PNL--7998-HEDR

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LETTER REPORT: TITLE LISTING OF DAILY OPERATING DATA ON HANFORD SINGLE-PASS REACTORS, 1944-1971

Hanford Environmental Dose Reconstruction Project

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February 1992

Prepared for the
Technical Steering Panel

Pacific Northwest Laboratory
Richland, Washington 99352

MASTER

SUMMARY

The primary objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that populations and individuals could have received as a result of emissions from Hanford Site operations since 1944, with descriptions of the uncertainties inherent in such estimates. A secondary objective is to make project documentation and Hanford-originated references used in the reports available to the public. Hanford-originated documents of potential interest and/or use to the HEDR Project are made publicly available through the U.S. Government's National Technical Information Service and placed in the U.S. Department of Energy Richland Field Office (RL) Public Reading Room in Richland, Washington.

Project work is conducted under several technical tasks, among which is the Source Terms Task. Under this task, estimates of radioactive emissions from Hanford facilities since 1944 are developed. These estimates are based on historical measurements and production information. The Information Resources Task identifies and retrieves historical production operating information for developing source terms.

The purpose of this letter report is to identify documents that record daily reactor operating information at the Hanford Site for the years 1944-1971. Complete bibliographic citations and sample pages from each different format for Hanford reactor operations data are included.

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INTRODUCTION

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that individuals could have received as a result of emissions from nuclear operations at the U.S. Department of Energy's (DOE's) Hanford Site since operations began in 1944. The HEDR Project is managed and conducted by Battelle staff at the Pacific Northwest Laboratory under the direction of an independent Technical Steering Panel.

The Information Resources Task within the HEDR Project is charged with the responsibility of ensuring that Hanford-originated documents of use in meeting project objectives are found and made available in a timely manner to HEDR Project staff and the public. Project information needs center around 1) information necessary to estimate doses people may have received and 2) information on operations and radioactive material releases in order to satisfy public interest. The first objective has priority.

Two types of information are needed: 1) facilities operation information necessary to calculate amounts of radioactive materials generated and released to the environment and 2) monitoring information indicating concentrations of radioactive materials in the environs and how those concentrations were measured or calculated.

Much of the information in documents located and provided by Information Resources Task staff is used in developing the source term -- the quantities of radionuclides that were released to the environment from various Hanford operations. The quantities of each radionuclide available for release at any time are a function of the irradiation history of the fuel, the time elapsed since the fuel was removed from the reactor, and the amount of irradiated fuel being dissolved. Calculating source terms is the first step in dose estimation.

Only documents containing information about reactor operations are listed here. A similar listing addressing operation of separations plants will be developed after the collection of that data has been completed.

APPROACH

The process used to collect daily operating information for Hanford reactors for the period 1944-1971 included the following activities:

- identifying - screening author, subject, periodical and serial indices, and other computer-generated lists
- searching - physically looking for documents
- retrieving - acquiring documents from their filed, stored, or archived locations
- evaluating - reading documents to determine content and usefulness
- declassifying - reading of documents by an Authorized Derivative Declassifier to determine whether the document could be declassified as is or declassified with certain information deleted in accordance with directives from originating agencies
- making available - processing and placing documents in the RL Public Reading Room in Richland and other publicly available collections of the National Technical Information Service (NTIS).

Some documents, especially older ones, were destroyed over the years when the storage retention dates assigned to them in accordance with the government's records disposition schedule were reached or exceeded. This was the case for daily operating records for the years 1960 through 1964. Consequently, the daily data are in an entirely different form as they had to be reconstructed from monthly reports that gave dates and exact times of reactor outages during these years.

DOE has declared that Hanford plutonium production and operations-related information generated between 1944 and 1960 is declassified (currently unclassified). Those documents that address similar information for the years 1961 through 1971 remain classified as SECRET-RESTRICTED DATA.

Table 1 gives the startup and shutdown dates for the Hanford single-pass reactors. A history of site operations (Ballinger and Hall 1991) should be consulted for additional information relative to the design of site facilities and some of the significant events during the early years of operation.

