01		
Pu-239	3.3E+02	1.7E+00	4.7E+01	1.4E-02	5.7E+01	3.6E-01		
Pu-240	2.1E-01	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
Pu-242	5.6E+00	1.1E-04	1.4E+00	5.7E-05	1.4E+00	5.7E-05		
Ra-226			2.0E-01	4.8E-07				
Sr-90	7.1E+01	4.6E-03	1.3E+01	1.4E-03	7.1E+00	1.4E-03		
Tc-99	2.5E+01	1.3E-02						
Th-230	1.0E+01	1.0E-09						
Th-232	1.8E+02	3.8E-04	2.0E-01	6.2E-07				
U-232	2.1E-01	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
U-233	2.1E-01	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
U-234	2.6E+02	7.2E-02	6.4E+01	1.4E-02	4.6E+01	7.5E-03		
U-235	4.0E+02	7.9E-03	8.1E+01	2.0E-03	1.1E+02	2.0E-03		
U-236	1.5E+02	1.4E-03	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
U-238	2.7E+02	2.4E-01	3.6E+01	8.2E-03	6.8E+00	3.3E-03		
Pit 39								
Am-241	2.9E+02	5.9E-03	5.0E+01	4.8E-04	2.1E+01	4.5E-02		
Am-243	5.7E-02	1.0E-09						
Ba-133	1.7E-01	3.8E-07						
Bi-207	3.8E-03	7.4E-05						
C-14	2.3E-01	2.7E-05						
Co-60	8.8E+01	2.9E-02	1.9E-01	1.8E-07	1.9E-01	1.8E-07		
Cs-135	3.4E-01	2.0E-05						
Cs-137	8.7E+01	4.5E-03	9.1E+01	9.6E-04	1.9E-01	9.6E-08		
Eu-152	6.2E-01	8.0E-09						
H-3	5.3E+01	5.6E-02	2.7E+01	1.1E-06				
Hf-182	2.3E-01	2.6E-05						

Table 3-13. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Ni-59	6.2E+00	2.1E-03						
Ni-63	5.7E-02	1.0E-06						
Np-237	2.1E+01	6.1E-04						
Pu-234	5.7E-02	2.0E-09						
Pu-238	3.3E+02	5.6E-03	5.6E+01	3.1E-04	2.7E+01	5.1E-01		
Pu-239	5.8E+02	1.1E-01	1.7E+02	5.4E-03	5.5E+01	8.4E-02		
Pu-240	1.7E+02	1.9E-02						
Pu-241	1.7E+02	2.8E-01						
Pu-242	1.7E+02	1.1E-06						
Ra-226	2.5E-04	3.9E-09	1.9E-02	1.8E-10				
Si-32	2.5E+00	4.0E-02						
Sr-90	9.6E+00	2.1E-03						
Tc-97	3.4E-01	6.0E-09						
Tc-99	6.6E+01	3.5E-03						
Th-232	4.1E+01	1.4E-03						
U-233	5.5E+00	5.3E-08	1.9E+00	9.5E-11	1.9E+00	9.5E-11		
U-234	2.9E+02	2.6E-01	1.7E+02	3.2E-05	1.3E+02	2.7E-05		
U-235	4.4E+02	1.3E-02	1.8E+02	1.0E-06	1.5E+02	4.6E-05		
U-236	2.3E+01	3.2E-04						
U-238	4.2E+02	6.4E-01	3.8E+01	4.6E-03	2.1E+01	1.2E-05		

Table 3-14. Shaft radionuclide inventories for September 26, 1988, through 1995.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ag-108m	6.2E+00	1.2E-01						
Am-241	8.8E+00	1.0E-03			3.6E+01	1.0E-01		
Ba-133	6.2E+00	4.5E+00						
Bi-207	3.8E-03	4.0E-06						
C-14	3.0E+00	8.9E-03						
Cd-113m	6.2E+00	5.1E-01						
Cf-252	3.8E-03	4.5E-08						
Co-60	6.9E+01	7.7E+02					2.8E+01	9.2E+01
Cs-135	8.9E+00	2.8E-05						
Cs-137	1.2E+01	8.3E+01						
Dy-154	6.2E+00	8.2E-07						
Eu-152	6.3E+00	2.8E-01						
Eu-154	6.6E+00	1.8E-01						
Gd-148	6.2E+00	2.2E-01						
Gd-150	6.2E+00	2.3E-06						
H-3	4.6E+01	4.3E+05	7.5E+00	1.5E-07				
I-129	6.2E+00	1.5E-06						
Kr-81	6.2E+00	2.7E-05						
Kr-85	6.2E+00	1.3E+00						
La-137	6.2E+00	4.4E-04						
Mo-93	6.2E+00	8.8E-03						
Nb-92	6.3E+00	4.0E-03						
Nb-94	6.2E+00	2.7E-03						
Ni-63	3.8E-03	3.0E-05						
Pb-210	1.9E-02	2.4E-09						
Pd-107	6.2E+00	3.8E-06						
Pu-238	1.7E+01	1.4E-03			3.6E+01	2.4E-01		
Pu-239	2.3E+01	1.3E-02			3.7E+01	7.7E-02		
Pu-240	4.2E-01	2.8E-03						
Pu-241	4.2E-01	4.2E-02						
Pu-242	4.2E-01	1.6E-07						
Ra-226	8.5E-02	1.5E-05						
Se-79	6.2E+00	2.5E-06						
Sm-146	6.2E+00	2.0E-07						
Sm-147	6.2E+00	1.6E-10						
Sm-151	6.2E+00	6.9E-02						
Sr-90	6.4E+00	6.9E+00						
Tb-157	6.2E+00	2.5E-03						
Tb-158	6.2E+00	1.1E-03						
Tc-97	6.2E+00	2.0E-05						
Tc-99	6.2E+00	2.5E-04						
Th-229	3.8E-03	5.4E-08						
Th-232	9.3E-01	4.1E-04						
U-234	2.8E-01	2.5E-03	1.8E-02	4.7E-08	1.8E-02	4.7E-08		
U-235	1.4E+01	1.2E-03	1.8E-02	1.1E-09	3.6E+01	2.2E-04		
U-236	1.5E-01	5.8E-06	1.8E-02	2.2E-09	1.8E-02	2.2E-09		
U-238	2.2E+01	2.0E-01	1.8E-02	6.1E-08	5.9E-01	4.4E-07		
Zr-93	6.2E+00	2.8E-05						

Tables 3-13 and 3-14 include radionuclides with half-lives greater than 5 years and those with parents or daughters with half-lives greater than 5 years. The radionuclides eliminated from the inventory projections based on half-life are listed in Appendix A.

3.2 PROJECTED LLW INVENTORY

The projected LLW inventory includes waste from routine operations and ER and D&D waste. Inventory projections for these types of waste are presented in this section. Projected operational waste inventories are discussed in Section 3.2.1, ER and D&D inventory projections are provided in Section 3.2.2, and inventories of MLLW residues are given in Section 3.2.3. The total future inventory is summarized in Section 3.2.4.

3.2.1 Operational LLW Inventory Projections

A total of 26 TAs were identified as major generators of LLW at LANL using the screening process described in Section 2.2.1. The screen based on the total volume of LLW generated identified 19 TAs as major generators of LLW, shown in Table 3-15. Several TAs consistently generated large volumes of waste throughout the 1990 to 1995 period, including TAs 3, 15, 21, 48, 50, 53, and 55. The remainder of the TAs listed in the table qualified as major generators of waste for three or less of the six years.

The results of the screening calculations based on total activity, shown in Table 3-16, indicate that a small number of TAs were responsible for most of the activity disposed of at Area G: seven areas were responsible for 95 percent of the activity disposed of between 1990 and 1995. Of these, TA-48 and TA-53 were the most consistent contributors, qualifying as major generators for five of the six years. All of the TAs identified as major generators of LLW using the total activity screen also were identified as such by the screen based on total waste volume.

The screening calculation based on radionuclide-specific activities identified 28 TAs as major generators of waste between 1990 and 1995 (Table 3-17). The TAs that were

Table 3-15. Major generators of LLW based on total volume.

Technical Area	Year of Disposal[a]					
	1990	1991	1992	1993	1994	1995
TA-0 Unassigned Land Reserve				X		X
TA-2 Omega Site	X				X	
TA-3 South Mesa Site	X	X	X	X	X	X
TA-15 R-Site	X	X	X	X	X	X
TA-16 S-Site			X	X		
TA-18 Parajito Laboratory	X		X			
TA-21 DP-Site	X	X	X	X	X	X
TA-33 HP-Site	X					
TA-35 Ten Site		X				X
TA-36 Kappa Site		X				X
TA-39 Ancho Canyon Site				X		
TA-43 Health Research Lab and DOE Headquarters	X			X		
TA-46 WA Site		X				
TA-48 Radiochemistry Site	X	X	X	X	X	X
TA-50 Waste Management Site	X	X	X	X	X	X
TA-52 Reactor Development Site	X					
TA-53 Meson Physics Facility	X	X	X	X	X	X
TA-54 Waste Disposal Site				X	X	X
TA-55 Plutonium Facility	X	X	X	X	X	X

a. "X" indicates that the waste shipped for disposal by the TA comprised 95 percent of the total volume of waste disposed of in the indicated year.

