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2983

Y-12

OAK RIDGE Y-12 PLANT

MARTIN MARIETTA

Historic Accountable Radionuclide Releases (U)

Y-12 Plant

CY 1943 Through FY 1984

Several factors cause uncertainty over the accuracy of the quantities reported. The historical records do not contain complete information on actual measurements of material released. However, the available information allows an estimate of these emissions to be made, based on what is known about the operating history of the installation. For much of the historical data presented in this report, emissions had to be estimated, although in latter years of operation, these measurement data are available for many of the radionuclides. Specific quantities of radioactive material shown in the report should be considered as the most reasonable estimate based on the information available. These numbers are not meant to be interpreted as precise measurements.

E. Owings
W. B. Kenna
M. S. Franklin

September 16, 1985

2983

Derivative Classifier: Edward [illegible], Supervisor, [illegible]

OPERATED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

[redacted]

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(continued)

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1.0 Introduction

1.1 Purpose

This document has been prepared to bring together in one report all accountability information relating to discards (quantities and ultimate dispositions) on all accountable radioactive materials Y-12 was required to include in the Nuclear Material Control and Accountability system. Therefore, the historical quantities have been routinely audited during the years by DOE survey teams for accuracy and compliance with the intent of DOE/ERDA/AEC Orders and Manual Chapters and Y-12 Procedure manuals.

In addition to sections containing tables presenting discards for each fiscal year, and cumulative discards, a section is also included which provides comments on philosophy, operating information and specific time frames for events. This information was compiled by reviewing commentary sections in the monthly reports to AEC and ERDA, by discussions with personnel who worked in the areas and from first hand knowledge from individuals in the Nuclear Materials Control and Accountability Department.

1.2 Scope

This report was prepared using all known accountability documentation for support of the quantities listed. All material balance summaries and commentaries were reviewed for pertinent information and only data supported by primary documentation is included.

1.3 Definitions

The following definitions are given to provide a term of reference for some of the words and phrases used in this report.

Burial Ground - A physical location identified by co-ordinates on plant engineering drawings for disposal of solids and some liquids. The accountability records do not differentiate between "interim burial", "retrievable storage", "construction spoil", "sanitary land fill", or other terms normally used to be more specific as to the type of burial.

Inventory Difference - The difference between the transaction-generated book inventory and the actual physical inventory (also in the past has been called Book-Physical Inventory Difference (BPID) and Material Unaccounted For (MUF)).

Normal Operating Losses - Occur when, due to the inherent nature of the operations known quantities of material (solids, solutions, or gases) are:

(a) Discharged to tanks or put into other containers and stored

(b) Discarded to sewers, cribs, stacks, burial grounds, etc.

Rover Program - An AEC-NASA program in the 1960's to develop a nuclear-fueled rocket engine. Y-12 was involved in development and production of fuel elements for the engine.

Source Material - Uranium or thorium or any combination or in any chemical or physical form or ores which contain by weight one-twentieth of one percent or greater of uranium or thorium, or any combination. Source material does not include special nuclear material.

Special Nuclear Material - (a) Plutonium, uranium enriched in the isotope 233, 235, or any other material which, pursuant to provisions of Section 51 of the Atomic Energy Act of 1954, as amended, has been determined to be special nuclear material, but does not include source material; or (b) any material artificially enriched by any of the foregoing, but does not include source material.

Sunflower Program - A code name for fission weapon component fabrication at the beginning of Y-12 involvement in weapon fabrication. Components were cast and machined from normal and depleted uranium.

1.4 Concepts

From a philosophical standpoint, waste, normal operational losses, and discards are measured conservatively (i.e. to be sure and not overstate these values).

All data in this report for burials, sewer, stack losses and track-out are based on measurements or are estimated based on measurements. If the data is not traceable to primary documentation, it is not used.

Some portions of reported ID (BPID, MUF) could be due to removals which have not been measured.

Solids and Solution Discards

Residues from the various production areas are discarded or reprocessed based on economic criteria, i.e. source material residues may be immediately discarded to the burial grounds or sewer because reprocessing costs exceed recovery value, whereas special nuclear material would be reprocessed until cost of recovery exceeds current value. Discards to the industrial sewer and sanitary sewer are measured prior to dumping and the sewers are sampled at various locations to assure that limits on radioactive material content are not exceeded.

The accountability data for radioactive material leaving the Y-12 Plant via East Fork Poplar Creek are based on proportional samples of flow taken at the entrance to New Hope Pond. Data used by some other groups are based on samples taken at the outflow of New Hope Pond. These two sets of data could be significantly different depending on several factors such as Ph, solubility, flow and mixing action within New Hope Pond.

Atmospheric Discards

Thirty six of 51 stacks which serve areas where special nuclear material is processed are equipped with monitoring systems.

Stacks serving areas processing normal or depleted uranium have not been monitored until recently. A stack monitoring system was recently installed on a stack serving the depleted foundry.

Accidental Losses (UF_6)

These losses occurred during inadvertent releases of uranium hexafluoride to the atmosphere from Dry Chemistry Operations. The accidental loss quantities were shown in our accounting records but originally excluded from routine discards and BPID. The total is shown as an adjustment in the summary table.

Track-out

Processing of radioactive materials eventually generates minute quantities of material that get on the floor and subsequently on the soles of employees shoes. A contamination control program was begun in 1983 wherein all employees must use shoe scuffs or safety shoes that do not leave the processing area. Prior to 1983, personal shoes or company safety shoes had some possibility of removing radioactive materials from the operating areas to the environment. Estimates based on periodic tests, have been made of discards by way of track-out of special material (Uranium >20% enriched) beginning in FY 1956.

Thorium

Natural thorium discards have resulted from two major sources: Oak Ridge National Laboratory reactor development activities and Y-12 Weapon Component fabrication.

Plutonium

Plutonium residues generated in the Y-12 Plant area by ORNL Isotope Separations activities have always been discarded to the ORNL Burial Ground.

U-233

Uranium-233 solutions have routinely been discarded to the ORNL tank farm, while Uranium-233 solids have been discarded to both Y-12 and ORNL burial grounds.

Americium 241, Americium 243, Plutonium 238

These transuranic accountable materials have been received and shipped by Y-12. There has been no processing involved so there has been no reportable quantities discarded or ID generated and therefore no possibility of these materials creating any type of environmental problems.

Neptunium

This material has been used for special cash-work projects since FY 1967. Its use has been in alloying Neptunium with both enriched and depleted uranium generally at 0.5 percent Np or lower. This processing has generated a small amount of unrecoverable residues which have been sent to the X-10 burial ground. Recovery of enriched uranium residues containing Np resulted in raffinates which were discarded to S-3 Ponds. The raffinates contained essentially all the Np and since the Np in raffinates was not measured and written off accountability records, the difference was reported as BPID.

1.5 Notes of Historical Interest

A. The first Request for Approved Inventory Write-offs (AIWO) is dated August 20, 1959. The form was initially designed to record non-routine "write-offs" only; however, in June of 1960 the form was changed to include routine monthly discards for a fiscal year. These requests were approved in advance by the Atomic Energy Commission, Oak Ridge Operations Office.

Prior to August 1959, all requests to remove accountable material from inventory was handled on an individual request basis by letter to AEC.

B. Significant quantities of depleted uranium (D-38) metal started to be received in Y-12 from National Lead of Ohio in FY 1953.

Discards of depleted uranium to sewer and burial ground were not significant in the years 1946-1954 mainly because Y-12 was not processing much depleted plus the fact that turnings and chips and massive metal were recycled through the casting process.

