



Eighth Annual Report of Radiation Exposures for ERDA & ERDA Contractor Employees

1975

Energy Research & Development Administration
Division Of Safety, Standards, & Compliance

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PREFACE

In 1968, the U.S. Atomic Energy Commission (AEC) established a program for reporting certain occupational radiation exposure information to a central radiation records repository maintained at the Union Carbide Computing Technology Center, Oak Ridge, Tennessee. Annual summaries (WASH-1350-R1 through WASH-1350-R6) were reported for the years 1968-1973 and included data on AEC contractor employees as well as employees of companies in the private sector licensed by the AEC. The 1974 data for what is presently ERDA and ERDA contractor employees are published in the ERDA 76/119 report. These reports may be seen at ERDA Public Documents Room, 20 Massachusetts Avenue, NW., Washington, D.C.

In January 1975, two new agencies, the Energy Research and Development Administration (ERDA) and the U.S. Nuclear Regulatory Commission (NRC) were formed and now share the responsibilities previously held by the AEC. Previous AEC licensees now report to NRC while the contractors report to ERDA. This report contains 1975 radiation exposure data for ERDA and ERDA contractor employees.

STANDARDS FOR RADIATION PROTECTION

ERDA Manual Chapter 0524, Standards for Radiation Protection, is applicable to ERDA and ERDA contractor operations not subject to Nuclear Regulatory Commission licensing. These standards serve to protect the general public, ERDA, and ERDA contractor personnel and property.

Two basic requirements exist for all ERDA operations. The first requirement is that all operations shall be conducted in a manner to assure that radiation exposure to individuals and population groups is limited to the lowest levels technically and economically practicable. The second requirement is that radiation exposure to individuals or population groups be maintained below prescribed limits. The prescribed limits for occupationally exposed individuals are given in the table below as excerpted from ERDA Manual Chapter 0524.

INDIVIDUALS IN CONTROLLED AREAS

A. RADIATION PROTECTION STANDARDS FOR EXTERNAL AND INTERNAL EXPOSURES:

1. Type of Exposure	Exposure Period	Dose Equivalent (Dose or Dose Commitment ¹ (rem))
Whole body, head and trunk, gonads, lens of the eye ² , red bone marrow, active blood forming organs.	Year	5 ³
	Calendar Quarter	3
Unlimited areas of the skin (except hands and forearms). Other organs, tissues, and organ systems (except bone).	Year	15
	Calendar Quarter	5
Bone.	Year	30
	Calendar Quarter	10
Forearms. ⁴	Year	30
	Calendar Quarter	10
Hands ⁴ and feet.	Year	75
	Calendar Quarter	25

¹ To meet the above dose commitment standards, operations must be conducted in such a manner that it would be unlikely that an individual would assimilate in a critical organ, by inhalation, ingestion, or absorption, a quantity of a radionuclide(s) that would commit the individual to an organ dose which exceeds the limits specified in the above table.

² A beta exposure below an average energy of 700 Kev will not penetrate the lens of the eye; therefore, the applicable limit for these energies would be that for the skin (15 rem/year).

³ In special cases with the approval of the Director, Division of Operational Safety, a worker may exceed 5 rem/year provided his average exposure per year since age 18 will not exceed 5 rem per year.

⁴ All reasonable effort shall be made to keep exposures of forearms and hands to the general limit for the skin.

WHOLE-BODY RADIATION EXPOSURES

General Trends

Data for ERDA or ERDA contractor employees for the past 12 years are presented in Tables 1 and 2. Table 1 illustrates that as time progresses, generally the number of people monitored as well as the number of people receiving large dose equivalents has diminished. Since the contractors have some flexibility as to what individuals they monitor, the number of individuals monitored is not necessarily a good indicator of the number of radiation workers. However, the increase in total number of workers monitored in 1975 is known to arise from increased employment in a few technical programs.

Table 2 provides information on the trends in higher exposures. Although the general trend is toward fewer employees with high dose equivalents, both in number and as a percentage of the work force, the number in 1975 increased somewhat. The source of this increase is more evident in Table 3 in which the total collective dose equivalent (all measurable exposures) for each field office is reported for the years 1974 and 1975 and the percent change calculated.

It is evident from Table 3 that many of the groups have reduced collective dose equivalents for 1975. However, some offices faced with much expanded programs or high reactor maintenance showed a significant increase. One example is the Oak Ridge Operations Office, whose contractors monitored approximately 7,000 more employees in 1975 than in 1974 which resulted in a 9 percent increase in total dose equivalent. This increase is primarily due to the expansion of the gaseous diffusion plant capability and radiation exposures should diminish when this work is completed. The increase in the Pittsburgh Naval Reactors Office total results from the replacement of a steam generator and major reactor plant modification for installation of the Light Water Breeder Reactor (LWBR) core at the Shippingport Atomic Power Station. The increase in the Schenectady Naval Reactors total results from overhaul, refueling, and modification of naval prototype reactor plants to test new design naval reactor plant components.