Table 3-16. Major generators of LLW based on total activity.

Technical Area	Year of Disposal[a]					
	1990	1991	1992	1993	1994	1995
TA-2 Omega Site			X			
TA-3 South Mesa Site	X			X		
TA-21 DP-Site				X		
TA-33 HP-Site					X	X
TA-48 Radiochemistry Site	X	X	X	X	X	
TA-53 Meson Physics Facility	X	X	X	X	X	
TA-55 Plutonium Facility						X

a. "X" indicates that the waste shipped for disposal by the TA comprised 95 percent of the total activity of waste disposed of in the indicated year.

Table 3-17. Major generators of LLW based on radionuclide-specific activity.

Technical Area	Year of Disposal[a] 1990	1991	1992	1993	1994	1995
TA-0 Unassigned Land Reserve				X		X
TA-1 Town Site						X
TA-2 Omega Site		X	X		X	
TA-3 South Mesa Site	X	X	X	X	X	X
TA-8 Anchor Site West		X				
TA-9 Anchor Site East						X
TA-11 K-Site	X					
TA-15 R-Site	X				X	X
TA-16 S-Site	X			X	X	
TA-18 Parajito Laboratory	X					X
TA-21 DP-Site	X	X	X	X	X	X
TA-33 HP-Site			X		X	X
TA-35 Ten Site		X	X	X		X
TA-36 Kappa Site						X
TA-39 Ancho Canyon Site			X		X	
TA-41 W-Site			X	X		
TA-43 Health Research Lab and DOE Headquarters				X	X	
TA-46 WA Site		X		X	X	X
TA-48 Radiochemistry Site	X	X	X	X	X	X
TA-50 Waste Management Site	X	X	X	X	X	X
TA-51 Radiation Exposure Facility						X
TA-52 Reactor Development Site	X					
TA-53 Meson Physics Facility	X	X	X	X	X	X
TA-54 Waste Disposal Site				X		X
TA-55 Plutonium Facility	X	X	X	X	X	X
TA-59 OH-Site		X	X	X	X	X
TA-60 Sigma Mesa					X	
TA-64 Central Guard Facility Site						X

a. "X" indicates that the waste shipped for disposal by the TA comprised 95 percent of the total radionuclide-specific activities of waste disposed of in the indicated year.

identified in addition to those revealed through total volume and activity screens include TA-1, TA-8, TA-9, TA-11, TA-41, TA-51, TA-59, TA-60, and TA-64. Of these, TA-60 and TA-64 were dismissed from further consideration. TA-60 was identified as a major generator of waste based on the activity of "gamma emitters" shipped for disposal in 1994. The total activity of this waste, 1.0E-08 Ci, was much less than the disposed activities of important gamma emitters (e.g., Co-60 and Cs-137) in that year (2.2E+02 and 1.5E+01 Ci, respectively). Given this fact, TA-60 was eliminated from consideration as a major generator of waste. The TA-64 waste shipments noted in the database consisted of soil samples collected from other TAs, including TA-1, TA-21, TA-50, and TA-54. Given that the waste was not generated at TA-64 and that the areas from which the contamination originated had already been identified as major generators of waste, this TA was removed from further consideration in the future waste projections.

Estimates of future levels of activity at the TAs identified as major generators of LLW at LANL are provided in Table 3-18. Current operations are expected to continue essentially unchanged for the foreseeable future at several TAs. In contrast, the waste generated at five TAs (TA-0, TA-1, TA-2, TA-33, and TA-52) is expected to consist of primarily ER and D&D waste as closed sites and facilities are remediated. Some or all of the operations are expected to continue at the remaining TAs, although the nature of the LLW generated at these TAs may change as operations evolve. For example, the quantities and types of waste shipped for disposal from TA-21 are expected to change significantly with the D&D of the plutonium and uranium facilities.

Based on the results provided in Table 3-18, LLW generated in the future at TA-0, TA-1, TA-2, TA-33, and TA-52 was assumed to consist solely of ER and D&D waste. These TAs were not considered in the development of projected operational waste inventories. With the exception of TA-54, all of the remaining TAs listed in Table 3-18 were included in the development of projected inventories for routine LLW. While the level of activity at some of these facilities may decline in the future, it was not feasible to use the existing LLW disposal information to identify a subset of the waste generated at a given TA as waste which will no longer be generated. Consequently, a conservative approach was adopted wherein all LLW generated at these TAs is included in the performance assessment and composite analysis. Adjustments to the projected inventory to account for the start of new operations at a small

Table 3-18. Projections of future operations at the major generators of LLW.

Technical Area	Future Operational Status
TA-0 Unassigned Land Reserve	Generation of ER waste only.
TA-1 Town Site	Generation of ER waste only.
TA-2 Omega Site	Reactor has been shut down; generation of ER and D&D waste only.
TA-3 South Mesa Site	Operations will continue.
TA-8 Anchor Site West	Operations will continue.
TA-9 Anchor Site East	Operations will continue.
TA-11 K-Site	Operations will continue.
TA-15 R-Site	Operations will continue.
TA-16 S-Site	Operations will continue.
TA-18 Parajito Laboratory	Operations will continue.
TA-21 DP-Site	D&D of plutonium and uranium facilities expected in future; other operations will continue.
TA-33 HP-Site	Facility closed and scheduled to undergo D&D.
TA-35 Ten Site	Work with radionuclides will decline; D&D of old fission product buildings is scheduled.
TA-36 Kappa Site	Operations will continue.
TA-39 Ancho Canyon Site	Operations will continue.
TA-41 W-Site	Decline in operations handling radionuclides.
TA-43 Health Research Lab and DOE Headquarters	Operations will continue.
TA-46 WA-Site	Operations will continue.
TA-48 Radiochemistry Site	Operations will continue; quantity of fresh fission-product waste will decline.
TA-50 Waste Management Site	Current facilities to operate until new liquid radioactive waste treatment facility is constructed. A moderate increase in the activity of the waste is expected from the more efficient treatment process.
TA-51 Radiation Exposure Facility	Operations will continue.
TA-52 Reactor Development Site	Reactors have undergone D&D; activities now center on non-LANL studies that generate little or no waste.
TA-53 Meson Physics Facility	Operations will continue; new waste streams are expected from the irradiation of targets when studies of accelerator production of tritium begin.
TA-54 Waste Disposal Site	No significant generation of waste expected.
TA-55 Plutonium Facility	Operations will continue; waste streams containing weapons-grade plutonium could increase slightly as LANL increases operational plutonium support for DOE. When fabrication of Pu-238 thermal generators is complete, this plutonium waste will decrease.
TA-59 OH-Site	Operations will continue.

number of TAs were not possible because the radiological characteristics of waste from these operations are unknown.

TA-54 was not assumed to be a major generator of LLW in the future. The waste that is attributed to TA-54 in the LLW database is generally material generated at other TAs. The origin of the waste was listed as TA-54 because the waste underwent special handling at the disposal facility prior to disposal. Quantities of operational LLW actually generated at TA-54 in the future are expected to be small.

In summary, the major generators upon which projections of future operational waste inventories were based are listed in Table 3-19. These generators are expected to account for approximately 95 percent of the operational LLW generated in the future on the basis of total volume, total activity, and radionuclide-specific activities.

As discussed in Section 2.2.1, high-activity tritium waste generated in the past six years is currently being stored while tritium recovery options are being investigated. Because no decision had been made about whether the recovery option would be pursued at the time the inventory was developed, it was assumed that all of this waste in storage and all such waste generated in the future would be sent to Area G for disposal. Table 3-20 lists the total volumes and activities of high-activity tritium waste in storage as of July 1996 and the expected rate of future generation.

The projected operational LLW inventories for Area G are listed in Tables 3-21 through 3-23 for the four waste forms discussed earlier. Table 3-21 lists the volumes and as-disposed activities of waste projected to require disposal for the remainder of the facility's lifetime. Table 3-22 provides the total as-disposed radionuclide inventories for the LLW disposed of in pits, while Table 3-23 provides similar information for the disposal shafts. The waste with high levels of tritium, summarized in Table 3-20, is included in Tables 3-21 through 3-23. Radionuclides with half-lives of 5 years or less have been screened from the projected inventories.

Table 3-19. Major generators of LLW between 1990 and 1995.

