

**NORTHEAST UTILITIES**



THE CONNECTICUT LIGHT AND POWER COMPANY  
WESTERN MASSACHUSETTS ELECTRIC COMPANY  
HOLYOKE WATER POWER COMPANY  
NORTHEAST UTILITIES SERVICE COMPANY  
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270  
HARTFORD, CONNECTICUT 06141-0270  
(203) 665-5000

February 24, 1988

Docket No. 50-245  
50-336  
50-423  
B12829

Re: 10CFR50.36a

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit Nos. 1, 2 and 3  
Semiannual Radioactive Effluents Release Report

In accordance with the requirements of 10CFR50.36a, the Safety Technical Specifications and the Radiological Effluents Monitoring Manual, a copy of the Semiannual Radioactive Effluents Release Report is herewith submitted.

This report includes a summary of the quantities of solid radioactive waste and liquid and gaseous effluents for the period of July - December, 1987. An annual Radioactive Effluents Dose Report (to be submitted in March, 1988) will include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released during the calendar year (January - December, 1987).

The report has been prepared in accordance with the format of Regulatory Guide 1.21 and copies of the report are being forwarded in accordance with the provisions of 10CFR50.4(b)(1).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

*E. J. Mroczka*

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E. J. Mroczka  
Senior Vice President

*C. F. Sears*

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By: C. F. Sears  
Vice President

- cc: W. T. Russell, Region I Administrator
- M. L. Boyle, NRC Project Manager, Millstone Unit No. 1
- D. H. Jaffe, NRC Project Manager, Millstone Unit No. 2
- R. L. Ferguson, NRC Project Manager, Millstone Unit No. 3
- W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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**NORTHEAST NUCLEAR ENERGY COMPANY**

**MILLSTONE NUCLEAR POWER STATION**

**UNITS NO. 1, 2 & 3**

**SEMIANNUAL RADIOACTIVE EFFLUENTS**

**RELEASE REPORT**

**JULY-DECEMBER 1987**

**OPERATING LICENSE NO's. DPR-21, DPR-65, & NPF-49**

**DOCKET NO's. 50-245, 50-336. & 50-423**

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W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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## INTRODUCTION

- 1.0 This report is being submitted for Northeast Nuclear Energy Company's Millstone Power Station, Units No. 1, 2, and 3 in accordance with the requirements of 10CFR50.36a, and the Radiological Effluent Technical Specifications and in the format outlined by U. S. NRC Regulatory Guide 1.21.

During the period covered by this report, Unit No. 1 operated with a unit capacity factor of 59%, Unit No. 2 with a unit capacity factor of 87%, and Unit 3 with a unit capacity factor of 63%.

Unit 1 completed their 2 1/2 month refueling outage on August 17, 1987, Unit 2 shutdown for a refueling outage on December 31, 1987, and Unit 3 shutdown for a refueling outage on November 1, 1987 through the end of the year.

A single report is being submitted for all units as the three units share a number of items related to this report. However, effluent release data are presented separately for each unit.

## RADIOACTIVE EFFLUENT RELEASES

2.0 The plants were operated in accordance with the Technical Specifications. The liquid and airborne radioactive effluents are given in the attached tables as follows:

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Table 2.1-1

## MILLSTONE NUCLEAR POWER STATION

UNIT #1

## LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

YEAR	UNITS	July	August	September	QUARTERLY TOTALS
1987					

## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	9.69E-02	2.21E-01	9.46E-02	4.13E-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	4.31E-07	5.59E-09	1.35E-09	3.75E-09

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	1.13E+00	8.96E-01	6.29E-01	2.66E+00
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	5.02E-06	2.27E-08	8.95E-09	2.42E-08

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	---	2.28E-06	3.21E-04	3.23E-04
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	---	5.57E-14	4.57E-12	2.94E-12

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	$\leq 6.15E-05$	$\leq 7.14E-05$	$\leq 6.73E-05$	---
----------------------------	----	-----------------	-----------------	-----------------	-----

## E. Volume

1. VOLUME OF WASTE RELEASED	LITERS	8.78E+05	1.02E+06	8.41E+05	2.74E+06
2. VOLUME OF DILUTION DURING RELEASES	LITERS	2.23E+08	4.05E+09	5.81E+09	1.01E+10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	2.25E+08	3.95E+10	7.03E+10	1.10E+11



Table 2.1-1

## MILLSTONE NUCLEAR POWER STATION

## UNIT #1

## LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	OCTOBER	NOVEMBER	DECEMBER	QUARTERLY TOTALS
-------	---------	----------	----------	------------------

## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	3.63E-02	1.30E-01	4.11E-01	5.77E-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	4.88E-10	1.91E-09	5.43E-09	2.65E-09

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	8.43E-01	9.38E-01	1.79E+00	3.57E+00
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	1.13E-08	1.38E-08	2.36E-08	1.64E-08

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	6.78E-06	3.34E-05	1.04E-03	1.08E-03
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	9.01E-14	4.90E-13	1.37E-11	4.95E-12

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	$\leq 5.32E-05$	$\leq 6.64E-05$	$\leq 7.70E-05$	-----
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## E. Volume

1. VOLUME OF WASTE RELEASED	LITERS	8.18E+05	8.30E+05	1.09E+06	2.74E+06
2. VOLUME OF DILUTION DURING RELEASES	LITERS	5.45E+09	5.58E+09	5.53E+09	1.66E+10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	7.44E+10	6.82E+10	7.57E+10	2.18E+11

Table 2.1-2

## MILLSTONE NUCLEAR POWER STATION - UNIT #1

## LIQUID EFFLUENTS - BATCH MODE

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	C1	4.96E-04			4.96E-04
Mn-54	C1	1.60E-02	3.53E-02	9.37E-03	6.07E-02
Tc-99M	C1				
Co-58	C1	1.20E-03	2.78E-03	3.26E-04	4.31E-03
Co-60	C1	4.05E-02	8.82E-02	4.67E-02	1.75E-01
I-131	C1	5.95E-05		1.14E-04	1.74E-04
I-133	C1			2.08E-05	2.08E-05
I-135	C1				
Cs-134	C1	1.42E-03	2.93E-03	1.17E-03	5.52E-03
Cs-137	C1	3.16E-02	6.86E-02	3.12E-02	1.31E-01
Mo-99	C1				
Ce-141	C1				
Ce-144	C1				
Zn-65	C1	1.29E-04	7.66E-04		8.95E-04
Fe-59	C1				
RU-103	C1	1.31E-04			1.31E-04
Sb-124	C1	4.32E-04			4.32E-04
Sb-125	C1	4.43E-04			4.43E-04
	C1				
	C1				
Fe-55	C1	≤7.46E-04	8.36E-03	2.02E-03	1.04E-02
Sr-89	C1	2.11E-03	7.75E-03	1.60E-03	1.15E-02
Sr-90	C1	2.37E-03	6.63E-03	2.10E-03	1.11E-02
Total Activity	C1	9.69E-02	2.21E-01	9.46E-02	4.13E-01
Xe-133	C1	---	2.28E-06	3.21E-04	3.23E-04
Xe-135	C1				
Xe-135M	C1				
	C1				
	C1				
	C1				

Table 2.1-2

## MILLSTONE NUCLEAR POWER STATION - UNIT #1

## LIQUID EFFLUENTS - BATCH MODE

Year 1987

Nuclides Released	Unit	OCT	NOV	DEC	Quarterly Total
Cr-51	Ci				
Mn-54	Ci	2.61E-03	1.01E-02	9.10E-03	2.18E-02
Tc-99M	Ci	3.89E-05			3.89E-05
Co-58	Ci		2.32E-04	5.52E-05	2.87E-04
Co-60	Ci	2.13E-02	9.67E-02	3.93E-01	5.11E-01
I-131	Ci		1.83E-04		1.83E-04
I-133	Ci				
I-135	Ci				
Cs-134	Ci	1.85E-04	2.30E-04	5.23E-05	4.67E-04
Cs-137	Ci	1.02E-02	1.37E-02	6.61E-03	3.05E-02
Mo-99	Ci				
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci	4.61E-05		4.31E-05	8.92E-05
Fe-59	Ci		2.15E-04		2.15E-04
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
Fe-55	Ci	1.06E-03	7.22E-03	1.53E-03	9.81E-03
Sr-89	Ci	2.94E-04	3.65E-04	5.45E-05	6.59E-04
Sr-90	Ci	5.56E-04	7.26E-04	2.29E-04	1.51E-03
Total Activity	Ci	3.63E-02	1.30E-01	4.11E-01	5.77E-01
Xe-133	Ci	6.78E-06	3.34E-05	1.04E-03	1.08E-03
Xe-135	Ci				
Xe-135M	Ci				
	Ci				
	Ci				
	Ci				

Table 2.1-3

## MILLSTONE NUCLEAR POWER STATION

## UNIT #1

## GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

UNITS	July	August	September	QUARTERLY TOTALS
YEAR <u>1987</u>				

## A. Fission and Activation Gases

1. TOTAL ACTIVITY RELEASED	Ci	1.71E+01	4.87E+00	1.55E+02	1.77E+02
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	5.64E+00	2.02E+00	5.17E+01	2.10E+01

## B. Iodines

1. TOTAL I-131 ACTIVITY RELEASED	Ci	6.31E-06	3.03E-05	1.09E-04	1.46E-04
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.08E-06	1.25E-06	3.63E-05	1.73E-05

## C. Particulates

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	2.54E-03	7.01E-04	1.94E-04	3.44E-03
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	8.38E-04	2.91E-04	6.47E-05	4.08E-04
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	1.01E-06	4.47E-07	2.65E-07	1.72E-06

## D. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	6.27E+01	4.11E+01	9.33E+00	1.13E+02
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.07E+01	1.71E+01	3.11E+00	1.34E+01

Table 2.1-3

## MILLSTONE NUCLEAR POWER STATION

## UNIT #1

## GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	OCTOBER	NOVEMBER	DECEMBER	QUARTERLY TOTALS
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## A. Fission and Activation Gases

1. TOTAL ACTIVITY RELEASED	Ci	1.76 E+01	1.29 E+02	3.52 E+00	1.49 E+02
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	7.27 E+00	5.33 E+01	8.34 E-01	1.92 E+01

## B. Iodines

1. TOTAL I-131 ACTIVITY RELEASED	Ci	6.62 E-05	2.49 E-04	7.01 E-05	3.85 E-04
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.74 E-05	1.03 E-04	2.32 E-05	4.90 E-05

