

1995

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

R. E. GINNA NUCLEAR PLANT

ROCHESTER GAS AND ELECTRIC

DOCKET NO. 50-244

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## 1.0 INTRODUCTION

This Annual Radioactive Effluent Release Report is for Rochester Gas and Electric Corporation R.E. Ginna plant and is submitted in accordance with the requirements of Technical Specification Section 6.9.1.4. The report covers the period from January 1, 1995 through December 31, 1995. This is the first Annual Report established by Amendment 58 to R.E. Ginna Technical Specifications.

This report includes a summary of the quantities of radioactive gaseous and liquid effluents and solid waste released from the plant presented in the format outlined in Appendix B of Regulatory Guide 1.21, Revision 1, June 1974.

All gaseous and liquid effluents discharged during this reporting period were in compliance with the limits of the R.E. Ginna Technical Specifications.

## 2.0 SUPPLEMENTAL INFORMATION

### 2.1 Regulatory Limits

The Technical Specification limits applicable to release of radioactive material in liquid and gaseous effluents are:

#### 2.1.1 Fission and Activation Gases

The instantaneous dose rate, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to a release rate which would yield  $\leq 500$  mrem/yr to the total body and  $\leq 3000$  mrem/yr to the skin if allowed to continue for a full year.

The air dose, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to the following:

- (i) During any calendar quarter to  $\leq 5$  mrad for gamma radiation and to  $\leq 10$  mrad for beta radiation.
- (ii) During any calendar year to  $\leq 10$  mrad for gamma radiation and to  $\leq 20$  mrad for beta radiation.

#### 2.1.2 Radioiodine, Tritium and Particulates

The instantaneous dose rate, as calculated in the ODCM, due to radioactive materials released in gaseous effluents from the site as radioiodines, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days shall be limited to a release rate which would yield  $\leq 1500$  mrem/yr to any organ if allowed to continue for a full year.

The dose to an individual, as calculated in the ODCM, from radioiodine, radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight days released with gaseous effluents from the site shall be limited to the following:

- (i) During any calendar quarter to  $\leq 7.5$  mrem to any organ.
- (ii) During any calendar year to  $\leq 15$  mrem to any organ.

### 2.1.3 Liquid Effluents

The release of radioactive liquid effluents shall be such that the concentration in the circulating water discharge does not exceed the limits specified in accordance with Appendix B, Table II, Column 2 and notes thereto of 10CFR20. For dissolved or entrained noble gases the total activity due to dissolved or entrained noble gases shall not exceed  $2 \text{ E-4 uCi/ml}$ .

The dose or dose commitment to an individual as calculated in the ODCM from radioactive materials in liquid effluents released to unrestricted areas shall be limited:

- (i) During any calendar quarter to  $\leq 1.5$  mrem to the total body and to  $\leq 5$  mrem to any organ, and
- (ii) During any calendar year to  $\leq 3$  mrem to the total body and to  $\leq 10$  mrem to any organ.

## 2.2 Maximum Permissible Concentrations (MPC)

2.2.1 For gaseous effluents, maximum permissible concentrations are not directly used in release rate calculations since the applicable limits are stated in terms of dose rate at the unrestricted area boundary.

2.2.2 For liquid effluents, the ten times the effluent concentration values specified in 10CFR20, Appendix B to 20.1-20.602, Table II, column 2, 1-1-93, are used to calculate release rates and permissible concentrations at the unrestricted area boundary. A value of  $2\text{E-}04 \text{ uCi/ml}$  is used as the MPC for dissolved and entrained noble gases in liquid effluents.

### 2.3 Release Rate Limits

The release rate limits for fission and activation gases from the R.E. Ginna plant are not based on the average energy of the radionuclide mixture in gaseous effluents; therefore, this value is not applicable. However, the average beta/gamma energy of the radionuclide mixture was 0.249 Mev.

### 2.4 Measurements and Approximations of Total Radioactivity

Gamma spectroscopy was the primary analysis method used to determine the radionuclide composition and concentration of gaseous and liquid effluents. Composite samples were analyzed for Sr-89, Sr-90 and Fe-55 by a contract laboratory. Tritium and alpha analysis were done using liquid scintillation and gas flow proportional counting respectively.

The total radioactivity in effluent releases was determined from the measured concentration of each radionuclide present and the total volume of effluents released.

### 2.5 Batch Releases

#### 2.5.1 Liquid

1. Number of batch releases:	2.97 E+02
2. Total time period for batch releases:	5.59 E+04 min
3. Maximum time period for a batch release:	9.30 E+03 min
4. Average time period for batch releases:	1.88 E+02 min
5. Minimum time period for a batch release:	1.5 E+01 min
6. Average stream flow (LPM) during periods of release effluent into a flowing stream:	1.58 E+02

#### 2.5.2 Gaseous

1. Number of batch releases:	2.0 E+01
2. Total time period for batch releases:	4.93 E+03 min
3. Maximum time period for a batch release:	4.79 E+02 min
4. Average time period for batch releases:	2.46 E+02 min
5. Minimum time period for a batch release:	3.8 E+01 min

## **2.6      Abnormal Releases**

There were no abnormal releases of liquid or gaseous effluents during the reporting period.