TA-3 South Mesa Site
TA-8 Anchor Site West
TA-9 Anchor Site East
TA-11 K-Site
TA-15 R-Site
TA-16 S-Site
TA-18 Parajito Laboratory
TA-21 DP-Site
TA-35 Ten Site
TA-36 Kappa Site
TA-39 Ancho Canyon Site
TA-41 W-Site
TA-43 Health Research Lab and DOE Headquarters
TA-46 WA Site
TA-48 Radiochemistry Site
TA-50 OH-Site
TA-51 Radiation Exposure Facility
TA-53 Meson Physics Facility
TA-55 Plutonium Facility
TA-59 OH-Site

Table 3-20. Stored and projected inventories of waste with high H-3 activities.

Disposal Unit/Waste Form	Volume in Storage (m^3)	Activity in Storage (Ci)	Annual Generation Rate Volume (m^3)	Annual Generation Rate Activity (Ci)	Total Waste Inventory Volume (m^3)	Total Waste Inventory Activity (Ci)
Pit Waste						
Surface-Contaminated Waste	5.8E+01	5.8E+02			5.8E+01	5.8E+02
Soils						
Concrete and Sludges						
Bulk-Contaminated Waste						
Shaft Waste						
Surface-Contaminated Waste	3.2E+00	6.2E+05	5.7E-01	1.0E+05	3.1E+01	5.5E+06
Soils						
Concrete and Sludges						
Bulk-Contaminated Waste						

Table 3-21. Projected operational LLW volumes and activities for pits and shafts.

Disposal Unit/Waste Form	Average Annual Volume (m^3)	Average Annual Activity (Ci)	Total Volume (m^3)	Total Activity (Ci)
Pit Waste			1.1E+05[a]	1.4E+03[b]
Surface-Contaminated Waste	2.2E+03	1.8E+01	4.8E+03	1.0E+00
Soils	9.9E+01	2.1E-02	1.1E+03	3.6E+01
Concrete and Sludges	2.2E+01	7.3E-01	2.5E+03	1.7E+01
Bulk-Contaminated Waste	5.2E+01	3.4E-01		
Shaft Waste				
Surface-Contaminated Waste	2.3E+01	1.1E+05	1.1E+03[c]	6.1E+06[d]
Soils	—	—	—	—
Concrete and Sludges	4.0E+00	7.0E-02	2.0E+02	3.4E+00
Bulk-Contaminated Waste	2.3E+00	3.3E+02	1.1E+02	1.6E+04

a. Includes 5.8E+01 m^3 of stored high-tritium-activity waste.
b. Includes 5.8E+02 Ci of stored high-tritium-activity waste.
c. Includes 3.2E+00 m^3 of stored high-tritium-activity waste.
d. Includes 6.2E+05 Ci of stored high-tritium-activity waste.

Table 3-22. Projected radionuclide inventories for operational waste disposed of in pits.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ag-108m	8.6E+03	2.0E-01						
Al-26	2.3E-01	3.1E-07						
Am-241	1.8E+04	1.1E+00			1.1E+03	4.9E+00		
Am-243	3.5E+02	2.0E-04						
Ba-133	8.8E+03	7.0E+00						
Bi-207	6.0E+00	7.7E-04						
Bk-247	1.5E+02	4.5E-07						
C-14	1.6E+03	1.4E-01						
Cd-113m	8.6E+03	8.0E-01						
Cf-252	1.2E+00	1.2E-04						
Cl-36	1.2E+00	3.1E-03						
Co-60	1.7E+04	2.0E+01			1.2E+00	2.5E-08	2.5E+03	5.5E-01
Cs-135	8.6E+03	2.0E-04						
Cs-137	1.2E+04	2.9E+00			4.9E-01	2.1E-04		
Dy-154	8.6E+03	1.3E-06						
Eu-152	8.7E+03	4.4E-01						
Eu-154	8.6E+03	1.3E-01						
Gd-148	8.6E+03	3.4E-01						
Gd-150	8.6E+03	3.6E-06						
H-3	5.2E+03	7.0E+02			1.9E+00	5.2E+00		
Hf-182	3.5E+02	5.2E-02						
Ho-163	1.1E+02	2.8E-02						
I-129	8.6E+03	2.4E-06						
Kr-81	8.6E+03	4.3E-05						
Kr-85	8.6E+03	2.1E+00						
La-137	8.6E+03	7.0E-04						
Mo-93	8.6E+03	1.4E-02						
Nb-92	8.6E+03	4.2E-06						
Nb-94	8.6E+03	2.1E-01						
Ni-59	1.5E+02	3.9E-02						
Ni-63	2.3E+00	1.3E-03						
Np-237	5.1E+02	5.0E-03						
Pa-231	1.4E+02	7.4E-08						
Pb-210	9.3E-01	7.8E-02						
Pd-107	8.6E+03	5.9E-06						
Pm-145	1.4E+02	6.4E-03						
Pu-238	2.6E+04	3.6E-01			1.1E+03	1.9E+01		
Pu-239	5.7E+04	1.8E+01			1.1E+03	6.8E+00		
Pu-240	1.9E+04	2.0E+00						
Pu-241	1.9E+04	3.1E+01						
Pu-242	1.9E+04	1.1E-04						
Ra-226	1.6E+02	2.0E-01						
Se-79	8.6E+03	4.0E-06						
Si-32	1.6E+03	4.3E-01						
Sm-146	8.6E+03	3.2E-07						

Table 3-22. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Sm-147	8.8E+03	2.5E-10						
Sm-151	8.6E+03	1.1E-01						
Sr-90	9.7E+03	3.0E+00						
Tb-157	8.6E+03	4.0E-03						
Tb-158	8.6E+03	1.7E-03						
Tc-97	8.6E+03	3.2E-05						
Tc-99	1.1E+04	1.6E-01						
Th-229	1.1E+02	3.1E-04						
Th-230	1.8E+02	3.5E-06						
Th-232	2.9E+03	1.8E-02						
Ti-44	5.7E+01	2.5E-03						
U-232	1.6E+00	1.6E-09						
U-233	4.5E+01	6.2E-03						
U-234	3.5E+03	3.3E+00	1.9E+03	7.7E-08				
U-235	3.4E+04	4.2E+00	1.9E+03	1.8E-09	1.1E+03	4.5E-03		
U-236	1.8E+03	1.8E-02	1.9E+03	3.7E-09				
U-238	2.2E+04	2.9E+01	4.5E+03	1.0E+00	4.6E+00	1.5E-02		
Zr-93	8.6E+03	4.4E-05						

Table 3-23. Projected shaft radionuclide inventories for Area G.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Am-241	7.2E+01	8.5E-03			2.9E+02	8.5E-01		
Ba-133	2.5E-01	2.0E-03						
Bi-207	3.1E-02	3.3E-05						
C-14	2.3E+01	2.2E-08						
Cf-252	3.1E-02	3.7E-07						
Co-60	4.1E+02	4.6E+03					1.1E+02	5.3E+02
Cs-135	2.2E+01	3.7E-05						
Cs-137	3.6E+01	6.7E+02						
Eu-152	1.0E+00	1.8E-02						
Eu-154	2.8E+00	7.9E-01						
H-3	1.8E+02	6.0E+06						
Kr-85	9.3E-03	8.2E-03						
Nb-92	9.3E-01	3.3E-02						
Ni-63	3.1E-02	2.5E-04						
Pb-210	1.5E-01	1.9E-08						
Pm-145	1.5E-01	3.2E-13						
Pu-238	1.2E+02	1.1E-02			2.9E+02	2.0E+00		
Pu-239	1.5E+02	1.1E-01			3.0E+02	6.3E-01		
Pu-240	3.4E+00	2.3E-02						
Pu-241	3.4E+00	3.5E-01						
Pu-242	3.4E+00	1.3E-06						
Ra-226	4.6E-01	1.6E-06						
Sm-147	1.5E-01	1.2E-14						
Sr-90	1.6E+00	3.4E+01						
Th-229	3.1E-02	4.4E-07						
Th-232	7.6E+00	3.3E-03						
U-234	9.6E-01	9.9E-04						
U-235	1.1E+02	8.9E-03			2.9E+02	1.8E-03		
U-236	9.6E-01	4.7E-05						
U-238	1.7E+02	1.6E+00			3.4E+00	3.1E-06		

3.2.2 ER and D&D LLW

The volumes of LLW expected to require disposal at Area G due to ER and D&D activities and the CMR upgrade are listed in Table 3-24. All of this waste is expected to be disposed of in pits. The volume of ER waste is based on estimates collected from the various Field Units at LANL. Estimates had been received from about 60 percent of the Units at the time the ER inventory projections were being developed for inclusion in the Area G inventory. These units are expected to account for approximately 85 percent of the total future waste (Maassen, 1996). Consequently, the projections were increased 15 percent to account for the non-responding Field Units. The D&D waste volume projections included in Table 3-24 are based on a specific set of funding assumptions. Waste projections were available through fiscal year 2001 at the time the Area G inventory was being developed; D&D activities may continue beyond this year. The volume estimate for the CMR upgrade waste accounts for the remainder of the projections (Kennicott, 1996).

