

Palisades Nuclear Plant Semiannual  
Radioactive Effluent Release Report

January - June 1991

This report provides information relating to radioactive effluent releases and solid radioactive waste processing at the Palisades Nuclear Plant during the period of January through June 1991. The report format is detailed in Plant Technical Specification 6.9.3.1.A. Palisades Plant was offline January 1 to March 12 (Steam Generator Replacement Project/Refout), online March 13 to March 24, offline March 25 & 26 due to Turbine balancing, then online from March 27 to June 30.

1. Supplemental Information

A. Batch Releases

Information relating to batch releases of gaseous and liquid effluents is provided in Table HP 10.5-1.

B. Abnormal Releases

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT  
SUPPLEMENT - REQUEST TO RETAIN SOIL IN ACCORDANCE WITH 10CFR 20.302

Consumers Power Company correspondence dated November 12, 1987 and January 25, 1988 requested authorization to dispose of contaminated soil in place as specified by 10CFR 20.302. The area known as the South Radwaste Area has been contaminated by numerous cooling tower overflows and contamination was redistributed by heavy rain showers. Although the majority of the radioactive material has been packed for waste shipment, a large volume of very low activity radioactive material remains. This volume of material would be very expensive to ship as waste. The NRC, by letter of March 15, 1988 to Consumers Power Company, requested additional inhalation dose information and clarification of the contaminated area. The request was approved by letter NRC (Brain Holian) to GBSlade dated June 7, 1991. 5.00E-03 curies of CS-137 is being added to the liquid effluent releases.

C. Lower Limits of Detection (LLD's) for gaseous and liquid effluents is provided in Table HP 10.5-1.

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D. Radioactive Gaseous Effluent Monitoring Instrumentation (Waste Gas Holdup System)

Technical Specification 3.24.2.1(b) requires that when a radioactive gaseous effluent monitoring instrument channel becomes inoperable, best efforts must be made to return the instrument to operable status within 30 days and if unsuccessful, report the incident in the next Semiannual Radioactive Effluent Report. Technical Specification Table 3.24-2(1a) further stipulates that radioactive gaseous effluent releases may continue to be made with less than the required amount of operable channels providing that at least two independent samples of the tanks' contents are analyzed, and at least two technically qualified members of the staff independently verify the release rate calculations and discharge value lineup, otherwise the release of radioactive effluent via this pathway must be suspended. On March 6, 1991 the Waste Gas Holdup System monitor (RIA 1113) was declared inoperable due to the failure of its detector. The detector was not replaced because the detectors vendor and the vendors' supplier believed the detector was obsolete. A subsequent search for a replacement detector resulted in finding a supply of detectors but with a lead time of three months before shipment. The lead time was reduced to two months but the time limit of 30 days was exceeded. The Waste Gas Holdup System monitor was returned to service June 6, 1991. During the period of inoperability, all of the technical specification sampling requirements as stated in table 3.24-2(1a) were met.

2. Gaseous Effluents

Table HP 10.5-3 lists and summarizes all liquid radioactive effluents released during the reporting period. The unidentified beta was  $2.31E-03\%$  of the total release.

3. Liquid Effluents

Table HP 10.5-3 lists and summarizes all liquid radioactive effluents released during the reporting period. The unidentified beta was  $7.17E-03\%$  of the total releases.

4. Solid Waste

There were no solid waste radwaste shipments from January 1 to June 30, 1991.

## 5. Summary of Radiological Impact on Man

Potential doses to individuals and populations were calculated using GASPAR and LADTAP computer program codes. The first and second quarter values for curies released were input of each nuclide and summarized as follows:

- A. The offsite air dose at the site boundary (0.48 SSE) due to noble gases were  $1.16\text{E-}05$  millirad beta and  $1.06\text{E-}07$  millirad gamma for the first quarter; and  $5.36\text{E-}06$  millirad beta and  $1.38\text{E-}06$  millirad gamma for the second quarter. The maximum noble gas offsite air dose to the nearest residence (0.5 mi S) for beta occurred during the first quarter, being  $8.29\text{E-}06$  millirads beta and for gamma during the second quarter being  $9.89\text{E-}07$  millirads gamma.
- B. The most restrictive organ dose to an individual in an unrestricted area (based on identified critical receptors) from gaseous effluent releases (tritium, particulate and iodine) was the child bone for the first and second quarters. Doses were  $1.09\text{E-}02$  and  $1.35\text{E-}02$  millirem, respectively.
- C. Integrated total body doses to the general population and average doses to individuals within the population from gaseous effluent release pathways to a distance of 50 miles from the site boundary were:  $7.62\text{E-}03$  manRem and  $7.23\text{E-}06$  millirem for the first quarter; and  $7.52\text{E-}03$  manRem and  $7.13\text{E-}06$  millirem for the second quarter.
- D. The maximum total body dose to an individual in unrestricted water-related exposure pathways was  $1.40\text{E-}03$  millirem (teenager) and  $8.51\text{E-}03$  millirem (adult) for the first and second quarters, respectively. The maximum organ doses were  $2.59\text{E-}03$  millirem (teenage bone) for the first quarter and  $1.37\text{E-}02$  millirem (child bone) for the second quarter.
- E. Integrated total body doses to the general population and average doses to individuals within the population from liquid effluent release pathways to a distance of 50 miles from the site boundary were:  $4.83\text{E-}03$  manRem and  $4.60\text{E-}06$  millirem for the first quarter; and  $2.87\text{E-}02$  manRem and  $2.73\text{E-}05$  millirem for the second quarter.