TABLE 1. Startup and Shutdown Dates for Hanford Single-Pass Reactors

Reactor	Startup (m/d/yr)	Shutdown (m/d/yr)
B*	09/16/44	02/12/68
D	12/17/44	06/26/67
F	02/25/45	06/25/65
DR	10/03/50	12/30/64
H	10/20/49	04/21/65
C	11/18/52	04/25/69
KW	01/04/55	02/01/70
KE	04/17/55	01/28/71

* B Reactor went down in March 1946 and went back on line in July 1948.

Documents that contain daily operating information for Hanford single-pass production reactors for the years 1944 through shutdown of the last reactor in 1971 are presented in Table 2. This table includes information for each year by document number, title, classification (if any), availability, date of publication, corporate and personal author(s) (when known), and number of pages.

Sample pages depicting various reporting formats used during the 28 years of operation are in the appendix. Because data for the years 1951 through 1959 are handwritten on accounting-type ledgers, only a description of the contents is given. Daily operating information for the missing data from 1960 through 1964 will be reconstructed by using information from daily reactor outage reports combined with monthly operating information, which is available in the specific production reports identified in the appendix.

TABLE 2. Daily Operating Information for Hanford Production Reactors, 1944-1971

Years Covered	Document Number	Title	Current Classification	Availability	Document Date Year of Publication	Corporate Author & Location	Number of Pages	Author(s)
1944 1945	HAN-45954 Pts 1 and 2	P Department Daily Reports RHA 712 Box A735[b]	Declassified	DOE RR Richland[a]	1945	duPont Hanford	461	None given
1946	HAN-45954 Pts 3&4	P Department Daily Reports	Declassified RHA 712 Box A735	DOE RR Richland	1946	duPont-Hanford	365	None given
1947	HAN-45954 Pts 5&6	P Department Daily Reports	Declassified RHA 712 Box A735	DOE RR Richland	1947	GE-Hanford[c]	365	None given
1948	HAN-45954 Pts 7&8	P Department Daily Reports	Declassified RHA 712 Box A735	DOE RR Richland	1948	GE-Hanford	366	None given
1949	HW-89079	Daily Operating Conditions 100 Areas	Unclassified	DOE RR Richland FRC Box G38170[d]	1950	GE-Hanford	59	None given
1950	HW-89080	Daily Operating Conditions 100 Areas	Unclassified	DOE RR Richland FRC Box G38170	1951	GE-Hanford	64	None given
1951	HW-89081	Daily Operating Conditions 100 Areas	Unclassified	DOE RR Richland FRC Box G38170	1952	GE-Hanford	72	None given
1951 1952 1953	FTS-CLVI-255 (DEL)[e]	I.P.D. Operating Summary - 100 Areas 9-1-51 through 12-31-53	*Declassified with deletions		1954	GE-Hanford	119	D.L. DeNeal
1954	FTS-CLVI-254 (DEL)	I.P.D. Operating Summary - 100 Areas 01-01-54 through 12-31-54	*Declassified with deletions	Classified Copy RHA 712 Box 28749	1955	GE-Hanford	54	D.L. DeNeal
1955	FTS-CLVI-256 (DEL)	I.P.D. Operating Summary - 100 Areas 01-01-55 through 12-31-55	*Declassifed with deletions	Classified Copy RHA 712 Box 28749	1956	GE-Hanford	74	D.L. DeNeal
1956 1957	FTS-CLVI-257 (DEL)	I.P.D. Operating Summary for 100 Areas 01-01-56 through 12-31-57	*Declassified with deletions	Classified Copy RHA 712 Box 28750	1958	GE-Hanford	338	D.L. DeNeal
1958	FTS-CLVI-697 (DEL)	Operating Summary for 100 Areas 01-01-58 through 12-31-58	*Declassified with deletions	Classified Copy RHA 712 Box 28749	1959	GE-Hanford	136	D.L. DeNeal
1959	FTS-CLVI-698 (DEL)	Operating Summary for 100 Areas 01-01-59 through 12-31-59	*Declassified with deletions	Classified Copy RHA 712 Box 28749	1960	GE-Hanford	122	D.L. DeNeal
1960	HAN-74591	Monthly Reports, Reactor Branch 1960	+SECRET-RESTRICTED DATA	RHA 712 Box 28732	1961	Hanford Operations Office, AEC - Richland[f]	168	R.L. Plum
1961	HAN-77681	Monthly Reports, Reactor Branch 1961	+SECRET - RESTRICTED DATA	RHA 712 Box 28732	1962	Hanford Operations Office, AEC - Richland	144	R.L. Plum