During the period 1953-1959 as long as the isotopic assay of depleted crucible oxide was higher than current tails assay at K-25, Y-12 shipped crucible oxide to K-25 to be reprocessed to feed for the diffusion plant.

During that same period approximately 1,800 55-gallon drums of depleted crucible oxide accumulated and was stored at Y-12 and in 1959 AEC gave permission to bury this material both in an unused oil pit and in the newly opened Bear Creek burial ground.

In January 1954, D-38 replaced normal uranium in Sunflower fabrication. Until then, there was a mix of normal and depleted in the fabrication stream.

In March 1954, physical inventories for D-38 were changed from monthly to annual (end of fiscal year).

C. Pit Number 1 in the "new" Y-12 burial ground (Bear Creek) was dug, filled with depleted crucible oxide and covered in September 1960.

It was found to be uneconomical to fill the concrete pit inside the Y-12 Plant perimeter to its capacity through the three port-holes in the top.

In the 4th quarter, FY 1964, the above material which had been deposited in loose form in an abandoned concrete oil pit identified as Building 9988-1 (behind 9201-1) within the Y-12 Plant area in CY 1959 was charged off the Y-12 inventory as a discard to burial ground to be consistent with the treatment of crucible oxide subsequently produced and consigned to Y-12 Plant burial ground No. 2.

D. Prior to August 1963, depleted chips and turnings had been briquetted and returned to casting as feed along with other massive metal scrap except for a five month period from August through December 1960, when special approval was given to bury depleted chips and turnings. Materials such as carbon molds, floor sweepings, pickling solutions, processing sludges and foundry spills have routinely been discarded to the burial ground (X-10 until 1960) and sewer since depleted processing was begun (~1953).

E. A one time approval dated August 5, 1965 was made to dispose of a large quantity (2,578,000 kgs) of excess depleted uranium scrap in a pit of approximately 50,000 cubic feet under the present coal storage yard in the Western Exclusion Area.

The approval included all excess depleted uranium "now on hand, plus expected accumulations" through FY 1967. NMC&A's records show 1,762,652 kgs under the coal pile.

F. The Y-12 Plant was rather heavily involved in the Savannah River normal Slug Program. The program was closed at Y-12 in June 1960 and clean-up operations produced discards to sewer and burial ground of normal uranium for several months in FY 1959 and 1960.

Normal uranium was used in process development for the Rover program. Approved Inventory Write-off No. 133, FY 1953, shows a discard of normal uranium salvage from Rover development.

G. A major one time discard by burial at Y-12 was the site residue clean-up from the United Nuclear facility at Wood River Junction, Rhode Island. Y-12 was directed by the Department of Energy in 1982 to accept this material and put it into the Y-12 burial grounds. There are 28,936 55-gallon drums of residue containing 16 kg of high enriched uranium fixed in concrete buried in a single use disposal site comprising about 2 acres at the West End of the Plant on the crest of Chestnut Ridge.

H. The entire operation of the electromagnetic isotope separation process from CY 1943 through CY 1946 resulted in a salvage discard of 14 kgs uranium at an average enrichment of almost 26% U-235.

I. The West Tank Farm at Y-12 was placed in operation in FY 1984.

J. The S-3 Pond at Y-12 was officially closed September 30,1984.

Section 2 - Summary of Discards

Table 2A

Table 2B

Table 2C

Table 2A*

Historic Accountable Uranium and Radionuclide Release Report[1]
Period CY 1943 Through FY 1984
(Kg)

Material Type	Cumulative[2] Discards	BPID[3]	Accidental Losses (UF_6)	Electromagnetic Process BPID	Electromagnetic Process Discards	(VZG)[4] Transfers From Offsite	Transfers[5] to Offsite	Transfers[6] From DOE	Maximum Credible Discards to Environment
Depleted U	17,950,440	(1,499,155)	-	-	-	1,404	522,175	-	15,930,514
Normal U	25,652	7,969	-	40,441	0	1,345	1,516	-	73,891
Thorium	178,306	(2,178)	-	-	-	1[13]	1,618	267[7]	174,778
>20% U-235	1,254	833	19	195[8]	14[8]	30	0	16[9]	2,361
<20% U-235	15,963	533	-	288[8]	-	2,041	173	-	18,652
U-233	1	1	-	-	-	-	0	-	2
Plutonium-239/241	0[10]	0	-	-	-	-	0	-	0
Plutonium-238	-[11]	-	-	-	-	-	-	-	-
Neptunium	0[12]	0	-	-	-	-	0	-	0
Americium-241	-	-	-	-	-	-	0	-	-
Americium-243	-	-	-	-	-	-	-	-	-
Total	18,171,616	(1,491,997)	19	40,924	14	4,821	525,482	283	16,200,198

*See following page for footnote explanations.

Table 2A
(continued)

Footnotes

[1]Quantities shown on this table were accounted for and controlled by Y-12 according to requirements defined in DOE Order 5630 and prior orders and manual chapters.

[2]West Tank Farm (Code 94) values not included in cumulative discards. See Table 2B for cumulative discards by category.

[3]( ) Denotes gain.

[4]Station VZG was designated as an inventory account to document discards from offsite facilities.

[5]Transfers to offsite include 8 kg of <20% U-235 to ORGDP. This balance was transferred to ORNL.

[6]Quantities shown in this column were approved by DOE for Y-12 disposal but did not enter Y-12 records.

[7]See pages 60 through 63 about residues trucked to Y-12 from Nuclear Chemicals and Metals Corp. Huntsville, TN.

[8]Disposal site uncertain for these totals. However, best assumption is that the totals should be included with ORNL releases.

[9]28,936 containers of residues received from United Nuclear Corporation buried at Y-12.

[10]Zero represents transactions, but less than 500 grams.

[11]Dash represents no transactions.

[12]This BPID probably resulted from recovery of enriched residues containing Np. The raffinate from secondary extraction which would contain most of the Np, was discarded to S-3 Ponds.

[13] This 30 kg. amount was received from United Nuclear Corp., Wood River Junction, R.I. in 1977 and ~~received~~ handled as FBY-VZG 1 thru 6 in the Accountability System

Table 2B

Cumulative Discards - CY 1947 Through FY 1984
(Kg)

Material Type	B.G.	Sewer	S-3 Pond	Stacks	Trackout	Cumulative Discards[1]
Depleted Uranium	17,920,400	14,446	15,594	0	0	17,950,440
Normal Uranium	22,539	3,111	2	0	0	25,652
Thorium	171,077	6,008	1,221	0	0	178,306
>20% U-235	718	261	56	114	105	1,254
<20% U-235	9,661	6,254	25	23	0	15,963
U-233	1	0	0	0	0	1
Plutonium 239/241	0	0	0	0	0	0
Neptunium	0	-	-	-	-	0
Total	18,124,396	30,080	16,898	137	105	18,171,616

[1]West Tank Farm (Code 94) values not included in Cumulative Discards.

Table 2C

Nuclear Material Management Safeguard System (NMMSS) Discard Report [1]
Cumulative Through September 30, 1984

DOE Material Type Code	Material Description	Comp. Code[2]	Discard Code[3]	Element	Isotope
10	Depleted Uranium	961	94, 96, 97	31,393	51
10	Depleted Uranium	962	98	17,920,400	40,359
	Total Depleted U			17,951,793 kg	40,410 kg
20	Enriched Uranium	961	94, 96, 97	6,599,392	327,646
20	Enriched Uranium	962	98	10,378,866	739,765
	Total Enriched U			16,978,258 grams	1,067,411 grams
81	Normal Uranium	961	94, 96, 97	3,113	-
81	Normal Uranium	962	98	22,539	-
	Total Normal U			25,652 kg	-
88	Thorium	958	98		-
88	Thorium	961	94, 96, 97	7,229	-
88	Thorium	962	98	171,077	-
	Total Thorium			kg	-

[1]DOE does not require Plutonium and U-233 in the NMMSS cumulative discard report. Also, discards to the atmosphere (stacks), Code 99, are not required for the cumulative report.