As discussed in Section 2.2.2, the radionuclide concentrations in the ER, D&D, and CMR upgrade waste were assumed to be the same as those found in mixed low-level ER waste by ERM/Golder (1995). These concentrations are provided in Table 3-25. The as-disposed radionuclide inventories based on these concentrations and the volume information provided in Table 3-24 are shown in Table 3-26. Inventories are listed for radionuclides with half-lives greater than 5 years and for radionuclides that have daughters or parents with half-lives greater than 5 years.

3.2.3 MLLW Residues

The total volume and activity of uranium chips and turnings in storage (i.e., waste plus diesel fuel) through 1995 was 24.8 m^3 and 5.3 Ci, respectively (Brazenger, 1996). Generation rates of uranium chips are expected to increase relative to historic levels as workloads in the LANL shops increase (Hodges, 1996a). The quantities of such waste expected to require disposal as a result of future operations are listed in Table 3-27. The waste was assigned to the soil waste form, based on the fact that the waste currently is expected to be stabilized in a clay matrix following treatment. The radionuclide inventories in the waste also are included in Table 3-27.

Table 3-24. **Projected ER and D&D and CMR Upgrade LLW inventories for Area G.**

	ER and D&D Waste		CMR Upgrade Waste		Total	
Waste Form	Total Volume (m^3)	Total Activity (Ci)	Total Volume (m^3)	Total Activity (Ci)	Total Volume (m^3)	Total Activity (Ci)
Surface-Contaminated Waste	8.9E+03	6.3E+00	5.2E+03	3.7E+00	1.4E+04	1.0E+01
Soils	4.4E+03	3.1E+00			4.4E+03	3.1E+00
Concrete and Sludges	4.4E+03	3.1E+00			4.4E+03	3.1E+00
Bulk-Contaminated Waste						

Table 3-25. Radionuclide concentrations in ER, D&D, and CMR upgrade waste.[a]

Radionuclide	Concentration (pCi/g)
Ac-227	2.2E+00
Am-241	1.6E+00
Ce-144	5.1E-01
Co-60	2.6E-01
Cs-137	5.0E-01
H-3	6.4E+01
K-40	2.6E+01
Pb-210	4.3E+00
Pb-212	1.4E+00
Pu-238	4.8E-01
Pu-239	8.9E+01
Pu-240	9.5E+01
Ra-226	1.5E+00
Sr-90	8.9E-01
Tc-99	3.0E-01
Th-228	1.4E+00
Th-230	1.1E+00
Th-232	1.8E+00
Th-234	1.9E+00
Tl-208	4.2E-01
U-234	6.5E+00
U-235	5.4E-01
U-238	5.6E+00

a. Source: ERM/Golder, 1995.

Table 3-26. Radionuclide inventories for ER, D&D, and CMR upgrade waste.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ac-227	1.4E+04	7.1E-02	4.4E+03	2.2E-02	4.4E+03	2.2E-02		
Am-241	1.4E+04	5.1E-02	4.4E+03	1.6E-02	4.4E+03	1.6E-02		
Co-60	1.4E+04	8.4E-03	4.4E+03	2.7E-03	4.4E+03	2.7E-03		
Cs-137	1.4E+04	1.6E-02	4.4E+03	5.1E-03	4.4E+03	5.1E-03		
H-3	1.4E+04	2.1E+00	4.4E+03	6.5E-01	4.4E+03	6.5E-01		
K-40	1.4E+04	8.3E-01	4.4E+03	2.6E-01	4.4E+03	2.6E-01		
Pb-210	1.4E+04	1.4E-01	4.4E+03	4.4E-02	4.4E+03	4.4E-02		
Pu-238	1.4E+04	1.6E-02	4.4E+03	4.9E-03	4.4E+03	4.9E-03		
Pu-239	1.4E+04	2.9E+00	4.4E+03	9.1E-01	4.4E+03	9.1E-01		
Pu-240	1.4E+04	3.1E+00	4.4E+03	9.7E-01	4.4E+03	9.7E-01		
Ra-226	1.4E+04	4.9E-02	4.4E+03	1.5E-02	4.4E+03	1.5E-02		
Sr-90	1.4E+04	2.9E-02	4.4E+03	9.1E-03	4.4E+03	9.1E-03		
Tc-99	1.4E+04	9.7E-03	4.4E+03	3.1E-03	4.4E+03	3.1E-03		
Th-230	1.4E+04	3.7E-02	4.4E+03	1.2E-02	4.4E+03	1.2E-02		
Th-232	1.4E+04	5.9E-02	4.4E+03	1.9E-02	4.4E+03	1.9E-02		
Th-234	1.4E+04	6.2E-02	4.4E+03	1.9E-02	4.4E+03	1.9E-02		
U-234	1.4E+04	2.1E-01	4.4E+03	6.6E-02	4.4E+03	1.9E-02		
U-235	1.4E+04	1.7E-02	4.4E+03	5.5E-03	4.4E+03	6.6E-02		
U-238	1.4E+04	1.8E-01	4.4E+03	5.7E-02	4.4E+03	5.5E-03		

Table 3-27. Projected inventories of uranium chip waste.

Waste Parameter	Disposal Volume (m^3)	Disposal Activity (Ci)
Total Volumes and Activities		
Stored Waste	2.5E+01	5.3E+00
1996	9.3E-01	1.6E-01
1997-2007	4.4E+01	7.7E+00
2008-2049	9.7E+01	1.7E+01
Radionuclide-Specific Activities		
U-234	1.7E+02	1.3E+01
U-235	1.7E+02	3.0E-01
U-236	1.7E+02	6.0E-01
U-238	1.7E+02	1.7E+01

3.2.4 Total Future Inventory

The total volumes and activities of LLW projected to require disposal at Area G in the future are listed in Table 3-28. Separate totals are provided for the four waste forms considered in source-term modeling and for waste disposed of in pits and shafts. Tables 3-29 and 3-30 list the total projected radionuclide inventories for the pits and shafts, respectively.

3.3 SUMMARY OF THE AREA G RADIOACTIVE WASTE INVENTORY

As discussed in Chapter 1, the Area G performance assessment and composite analysis address different portions of the waste that has been disposed of, and which is expected to require disposal at, the disposal facility. This section summarizes the radioactive waste inventories specific to these two analyses. The Area G inventory for the performance assessment is summarized in Section 3.3.1, while Section 3.3.2 presents the inventory for the composite analysis.

3.3.1 Radioactive Waste Inventory for the Area G Performance Assessment

The Area G performance assessment includes waste disposed of since September 26, 1988, and the waste expected to require disposal over the remainder of the facility's lifetime. The characteristics of this waste are detailed in Sections 3.1.3 and 3.2 of this report. The summary tables that follow are based on the information in those sections.

The total volumes and activities of waste projected to be disposed of between September 26, 1988, and the year 2044 are provided in Table 3-31 for the disposal pits and shafts. These quantities are provided for the four waste forms that will be considered in source-term modeling, and are summed over all pits and shafts receiving waste during this period. The projected radionuclide inventories for this waste are listed in Tables 3-32 and 3-33 for pits and shafts, respectively. The waste volumes listed in these tables represent the quantities of waste contaminated with each radionuclide. Because several radionuclides may

Table 3-28. Total future inventory volume and activity projections.

Disposal Unit/Waste Form	Total Volume (m^3)	Total Activity (Ci)
Pit Waste		
Surface-Contaminated Waste	1.2E+05	1.4E+03
Soils	9.4E+03	3.4E+01
Concrete and Sludges	5.5E+03	3.9E+01
Bulk-Contaminated Waste	2.5E+03	1.7E+01
Shaft Waste		
Surface-Contaminated Waste	1.1E+03	6.1E+06
Soils	—	—
Concrete and Sludges	2.0E+02	3.4E+00
Bulk-Contaminated Waste	1.1E+02	1.6E+04