TABLE 2. (contd)

Years Covered	Document Number	Title	Current Classification	Availability	Document Date Year of Publication	Corporate Author & Location	Number of Pages	Author(s)
1962	HAN-80948	Monthly Reports, Reactor Branch 1962	+SECRET - RESTRICTED DATA	RHA 712 Box 28732	1963	Hanford Operations Office, AEC - Richland	136	R.L. Plum
1963	HAN-84213	Monthly Reports, Reactor Branch 1963	+SECRET - RESTRICTED DATA	RHA 712 Box 28732	1964	Hanford Operations Office, AEC - Richland	129	R.L. Plum
1964	HAN-87470	Monthly Reports, Reactor Branch 1964	+SECRET - RESTRICTED DATA	RHA 712 Box 28732	1965	Hanford Operations Office, AEC - Richland	132	R.L. Plum
1965	RL-REA-345 RD	1965 Reactor Daily Report 01-01-65 through 10-31-65	+SECRET - RESTRICTED DATA	PNL 3760 Bldg[g]	1965	GE-Hanford	304	D.L. DeNeal
1966	DUN-31 RD (HAN-92922)	Reactor Operations Daily Report 11-01-65 through 06-30-66	+SECRET - RESTRICTED DATA	PNL 3760 Bldg	1966	Douglas-United Nuclear-Richland	242	D.L. DeNeal
1967	DUN-1174 RD	Reactor Operations Daily Reports 07-01-66 through 06-30-67	+SECRET - RESTRICTED DATA	PNL 3760 Bldg	1967	Doug as-United Nuclear-Richland	365	D.L. DeNeal
1968	DUN-2634 RD	Reactor Operations Daily Reports 07-01-67 through 06-30-67	+SECRET - RESTRICTED DATA	PNL 3760 Bldg	1968	Douglas-United Nuclear-Richland	366	D.L. DeNeal
1968	DUN-4440 RD	Reactor Operations Daily Reports 07-01-68 through 08-31-68	+SECRET - RESTRICTED DATA	PNL 3760 Bldg	1968	Douglas-United Nuclear-Richland	64	D.L. DeNeal
1969	DUN-4597 RD	Reactor Operations Daily Reports 09-01-68 through 06-30-69	+SECRET - RESTRICTED DATA	PNL 3760 Bldg	1969	Douglas-United Nuclear-Richland	305	D.L. DeNeal
1970	DUN-5947	Reactor Operations Daily Reports 07-01-69 through 06-30-70	+CONF[h] - RESTRICTED DATA	PNL 3760 Bldg	1970	Douglas-United Nuclear-Richland	367	C. O'Malley
1971	DUN-7038 RD	Reactor Operations Daily Reports 07-01-70 through 06-30-71	+CONF - RESTRICTED DATA	PNL 3760 Bldg	1971	Douglas-United Nuclear-Richland	366	M.A. Thress

(a) DOE RR Richland = RL Public Reading Room, Federal Building, Richland, Washington.
(b) RHA 712 = 712 Building, Richland, Washington. Box XXXX indicates number of boxes that contains the document.
(c) GE = General Electric Company.
(d) FRC = Federal Records Center, Seattle, Washington.
(e) DEL = Declassification w/deletions.
(f) AEC = Atomic Energy Commission.
(g) PNL-3760 Bldg = 3760 Building in the 300 Area of the Hanford Site (Hanford Technical Library)
(h) CONF = Confidential
\+ Can be made available to individuals who have the appropriate level of security clearance and need-to-know. Contact the HEDR Project Office in Richland, Washington.
* Declassified copy available for review upon request. Contact the RL Public Reading Room in Richland, Washington.