Table 1

WHOLE-BODY RADIATION EXPOSURE HISTORY FOR ERDA AND ERDA CONTRACTOR EMPLOYEES

YEAR	NUMBER OF ESTIMATED DOSE EQUIVALENTS IN EACH OF FOLLOWING RANGES (rems)													TOTAL
	0-1*	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	>12	MONITORED
1964	122711	3583	1823	575	176	43	20	10	7	6	10	1		128965
1965	128360	4158	1704	515	294	70	32	26	25	22	6	2		135214
1966	130552	3706	1630	597	313	88	47	24	6	2			1	137939
1967	102510	3472	1572	555	168	35	29	23	17	4	1			103386
1968	103206	2799	1408	425	144	3	1							107986
1969	98625	2554	1313	335	86	4					1			102918
1970	92185	2698	1329	279	158	5	4	2		1				96661
1971	90640	2380	888	275	118	8	3				1			94315
1972	86077	2130	929	219	95	8	2						2	89460
1973	89071	1944	727	172	60	2	1							91977
1974***	75706	1689	692	149	40	4								78232
1975	85451	1846	753	232	142				1					88425

*In 1975, approximately 65 percent of these employees received a dose equivalent which was less than measurable.

**Data for 1966 and 1967 differ from previous reports due to the discovery of an error in the radiation exposure records of one major contractor.

***These data differ slightly from that reported in ERDA-76/119 because of the late reporting of exposures for 227 individuals.

Table 2

WHOLE-BODY EXPOSURE HISTORY OF ERDA AND ERDA CONTRACTOR EMPLOYEES

Year	(Percent of employees with dose equivalent greater than)		Total Man rem*	Total Monitored
	1 rem (number)	2 rem (number)		
1964	4.85 (6254)	2.07 (2671)	13411	128965
1965	5.07 (6854)	1.99 (2696)	14818	135214
1966**	5.35 (7387)	1.98 (2738)	15454	137939
1967**	6.11 (6622)	2.23 (2415)	13715	108386
1968	4.43 (4780)	1.83 (1981)	9877	107986
1969	4.17 (4293)	1.69 (1739)	8707	102918
1970	4.63 (4476)	1.84 (1778)	9137	96661
1971	3.90 (3675)	1.37 (1295)	5395	94315
1972	3.78 (3383)	1.40 (1253)	6170	89460
1973	3.16 (2906)	1.05 (962)	5623	91977
1974***	3.26 (2549)	1.13 (882)	4935	78232
1975	3.36 (2974)	1.28 (1128)	5813	88425

*Individuals with dose equivalent of less than 1 rem have been excluded. In 1975, this represented approximately 50 percent of the total man rem. Therefore, these data reflect only the trend in high ranges of dose equivalents rather than the total collective dose equivalent.

**Data for 1966 and 1967 differ from previous reports due to the discovery of an error in the radiation exposure records of one major contractor.

***These data differ slightly from that reported in ERDA-76/119 because of the late reporting of exposures for 227 individuals.

Table 3

OCCUPATIONAL DOSE EQUIVALENT FOR 1974-1975

BY FIELD OFFICE

<u>Field Office</u>	<u>Man-Rem</u>		<u>Change (Percent)</u>
	<u>1974</u>	<u>1975</u>	
Albuquerque	2405	2324	-3
Chicago	1943	1638	-17
Grand Junction	--	5	--
Idaho	686	611	-11
Nevada	58	55	-5
Oak Ridge	1178	1284	+9
Pittsburgh Naval Reactors	587	1876	+220
Richland	2079	2257	+8
San Francisco	320	283	-12
Schenectady Naval Reactors	261	1022	+292
Savannah River	<u>1484</u>	<u>1268</u>	<u>-15</u>
TOTAL	11001	12622	+15

DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES BY FACILITY TYPE—1975

Table 4 provides a breakdown of the 1975 whole-body dose equivalents according to facility type. Employees working in reactor, fuel processing, and accelerator facilities continue to receive the highest average exposures. However, the general research and other facilities account for approximately 50 percent of the total dose equivalent. It is known that many employees reported under the general research and other facility types more appropriately belong to another facility type. The accuracy of this report will therefore increase as more of the contractors correct these reporting deficiencies.

Appendix A contains whole-body equivalent distributions by facility type as reported to each of the 11 operations offices or Naval Reactors offices.

Appendix B contains whole-body dose equivalent distributions for each contractor. These are placed alphabetically under their respective field office or Naval Reactors office. Exposure distributions for each ERDA field office or area office are also presented.