Table 3-29. Total future radionuclide inventories for Area G pits.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Ac-227	1.4E+04	7.1E-02	4.4E+03	2.2E-02	4.4E+03	2.2E-02		
Ag-108m	8.6E+03	2.0E-01						
Al-26	2.3E-01	3.1E-07						
Am-241	3.2E+04	1.1E+00	4.4E+03	1.6E-02	5.5E+03	5.0E+00		
Am-243	3.5E+02	2.0E-04						
Ba-133	8.8E+03	7.0E+00						
Bi-207	6.0E+00	7.7E-04						
Bk-247	1.5E+02	4.5E-07						
C-14	1.6E+03	1.4E-01						
Cd-113m	8.6E+03	8.0E-01						
Cf-252	1.2E+00	1.2E-04						
Cl-36	1.2E+00	3.1E-03						
Co-60	3.1E+04	2.0E+01	4.4E+03	2.7E-03	4.4E+03	2.7E-03	2.5E+03	5.5E-01
Cs-135	8.6E+03	2.0E-04						
Cs-137	2.6E+04	2.9E+00	4.4E+03	5.1E-03	4.4E+03	5.3E-03		
Dy-154	8.6E+03	1.3E-06						
Eu-152	8.7E+03	4.4E-01						
Eu-154	8.6E+03	1.3E-01						
Gd-148	8.6E+03	3.4E-01						
Gd-150	8.6E+03	3.6E-06						
H-3	1.9E+04	7.0E+02	4.4E+03	6.5E-01	4.4E+03	5.8E+00		
Hf-182	3.5E+02	5.2E-02						
Ho-163	1.1E+02	2.8E-02						
I-129	8.6E+03	2.4E-06						
K-40	1.4E+04	8.3E-01	4.4E+03	2.6E-01	4.4E+03	2.6E-01		
Kr-81	8.6E+03	4.3E-05						
Kr-85	8.6E+03	2.1E+00						
La-137	8.6E+03	7.0E-04						
Mo-93	8.6E+03	1.4E-02						
Nb-92	8.6E+03	4.2E-06						
Nb-94	8.6E+03	2.1E-01						
Ni-59	1.5E+02	3.9E-02						
Ni-63	2.3E+00	1.3E-03						
Np-237	5.1E+02	5.0E-03						
Pa-231	1.4E+02	7.4E-08						
Pb-210	1.4E+04	2.2E-01	4.4E+03	4.4E-02	4.4E+03	4.4E-02		
Pd-107	8.6E+03	5.9E-06						
Pm-145	1.4E+02	6.4E-03						
Pu-238	4.1E+04	3.8E-01	4.4E+03	4.9E-03	5.5E+03	1.9E+01		
Pu-239	7.1E+04	2.1E+01	4.4E+03	9.1E-01	5.5E+03	7.7E+00		
Pu-240	3.3E+04	5.1E+00	4.4E+03	9.7E-01	4.4E+03	9.7E-01		
Pu-241	1.9E+04	3.1E+01						
Pu-242	1.9E+04	1.1E-04						
Ra-226	1.4E+04	2.4E-01	4.4E+03	1.5E-02	4.4E+03	1.5E-02		
Se-79	8.6E+03	4.0E-06						
Si-32	1.6E+03	4.3E-01						

Table 3-29. Continued.

Radionuclide	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Sm-146	8.6E+03	3.2E-07						
Sm-147	8.8E+03	2.5E-10						
Sm-151	8.6E+03	1.1E-01						
Sr-90	2.4E+04	3.0E+00	4.4E+03	9.1E-03	4.4E+03	9.1E-03		
Tb-157	8.6E+03	4.0E-03						
Tb-158	8.6E+03	1.7E-03						
Tc-97	8.6E+03	3.2E-05						
Tc-99	2.5E+04	1.7E-01	4.4E+03	3.1E-03	4.4E+03	3.1E-03		
Th-229	1.1E+02	3.1E-04						
Th-230	1.4E+04	3.7E-02	4.4E+03	1.2E-02	4.4E+03	1.2E-02		
Th-232	1.7E+04	7.7E-02	4.4E+03	1.9E-02	4.4E+03	1.9E-02		
Ti-44	5.7E+01	2.5E-03						
U-232	1.6E+00	1.6E-09						
U-233	4.5E+01	6.2E-03						
U-234	1.8E+04	3.5E+00	6.5E+03	1.3E+01	4.4E+03	6.6E-02		
U-235	4.8E+04	4.2E+00	6.5E+03	3.1E-01	5.5E+03	1.0E-02		
U-236	1.8E+03	1.8E-02	2.0E+03	6.0E-01				
U-238	3.7E+04	2.9E+01	9.1E+03	1.8E+01	4.4E+03	7.2E-02		
Zr-93	8.6E+03	4.4E-05						

Table 3-30. Total future radionuclide inventories for Area G shafts.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Am-241	7.2E+01	8.5E-03			2.9E+02	8.5E-01		
Ba-133	2.5E-01	2.0E-03						
Bi-207	3.1E-02	3.3E-05						
C-14	2.3E+01	2.2E-08						
Cf-252	3.1E-02	3.7E-07						
Co-60	4.1E+02	4.6E+03					1.1E+02	5.3E+02
Cs-135	2.2E+01	3.7E-05						
Cs-137	3.6E+01	6.7E+02						
Eu-152	1.0E+00	1.8E-02						
Eu-154	2.8E+00	7.9E-01						
H-3	2.4E+02	6.2E+06						
Kr-85	9.3E-03	8.2E-03						
Lu-172	1.1E+01	2.1E+00						
Nb-92	9.3E-01	3.3E-02						
Ni-63	3.1E-02	2.5E-04						
Pb-210	1.5E-01	1.9E-08						
Pm-145	1.5E-01	3.2E-13						
Pu-238	1.2E+02	1.1E-02			2.9E+02	2.0E+00		
Pu-239	1.5E+02	1.1E-01			3.0E+02	6.3E-01		
Pu-240	3.4E+00	2.3E-02						
Pu-241	3.4E+00	3.5E-01						
Pu-242	3.4E+00	1.3E-06						
Ra-226	4.6E-01	1.6E-06						
Sm-147	1.5E-01	1.2E-14						
Sr-90	1.6E+00	3.4E+01						
Th-229	3.1E-02	4.4E-07						
Th-232	7.6E+00	3.3E-03						
U-234	9.6E-01	9.9E-04						
U-235	1.1E+02	8.9E-03			2.9E+02	1.8E-03		
U-236	9.6E-01	4.7E-05						
U-238	1.7E+02	1.6E+00			3.4E+00	3.1E-06		

Table 3-31. Pit and shaft waste volumes and activities included in the Area G performance assessment inventory.

Disposal Unit/ Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pits		
Surface-Contaminated Waste	1.5E+05	1.6E+03
Soils	1.4E+04	4.0E+01
Concrete and Sludges	6.8E+03	4.4E+01
Bulk-Contaminated Waste	3.5E+03	2.4E+01
Shafts		
Surface-Contaminated Waste	1.3E+03	6.6E+06
Soils	1.3E+01	2.7E-07
Concrete and Sludges	2.2E+02	3.9E+00
Bulk-Contaminated Waste	1.4E+02	1.9E+04

Table 3-32. Pit radionuclide inventories for the Area G performance assessment.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ac-227	1.4E+04	7.1E-02	4.4E+03	2.2E-02	4.4E+03	2.2E-02		
Ag-108m	1.0E+04	2.3E-01	6.8E+02	3.4E-06	7.2E+01	1.6E-06		
Al-26	2.6E-01	3.4E-07						
Am-241	3.5E+04	1.2E+00	4.9E+03	2.0E-02	5.7E+03	5.6E+00		
Am-243	3.9E+02	3.4E-04	1.6E+00	5.7E-06	1.6E+00	5.7E-06		
Ba-133	1.1E+04	8.3E+00	6.8E+02	1.2E-04	7.2E+01	5.8E-05		
Bi-207	6.8E+00	8.6E-04						
Bk-247	1.7E+02	5.1E-07						
C-14	1.9E+03	1.5E-01	9.0E+00	3.9E-05	8.8E+00	3.9E-05		
Cd-113m	1.0E+04	9.5E-01	6.8E+02	1.4E-05	7.2E+01	6.6E-06		
Cf-252	1.3E+00	1.3E-04						
Cl-36	1.3E+00	3.4E-03						
Co-60	3.5E+04	3.0E+01	4.8E+03	2.7E-01	4.6E+03	2.6E-01	3.5E+03	7.8E-01
Cs-135	1.0E+04	2.3E-04	6.8E+02	6.3E-10	7.2E+01	3.0E-10		
Cs-137	2.9E+04	4.3E+00	5.5E+03	5.9E-01	4.7E+03	5.0E-01		
Dy-154	1.0E+04	1.5E-06	6.8E+02	2.2E-11	7.2E+01	1.1E-11		
Eu-152	1.0E+04	5.6E-01	6.8E+02	8.0E-06	7.3E+01	3.7E-06		
Eu-154	1.0E+04	1.5E-01	6.8E+02	2.2E-06	7.2E+01	1.1E-06		
Gd-148	1.0E+04	4.0E-01	6.8E+02	5.9E-06	7.2E+01	2.8E-06		
Gd-150	1.0E+04	4.2E-06	6.8E+02	6.2E-11	7.2E+01	3.0E-11		
H-3	2.0E+04	7.1E+02	4.7E+03	3.5E+00	4.5E+03	6.5E+00		
Hf-182	3.9E+02	5.9E-02						
Ho-163	1.2E+02	3.2E-02						
I-129	1.0E+04	2.9E-06	6.8E+02	4.2E-11	7.2E+01	2.0E-11		
K-40	1.4E+04	8.3E-01	4.4E+03	2.6E-01	4.4E+03	2.6E-01		
Kr-81	1.0E+04	5.1E-05	6.8E+02	7.4E-10	7.2E+01	3.6E-10		
Kr-85	1.0E+04	2.5E+00	6.8E+02	3.6E-05	7.2E+01	1.8E-05		
La-137	1.0E+04	8.3E-04	6.8E+02	1.2E-08	7.2E+01	5.8E-09		
Mo-93	1.0E+04	1.6E-02	6.8E+02	2.4E-07	7.2E+01	1.2E-07		
Nb-92	1.0E+04	5.0E-06	6.8E+02	7.2E-11	7.2E+01	3.5E-11		
Nb-94	1.0E+04	2.3E-01	6.8E+02	1.0E-07	7.2E+01	6.5E-08		
Ni-59	1.7E+02	4.9E-02	3.8E-01	1.4E-03	3.8E-01	1.4E-03		
Ni-63	2.6E+00	1.5E-03						
Np-237	5.8E+02	5.7E-03	1.7E+00	3.5E-08	1.7E+00	3.5E-08		
Pa-231	1.6E+02	8.3E-06						
Pb-210	1.4E+04	2.3E-01	4.4E+03	4.4E-02	4.4E+03	4.4E-02		
Pd-107	1.0E+04	7.0E-06	6.8E+02	1.0E-10	7.2E+01	4.9E-11		
Pm-145	1.6E+02	5.2E-03						
Pu-238	4.5E+04	4.2E-01	5.2E+03	1.6E+00	5.7E+03	2.1E+01		
Pu-239	8.1E+04	2.4E+01	5.2E+03	1.1E+00	5.8E+03	8.6E+00		
Pu-240	3.6E+04	5.4E+00	4.4E+03	9.7E-01	4.4E+03	9.7E-01		
Pu-241	2.2E+04	3.5E+01	1.1E+00	1.6E-07	1.1E+00	9.5E-13		
Pu-242	2.2E+04	2.4E-04	2.5E+00	5.7E-05	2.5E+00	5.7E-05		
Ra-226	1.4E+04	2.7E-01	4.4E+03	1.5E-02	4.4E+03	1.5E-02		
Se-79	1.0E+04	4.7E-06	6.8E+02	6.8E-11	7.2E+01	3.3E-11		
Si-32	1.9E+03	2.6E+00						
Sm-146	1.0E+04	3.8E-07	6.8E+02	5.6E-12	7.2E+01	2.7E-12		
Sm-147	1.1E+04	3.0E-10	6.8E+02	4.5E-15	7.2E+01	2.1E-15		
Sm-151	1.0E+04	1.3E-01	6.8E+02	1.9E-06	7.2E+01	9.0E-07		