## 6. Process Control Program (PCP)

No changes were made to the Process Control Program.

## 7. Offsite Dose Calculation Manual (ODCM)

No Changes were made to the Offsite Dose Calculation Manual.

8.

Supplemental Information to the Palisades Semiannual from January-June 1986 to July-December 1990; Ten Semiannual Radioactive Effluent Release Reports

Revisions for the Palisades Nuclear Plant Semi-Annual Radioactive Effluent Release Reports from January-June 1986 to July-December 1990, ten semi-annual reports narratives for the maximum total body dose to an individual in unrestricted water-related exposure pathways, the maximum organ dose, the integrated total body dose to the general population and average dose to individuals within the population from liquid effluent release pathways to a distance of 50 miles from the site boundary are being submitted as an attachment:

A. January-June 1986 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.C - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "1.08E-02 millirem and 5.10E-03 millirem for the first and second quarter" to "1.25E-02 millirem and 4.90E-03 millirem for the first and second quarters," respectively. Change the maximum organ doses from "2.07E-02 millirem for the first quarter and 8.43E-03 millirem for the second quarter" to "2.40E-02 millirem for the first quarter and 8.09E-03 millirem for the second quarter.

Item 5.D - Summary of Radiological Impact on Man: change "3.60E-02 man-Rem and 3.43E-05 millirem" to "4.18E-02 man-Rem and 3.98E-05 millirem" for the first quarter and change "1.68E-02 man-Rem and 1.60E-05 millirem" to "1.61E-02 man-Rem and 1.54E-05 millirem" for the second quarter.

B. July-December 1986 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.C - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "8.42E-03 millirem and 4.43E-03 millirem for the third and fourth quarters" to "1.17E-02 millirem and 6.65E-03 millirem for the third and fourth quarters," respectively. Change the maximum organ doses from "1.32E-02 millirem for the third quarter and 7.62E-03 millirem for the fourth quarter" to "1.83E-02 millirem for the third quarter and 1.14E-02 millirem for the fourth quarter."

Item 5.D - Summary of Radiological Impact on Man: change "2.83E-02 man-Rem and 2.70E-05 millirem" to "3.93E-02 man-Rem and 3.75E-05 millirem" for the third quarter and change "1.45E-02 man-Rem and 1.38E-05 millirem" to "2.18E-02 man-Rem and 2.07E-05 millirem" for the fourth quarter.

- C. January - June 1987 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.C - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "3.59E-03 millirem and 6.24E-03 millirem for the first and second quarters" to "3.27E-03 millirem and 5.68E-03 millirem for the first and second quarters," respectively. Change the maximum organ doses from "4.73E-03 millirem for the first quarter and 1.10E-02 millirem for the second quarter" to "4.30E-03 millirem for the first quarter and 1.00E-02 millirem for the second quarter."

Item 5.D - Summary of Radiological Impact on Man: change "1.19E-02 man-Rem and 1.13E-05 millirem" to "1.08E-02 man-Rem and 1.03E-05 millirem" for the first quarter and change "2.05E-02 man-Rem and 1.95E-05 millirem" to "1.87E-02 man-Rem and 1.77E-05 millirem" for the second quarter.

- D. July - December 1987 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.C - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "4.38E-03 millirem for the third quarter" to "3.94E-03 millirem for the third quarter". Change the maximum organ dose from "7.83E-03 millirem for the third quarter" to "7.05E-03 millirem for the third quarter." \*No fourth quarter change.

Item 5.D - Summary of Radiological Impact on Man: change "1.48E-02 man-Rem and 1.41E-05 millirem" to "1.33E-02 man-Rem and 1.27E-05 millirem" for the third quarter. \*No fourth quarter change.

- E. January - June 1988 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "4.54E-03 millirem and 2.67E-03 millirem for the first and second quarters" to "4.72E-03 millirem and 2.36E-03 millirem for the first and second quarters," respectively. Change the maximum organ doses from "7.90E-03 millirem for the first quarter and 4.42E-03 millirem for the second quarter" to "8.22E-03 millirem for the first quarter and 4.02E-03 millirem for the second quarter."