TABLE 4

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
FOR ALL EMPLOYEES
1975

FACILITY TYPE	TOTAL MONITR	< MEAS.	EXPOSURE RANGES (REMS)																	TOTAL MAN-REM	
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	>12		
REACTOR	3812	1082	882	427	427	258	146	299	238	50	3										1800
FUEL FAB	1050	74	519	190	155	55	27	25	5												225
FUEL PRCC	1865	285	619	245	224	140	108	170	61	13											793
URAN ENRCH	7471	1807	5236	282	105	29	6	6													383
WEAPON F&T	19425	11579	4365	2341	594	224	113	181	24	4											1435
IRRAD FACL																					
GEN RESRCH	33769	19430	9242	2453	1184	510	330	484	118	14	3									1	3035
ACCELERATR	7384	5002	1161	446	247	135	81	176	72	45	19										1071
UTHER	11479	2340	6055	876	651	343	253	503	235	106	117										3375
VISITORS	58946	54190	3764	750	157	40	20	21	4												462
ERDA OFFCS	2170	1711	376	51	23	5	2	2													44
TOTAL	147371	97500	32219	8061	3767	1739	1086	1867	757	232	142									1	12623

TABLE 5

MAN-REMS PER FACILITY TYPE
1975

FACILITY TYPE	TOTAL NO. INDIVIDUALS MONITORED	NO. INDIVIDUALS WITH MEASURABLE EXPOSURE	TOTAL NO. MAN-REMS	AVERAGE EXPOSURE (REM) PER INDIVIDUAL (BASED ON ALL EXPOSURES)	AVERAGE EXPOSURE (REM) PER INDIVIDUAL (BASED ON MEASURABLE EXPOSURE)
REACTOR	3812	2730	1800	.47	.66
FUEL FAB	1050	976	225	.22	.23
FUEL PROC	1865	1580	793	.43	.50
URAN ENRCH	7471	5664	383	.05	.07
WEAPON F&T	19425	7846	1435	.07	.18
IRRAD FACL	0				
GEN RESRCH	33769	14339	3035	.09	.21
ACCELERATR	7384	2382	1071	.15	.45
OTHER	11479	9139	3375	.29	.37
VISITORS	58946	4756	462	.01	.10
ERDA OFFCS	2170	459	44	.02	.10

RATIOS OF AVERAGE EXPOSURES

It is known that exposure data is inadequate in assessing whether radiation exposures are reduced to as low as practicable. Variables such as facility age and design, along with all the other factors which enter into accomplishing the program objectives may by far outweigh the efforts of management, radiation workers, and safety personnel in reducing personnel exposures to the levels that exist at similar facilities elsewhere.

In some instances, it might be desirable to compare average radiation exposures associated with the same facility type but at different locations. Average exposure ratios have been calculated for each facility type under the operations offices and presented in Table 5. The average exposure ratio is defined as the ratio of the average personnel exposure of the subgroup and the average personnel exposure of the group. The numbers in Table 5 are derived by discarding all exposures less than 0.5 rem. By discarding numbers less than 0.5 rem, it is intended to include only the people working in the radiation areas. No interpretation of these numbers is possible other than that those numbers less than 1 indicate low average exposures relative to the average for that facility type while those ratios larger than 1 indicate a higher average exposure relative to the average for that facility type.

TABLE 6

AVERAGE EXPOSURE RATIO

FIELD OFFICE	1975										
	REACTOR	FUEL FABRIC	FUEL PROCESS	URAN ENRICH	WEAPONS FAB&TEST	IRRAD FACIL	GENERAL RESEARCH	ACCELER	OTHER	VISITR	ERDA OFFICES
ALBUQUERQUE OPERATNS					1.01		1.14		.78	1.07	1.05
CHICAGO OPERATIONS	.88						.94	1.02	1.34	.90	
GRAND JUNCTION OPERATN									.36		
IDAHO OPERATIONS	.76		1.33								.86
NEVADA OPERATIONS					.79						
OAK RIDGE OPERATIONS		.82		1.00	.99		.95		.41	1.00	
PITTSBURG NAVL REACTRS	1.24						.93		1.28	.83	
RICHLAND OPERATIONS	1.27	.94					.96		.76	.98	1.00
SAN FRANCISCO OPERATN					.58		.83	.71	.75		
SCHENCTDY NAVL REACTR							1.10		1.44	1.50	
SAVANNAH RIVR OPERATN	.58	1.13	.86		1.01		1.02		.64		

INTERNAL EXPOSURES

ERDA Manual Chapter 0525 requires ERDA contractors to submit a report on personnel with radioactive material deposited in their bodies. A report is required when:

- a. any uptake of radioactive material occurring during the reporting year that independently, or when added to a current burden, is estimated to result in dose commitment to the critical organ in excess of 50 percent of the pertinent annual dose equivalent standards set forth in appendix 0524.
- b. any previously unreported uptake of radioactive material that is determined to have been reportable according to the above criteria by reason of more recent dose estimates.