CONCLUSIONS AND RECOMMENDATION

Documents containing daily operating data for the Hanford single-pass reactors have been identified, located, and evaluated; these documents are listed in this letter report. Though the format is different for each year, the data needed to support HEDR technical goals and milestones are complete and have been directed to appropriate staff. We have a high degree of confidence that all significant documents related to reactor operations of interest to HEDR source term development have been identified. Operating information about N Reactor (after 1971) is not classified and is available.

The documents identified in this report may be of significant value to other Hanford Site activities requiring operating information. Consequently, it is recommended that they be identified as Historical Records for permanent retention.

REFERENCE

Ballinger, M. Y., and R. B. Hall. 1991. A History of Major Hanford Operations Involving Radioactive Material. PNL-6964, Pacific Northwest Laboratory, Richland, Washington.

APPENDIX

SAMPLE FORMAT PAGES AND DESCRIPTIONS OF PRODUCTION REACTOR OPERATIONS INFORMATION FROM 1944 THROUGH 1971

APPENDIX

SAMPLE FORMAT PAGES AND DESCRIPTIONS OF PRODUCTION REACTOR OPERATIONS INFORMATION FROM 1944 THROUGH 1971

This appendix contains sample pages of the format used for Hanford Site operations data compilation for the years 1944 through 1971. Descriptions of only the contents of data from the years 1951 through 1964 are given.

Sample Format for Hanford Site Operations Data, 1944-48 . . . . . A.2

Sample Format for Hanford Site Operations Data, 1949-51 . . . . . A.3

Description for 1951-1959 . . . . . A.4

Description for 1960-1964 . . . . . A.6

Sample Format for Hanford Site Operations Data, 1965-1971 . . . . A.7

Copy #1 - W. Cross, O. G. Lail
2 - Lt. Col. H. E. Skinner
#3 - J. E. Maider

HW3 19

[redacted] HES

HAN-45954-Pt4

DAILY REPORT - P DEPARTMENT

DATE 12-31-46

	B	D	F
1. Hours Operated		24	24
2. MD Production		250	200
3. Operating Level		250	200
4. Pieces Discharged		-	-
5. Pieces Shipped		-	-
6. MD Discharged		-	-
7. MD Shipped		-	-
8. Pieces in Basin		216	3033
9. MD in Basin		336	2641
10. Equiv. Spec. Pieces in Unit		-	-
11. Received from 300 Area		12	-
12. Returned to 300 Area		-	-
13. Inventory 103		3486	104
14. Average of 10 Hottest Tubes - 240 Zone		42.8	38.0
15. Highest .240 Number & Temperature		2474 at 43.4	2674 at 38.1
16. Highest .200 Number & Temperature		3967 at 43.4	3786 at 36.9
17. Highest .175 Number & Temperature		3962 at 45.0	4086 at 36.1
18. Highest .140 Number & Temperature		4467 at 42.3	3892 at 37.4
18A. River Temperature			4.6
19. Inlet Temperature		6.0	6.0

REMARKS

100-D: "A" rod controlling at 32.8", moving very little. No. 9 rod at 180.0" All others out.

100-F: "A" rod controlling at 113.0", moving in .5" per hour. No. 9 rod at 160", others out.

CLASSIFICATION CANCELLED
[illegible] Declassified
BY [illegible] SE Gydson
BY Elaine [illegible] DATE 3-16-70
[illegible]

[redacted]

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U. S. AEC Division of Classification