## **3.0      SUMMARY OF GASEOUS RADIOACTIVE EFFLUENTS**

The quantities of radioactive material released in gaseous effluents are summarized in tables 1A and 1B. All releases were considered to be ground level releases.

## **4.0      SUMMARY OF LIQUID RADIOACTIVE EFFLUENTS**

The quantities of radioactive material released in liquid effluents are summarized in tables 2A and 2B.

## **5.0      SOLID WASTES**

The quantities of radioactive material released in shipments of solid waste transported from the site during the reporting period are summarized in table 3. Principal nuclides were determined by gamma spectroscopy and non-gamma emitters were calculated from scaling factors determined by an independent laboratory from representative samples of that waste type. The majority of Dry Active Waste is processed utilizing an off-site processor who reduces the volume and then sends the waste for burial.

## **6.0      LOWER LIMIT OF DETECTION NOT MET**

There were no liquid or gaseous releases for which the LLD for specified gamma emitting nuclides was not met.

## **7.0      RADIOLOGICAL IMPACT**

An assessment of doses to the maximally exposed individual from gaseous and liquid effluents was performed for locations representing the maximum dose. In all cases, doses were well below Technical Specification limits. Doses were assessed based upon actual meteorological conditions considering the noble gas exposure, inhalation, ground plane and ingestion pathways. The ingestion pathways considered were the fruit, vegetable, fish, drinking water, goat's milk, cow's milk and meat pathway. The results of this assessment are presented in Tables 5A and 5B.



## **8.0 METEOROLOGICAL DATA**

The annual summary of hourly meteorological data collected during 1995 is not included with this report, but can be made available at the RG&E Ginna Plant as allowed by Technical Specifications.

## **9.0 LAND USE CHANGES**

There were no changes in critical receptor location for dose calculations during the reporting period. There were no large changes in land use within 5 miles of the plant, other than several new homes being built.

## **10.0 CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)**

The ODCM was totally rewritten for the implementation of Amendment 61 to R.E. Ginna Technical Specifications. The change did not become effective until 2/24/96; however, the new ODCM is attached to this report.

## **11.0 CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)**

The change to the PCP for the implementation of Amendment 61 was the removal of the reference to R.E. Ginna Technical Specifications.

## **12.0 MAJOR CHANGES TO RADWASTE TREATMENT SYSTEMS**

There were no major changes to the Radwaste Treatment Systems during the reporting period.



**ROCHESTER GAS ELECTRIC CORPORATION**

Table 1A

**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT**

**GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES  
JANUARY - JUNE 1995**

<b>A. Fission &amp; activation gases</b>	<b>Unit</b>	<b>Quarter 1st</b>	<b>Quarter 2nd</b>	<b>Est. Total Error, %</b>
1. Total release	CI	1.48E+01	9.00E+00	9.50E+00
2. Average release rate for period	uCi/sec	1.90E+00	1.14E+00	
3. Percent of technical specification limit	%	3.01E-04	1.82E-04	
<b>B. Iodines</b>				
1. Total iodine-131	CI	1.83E-05	1.84E-05	2.60E+01
2. Average release rate for period	uCi/sec	2.36E-06	2.34E-06	
3. Percent of technical specification limit	%	5.18E-03	5.15E-03	
<b>C. Particulates</b>				
1. Particulates with half-lives > 8days	CI	1.32E-06	5.36E-07	1.40E+01
2. Average release rate for period	uCi/sec	1.69E-07	6.82E-08	
3. Percent of technical specification limit	%	1.27E-05	5.13E-06	
4. Gross alpha radioactivity	CI			
<b>D. Tritium</b>				
1. Total release	CI	1.55E+01	7.36E+00	3.20E+00
2. Average release rate for period	uCi/sec	2.00E+00	9.36E-01	
3. Percent of technical specification limit	%	2.35E-04	1.10E-04	

**ROCHESTER GAS ELECTRIC CORPORATION**

Table 1A

**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT**

**GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES  
JULY - DECEMBER 1995**

	Unit	Quarter 3rd	Quarter 4th	Est. Total Error, %
<b>A. Fission &amp; activation gases</b>				
1. Total release	Ci	9.49E+00	1.16E+01	6.60E+00
2. Average release rate for period	uCi/sec	1.19E+00	1.46E+00	
3. Percent of technical specification limit	%	1.89E-04	2.32E-04	
<b>B. Iodines</b>				
1. Total iodine-131	Ci	1.16E-05	2.43E-05	2.80E+01
2. Average release rate for period	uCi/sec	1.46E-06	3.06E-06	
3. Percent of technical specification limit	%	3.21E-03	6.72E-03	
<b>C. Particulates</b>				
1. Particulates with half-lives > 8days	Ci	9.38E-07	9.95E-07	4.00E+01
2. Average release rate for period	uCi/sec	1.18E-07	1.25E-07	
3. Percent of technical specification limit	%	8.88E-06	9.41E-06	
4. Gross alpha radioactivity	Ci			
<b>D. Tritium</b>				
1. Total release	Ci	2.00E+01	9.47E+00	3.20E+00
2. Average release rate for period	uCi/sec	2.51E+00	1.19E+00	
3. Percent of technical specification limit	%	2.95E-04	1.40E-04	