Item 5E - Summary of Radiological Impact on Man: change "1.63E-02 man-Rem and 1.55E-05 millirem" to "1.70E-02 man-Rem and 1.61E-05 millirem" for the first quarter and change "1.02E-02 man-Rem and 9.71E-06 millirem" to "8.94E-03 man-Rem and 8.51E-06 millirem" for the second quarter.

- F. July - December 1988 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "5.13E-03 millirem and 3.38E-03 millirem for the third and fourth quarters" to "5.75E-03 millirem and 4.39E-03 millirem for the third and fourth quarters," respectively. Change the maximum organ doses from "9.45E-03 millirem for the third quarter and 6.41E-03 millirem for the fourth quarter" to 1.06E-02 millirem for the third quarter and 8.33E-03 millirem for the fourth quarter."

Item 5.E - Summary of Radiological Impact on Man: change "1.95E-02 man-Rem and 1.86E-05 millirem" to "2.18E-02 man-Rem and 2.08E-05 millirem" for the third quarter and change "1.19E-02 man-Rem and 1.13E-05 millirem" to "1.55E-02 man-Rem and 1.47E-05 millirem" for the fourth quarter.

- G. January - June 1989 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "8.91E-04 millirem and 7.00E-04 millirem for the first and second quarters" to "8.29E-04 millirem and 6.37E-04 millirem for the first and second quarters," respectively. Change the maximum organ doses from "1.75E-03 millirem for the first quarter and 1.28E-03 millirem for the second quarter" to "1.63E-03 millirem for the first quarter and 1.16E-03 millirem for the second quarter."

Item 5.E - Summary of Radiological Impact on Man: change "3.34E-03 man-Rem and 3.18E-06 millirem" to "3.11E-03 man-Rem and 2.96E-06 millirem" for the first quarter and change "2.61E-03 man-Rem and 2.49E-05 millirem" to "2.38E-03 man-Rem and 2.27E-06 millirem" for the second quarter.

- H. July-December 1989 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "5.43E-04 millirem and 7.91E-03 millirem for the third and fourth quarters" to "4.94E-04 millirem and 9.25E-03 millirem for the third and fourth quarters," respectively. Change the maximum organ doses from "9.71E-04 millirem for the third quarter and 1.27E-02 millirem for the fourth quarter" to "8.84E-04 millirem for the third quarter and 1.48E-02 millirem for the fourth quarter."

Item 5.E - Summary of Radiological Impact on Man: change "2.24E-03 man-Rem and 2.13E-06 millirem" to "2.04E-03 man-Rem and 1.94E-06 millirem" for the third quarter and change "2.66E-02 man-Rem and 2.53E-05 millirem" to "3.11E-02 man-Rem and 2.96E-05 millirem" for the fourth quarter.

- I. January - June 1990 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "7.45E-04 millirem and 3.77E-04 millirem for the first and second quarters" to "7.31E-04 millirem and 3.73E-04 millirem for the first and second quarters," respectively. Change the maximum organ dose from "1.37E-03 millirem for the first quarter and 5.59E-04 millirem for the second quarter" to "1.33E-03 millirem for the first quarter and 5.53E-04 millirem for the second quarter.

Item 5.E - Summary of Radiological Impact on Man: change "2.85E-03 man-Rem and 2.71E-06 millirem" to "2.76E-03 man-Rem and 2.63E-06 millirem" for the first quarter and change "1.69E-03 man-Rem and 1.61E-06 millirem" to "1.67E-03 man-Rem and 1.59E-06 millirem" for the second quarter.

- J. July - December 1990 Semiannual Radioactive Effluent Release Report Narrative, the following changes are noted:

Item 5.D - Summary of Radiological Impact on Man: change the maximum total body dose to an individual in unrestricted water-related exposure pathways from "5.00E-04 millirem and 1.64E-03 millirem for the third and fourth quarters" to "4.50E-04 millirem and 2.26E-03 millirem for the third and fourth quarters," respectively. Change the maximum organ doses from "8.17E-04 millirem for the third quarter and 2.68E-03 millirem for the fourth quarter" to "7.35E-04 millirem for the third quarter and 3.70E-03 millirem for the fourth quarter.

Item 5.E - Summary of Radiological Impact on Man: change "1.78E-03 man-Rem and 1.70E-06 millirem" to "1.60E-03 man-Rem and 1.53E-06 millirem" for the third quarter and change "6.17E-03 man-Rem and 5.88E-06 millirem" to "8.51E-03 man-Rem and 8.11E-06 millirem" for the fourth quarter.