## C. Particulates

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	2.03 E-04	1.50 E-04	6.55 E-05	4.12 E-04
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	8.39 E-05	6.20 E-05	2.17 E-05	5.33 E-05
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	4.03 E-07	2.42 E-07	5.82 E-08	7.03 E-07

## D. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	5.78 E+00	5.45 E+00	1.06 E+01	2.19 E+01
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.39 E+00	2.25 E+00	3.51 E+00	2.77 E+00

Table 2.1-4

## MILLSTONE NUCLEAR POWER STATION - UNIT #1

## GASEOUS EFFLUENTS - ELEVATED RELEASE - CONTINUOUS MODE

Nuclides Released	Unit	JULY	AUG	SEPT.	Quarterly Total
-------------------	------	------	-----	-------	-----------------

## 1. Fission gases

Xe-135	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf		5.02E-01		5.02E-01
Xe-135	Cf	2.33E-01	3.11E+00		3.34E+00
Xe-133	Cf	1.69E+01	1.26E+00	3.57E+00	2.17E+01
Kr-89	Cf				
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf			1.51E+02	1.51E+02
Ar-37	Cf				
Total For Period	Cf	1.71E+01	4.87E+00	1.55E+02	1.77E+02

## 2. Iodines

Iodine-131	Cf	6.31E-06	3.03E-05	1.09E-04	1.46E-04
Iodine-133	Cf	≤ LLD	≤ LLD	3.93E-04	3.93E-04

## 3. Particulates

Cr-51	Cf				
Mn-54	Cf	2.86E-04	1.22E-04	2.90E-05	4.37E-04
Fe-59	Cf				
Co-58	Cf	1.17E-05	1.56E-05	9.00E-06	3.63E-05
Co-60	Cf	1.60E-03	3.75E-04	1.18E-04	2.09E-03
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf	1.78E-05			1.78E-05
Cs-137	Cf	6.14E-04	7.58E-05	8.94E-06	6.99E-04
Ba-140	Cf		5.45E-05		5.45E-05
Ce-141	Cf				
Ce-144	Cf				
	Cf				
La-140	Cf				
	Cf				
Sr-89	Cf	≤ 1.70E-06	5.59E-05	2.89E-05	8.48E-05
Sr-90	Cf	1.53E-05	2.13E-06	4.62E-07	1.79E-05
	Cf				
TOTAL	Cf	2.54E-03	7.01E-04	1.94E-04	3.44E-03

Tab.e 2.1-4

MILLSTONE NUCLEAR POWER STATION - UNIT #1

GASEOUS EFFLUENTS - ELEVATED RELEASE - CONTINUOUS MODE

Nuclides Released	Unit	OCT	NOV	DEC	Quarterly Total
-------------------	------	-----	-----	-----	-----------------

1. Fission gases

Xe-135	C1	5.08 E+00	---		5.08E+00
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1	1.02E+00		6.92E-02	1.09E+00
Xe-133	C1	1.15E+01	8.50E+00	2.26E+00	2.23E+01
Kr-89	C1				
Xe-137	C1				
Xe-135m	C1			1.86E-01	1.86E-01
Kr-83m	C1				
Xe-133m	C1				
Xe-131m	C1				
Kr-85	C1		1.20E+02		1.20E+02
Ar-37	C1				
Total For Period	C1	1.76E+01	1.29E+02	2.52E+00	1.49E+02

2. Iodines

Iodine-131	C1	6.62E-05	2.49 E-04	7.01E-05	3.85E-04
Iodine-133	C1	9.40E-05	3.21E-04	7.85E-05	4.94E-04

3. Particulates

Cr-51	C1		2.15E-05		2.15E-05
Mn-54	C1	1.26E-05	6.85E-06		1.95E-05
Fe-59	C1				
Co-58	C1				
Co-60	C1	1.10E-04	5.00E-05	3.65E-05	1.97E-04
Zn-65	C1				
I-131	C1		9.42E-06		9.42E-06
Cs-134	C1	2.44E-05			2.44E-05
Cs-137	C1		9.06E-06		9.06E-06
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
La-140	C1				
	C1				
Sr-89	C1	5.49E-05	5.23E-05	2.90E-05	1.36E-04
Sr-90	C1	6.21E-07	4.64E-07	1.01E-07	1.09E-06
	C1				
TOTAL	C1	2.03E-04	1.50E-04	6.55E-05	4.10E-04

Table 2.1-5  
MILLSTONE NUCLEAR POWER STATION - UNIT #1

GASEOUS EFFLUENTS -

RATCH MODE

Year

Nuclides Released	Units	July	August	September	Quarterly Total
-------------------	-------	------	--------	-----------	-----------------

1. Fission gases

NONE

Xe-135	CI				
Kr-87	CI				
Kr-88	CI				
Kr-89m	CI				
Xe-135	CI				
Xe-133	CI				
Kr-89	CI				
Xe-137	CI				
Xe-137m	CI				
Kr-89m	CI				
Xe-137m	CI				
Xe-131m	CI				
Kr-85	CI				
Ar-37	CI				
Total For Period	CI				

2. Iodines

Iodine-131	CI				
Iodine-133	CI				

3. Particulates

Cr-51	CI				
Mn-54	CI				
Fe-59	CI				
Co-58	CI				
Co-60	CI				
Zn-65	CI				
I-131	CI				
Cs-134	CI				
Cs-137	CI				
Ba-140	CI				
Ce-141	CI				
Ce-144	CI				
	CI				
	CI				
	CI				
Br-89	CI				
Sr-90	CI				
	CI				
TOTAL	CI				



Table 2.1-5

MILLSTONE NUCLEAR POWER STATION - UNIT #1

GASEOUS EFFLUENTS -

WATCH MODE

Year

Nuclides Released	Unit	October	November	December	Quarterly Total
-------------------	------	---------	----------	----------	-----------------

1. Fission gases

NONE

Xe-135	CI				
Kr-87	CI				
Kr-88	CI				
Kr-89m	CI				
Xe-135	CI				
Xe-137	CI				
Kr-89	CI				
Xe-137	CI				
Xe-137m	CI				
Kr-89m	CI				
Xe-137m	CI				
Xe-131m	CI				
Kr-85	CI				
Ar-37	CI				
Total For Period	CI				

2. Iodines

Iodine-131	CI				
Iodine-133	CI				

3. Particulates

Cr-51	CI				
Mn-54	CI				
Fe-59	CI				
Co-58	CI				
Co-60	CI				
Zn-65	CI				
I-131	CI				
Cs-134	CI				
Cs-137	CI				
Ba-140	CI				
Ce-141	CI				
Ce-144	CI				
	CI				
	CI				
	CI				
Br-89	CI				
Sr-90	CI				
	CI				
TOTAL	CI				

Table 2.2-1

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

## LIQUID EFFLUENT - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	JULY	AUGUST	SEPTEMBER	QUARTERLY TOTALS
-------	------	--------	-----------	------------------

## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	4.14-02	3.21-02	3.63-02	1.10-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	4.33E-10	3.53E-10	4.26E-10	4.03E-10

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	5.24+01	1.73+01	3.84+01	1.08+02
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	5.48E-07	1.90E-07	4.50E-07	3.96E-07

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	9.46-02	4.05-02	3.91-01	5.26-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	9.89E-10	4.45E-10	4.58E-09	1.93E-09

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	≤ 7.38-04	≤ 6.55-04	≤ 6.70-04	≤ 7.38-04
----------------------------	----	-----------	-----------	-----------	-----------

## E. Volume

1. VOLUME OF WASTE RELEASED	LITERS	1.46+07	1.50+07	1.58+07	4.54+07
2. VOLUME OF DILUTION DURING RELEASES	LITERS	2.17+10	1.48+10	4.19+10	7.84+10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	9.57+10	9.18+10	8.53+10	2.73+11

Table 2.2-1

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

## LIQUID EFFLUENT - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	OCTOBER	NOVEMBER	DECEMBER	QUARTERLY TOTALS
-------	---------	----------	----------	------------------

## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	4.28-02	5.40-01	7.22-01	1.30
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	4.52-10	5.78-09	9.13-09	4.87-09

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	2.07+01	3.73+01	1.09+1	6.86+01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	2.19-07	3.99-07	1.38-07	2.57-07

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	2.81-01	6.87+00	3.82+00	1.10+01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	2.97-09	7.36-08	4.83-08	4.12-08

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	≤ 5.46-04	≤ 7.63-04	≤ 8.40-04	≤ 8.40-04
----------------------------	----	-----------	-----------	-----------	-----------

## E. Volume

1. VOLUME OF WASTE RELEASED Batch & Blow	LITERS	1.12+07	1.21+07	1.29+07	3.62+07
2. VOLUME OF DILUTION DURING RELEASES	LITERS	1.52+10	1.12+10	8.99+09	3.63+10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	9.46+10	9.34+10	7.91+10	2.67+11

Table 2.2-2

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

Year 1987

## LIQUID EFFLUENTS - CONTINUOUS - S/G

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci				
Tc-99M	Ci				
Co-58	Ci				
Co-60	Ci		2.05-04	9.40-04	1.15-03
I-131	Ci	7.66-04		1.23-03	2.00-03
I-133	Ci	3.49-04		6.06-04	9.55-04
I-135	Ci	6.51-04			6.51-04
Cs-134	Ci				
Cs-137	Ci			9.79-04	9.79-04
Mo-99	Ci				
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci				
Fe-59	Ci				
SB-125	Ci			5.30-04	5.30-04
	Ci				
	Ci				
	Ci				
	Ci				
Fe-55	Ci	≤ 1.17-02	≤ 1.24-02	≤ 1.34-02	≤ 1.34-02
Sr-89	Ci	≤ 3.69-04	≤ 3.93-04	≤ 4.02-04	≤ 4.02-04
Sr-90	Ci	≤ 9.84-05	≤ 7.86-05	≤ 4.69-05	≤ 9.84-05
Total Activity	Ci	1.77-03	2.05-04	4.30-03	6.28-03
GROSS α	Ci	≤ 7.38-04	≤ 6.55-04	≤ 6.70-04	≤ 7.38-04
KR-85	Ci			7.31-02	7.31-02
Xe-135	Ci				
Xe-135M	Ci				
H-3	Ci	1.22-01	8.26-02	6.47-02	2.69-01

