Grand Gulf Nuclear Station

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

July 1 - December 31, 1991

Prepared By: D. Crawley 1/29/92

Reviewed By: Rick Buckley 1-13-92

Approved By: [signature] 1-25-92

9203050101 911231
PDR ADOCK 05000416
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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF ATTACHMENTS

I. INTRODUCTION

This Semiannual Radioactive Effluent Release Report for the period of July 1 through December 31, 1991 is submitted in accordance with Section 6.9.1.8 of Appendix A to Grand Gulf Nuclear Station (GGNS) License No. NPF-29. That portion of Appendix A which refers to the monitoring of radioactive effluents, Sections 3/4-11 and 3/4-12, will hereafter be referred to as the Radiological Effluent Technical Specification (RETS).

Airborne discharges at GGNS are considered ground-level releases. All liquid and airborne discharges to the environment were analyzed in accordance with the RETS requirements. All effluent releases were within the concentration and total release limits specified by the RETS.

Projected offsite doses were within the dose limits specified by the RETS. The doses were projected using the methodology of the GGNS Offsite Dose Calculation Manual (ODCM).

The summation of all gaseous releases during the reporting period is given in Table 1A, while elevated releases and ground-level releases for the reporting period are given in Tables 1B and 1C, respectively. Table 1D describes the radioactive gaseous sampling and analysis program implemented at GGNS.

The summation of all liquid releases during the reporting period is given in Table 2A, while continuous and batch mode releases are given in Table 2B. Table 2C describes the radioactive liquid waste sampling and analysis program implemented at GGNS. Solid radioactive waste and irradiated fuel shipments during the reporting period are summarized in Table 3. Meteorological data is included in Tables 4A - 4C. Table 4D presents atmospheric stability classifications.

II. DETAILED INFORMATION

A. Regulatory Limits

1. 10CFR20 Limits

a. Fission and Activation Gases - The release rate limit at any time for noble gases to areas at or beyond the site boundary shall be such that:

D_{tb} = average total body dose rate in the current year (mrem/yr)

$$= \overline{X/Q} \; \Sigma \; K_i \; Q'_i \leq 500 \text{ mrem/yr}$$

D_s = average skin dose rate in the current year (mrem/yr)

$$= \overline{X/Q} \; \Sigma \; (L_i + 1.1 \; M_i) \; Q'_i \leq 3000 \text{ mrem/yr}$$

where the terms are defined in the GGNS ODCM.

b. Radioiodines and Particulates - The release rate limit for the sampling period for all radioiodines, tritium and radioactive materials in particulate form with half-lives greater than 8 days shall be such that:

D_o = average organ dose rate in current year (mrem/yr)

$$= \Sigma_i W \; P_i \; \bar{Q}'_i \leq 1500 \text{ mrem/yr}$$

where the terms are defined in the GGNS ODCM.

c. Liquid Effluents - The concentration of radioactive materials released in liquid effluents to unrestricted areas from the reactors at the site shall not exceed at any time the values specified in 10CFR20, Appendix B, Table II, Column 2. The concentration of dissolved or entrained noble gases, released in liquid effluents to unrestricted areas from all reactors at the site, shall be limited to 2×10^{-4} microcuries/ml maximum concentration.

2. 10CFR50, Appendix I Limits

a. Fission and Activation Gases - The dose from noble gases in gaseous effluents to areas at or beyond the site boundary shall be such that:

D_γ = air dose due to gamma emissions from noble gases

$$= 3.17 \times 10^{-8} \Sigma_i M_i \overline{X/Q}' Q_i \leq 5 \text{ mrad/qtr}$$

$$\leq 10 \text{ mrad/yr}$$

D_β = air dose due to beta emissions from noble gas

$$= 3.17 \times 10^{-8} \Sigma_i N_i \overline{X/Q}' Q_i \leq 10 \text{ mrad/qtr}$$

$$\leq 20 \text{ mrad/yr}$$

where the terms are defined in the GGNS ODCM.

b. Radioiodines and Particulates - The dose to an individual from tritium, I-131, I-133 and radioactive material in particulate form with half-lives greater than 8 days in gaseous effluents shall be such that:

D_p = dose to an individual from tritium, I-131, I-133 and radionuclides in particulate form with half-lives greater than 3 days (mrem)

$$= 3.17 \times 10^{-8} \sum_i R_i W' Q_i \leq 7.5 \text{ mrem/qtr Any Organ}$$

$$\leq 15 \text{ mrem/yr Any Organ}$$

where the terms are defined in the GGNS ODCM.

c. Liquid Effluents - The dose from radioactive materials in liquid effluents shall be such that:

$$D_{Tau} = \Sigma_i \left[A_{iTau} \sum_{i=1}^{m} \Delta t_1 C_{i1} F_1\right] \leq 1.5 \text{ mrem/qtr Total Body}$$

$$\leq 5 \text{ mrem/qtr Any Organ}$$

$$\leq 3 \text{ mrem/yr Total Body}$$

$$\leq 10 \text{ mrem/yr Any Organ}$$

where the terms are defined in the GGNS ODCM.