[2]Comp. Code 958 - Discards to 98 - Stored Retrievably - Solids;
Comp. Code 961 - Discards to 94, 96, 97 - Liquids to Tanks, Ponds, etc.;
Comp. Code 962 - Discards to 98 - Buried Solids.

[3]Discard Codes:

West Tank Farm - Code 94;
Sewer (Storm) - Code 96;
Pit (S-3 Pond) - Code 97;
Burial Ground - Code 98;
Atmosphere - Code 99.

Section 3 - Discards to Burial Ground

Table 3A - Depleted Uranium

Table 3B - Normal Uranium

Table 3C - Thorium

Table 3D - Enriched Uranium >20%

Table 3E - Enriched Uranium <20%

Table 3F - U-233

Table 3G - Plutonium

Table 3H - Neptunium

Table 3A

Depleted Uranium Discards to Burial Ground
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	-[1]	-	-	-
CY 1948	-	-	-	-
CY 1949	-	-	-	-
CY 1950	-	-	-	-
CY 1951	-	-	-	-
FY 1952	-	-	-	-
FY 1953[2]	0[3]	0	0	0
FY 1954[4]	41	1	41	1
FY 1955[4]	281	1	322	2
FY 1956[4]	24,253	68	24,575	70
FY 1957[4]	103,859	297	128,434	367
FY 1958[4]	148,731	413	277,165	780
FY 1959[4]	245,010	701	522,175	1,481
FY 1960	231,586	648	753,761	2,129
FY 1961	1,492,895	4,174	2,246,656	6,303
FY 1962	293,931	824	2,540,587	7,127
FY 1963	205,680	576	2,746,267	7,703
FY 1964	637,087	1,784	3,383,354	9,487
FY 1965	373,849	1,047	3,757,203	10,534
FY 1966	1,303,314	3,649	5,060,517	14,183
FY 1967	928,441	2,460	5,988,958	16,643
FY 1968	277,815	553	6,266,773	17,196
FY 1969	528,242	1,053	6,795,015	18,249
FY 1970	656,601	1,315	7,451,616	19,564
FY 1971	787,527	1,576	8,239,143	21,140
FY 1972	1,059,474	2,117	9,298,617	23,257
FY 1973	684,801	1,367	9,983,418	24,624
FY 1974	918,577	1,839	10,901,995	26,463
FY 1975	463,807	922	11,365,802	27,385
FY 1976	311,373	96	11,677,175	27,481

[1]Dash represents no transactions.

[2]Prior to FY 1953 depleted U discards were combined with <20% U-235 discards.

[3]Zero represents transactions less than 500 grams.

[4]Disposed to X-10 Burial Ground.

Table 3A

Depleted Uranium Discards to Burial Ground
(Kg)
(continued)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1976A	49,716	617	11,726,891	28,098
FY 1977	293,046	584	12,019,937	28,682
FY 1978	601,724	1,192	12,621,661	29,874
FY 1979	461,950	921	13,083,611	30,795
FY 1980	999,343	1,987	14,082,954	32,782
FY 1981	618,216	1,321	14,701,170	34,103
FY 1982	871,466	1,772	15,572,636	35,875
FY 1983	971,245	1,865	16,543,881	37,740
FY 1984	1,376,519	2,619	17,920,400	40,359

Table 3B

Normal Uranium Discards to Burial Ground
(Kg)

Period	U	Cumulative U
CY 1947	-[1]	-
CY 1948	-	-
CY 1949	-	-
CY 1950	-	-
CY 1951	-	-
FY 1952	-	-
FY 1953[2, 3]	170	170
FY 1954[4]	251	421
FY 1955[4]	41	462
FY 1956[4]	308	770
FY 1957[4]	148	918
FY 1958[4]	39	957
FY 1959[4]	568	1,525
FY 1960	2,480	4,005
FY 1961	1,465	5,470
FY 1962	1,253	6,723
FY 1963	10	6,733
FY 1964	31	6,764
FY 1965	77	6,841
FY 1966	301	7,142
FY 1967	110	7,252
FY 1968	128	7,380
FY 1969	158	7,538
FY 1970	0[5]	7,538
FY 1971	22	7,560
FY 1972	1,592	9,152
FY 1973	51	9,203
FY 1974	609	9,812
FY 1975	34	9,846
FY 1976	1,892	11,738

[1]Dash represents no transactions.

[2]Prior to FY 1953 normal U discards were combined with <20% U-235 discards.

[3]Includes 161 kg disposed to X-10 Burial Ground.

[4]Disposed to X-10 Burial Ground.

[5]Zero represents transactions less than 500 grams.

Table 3B

Normal Uranium Discards to Burial Ground
(Kg)
(continued)

Period	U	Cumulative U
FY 1976A	15	11,753
FY 1977	9,486	21,239
FY 1978	258	21,497
FY 1979	537	22,034
FY 1980	8	22,042
FY 1981	90	22,132
FY 1982	204	22,336
FY 1983	178	22,514
FY 1984	25	22,539

Table 3C

Thorium Discards to Burial Ground
(Kg)

Period	Th	Cumulative Th Element
CY 1947[1]	1	1
CY 1948	-[2]	1
CY 1949	-	1
CY 1950	-	1
CY 1951	-	1
FY 1952	0[3]	1
FY 1953	0	1
FY 1954[1]	7	8
FY 1955	0	8
FY 1956[1]	12	20
FY 1957[1]	652	672
FY 1958[1]	252	924
FY 1959[1]	694	1,618
FY 1960	0	1,618
FY 1961	807	2,425
FY 1962	2,514	4,939
FY 1963	3,167	8,106
FY 1964	14,447	22,553
FY 1965	15,098	37,651
FY 1966	6,586	44,237
FY 1967	5,914	50,151
FY 1968	517	50,668
FY 1969	770	51,438
FY 1970	10,052	61,490
FY 1971	8,628	70,118
FY 1972	10,083	80,201
FY 1973	7,573	87,774
FY 1974	8,131	95,905
FY 1975	9,362	105,267
FY 1976[4]	736	106,003

[1]Disposed to X-10 Burial Ground.

[2]Dash represents no transactions.

[3]Zero represents transactions less than 500 grams.

[4]FY 1976 does not include

Table 3C

Thorium Discards to Burial Ground
(Kg)
(continued)

Period	Th	Cumulative Th Element
FY 1976A	0	106,003
FY 1977	0	106,003
FY 1978	0	106,003
FY 1979	0	106,003
FY 1980	340	106,343
FY 1981	252	106,595
FY 1982	0	106,595
FY 1983	64,397	170,992
FY 1984	85	171,077

Table 3D

Enriched Uranium >20% Discards to Burial Ground
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	-[1]	-	-	-
CY 1948	-	-	-	-
CY 1949	0[2]	0	0	0
CY 1950	0	0	0	0
CY 1951	0	0	0	0
FY 1952	0	0	0	0
FY 1953	1	1	1	1
FY 1954	4	4	5	5
FY 1955	2	2	7	7
FY 1956	4	3	11	10
FY 1957	12	11	23	21
FY 1958	15	14	38	35
FY 1959	53	49	91	84
FY 1960	37	34	128	118
FY 1961	29	27	157	145
FY 1962	25	23	182	168
FY 1963	33	31	215	199
FY 1964	38	35	253	234
FY 1965	34	27	287	261
FY 1966	54	32	341	293
FY 1967	25	22	366	315
FY 1968	37	34	403	349
FY 1969	28	20	431	369
FY 1970	34	25	465	394
FY 1971	30	26	495	420
FY 1972	39	35	534	455
FY 1973	30	24	564	479
FY 1974	22	18	586	497
FY 1975	20	15	606	512
FY 1976	13	9	619	521

[1]Dash represents no transactions.