ROCHESTER GAS ELECTRIC CORPORATION

Table 1B  
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
GASEOUS EFFLUENTS - ELEVATED RELEASE

		Continuous Mode		Batch Mode	
Nuclides released	Unit	Quarter	Quarter	Quarter	Quarter
		1st	2nd	1st	2nd
1. Fission gases					
argon-41	Ci	4.08E-01	3.39E-01	2.09E-01	1.57E-02
krypton-85	Ci				3.05E-04
krypton-85m	Ci	6.12E-02	3.26E-02		
krypton-87	Ci	1.05E-01	5.38E-02		
krypton-88	Ci	1.22E-01	6.75E-02		
xenon-131m	Ci	4.51E-02	1.75E-02	9.30E-03	2.15E-03
xenon-133	Ci	4.56E+00	5.72E+00	4.73E+00	3.66E-01
xenon-133m	Ci	9.86E-03	4.39E-03	7.83E-03	2.48E-04
xenon-135	Ci	2.48E+00	1.62E+00	1.99E-01	1.30E-03
xenon-135m	Ci	1.32E+00	5.56E-01		
xenon-138	Ci	5.00E-01	2.04E-01		1.88E-05
others (specify)	Ci				
	Ci				
	Ci				
	Ci				
Total for period	Ci	9.61E+00	8.61E+00	5.16E+00	3.86E-01

**2. Iodines**

iodine-131	Ci	1.82E-05	1.78E-05	1.77E-07	6.04E-07
iodine-133	Ci	2.12E-05	1.86E-05	3.77E-07	2.01E-09
iodine-135	Ci				
<b>Total for period</b>	<b>Ci</b>	<b>3.94E-05</b>	<b>3.65E-05</b>	<b>5.54E-07</b>	<b>6.06E-07</b>

**3. Particulates**

strontium-89	Ci				
strontium-90	Ci				
cesium-134	Ci				
cesium-137	Ci	1.32E-06	5.36E-07		
niobium-95	Ci				
cobalt-58	Ci				
cobalt-60	Ci				
<b>Total for period</b>	<b>Ci</b>	<b>1.32E-06</b>	<b>5.36E-07</b>		
unidentified	Ci				

1981  
1982  
1983

1984  
1985  
1986

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Table 1B  
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
GASEOUS EFFLUENTS - ELEVATED RELEASE

		Continuous Mode		Batch Mode	
Nuclides released	Unit	Quarter	Quarter	Quarter	Quarter
		3rd	4th	3rd	4th
1. Fission gases					
argon-41	Ci	1.87E-01	3.50E-01	4.42E-02	3.52E-02
krypton-85	Ci			1.10E-02	1.61E-01
krypton-85m	Ci	4.20E-02	9.96E-02		9.56E-05
krypton-87	Ci	6.47E-02	1.33E-01		
krypton-88	Ci	8.13E-02	1.83E-01		
xenon-131m	Ci	2.02E-03	2.48E-02	1.43E-03	3.53E-03
xenon-133	Ci	5.35E+00	5.16E+00	3.24E-01	7.75E-01
xenon-133m	Ci	9.54E-03	2.82E-02	8.90E-04	5.94E-03
xenon-135	Ci	2.42E+00	2.91E+00	7.14E-03	6.42E-03
xenon-135m	Ci	6.94E-01	1.30E+00		
xenon-138	Ci	2.55E-01	4.67E-01		
others (specify)	Ci				
	Ci				
	Ci				
	Ci				
Total for period	Ci	9.10E+00	1.07E+01	3.89E-01	9.87E-01

## 2. Iodines

iodine-131	Ci	1.15E-05	2.43E-05	1.52E-07	
iodine-133	Ci	1.23E-05	7.00E-05	3.57E-07	
iodine-135	Ci				
<b>Total for period</b>	<b>Ci</b>	<b>2.38E-05</b>	<b>9.43E-05</b>	<b>5.09E-07</b>	

## 3. Particulates

strontium-89	Ci				
strontium-90	Ci				
cesium-134	Ci				
cesium-137	Ci	9.38E-07	9.95E-07		
Nb-95	Ci				
cobalt-58	Ci				
cobalt-60	Ci				
<b>Total for period</b>	<b>Ci</b>	<b>9.38E-07</b>	<b>9.95E-07</b>		
unidentified	Ci				



ROCHESTER GAS ELECTRIC CORPORATION

Table 2A  
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES  
JANUARY - JUNE 1995