In 1975, 48 workers were determined to have radioactive material deposited in their bodies which produced 50 percent of the annual dose equivalent standard for a critical organ. Many of these had had a previous organ burden but were not reportable according to the Manual Chapter criteria. Additional exposure in 1975 added to their previous organ burden and thus they were reported in 1975. Fifteen of the uranium workers were reported in one or both of the two preceding years but determined to have received an additional uptake during 1975 and were included in the 1975 report.

Table 7 gives a breakdown of these 48 cases where the annual dose commitment exceeded 50 percent of an organ dose standard. The radionuclides are specified as well as the critical organ. The maximum annual dose equivalent limit for the lungs is 15 rem and that for bone is 30 rem as prescribed in ERDA Manual Chapter 0524.

Table 7

SUMMARY OF EXPOSURES RESULTING IN INTERNAL BODY
DEPOSITIONS OF RADIOACTIVE MATERIALS FOR CY 1975

<u>Nuclide</u>	<u>Organ</u>	<u>Dose (rem)</u>									
		0-5	5-10	10-15	15-20	20-25	25-30	30-50	50-100	100-200	200-300
239-240 Plutonium	Bone										
238-239-240 Plutonium	Bone				2	1					
239-240-241 Plutonium	Lung				1						
239-240 241 Plutonium Am	Lung		6								
235 Uranium	Lung		2	1							
234-235 Uranium	Lung		4	4							
234-235-238 Uranium	Lung			20	6						
234-38 Uranium	Lung			1							

WORKER TERMINATIONS

There were 6,586 monitored workers in 1975 who terminated their employment with the AEC or AEC contractors. Table 8 gives the length of employment time distribution as well as the average cumulative dose equivalent for the workers in each time interval. These data indicate that the average annual dose equivalent for the workers terminating in 1975 was a small fraction of the 5 rem per year limit.

TABLE 8

LENGTH OF EMPLOYMENT FOR
INDIVIDUALS TERMINATING EACH YEAR

	CALENDAR YEAR	1-89 DAYS	90-180 DAYS	180-365 DAYS	1-2 YEARS	2-4 YEARS	4-6 YEARS	>6 YEARS
TOTAL NUMBER	1975	2016	700	677	743	509	329	1612
TOTAL CUM. DOSE EQUIVALENT (REM)		519.40	192.37	292.68	399.57	316.58	480.18	4171.88
AVG. CUM. DOSE EQUIVALENT (REM)		.26	.27	.43	.54	.62	1.46	2.59

WHOLE-BODY EXPOSURES GREATER THAN 5 REM

Only one person received a whole-body exposure greater than the limit of 5 rem. This exposure of 8-9 rem as measured by the worker's dosimeter occurred in a well-type gamma-ray calibration facility. An investigation was conducted in which no apparent cause for this exposure was found nor sufficient evidence to discount it. In conformance with standard policy, the exposure was thus credited to the individual.

APPENDIX A

**OPERATIONS OFFICE REPORT
DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
BY FACILITY TYPE**

1975

TABLE 1

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
ALBUQUERQUE OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MCNTR	EXPOSURE RANGES (REMS)																TOTAL MAN-REM				
		< MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11		11-12	>12		
REACTOR																						
FUEL FAE																						
FUEL PROC																						
URAN ENRCH																						
WEAPON F&T	5060	614	1354	2084	500	205	105	170	24	4											1169	
IRRAD FACL																						
GEN RESRCH	9277	5211	2722	726	301	97	54	118	41	4	2									1	795	
ACCELERATR																						
OTHER	872	310	361	89	64	17	8	11	12													122
VISITORS	7938	5319	2063	492	55	5	1	2	1													219
ERDA OFFCS	656	459	166	19	6	4		2														19
TOTAL	23803	11913	6666	3410	926	328	168	303	78	8	2									1	2324	

TABLE 2

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
CHICAGO OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MCNTR	< MEAS.	EXPOSURE RANGES (REMS)															TOTAL MAN-REM			
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11		11-12	>12	
REACTOR	264	29	77	60	30	27	8	21	7	4	1									117	
FUEL FAB																					
FUEL PROC																					
URAN ENRCH																					
WEAPON F&T																					
IRRAD FACL																					
GEN RESRCH	4844	2859	1223	496	126	54	42	32	8	3	1										349
ACCELERATR	2383	989	437	271	192	117	73	169	72	45	18										950
OTHER	422	210	152	27	5	2	3	7	7	8	1										79
VISITORS	14298	13154	855	105	77	26	11	9	1												142
ERDA OFFCS	320	312	4	4																	1
TOTAL	22531	17553	2748	1023	430	226	137	238	95	60	21										1638

TABLE 3

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
 GRAND JUNCTION OPERATIONS OFFICE
 1975