3. 40CFR190 Limits

Doses are calculated for Fission and Activation Gases; Radioiodines and Particulates; and Liquid Effluents according to equations contained in Sections 2.(a), (b), and (c) respectively, with the exception that the limits applied are:

≤25 mrem/yr, Total Body or any Organ except Thyroid

≤75 mrem/yr, Thyroid

≤10 mrad γ/qtr or ≤20 mrad γ/yr, Fission and Activation Gases

≤20 mrad β/qtr or ≤40 mrad β/yr, Fission and Activation Gases

≤15 mrem/qtr or ≤30 mrem/yr, any Organ, Iodine and Particulates

≤3 mrem/qtr or ≤6 mrem/yr, Total Body, Liquid Effluents

≤10 mrem/qtr or ≤20 mrem/yr, any Organ, Liquid Effluents

B. Maximum Permissible Concentrations

1. Airborne

The Maximum Permissible Concentration (MPC) of radioactive materials in gaseous effluents is limited by the dose rate restrictions of 10CFR20. In this case, the MPCs are actually determined by the dose factors in Table 2.1-1 of the GGNS ODCM.

2. Liquid

The MPC of radioactive materials in liquid effluents is limited by 10CFR20, Appendix B, Table II, Column 2. The MPC chosen is the most conservative value of either the soluble or insoluble MPC for each radioisotope.

C. Average Energy

Not applicable for GGNS RETS.

D. Measurements and Approximations of Total Activity

The following discussion details the methods used to measure and approximate total activity for the following:

1. Fission and Activation Gases
2. Radioiodines
3. Particulates
4. Liquid Effluents

Tables 1D and 2C give sampling frequencies and minimum detectable sensitivity requirements for the analysis of gaseous and liquid effluent streams, respectively.

Values in the attached tables given as zero do not necessarily imply that the radionuclides were not present. A zero indicates that the radionuclide was not present at levels greater than the sensitivity requirements shown in Tables 1D and 2C. For some radionuclides, lower detection limits than required may be readily achievable; when a radionuclide is measured below its stated detection limits, it is reported.

1. For Fission and Activation Gases

The following noble gases are considered in evaluating gaseous airborne discharges:

Ar-41	Xe-131m
Kr-85m	Xe-133
Kr-85	Xe-133m
Kr-87	Xe-135m
Kr-88	Xe-135
Kr-89	Xe-138

Periodic grab samples from Station effluent streams are analyzed by a computerized pulse height analyzer system utilizing high-resolution germanium detectors. (See Table 1D for sampling and analytical requirements.) Isotopic values thus obtained are used for dose release rate calculations due to effluent releases as given in Section II.A.1. of this report. Only those radionuclides that are detected are used in this computation. During the period between grab samples, the amount of radioactivity released is based on the effluent monitor readings. Monitors are assigned a calibration factor based upon the last isotopic analysis, using the following relationship:

$$C_i = U_i \div m$$

where

C_i = isotopic calibration factor for isotope i

U_i = concentration of isotope i in the grab sample in μCi/ml.

m = net monitor reading associated with the effluent stream (determined at the time of grab sampling).

These calibration factors, along with the hourly effluent monitor values and flow rates, are entered into the laboratory computer where the release rates for individual radionuclides are calculated and stored. If no activity is detected in the grab sample, the calibration factor defaults to a historical mixture of Kr-88, Xe-133, Xe-135m, Xe-135, and Xe-138.

2. For Particulates and Radioiodines

The radioiodines and radioactive materials in particulate form to be considered are:

Zn-65	I-133
Cr-51	Cs-134
Mn-54	Cs-136
Fe-59	Cs-137
Co-58	Ba-140
Co-60	Ce-141
Sr-89	Ce-144
Sr-90	Other radionuclides
Zr-95	with half-lives
Sb-124	greater than
I-131	8 days.