Reason for the above data revisions to the Palisades Radioactive Effluent Release Reports, January-June 1986 to July-December 1990, were that the total discharge flow value used was from the Plant design basis rather than using actual flow values. The actual discharge flow was calculated, and used to recalculate the values. All data changes are indicated by the "#" in the right-hand margin.



**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**January 1986 to June 1986**

A. FISSION AND ACTIVATION PRODUCTS	Units	1st Qtr	2nd Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	1.11E-01	7.98E-03	7.74
2. Average diluted concentration during period	µCi/ml	4.33E-09	2.56E-10	
3. Percent of MPC	%	7.18E-02	9.12E-04	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.91E+01	1.48E+01	4.05
2. Average diluted concentration during period	µCi/ml	7.43E-07	4.75E-07	
3. Percent of MPC	%	2.48E-02	1.58E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	None	4.87E-05	11.9
2. Average diluted concentration during period	µCi/ml	None	1.56E-12	
3. Percent of MPC	%	None	7.80E-07	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	3.74E-06	4.02E-06	
<b>E. VOLUME OF WASTE RELEASED</b>				
(Prior to Dilution)	Liters	1.16E+06	5.02E+05	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	2.57E+10	3.12E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	1.25E-02	4.90E-03	#
	%	8.33E-01	3.27E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	2.40E-02	8.09E-03	#
	%	4.80E-01	1.62E-01	#

\* NOTE: Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**July 1986 to December 1986**

A. FISSION AND ACTIVATION PRODUCTS	Units	3rd Qtr	4th Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	1.45E-02	6.50E-03	10.4
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	6.66E-10	3.22E-10	
3. Percent of MPC	%	3.89E-02	1.10E-02	
<b>B. TRITIUM</b>				
1. Total Release	Ci	2.09E+01	8.39E+00	9.56
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	9.58E-07	4.15E-07	
3. Percent of MPC	%	3.19E-02	1.38E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	None	None	N/A
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	None	None	
3. Percent of MPC	%	None	None	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	4.05E-06	3.45E-06	
<b>E. VOLUME OF WASTE RELEASED</b>				
(Prior to Dilution)	Liters	8.49E+05	5.55E+04	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	2.18E+10	2.02E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	1.17E-02	6.65E-03	#
	%	7.80E-01	4.43E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	1.83E-02	1.14E-02	#
	%	3.66E-01	2.28E-01	#

\* **NOTE:** Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**January 1987 to June 1987**

A. FISSION AND ACTIVATION PRODUCTS	Units	1st Qtr	2nd Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	3.61E-03	1.11E-02	9.55
2. Average diluted concentration during period	μCi/ml	1.09E-10	3.40E-10	
3. Percent of MPC	%	5.16E-03	2.31E-02	
<b>B. TRITIUM</b>				
1. Total Release	Ci	5.85E+00	1.16E+01	18.8
2. Average diluted concentration during period	μCi/ml	1.77E-07	3.55E-07	
3. Percent of MPC	%	5.91E-03	1.18E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	None	6.24E-03	18.8
2. Average diluted concentration during period	μCi/ml	None	1.91E-10	
3. Percent of MPC	%	None	9.55E-05	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	4.01E-06	1.06E-05	
1. Gross alpha average diluted concentration during period		1.02E-13	4.09E-13	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	4.38E+05	4.76E+05	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	3.30E+10	3.27E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	3.27E-03	5.68E-03	#
	%	2.18E-01	3.79E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	4.30E-03	1.00E-02	#
	%	8.60E-02	2.00E-01	#

\* **NOTE:** Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**July 1987 to December 1987**

A. FISSION AND ACTIVATION PRODUCTS	Units	3rd Qtr	4th Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	8.80E-03	6.88E-02	15
2. Average diluted concentration during period	μCi/ml	2.62E-10	2.27E-09	
3. Percent of MPC	%	1.06E-02	6.17E-02	
<b>B. TRITIUM</b>				
1. Total Release	Ci	5.73E+01	4.47E+01	16
2. Average diluted concentration during period	μCi/ml	1.71E-06	1.47E-06	
3. Percent of MPC	%	5.68E-02	4.92E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	7.97E-02	3.76E-02	5.6*
2. Average diluted concentration during period	μCi/ml	2.37E-09	1.24E-09	
3. Percent of MPC	%	1.19E-03	6.20E-04	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	2.06E-05	2.07E-05	
1. Gross alpha average diluted concentration during period		7.07E-13	8.09E-13	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	9.55E+05	1.40E+06	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	3.36E+10	3.03E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	3.94E-03	5.86E-02	#
	%	2.63E-01	3.91E00	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	7.05E-03	9.72E-02	#
	%	1.41E-01	1.94E00	#

