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LOS ALAMOS SCIENTIFIC LABO
UNIVERSITY OF CALIFORNI
LOS ALAMOS, NEW MEXICO 8

OFFICE MEMORANDUM

NOV 1 1

TO : Harry Jordan, H-DO

DATE: November 8, 1

FROM : C. W. Christenson, Group Ldr., H-7

SUBJECT : NUCLIDE INVENTORY DATA

SYMBOL : H7-CWC-437

Data has been assembled on nuclides released onsite to canyons and absorption beds and the listings are attached in the form of annual totals and an overall summary.

Many estimates are included and, given additional time, more accurate data could be provided.

CWC:LAE:gm

Attachments: a/s

Received by ER-R
JAN 13 1993
BAB

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SUMMARY

ONSITE RELEASES OF RADIONUCLIDES[1]
to December 31, 1972

Covered Absorption Beds

Nuclide	Released, Ci	Remaining,[3] Ci
Pu[2]	9.86	9.86
^{89}Sr	0.35	0
^{90}Sr-^{90}Y	0.03	0.02
^{140}Ba-^{140}La	2.93	0
^{227}Ac	2.50	1.36

Canyons (Intermittent Flow)

Nuclide	Released, Ci	Remaining,[3] Ci
Pu[2]	0.25	0.25
^{3}H	143.00	71.00
^{89}Sr	2.44	0
^{90}Sr	0.65	0.45

(1) Much of the data is estimated. Many other nuclides such as ^{3}H (to absorption beds) and U and ^{241}Am (to canyons) were released but data are not available.

(2) The LASL did not discharge any substantial quantiti of ^{238}Pu until 1967. No routine analyses were made on the differentiation between Pu-238 and Pu-239 until 1971 at which time about 80% of the plutonium was Pu-238. This ratio has continued to increase until ^{238}Pu is now about 95% of the total plutonium activity.

(3) Quantity remaining after decay.

ON-SITE

RADIOACTIVITY TO CANYONS (ESTIMATED)
(Acid, DP, Mortendad & Ten Site Canyons)

Year	Pu(1)	Initial ^{3}H	Remain. ^{3}H	Initial ^{89}Sr	Remain. ^{89}Sr	Initial ^{90}Sr
	Curies					
1945		5.00	1.05	0.040	0	0.015
1946		5.00	1.10	0.040	0	0.015
1947		5.00	1.15	0.040	0	0.015
1948	0.143	5.00	1.20	0.040	0	0.015
1949		5.00	1.30	0.040	0	0.015
1950		5.00	1.35	0.040	0	0.015
1951	0.001	5.00	1.45	0.040	0	0.015
1952	0.001	5.00	1.55	0.040	0	0.015
1953	0.002	5.00	1.60	0.040	0	0.015
1954	0.003	5.00	1.70	0.040	0	0.015
1955	0.003	5.00	1.80	0.040	0	0.015
1956	0.002	5.00	1.90	1.000	0	0.180
1957	0.002	5.00	2.00	0.250	0	0.050
1958	0.001	5.00	2.15	0.150	0	0.030
1959	0.002	5.00	2.25	0.050	0	0.020
1960	0.004	5.00	2.40	0.080	0	0.020
1961	0.011	5.00	2.55	0.060	0	0.015
1962	0.007	5.00	2.70	0.050	0	0.015
1963	0.007	5.00	2.85	0.045	0	0.015
1964	0.003	5.00	3.00	0.045	0	0.015
1965	0.004	5.00	3.20	0.045	0	0.015
1966	0.003	5.00	3.35	0.045	0	0.015
1967	0.007	5.00	3.55	0.058	0	0.015
1968	0.004	5.00	3.75	0.033	0	0.010
1969	0.008	5.00	4.00	0.055	0	0.010
1970	0.006	5.00	4.25	0.015	0	0.020
1971	0.008	3.02	2.72	0.013	0	0.030
1972	0.017	9.62	9.14	0.004	0	0.010
TOTALS	0.249	143	71	2.438	0	0.650

(1) Total plutonium, but largely ^{239}Pu to 1960's. ^{238}Pu increas
until in late 60's and early 70's, it constituted more than
of Pu. Other Pu isotopes and isotopes of U and Am were pre

ON-SITE

RADIOACTIVITY TO CANYONS (DETERMINATIONS)
(Acid, DP, Mortendad & Ton Site Canyons)