Table 2.2-2

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

Year 1987

## LIQUID EFFLUENTS - CONTINUOUS - S/G

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci				
Tc-99M	Ci				
Co-58	Ci				
Co-60	Ci				
I-131	Ci		1.92-03		1.92-03
I-133	Ci		7.40-04		7.40-04
I-135	Ci				
Cs-134	Ci		3.40-04		3.40-04
Cs-137	Ci		1.09-03		1.09-03
Mo-99	Ci				
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci				
Fe-59	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
Fe-55	Ci	≤ 9.10-03	1.29-02	≤ 1.05-02	1.29-02
Sr-89	Ci	≤ 3.64-04	≤ 1.91-04	≤ 2.63-04	≤ 3.64-04
Sr-90	Ci	≤ 1.23-04	≤ 7.63-05	≤ 4.73-05	≤ 1.23-04
Total Activity	Ci	-0-	1.70-02	-0-	1.70-02
Gross α	Ci	≤ 5.46-04	≤ 7.63-04	≤ 8.40-04	≤ 8.40-04
Xe-133	Ci	3.31-04	-0-	-0-	3.31-04
Xe-135	Ci				
Xe-135M	Ci				
Kr-85	Ci	7.39-02			7.39-02
	Ci				
H-3	Ci	4.45-02	5.88-02	4.94-02	1.53-01

Table 2.2-3

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

Year 1987

LIQUID EFFLUENTS - BATCH - AWMT/CWMT /TK10-11

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci	3.11-04	1.19-04	6.06-05	4.91-04
NB-95	Ci	5.17-05	5.65-05		1.08-04
Co-58	Ci	5.76-03	1.17-03	7.26-04	7.66-03
Co-60	Ci	2.13-02	1.45-02	1.91-02	5.49-02
I-131	Ci	1.82-03	6.40-04	2.07-03	4.53-03
I-133	Ci	4.95-04	3.25-04	3.74-04	1.19-03
BA-139	Ci			1.12-03	1.12-03
Cs-134	Ci	1.18-03	4.98-04	8.62-04	2.54-03
Cs-137	Ci	6.10-03	2.77-03	5.33-03	1.42-02
SB-125	Ci	1.17-04	3.64-03	9.54-04	4.71-03
SB-124	Ci		2.91-04	1.41-05	3.05-04
NA-24	Ci			2.55-04	2.55-04
Zn-65	Ci				
Fe-59	Ci				
CO-57	Ci	7.88-05			7.88-05
AG-110M	Ci	5.98-04			5.98-04
NB-97	Ci	9.89-04	1.71-04	2.06-04	1.37-03
SR-92	Ci	1.99-04	1.13-05	1.49-05	2.25-04
LA-140	Ci	6.31-04	5.27-04	9.00-04	2.06-03
Fe-55	Ci	≤ 2.31-03	7.14-03	≤ 2.44-03	≤ 7.14-03
Sr-89	Ci	≤ 6.93-05	≤ 5.64-05	≤ 7.32-05	≤ 7.32-05
Sr-90	Ci	≤ 1.39-05	≤ 1.13-05	≤ 2.20-05	≤ 2.20-05
Total Activity	Ci	3.96-02	3.19-02	3.20-02	1.03-01
H-3	Ci	52.3	17.2	38.3	1.08+02
Xe-133	Ci	8.72-02	2.26-02	2.89-01	3.99-01
Xe-135	Ci	6.59-03	1.72-02	1.85-02	2.38-02
Xe-135M	Ci	8.18-04	7.32-04	1.98-03	3.53-03
XE-131M	Ci	2.63-06		8.83-03	8.83-03

GROSS  $\alpha$  Ci ≤ 2.08-04 ≤ 1.50-04 ≤ 2.44-04 ≤ 2.44-04

Table 2.2-3

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

Year 1987

## LIQUID EFFLUENTS - BATCH - AWMT/CWMT/TK

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
Co-57			1.33-03	8.32-04	2.16-03
Cs-136			8.25-05	8.21-04	9.04-04
Cr-51	Ci		7.23-04	6.69-04	1.39-03
Mn-54	Ci	4.51-05	5.07-03	5.59-03	1.07-02
Nb-97	Ci	4.82-04	9.48-03	9.34-03	6.70-02
Co-58	Ci	5.30-04	3.68-02	2.33-02	6.06-02
Co-60	Ci	1.57-02	2.29-01	2.62-01	5.07-01
I-131	Ci	1.24-03	1.53-02	1.92-02	3.57-02
I-133	Ci	2.90-04	4.21-03	6.17-03	1.07-02
Ce-144	Ci		5.33-04		5.33-04
Cs-134	Ci	6.93-04	9.86-03	2.41-02	3.47-02
Cs-137	Ci	4.29-03	4.14-02	7.12-02	1.17-10
Sb-125	Ci	5.07-04	2.70-02	6.03-02	8.78-02
Sb-124	Ci		8.29-06	4.70-04	4.78-04
Ru-106	Ci		5.16-03	6.31-03	1.15-02
Rb-88	Ci		5.57-03		5.57-03
Nb-95	Ci		3.99-04	2.01-04	6.00-04
La-140	Ci	3.55-04	1.09-04		4.64-04
AG-110M	Ci	9.71-05	4.71-03	4.77-03	9.58-03
Sr-92	Ci	3.13-05	1.89-03	2.04-03	3.96-03
Ba-139	Ci	2.16-04			2.16-04
Na-24	Ci	1.92-05	5.47-04	7.04-04	1.27-03
Fe-55	Ci	1.02-02	1.16-01	2.24-01	3.50-01
Sr-89	Ci	4.03-03	1.16-04	1.22-04	4.15-03
Sr-90	Ci	4.03-04	2.53-05	2.43-05	4.03-04
Total Activity	Ci	4.28-02	5.23-01	7.22-01	1.32+00
Gross $\alpha$		$\leq 1.27-04$	$\leq 2.53-04$	$\leq 2.43-04$	$\leq 2.53-04$
Xe-133	Ci	1.83-01	6.60+00	3.61+00	1.04+01
Xe-135	Ci	1.82-02	4.48-02	2.71-02	9.01-02
Xe-135M	Ci	6.46-05			6.46-05
Xe-133M	Ci	1.71-03	7.11-02	2.85-02	1.01-01
Xe-131M	Ci	3.82-03	9.74-02	8.33-02	1.85-01
Kr-85	Ci		5.57-02	7.09-02	1.27-01
H-3	Ci	2.07E+01	3.72E+01	1.09E+01	6.88E+01

Table 2.2-4

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

## GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	JULY	AUGUST	SEPTEMBER	QUARTERLY TOTALS
-------	------	--------	-----------	------------------

## A. Fission and Activation Gases

1. TOTAL ACTIVITY RELEASED	Ci	4.93+01	3.76+01	4.62+01	1.33+02
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.04+01	1.25+01	1.91+01	1.69+01

## B. Iodines

1. TOTAL I-131 ACTIVITY RELEASED	Ci	5.72-04	5.14-04	5.23-04	1.61-03
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.36-04	1.70-04	2.16-04	2.05-04

## C. Particulates

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	3.00-07	1.25-06	≤ LLD	1.55-06
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.24-07	4.14-07	-----	1.98-07
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	≤ 1.71-07	≤ 2.57-07	≤ 5.03-08	≤ 2.57-07

## D. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	3.00+01	1.67+01	1.60+01	6.27+01
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.24+01	5.53+00	6.61+00	7.98+00



Table 2.2-4

## MILLSTONE NUCLEAR POWER STATION

## UNIT #2

## GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

YEAR 1987

UNITS	October	November	December	QUARTERLY TOTALS
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## A. Fission and Activation Gases

1. TOTAL ACTIVITY RELEASED	Ci	3.00+01	1.90+01	4.20+01	9.10+01
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.24+01	6.29+00	1.74+01	1.16+01

## B. Iodines

1. TOTAL I-131 ACTIVITY RELEASED	Ci	4.71-04	1.64-03	2.09-04	2.32-03
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.95-04	5.40-04	8.64-05	2.95-04

## C. Particulates

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	-0-	3.18-06	-0-	3.18-06
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	-0-	1.05-06	-0-	4.05-07
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	≤ 2.7-07	≤ 3.1-07	≤ 4.6-08	≤ 2.7-07

## D. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	8.04+00	8.33+00	4.13+00	2.05+01
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	3.32+00	2.76+00	1.71+00	2.61+00

Table 2.2-5

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

## GASEOUS EFFLUENTS - MIXED RELEASE - CONTINUOUS MODE

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
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## 1. Fission gases

Xe-136	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf	5.64-01	2.77+00	3.64+00	6.97+00
Xe-133	Cf	4.87+01	3.48+01	4.21+01	1.26+02
Kr-89	Cf				
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf			4.64-01	4.64-01
Ar-37	Cf				
Total For Period	Cf	4.93+01	3.76+01	4.62+01	1.33+02

## 2. Iodines

Iodine-131	Cf	5.72-04	5.14-04	5.23-04	1.61-03
Iodine-133	Cf	6.01-04	7.14-04	4.92-04	1.81-03

## 3. Particulates

Cr-51	Cf				
Mn-54	Cf	3.00-07	3.40-07		6.40-07
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf		9.10-07		9.10-07
Cs-134	Cf				
Cs-137	Cf				
	Cf				
SR 89	Cf	≤7.75-08	≤1.35-07	≤1.34-07	≤1.35-07
SR 90	Cf	≤3.88-08	≤4.05-08	≤4.02-08	≤4.05-08
	Cf				
	Cf				
GROSS c'	Cf	≤1.71-07	≤2.57-07	≤5.03-08	≤2.57-07
H-3	Cf	3.00+01	1.67+01	1.60+01	62.7
	Cf				
	Cf				

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

## GASEOUS EFFLUENTS - MIXED RELEASE - CONTINUOUS MODE

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
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## 1. Fission gases

Xe-136	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf	6.12-01	3.55-01	1.15+00	2.12+00
Xe-133	Cf	2.94+01	1.86+01	4.08+01	8.88+01
Kr-89	Cf				
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf				
Ar-37	Cf				
Total For Period	Cf	3.00+01	1.90+01	4.20+01	9.10+01

## 2. Iodines

Iodine-131	Cf	4.71-04	1.64-03	2.09-04	2.32-03
Iodine-133	Cf	4.44-04	2.08-03	2.36-04	2.76-03

## 3. Particulates

Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf		1.57-06		1.57-06
Cs-134	Cf				
Cs-137	Cf		1.61-06		1.61-06
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
Total	Cf	-0-	3.18-06	-0-	3.18-06
H-3	Cf	8.04+00	8.33+00	4.13+00	2.05+01
Gross Alpha	Cf	≤2.70-07	≤3.14-07	≤4.59-08	—
Sr-89	Cf	≤7.31-08	≤1.79-07	≤7.06-08	—
Sr-90	Cf	≤2.19-08	≤2.69-08	≤2.12-08	—