\* NOTE: Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**January 1988 to June 1988**

A. FISSION AND ACTIVATION PRODUCTS	Units	1st Qtr	2nd Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	7.31E-03	4.23E-03	14.4
2. Average diluted concentration during period	μCi/ml	2.56E-10	1.29E-10	
3. Percent of MPC	%	9.35E-03	2.52E-03	
<b>B. TRITIUM</b>				
1. Total Release	Ci	3.49E+01	1.07E+02	22.3
2. Average diluted concentration during period	μCi/ml	1.22E-06	3.28E-06	
3. Percent of MPC	%	4.07E-02	1.09E-01	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	1.93E-03	7.55E-02	4.0*
2. Average diluted concentration during period	μCi/ml	6.75E-11	2.31E-09	
3. Percent of MPC	%	3.38E-05	1.16E-03	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	3.00E-06	2.05E-06	
1. Gross alpha average diluted concentration during period		1.00E-13	7.06E-14	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	8.27E+05	1.03E+06	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	2.86E+10	3.27E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	4.72E-03	2.36E-03	#
	%	3.15E-01	1.57E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	8.22E-03	4.02E-03	#
	%	1.64E-01	8.04E-02	#

\* NOTE: Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**July 1988 to December 1988**

	Units	3rd Qtr	4th Qtr	Est Total Error %
<b>A. FISSION AND ACTIVATION PRODUCTS</b>				
1. Total release (Not including tritium, gases, alpha)	Ci	1.42E-02	8.75E-03	16.1
2. Average diluted concentration during period	μCi/ml	5.24E-10	3.77E-10	
3. Percent of MPC	%	4.46E-02	3.20E-02	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.25E+02	1.58E+01	13.6
2. Average diluted concentration during period	μCi/ml	4.60E-06	6.81E-07	
3. Percent of MPC	%	1.53E-01	2.27E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	9.31E-02	6.77E-06	14.2*
2. Average diluted concentration during period	μCi/ml	3.42E-09	2.92E-13	
3. Percent of MPC	%	1.72E-03	1.46E-07	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	1.04E-05	5.00E-06	
1. Gross alpha average diluted concentration during period		5.01E-13	2.02E-13	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	3.22E+06	1.43E+06	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	2.72E+10	2.32E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	5.75E-03	4.39E-03	#
	%	3.83E-01	2.93E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	1.06E-02	8.33E-03	#
	%	2.12E-01	1.67E-01	#

\* **NOTE:** Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**January 1989 to June 1989**

A. FISSION AND ACTIVATION PRODUCTS	Units	1st Qtr	2nd Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	1.14E-03	1.07E-03	8.77
2. Average diluted concentration during period	μCi/ml	3.56E-11	3.26E-11	
3. Percent of MPC	%	3.92E-03	1.90E-03	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.77E+01	2.09E+01	4.58
2. Average diluted concentration during period	μCi/ml	5.55E-07	6.40E-07	
3. Percent of MPC	%	1.85E-02	2.13E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	None	None	N/A
2. Average diluted concentration during period	μCi/ml	None	None	
3. Percent of MPC	%	None	None	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	1.51E-06	8.22E-07	
1. Gross alpha average diluted concentration during period		4.73E-14	2.51E-14	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	1.13E+06	7.66E+05	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	3.19E+10	3.28E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	8.29E-04	6.37E-04	#
	%	5.53E-02	4.25E-02	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	1.63E-03	1.16E-03	#
	%	3.26E-02	2.32E-02	#

\* NOTE: Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**July 1989 to December 1989**

A. FISSION AND ACTIVATION PRODUCTS	Units	3rd Qtr	4th Qtr	Est Total Error %
1. Total release (Not including tritium, gases, alpha)	Ci	4.73E-04	1.07E-03	20.8
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	1.41E-11	4.10E-11	
3. Percent of MPC	%	1.95E-03	6.76E-03	
<b>B. TRITIUM</b>				
1. Total Release	Ci	2.33E+01	1.87E+01	4.2
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	6.96E-07	7.17E-07	
3. Percent of MPC	%	2.32E-02	2.39E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	<LLD	<LLD	N/A
2. Average diluted concentration during period	$\mu\text{Ci/ml}$	N/A	N/A	
3. Percent of MPC	%	N/A	N/A	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	6.48E-07	3.32E-07	
1. Gross alpha average diluted concentration during period		1.93E-14	1.27E-14	
<b>E. VOLUME OF WASTE RELEASED (Prior to Dilution)</b>				
	Liters	5.65E+05	3.52E+05	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	3.35E+10	2.61E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	4.94E-04	9.25E-03	#
	%	3.29E-02	6.17E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	8.84E-04	1.48E-02	#
	%	1.77E-02	2.96E-01	#

\* **NOTE:** Large error due to small amount of dissolved and entrained gases present in liquid effluents.