	Unit	Quarter 1st	Quarter 2nd	Est.Total Error, %
<b>A. Fission and activation products</b>				
1. Total release (not including tritium, gases, alpha)	Ci	1.67E-02	8.52E-03	1.80E+01
2. Average diluted concentration during period	uCi/ml	1.16E-10	7.62E-11	
3. Percent of applicable limit	%	9.18E-03	5.13E-03	
<b>B. Tritium</b>				
1. Total release	Ci	2.32E+01	3.13E+01	3.20E+00
2. Average diluted concentration during period	uCi/ml	1.62E-07	2.80E-07	
3. Percent of applicable limit	%	5.40E-03	9.32E-03	
<b>C. Dissolved and entrained gases</b>				
1. Total release	Ci	1.09E-03	6.97E-04	2.80E+01
2. Average diluted concentration during period	uCi/ml	7.57E-12	6.22E-12	
3. Percent of applicable limit	%	3.78E-06	3.11E-06	
<b>D. Gross alpha radioactivity</b>				
1. Total release	Ci	N/A	N/A	
<b>E. Vol. of waste released (prior to dilution)</b>				
	Liters	2.65E+07	2.23E+07	5.00E+00
<b>F. Vol. of dilution water used during period</b>				
	Liters	1.43E+11	1.12E+11	5.00E+00



**ROCHESTER GAS ELECTRIC CORPORATION**

Table 2A  
**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT**  
**LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES**  
**JULY - DECEMBER 1995**

	Unit	Quarter 3rd	Quarter 4th	Est.Total Error, %
<b>A. Fission and activation products</b>				
1. Total release (not including tritium, gases, alpha)	Ci	7.94E-03	3.08E-03	7.00E+00
2. Average diluted concentration during period	uCi/ml	4.78E-11	1.90E-11	
3. Percent of applicable limit	%	6.92E-03	3.98E-03	
<b>B. Tritium</b>				
1. Total release	Ci	1.68E+01	2.64E+01	3.20E+00
2. Average diluted concentration during period	uCi/ml	1.01E-07	1.64E-07	
3. Percent of applicable limit	%	3.36E-03	5.45E-03	
<b>C. Dissolved and entrained gases</b>				
1. Total release	Ci	1.34E-03	1.01E-04	4.00E+01
2. Average diluted concentration during period	uCi/ml	8.08E-12	6.25E-13	
3. Percent of applicable limit	%	4.04E-06	3.13E-07	
<b>D. Gross alpha radioactivity</b>				
1. Total release	Ci	N/A	N/A	
<b>E. Vol. of waste released (prior to dilution)</b>				
	Liters	4.80E+07	2.55E+07	5.00E+00
<b>F. Vol. of dilution water used during period</b>				
	Liters	1.66E+11	1.62E+11	5.00E+00

ROCHESTER GAS ELECTRIC CORPORATION

Table 2B  
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
chromium-51	Ci			3.31E-05	
manganese-54	Ci				1.82E-05
iron-55	Ci	3.26E-03		1.07E-04	
iron-59	Ci				
cobalt-58	Ci		7.06E-07	4.28E-04	5.41E-04
cobalt-60	Ci		8.33E-05	4.93E-06	3.85E-05
zinc-65	Ci				
strontium-89	Ci	2.33E-04		2.33E-04	
strontium-90	Ci		6.61E-06		6.30E-05
zirconium/niobium-95	Ci				1.23E-05
molybdenum-99	Ci			1.08E-04	1.05E-05
silver-110m	Ci				3.27E-05
antimony-122	Ci				
antimony-124	Ci			1.19E-04	6.32E-04
antimony-125	Ci			2.95E-03	1.40E-03
iodine-131	Ci	9.99E-05	3.04E-06	3.00E-03	9.64E-04
iodine-133	Ci	2.79E-05	1.63E-04	2.70E-04	1.48E-03
iodine-135	Ci	2.60E-05	2.44E-05	2.88E-03	2.01E-03
cesium-134	Ci	4.42E-06		1.04E-03	2.98E-04
cesium-136	Ci				
cesium-137	Ci	4.14E-05	7.86E-05	1.79E-03	6.45E-04
barium/lanthanum-140	Ci				1.58E-05
cerium-141	Ci				
technetium-123m	Ci				
ruthenium-103	Ci				
Total for period (above)	Ci	3.69E-03	3.60E-04	1.30E-02	8.16E-03
unidentified	Ci				
xenon-133	Ci			5.34E-04	1.51E-04
xenon-135	Ci			5.51E-04	5.46E-04

Note: Isotope for which no value is given were not identified in applicable releases.