FIGURE A.1. Sample Format for Hanford Site Operations Data, 1944-1948

LOCATION 100-D

September, 1951

Date	Power Levels 12-8	8-4	4-12	Average Gamma 12-8	8-4	4-12	Average Beta 12-8	8-4	4-12	Basin Operation	Unusual conditions
1	490	490	*	4.2	4.0	-	2.1	2.0	-	N	* DOWN
2	*										* DOWN
3	*										* DOWN
4	*										* DOWN
5	*	350	0	*	2.0	2.4	*	1.4	1.7	N	DOWN
6	350	360	*	2.6	2.6	*	1.8	1.6	*	N	* DOWN
7	*	*	350	-	-	2.8	-	-	2.3	N	* DOWN
8	220	496	360	2.6	2.8	3.6	1.6	1.2	1.4	N	
9	415	449	465	3.8	3.2	3.0	1.4	2.0	1.8	N	
10	465	465	*	3.0	2.8	-	1.8	1.7	-	N	* DOWN
11	*	*	*	—	-	-	—	—	-		* DOWN
12	260	297	407	2.2	2.2	2.6	1.3	.9	1.0	N	
13	435	435	475	3.3	3.3	3.5	1.3	1.7	1.8	N	
14	475	475	475	3.3	3.5	3.5	1.6	1.8	1.5	N	
15	475	475	475	3.9	3.7	3.7	1.9	1.9	1.9	N	
16	475	475	475	4.1	3.7	3.9	2.0	1.9	1.9	N	
17	475	475	475	4.2	4.0	4.2	1.9	2.0	2.1	N	
18	475	475	475	4.2	4.1	4.2	2.1	2.5	2.3	N	
19	475	475	*	4.4	4.2	3.0	2.6	2.1	1.5	N+S	*SOUTH BASIN P-4 SHIFT 4-12 DOWN WEST 3pm
20	—	*	up	—	—	—	—	—	—	—	* DOWN
21	250	299	375	2.0	2.4	3.3	1.0	1.2	1.6	N	
22	445	450	475	3.5	3.7	4.1	1.8	1.9	1.9	N	
23	475	480	480	4.2	4.2	4.1	2.1	3.2	2.1	N	
24	480	480	480	4.4	4.2	4.4	2.2	1.7	1.7	N	
25	485	485	485	4.4	4.2	4.4	1.8	2.1	2.2	N	
26	485	485	485	4.6	4.4	4.1	2.3	2.2	2.0	N	
27	490	490	490	4.6	3.7	4.0	2.3	1.4	1.6	N	
28	490	490	490	4.1	4.0	4.0	1.6	2.0	2.0	S	— 52
29	485	485	485	4.0	4.1	4.1	2.0	2.0	2.0	S	
30	*	-	-	-			-	-			* DOWN
31											

FIGURE A.2. Sample Format for Hanford Site Operations Data, 1949-1951

DESCRIPTION FOR 1951-1959

All of these documents are handwritten, some on 8-1/2- x 11-in. paper and others on 11- x 14-in. paper. They all contain the following daily data by reactor:

- daily reactor outages and outage hours
- daily operating level (MW; Figure A.3)
- input production (MWD)
- cause of reactor outages.

The later years also give

- scram and rupture summary
- annual recap.

SECRET

Maximum Power Levels MW NOVEMBER, 1958

ROUGH DRAFT

CRYI-697-1A

Date	B	C	D	DR	F	H	KE	KW	Breakdown	Total
1	1435	1000	1440	0	0	1410	3050	3090		11395
2	1410	1550	1440	0	0	1410	3050	3090		11950
3	1410	1665	1440	1160	0	1410	3050	3090		13225
4	1410	0	1440	1240	0	1410	3050	0		5550
5	1410	1215	1440	1325	900	1410	3050	0		10790
6	1410	1550	1440	1375	1220	1410	2960	0		11395
7	1410	0	1440	1345	1330	1410	2950	0		9925
8	1410	1440	1440	1385	1335	1410	2950	0		11070
9	1410	1090	1440	1390	1000	1410	0	0		8240
10	1410	0	1440	1390	1300	1410	1460	0		8420
11	0	600	1440	0	1360	1380	2620	0		7400
12	0	1135	1440	0	1360	1440	2940			8275
13	1200	1000	1440	0	1380	1410	2940	0		9370
14	1410	1385	1440	1150	1380	1410	2940	0		11115
15	1420	1335	1440	1305	1380	1410	2940	0		11430
16	1420	1000	1440	1355	1380	1410	2940	0		10945
17	1420	1455	1440	1375	1380	1410	2940	0		11420
18	0	0	0	0	1380	1410	1365	0		4155
19	1000	1145	940	1170	0	0	2655	0		6960
20	1350	1555	1170	1220	1100	560	2900	0		10155
21	1370	1460	1355	1345	1300	1200	2900	0		11130
22	1370	1580	1365	1400	1390	1360	2900	0		11365
23	1370	1660	1375	1415	1370	1360	2940	0		11480
24	1370	1710	1375	0	1390	1370	2800	0		10015
25	1370	1090	1375	0	1390	1370	2800	0		9345
26	1370	1450	1410	0	400	1410	2520	0		8540
27	1370	1715	1430	1100	1130	1430	2520	0		10955
28	1370	1740	1430	1305	1250	1440	2560	0		11295
29	1370	1740	1430	1365	1300	1440	2560	0		11305
30	1370	1740	1430	1400	1390	1440	2560	0		11330
31										