3. For Continuous Releases

Continuous sampling is performed on the continuous release points (i.e., Radwaste Vent, Containment Purge, Fuel Handling Area Vent, Turbine Building Vent). Particulate material is collected by filtration. Radioiodines are collected by adsorption onto a charcoal filter. Periodically these filters are removed and analyzed on the pulse height analyzer to identify and quantify radioactive materials collected on the filters. Particulate filters are then analyzed for gross alpha and Strontium-89 and -90 as required. Gross alpha determinations are made using a 2-pi gas flow proportional counter. Strontium-89 and -90 values are obtained by chemical separation and subsequent analysis using 2-pi gas flow proportional counters. During major operational occurrences, the frequency of sampling is increased to satisfy the requirements of footnote "c" of Table 1D, "Radioactive Gaseous Waste Sampling and Analysis," (GGNS RETS, Table 4.11.2.2-1).

4. For Batch Releases: Gases

The processing of batch type releases (from Containment Purge) is analogous to that for continuous releases.

5. For Batch Releases: Liquid Effluents

The radionuclides listed below are considered when evaluating liquid effluents:

H-3	Mo-99
Co-58	Tc-99m
Co-60	I-131
Fe-55	I-132
Fe-59	I-133
Zn-65	I-135
Mn-54	Cs-134
Cr-51	Cs-137
Sr-89	Ba-140
Sr-90	La-140
Nb-95	Ce-141
Zr-95	Ce-144

Representative pre-release grab samples are obtained and analyzed as required by Table 2C. Isotopic analyses are performed using the computerized pulse height analysis system previously described. Aliquots of each pre-released sample, proportional to the waste volume released, are composited in accordance with the requirements of Table 2C. Strontium determinations are made by performing a chemical separation and counting the separated strontium using a 2-pi gas flow proportional counter. Gross alpha determinations are made using 2-pi gas flow proportional counters. Tritium and Iron-55 concentrations are determined by using liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and then counting on the pulse height analyzer system.

E. Batch Releases

1. Liquid

3rd Quarter 1991

a.	Number of batch releases: 84	
b.	Total time period for batch releases:	25,607 minutes
c.	Maximum time period for a batch release:	328 minutes
d.	Average time period for batch releases:	305 minutes
e.	Minimum time period for a batch release:	247 minutes

4th Quarter 1991

a.	Number of batch releases: 75	
b.	Total time period for batch releases:	22,722 minutes
c.	Maximum time period for a batch release:	420 minutes
d.	Average time period for batch releases:	303 minutes
e.	Minimum time period for a batch release:	90 minutes

2. Gaseous

3rd & 4th Quarter 1991

No batch releases were made during this period.

F. Unplanned Releases

1. Liquid

3rd & 4th Quarter 1991

No unplanned liquid release occurred during this period.

2. Gaseous

3rd & 4th Quarter 1991

No unplanned gaseous release occurred during this period.

G. Estimate of Total Error

1. Liquid

The maximum errors are collectively estimated to be

	Fission & Activation Products	Tritium	Dissolved & Entrained Gases	Gross Alpha
Sampling	26%	26%	26%	26%
Measurement	68%	65%	61%	92%
Total	73%	70%	66%	95%

Sampling errors include uncertainty associated with mixing, representative sampling and discharge volume. Measurement errors include uncertainty associated with instrument calibration and the preparation and counting of low-activity samples. Counting errors are based on measurements of blank samples and, for germanium detectors, the least-readily-detectable radioisotope. Calibration errors are calculated by summing the errors associated with the calibration of a particular instrument with a radioactive source.

Total error is calculated by taking the square root of the sum of the squares of the individual errors.

2. Gaseous

The maximum errors (not including sample line loss) are collectively estimated to be

	Fission & Activation Gases	Iodine	Particulate	Gross Alpha	Tritium
Sampling	32%	23%	22%	22%	23%
Measurement	61%	67%	65%	101%	62%
Total	69%	71%	69%	103%	66%

Sampling errors include uncertainty associated with sample flow, vent flow and monitor calibration.

Measurement errors include uncertainty associated with instrument calibration and preparation and counting of low-activity samples. Measurement and total errors are calculated by the same methods used for liquid effluents.

3. Solid Radioactive Waste

See Table 3 for error terms.

H. Solid Radioactive Waste Shipments

See Table 3 for shipment information.