Table 3-32. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Sr-90	2.6E+04	3.6E+00	5.2E+03	4.3E-02	4.5E+03	4.3E-02		
Tb-157	1.0E+04	4.7E-03	6.8E+02	6.9E-06	7.2E+01	3.3E-06		
Tb-158	1.0E+04	2.0E-03	6.8E+02	2.9E-06	7.2E+01	1.4E-06		
Tc-97	1.0E+04	3.8E-05	6.8E+02	5.6E-10	7.2E+01	2.7E-10		
Tc-99	2.7E+04	1.9E-01	5.1E+03	3.1E-03	4.5E+03	3.1E-03		
Th-229	1.2E+02	3.5E-04	1.7E-01	5.2E-07	1.7E-01	5.2E-07		
Th-230	1.4E+04	3.7E-02	4.4E+03	1.2E-02	4.4E+03	1.2E-02		
Th-232	1.7E+04	1.2E-01	4.4E+03	1.9E-02	4.4E+03	1.9E-02		
Ti-44	6.4E+01	2.8E-03						
U-232	2.0E+00	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
U-233	5.8E+01	7.7E-03	4.0E+00	3.4E-04	4.0E+00	3.4E-04		
U-234	1.9E+04	4.1E+00	7.4E+03	1.3E+01	4.7E+03	7.5E-02		
U-235	5.6E+04	4.9E+00	7.6E+03	3.7E-01	6.1E+03	6.8E-02		
U-236	2.1E+03	2.1E-02	2.2E+03	6.0E-01	9.0E+00	6.0E-05		
U-238	4.1E+04	3.4E+01	1.0E+04	1.8E+01	4.6E+03	1.0E-01		
Zr-93	1.0E+04	5.2E-05	6.8E+02	7.6E-10	7.2E+01	3.6E-10		

Table 3-33. Shaft radionuclide inventories for the Area G performance assessment.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ag-108m	6.2E+00	1.2E-01						
Am-241	8.1E+01	9.5E-03			3.3E+02	9.6E-01		
Ba-133	6.5E+00	4.5E+00						
Bi-207	3.5E-02	3.7E-05						
C-14	2.6E+01	8.9E-03						
Cd-113m	6.2E+00	5.1E-01						
Cf-252	3.5E-02	4.2E-07						
Co-60	4.8E+02	5.4E+03					1.4E+02	6.2E+02
Cs-135	3.1E+01	6.4E-05						
Cs-137	4.8E+01	7.5E+02						
Dy-154	6.2E+00	8.2E-07						
Eu-152	7.3E+00	3.0E-01						
Eu-154	9.4E+00	9.7E-01						
Gd-148	6.2E+00	2.2E-01						
Gd-150	6.2E+00	2.3E-06						
H-3	2.9E+02	6.6E+06	7.5E+00	1.5E-07				
I-129	6.2E+00	1.5E-06						
Kr-81	6.2E+00	2.7E-05						
Kr-85	6.2E+00	1.4E+00						
La-137	6.2E+00	4.4E-04						
Lu-172	1.1E+01	2.1E+00						
Mo-93	6.2E+00	8.8E-03						
Nb-92	7.2E+00	3.7E-02						
Nb-94	6.2E+00	2.7E-03						
Ni-63	3.5E-02	2.8E-04						
Pb-210	1.7E-01	2.2E-08						
Pd-107	6.2E+00	3.8E-06						
Pm-145	1.5E-01	3.2E-13						
Pu-238	1.4E+02	1.3E-02			3.3E+02	2.2E+00		
Pu-239	1.7E+02	1.2E-01			3.3E+02	7.1E-01		
Pu-240	3.8E+00	2.6E-02						
Pu-241	3.8E+00	3.9E-01						
Pu-242	3.8E+00	1.5E-06						
Ra-226	5.5E-01	1.7E-05						
Se-79	6.2E+00	2.5E-06						
Sm-146	6.2E+00	2.0E-07						
Sm-147	6.4E+00	1.6E-10						
Sm-151	6.2E+00	6.9E-02						
Sr-90	8.0E+00	4.1E+01						
Tb-157	6.2E+00	2.5E-03						
Tb-158	6.2E+00	1.1E-03						
Tc-97	6.2E+00	2.0E-05						
Tc-99	6.2E+00	2.5E-04						
Th-229	3.5E-02	5.0E-07						
Th-232	8.5E+00	3.7E-03						
U-234	1.2E+00	3.5E-03	1.8E-02	4.7E-08	1.8E-02	4.7E-08		
U-235	1.2E+02	1.0E-02	1.8E-02	1.1E-09	3.3E+02	2.0E-03		
U-236	1.1E+00	5.3E-05	1.8E-02	2.2E-09	1.8E-02	2.2E-09		
U-238	1.9E+02	1.8E+00	1.8E-02	6.1E-08	4.0E+00	3.5E-06		
Zr-93	6.2E+00	2.8E-05						

occur in a single waste package, the sum of these volumes is greater than the total volume of waste disposed of in the pits and shafts.

3.3.2 Radioactive Waste Inventory for the Area G Composite Analysis

The composite analysis includes all waste disposed of since the Area G disposal facility opened in 1957 and the waste expected to require disposal over the remainder of the facility's lifetime. Estimated quantities, physical forms, and radiological characteristics of this waste are presented and discussed in Sections 3.1 and 3.2 of this report. The information summarized in the tables that follow is based on the data presented in those sections.

The projected quantities of waste disposed of from the beginning of operations at Area G through the year 2044 are provided in Table 3-34 for the disposal pits and shafts. Total volumes and activities are provided for surface-contaminated waste, soils, concrete and sludges, and bulk-contaminated waste. They are summed over all pits and shafts receiving waste during this period. Tables 3-35 and 3-36 list the projected pit and shaft radionuclide inventories, respectively, for the waste included in the composite analysis. The waste volumes listed in these tables represent the quantities of waste contaminated with each radionuclide. Because several radionuclides may occur in a single waste package, the sum of these volumes exceeds the total volume of waste disposed of in the pits and shafts.

Table 3-34. Pit and shaft waste volumes and activities included in the Area G composite analysis inventory.