[2]Zero represents transactions less than 500 grams.

Table 3D

Enriched Uranium >20% Discards to Burial Ground
(Kg)
(continued)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1976A	3	3	622	524
FY 1977	9	6	631	530
FY 1978	10	7	641	537
FY 1979	7	5	648	542
FY 1980	8	6	656	548
FY 1981	8	6	664	554
FY 1982	14	11	678	565
FY 1983	22	18	700	583
FY 1984	18	15	718	598

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Table 3E*

Enriched Uranium <20% Discards to Burial Ground
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	40	0	40	0
CY 1948	70	1	110	1
CY 1949[1,2]	45	0	155	1
CY 1950	11	0	166	1
CY 1951[3]	26	0	192	1
FY 1952[4]	57	1	249	2
FY 1953[5]	17	3	266	5
FY 1954[6]	1	0	267	5
FY 1955[7]	2	0	269	5
FY 1956[8]	99	2	368	7
FY 1957	183	4	551	11
FY 1958	5,051	50	5,602	61
FY 1959	1,274	16	6,876	77
FY 1960	2,044	28	8,920	105
FY 1961	277	6	9,197	111
FY 1962	173	6	9,370	117
FY 1963	171	12	9,541	129
FY 1964	42	6	9,583	135
FY 1965	2	0	9,585	135
FY 1966	72	8	9,657	143
FY 1967	1	0	9,658	143
FY 1968	0[9]	0	9,658	143
FY 1969	1	0	9,659	143
FY 1970	1	0	9,660	143
FY 1971	0	0	9,660	143
FY 1972	0	0	9,660	143
FY 1973	0	0	9,660	143
FY 1974	0	0	9,660	143
FY 1975	1	0	9,661	143
FY 1976	0	0	9,661	143
FY 1976A	0	0	9,661	143
FY 1977	0	0	9,661	143
FY 1978	0	0	9,661	143
FY 1979	0	0	9,661	143
FY 1980	0	0	9,661	143
FY 1981	0	0	9,661	143
FY 1982	0	0	9,661	143
FY 1983	0	0	9,661	143
FY 1984	0	0	9,661	143

*See following page for footnote explanations.

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Table 3E
(continued)

Footnotes

		Kg	
		U	U-235
[1]Includes disposition to X-10 Burial Ground	CY 49	18	0
[2]Includes disposition to K-25 Burial Ground	CY 49	8	0
[3]Includes disposition to X-10 Burial Ground	CY 51	11	0
[4]Includes disposition to X-10 Burial Ground	FY 52	18	0
[5]Includes disposition to X-10 Burial Ground	FY 53	16	3
[6]Includes disposition to X-10 Burial Ground	FY 54	1	0
[7]Includes disposition to X-10 Burial Ground	FY 55	2	0
[8]Includes disposition to X-10 Burial Ground	FY 56	99	2

[9]Zero represents transactions less than 500 grams.

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Table 3F

U-233 Discards to Burial Ground
(Grams)

Period	U	U-233	Cumulative U	Cumulative U-233
CY 1947	-[1]	-	-	-
CY 1948	-	-	-	-
CY 1949	-	-	-	-
CY 1950	-	-	-	-
CY 1951	-	-	-	-
FY 1952	-	-	-	-
FY 1953[2]	1	1	1	1
FY 1954[2]	1	1	2	2
FY 1955	-	-	2	2
FY 1956[2]	5	3	7	5
FY 1957[2]	5	3	12	8
FY 1958	-	-	12	8
FY 1959[2]	35	31	47	39
FY 1960[2]	19	19	66	58
FY 1961[2]	18	18	84	76
FY 1962	-	-	84	76
FY 1963[2]	62	60	146	136
FY 1964[2]	17	6	163	142
FY 1965	-	-	163	142
FY 1966	-	-	163	142
FY 1967	304	290	467	432
FY 1968	415	380	882	812
FY 1969	1	1	883	813
FY 1970	26	26	909	839
FY 1971	-	-	909	839
FY 1972	-	-	909	839
FY 1973	-	-	909	839
FY 1974	-	-	909	839
FY 1975	-	-	909	839
FY 1976	-	-	909	839

[1]Dash represents no transactions.

[2]Disposed to X-10 Burial Ground.

Table 3F

U-233 Discards to Burial Ground
(Grams)
(continued)

Period	U	U-233	Cumulative U	Cumulative U-233
FY 1976A	-	-	909	839
FY 1977	-	-	909	839
FY 1978	-	-	909	839
FY 1979	-	-	909	839
FY 1980	-	-	909	839
FY 1981	-	-	909	839
FY 1982	-	-	909	839
FY 1983	-	-	909	839
FY 1984	-	-	909	839

Table 3G

Plutonium Discards to Burial Ground
(Grams)

Period	Plutonium	Cumulative Plutonium
CY 1949	0[1]	0
CY 1950	-[2]	0
CY 1951	-	0
FY 1952	-	0
FY 1953[3]	0	0
FY 1954[3]	3	3
FY 1955[3]	0	3
FY 1956[3]	10	13
FY 1957[3]	0	13
FY 1958[3]	85	98
FY 1959[3]	87	185
FY 1960[3]	99	284
FY 1961[3]	127	411
FY 1962[3]	0	411
FY 1963	-	411
FY 1964	-	411
FY 1965	-	411
FY 1966	-	411
FY 1967	-	411
FY 1968	-	411
FY 1969	-	411
FY 1970	-	411
FY 1971	-	411
FY 1972	-	411
FY 1973	-	411
FY 1974	-	411
FY 1975	-	411
FY 1976	-	411

[1]Zero represents transactions less than 1 gram.

[2]Dash represents no transactions.

[3]Disposed to X-10 Burial Ground.

Table 3G

Plutonium Discards to Burial Ground
(Grams)
(continued)

Period	Plutonium	Cumulative Plutonium
FY 1976A	-	411
FY 1977	-	411
FY 1978	-	411
FY 1979	-	411
FY 1980	-	411
FY 1981	-	411
FY 1982	-	411
FY 1983	-	411
FY 1984	-	411

Table 3H

Neptunium Discards to Burial Ground
(Grams)

Period	Neptunium	Cumulative Neptunium
FY 1967[1]	4	4
FY 1968[1]	3	7
FY 1969	-[2]	7
FY 1970	-	7
FY 1971	-	7
FY 1972	0[3]	7
FY 1973[1]	1	8
FY 1974	0	8
FY 1975	-	8
FY 1976	0	8
FY 1976A	-	8
FY 1977[1]	9	17
FY 1978	0	17
FY 1979	-	17
FY 1980	-	17
FY 1981	-	17
FY 1982	-	17
FY 1983	-	17
FY 1984	-	17

[1]Disposed to X-10 Burial Ground.

[2]Dash represents no transactions.

[3]Zero represents transactions less than 500 grams.