FACILITY TYPE	TOTAL MONITR	< MEAS.	EXPOSURE RANGES (REMS)															TOTAL MAN-REM						
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11		11-12	>12				
REACTOR																								
FUEL FAB																								
FUEL PROC																								
URAN ENRCH																								
WEAPON F&T																								
IRRAD FACL																								
GEN RESRCH																								
ACCELERATR																								
OTHER	56	36	7	6	5	2																	5	
VISITORS																								
ERDA OFFCS																								
TOTAL	56	36	7	6	5	2																	5	

TABLE 4

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
IDAHO OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MONITR	< MEAS.	EXPOSURE RANGES (REMS)																TOTAL MAN-REM		
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12		>12	
REACTOR	1838	782	519	222	144	50	39	62	12	2										318	
FUEL FAB																					
FUEL PROC	524	128	159	48	41	25	18	53	39	13											200
URAN ENRCH																					
WEAPON F&T																					
IRRAD FACL																					
GEN RESRCH																					
ACCELERATR																					
OTHER																					
VISITORS																					
ERDA OFFCS	218	126	82	7	1	1	1														7
TOTAL	2580	1036	760	277	186	82	58	115	51	15											511

TABLE 5

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
NEVADA OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MCNITR	< MEAS.	EXPOSURE RANGES (REMS)																TOTAL MAN-REM			
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12		>12		
REACTOR																						
FUEL FAB																						
FUEL PRCC																						
URAN ENRCH																						
WEAPON F&T	11186	10832	219	77	39	10	6	3														55
IRRAD FACL																						
GEN RESRCH																						
ACCELERATR																						
OTHER	1	1																				
VISITORS	8189	8187	2																			
ERDA OFFCS	597	592	4	1																		
TOTAL	19973	19612	225	78	39	10	6	3														55

TABLE 6

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
 OAK RIDGE OPERATIONS OFFICE
 1975

FACILITY TYPE	TOTAL MGNTR	< MEAS.	EXPOSURE RANGES (REMS)																TOTAL MAN-REM		
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12		>12	
REACTOR	13	8	5																		
FUEL FAB	661	47	365	126	87	25	6	5													101
FUEL PRGC																					
URAN ENRCH	7471	1807	5236	262	105	29	6	6													383
WEAPON F&T	2969	14	2733	162	48	6		6													196
IRRAD FACL																					
GEN RESRCH	6856	4752	1516	251	158	64	43	59	13												378
ACCELERATR																					
OTHER	3598	89	3425	68	13	2	1														190
VISITORS	7513	7130	322	48	3	3	4	3													36
ERDA OFFCS	1		1																		
TOTAL	29082	13847	13603	937	414	129	60	79	13												1284

TABLE 7

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
PITTSBURGH NAVAL REACTORS OFFICE
1975

FACILITY TYPE	TOTAL MCNTR	< MEAS.	EXPOSURE RANGES (REMS)														TOTAL MAN-REM					
			<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10		10-11	11-12	>12		
REACTOR	444	100	88	32	45	26	12	59	64	18											365	
FUEL FAB																						
FUEL PROC																						
URAN ENRCH																						
WEAPON F&T																						
IRRAD FACL																						
GEN RESRCH	2204	272	1042	315	196	137	99	119	24													591
ACCELERATR																						
OTHER	1358	245	532	118	91	59	48	99	59	39	68											899
VISITORS	830	599	198	21	11	1																18
ERDA OFFCS	49	6	36	5	2																	3
TOTAL	4885	1222	1896	491	345	223	159	277	147	57	68											1876

TABLE 8

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
RICHLAND OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MCNITR	EXPOSURE RANGES (REMS)																	TOTAL MAN-REM			
		< MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12		>12		
REACTOR	446	3	10	28	44	37	33	108	155	26	2										723	
FUEL FAB	66		15	10	23	10	3	5													28	
FUEL PRGC																						
URAN ENRCH																						
WEAPON F&T																						
IRRAD FACL																						
GEN RESRCH	1163	21	426	320	203	77	40	59	15	2											370	
ACCELERATR																						
OTHER	1507	7	151	312	321	205	137	263	99	10	2										1117	
VISITORS	29	4	6	4	6	4	2	3													12	
ERDA OFFCS	32		9	11	11		1														7	
TOTAL	3243	35	617	685	608	333	216	438	269	38	4										2257	

TABLE 9

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
SAN FRANCISCO OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MONITR	EXPOSURE RANGES (REMS)																TOTAL MAN-REM					
		< MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11		11-12	>12			
REACTOR	5	2	2	1																			
FUEL FAB																							
FUEL PRCC																							
URAN ENRCH																							
WEAPON F&T	99	87	5	2	3	2																3	
IRRAD FACL																							
GEN RESRCH	6929	5987	740	120	41	20	10	9	2													113	
ACCELERATR	5001	4013	724	175	55	18	6	8		1	1											126	
OTHER	409	253	105	22	12	4	5	6	1	1												35	
VISITORS	19788	19631	141	16																		10	
ERDA OFFCS	67	53	13	1																		1	
TOTAL	32298	30026	1730	337	111	44	21	23	3	2	1											288	