Table 2.2-6

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

## GASEOUS EFFLUENTS - MIXED RELEASE - BATCH MODE - CONTAINMENT PURGE

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
<b>1. Fission gases</b>		NONE	NONE	NONE	
Xe-132	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1				
Xe-133	C1				
Kr-89	C1				
Xe-137	C1				
Xe-135m	C1				
Kr-83m	C1				
Xe-133m	C1				
Xe-131m	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1				
<b>2. Iodines</b>					
Iodine-131	C1				
Iodine-133	C1				
<b>3. Particulates</b>					
Cr-51	C1				
Mn-54	C1				
Fe-59	C1				
Co-58	C1				
Co-60	C1				
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
	C1				
	C1				
Sr-89	C1				
Sr-90	C1				
	C1				
	C1				

Table 2.2-6

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

GASEOUS EFFLUENTS MIXED RELEASE - BATCH MODE - CONTAINMENT PURGE

Year 1987

Nuclides Released	Unit	October	November	December	Quarterly Total
<b>1. Fission gases</b>					
Xe-132	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1	NONE THIS QUARTER			
Xe-133	C1				
Kr-89	C1				
Xe-137	C1				
Xe-135m	C1				
Kr-83m	C1				
Xe-133m	C1				
Xe-131m	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1				
<b>2. Iodines</b>					
Iodine-131	C1				
Iodine-133	C1				
<b>3. Particulates</b>					
Cr-51	C1				
Mn-54	C1				
Fe-59	C1				
Co-58	C1				
Co-60	C1				
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
	C1				
	C1				
Sr-89	C1				
Sr-90	C1				
	C1				
TOTAL	C1				

Table 2.2-7

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

## GASEOUS EFFLUENTS ELEVATED RELEASE - BATCH MODE - WGD

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
<b>1. Fission gases</b>		NONE	NONE	NONE	
Xe-132	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1				
Xe-133	C1				
Kr-89	C1				
Xe-137	C1				
Xe-135m	C1				
Kr-83m	C1				
Xe-133m	C1				
Xe-131m	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1				
<b>2. Iodines</b>					
Iodine-131	C1				
Iodine-133	C1				
<b>3. Particulates</b>					
Cr-51	C1				
Mn-54	C1				
Fe-59	C1				
Co-58	C1				
Co-60	C1				
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
	C1				
	C1				
Sr-89	C1				
Sr-90	C1				
	C1				
	C1				

## MILLSTONE NUCLEAR POWER STATION - UNIT #2

## GASEOUS EFFLUENTS ELEVATED RELEASE - BATCH MODE - WGDT

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
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## 1. Fission gases

Xe-135	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85	Cf	1.91-01	1.56-01	8.43-02	4.31-01
Xe-135	Cf	1.25-03	2.42-04		1.49-03
Xe-133	Cf	1.20+00	3.69+00	3.67+00	8.56+00
Kr-89	Cf				
XE-133M	Cf	3.13-03	1.13-02	7.08-04	1.51-02
Xe-135m	Cf				
Xe-131M	Cf	3.10-02	9.97-03	4.46-02	8.56-02
Total	Cf	1.42+00	3.87+00	3.80+00	9.09+00
H-3	Cf	2.30-02	2.92-01	3.31-01	6.46-01
	Cf				

## 2. Iodines

Iodine-131	Cf				
Iodine-133	Cf				

## 3. Particulates

Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
	Cf				
Sr-89	Cf				
Sr-90	Cf				
	Cf				
TOTAL	Cf				

Table 2.3-1

## MILLSTONE UNIT No. 3

## SUMMATION OF LIQUID EFFLUENT RELEASES

YEAR	UNITS	JULY	AUGUST	SEPTEMBER	QUARTERLY TOTALS
1987					

## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	2.73E-01	7.01E-02	9.10E-02	4.34E-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	1.73E-09	4.41E-10	5.95E-10	9.23E-10

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	17.1	43.6	37.6	98.3
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	1.08E-07	2.74E-07	2.46E-07	2.09E-07

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	2.07E-03	3.2E-03	1.03E-02	1.55E-02
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UCi/ml	1.31E-11	2.01E-11	6.73E-11	3.30E-11

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	$\leq 1.38E-04$	$\leq 2.41E-04$	$\leq 2.27E-04$	$\leq 2.02E-04$
----------------------------	----	-----------------	-----------------	-----------------	-----------------

## E. Volume

1. VOLUME OF WASTE RELEASED	LITERS	1.38E+06	2.41E+06	2.27E+06	6.60E+06
2. VOLUME OF DILUTION DURING RELEASES	LITERS	5.91E+09	9.99E+09	9.79E+09	2.57E+10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	1.58E+11	1.59E+11	1.53E+11	4.70E+11



Table 2.3-1

## MILLSTONE UNIT No. 3

## SUMMATION OF LIQUID EFFLUENT RELEASES

YEAR 1987

UNITS	OCTOBER	NOVEMBER	DECEMBER	QUARTERLY TOTALS
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## A. Fission and Activation Products

1. TOTAL ACTIVITY RELEASED	Ci	9.19E-02	3.47E-01	7.77E-01	1.22E+00
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UC1/ml	5.78E-10	4.49E-06	1.11E-09	3.97E-09

## B. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	49.0	23.7	4.73	77.43
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UC1/ml	3.08E-07	3.07E-07	6.73E-08	2.52E-07

## C. Dissolved and Entrained Gases

1. TOTAL ACTIVITY RELEASED	Ci	3.83E-02	3.71E-01	3.07E-04	4.10E-01
2. AVERAGE DILUTED ACTIVITY DURING PERIOD	UC1/ml	2.41E-10	4.81E-09	4.37E-12	1.34E-09

## D. Gross Alpha

1. TOTAL ACTIVITY RELEASED	Ci	$\leq 3.51E-04$	$\leq 2.82E-04$	$\leq 1.60E-04$	$\leq 7.99E-04$
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## E. Volume

1. VOLUME OF WASTE RELEASED	LITERS	3.51E06	2.82E06	1.64E06	7.97E06
2. VOLUME OF DILUTION DURING RELEASES	LITERS	1.62E10	1.21E10	6.37E10	9.20E10
3. VOLUME OF DILUTION DURING TIME PERIOD	LITERS	1.59E+11	7.72E+10	7.03E+10	3.07E+11

Table 2.3-2

## MILLSTONE UNIT No. 3

## LIQUID EFFLUENTS - CONTINUOUS

Year 1987

## STEAM GENERATOR BLOWDOWN

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci				
Tc-99M	Ci				
Co-58	Ci				
Co-60	Ci				
I-131	Ci				
I-133	Ci		NO DISCHARGES		
I-135	Ci				
Cs-134	Ci				
Cs-137	Ci				
Mo-99	Ci				
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci				
Fe-59	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
Fe-55	Ci				
Sr-89	Ci				
Sr-90	Ci				
Total Activity	Ci				
Xe-133	Ci				
Xe-135	Ci				
Xe-135M	Ci				
	Ci				
	Ci				
H-3	Ci				

Table 2.3-2

MILLSTONE UNIT No. 3  
 LIQUID EFFLUENTS - CONTINUOUS  
 STEAM GENERATOR BLOWDOWN

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
No discharges this quarter					
Cr-51	C1				
Mn-54	C1				
Tc-99M	C1				
Co-58	C1				
Co-60	C1				
I-131	C1				
I-133	C1				
I-135	C1				
Cs-134	C1				
Cs-137	C1				
Mb-99	C1				
Co-141	C1				
Ce-144	C1				
Zn-65	C1				
Fe-59	C1				
	C1				
	C1				
	C1				
	C1				
	C1				
	C1				
Fe-55	C1				
Sr-89	C1				
Sr-90	C1				
Total Activity	C1				
Xe-133	C1				
Xe-135	C1				
Xe-135M	C1				
	C1				
	C1				
H-3	C1				

Table 2.3-3

## MILLSTONE UNIT No. 3

Year 1987 LIQUID RAD WASTE EFFLUENTS - BATCH - LWS

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci	1.92E-02	1.09E-02	2.22E-02	5.23E-02
Tc-99M	Ci			1.60E-04	1.60E-04
Co-58	Ci	2.03E-01	4.08E-02	2.66E-02	2.7E-01
Co-60	Ci	1.73E-02	9.17E-03	1.88E-02	4.53E-02
I-131	Ci	4.16E-04	2.48E-05	2.31E-03	2.75E-03
I-133	Ci			4.7E-04	4.7E-04
I-135	Ci				
Cs-134	Ci	1.01E-02	2.54E-03	3.27E-03	1.59E-02
Cs-137	Ci	1.45E-02	3.92E-03	4.89E-03	2.33E-02
CS-136	Ci			3.17E-05	3.17E-05
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci				
Fe-59	Ci				
Na-24	Ci	5.3E-03	1.85E-03	5.38E-03	1.25E-02
CO-57	Ci	6.76E-04	2.17E-04	4.16E-04	1.31E-03
NB-95	Ci	6.95E-04	3.72E-04	6.14E-04	1.68E-03
ZR-95	Ci	2.41E-05	1.37E-04	5.33E-05	2.14E-04
SE-125	Ci		1.93E-04	6.5E-04	8.43E-04
Fe-55	Ci	1.65E-03	≤ 2.41E-03	5.44E-03	7.09E-03
Sr-89	Ci	1.06E-04	≤ 7.22E-5	≤ 9.06E-05	1.06E-04
Sr-90	Ci	≤ 1.38E-05	≤ 2.41E-05	≤ 2.27E-05	≤ 2.02E-05
Total Activity	Ci	2.73E-01	7.01E-02	9.10E-02	4.34E-01
Xe-133	Ci	9.46E-04	1.61E-03	3.98E-03	6.54E-03
Xe-135	Ci	1.12E-03	1.59E-03	1.63E-03	4.34E-03
Xe-135M	Ci				
KR-85	Ci			4.66E-03	4.66E-03
Total	Ci	2.07E-03	3.2E-03	1.03E-02	1.55E-02
H-3	Ci	17.1	43.57	37.6	98.3