Table 4A

Depleted Uranium Discards to Sanitary and Storm Sewer
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	-[1]	-	-	-
CY 1948	-	-	-	-
CY 1949	-	-	-	-
CY 1950	-	-	-	-
CY 1951	-	-	-	-
FY 1952	-	-	-	-
FY 1953[2]	-	-	-	-
FY 1954	10	0	10	0
FY 1955	41	0	51	0
FY 1956	557	2	608	2
FY 1957	1,094	3	1,702	5
FY 1958	504	2	2,206	7
FY 1959	787	2	2,993	9
FY 1960	584	2	3,577	11
FY 1961	225	1	3,802	12
FY 1962	36	0	3,838	12
FY 1963	10	0	3,848	12
FY 1964	17	0	3,865	12
FY 1965	8	0	3,873	12
FY 1966	32	0	3,905	12
FY 1967	21	0	3,926	12
FY 1968	17	0	3,943	12
FY 1969	26	0	3,969	12
FY 1970	30	0	3,999	12
FY 1971	15	0	4,014	12
FY 1972	1,627	3	5,641	15
FY 1973	1,796	3	7,437	18
FY 1974	1,600	0	9,037	18
FY 1975	1,427	1	10,464	19
FY 1976	623	0	11,087	19

[1]Dash represents no transactions.

[2]Prior to FY 1953 depleted uranium discards were combined with <20% U-235 discards.

Table 4A

Depleted Uranium Discards to Sanitary and Storm Sewer
(Kg)
(continued)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1976A	66	0	11,153	19
FY 1977	602	0	11,755	19
FY 1978	442	0	12,197	19
FY 1979	356	0	12,553	19
FY 1980	232	0	12,785	19
FY 1981	347	0	13,132	19
FY 1982	253	0	13,385	19
FY 1983	560	0	13,945	19
FY 1984	501	0	14,446	19

Table 48

Normal Uranium Discards to Sanitary and Storm Sewer
(Kg)

Period	U	Cumulative U
CY 1947	-[1]	-
CY 1948	-	-
CY 1949	-	-
CY 1950	-	-
CY 1951	-	-
FY 1952	-	-
FY 1953[2]	13	13
FY 1954	59	72
FY 1955	129	201
FY 1956	1,613	1,814
FY 1957	11	1,825
FY 1958	11	1,836
FY 1959	1,171	3,007
FY 1960	21	3,028
FY 1961	26	3,054
FY 1962	27	3,081
FY 1963	5	3,086
FY 1964	3	3,089
FY 1965	14	3,103
FY 1966	5	3,108
FY 1967	3	3,111
FY 1968	-	3,111
FY 1969	-	3,111
FY 1970	-	3,111
FY 1971	-	3,111
FY 1972	-	3,111
FY 1973	-	3,111
FY 1974	0[3]	3,111
FY 1975	-	3,111
FY 1976	-	3,111

[1]Dash represents no transactions.

[2]Prior to FY 1953 normal U discards were combined with <20% U-235 discards.

[3]Zero represents transactions less than 500 grams.

Table 4B

Normal Uranium Discards to Sanitary and Storm Sewer
(Kg)
(continued)

Period	U	Cumulative U
FY 1976A	-	3,111
FY 1977	-	3,111
FY 1978	-	3,111
FY 1979	-	3,111
FY 1980	-	3,111
FY 1981	-	3,111
FY 1982	-	3,111
FY 1983	-	3,111
FY 1984	-	3,111

Table 4C

Thorium Discards to Sanitary and Storm Sewer
(Kg)

Period	Th	Cumulative Th Element
CY 1947	-[1]	-
CY 1948	-	-
CY 1949	-	-
CY 1950	-	-
CY 1951	-	-
FY 1952	-	-
FY 1953	-	-
FY 1954	11	11
FY 1955	26	37
FY 1956	44	81
FY 1957	49	130
FY 1958	70	200
FY 1959	3,363	3,563
FY 1960	283	3,846
FY 1961	927	4,773
FY 1962	0[2]	4,773
FY 1963	20	4,793
FY 1964	7	4,800
FY 1965	-	4,800
FY 1966	-	4,800
FY 1967	-	4,800
FY 1968	-	4,800
FY 1969	-	4,800
FY 1970	-	4,800
FY 1971	-	4,800
FY 1972	-	4,800
FY 1973	-	4,800
FY 1974	65	4,865
FY 1975	195	5,060
FY 1976	175	5,235

[1]Dash represents no transactions.

[2]Zero represents transactions less than 500 grams.

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Table 4C

Thorium Discards to Sanitary and Storm Sewer
(Kg)
(continued)

Period	Th	Cumulative Th Element
FY 1976A	28	5,263
FY 1977	176	5,439
FY 1978	120	5,559
FY 1979	93	5,652
FY 1980	80	5,732
FY 1981	85	5,817
FY 1982	52	5,869
FY 1983	49	5,918
FY 1984	90	6,008

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Table 4D

Enriched Uranium >20% Discards to Sanitary and Storm Sewer[1]
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	-[2]	-	-	-
CY 1948	-	-	-	-
CY 1949	-	-	-	-
CY 1950	-	-	-	-
CY 1951	-	-	-	-
FY 1952	-	-	-	-
FY 1953	0[3]	0	0	0
FY 1954	0	0	0	0
FY 1955	0	0	0	0
FY 1956	0	0	0	0
FY 1957	0	0	0	0
FY 1958	0	0	0	0
FY 1959	9	8	9	8
FY 1960	9	8	18	16
FY 1961	10	9	28	25
FY 1962	21	13	49	38
FY 1963	14	13	63	51
FY 1964	14	12	77	63
FY 1965	24	14	101	77
FY 1966	13	11	114	88
FY 1967	11	10	125	98
FY 1968	12	10	137	108
FY 1969	13	11	150	119
FY 1970	10	9	160	128
FY 1971	12	10	172	138
FY 1972	14	13	186	151
FY 1973	11	10	197	161
FY 1974	7	7	204	168
FY 1975	8	8	212	176
FY 1976	5	4	217	180

[1]These totals include values in Table 4E.

[2]Dash represents no transactions.

[3]Zero represents transactions less than 500 grams.

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Table 4D

Enriched Uranium >20% Discards to Sanitary and Storm Sewer[1]
(Kg)
(continued)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1976A	1	1	218	181
FY 1977	5	4	223	185
FY 1978	3	3	226	188
FY 1979	3	2	229	190
FY 1980	3	2	232	192
FY 1981	11	10	243	202
FY 1982	6	5	249	207
FY 1983	7	7	256	214
FY 1984	5	4	261	218

[1]These totals include values in Table 4E.

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Table 4E

Enriched Uranium >20% Discards to Sanitary Sewer Only[1]
(Kg)

(before?)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1967	2	2	2	2
FY 1968	2	2	4	4
FY 1969	2	2	6	6
FY 1970	2	2	8	8
FY 1971	2	2	10	10
FY 1972	2	2	12	12
FY 1973	2	2	14	14
FY 1974	1	1	15	15
FY 1975	2	2	17	17
FY 1976	1	1	18	18
FY 1976A	0[2]	0	18	18
FY 1977	0	0	18	18
FY 1978	0	0	18	18
FY 1979	0	0	18	18
FY 1980	0	0	18	18
FY 1981	0	0	18	18
FY 1982	0	0	18	18
FY 1983	0	0	18	18
FY 1984	0	0	18	18

[1]These totals are included in Table 4D.

[2]Zero represents transactions less than 500 grams.