**TABLE HP 10.5-3 (Revised)**  
**PALISADES PLANT/SEMIANNUAL RADIOACTIVE**  
**EFFLUENT RELEASE REPORT**

**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**January 1, 1990 to June 30, 1990**

	Units	3rd Qtr	4th Qtr	Est Total Error %
<b>A. FISSION AND ACTIVATION PRODUCTS</b>				
1. Total release (Not including tritium, gases, alpha)	Ci	9.06E-04	6.37E-04	13.3
2. Average diluted concentration during period	μCi/ml	2.96E-11	2.12E-11	
3. Percent of MPC	%	2.94E-03	6.78E-04	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.97E+01	3.12E+01	4.0
2. Average diluted concentration during period	μCi/ml	6.44E-07	1.04E-06	
3. Percent of MPC	%	2.15E-02	3.47E-02	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	<LLD	<LLD	N/A
2. Average diluted concentration during period	μCi/ml	N/A	N/A	
3. Percent of MPC	%	N/A	N/A	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	4.40E-07	3.90E-07	
<b>E. VOLUME OF WASTE RELEASED</b>				
(Prior to Dilution)	Liters	3.95E+05	3.89E+05	
<b>F. VOLUME OF DILUTION WATER USED DURING PERIOD</b>				
	Liters	3.06E+10	3.00E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	7.31E-04	3.73E-04	#
	%	4.87E-02	2.49E-02	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	1.33E-03	5.53E-04	#
	%	2.66E-02	1.11E-02	#

\* **NOTE:** Large error due to small amount of dissolved and entrained gases present in liquid effluents.

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE (Revised)  
EFFLUENT RELEASE REPORT**

**TABLE HP 10.3-3  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES  
July 1, 1990 to December 31, 1990**

<b>A. FISSION AND ACTIVATION PRODUCTS</b>	<b>Units</b>	<b>3rd Qtr</b>	<b>4th Qtr</b>	<b>Est Total Error %</b>
1. Total release (Not including tritium, gases, alpha)	Ci	5.15E-04	5.69E-03	8.5
2. Average diluted concentration during period	μCi/ml	1.52E-11	2.60E-10	
3. Percent of MPC	%	6.75E-05	6.88E-03	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.11E+01	8.71E+01	4.0
2. Average diluted concentration during period	μCi/ml	3.27E-07	3.98E-06	
3. Percent of MPC	%	1.09E-02	1.33E-01	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	6.67E-05	<LLD	*35.3
2. Average diluted concentration during period	μCi/ml	1.97E-12	N/A	
3. Percent of MPC	%	9.85E-07	N/A	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	1.13E-06	1.42E-06	
<b>E. VOLUME OF WASTE RELEASED</b>				
(Prior to Dilution)	Liters	4.57E+05	1.24E+06	
<b>F. VOLUME OF DILUTION WATER USED</b>				
<b>DURING PERIOD</b>	Liters	3.39E+10	2.19E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 13.1.4.1a Wholebody limit	mRem	4.50E-04	2.26E-03	#
	%	3.00E-02	1.51E-01	#
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 13.1.4.1a Organ limit	mRem	7.35E-04	3.70E-03	#
	%	1.47E-02	7.40E-02	#

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

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**TABLE HP 10.5-1**

**BATCH RELEASES**

January 1, 1991 to June 1, 1991

<b>A. GASEOUS</b>	<b>UNITS</b>	<b>3rd QUARTER</b>	<b>4th QUARTER</b>
Number of Releases		9	5
Total Release Time	Minutes	2.42E+03	8.39E+02
Maximum Release Time	Minutes	6.85E+02	2.60E+02
Average Release Time	Minutes	2.69E+02	1.68E+02
Minimum Release Time	Minutes	1.35E+02	5.30E+01

<b>B. LIQUID</b>	<b>UNITS</b>	<b>3rd QUARTER</b>	<b>4th QUARTER</b>
Number of Releases		2	1
Total Release Time	Minutes	1.16E+03	6.83E+02
Maximum Release Time	Minutes	6.65E+02	6.83E+02
Average Release Time	Minutes	5.79E+02	6.83E+02
Minimum Release Time	Minutes	4.92E+02	6.83E+02