	Curies(3)					
Year	Pu(1)	^{238}Pu(2)	^{239}Pu(2)	Initial ^{3}H	Initial ^{89}Sr	Ir
1945						
1946						
1947						
1948	0.143					
1949						
1950						
1951	1.31×10^{-3}					
1952	1.42×10^{-3}					
1953	2.24×10^{-3}					
1954	3.21×10^{-3}					
1955	3.14×10^{-3}					
1956	1.81×10^{-3}				0.935	(
1957	1.94×10^{-3}				0.213	(
1958	1.47×10^{-3}				0.102	(
1959	2.06×10^{-3}				0.026	(
1960	4.36×10^{-3}				0.034	(
1961	10.69×10^{-3}				0.009	(
1962	6.84×10^{-3}				0.009	(
1963	6.81×10^{-3}					
1964	3.11×10^{-3}					
1965	4.48×10^{-3}					
1966	2.50×10^{-3}					
1967	6.50×10^{-3}				0.058	(
1968	4.20×10^{-3}				0.033	(
1969	8.36×10^{-3}				0.055	
1970	6.47×10^{-3}				0.015	
1971	7.62×10^{-3}			3.02	0.013	
1972	17.01×10^{-3}	7.85×10^{-3}	9.16×10^{-3}	9.62	0.004	
TOTALS	0.249					

(1) Total plutonium but largely ^{239}Pu.

(2) Use of ^{238}Pu increased in late 1960's. Isotopic separations beginning 1972.

(3) Certain amount of ^{3}H discharged every year. Detailed record beginning 1972.

ON-SITE

RADIOACTIVITY TO ABSORPTION BEDS
(Area U)

Wastes containing ^{210}Pu were discharged to these beds during their use from 1945-1968. The amount of ^{210}Pu inclu is not known, but as of the end of 1972, none should remain

Approximately 2.5 Ci of ^{227}Ac were discharged to the bed in 1953. About 1.36 Ci should have been in the beds as of 1/1/73.

ON-SITE

RADIOACTIVITY TO ABSORPTION BEDS* (COVERED SEEPAGE PITS)
(Area T and Area V)

Year	Plutonium Ci
1945	1.4035
1946	1.4035
1947	1.4035
1948	1.4035
1949	1.4035
1950	1.4035
1951	1.4035
1952	0.0035
1953	0.0035
1954	0.0035
1955	0.0035
1956	0.0035
1957	0.0035
1958	0.0035
1959	0.0035
1960	0.0035
1961	0.0035
TOTAL	9.8595

*Area T beds were operated through 1951, Area V beds through 1961. Most of the plutonium was ^{239}Pu, but analyses were not performed to determine specific isotopes. Data are estimated.

ON-SITE

RADIOACTIVITY TO ABSORPTION BEDS* (COVERED SEEPAGE PITS)
(Area V)

Year	Ci ^{90}Sr-^{90}Y (original)	Ci ^{90}Sr-^{90}Y (remaining as of 1/1/73)
1945	0.002	0.0010
1946	0.002	0.0010
1947	0.002	0.0011
1948	0.002	0.0011
1949	0.002	0.0011
1950	0.002	0.0011
1951	0.002	0.0012
1952	0.002	0.0012
1953	0.002	0.0012
1954	0.002	0.0013
1955	0.002	0.0013
1956	0.002	0.0013
1957	0.002	0.0013
1958	0.002	0.0014
1959	0.002	0.0014
1960	0.002	0.0015
1961	0.002	0.0015
TOTAL	0.034	0.0210

*Data estimated.

ON-SITE

RADIOACTIVITY TO ABSORPTION BEDS (COVERED SEEPAGE PITS)
(Area V)

Year	Ci ^{89}Sr*	Ci ^{140}Ba - ^{140}La*
1945	0.0205	0.1725
1946	0.0205	0.1725
1947	0.0205	0.1725
1948	0.0205	0.1725
1949	0.0205	0.1725
1950	0.0205	0.1725
1951	0.0205	0.1725
1952	0.0205	0.1725
1953	0.0205	0.1725
1954	0.0205	0.1725
1955	0.0205	0.1725
1956	0.0205	0.1725
1957	0.0205	0.1725
1958	0.0205	0.1725
1959	0.0205	0.1725
1960	0.0205	0.1725
1961	0.0205	0.1725
TOTAL	0.3485	2.9325

*Essentially no ^{89}Sr or ^{140}Ba - ^{140}La would remain at this time. Data are estimated.

TEN SITE

ON-SITE DISCHARGES TO 10-S CANYON (MORTANDAD)

Year	Discharged[1] ^{89}Sr, Ci	Discharged[1] ^{90}Sr, Ci	Available Jan 1, 72 ^{89}Sr	Available Jan 1, 72 ^{90}Sr
1956	0.935[2]	0.165[2]	∿0	0.111
1957	0.213	0.037	∿0	0.025
1958	0.102	0.018	∿0	0.013
1959	0.026	0.004	∿0	0.003
1960	0.034	0.006	∿0	0.004
1961	0.009	0.001	∿0	0.001
1962	0.009	0.001	∿0	0.001
1963	0.0	0.0	∿0	0.0
	1.328	0.232	0	0.158

(1) Assume total strontium was 15% ^{90}Sr.

(2) A full tank of waste drained to the canyon due to a broken line (Feb. 1956). Total Sr lost is estimated at 1 Ci.