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Table 4F

Enriched Uranium <20% Discards to Sanitary and Storm Sewer
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
CY 1947	0[1]	0	0	0
CY 1948	0	0	0	0
CY 1949	45	0	45	0
CY 1950	0	0	45	0
CY 1951	7	1	52	1
FY 1952	3	0	55	1
FY 1953	1	0	56	1
FY 1954	1	0	57	1
FY 1955	5	1	62	2
FY 1956	7	1	69	3
FY 1957	18	1	87	4
FY 1958	1,291	13	1,378	17
FY 1959	1,556	9	2,934	26
FY 1960	3,257	33	6,191	59
FY 1961	48	2	6,239	61
FY 1962	1	0	6,240	61
FY 1963	4	0	6,244	61
FY 1964	0	0	6,244	61
FY 1965	5	1	6,249	62
FY 1966	5	1	6,254	63
FY 1967	0	0	6,254	63
FY 1968	0	0	6,254	63
FY 1969	0	0	6,254	63
FY 1970	0	0	6,254	63
FY 1971	0	0	6,254	63
FY 1972	0	0	6,254	63
FY 1973	0	0	6,254	63
FY 1974	0	0	6,254	63
FY 1975	0	0	6,254	63
FY 1976	0	0	6,254	63

[1]Zero represents transactions less than 500 grams.

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Table 4F

Enriched Uranium <20% Discards to Sanitary and Storm Sewer
(Kg)
(continued)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1976A	0	0	6,254	63
FY 1977	0	0	6,254	63
FY 1978	0	0	6,254	63
FY 1979	0	0	6,254	63
FY 1980	0	0	6,254	63
FY 1981	0	0	6,254	63
FY 1982	0	0	6,254	63
FY 1983	0	0	6,254	63
FY 1984	0	0	6,254	63

Table 4G

U-233 Discards to Sanitary and Storm Sewer
(Grams)

Period	U	U-233	Cumulative U	Cumulative U-233
CY 1947	-[1]	-	-	-
CY 1948	-	-	-	-
CY 1949	-	-	-	-
CY 1950	-	-	-	-
CY 1951	-	-	-	-
FY 1952	-	-	-	-
FY 1953	-	-	-	-
FY 1954	-	-	-	-
FY 1955	-	-	-	-
FY 1956	-	-	-	-
FY 1957	-	-	-	-
FY 1958	-	-	-	-
FY 1959	-	-	-	-
FY 1960	-	-	-	-
FY 1961	2	2	2	2
FY 1962	-	-	2	2
FY 1963	-	-	2	2
FY 1964	-	-	2	2
FY 1965	-	-	2	2
FY 1966	-	-	2	2
FY 1967	-	-	2	2
FY 1968	-	-	2	2
FY 1969	-	-	2	2
FY 1970	-	-	2	2
FY 1971	-	-	2	2
FY 1972	-	-	2	2
FY 1973	-	-	2	2
FY 1974	-	-	2	2
FY 1975	-	-	2	2
FY 1976	-	-	2	2

[1]Dash represents no transactions.

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Table 4G

U-233 Discards to Sanitary and Storm Sewer
(Grams)
(continued)

Period	U	U-233	Cumulative U	Cumulative U-233
FY 1976A	-	-	2	2
FY 1977	-	-	2	2
FY 1978	-	-	2	2
FY 1979	-	-	2	2
FY 1980	-	-	2	2
FY 1981	-	-	2	2
FY 1982	-	-	2	2
FY 1983	-	-	2	2
FY 1984	-	-	2	2

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Table 4H

Plutonium Discards to Sanitary and Storm Sewer
(Grams)

Period	Plutonium	Cumulative Plutonium
CY 1949	-[1]	-
CY 1950	-	-
CY 1951	-	-
FY 1952	-	-
FY 1953	-	-
FY 1954	-	-
FY 1955	0[2]	0
FY 1956	0	0
FY 1957	-	0
FY 1958	-	0
FY 1959	-	0
FY 1960	-	0
FY 1961	-	0
FY 1962	-	0
FY 1963	-	0
FY 1964	-	0
FY 1965	-	0
FY 1966	-	0
FY 1967	-	0
FY 1968	-	0
FY 1969	-	0
FY 1970	-	0
FY 1971	-	0
FY 1972	-	0
FY 1973	-	0
FY 1974	-	0
FY 1975	-	0
FY 1976	-	0

[1]Dash represents no transactions.

[2]Zero represents transactions less than 1 gram.

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Table 4H

Plutonium Discards to Sanitary and Storm Sewer
(Grams)
(continued)

Period	Plutonium	Cumulative Plutonium
FY 1976A	-	0
FY 1977	-	0
FY 1978	-	0
FY 1979	-	0
FY 1980	-	0
FY 1981	-	0
FY 1982	-	0
FY 1983	-	0
FY 1984	-	0

Section 5 - S-3 Pond Discards

Table 5A - Depleted Uranium

Table 5B - Normal Uranium

Table 5C - Thorium

Table 5D - Enriched Uranium >20%

Table 5E - Enriched Uranium <20%

Table 5A

Depleted Uranium S-3 Pond Discards
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1972[1]	2,228	4	2,228	4
FY 1973	763	1	2,991	5
FY 1974	3,799	7	6,790	12
FY 1975	1,319	2	8,109	14
FY 1976	799	2	8,908	16
FY 1976A	2	0	8,910	16
FY 1977	1,698	4	10,608	20
FY 1978	1,566	3	12,174	23
FY 1979	1,407	3	13,581	26
FY 1980	730	2	14,311	28
FY 1981	79	0	14,390	28
FY 1982	795	1	15,185	29
FY 1983	409	1	15,594	30
FY 1984	0[2]	0	15,594	30

[1]Prior to FY 1972 S-3 Pond values were combined with burial ground totals.

[2]Zero represents transactions less than 500 grams.

Table 5B

Normal Uranium S-3 Pond Discards
(Kg)

Period	U	Cumulative U
FY 1972[1]	1	1
FY 1973	0[2]	1
FY 1974	0	1
FY 1975	0	1
FY 1976	0	1
FY 1976A	0	1
FY 1977	0	1
FY 1978	1	2
FY 1979	0	2
FY 1980	0	2
FY 1981	-[3]	2
FY 1982	0	2
FY 1983	-	2
FY 1984	-	2

[1]Prior to FY 1972 S-3 Pond values were combined with burial ground totals.

[2]Zero represents transactions less than 500 grams.

[3]Dash represents no transactions.

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Table 5C

Thorium S-3 Pond Discards
(Kg)

Period	Th	Cumulative Th Element
FY 1972[1]	-[2]	-
FY 1973	-	-
FY 1974	629	629
FY 1975	592	1,221
FY 1976	-	1,221
FY 1976A	-	1,221
FY 1977	-	1,221
FY 1978	-	1,221
FY 1979	-	1,221
FY 1980	-	1,221
FY 1981	-	1,221
FY 1982	-	1,221
FY 1983	-	1,221
FY 1984	-	1,221

[1]Prior to FY 1972 S-3 Pond values were combined with burial ground totals.

[2]Dash represents no transactions.

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Table 5D

Enriched Uranium >20% S-3 Pond Discards
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1972[1]	9	7	9	7
FY 1973	5	4	14	11
FY 1974	6	3	20	14
FY 1975	4	3	24	17
FY 1976	4	2	28	19
FY 1976A	1	1	29	20
FY 1977	2	1	31	21
FY 1978	1	1	32	22
FY 1979	2	2	34	24
FY 1980	3	3	37	27
FY 1981	5	5	42	32
FY 1982	6	5	48	37
FY 1983	5	4	53	41
FY 1984	3	3	56	44

[1]Prior to FY 1972 S-3 Pond values were combined with burial ground totals.