Table 2.3-3

## MILLSTONE UNIT No. 3

Year 1987 LIQUID RAD WASTE EFFLUENTS - BATCH - LWS

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
AG-110M			3.41E-04	1.41E-03	1.75E-03
SE-124			6.04E-04	1.36E-03	1.96E-03
Cr-51	C1		5.27E-03	2.49E-02	3.02E-02
Mn-54	C1	2.19E-02	7.16E-02	8.38E-02	1.77E-01
Tc-99M	C1	1.56E-05			1.56E-05
Co-58	C1	3.36E-02	1.76E-01	5.63E-01	7.73E-01
Co-60	C1	1.68E-02	1.17E-02	4.69E-02	7.54E-01
I-131	C1	2.93E-02	2.62E-02	2.42E-03	3.16E-02
I-133	C1	8.42E-04	5.23E-04		1.37E-03
SB-125	C1	4.44E-05	1.25E-03	2.98E-03	4.27E-03
Cs-134	C1	3.36E-03	1.76E-02	6.49E-03	2.75E-02
Cs-137	C1	5.39E-03	1.75E-02	9.16E-03	3.21E-02
NB-97	C1		4.9E-04	1.89E-03	2.38E-03
ZR-95	C1	2.59E-05	2.95E-05	2.57E-03	2.63E-03
CS-136	C1		3.29E-03		3.29E-03
Zn-65	C1		2.15E-04	6.27E-04	8.42E-04
Fe-59	C1		7.98E-03	6.71E-03	1.47E-02
CO-57	C1	3.34E-04	9.73E-05	1.21E-03	1.64E-03
Na-24	C1	5.74E-03	2.37E-04	8.82E-05	6.07E-03
RB-88	C1	3.60E-04			3.60E-04
Y-88	C1	1.71E-05			1.71E-05
NB-95	C1	3.25E-04	6.05E-04	5.92E-03	6.85E-03
SR-92	C1		1.06E-04	3.78E-04	4.84E-04
Sr-89	C1	2.07E-04	1.52E-04	≤ 6.55E-05	3.59E-04
Sr-90	C1	≤ 7.03E-05	≤ 2.82E-05	≤ 1.15E-05	≤ 1.10E-04
FE-55		≤ 3.51E-03	4.80E-03	1.52E-02	2.00E-02
Total Activity	C1	9.19E-02	3.47E-01	7.77E-01	1.22E+00
XE-131M			2.96E-03		2.96E-03
KR-85M		1.17E-05			1.17E-05
Xe-133	C1	3.46E-02	3.65E-01	2.41E-04	4.00E-01
Xe-135	C1	3.37E-03	9.05E-04		4.28E-03
AR-41	C1			6.6E-05	6.6E-05
XE-133M	C1	2.80E-04	1.73E-03		2.01E-03
TOTAL	C1	3.83E-02	3.71E-01	3.07E-04	4.09E-01
H-3	C1	49.0	23.7	4.73	77.4

Alpha

≤ 3.51E-04 ≤ 2.82E-04 ≤ 1.6E-04 ≤ 7.99E-04

Table 2.3-4

## MILLSTONE UNIT No. 3

## LIQUID RAD WASTE EFFLUENTS - BATCH

Year 1987

## CPF WASTE NEUTRALIZING SUMPS

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
Cr-51	Ci				
Mn-54	Ci				
Tc-99M	Ci				
Co-58	Ci				
Co-60	Ci				
I-131	Ci		NO DISCHARGES		
I-133	Ci				
I-135	Ci				
Cs-134	Ci				
Cs-137	Ci				
Mo-99	Ci				
Ce-141	Ci				
Ce-144	Ci				
Zn-65	Ci				
Fe-59	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
Fe-55	Ci				
Sr-89	Ci				
Sr-90	Ci				
Total Activity	Ci				
Xe-133	Ci				
Xe-135	Ci				
Xe-135M	Ci				
	Ci				
	Ci				
H-3	Ci				

Table 2.3-4

## MILLSTONE UNIT No. 3

Year 1987

## LIQUID RAD WASTE EFFLUENTS - BATCH

## CPF WASTE NEUTRALIZING SUMPS

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
No discharges this quarter					
Cr-51	C1				
Mn-54	C1				
Tc-99M	C1				
Co-58	C1				
Co-60	C1				
I-131	C1				
I-133	C1				
I-135	C1				
Cs-134	C1				
Cs-137	C1				
Mo-99	C1				
Ce-141	C1				
Ce-144	C1				
Zn-65	C1				
Fe-55	C1				
	C1				
	C1				
	C1				
	C1				
	C1				
	C1				
Fe-55	C1				
Sr-89	C1				
Sr-90	C1				
Total Activity	C1				
Xe-133	C1				
Xe-135	C1				
Xe-135M	C1				
	C1				
	C1				
H-3	C1				

Table 2.3-5

MILLSTONE UNIT No. 3  
SUMMATION OF GASEOUS EFFLUENT RELEASES

YEAR 1987

UNITS	JULY	AUGUST	SEPTEMBER	QUARTERLY TOTALS
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## A. Fission and Activation Gases

1. TOTAL ACTIVITY RELEASED	Ci	-0-	-0-	1.43E-02	1.43E-02
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	-0-	-0-	5.91E-03	1.82E-03

## B. Iodines

1. TOTAL I-131 ACTIVITY RELEASED	Ci	1.96E-07	6.38E-06	1.16E-05	1.82E-05
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	6.49E-08	2.64E-06	4.79E-06	2.31E-06

## C. Particulates

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	1.33E-05	≤ 2.27E-06	≤ 2.0E-06	1.33E-05
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	4.39E-06	≤ 9.37E-07	≤ 8.26E-07	1.69E-06
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	≤ 8.05E-07	≤ 3.28E-07	≤ 6.49E-07	≤ 5.94E-07

## D. Tritium

1. TOTAL ACTIVITY RELEASED	Ci	4.82	≤ 2.82	≤ 4.0	4.82
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.59	≤ 1.17	≤ 1.65	6.13E-01



Table 2.3-5

**MILLSTONE UNIT No. 3**  
**SUMMATION OF GASEOUS EFFLUENT RELEASES**

YEAR 1967

UNITS	OCTOBER	NOVEMBER	DECEMBER	QUARTERLY TOTALS
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**A. Fission and Activation Gases**

1. TOTAL ACTIVITY RELEASED	Ci	8.61E-03	4.55E+01	3.27E-02	4.55E+01
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	2.93E-03	1.88E+01	1.35E-02	6.27E00

**B. Iodines**

1. TOTAL I-131 ACTIVITY RELEASED	Ci	2.95E-04	1.14E-03	1.04E-04	1.54E-03
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	1.00E-04	4.71E-04	4.30E-05	2.05E-04

**C. Particulates**

1. TOTAL PARTICULATE ACTIVITY RELEASED	Ci	1.23E-04	2.94E-04	2.13E-03	2.55E-03
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	4.18E-05	1.21E-04	8.80E-04	3.48E-04
3. TOTAL GROSS ALPHA ACTIVITY RELEASED	Ci	1.11E-08	3.76E-09	2.02E-09	1.69E-08

**D. Tritium**

1. TOTAL ACTIVITY RELEASED	Ci	≤5.62E00	1.55E00	7.83E00	9.38E00
2. AVERAGE RELEASE RATE FOR THE PERIOD	UCi/sec	≤1.91E00	6.40E-01	3.24E00	1.29E00

Table 2.3-6

## MILLSTONE UNIT No. 3 - GASEOUS EFFLUENT - CONTINUOUS

## NORMAL VENTILATION

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
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## 1. Fission gases

Xe-132	Ci				
Kr-87	Ci				
Kr-88	Ci				
Kr-85m	Ci				
Xe-135	Ci				
Xe-133	Ci				
Kr-89	Ci				
Xe-137	Ci				
Xe-135m	Ci				
Kr-83m	Ci				
Xe-133m	Ci				
Xe-131m	Ci				
Kr-85	Ci				
Ar-37	Ci				
Total For Period	Ci				

## 2. Iodines

Iodine-131	Ci	$\leq 2.74E-05$	6.38E-06	1.16E-05	1.8E-05
Iodine-133	Ci	$\leq 2.64E-05$	4.58E-06	1.17E-05	1.61E-05

## 3. Particulates

Cr-51	Ci				
Mn-54	Ci				
Fe-59	Ci				
Co-58	Ci				
Co-60	Ci				
Zn-65	Ci				
I-131	Ci				
Cs-134	Ci				
Cs-137	Ci				
Ba-140	Ci				
Ce-141	Ci				
Ce-144	Ci				
Y-88	Ci	1.30E-05			
	Ci				
	Ci				
Sr-89	Ci	$\leq 1.56E-06$	$\leq 1.61E-06$	$\leq 1.61E-06$	$\leq 1.60E-06$
Sr-90	Ci	$\leq 3.99E-07$	$\leq 6.44E-07$	$\leq 1.61E-07$	$\leq 4.01E-07$
Total	Ci	1.30E-05	$\leq 2.25E-06$	$\leq 1.77E-06$	1.30E-05
H3	Ci	4.75	$\leq 2.76$	$\leq 3.99$	4.75
Alpha	Ci	$\leq 7.98E-07$	$\leq 3.22E-07$	$\leq 6.42E-07$	$\leq 5.87E-07$

Table 2.3-6

## MILLSTONE UNIT No. 3 - GASEOUS EFFLUENT - CONTINUOUS

## NORMAL VENTILATION

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-135	Ci				
Kr-87	Ci				
Kr-88	Ci				
Kr-89m	Ci				
Xe-135	Ci				
Xe-133	Ci		3.62E+01		3.62E+01
Kr-89	Ci				
Xe-137	Ci				
Xe-137m	Ci				
Kr-87m	Ci				
Xe-137m	Ci				
Xe-137m	Ci				
Kr-85	Ci				
Ar-37	Ci				
Total For Period	Ci		3.62E+01		3.62E+01
<b>2. Iodines</b>					
Iodine-131	Ci	2.94E-04	1.13E-03	1.04E-04	1.53E-03
Iodine-133	Ci	3.22E-04	1.60E-04	5.40E-05	5.36E-04
<b>3. Particulates</b>					
Cr-51	Ci			5.75E-04	5.75E-04
Mn-54	Ci	2.21E-05	1.10E-05	1.02E-04	1.35E-04
Fe-59	Ci				
Co-58	Ci	9.76E-05	2.83E-04	9.97E-04	1.38E-03
Co-60	Ci			1.13E-04	1.13E-04
Zn-65	Ci				
I-131	Ci				
Ce-134	Ci				
Cs-137	Ci				
Ba-140	Ci				
Ce-141	Ci				
Ce-144	Ci				
Nb-95	Ci			1.26E-04	1.26E-04
	Ci				
	Ci				
Sr-89	Ci	≤8.01E-07	≤9.61E-07	≤.60E-06	≤3.36E-06
Sr-90	Ci	≤3.21E-07	≤2.56E-07	≤3.22E-07	≤6.99E-06
Total	Ci	1.20E-04	2.94E-04	1.91E-03	2.33E-03
H-3	Ci	≤5.52E-00	≤6.90E-01	7.83E00	7.83E00