ROCHESTER GAS ELECTRIC CORPORATION

Table 2B  
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3rd	Quarter 4th	Quarter 3rd	Quarter 4th
chromium-51	Ci				
manganese-54	Ci			2.77E-05	
iron-55	Ci				
iron-59	Ci				
cobalt-58	Ci			3.47E-05	2.59E-06
cobalt-60	Ci			2.45E-04	
zinc-65	Ci				
strontium-89	Ci			7.16E-06	
strontium-90	Ci				
zirconium/niobium-95	Ci				
molybdenum-99	Ci			2.56E-05	4.41E-06
silver-110m	Ci			4.15E-06	
antimony-122	Ci				
antimony-124	Ci			1.19E-04	1.45E-05
antimony-125	Ci			3.79E-04	2.75E-04
iodine-131	Ci	9.36E-05	5.74E-05	2.48E-03	1.78E-03
iodine-133	Ci	3.13E-05	1.21E-04	2.59E-03	1.42E-04
iodine-135	Ci	3.75E-05	4.94E-05	8.50E-04	
cesium-134	Ci			2.19E-04	9.48E-05
cesium-136	Ci				
cesium-137	Ci	7.33E-05	1.42E-05	6.86E-04	5.23E-04
barium/lanthanum-140	Ci				
cerium-141	Ci				
ruthenium -106	Ci			4.96E-05	
ruthenium -103	Ci				
Total for period (above)		2.36E-04	2.42E-04	7.71E-03	2.83E-03
unidentified					
xenon-133	Ci			1.06E-03	4.76E-05
xenon-135	Ci		6.79E-06	2.86E-04	4.67E-05

Table 3

**EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT  
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS**

January 1, 1995 - December 31, 1995

**A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL - (Not irradiated fuel)**

1. Type of waste	Unit	12 month period	Est. total Error %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup> Ci		
b. Dry compressible waste, contaminated equip, etc.	m <sup>3</sup> Ci	1.36 E+02 4.13 E+02	2 E+00 5 E+00
c. Irradiated components, control rods, etc.	m <sup>3</sup> Ci		
d. Other: <u>Mixed Waste</u>	m <sup>3</sup> Ci	4.84 E+00 5.00 E-02	

2. Estimate of major nuclide composition (by type of waste)					
b. Fe-55	%	3.85 E+01	d. Fe-55	%	3.16 E+01
Co-60	%	1.01 E+01	Co-60	%	1.70 E+01
Nb-95	%	9.6 E+00	Cs-137	%	1.70 E+01
Cs-137	%	8.4 E+00	Ni-63	%	8.0 E+00
Zr-95	%	7.1 E+00	Cs-134	%	2.1 E+00
Co-58	%	6.9 E+00	Pu-241	%	2.3 E+00
Cr-51	%	5.9 E+00	Ce-144	%	2.3 E+00
Ni-63	%	4.1 E+00			
Ce-144	%	4.5 E+00			
Cs-134	%	1.7 E+00			
Pu-241	%	1.2 E+00			
Mn-54	%	1.1 E+00			
Ru-103	%	6.0 E-01			
H-3	%	1 E-01			

3. Solid Waste Disposition		
Number of Shipments	Mode of Transportation	Destination
4	Highway Vehicle	Oak Ridge, TN
1	Highway Vehicle	Kingston, TN

**B. IRRADIATED FUEL SHIPMENTS (Disposition)**

Number of Shipments	Mode of Transportation	Destination
None		

Attachment 4A  
Radiation Doses to Maximally Exposed Individual Receptor  
From Gaseous Releases in Rem  
First Quarter 1995

	ADULT			TEEN			CHILD			INFANT		
	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN
N	2.1E-08	2.1E-08	8.9E-08	2.1E-08	2.1E-08	8.9E-09	1.9E-08	1.9E-08	8.9E-08	1.2E-08	1.3E-08	8.9E-09
NNE	2.2E-08	2.2E-08	1.1E-08	2.2E-08	2.3E-08	1.1E-08	2.0E-08	2.1E-08	1.1E-08	1.3E-08	1.4E-08	1.1E-08
NE	2.7E-08	2.7E-08	1.3E-08	2.7E-08	2.7E-08	1.3E-08	2.4E-08	2.5E-08	1.3E-08	1.6E-08	1.7E-08	1.3E-08
ENE	4.0E-08	4.1E-08	2.0E-08	4.0E-08	4.1E-08	2.0E-08	3.7E-08	3.7E-08	2.0E-08	2.4E-08	2.5E-08	2.0E-08
E	3.0E-07	3.0E-07	2.3E-07	3.0E-07	3.0E-07	2.3E-07	2.7E-07	2.8E-07	2.3E-07	2.0E-07	2.0E-07	2.3E-07
ESE	3.4E-07	3.5E-07	2.6E-07	3.4E-07	3.5E-07	2.6E-07	3.2E-07	3.2E-07	2.6E-07	2.4E-07	2.4E-07	2.6E-07
SE	4.0E-07	4.0E-07	2.6E-07	4.0E-07	4.1E-07	2.6E-07	3.7E-07	3.8E-07	2.6E-07	2.6E-07	2.7E-07	2.6E-07
SSE	1.0E-07	1.1E-07	6.0E-08	1.0E-07	1.1E-07	6.0E-08	9.6E-08	9.8E-08	6.0E-08	6.7E-08	6.9E-08	6.0E-08
S	2.4E-07	2.4E-07	1.6E-07	2.4E-07	2.4E-07	1.6E-07	2.2E-07	2.2E-07	1.6E-07	1.6E-07	1.7E-07	1.6E-07
SSW	1.7E-07	1.8E-07	1.0E-07	1.8E-07	1.8E-07	1.0E-07	1.6E-07	1.6E-07	1.0E-07	1.1E-07	1.1E-07	1.0E-07
SW	3.3E-07	3.3E-07	3.2E-07	3.3E-07	3.3E-07	3.2E-07	3.0E-07	3.1E-07	3.2E-07	2.3E-07	2.3E-07	3.2E-07
WSW	1.6E-07	1.6E-07	1.4E-07	1.6E-07	1.6E-07	1.4E-07	1.4E-07	1.5E-07	1.4E-07	1.1E-07	1.1E-07	1.4E-07
W	1.0E-07	1.0E-07	8.0E-08	1.0E-07	1.0E-07	8.0E-08	9.4E-08	9.5E-08	8.0E-08	6.7E-08	6.8E-08	8.0E-08
WNW	2.1E-08	2.1E-08	2.0E-08	2.1E-08	2.1E-08	2.0E-08	2.0E-08	2.0E-08	2.0E-08	1.4E-08	1.5E-08	2.0E-08
NW	1.4E-08	1.5E-08	6.5E-09	1.5E-08	1.5E-08	6.5E-09	1.3E-08	1.3E-08	6.5E-09	8.6E-09	8.9E-09	6.8E-09
NNW	2.0E-08	2.1E-08	8.6E-09	2.1E-08	2.1E-08	8.6E-09	1.9E-08	1.9E-08	8.6E-09	1.2E-08	1.2E-08	8.6E-09
MAX.	4.0E-07	4.0E-07	3.2E-07	4.0E-07	4.1E-07	3.2E-07	3.7E-07	3.8E-07	3.2E-07	2.6E-07	2.7E-07	3.2E-07