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Table 5E

Enriched Uranium <20% S-3 Pond Discards
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1972[1]	4	0	4	0
FY 1973	1	0	5	0
FY 1974	0[2]	0	5	0
FY 1975	1	0	6	0
FY 1976	0	0	6	0
FY 1976A	1	0	7	0
FY 1977	2	0	9	0
FY 1978	2	0	11	0
FY 1979	2	0	13	0
FY 1980	4	0	17	0
FY 1981	4	0	21	0
FY 1982	2	0	23	0
FY 1983	2	0	25	0
FY 1984	0	0	25	0

[1]Prior to FY 1972 S-3 Pond values were combined with burial ground totals.

[2]Zero represents transactions less than 500 grams.

Section 6 - Atmospheric Discards (Stacks)

Table 6A - Enriched Uranium >20%

Table 6B - Enriched Uranium <20%

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Table 6A

Enriched Uranium >20% Atmospheric Discards (Stacks)
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1956[1]	8	3	8	3
FY 1957	7	3	15	6
FY 1958	7	4	22	10
FY 1959	5	5	27	15
FY 1960	8	7	35	22
FY 1961	6	5	41	27
FY 1962	6	5	47	32
FY 1963	9	8	56	40
FY 1964	5	4	61	44
FY 1965	3	2	64	46
FY 1966	3	2	67	48
FY 1967	1	1	68	49
FY 1968	0[2]	0	68	49
FY 1969	3	2	71	51
FY 1970	3	2	74	53
FY 1971	4	4	78	57
FY 1972	6	6	84	63
FY 1973	9	9	93	72
FY 1974	3	3	96	75
FY 1975	2	1	98	76
FY 1976	2	1	100	77
FY 1976A	1	0	101	77
FY 1977	1	1	102	78
FY 1978	1	1	103	79
FY 1979	2	1	105	80
FY 1980	1	1	106	81
FY 1981	2	2	108	83
FY 1982	2	2	110	85
FY 1983	2	1	112	86
FY 1984	2	2	114	88

[1]Transactions for stacks were first reported in FY 1956.

[2]Zero represents transactions less than 500 grams.

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Table 68

Enriched Uranium <20% Atmospheric Discards (Stacks)
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1956[1]	-[2]	-	-	-
FY 1957	-	-	-	-
FY 1958	-	-	-	-
FY 1959	23[3]	1	23	1
FY 1960	-	-	23	1
FY 1961	-	-	23	1
FY 1962	-	-	23	1
FY 1963	-	-	23	1
FY 1964	-	-	23	1
FY 1965	-	-	23	1
FY 1966	-	-	23	1
FY 1967	-	-	23	1
FY 1968	-	-	23	1
FY 1969	-	-	23	1
FY 1970	-	-	23	1
FY 1971	-	-	23	1
FY 1972	-	-	23	1
FY 1973	-	-	23	1
FY 1974	-	-	23	1
FY 1975	-	-	23	1
FY 1976	-	-	23	1
FY 1976A	-	-	23	1
FY 1977	-	-	23	1
FY 1978	-	-	23	1
FY 1979	-	-	23	1
FY 1980	-	-	23	1
FY 1981	-	-	23	1
FY 1982	-	-	23	1
FY 1983	-	-	23	1
FY 1984	-	-	23	1

[1]Transactions for stacks were first reported in FY 1956.

[2]Dash represents no transactions.

[3]This amount was an inadvertent release of uranium hexafluoride to the atmosphere from processing 3 and 4 percent U-235.

Section 7 - Track-out

Table 7A - Enriched Uranium >20%

Table 7A

Enriched Uranium >20% Track-out
(Kg)

Period	U	U-235	Cumulative U	Cumulative U-235
FY 1956	0[1]	0	0	0
FY 1957	0	0	0	0
FY 1958	0	0	0	0
FY 1959	0	0	0	0
FY 1960	0	0	0	0
FY 1961	0	0	0	0
FY 1962	3	3	3	3
FY 1963	3	3	6	6
FY 1964	2	2	8	8
FY 1965	3	3	11	11
FY 1966	5	4	16	15
FY 1967	5	4	21	19
FY 1968	5	4	26	23
FY 1969	4	3	30	26
FY 1970	4	3	34	29
FY 1971	3	2	37	31
FY 1972	3	2	40	33
FY 1973	5	3	45	36
FY 1974	4	3	49	39
FY 1975	6	5	55	44
FY 1976	5	4	60	48
FY 1976A	1	1	61	49
FY 1977	5	4	66	53
FY 1978	5	4	71	57
FY 1979	5	4	76	61
FY 1980	6	5	82	66
FY 1981	5	4	87	70
FY 1982	6	4	93	74
FY 1983	6	5	99	79
FY 1984	6	5	105	84

[1]Zero represents transactions less than 500 grams.

8.0 Transfers From DOE

8.1 >20% U-235 - United Nuclear Corp., Wood River Junction, Rhode Island

8.2 Thorium - Nuclear Chemicals and Metals Corp., Huntsville, TN

8.2A - Cumulative Thorium Activity
8.2B - Waste Shipment Data
8.2C - Normal Operating Loss

8.1 >20% U-235 - United Nuclear Corp., Wood River Junction, Rhode Island

NMC&A personnel coordinated the United Nuclear Corporation shipments to Y-12 for burial. The NRC/DOE 741 transfer documents were numbered consecutively but were received as "memo"documents. A memo 741 document is for information purposes only and is not used as an official interplant transfer.

The receipts are reconciled as follows:

Transfer Series	741 Document No.	No. of Containers	Element (Grams)	Weight Percent
ZWT-VZG	1 thru 496[1]	28,641	16,267	85
ZWT-VZJ	1 thru 6[2]	295	36	85
Totals	502	28,936	16,303	

Although the receipts were originally designated as memo transfers, DOE directed Y-12 to receive the following 741's into the Nuclear Material Management Safeguard System (NMMSS).

Transfer Series	741 Document No.	Date	Element (Grams)	Weight Percent
ZWT-VZG	254	11-08-82	11	85
ZWT-VZG	260	11-09-82	11	85
ZWT-VZG	262	11-10-82	11	85
ZWT-VZG	264	11-15-82	11	85
ZWT-VZG	270	11-16-82	11	85
ZWT-VZG	446	01-26-83	67	85
ZWT-VZG	449	01-28-83	63	85
ZWT-VZG	450	02-01-83	62	85
ZWT-VZG	451	02-02-83	73	85
Total			320	

Officially, the nine 741's were brought into the Y-12 accountability system with a total of 320 grams uranium. However, the total amount of material received (16,303 grams) was disposed to the burial ground.

[1]These NRC/DOE 741's were dated from 6/82 through 5/83.

[2]These NRC/DOE 741's were dated from 4/84 through 10/84.

8.2 Thorium - Nuclear Chemicals and Metals Corp., Huntsville, TN

The thorium tabulation (Table 3C) of discards does not include a quantity of thorium-bearing waste sludge from Nuclear Chemicals and Metals Corporation operations at Huntsville, Tennessee. The Energy Research and Development Administration (ERDA) assigned Union Carbide Corporation - Nuclear Division, Y-12 Plant responsibility to bury this sludge for the State of Tennessee.

The quantity of thorium contained in the sludge did not enter the accountability records at Y-12 and therefore no quantative value for thorium is available for the sludge. An estimate of the contained thorium can be made by using the State of Tennessee's estimate of the quantity of sludge (700 tons) and data from the limited sampling and analysis (average 4.2×10^{-4} g Th/g. This value is about 267 kg. See details on page 63.