Alpha

Ci ≤6.43E-07 ≤8.12E-07 ≤7.43E-07 ≤2.18E-06

Table 2.3-7

## MILLSTONE UNIT No. 3 - GASEOUS EFFLUENT - CONTINUOUS

## ESF BUILDING VENTILATION

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-132	Ci				
Kr-87	Ci				
Kr-86	Ci				
Kr-85m	Ci				
Xe-135	Ci				
Xe-133	Ci			1.43E-02	1.43E-02
Kr-89	Ci				
Xe-137	Ci				
Xe-135m	Ci				
Kr-83m	Ci				
Xe-133m	Ci				
Xe-131m	Ci				
Kr-85	Ci				
Ar-37	Ci				
Total For Period	Ci	-0-	-0-	1.43E-02	1.43E-02

**2. Iodines**

Iodine-131	Ci	1.96E-07	≤ 1.85E-07	≤ 1.71E-07	1.96E-07
Iodine-133	Ci	1.44E-07	≤ 1.79E-07	≤ 2.7E-07	1.44E-07

**3. Particulates**

Cr-51	Ci				
Mn-54	Ci				
Fe-59	Ci				
Co-58	Ci	2.59E-07			2.59E-07
Co-60	Ci				
Zn-65	Ci				
I-131	Ci				
Cs-134	Ci				
Cs-137	Ci				
Ba-140	Ci				
Ce-141	Ci				
Ce-144	Ci				
	Ci				
	Ci				
	Ci				
Sr-89	Ci	≤ 1.85E-08	≤ 1.49E-08	≤ 2.2E-08	≤ 1.85E-08
Sr-90	Ci	≤ 3.69E-09	≤ 3.71E-09	≤ 2.2E-09	≤ 3.2E-09
Total	Ci	2.59E-07	≤ 1.86E-08	≤ 2.4E-08	2.59E-07
H3	Ci	7.5E-02	≤ 6.4E-02	≤ 1.1E-01	7.5E-02
Alpha	Ci	≤ 7.38E-09	≤ 6.69E-09	≤ 7.43E-09	≤ 7.16E-09

Table 2.3-7

## MILLSTONE UNIT No. 3 - GASEOUS EFFLUENT - CONTINUOUS

## ESF BUILDING VENTILATION

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-135	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1				
Xe-137	C1	8.61E-03	9.30E-01	3.27E-02	9.71E-01
Kr-89	C1				
Xe-137	C1				
Xe-137m	C1				
Kr-83m	C1				
Xe-137e	C1				
Xe-137n	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1	8.61E-03	9.30E-01	3.27E-02	9.71E-01
<b>2. Iodines</b>					
Iodine-131	C1	1.321E-06	9.95E-06	2.31E-07	1.15E-05
Iodine-133	C1	2.27E-06	1.18E-06	2.36E-07	3.69E-06
<b>3. Particulates</b>					
Cr-51	C1			7.60E-07	7.60E-07
Mn-54	C1	1.58E-07		5.61E-06	5.77E-07
Fe-59	C1				
Co-58	C1	1.86E-06	9.50E-07	2.08E-04	2.11E-04
Co-60	C1	1.29E-06	7.90E-08	5.08E-06	6.45E-06
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
Co-57	C1			2.70E-07	2.70E-07
	C1				
	C1				
Sr-89	C1	≤ 1.84E-08	≤ 7.43E-09	≤ 4.49E-06	≤ 4.07E-08
Sr-90	C1	≤ 3.69E-09	≤ 3.72E-10	≤ 3.72E-09	≤ 7.78E-09
Total	C1	3.31E-06	1.09E-07	2.20E-04	2.23E-04
H-3	C1	≤ 1.03E-01	1.55E00	≤ 1.07E-01	1.55E00

Alpha

1.11E-08

3.76E-09

2.02E-09

1.69E-09

Table 2.3-8

## MILLSTONE UNIT No. 3 - BATCH

## CONTAINMENT DRAWDOWN

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-132	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf				
Xe-133	Cf				
Kr-89	Cf	NO DISCHARGES			
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf				
Ar-37	Cf				
Total For Period	Cf				
<b>2. Iodines</b>					
Iodine-131	Cf				
Iodine-133	Cf				
<b>3. Particulates</b>					
Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
TOTAL	Cf				
	Cf				
	Cf				
H-3	Cf				
	Cf				

Table 2.3-8

MILLSTONE UNIT No. 3 - BATCH  
CONTAINMENT DRAWDOWN

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
1. Fission gases		No discharges this quarter			
Xe-132	CI				
Kr-87	CI				
Kr-88	CI				
Kr-85m	CI				
Xe-135	CI				
Xe-133	CI				
Kr-89	CI				
Xe-137	CI				
Xe-137m	CI				
Kr-83m	CI				
Xe-137c	CI				
Xe-137d	CI				
Kr-85	CI				
Ar-37	CI				
Total For Period	CI				
2. Iodines					
Iodine-131	CI				
Iodine-133	CI				
3. Particulates					
Cr-51	CI				
Mn-54	CI				
Fe-59	CI				
Co-58	CI				
Co-60	CI				
Zn-65	CI				
I-131	CI				
Cs-134	CI				
Cs-137	CI				
Ba-140	CI				
Ce-141	CI				
Ce-144	CI				
	CI				
	CI				
TOTAL	CI				
	CI				
	CI				
H-3	CI				
	CI				

Table 2.3-9

## MILLSTONE UNIT No. 3 - BATCH

## CONTAINMENT PURGES

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-135	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf				
Xe-133	Cf				
Kr-89	Cf		NO DISCHARGES		
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf				
Ar-37	Cf				
Total For Period	Cf				
<b>2. Iodines</b>					
Iodine-131	Cf				
Iodine-133	Cf				
<b>3. Particulates</b>					
Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
TOTAL	Cf				
	Cf				
	Cf				
H-3	Cf				
	Cf				



Table 2.3-9

MILLSTONE UNIT No. 3 - BATCH  
CONTAINMENT PURGES

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
<b>1. Fission gases</b>					
Xe-135	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf		1.59E-01		1.59E-01
Xe-133	Cf		7.74E00		7.74E00
Kr-89	Cf				
Xe-137	Cf				
Xe-137m	Cf				
Kr-83m	Cf				
Xe-137m	Cf		1.00E-01		1.00E-01
Xe-133m	Cf		7.74E-02		7.74E-02
Kr-85	Cf		2.41E-01		2.41E-01
Ar-37	Cf				
Total For Period	Cf		8.32E00		8.32E00

**2. Iodines**

Iodine-131	Cf				
Iodine-133	Cf				

**3. Particulates**

Cr-51	Cf				
Mn-54	Cf		1.11E-06		1.11E-06
Fe-59	Cf				
Co-58	Cf		2.16E-06		2.16E-06
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
TOTAL	Cf		3.27E-06		3.27E-06
	Cf				
	Cf				
H-3	Cf		≤1.12E-03		≤1.12E-03
	Cf				

Table 2.3-10

MILLSTONE UNIT No. 3 - CONTINUOUS  
TURBINE GLAND SEALING SYSTEM EXHAUST

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
1. Fission gases					
Xe-132	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf				
Xe-133	Cf				
Kr-89	Cf		NO DISCHARGES		
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf				
Ar-37	Cf				
Total For Period	Cf				

## 2. Iodines

Iodine-131	Cf				
Iodine-133	Cf				

## 3. Particulates

Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
TOTAL	Cf				
	Cf				
	Cf				
	Cf				
	Cf				

Table 2.3-10

MILLSTONE UNIT No. 3 - CONTINUOUS  
TURBINE GLAND SEALING SYSTEM EXHAUST

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
1. Fission gases		No discharges this quarter			
Xe-135	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-135	C1				
Xe-133	C1				
Kr-89	C1				
Xe-137	C1				
Xe-137m	C1				
Kr-83m	C1				
Xe-137m	C1				
Xe-131m	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1				
2. Iodines					
Iodine-131	C1				
Iodine-133	C1				
3. Particulates					
Cr-51	C1				
Mn-54	C1				
Fe-59	C1				
Co-58	C1				
Co-60	C1				
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
	C1				
TOTAL	C1				
	C1				
	C1				
	C1				
	C1				

Table 2.3-11

MILLSTONE UNIT No. 3 - BATCH

MAIN CONDENSER MECHANICAL VACUUM PUMP EXHAUST

Year 1987

Nuclides Released	Unit	JULY	AUGUST	SEPTEMBER	Quarterly Total
-------------------	------	------	--------	-----------	-----------------

1. Fission gases

Xe-135	Cf				
Kr-87	Cf				
Kr-88	Cf				
Kr-85m	Cf				
Xe-135	Cf				
Xe-133	Cf				
Kr-89	Cf		NO DISCHARGES		
Xe-137	Cf				
Xe-135m	Cf				
Kr-83m	Cf				
Xe-133m	Cf				
Xe-131m	Cf				
Kr-85	Cf				
Ar-37	Cf				
Total For Period	Cf				

2. Iodines

Iodine-131	Cf				
Iodine-133	Cf				

3. Particulates

Cr-51	Cf				
Mn-54	Cf				
Fe-59	Cf				
Co-58	Cf				
Co-60	Cf				
Zn-65	Cf				
I-131	Cf				
Cs-134	Cf				
Cs-137	Cf				
Ba-140	Cf				
Ce-141	Cf				
Ce-144	Cf				
	Cf				
	Cf				
TOTAL	Cf				
	Cf				
	Cf				
	Cf				
	Cf				

Table 2.3-11

MILLSTONE UNIT No. 3 - BATCH

MAIN CONDENSER MECHANICAL VACUUM PUMP EXHAUST

Year 1987

Nuclides Released	Unit	OCTOBER	NOVEMBER	DECEMBER	Quarterly Total
-------------------	------	---------	----------	----------	-----------------

1. Fission gases

No discharges this quarter

Xe-135	C1				
Kr-87	C1				
Kr-88	C1				
Kr-85m	C1				
Xe-139	C1				
Xe-133	C1				
Kr-89	C1				
Xe-137	C1				
Xe-135m	C1				
Kr-83m	C1				
Xe-137m	C1				
Xe-132m	C1				
Kr-85	C1				
Ar-37	C1				
Total For Period	C1				

2. Iodines

Iodine-131	C1				
Iodine-133	C1				

3. Particulates

Cr-51	C1				
Mn-54	C1				
Fe-59	C1				
Co-58	C1				
Co-60	C1				
Zn-65	C1				
I-131	C1				
Cs-134	C1				
Cs-137	C1				
Ba-140	C1				
Ce-141	C1				
Ce-144	C1				
	C1				
	C1				
TOTAL	C1				
	C1				
	C1				
	C1				
	C1				

### 3.0 Radioactive Solid Waste

Summaries of solid waste shipments for each unit are given in the attached Tables. The principal radionuclides were considered to be those included on the shipping manifest.