Efficiency [illegible]

	Acid		DP		Mortimer	
	Released	Remaining	Relons	Remain	Relons	Remain
1945	3	0.65	2	0.40	—	—
46	3	0.68	2	0.42	—	—
47	3	0.71	2	0.43	—	—
48	3	0.74	2	0.46	—	—
49	3	0.81	2	0.49	—	—
50	3	0.84	2	0.51	—	—
51	3	0.90	2	0.55	—	—
52	3	0.96	2	0.59	—	—
53	3	0.99	2	0.61	—	—
54	3	1.05	2	0.65	—	—
55	3	1.12	2	0.68	—	—
56	3	1.18	2	0.72	—	—
57	3	1.24	2	0.76	—	—
58	3	1.33	2	0.82	—	—
59	3	1.40	2	0.85	—	—
60	3	1.49	2	0.91	—	—
61	3	1.58	2	0.97	—	—
62	3	1.67	2	1.03	—	—
63	—	—	2	1.08	3	1.77
64	—	—	2	1.14	3	1.86
65	—	—	2	1.22	3	1.98
66	—	—	2	1.27	3	2.08
67	—	—	2	1.35	3	2.20
68	—	—	2	1.42	3	2.33
69	—	—	2	1.52	3	2.48
70	—	—	2	1.61	3	2.62
71	—	—	1.15	1.03	1.87	1.69
72	—	—	3.65	3.47	5.97	5.67
	54	19.72	56.87	25.96	31.84	24.70

Estimated ^{89}Sr, Cs

Acid		DP		Mortandad		Tonsite	
Release	Remain	Release	Remain	Release	Remain	Release	Remain
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.040	0	—	—	—	—	—	—
0.036	0	0.004	0	—	—	—	—
0.036	0	0.004	0	—	—	—	—
0.036	0	0.004	0	—	—	—	—
0.036	0	0.004	0	—	—	—	—
0.050	0	0.015	0	—	—	0.[illegible]	0
0.033	0	0.004	0	—	—	0.213	0
0.034	0	0.004	0	—	—	0.102	0
0.020	0	0.004	0	—	—	0.026	0
0.036	0	0.010	0	—	—	0.034	0
0.036	0	0.004	0	—	—	0.009	0
0.036	0	0.005	0	—	—	0.009	0
—	—	0.009	0	0.036	0	—	—
—	—	0.009	0	0.036	0	—	—
—	—	0.009	0	0.036	0	—	—
—	—	0.009	0	0.036	0	—	—
—	—	0.004	0	0.054	0	—	—
—	—	0	0	0.033	0	—	—
—	—	0	0	0.015	0	—	—
—	—	0.002	0	0.013	0	—	—
—	—	0	0	0.012	0	—	—
—	—	0.001	0	0.003	0	—	—
0.669	0	0.105		0.315	0	0.328	0

		Refons	Kennin	Refons	Kennin	Refons	Kennin	Refons	Kennin
1945		0.015	0.007	—	—	—	—	—	—
46		0.015	0.007	—	—	—	—	—	—
47		0.015	0.007	—	—	—	—	—	—
48		0.015	0.007	—	—	—	—	—	—
49		0.015	0.007	—	—	—	—	—	—
50		0.015	0.007	—	—	—	—	—	—
51		0.015	0.007	—	—	—	—	—	—
52		0.013	0.008	0.002	0.001	—	—	—	—
53		0.013	0.008	0.002	0.001	—	—	—	—
54		0.013	0.008	0.002	0.001	—	—	—	—
55		0.013	0.008	0.002	0.001	—	—	—	—
56		0.013	0.008	0.002	0.001	—	—	0.165	0.111
57		0.010	0.007	0.003	0.002	—	—	0.037	0.025
58		0.010	0.007	0.002	0.001	—	—	0.018	0.013
59		0.012	0.008	0.004	0.003	—	—	0.004	0.003
60		0.010	0.007	0.002	0.001	—	—	0.006	0.004
61		0.012	0.009	0.002	0.001	—	—	0.001	0.001
62		0.012	0.009	0.002	0.002	—	—	0.001	0.001
63		—	—	0.002	0.002	0.013	0.012	—	—
64		—	—	0.002	0.002	0.013	0.012	—	—
65		—	—	0.002	0.002	0.013	0.011	—	—
66		—	—	0.002	0.002	0.013	0.011	—	—
67		—	—	0.002	0.002	0.013	0.011	—	—
68		—	—	0	0	0.010	0.007	—	—
69		—	—	0	0	0.010	0.007	—	—
70		—	—	0.002	0.002	0.018	0.017	—	—
71		—	—	0.001	0.001	0.032	0.030	—	—
72		—	—	0.001	0.001	0.006	0.006	—	—
		0.236	0.136	0.039	0.029	0.141	0.124	0.212	0.152