Table 8.2A

Nuclear Chemicals and Metals Corp. (FCY)
Huntsville, TN

Cumulative Thorium Activity For Period
CY 1970 Through CY 1975
(Kgs)

NLO (Natl. Lead)	25,948	22,709	FZB (Y-12)
FZB (Y-12)	228	3,467[1]	NOL
	26,176	26,176	

[1]Normal Operating Loss (NOL) entry was made to Evaporator Pond in November 1975. This was possibly a book entry.

Table 8.2B

FILL IN ALL BLANK SPACES. STATE IF INFORMATION IS NOT APPLICABLE OR UNKNOWN. ATTACH EXTRA SHEETS AND DRAWINGS SECURELY IF NEEDED.

PACKAGES IN PROPOSED SHIPMENT	TOTAL WEIGHT OF PROPOSED SHIPMENT	VOL. OF PROPOSED SHIPMENT (CUBIC FEE
Bulk	~ 700 Tons	~ 14,000

COMPLETE DESCRIPTION OF CONTENTS AND PACKAGING METHOD

Material is process waste sludge and dirt from a settling pond at a facility originally licensed to process Thorium nitrate to Thorium metal. The material is to be handled in a moist state to reduce dusting and loaded in bulk form into plastic lined metal truck beds for transport. Plastic sheets will also be used to cover material in transit.

Analysis shown max. of 2.3×10^{-3} gm Th/gram; avg. of 4.2×10^{-4} gm Th/gm in samples taken. Other radionuclides are Th daughter in-growth since separation, an indeterminate time.

MAXIMUM RADIATION LEVEL AT OUTSIDE SURFACE OF PACKAGE(S)	CHEMICAL FORM OF MATERIAL COMPRISING BULK OF WASTE
less CFR 173.393(1,2, 3 & 4 or by State exemption	Thorium Hydroxide

CORROSIVE ACIDS OR BASES CONTAINED IN WASTE STRENGTH OF SUCH CORROSIVE ACIDS OR BASES

~ pH 7

EXPLOSIVE CONDITIONS OF THE CONTENTS

THE [X] ARE NOT Potentially Explosive

DETAILS IF POTENTIALLY EXPLOSIVE

REACTIVE CONDITIONS OF THE CONTENTS

THEY [X] WILL NOT React Violently When Exposed to Air or Water

DETAILS IF CONTENTS WILL REACT VIOLENTLY WHEN EXPOSED TO AIR OR WATER

RADIOISOTOPES CONTAINED	ESTIMATED QUANTITY IN CURIES
Natural Thorium & ingrown daughters	~ 0.3

SPECIAL PRECAUTIONS THAT MAY BE NECESSARY BECAUSE OF BACTERIAL CONTENT

None

ANY INFORMATION THAT MAY BE USEFUL IN REDUCING SHIPPING AND HANDLING HAZARDS

PROPOSED MEANS OF TRANSPORTATION	APPROXIMATE DATE OF SHIPMENT
Truck	in approximately 90 days

This form was attached to a memo from Joseph A. Lenhard to Dr. Herman Postma, dated July 20, 1976 subject, "Disposal of Waste for State of Tennessee"

[redacted]

Table 8.2C

Nuclear Chemicals and Metals Corp. (FCY)

Huntsville, TN

Normal Operating Loss (NOL) Calculation
For the 700 tons of residue trucked to Y-12
is as follows:

Ave. Analysis - 4.2×10^{-4} g Th/g

700T = 636,364 kgs

.42 g Th/kg X 636,364 = 267,273 g Th
or 267 kgs Th

NOL Reconciliation

	Kgs
Cumulative NOL Value from Page 61	3,467
Less Calculated value shipped to Y-12	267
Difference	3,200

Assuming the calculated value of 267 kgs is correct, the remaining 3,200 kg NOL amount should be in the Evaporator Pond on plant site.

[redacted]

9.0 Receipts From ARCO and SRP

Table 9A - ARCO

Table 9B - SRP

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9.0 Cumulative Receipts From Atlantic Richfield Company (ARCO)
Idaho Falls, Idaho and Savannah River Plant, Aiken, South Carolina

These tables document receipts by fiscal year since the beginning of Y-12 involvement in recovery of these materials. Since both these flows involve recovery of highly enriched irradiated uranium, they do contain trace quantities of fission products, and some transuranic nuclides.

These tables have been prepared so that they could be used to calculate an upper bound on the quantity of these nuclides received and processed by Y-12.

Because there is some level of decontamination each time the solutions are run through extraction columns, some portion of these nuclides would be removed in raffinate and would ultimately be put in the S-3 ponds. The residual stays in the metal and has, since 1963, been recycled to SRP.

Reconciliation of Cumulative Receipts From ARCO And SRP
(Kg)

	Element	U-235 Isotope
ARCO FY 1953 Through FY 1984	24,722	20,583
SRP FY 1955 Through FY 1984	102,824	63,752
Total Receipts From ARCO and SRP	127,546	84,335

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Table 9A

Summary of ARCO Reactor Material Received By Y-12
(Kg)

Period	Element	% U-235	Isotope
FY 1953	101	90	91
FY 1954	217	89	194
FY 1955	828	89	741
FY 1956	744	90	671
FY 1957	797	89	707
FY 1958	898	86	773
FY 1959	3,741	86	3,220
FY 1960	769	88	673
FY 1961	-[1]	-	-
FY 1962	775	87	671
FY 1963	-	-	-
FY 1964	771	88	676
FY 1965	425	87	370
FY 1966	1,408	84	1,180
FY 1967	-	-	-
FY 1968	394	75	294
FY 1969	427	88	377
FY 1970	108	76	82
FY 1971	1,660	79	1,312
FY 1972	415	80	334
FY 1973	563	75	423
FY 1974	-	-	-
FY 1975	1,702	80	1,369
FY 1976	195	55	107
FY 1976A	-	-	-
FY 1977	1,333	77	1,022
FY 1978	525	70	366
FY 1979	535	76	408
FY 1980	-	-	-
FY 1981	905	76	686
FY 1982	577	66	380
FY 1983	1,041	76	791
FY 1984	2,868	93	2,665

[1]Dash represents no transactions.

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Table 9B

Summary of SRP Reactor Material Received By Y-12
(Kg)

Period	Element	% U-235	Isotope
FY 1955	3	93	3
FY 1956	-[1]	-	-
FY 1957	201	93	187
FY 1958	258	92	238
FY 1959	270	88	238
FY 1960[2]	6,395	85	5,454
FY 1961	2,305	85	1,963
FY 1962	2,701	85	2,298
FY 1963	6,461	81	5,204
FY 1964	2,977	81	2,415
FY 1965	3,546	77	2,716
FY 1966	3,467	72	2,509
FY 1967	2,604	66	1,726
FY 1968	2,097	57	1,202
FY 1969	4,121	62	2,570
FY 1970	2,045	54	1,104
FY 1971	3,805	60	2,272
FY 1972	4,716	55	2,577
FY 1973	5,051	57	2,871
FY 1974	4,599	55	2,528
FY 1975	5,110	55	2,792
FY 1976	3,207	51	1,634
FY 1976A	1,113	50	551
FY 1977	4,497	45	2,037
FY 1978	2,070	47	981
FY 1979	4,591	48	2,219
FY 1980	1,510	59	898
FY 1981	4,918	54	2,657
FY 1982	5,728	50	2,846
FY 1983	6,682	52	3,451
FY 1984	5,776	63	3,611

[1]Dash represents no transactions.

[2]First major solution quantities were received from SRP beginning FY 1960.

Distribution:

T. R. Butz
G. G. Fee
M. S. Franklin
W. H. Hopwood, Jr.
M. L. Jones
W. B. Kenna
W. T. Mee
J. M. Mills
E. Owings - NoRC (5)
J. C. White
R. D. Williams