#### Solidification Agent(s)-

Portland I Cement

#### Types and typical volumes of containers-

55 gallon steel drum DOT 17-H container

202 ft<sup>3</sup> steel container

87 ft<sup>3</sup> LSA steel box

132 ft<sup>3</sup> Polyurethane high integrity container

202 ft<sup>3</sup> Polyurethane high integrity container

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMI ANNUAL REPORT -  
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

MILLSTONE UNIT 1

JULY 1, 1987 - DECEMBER 31, 1987

1. Type of Waste	Unit	6-Month Period	Est. Total Error, %
a) Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.	M <sup>3</sup> Ci	8.31E1 4.65E2	2.5E1
b) Dry Compressable Waste, Contaminated Equipment, Etc.	(CNSI) Burial	M <sup>3</sup> Ci	4.67E0 5.61E-1
	(SEG) Super	M <sup>3</sup> Ci	4.69E2 1.28E0
	Compaction	Ci	2.5E1
See Page 10 (SEG) Burial Data			
c) Irradiated Components, Control Rods, Etc.	M <sup>3</sup> Ci	N/A	N/A
d) Other (Describe)	M <sup>3</sup> Ci	N/A	N/A
2. Estimate of Major Nuclide Composition (By Type of Waste)			
a) Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.			
	<u>Nuclide</u>	<u>(%)</u>	
	H <sup>3</sup>	1.06E-2	
	C <sup>14</sup>	2.45E0	
	Cr <sup>51</sup>	2.08E-1	
	Mn <sup>54</sup>	1.07E1	
	Fe <sup>55</sup>	2.31E1	
	Fe <sup>59</sup>	4.12E-1	
	Co <sup>57</sup>	1.07E-2	
	Co <sup>58</sup>	1.21E0	
	Co <sup>60</sup>	2.73E1	

<u>Nuclide</u>	<u>(%)</u>
Ni <sup>63</sup>	3.08E0
Zn <sup>65</sup>	9.85E0
Sr <sup>89</sup>	2.74E-3
Sr <sup>90</sup>	1.05E-1
Sb <sup>124</sup>	1.23E-2
Tc <sup>99</sup>	6.62E-3
Ru <sup>103</sup>	1.72E-3
I <sup>131</sup>	4.08E-2
Cs <sup>134</sup>	9.60E-1
Cs <sup>137</sup>	2.03E1
Ba <sup>140</sup>	6.03E-2
La <sup>140</sup>	3.59E-2
Ce <sup>141</sup>	9.55E-3
Pu <sup>238</sup>	1.84E-3
Pu <sup>239</sup>	6.22E-4
Pu <sup>241</sup>	1.53E-1
Am <sup>241</sup>	1.91E-3
Cm <sup>242</sup>	1.68E-4
Cm <sup>244</sup>	4.01E-3

b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Burial)

<u>Nuclide</u>	<u>(%)</u>
Mn <sup>54</sup>	2.84E1
Fe <sup>55</sup>	2.49E0
Co <sup>58</sup>	7.11E-1
Co <sup>60</sup>	6.60E1
Ni <sup>63</sup>	4.52E-2
Sr <sup>90</sup>	2.05E-2
Tc <sup>99</sup>	1.53E-4
Cs <sup>137</sup>	2.38E0



b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Super Compaction)

<u>Nuclide</u>	<u>(%)</u>
Mn <sup>54</sup>	2.64E1
Fe <sup>55</sup>	2.58E0
Co <sup>58</sup>	4.71E-1
Co <sup>60</sup>	6.82E1
Ni <sup>63</sup>	4.67E-2
Sr <sup>90</sup>	4.83E-3
Tc <sup>99</sup>	4.83E-3
Cs <sup>137</sup>	2.29E0

3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
17	Truck (Sole Use Vehicle)	Chem Nuclear Barnwell, S.C.
10	Truck (Sole Use Vehicle)	Scientific Ecology Group Oakridge, Tenn.

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMI ANNUAL REPORT -  
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

## MILLSTONE UNIT 2

JULY 1, 1987 - DECEMBER 31, 1987

1. Type of Waste	Unit	6-Month Period	Est. Total Error, %
a) Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.	M <sup>3</sup> Ci	3.41E0 9.95E1	2.5E1
b) Dry Compressable Waste, Contaminated Equipment, Etc.	(CNSI) Burial	M <sup>3</sup> Ci	1.17E0 1.40E-1
	(SEG) Super	M <sup>3</sup> Ci	8.21E1 4.86E-1
	Compaction	Ci	2.5E1
See Page 10 (SEG) Burial Data			
c) Irradiated Components, Control Rods, Etc.	M <sup>3</sup> Ci	N/A	N/A
d) Other (Describe)	M <sup>3</sup> Ci	N/A	N/A
2. Estimate of Major Nuclide Composition (By Type of Waste)			
a) Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.			
	<u>Nuclide</u>	<u>(%)</u>	
	H <sup>3</sup>	5.00E-3	
	C <sup>14</sup>	1.71E-2	
	Mn <sup>54</sup>	1.38E0	
	Fe <sup>55</sup>	1.92E1	
	Co <sup>57</sup>	1.99E-1	
	Co <sup>58</sup>	3.52E0	
	Co <sup>60</sup>	4.92E1	
	Ni <sup>63</sup>	1.96E1	
	Sr <sup>90</sup>	2.09E-1	

<u>Nuclide</u>	<u>(%)</u>
Tc <sup>99</sup>	1.13E-2
Sb <sup>125</sup>	6.33E-1
I <sup>129</sup>	1.19E-4
Cs <sup>134</sup>	1.09E0
Cs <sup>137</sup>	4.99E0
Pu <sup>238</sup>	9.47E-5
Pu <sup>239</sup>	2.65E-3
Pu <sup>241</sup>	7.33E-3
Am <sup>241</sup>	5.20E-5
Cm <sup>242</sup>	6.72E-6

- b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Burial)

<u>Nuclide</u>	<u>(%)</u>
Mn <sup>54</sup>	2.84E1
Fe <sup>55</sup>	2.49E0
Co <sup>58</sup>	7.11E-1
Co <sup>60</sup>	6.60E1
Ni <sup>63</sup>	4.52E-2
Sr <sup>90</sup>	2.05E-3
Tc <sup>99</sup>	1.53E-4
Cs <sup>137</sup>	2.30E0

- b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Super Compaction)

<u>Nuclide</u>	<u>(%)</u>
Fe <sup>55</sup>	3.15E0
Co <sup>58</sup>	2.10E1
Co <sup>60</sup>	5.92E1
Ni <sup>63</sup>	1.92E0
Sr <sup>90</sup>	4.94E-3
Tc <sup>99</sup>	8.03E-2
Cs <sup>134</sup>	2.99E0
Cs <sup>137</sup>	1.17E1

## Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1	Truck (Sole Use Vehicle)	Chem Nuclear Barnwell, S.C.
2	Truck (Sole Use Vehicle)	Scientific Ecology Group Oakridge, Tenn.

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMI ANNUAL REPORT -  
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

## MILLSTONE UNIT 3

JULY 1, 1987 - DECEMBER 31, 1987

1.	Type of Waste	Unit	6-Month Period	Est. Total Error, %	
a)	Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.	M <sup>3</sup> Ci	7.50E0 5.01E1	2.5E1	
		(CNSI) Burial	M <sup>3</sup> Ci	5.32E0 2.76E0	2.5E1
b)	Dry Compressable Waste, Contaminated Equipment, Etc.	(SEG) Super Compaction	M <sup>3</sup> Ci	8.01E1 1.19E0	2.5E1
			See Page 10 (SEG) Burial Data		
c)	Irradiated Components, Control Rods, Etc.	M <sup>3</sup> Ci	N/A	N/A	
d)	Other (Describe)	M <sup>3</sup> Ci	N/A	N/A	

## 2. Estimate of Major Nuclide Composition (By Type of Waste)

a)	Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.	Nuclide	(%)
		H <sup>3</sup>	8.31E-3
		Cr <sup>51</sup>	5.05E-2
		Mn <sup>54</sup>	1.26E1
		Fe <sup>55</sup>	9.84E0
		Fe <sup>59</sup>	1.36E-2
		Co <sup>57</sup>	4.78E-1
		Co <sup>58</sup>	5.40E1
		Co <sup>60</sup>	1.19E1

<u>Nuclide</u>	<u>(%)</u>
Ni <sup>63</sup>	1.13E1
Zn <sup>65</sup>	2.58E-2
Sr <sup>89</sup>	2.21E-2
Sr <sup>90</sup>	1.62E-2
Nb <sup>95</sup>	7.33E-2
Zr <sup>95</sup>	3.39E-2
Tc <sup>99</sup>	1.28E-3
Sb <sup>125</sup>	1.75E-2
Cs <sup>134</sup>	1.25E-2
Cs <sup>137</sup>	3.87E-2
Pu <sup>239</sup>	6.39E-5
Pu <sup>241</sup>	6.87E-3
Am <sup>241</sup>	2.46E-5
Cm <sup>244</sup>	8.35E-6

- b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Burial)

<u>Nuclide</u>	<u>(%)</u>
Cr <sup>51</sup>	2.04E1
Mn <sup>54</sup>	3.47E0
Fe <sup>55</sup>	5.17E0
Fe <sup>59</sup>	4.60E0
Co <sup>58</sup>	6.00E1
Co <sup>60</sup>	5.07E0
Ni <sup>63</sup>	2.10E-1
Nb <sup>95</sup>	1.05E0

- b) Dry Compressible Waste,  
Contaminated Equipment, Etc. (Super Compaction)

<u>Nuclide</u>	<u>(%)</u>
Cr <sup>51</sup>	2.89E0
Mn <sup>54</sup>	4.87E0
Fe <sup>55</sup>	4.70E0

<u>Nuclide</u>	<u>(%)</u>
Fe <sup>59</sup>	1.20E0
Co <sup>58</sup>	8.03E1
Co <sup>60</sup>	4.61E0
Ni <sup>63</sup>	1.92E-1
Nb <sup>95</sup>	7.38E-1
Zr <sup>95</sup>	4.85E-1

### 3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
3	Truck (Sole Use Vehicle)	Chem Nuclear Barnwell, S.C.
4	Truck (Sole Use Vehicle)	Scientific Ecology Group Oakridge, Tenn.