Attachment 4A  
Radiation Doses to Maximally Exposed Individual Receptor  
From Gaseous Releases in Rem  
Second Quarter 1995

	ADULT			TEEN			CHILD			INFANT		
	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN
N	3.6E-08	3.6E-08	2.2E-07	3.6E-08	3.6E-08	2.2E-07	3.3E-08	3.3E-08	2.2E-07	2.5E-08	2.5E-08	2.2E-07
NNE	2.3E-08	2.3E-08	1.3E-07	2.3E-08	2.3E-08	1.3E-07	2.1E-08	2.1E-08	1.3E-07	1.6E-08	1.6E-08	1.3E-07
NE	2.1E-08	2.1E-08	1.4E-07	2.1E-08	2.1E-08	1.4E-07	2.0E-08	2.0E-08	1.4E-07	1.4E-08	1.5E-08	1.4E-07
ENE	2.7E-08	2.7E-08	2.9E-07	2.7E-08	2.8E-08	2.9E-07	2.5E-08	2.6E-08	2.9E-07	1.9E-08	1.9E-08	2.9E-07
E	5.6E-07	5.7E-07	1.8E-06	5.7E-07	5.9E-07	1.8E-06	5.9E-07	6.2E-07	1.8E-06	4.0E-07	4.3E-07	1.8E-06
ESE	8.4E-07	8.8E-07	4.1E-06	8.6E-07	9.0E-07	4.1E-06	8.8E-07	9.5E-07	4.1E-06	6.0E-07	7.0E-07	4.1E-06
SE	5.9E-07	6.0E-07	2.3E-06	6.0E-07	6.2E-07	2.3E-06	6.0E-07	6.3E-07	2.3E-06	4.8E-07	5.3E-07	2.3E-06
SSE	1.1E-07	1.1E-07	1.9E-07	1.1E-07	1.2E-07	1.9E-07	1.2E-07	1.3E-07	1.9E-07	1.0E-07	1.2E-07	1.9E-07
S	1.6E-07	1.6E-07	5.5E-07	1.6E-07	1.7E-07	5.5E-07	1.6E-07	1.7E-07	5.5E-07	1.3E-07	1.4E-07	5.5E-07
SSW	4.6E-07	4.7E-07	1.0E-06	4.7E-07	4.7E-07	1.0E-06	4.6E-07	4.7E-07	1.0E-06	3.4E-07	3.6E-07	1.0E-06
SW	4.7E-07	4.8E-07	2.2E-06	4.8E-07	4.9E-07	2.2E-06	4.9E-07	5.0E-07	2.2E-06	4.0E-07	4.3E-07	2.2E-06
WSW	3.8E-07	3.9E-06	1.5E-06	3.9E-07	4.0E-07	1.5E-06	4.2E-07	4.3E-07	1.5E-06	3.2E-07	3.6E-07	1.5E-06
W	3.2E-07	3.2E-07	1.1E-06	3.3E-07	3.3E-07	1.1E-06	3.4E-07	3.4E-07	1.1E-06	2.5E-07	2.5E-07	1.1E-06
WNW	1.7E-07	1.7E-07	2.5E-07	1.7E-07	1.7E-07	2.5E-07	1.7E-07	1.7E-07	2.5E-07	1.2E-07	1.2E-07	2.5E-07
NW	1.2E-08	1.2E-08	1.1E-07	1.2E-08	1.2E-08	1.1E-07	1.1E-08	1.1E-08	1.1E-07	8.2E-09	8.3E-09	1.1E-07
NNW	1.7E-08	1.7E-08	1.4E-07	1.7E-08	1.7E-08	1.4E-07	1.6E-08	1.6E-08	1.4E-07	1.2E-08	1.2E-08	1.4E-07
MAX.	8.4E-07	3.9E-06	4.1E-06	8.6E-07	9.0E-07	4.1E-06	8.8E-07	9.5E-07	4.1E-06	6.0E-07	7.0E-07	4.1E-06