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

**TABLE HP 10.5-2  
GASEOUS EFFLUENTS - SUMMATION OF RELEASES  
January 1, 1991 to June 30, 1991**

A. FISSION AND ACTIVATION GASES	Units	1st Qtr	2nd Qtr	Est Total Error %
1. Total release	Ci	1.34E-01	1.02E-01	2.44E+01
2. Average release rate for period	μCi/sec	1.72E-02	1.30E-02	
3. Percent of annual avg MPC	%	8.21E-06	6.16E-06	
<b>B: IODINES</b>				
1. Total Iodine	Ci	2.81E-06	4.41E-05	1.90E+01
2. Average release rate for period	μCi/sec	3.61E-07	5.61E-06	
3. Percent of annual avg MPC	%	1.29E-07	4.96E-06	
<b>C. PARTICULATES</b>				
1. Particulates with half-life >8 days	Ci	3.74E-05	5.09E-05	2.71E+01
2. Average release rate for period	μCi/sec	4.81E-06	6.48E-06	
3. Percent of annual avg MPC	%	1.95E-05	2.34E-05	
4. Gross alpha radioactivity	Ci	1.25E-05	1.79E-05	
<b>D. TRITIUM</b>				
1. Total Release	Ci	1.58E+00	1.13E+00	
2. Average release rate for period	μCi/sec	2.03E-01	1.44E-01	
3. Percent of annual avg MPC	%	1.45E-04	1.03E-04	
<b>E.</b>				
1. Beta Air dose at Site Boundary Due to Noble Gases (TS 3.24.5.2a)	mRads	1.16E-05	5.36E-06	
2. Percent limit	%	1.16E-04	5.36E-05	
3. Gamma Air dose at Site Boundary due to Noble Gases (TS 3.24.5.21)	mRads	1.06E-07	1.38E-06	
4. Percent limit	%	2.12E-06	2.76E-05	
<b>F.</b>				
1. Maximum Organ Dose to Public Based on Critical Receptors (TS 3.24.5.3)	mRads	1.09E-02	1.35E-02	
2. Percent of limit	%	1.45E-01	1.80E-01	

\*NOTE: Data is reported for I-131 and I-133 only.

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

**TABLE HP 10.5-2**

**GASEOUS EFFLUENTS**

January 1, 1991 to June 30, 1991

<b>1. FISSION GASES</b>	<b>UNITS</b>	<b>1st QUARTER</b>	<b>2nd QUARTER</b>
Argon-41	Ci	<LLD	<LLD
Krypton-85	Ci	1.34E-01	1.43E-02
Krypton-85m	Ci	<LLD	<LLD
Krypton-87	Ci	<LLD	<LLD
Krypton-88	Ci	<LLD	<LLD
Xenon-131m	Ci	1.08E-04	1.58E-03
Xenon-133	Ci	1.71E-05	8.53E-02
Xenon-133m	Ci	<LLD	6.89E-04
Xenon-135	Ci	<LLD	1.86E-04
Xenon-135m	Ci	1.79E-05	<LLD
Xenon-138	Ci	<LLD	<LLD
Total for Period	Ci	1.34E-01	1.02E-01

<b>2. IODINES</b>	<b>UNITS</b>	<b>1st QUARTER</b>	<b>2nd QUARTER</b>
Iodine-131	Ci	<LLD	2.17E-05
Iodine-132	Ci	<LLD	<LLD
Iodine-133	Ci	2.81E-06	2.24E-05
Iodine-134	Ci	<LLD	<LLD
Iodine-135	Ci	<LLD	<LLD
Total for Period *	Ci	2.81E-06	4.41E-05

\* Total for I-131, 133, 135

**PALISADES NUCLEAR PLANT SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

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**TABLE HP 10.5-2**

**GASEOUS EFFLUENTS**

January 1, 1991 to June 30, 1991

<b>3. PARTICULATES *</b>	<b>UNITS</b>	<b>3rd QUARTER</b>	<b>4th QUARTER</b>
Chromium-51	Ci	<LLD	<LLD
Manganese-54	Ci	<LLD	<LLD
Cobalt-58	Ci	8.86E-07	<LLD
Iron-59	Ci	<LLD	<LLD
Cobalt-60	Ci	2.49E-06	9.11E-06
Zinc-65	Ci	<LLD	<LLD
Selenium-75	Ci	8.11E-07	<LLD
Strontium-89	Ci	4.65E-07	1.93E-06
Strontium-90	Ci	4.40E-07	4.25E-07
Niobium-95	Ci	<LLD	<LLD
Zirconium-95	Ci	<LLD	<LLD
Molybdenum-99	Ci	<LLD	<LLD
Silver-110m	Ci	<LLD	<LLD
Antimony-125	Ci	<LLD	<LLD
Cesium-134	Ci	<LLD	<LLD
Cesium-136	Ci	<LLD	<LLD
Cesium-137	Ci	1.28E-06	2.43E-06
Cerium-141	Ci	<LLD	<LLD
Cerium-144	Ci	<LLD	<LLD
Net Unidentified Beta	Ci	3.10E-05	3.70E-05
<b>Total</b>	<b>Ci</b>	<b>3.74E-05</b>	<b>5.09E-05</b>

\* NOTE: Particulates with half lives >8 days.