TABLE 11

DISTRIBUTION OF ANNUAL WHOLE BODY EXPOSURES
SAVANNAH RIVER OPERATIONS OFFICE
1975

FACILITY TYPE	TOTAL MONITR	EXPOSURE RANGES (REMS)															TOTAL MAN-REM			
		< MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10		10-11	11-12	>12
REACTOR	802	158	181	84	164	112	54	49												276
FUEL FAB	323	27	139	54	45	20	18	15	5											97
FUEL PRCC	1341	157	460	497	183	115	90	117	22											507
URAN ENRCH																				
WEAPON F&T	111	32	54	16	4	1	2	2												12
IRRAD FACL																				
GEN RESRCH	589	105	310	51	44	23	19	30	7											134
ACCELERATR																				
OTHER	2324	881	1049	186	101	36	22	47	2											240
VISITORS																				
ERDA OFFCS	194	157	35	2																2
TOTAL	5684	1517	2228	590	541	307	205	260	36											1268

APPENDIX B

**OPERATIONS OFFICE REPORT
DISTRIBUTION OF ANNUAL WHOLE-BODY EXPOSURES
BY ERDA OFFICE OR CONTRACTOR**

1975

TABLE 1

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

PAGE 1

ALBUQUERQUE OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
DOW CHEMICAL, USA C01-07-0007-01	657	1233	2238	413	183	91	161	22	3								1109
GENERAL ELECTRIC COM C01-06-0006-01	223	99	2														5
GENERAL ELECTRIC COM C01-08-0006-02	91	56	62	42	8	7	11	12									87
INHALATION TOXICOLOG C01-08-0009-01	1222	68	5	7	2		2										11
LINCOLN LABORATORY C01-00-0218-01		128	1	1													7
MARTIN MARIETTA AERO C01-00-0213-01	94	70	26	21	9	2	1										25
MASON & HANGER-SILAS C01-01-0001-01	390	368	47	40	4	3	6										56
MASON & HANGER-SILAS C01-02-0001-02	32																
MONSANTO RESEARCH CO C01-03-0002-01	660	788	167	70	21	11	3	2	1								131
ROSS AVIATION, INC. C01-00-0212-01		34	1														2
SANDIA LABORATORIES C01-08-0008-01	2168	1347	250	75	14	5	18	1		1				1			195
SANDIA LABORATORIES C01-08-0008-01	987	721	157	45	8	4	10	4		1							118
SANDIA LABORATORIES C01-08-0008-02	779	157	9	4		1											12
TELEDYNE ISOTOPES C01-00-0211-01	1	24	6	2													3
THE BENDIX CORPORATI C01-04-0003-01	82	58	4	3													5
THE ZIA COMPANY C01-05-0005-01	661	137	83	40	10	3	7										56

TABLE 1

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

ALBUQUERQUE OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
UNIVERSITY OF CALIFO C01-05-0004-01	2542	834	281	137	63	41	82	36	4								445
SUBTOTAL	10589	6122	3339	900	322	168	301	77	8	2				1			2266

TABLE 2

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

CHICAGO OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
AMES LABORATORY C03-00-0011-01	884	84	25	6	5		4	1									22
ARGONNE NATIONAL LAB C03-00-0012-02	12890	794	226	129	65	58	61	14	6	3							380
BROOKHAVEN NATIONAL C03-02-0010-01	131	853	619	202	101	48	127	56	30	16							839
CHICAGO MISCELLANEOU C03-00-0013-00	280	477	38	11	4	4	6	7	8	1							100
CHICAGO MISCELLANEOU C03-00-0013-00	82																
FERMI NATIONAL ACCEL C03-01-0135-01	1277	485	103	80	51	27	39	17	16	1							289
MASSACHUSETTS INSTIT C03-00-0035-01	737	14	4	1													2
PRINCETON UNIVERSITY C03-00-0037-01	874	22	2	1													2
SUBTOTAL	17155	2729	1017	430	226	137	237	95	60	21							1634

TABLE 3
 ERDA CONTRACTORS
 AVERAGE WHOLE BODY EXPOSURES
 1975

GRAND JUNCTION OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
BENDIX FIELD ENGINEE C04-00-0001-00	35	6	6	5	2												4
SUBTOTAL	35	6	6	5	2												4