Disposal Unit/ Waste Form	Total Disposal Volume (m^3)	Total Disposal Activity (Ci)
Pits		
Surface-Contaminated Waste	2.4E+05	5.9E+04
Soils	5.4E+04	1.0E+02
Concrete and Sludges	2.0E+04	2.9E+03
Bulk-Contaminated Waste	4.4E+03	5.7E+02
Shafts		
Surface-Contaminated Waste	2.2E+03	7.4E+06
Soils	3.5E+01	1.0E+02
Concrete and Sludges	2.2E+02	1.0E+02
Bulk-Contaminated Waste	2.6E+02	2.6E+04

Table 3-35. Pit radionuclide inventories for the Area G composite analysis.

	Waste Form							
	Surface-Contaminated Waste		Soils		Concrete and Sludges		Bulk-Contaminated Waste	
Radionuclide	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)	Volume (m^3)	Activity (Ci)
Ac-227	1.4E+04	1.0E+00	4.4E+03	2.2E-02	4.4E+03	2.2E-02		
Ag-108m	1.7E+04	3.7E+00	8.1E+02	2.6E-05	3.0E+02	1.2E-03		
Al-26	2.6E-01	3.4E-07						
Am-241	3.6E+04	4.6E+01	5.4E+03	1.2E+00	1.1E+04	2.2E+03		
Am-243	3.9E+02	3.4E-04	1.6E+00	5.7E-05	1.6E+00	5.7E-05		
Ba-133	1.7E+04	1.3E+02	8.1E+02	9.5E-04	3.0E+02	4.2E-02		
Bi-207	6.8E+00	8.6E-04						
Bk-247	1.7E+02	5.1E-07						
C-14	1.9E+03	3.8E-01	9.0E+00	3.9E-05	8.8E+00	3.9E-05		
Cd-109	3.2E+03	3.7E+01						
Cd-113m	1.7E+04	1.5E+01	8.1E+02	1.1E-04	3.0E+02	4.8E-03		
Cf-249	1.9E+00	2.8E-03						
Cf-251	2.3E-01	4.3E-03						
Cf-252	2.1E+00	2.3E-02						
Cl-36	1.3E+00	3.4E-03						
Cm-244	3.6E-01	1.7E-03						
Co-60	3.8E+04	1.3E+03	5.0E+03	6.0E-01	4.7E+03	2.6E-01	4.4E+03	1.9E+01
Cs-135	1.7E+04	8.7E-04	8.1E+02	4.9E-09	3.0E+02	2.2E-07		
Cs-137	3.6E+04	1.1E+03	6.6E+03	6.0E-01	5.0E+03	5.1E-01		
Dy-154	1.7E+04	2.4E-05	8.1E+02	1.7E-10	3.0E+02	7.7E-09		
Eu-152	1.7E+04	8.4E+00	8.1E+02	6.0E-05	3.0E+02	2.7E-03		
Eu-154	1.7E+04	2.4E+00	8.1E+02	1.7E-05	3.0E+02	7.6E-04		
Gd-148	1.7E+04	6.4E+00	8.1E+02	4.6E-05	3.0E+02	2.0E-03		
Gd-150	1.7E+04	6.7E-05	8.1E+02	4.8E-10	3.0E+02	2.1E-08		
H-3	2.3E+04	8.2E+03	4.7E+03	4.7E+00	4.7E+03	7.7E+00		
Hf-182	3.9E+02	5.9E-02						
Ho-163	1.2E+02	3.2E-02						
I-129	1.7E+04	4.6E-05	8.1E+02	3.2E-10	3.0E+02	1.4E-08		
K-40	1.4E+04	8.3E-01	4.4E+03	2.6E-01	4.4E+03	2.6E-01		
Kr-81	1.7E+04	8.1E-04	8.1E+02	5.8E-09	3.0E+02	2.6E-07		
Kr-85	1.7E+04	4.0E+01	8.1E+02	2.8E-04	3.0E+02	1.3E-02		
La-137	1.7E+04	1.3E-02	8.1E+02	9.4E-08	3.0E+02	4.2E-06		
Mo-93	1.7E+04	2.6E-01	8.1E+02	1.9E-06	3.0E+02	8.3E-05		
Nb-92	1.7E+04	5.2E-05	8.0E+02	5.6E-10	3.0E+02	2.5E-08		
Nb-94	1.7E+04	3.1E-01	8.1E+02	5.9E-07	3.0E+02	2.5E-05		
Ni-59	1.7E+02	4.9E-02	3.8E-01	1.4E-03	3.8E-01	1.4E-03		
Ni-63	2.6E+00	1.5E-03						
Np-237	5.9E+02	9.6E-03	1.7E+00	3.5E-08	1.7E+00	3.5E-08		
Pa-231	1.6E+02	8.3E-08						
Pb-210	1.4E+04	2.3E-01	4.4E+03	4.4E-02	4.4E+03	4.4E-02		
Pd-107	1.7E+04	1.1E-04	8.1E+02	8.0E-10	3.0E+02	3.6E-08		
Pm-145	1.6E+02	5.2E-03						
Pu-238	6.4E+04	4.2E+03	9.6E+03	3.4E+00	1.1E+04	6.4E+02		
Pu-239	1.2E+05	1.8E+03	1.7E+04	4.1E+01	1.6E+04	1.0E+02		
Pu-240	4.2E+04	4.6E+02	4.8E+03	1.0E+00	4.6E+03	9.7E-01		
Pu-241	2.8E+04	8.2E+03	3.2E+02	6.5E-01	1.5E+02	6.7E-02		
Pu-242	2.8E+04	4.9E-02	3.2E+02	6.7E-06	1.5E+02	5.7E-06		
Ra-226	1.4E+04	4.6E-01	4.4E+03	1.5E-02	4.4E+03	1.5E-02		
Se-79	1.7E+04	7.5E-05	8.1E+02	5.3E-10	3.0E+02	2.4E-08		

Table 3-35. Continued.

Radionuclide	Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Si-32	2.0E+03	2.6E+00						
Sm-146	1.7E+04	6.1E-06	8.1E+02	4.3E-11	3.0E+02	1.9E-09		
Sm-147	1.7E+04	2.7E-02	8.1E+02	3.4E-14	3.0E+02	1.5E-12		
Sm-151	1.7E+04	2.1E+00	8.1E+02	1.5E-05	3.0E+02	6.5E-04		
Sr-90	3.4E+04	1.4E+03	6.8E+03	2.3E-01	4.9E+03	6.1E-02		
Tb-157	1.7E+04	7.5E-02	8.1E+02	5.4E-07	3.0E+02	2.4E-05		
Tb-158	1.7E+04	3.2E-02	8.1E+02	2.3E-07	3.0E+02	1.0E-06		
Tc-97	1.7E+04	6.1E-04	8.1E+02	4.3E-09	3.0E+02	1.9E-07		
Tc-99	3.3E+04	2.0E-01	5.3E+03	3.1E-03	4.7E+03	3.1E-03		
Th-229	1.2E+02	3.5E-04	1.7E-01	5.2E-07	1.7E-01	5.2E-07		
Th-230	1.4E+04	2.6E+01	4.4E+03	1.2E-02	4.4E+03	1.2E-02		
Th-232	1.7E+04	1.5E-01	4.4E+03	1.9E-02	4.4E+03	1.9E-02		
Ti-44	6.4E+01	2.8E-03						
U-232	2.0E+00	1.1E-04	1.0E-01	5.7E-05	1.0E-01	5.7E-05		
U-233	6.3E+01	2.7E-02	4.0E+00	3.4E-04	2.5E+03	6.2E+00		
U-234	2.0E+04	7.8E+00	7.4E+03	1.4E+01	4.7E+03	7.5E-02		
U-235	8.7E+04	6.1E+00	1.0E+04	4.0E-01	9.0E+03	7.9E-02		
U-236	2.2E+03	2.1E-02	2.2E+03	6.0E-01	9.0E+00	6.0E-05		
U-238	6.5E+04	5.5E+01	1.9E+04	2.3E+01	4.7E+03	1.0E-01		
Zr-93	1.7E+04	8.3E-04	8.1E+02	5.9E-09	3.0E+02	2.6E-07		