Attachment 4A  
Radiation Doses to Maximally Exposed Individual Receptor  
From Gaseous Releases in Rem  
Third Quarter 1995

	ADULT			TEEN			CHILD			INFANT		
	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN
N	7.1E-07	7.1E-07	4.3E-08	7.2E-07	7.2E-07	4.3E-08	6.4E-07	6.4E-07	4.3E-08	3.7E-07	3.7E-07	4.3E-08
NNE	1.20E-06	1.2E-06	9.6E-08	1.2E-06	1.2E-06	9.6E-08	1.0E-06	1.0E-06	9.6E-08	6.1E-07	6.2E-07	9.6E-08
NE	1.4E-06	1.4E-06	8.9E-08	1.4E-06	1.4E-06	8.9E-08	1.3E-06	1.3E-06	8.9E-08	7.5E-07	7.6E-07	8.9E-08
ENE	4.0E-07	4.0E-07	2.5E-08	4.0E-07	4.0E-07	2.5E-08	3.6E-07	3.6E-07	2.5E-08	2.1E-07	2.1E-07	2.5E-08
E	9.2E-06	9.4E-06	7.1E-07	9.9E-06	1.0E-05	7.1E-07	1.2E-05	1.2E-05	7.1E-07	3.4E-06	3.6E-06	7.1E-07
ESE	6.5E-06	6.6E-06	6.0E-07	6.9E-06	7.0E-06	6.0E-07	8.1E-06	8.4E-06	6.0E-07	2.5E-06	2.8E-06	6.0E-07
SE	9.6E-06	9.8E-06	1.0E-06	1.0E-05	1.0E-05	1.0E-06	1.1E-05	1.2E-05	1.0E-06	4.0E-06	4.3E-06	1.0E-06
SSE	7.0E-06	7.1E-06	5.4E-07	7.6E-06	7.6E-06	5.4E-07	9.4E-06	9.5E-06	5.4E-07	2.7E-06	2.9E-06	5.4E-07
S	3.1E-07	3.3E-07	3.0E-08	3.4E-07	3.6E-07	3.0E-08	4.6E-07	5.0E-07	3.0E-08	1.9E-07	2.4E-07	3.0E-08
SSW	6.2E-07	6.5E-07	5.4E-08	6.7E-07	7.1E-07	5.4E-08	8.6E-07	9.2E-07	5.4E-08	2.8E-07	3.4E-07	5.4E-08
SW	9.2E-06	9.3E-06	7.3E-07	9.9E-06	1.0E-05	7.3E-07	1.2E-05	1.2E-05	7.3E-07	3.5E-06	3.8E-06	7.3E-07
WSW	7.8E-06	7.9E-06	5.8E-07	8.3E-06	8.5E-06	5.8E-07	1.0E-05	1.0E-05	5.8E-07	3.2E-06	3.5E-06	5.8E-07
W	1.0E-05	1.0E-05	6.0E-07	1.1E-05	1.1E-05	6.0E-07	1.5E-05	1.5E-05	6.0E-07	6.3E-06	6.5E-06	6.0E-07
WNW	1.3E-08	1.4E-08	2.4E-09	1.4E-08	1.5E-08	2.4E-09	1.9E-08	2.0E-08	2.4E-09	3.2E-09	3.2E-09	2.4E-09
NW	1.5E-08	1.5E-08	4.2E-09	1.5E-08	1.5E-08	4.2E-09	1.4E-08	1.4E-08	4.2E-09	8.5E-09	8.7E-09	4.2E-09
NNW	3.1E-08	3.1E-08	6.4E-09	3.1E-08	3.1E-08	6.4E-09	2.8E-08	2.8E-08	6.4E-09	1.7E-08	1.7E-08	6.4E-09
MAX.	1.0E-05	1.0E-05	1.0E-06	1.1E-05	1.1E-05	1.0E-06	1.5E-05	1.5E-05	1.0E-06	6.3E-06	6.5E-06	1.0E-06

Attachment 4A  
Radiation Doses to Maximally Exposed Individual Receptor  
From Gaseous Releases in Rem  
Fourth Quarter 1995