TABLE 4

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

IDAHO OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
																	452
AERJET NUCLEAR COMP C05-00-0163-01	625	462	204	144	57	48	88	38	10								111
ALLIED CHEMICAL CORP C05-00-0169-01	138	159	38	21	11	3	21	12	5								23
ARRINGTON CONSTRUCTI C05-00-0070-01	20	20	21	9	10	2	3	1									1
BIGGERS CONSTRUCTION C05-00-0074-01	7	8	2														7
BINGHAM MECHANICAL & C05-00-0082-01	8	6	1	3	1	2	2										1
C-L ELECTRIC COMPANY C05-00-0075-01	2	1		2													
CONSULTANTS & DESIGN C05-00-0181-01	6																1
LEHIGH DESIGN CO., I C05-00-0071-01	33	9	1														2
MORRISON-KNUDSEN C05-00-0134-01	58	6	1	1	1	1											5
ORMOND CONSTRUCTION C05-00-0069-01	9	5	2	3	1	1	1										1
WATERS ASBESTOS & SU C05-00-0156-01	4	2		2													
SUBTOTAL	910	678	270	185	81	57	115	51	15								604

TABLE 5

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

NEVADA OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
AIR RESOURCES LABORA C06-00-0159-01	11																
BIRDWELL DIVISION OF C06-00-0214-01	32	12	5	1													2
CER GEONUCLEAR C06-00-0215-01	1																
EG&G, INC. C06-00-0028-01	1139	15	4	1													2
ENVIRONMENTAL PROTEC C06-00-0116-01	399	4	3	2	1												2
FENIX & SCISSON, INC C06-00-0113-01	125	1															
HALLIBURTON SERVICES C06-00-0131-01	125																
HOLMES & NARVER, INC C06-00-0029-01	335	3	1														
NEVADA MISCELLANEOUS C06-00-0157-00	2525	67	23	11	4												14
REECO G06-00-0027-01	1858	57	21	7	2	2	3										17
REYNOLDS ELECTRICAL C06-00-0093-01	5480	55	18	13	2	2											14
SPERRY-SUN WELL SURV C06-00-0150-01	8																
U. S. DEPARTMENT OF C06-00-0216-01	106	5			1												1
WACKENHUT SERVICES, C06-00-0118-01	252		1														
WESTINGHOUSE ELECTRI C06-00-0217-01	15	2	1	4		2											4
SUBTOTAL	12411	221	77	39	10	6	3										55

TABLE 6

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

OAK RIDGE OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
COMPARATIVE ANIMAL R C08-00-0044-01	63	65	1			1											4
GOODYEAR ATOMIC CORP C08-04-0049-01	287	169	67	26	11	5	5										49
NATIONAL LEAD COMPAN C08-01-0047-01	47	365	126	87	25	6	5										101
OAK RIDGE ASSOCIATED C08-00-0128-01	105	420	14	5	1												26
PUERTO RICO NUCLEAR C08-05-0046-02	7334	326	47	1	2		1										28
RMI COMPANY C08-00-0043-01	19	31	11	1													4
RUST ENGINEERING COM C08-00-0045-01		1449	27	2	1												79
UNION CARBIDE CORPOR C08-00-0042-01	456	4327	91	22	5												244
UNION CARBIDE CORPOR C08-00-0042-02		5048	197	62	7	2	6										325
UNION CARBIDE CORPOR C08-00-0042-03	4458	650	232	151	64	45	61	13									333
UNION CARBIDE CORPOR C08-00-0042-04	1064	740	124	57	13	1	1										91
SUBTOTAL	13833	13590	937	414	129	60	79	13									1283

TABLE 7

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

PITTSBURGH NAVAL REACTORS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
DUQUESNE LIGHT COMPA C09-02-0051-01	434	138	38	46	26	12	59	64	18								369
WESTINGHOUSE ELECTRI C09-00-0050-02	593	1223	381	244	178	131	211	83	39	68							1412
WESTINGHOUSE ELECTRI C09-01-0050-01	189	499	67	53	19	16	7										93
SUBTOTAL	1216	1860	486	343	223	159	277	147	57	68							1874

TABLE 8

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

RICHLAND OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
ATLANTIC RICHFIELD H C10-00-0052-01	3	94	252	259	168	100	176	32	2	1							694
AUTOMATION INDUSTRIE C10-00-0205-01	1	2	9	7	8	3	3										16
BATTELLE MEMORIAL IN C10-00-0013-02	18	345	200	104	27	12	21	12	2								187
HANFORD ENGINEERING C10-00-0142-01	4	82	122	102	50	28	38	3									184
HANFORD ENVIRONMENTA C10-00-0057-01		1															
J. A. JONES CONSTRUC C10-00-0058-01	6	59	53	58	33	36	87	67	8	1							417
UNITED NUCLEAR INDUS C10-00-0055-01	3	25	38	67	47	36	113	155	26	2							751
SUBTOTAL	35	608	674	597	333	215	438	269	38	4							2249