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

**TABLE HP 10.5-3  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES  
January 1, 1991 to June 1, 1991**

<b>A. FISSION AND ACTIVATION PRODUCTS</b>	<b>Units</b>	<b>1st Qtr</b>	<b>2nd Qtr</b>	<b>Est Total Error %</b>
1. Total release (Not including tritium, gases, alpha)	Ci	3.00E-03	6.70E-03	1.25E+01
2. Average diluted concentration during period	μCi/ml	9.52E-11	1.97E-10	
3. Percent of MPC	%	4.63E-03	1.22E-02	
<b>B. TRITIUM</b>				
1. Total Release	Ci	1.55E+01	6.42E+00	4.14E+00
2. Average diluted concentration during period	μCi/ml	4.92E-07	1.88E-07	
3. Percent of MPC	%	1.64E-02	6.28E-03	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. Total Release	Ci	<LLD	<LLD	N/A
2. Average diluted concentration during period	μCi/ml	N/A	N/A	
3. Percent of MPC	%	N/A	N/A	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
(Total Release)	Ci	2.54E-06	3.56E-07	
<b>E. VOLUME OF WASTE RELEASED</b>				
(Prior to Dilution)	Liters	3.52E+05	1.62E+05	
<b>F. VOLUME OF DILUTION WATER USED</b>				
DURING PERIOD	Liters	3.15E+10	3.41E+10	
<b>G. MAXIMUM DOSE COMMITMENT - WHOLEBODY</b>				
Percent of TS 3.24.4.1a Wholebody limit	mRem	1.40E-03	8.51E-03	
	%	9.33E-02	5.67E-05	
<b>H. MAXIMUM DOSE COMMITMENT - ORGAN</b>				
Percent of TS 3.24.4.1a Organ limit	mRem	2.59E-03	1.37E-02	
	%	5.18E-02	2.74E-01	

**PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT**

**TABLE HP 10.5-3**

**LIQUID EFFLUENTS**

January 1, 1991 to June 1, 1991

1. NUCLIDES RELEASED	UNITS	3rd QUARTER	4th QUARTER
Manganese-54	Ci	<LLD	<LLD
Cobalt-58	Ci	5.03E-04	6.76E-05
Iron-59	Ci	<LLD	<LLD
Cobalt-60	Ci	1.06E-03	2.67E-04
Zinc-65	Ci	<LLD	<LLD
Strontium-89	Ci	1.27E-06	2.11E-07
Strontium-90	Ci	1.03E-05	1.39E-06
Molybdenum-99	Ci	<LLD	<LLD
Iodine-131	Ci	<LLD	<LLD
Cesium-134	Ci	4.63E-05	1.70E-05
Cesium-137	Ci	5.58E-04	5.18E-03
Cerium-141	Ci	<LLD	<LLD
Cerium-144	Ci	<LLD	<LLD
Antimony-125	Ci	4.17E-04	<LLD
Net Unidentified Beta	Ci	4.03E-04	1.17E-03
Fission & Activation Product Total	Ci	3.00E-03	6.70E-03
Tritium	Ci	1.55E+01	6.42E+00
Dissolved Gas Xenon-133	Ci	<LLD	<LLD
Grand Total	Ci	1.55E+01	6.43E+00



PALISADES PLANT/SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT

TABLE HP 10.5-4

SOLID WASTE

-January 1, 1991 to June 30, 1991-

<u>Waste Class</u>	<u>Source of Waste</u>	<u>Solidification Agent</u>	<u>Container Type</u>	<u>Volume (cu ft)</u>	<u>Total Curies</u>	<u>Principal Radionuclides</u>
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Note: No solid radwaste shipments from January 1, 1991 to June 30, 1991.

Attachment 1Lower Limits of Detection (LLD's) for Palisades EffluentsGaseous Effluents

	<u>LLD (<math>\mu\text{Ci}/\text{cc}</math>)</u>
Cr-51	8.05E-13
Mn-54	1.34E-13
Co-58	7.98E-14
Fe-59	2.74E-13
Zn-65	3.09E-13
Nb-95	1.22E-13
Zr-95	2.20E-13
Mo-99	5.05E-14
Sb-125	3.60E-13
Ce-141	9.13E-14
Ce-144	4.39E-13

Liquid Effluents

	<u>LLD (<math>\mu\text{Ci}/\text{cc}</math>)</u>
Mn-54	5.48E-08
Fe-59	1.12E-07
Zn-65	1.27E-07
Mo-99	2.07E-08
I-131	3.94E-08
Cs-134	5.30E-08
Ce-141	3.74E-08
Ce-144	1.80E-07