	ADULT			TEEN			CHILD			INFANT		
	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN	T.BODY	THYRD	SKIN
N	2.4E-08	2.4E-08	8.4E-09	2.4E-08	2.4E-08	8.4E-09	2.1E-08	2.2E-08	8.4E-09	1.4E-08	1.4E-08	8.4E-09
NNE	2.3E-08	2.3E-08	8.4E-09	2.3E-08	2.3E-08	8.4E-09	2.0E-08	2.1E-08	8.4E-09	1.3E-08	1.3E-08	8.4E-09
NE	2.6E-08	2.6E-08	9.3E-09	2.6E-08	2.6E-08	9.3E-09	2.3E-08	2.4E-08	9.3E-09	1.5E-08	1.5E-08	9.3E-09
ENE	3.1E-08	3.2E-08	1.2E-08	3.1E-08	3.2E-08	1.2E-08	2.8E-08	2.9E-08	1.2E-08	1.8E-08	1.9E-08	1.2E-08
E	2.3E-07	2.4E-07	1.1E-07	2.4E-07	2.6E-07	1.1E-07	2.6E-07	2.8E-07	1.1E-07	1.4E-07	1.6E-07	1.1E-07
ESE	2.1E-07	2.2E-07	1.0E-07	2.1E-07	2.3E-07	1.0E-07	2.3E-07	2.5E-07	1.0E-07	1.3E-07	1.5E-07	1.0E-07
SE	2.9E-07	3.0E-07	1.5E-07	3.0E-07	3.1E-07	1.5E-07	3.0E-07	3.2E-07	1.5E-07	1.9E-07	2.2E-07	1.5E-07
SSE	5.2E-08	5.4E-08	2.5E-08	5.4E-08	5.5E-08	2.5E-08	5.4E-08	5.7E-08	2.5E-08	3.5E-08	4.0E-08	2.5E-08
S	5.9E-08	6.1E-08	2.4E-08	6.1E-08	6.4E-08	2.4E-08	6.5E-08	7.0E-08	2.4E-08	4.4E-08	5.2E-08	2.4E-08
SSW	4.5E-08	4.7E-08	1.9E-08	4.9E-08	4.7E-08	1.9E-08	5.1E-08	5.4E-08	1.9E-08	3.9E-08	4.3E-08	1.9E-08
SW	5.6E-08	5.8E-08	2.5E-08	5.8E-08	6.1E-08	2.5E-08	6.2E-08	6.6E-08	2.5E-08	4.1E-08	4.7E-08	2.5E-08
WSW	1.3E-07	1.4E-07	4.4E-08	1.4E-07	1.5E-07	4.4E-08	1.7E-07	1.8E-07	4.4E-08	8.5E-08	1.1E-07	4.4E-08
W	7.9E-08	8.1E-08	2.3E-08	8.4E-08	8.7E-08	2.3E-08	1.0E-07	1.0E-07	2.3E-08	5.5E-08	6.4E-08	2.3E-08
WNW	5.4E-09	5.5E-09	3.0E-09	5.4E-09	5.5E-09	3.0E-09	5.2E-09	5.3E-09	3.0E-09	3.3E-09	3.4E-09	3.0E-09
NW	7.1E-09	7.2E-09	2.7E-09	7.2E-09	7.3E-09	2.7E-09	6.5E-09	6.6E-09	2.7E-09	4.1E-09	4.3E-09	2.7E-09
NNW	1.7E-08	1.7E-08	5.9E-09	1.7E-08	1.7E-08	5.9E-09	1.5E-08	1.5E-08	5.9E-09	9.5E-09	9.9E-09	5.9E-09
MAX.	2.9E-07	3.0E-07	1.5E-07	3.0E-07	3.1E-07	1.5E-07	3.0E-07	3.2E-07	1.5E-07	1.9E-07	2.2E-07	1.5E-07

Attachment 4B

**Radiation Dose To Maximally Exposed Individual  
From Liquid Release in Rem  
1995**

	Adult	Teen	Child	Infant
<b>First Quarter</b>				
T. Body	3.13E-07	3.14E-07	2.82E-07	1.77E-07
Bone	3.45E-08	3.46E-08	3.46E-08	3.46E-08
Thyroid	3.19E-07	3.21E-07	2.90E-07	1.84E-07
<b>Second Quarter</b>				
T. Body	5.78E-07	5.96E-07	6.12E-07	3.32E-07
Bone	5.61E-08	5.74E-08	6.17E-08	5.63E-08
Thyroid	6.04E-07	6.21E-07	6.56E-07	3.74E-07
<b>Third Quarter</b>				
T. Body	1.15E-05	1.24E-05	1.52E-05	5.76E-06
Bone	2.01E-08	2.31E-08	3.43E-08	2.01E-08
Thyroid	1.16E-05	1.24E-05	1.52E-05	5.83E-06
<b>Fourth Quarter</b>				
T. Body	2.63E-07	2.72E-07	2.84E-07	1.42E-07
Bone	2.65E-08	2.65E-08	2.66E-08	2.65E-08
Thyroid	2.73E-07	2.82E-07	3.00E-07	1.59E-07