TABLE 9
ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

SAN FRANCISCO OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
ATOMICS INTERNATIONA C11-00-0060-01	1324	170	24	12	4	5	6	1	1								39
STANFORD LINEAR ACCE C11-00-0062-01	68	88	37	8	3	1											17
UNIVERSITY OF CALIFO C11-00-0004-02	3945	636	138	47	15	4	5										94
UNIVERSITY OF CALIFO C11-00-0004-03	24237	793	126	37	17	8	9	2									112
UNIVERSITY OF CALIFO C11-00-0004-04	113	11	2			1											2
UNIVERSITY OF CALIFO C11-00-0004-05	187	12	6	4	3	4	2			1							16
UNIVERSITY OF CALIFO C11-00-0004-06	10																
UNIVERSITY OF CALIFO C11-00-0004-07	89	7	3	3	2												3
SUBTOTAL	29973	1717	336	111	44	21	23	3	2	1							283

TABLE 10

ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

SCHENECTADY NAVAL REACTORS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
GENERAL ELECTRIC CUM C13-00-0006-06	692	1713	221	159	55	54	132	65	53	46							1019
SUBTOTAL	692	1713	221	159	55	54	132	65	53	46							1019

TABLE 11
ERDA CONTRACTORS
AVERAGE WHOLE BODY EXPOSURES
1975

SAVANNAH RIVER OPERATIONS OFFICE

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
E. I. DU PONT DE NEM C14-00-0063-01	870	1791	496	475	286	190	224	34									1120
E. I. DU PONT DE NEM C14-00-0063-02	450	382	92	66	21	15	36	2									145
SAVANNAH RIVER ECOLO C14-00-0064-01	40	20															1
SUBTOTAL	1360	2193	588	541	307	205	260	36									1267

TABLE 12

ERDA FIELD OFFICE/AREA OFFICE EMPLOYEE
AVERAGE WHOLE BODY EXPOSURES
1975

PAGE 1

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
ALBUQUERQUE OPERATIO G01-00-0000-00	986	420	56	21	2			1									42
AMARILLO AREA OFFICE G01-01-0000-00	3	23	1														1
KANSAS CITY AREA OFF G01-04-0000-00	9																
LDS ALAMOS AREA OFFI G01-05-0000-00	304	32	3	3	3		2										8
MONSANTO RESEARCH CO C01-03-0000-00	7	14	4	1													2
PINELLAS AREA OFFICE G01-06-0000-00	5	3															
ROCKY FLATS AREA OFF G01-07-0000-00	7	51	7	1	1												5
SANDIA AREA OFFICE G01-08-0000-00	3	1															
SUBTOTAL	1324	544	71	26	6		2	1									59
BROOKHAVEN NATIONAL C03-02-0000-00		1	2														
CHICAGO OPERATIONS O G03-00-0000-00	312	3	2														1
HEALTH AND SAFETY LA G03-04-0000-00	25	4	1				1										2
NEW BRUNSWICK LABORA C03-03-0000-00	61	11	1														1
SUBTOTAL	398	19	6				1										4
GRAND JUNCTION OFFIC G04-00-0000-00	1	1															
SUBTOTAL	1	1															

TABLE 12

ERDA FIELD OFFICE/AREA OFFICE EMPLOYEE
AVERAGE WHOLE BODY EXPOSURES
1975

PAGE 2

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
IDAHO OPERATIONS OFF G05-00-0000-00	126	82	7	1	1	1											7
SUBTOTAL	126	82	7	1	1	1											7
NEVADA OPERATIONS OF G06-00-0000-00	7201	4	1														
SUBTOTAL	7201	4	1														1
OAK RIDGE OPERATIONS G08-00-0000-00	14	12															
PADUCAH AREA OFFICE G08-02-0000-00		1															
SUBTOTAL	14	13															1
PITTSBURGH NAVAL REA G09-00-0000-00	6	32	5	1													
PITTSBURGH NAVAL REA G09-01-0000-00		4															
SHIPPINGPORT BRANCH G09-02-0000-00				1													
SUBTOTAL	6	36	5	2													3
RICHLAND OPERATIONS G10-00-0000-00		9	11	11		1											
SUBTOTAL		9	11	11		1											7
SAN FRANCISCO OPERAT G11-00-0000-00	53	13	1														
SUBTOTAL	53	13	1														1
SCHENECTADY NAVAL RE G13-00-0000-00	5	24	1	2													
SCHENECTADY NAVAL RE G13-01-0000-00	1	2															
WINDSOR FIELD OFFICE G13-02-0000-00					1												

TABLE 12

 ERDA FIELD OFFICE/AREA OFFICE EMPLOYEE
 AVERAGE WHOLE BODY EXPOSURES
 1975

PAGE 3

OFFICE	<MEAS.	<0.10	0.10 0.25	0.25 0.50	0.50 0.75	0.75 1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTAL MAN-REM
SUBTOTAL	6	26	1	3													3
SAVANNAH RIVER OPERA G14-00-0000-00	157	35	2														2
SUBTOTAL	157	35	2														2
MORGANTOWN ENERGY RE G15-00-0000-00	2		5														1
SUBTOTAL	2		5														1
GRAND FURKS ENERGY R G17-00-0000-00	3																