Table 3-36. Shaft radionuclide inventories for the Area G composite analysis.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m^3)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m^3)	Soils Activity (Ci)	Concrete and Sludges Volume (m^3)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m^3)	Bulk-Contaminated Waste Activity (Ci)
Ag-108m	4.2E+01	1.9E+01						
Am-241	8.8E+01	4.9E-02			3.3E+02	9.6E-01		
Am-243	2.6E-02	1.1E-05						
Ba-133	4.2E+01	6.8E+02						
Bi-207	3.5E-02	3.7E-05						
C-14	3.2E+01	1.1E+00						
Cd-113m	4.2E+01	7.7E+01						
Cf-252	5.9E-01	1.1E+02						
Cm-244	7.7E-01	3.7E-01						
Co-60	6.4E+02	8.5E+03					2.6E+02	8.4E+02
Cs-135	6.7E+01	3.6E-03						
Cs-137	8.6E+01	9.2E+02						
Dy-154	4.2E+01	1.2E-04						
Eu-152	4.3E+01	4.3E+01						
Eu-154	4.5E+01	1.3E+01						
Gd-148	4.2E+01	3.3E+01						
Gd-150	4.2E+01	3.4E-04						
H-3	4.8E+02	7.5E+06	7.6E+00	1.0E+02	5.3E-01	1.0E+02		
Hf-182	2.8E-02	3.1E+01						
I-129	4.2E+01	2.3E-04						
Kr-81	4.2E+01	4.1E-03						
Kr-85	4.5E+01	2.0E+02						
La-137	4.2E+01	6.7E-02						
Lu-172	1.1E+01	2.1E+00						
Mo-93	4.2E+01	1.3E+00						
Nb-92	4.1E+01	3.7E-02						
Nb-94	4.2E+01	4.0E-01						
Ni-63	3.9E+00	4.6E-03						
Np-237	1.4E-01	1.5E-04						
Pb-210	1.7E-01	2.2E-08						
Pd-107	4.2E+01	5.7E-04						
Pm-145	1.5E-01	3.2E-13						
Pu-238	2.7E+02	2.5E+00			3.3E+02	2.2E+00		
Pu-239	3.9E+02	1.5E+02			3.3E+02	7.1E-01		
Pu-240	1.7E+01	4.7E+00						
Pu-241	1.7E+01	7.3E+01						
Pu-242	1.7E+01	2.7E-04						
Ra-226	1.9E+00	2.5E+00						
Se-79	4.2E+01	3.8E-04						
Sm-146	4.2E+01	3.1E-05						
Sm-147	4.4E+01	2.4E-08						
Sm-151	4.2E+01	1.1E+01						
Sr-90	4.5E+01	3.0E+02						
Tb-157	4.2E+01	3.9E-01						
Tb-158	4.2E+01	1.6E-01						
Tc-97	4.2E+01	3.1E-03						
Tc-99	4.2E+01	3.8E-02						
Th-229	3.5E-02	5.0E-07						
Th-232	2.1E+01	3.4E-02						

Table 3-36. Continued.

Radionuclide	Waste Form: Surface-Contaminated Waste Volume (m³)	Surface-Contaminated Waste Activity (Ci)	Soils Volume (m³)	Soils Activity (Ci)	Concrete and Sludges Volume (m³)	Concrete and Sludges Activity (Ci)	Bulk-Contaminated Waste Volume (m³)	Bulk-Contaminated Waste Activity (Ci)
U-232	7.6E-03	4.3E-01						
U-233	7.7E-01	8.0E+00						
U-234	2.9E+01	5.2E-01	6.2E+00	2.8E-02	1.8E-02	4.7E-08		
U-235	2.7E+02	1.0E+00	6.2E+00	1.1E-03	3.3E+02	2.0E-03		
U-236	2.5E+00	4.1E-04	1.8E-02	2.2E-09	1.8E-02	2.2E-09		
U-238	3.9E+02	1.7E+01	8.0E+00	1.8E-01	4.0E+00	3.5E-06		
Zr-93	4.2E+01	4.3E-03						

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APPENDIX A

RADIONUCLIDES EXCLUDED FROM AREA G INVENTORY PROJECTIONS BASED ON HALF-LIFE CONSIDERATIONS

APPENDIX A

RADIONUCLIDES EXCLUDED FROM AREA G INVENTORY PROJECTIONS BASED ON HALF-LIFE CONSIDERATIONS

As discussed in the main report, institutional control over the Area G disposal facility will be maintained for at least 100 years following the end of disposal operations. During this period, persons will be prevented from intruding onto the site for extended periods and measures will be taken to maintain proper facility function. Consequently, at Area G, there will be little or no potential for exposures to result from radionuclides with extremely short half-lives.

Consistent with the preceding discussion, most radionuclides with half-lives of 5 years or less were excluded from the Area G disposal facility inventory. Exceptions include short-lived radionuclides that decay to one or more daughter products with half-lives exceeding 5 years, and radionuclides that are daughters of parents with half-lives greater than 5 years. The radionuclides that were excluded from the inventory are listed in Table A-1.

Table A-1. Radionuclides excluded from the Area G inventory based on half-life considerations.

Radionuclide	Half-Life (yr)	Notes
Ag-110m	7.0E-01	
As-72	3.0E-03	
As-73	2.2E-01	
As-74	4.9E-02	
Ba-139	1.6E-04	
Ba-140	3.5E-02	
Be-7	1.5E-01	
Bk-249	8.6E-01	Included as Cf-249
Ca-45	4.5E-01	
Cd-109	1.2E+00	
Ce-139	3.8E-01	
Ce-141	8.9E-02	
Ce-144	7.8E-01	
Cm-242	4.5E-01	Included as Pu-238
Co-56	2.1E-01	
Co-57	7.4E-01	
Co-58	2.0E-01	
Cr-51	7.6E-02	
Cs-134	2.1E+00	
Cs-136	3.8E-02	
Cu-67	6.7E-03	
Dy-159	4.0E-01	
Eu-149	2.9E-01	
Eu-150	1.4E-03	Included as Gd-150
Eu-155	1.8E+00	
Eu-156	4.2E-02	
Fe-55	2.6E+00	
Fe-59	1.2E-01	
Gd-151	3.3E-01	
Gd-153	6.6E-01	
Ge-68	7.5E-01	
Hf-172	5.0E+00	
Hf-175	1.9E-01	
Hg-203	1.3E-01	
I-125	1.6E-01	
I-131	2.2E-02	
In-114m	1.4E-01	
In-115m	5.1E-04	
Ir-192	2.0E-01	

Table A-1. Continued.

Radionuclide	Half-Life (yr)	Notes
La-140	4.6E-03	
Lu-172	1.8E-02	
Lu-172m	7.0E-06	
Lu-173	1.4E+00	
Lu-174	3.6E+00	
Mn-52	1.5E-02	
Mn-52m	4.0E-05	
Mn-54	8.3E-01	
Na-22	2.6E+00	
Nb-91m	1.8E-01	
Nb-92m	2.8E-02	
Nb-95	9.6E-02	
Nd-147	3.0E-02	Included as Sm-147
Ni-56	1.7E-02	
Ni-65	2.9E-04	
Np-239	6.4E-03	Included as daughter of Am-243
P-32	3.9E-02	Included as Si-32
Pa-233	7.4E-02	Included as daughter of Np-237
Pb-212	1.2E-03	Included as daughter of Th-232
Pm-143	7.3E-01	
Pm-144	9.6E-01	
Pm-146	4.4E+00	
Pm-147	2.6E+00	Included as Sm-147
Po-210	3.8E-01	Included as daughter of Ra-226
Pu-233	3.8E-05	
Pu-234	1.0E-03	
Ra-228	6.7E+00	Included as daughter of Th-232
Rb-82	2.4E-06	
Rb-83	2.3E-01	
Rb-84	9.0E-02	
Rb-86	5.1E-02	
Re-183	2.0E-01	
Re-188	1.9E-03	
Rh-97	1.9E-06	
Rh-99	4.4E-02	
Rh-101	3.0E+00	
Rh-102	5.6E-01	
Ru-103	1.1E-01	
Ru-106	1.0E+00	

Table A-1. Continued.

Radionuclide	Half-Life (yr)	Notes
S-35	2.4E-01	
Sb-124	1.7E-01	
Sb-125	2.7E+00	
Sb-126	3.4E-02	
Sc-43	4.5E-04	
Sc-44	4.5E-04	Included as daughter of Ti-44
Sc-46	2.3E-01	
Se-75	3.3E-01	
Sm-145	9.3E-01	Included as Pm-145
Sn-113	3.2E-01	
Sn-121	3.1E-03	
Sr-82	6.8E-02	
Sr-85	1.8E-01	
Sr-89	1.4E-01	
Ta-179	1.6E+00	
Ta-182	3.2E-01	Included as Hf-182
Ta-183	1.4E-02	
Tc-95	2.3E-03	
Tc-95m	1.7E-01	
Tc-99m	6.9E-04	Included as Tc-99
Th-228	1.9E+00	Included as daughter of Th-232
Th-234	6.6E-02	Included as daughter of U-238
Tl-204	3.8E+00	
Tl-208	5.9E-06	Included as daughter of Th-232
Tm-170	3.7E-01	
Tm-171	1.9E+00	
U-237	1.8E-02	Included as Np-237
U-239	4.5E-05	
V-48	4.4E-02	
V-49	9.0E-01	
V-52	3.8E-06	
W-181	3.8E-01	
W-185	2.1E-01	
Y-88	3.0E-01	
Y-90	7.3E-03	Included as daughter of Sr-90
Yb-169	8.7E-02	
Zn-65	6.7E-01	
Zr-88	2.3E-01	
Zr-95	1.8E-01	