Scientific Ecology Group  
Burial Data

SEG does not designate waste as Unit 1, 2 or 3. SEG designates waste as from Millstone. RMHD has broken down waste burial as proportional to waste shipped, from each unit.

The following breakdown is of (5) shipments that were Unit 1 completely:

<u>M<sup>3</sup> SHIPPED TO SEG</u>	<u>REDUCED M<sup>3</sup> BURIED</u>	<u>Ci BURIED</u>
2.76E2	5.79E1	2.35E-1

The following breakdown is of (11) shipments that contained waste from the (3) station units:

<u>M<sup>3</sup> SHIPPED TO SEG</u>	<u>REDUCED M<sup>3</sup> BURIED</u>	<u>Ci BURIED</u>
3.55E2	1.91E2	1.37E0



## 4.0 SUPPLEMENTAL INFORMATION

### A. MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

#### 4.1 Gaseous Releases

##### a. Unit 1 Stack - Gaseous Releases

###### (1) Fission and Activation Gases

Stack monitors continuously record the effluent activity and flow rate. During periods when the augmented off-gas system is not operable, the radiation monitor reading is related to uCi by off-gas sampling at the steam jet air ejectors and subsequent isotopic analysis. The isotopic activity at the SJAE is mathematically decayed to establish the activity in the stack using the known holdup time. During periods of augmented off-gas system operation, samples are taken directly from the stack with a subsequent isotopic analysis. In both cases, the calculated activity in the stack is then correlated to the monitor reading. The isotopic concentrations at the release point are multiplied by the total stack flow to obtain total uCi release for each isotope.

###### (2) Iodines and Particulates

Charcoal cartridges and particulate filters are used to collect iodines and particulates, respectively. The filters are then analyzed for isotopic content using a gamma spectrometer; particulate filters are also analyzed for strontium. Isotopic concentrations are multiplied by the release flow rate to determine the total amount of activity released.

b. Unit 2 Vent

Total effluent volume from the Unit 2 Vent per month is multiplied by the isotopic concentrations as measured by gamma spectrometer Ge(Li) analysis of grab samples of gases, iodine and particulates to obtain total uCi released from the Vent.

c. Unit 2 Containment Purges

Grab samples are taken for gaseous, particulate, and iodine. These are analyzed on Ge(Li) gamma spectrometer and concentrations computed. Computed concentrations are then multiplied by the purge volume for total uCi released.

Tritium collection is accomplished by the gas washing bottle method. The sample is counted on a liquid scintillation counter. Concentration is computed using worst possible case, 100% humidity. Concentration is multiplied by volume purged to give total uCi released.

d. Unit 2 Steam Generator Blowdown Tank Vent

A decontamination factor (DF) across the steam generator blowdown tank vent has been determined for iodines by comparison of the results of gamma spectrometry, Ge(Li), analysis of steam generator blowdown water and grab samples of condensed steam exiting the blowdown tank vent. This DF was then applied to the total iodine releases via the steam generator blowdown water to determine the iodine releases out of the blowdown tank vent. An additional factor of 0.33 was utilized to account for the fraction of blowdown volume actually flashing to steam in the blowdown tank.

e. Unit 3 Vent and ESF Building Vent

The Unit 3 Ventilation Vent collects gas streams from the Auxiliary, Fuel, Waste Disposal, and Service Building exhausts, containment purge and gaseous waste process vent. The Unit 3 Vent is located on the roof of the turbine building and discharges 133 feet above grade. The Unit 3 ESF Building Vent collects gas streams from the Engineered Safety Features Building Ventilation System. This vent is located on the south wall and discharges 23 feet above grade. Total Effluent Volume per month is multiplied by isotopic concentrations from the analysis of grab samples to obtain the total activity released. These grab samples are obtained monthly for fission gas and tritium, weekly filters for iodines and particulates, monthly composites of particulate filters for gross alpha and Strontium.

f. Unit 3 Containment Drawdown and Purge

Unit 3 Containment is drawn down and purged intermittently. The drawdown is accomplished by using the containment vacuum steam jet ejector and releases through an unmonitored vent on the roof of the Auxiliary Building. The containment vacuum pump discharge, which maintains sub-atmospheric pressure following the initial drawdown, is released through the Unit 1 Stack. The purge is the process of discharging air from containment to maintain temperature, humidity, pressure, concentration, etc., where air is replaced. Purges are filtered and normally released through the Unit 3 Vent but may use the Unit 1 Stack. Purges and Drawdowns are intermittent

and are therefore considered batch releases. Calculated volume discharged is multiplied by isotopic concentrations from the analysis of grab samples to obtain activity released.

g. Unit 3 Turbine Gland Sealing System Exhaust

The turbine gland sealing system prevents air leakage into the turbine and valve stems and collects steam leakage. A mixture of air and steam drawn from the turbine shaft packing is condensed and the noncondensable gases are vented to the atmosphere at a point above the condensate polishing building. This vent is at an elevation of 48 feet above grade. Noble Gas Activity released is calculated using the air ejector monitor activity concentration and the percentage of steam to the gland sealing condenser. Iodine and particulate activity is calculated using the steam generator blowdown activity concentration and appropriate carry over fraction. (See Appendix H, ODCM).

h. Unit 3 Main Condensor Mechanical Vacuum Pump Exhaust

The Main Condensor Evacuation System draws the initial vacuum in the condensor during startup and maintains vacuum during startup. The Main Condensor mechanical vacuum pumps exhaust through the vent on the condensate polishing building roof. Steam Jet Air Ejectors maintains condensor vacuum during normal operation. Air and noncondensable gases removed from the condensor by the steam jet air ejectors are discharged to the Unit 1 Stack.

Noble Gas Activity released during startup by the Main Condensor Vacuum Pumps is obtained by multiplying the condensor volume by a grab sample of the air ejector decay corrected for time of shutdown. Iodine and particulate activity is obtained from a grab sample of the mechanical vacuum pump exhaust and volume discharged. (See Appendix H, ODCM).

#### 4.2 Liquid Effluents

##### a. Liquid Tanks

There are numerous tanks which are used to discharge liquids containing radioactivity to the environs; they are:

Unit 1 - Decontamination Solution Tank

Unit 1 - Floor Drain Sample Tanks (2)

Unit 1 - Waste Sample Tanks (2)

Unit 2 - Clean Waste Monitor Tanks (2)

Unit 2 - Aerated Waste Monitor Tank

Unit 3 - High Level Waste Test Tanks (2)

Unit 3 - Low Level Waste Tanks (2)

Prior to release, a tank is recirculated for two equivalent tank volumes, a sample is drawn and analyzed on the Ge(Li) gamma spectrometer for individual radionuclide composition. An aliquot of the sample is analyzed for tritium. Isotopic concentrations are multiplied by the volume released to obtain the total activity released.

A proportional aliquot of each discharge is retained for composite analysis for strontium and gross alpha.

b. Unit 2 and Unit 3 Steam Generator Blowdown

Grab samples are taken of steam generator blowdown water, and are analyzed by gamma spectrometry, Ge(Li). Total volume of blowdown is multiplied by the isotopic concentrations to determine the total activity released via blowdown. The calculated activity released out of the blowdown tank vent is accounted for pending the point of blowdown sampling.

Tritium is determined through liquid scintillation counting and strontiums are analyzed by radiochemical separations and appropriate counting techniques.

4.3 Estimates of Errors

Estimates of errors associated with radioactivity measurements were made using the following guidelines:

- (1) Sampling and Data Collection - 10% accounts for variation in personnel obtaining required data.
- (2) Calibration - 5% instrument calibration to NBS standards.
- (3) Counting of Samples - 10% maximum error due to counting statistics.
- (4) Flow and Level Measurements - 10% maximum errors on volumes released.

#### 4.4 BATCH RELEASES

##### Liquid

	<u>Unit 1</u>	<u>Unit 2</u>	<u>Unit 3</u>
a. Number of Batches:	213	257	143
b. Total Time: (Min.)	24,572	64,314	14,872
c. Maximum Time: (Min.)	920	993	285
d. Average Time: (Min.)	115	250	104
e. Minimum Time: (Min.)	6	1	2

Average Stream Flow - Not Applicable - Ocean Site

##### Gaseous

	<u>Unit 1 Purge</u>	<u>Unit 2 Purge</u>	<u>Unit 2 WGDT</u>	<u>Unit 3 Purge</u>	<u>Unit 3 Drawdown</u>
a. Number of Batches:	0	0	11	1	0
b. Total Time: (Min.)	-	-	4,378	270	-
c. Maximum Time: (Min.)	-	-	655	270	-
d. Average Time: (Min.)	-	-	398	270	-
E. Minimum Time: (Min.)	-	-	20	270	-

#### 4.5 ABNORMAL RELEASES

None

5.0 CHANGES TO THE REMM/ODCM/PCP

There were no changes to the REMM/ODCM/PCP during the period.



6.0

EFFLUENT MONITOR INOPERABILITY

During the period covered by this report, the following monitors were inoperable for greater than 30 days:

1. Unit 3 Steam Generator Blowdown Monitor

This monitor has not been placed in initial service yet. Until this monitor is in-service, Steam Generator Blowdown is being recovered without discharge to the environment.

APPENDIX A - UPDATED TABLES

The volumes of solid radioactive waste shipped offsite for burial or disposal as reported in the Millstone Semiannual Radioactive Effluents Release Report (January-June 1986) were in the units of  $\text{ft}^3$ . The following are the volumes in the appropriate units of  $\text{m}^3$ .

	<u>Unit 1</u>	<u>Unit 2</u>
1a.	8.98E+01 $\text{m}^3$	4.96E+01 $\text{m}^3$
1b.	2.52E+02 $\text{m}^3$	-
1c.	-	1.07E+01 $\text{m}^3$
1d.	-	-