LATEST POWER LEVELS NOVEMBER, 1958 SECRET Page 104

ROUGH DRAFT

FIGURE A.3. Sample Format for Hanford Site Operations Data (Daily Operating Level), 1951-1959

DESCRIPTION FOR 1960-1964

The 100 Area Daily Operating Reports for the years 1960 - 1964 were destroyed in July 1969. They were all authored by D. L. DeNeal and bore the following document numbers:

- HW-63287 1960
- HW-68050 1961
- HW-72063 RD 1962
- HW-75932 RD 1963
- HW-80182 RD 1964.

The daily data critical to HEDR needs can be developed from the Reactor Branch monthly reports identified in Table 2 along with information included in Monthly Production Reports 1960-1964 in Box 27222. All are classified SECRET-RESTRICTED DATA.

Each monthly report bears a unique HAN number. The table entitled "Comparative Pile Performance" includes the following by reactor:

- Maximum Power Level to Date, MW
- Maximum Power Level During Month, MW
- Average Power Level While Operating, MW
- Maximum Tube Power, KW
- Effective Central Tubes
- Time Operated Efficiency, %
- Operational Limitation
- Uranium Throughput, Tons
- Production forecast, %.

SECRET – ROUGH DRAFT
AFTER FILL-IN

REACTOR OPERATIONS DAILY REPORT

DATE _____ _____

	B	C	D	DR	F	H	KE	KW	SMALL	K'S	TOTAL
1. POWER LEVEL AT 0800 FOLLOWING DAY – MW											
2. MAXIMUM POWER LEVEL – MW											
3. INPUT PRODUCTION – MWD											
4. OUTAGE HOURS											
5. INPUT PRODUCTION VARIANCE FROM FORECAST-M-T-D – MWD									LINE 5 TOTALS IN KMWD'S		
6. REACTOR INLET WATER TEMPERATURE AT 2330- C									INPUT PROD. FORECAST FOR MO.		
7. BULK OUTLET WATER TEMPERATURE AT 2330- C									TIME OPER. EFF. – MO-TO-DATE		
8. REACTOR WATER FLOW RATE AT 2330- GPM ÷ 1000											
9. FACTOR LIMITING POWER LEVEL									TIME OPER. EFF. – 30 DAY AVG.		
10. DAILY ABNORMAL WATER COLLECTION - GALS.									TIME OPER. EFF. FORECAST FOR MO.		
11. ESTIMATED STARTUP TIME DATE / HOUR											

	RUPTURES		WATER LEAKS		SCRAMS	RECOVERIES	SCHEDULED OUTAGES		OTHER OUTAGES	DAILY PEAK ELECT. DEMAND - MEGAWATTS
	NAT.	ENR.	TUBE	V.S.			COMPLETED	REMAINING		
12. COMBINED REACTORS MONTH-TO-DATE										

REMARKS:

This is a sample for the years 1965-71

SECRET – ROUGH DRAFT
AFTER FILL IN

BM-5000-052 (7-64) ARC DE RICHLAND WASH.

FIGURE A.4. Sample Format for Hanford Site Operations Data, 1965-1971

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