I. Meteorological Data

1. Meteorological Data Recovery Rate
3rd Qtr.

Parameter	% Data Recovery
50m Wind Direction	99.64
50m Wind Speed	99.64
10m Wind Direction	99.64
10m Wind Speed	99.64
Temperature	99.64
Dew Point	98.01
Delta T	99.64
Precipitation	99.64

4th Qtr. Parameter	% Data Recovery
50m Wind Direction	99.18
50m Wind Speed	99.18
10m Wind Direction	100.00
10m Wind Speed	100.00
Temperature	100.00
Dew Point	95.88
Delta T	98.64
Precipitation	98.37

2. Meteorological data for the period of the report is included in Tables 4A through 4C.

J. Radioactive Effluent Monitoring Instrumentation Operability

No reportable instances of inoperability occurred during the report period.

K. Annual Sewage Disposal Summary

Table 3, Section C, summarizes the 1991 sewage sludge shipments. Attachment I is the report submitted to the State of Mississippi.

III. 1991 RADIATION DOSE SUMMARY

Indicated below is the annual summary of offsite doses attributable to GGNS during 1991. Inspection of the values indicate that GGNS releases were within the 10CFR50, Appendix I design objectives.

Since there are no other fuel cycle facilities within 8 km of GGNS, 40CFR190 limits have also been met during this period.

All parameters listed were calculated in accordance with the GGNS ODCM.

A. Water-Related Exposure Pathways

The values calculated in this section utilize the information provided in Tables 2A and 2B of this report and the calculational methodology of the ODCM.

Liquid Effluents

Total body dose and critical organ doses are computed for the maximum exposed individual. The maximum dose contribution from liquid effluents is considered to occur in the adult age group via consumption of fish.

1991 Liquid Effluent Dose (mrem)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Whole Body	4.60E-02	1.24E-02	7.09E-03	1.01E-02	7.56E-02
Bone	9.84E-02	2.42E-02	2.80E-02	1.45E-02	1.65E-01
Liver	1.11E-01	4.03E-02	2.61E-02	3.35E-02	2.11E-01
Thyroid	5.67E-04	5.74E-04	4.57E-04	5.15E-04	2.11E-03
Kidney	1.69E-02	7.12E-03	2.09E-03	7.42E-03	3.35E-02
Lung	3.72E-02	9.78E-03	1.12E-02	4.07E-03	6.23E-02
GI-LLI	1.60E-01	1.09E-01	4.21E-02	1.53E-01	4.64E-01

B. Airborne-Related Exposure Pathways

The values presented in this section utilize information provided in Tables 1A and 1C of this report and the calculational methodology of the ODCM. Doses and dose rates are computed for locations at the site boundary or at unrestricted areas within the site boundary. The use of unrestricted areas within the site boundary as controlling receptor locations provides assurance that offsite doses will not be substantially underestimated, as well as determining the radiation dose from gaseous effluents to members of the public due to their activities inside the site boundary.

Particulate, Radioiodine and Tritium

Organ doses from exposure to radioiodines, tritium and particulates are computed for an individual located in the south sector at a distance of 0.5 miles. This location corresponds to one of the two onsite GGNS gardens. Pathways considered in the dose calculations are inhalation, ground plane, grass/cow/milk, grass/cow/meat and vegetation. For a particular radionuclide, the maximum dose factor obtainable from a combination of age groups and organs is used in the calculation of organ dose.

Noble Gases

Gamma and beta air dose and individual total body and skin dose rates from exposure to a semi-infinite cloud of noble gas are computed for a location in the west-northwest sector at a distance of 0.75 miles. This controlling location corresponds to the highest annual average atmospheric dispersion for an unrestricted area inside the site boundary (Hamilton Lake). The total body and skin doses reported below are derived from the quarterly average of the maximum instantaneous dose rates determined daily during the reporting period and would represent the maximum possible dose received by members of the public onsite.

Direct Radiation

Direct radiation dose is calculated by subtracting average doses measured by thermoluminescent dosimeter (TLD) badges located at control locations from average doses measured by TLD badges located near the site boundary.

1991 Airborne Effluent Dose (mrem)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Iodine, Tritium & Particulates	1.79E-03	5.40E-02	4.36E-02	8.81E-01	9.80E-01
Fission and Activation Gases (Total Body dose)	2.92E-02	1.79E-01	1.21E-01	1.69E-02	3.46E-01
(Skin dose)	5.12E-02	3.21E-01	2.13E-01	3.40E-02	6.19E-01
Gamma Air dose*	4.79E-03	9.71E-03	3.80E-03	2.40E-03	2.07E-02
Beta Air dose*	2.93E-03	6.21E-03	3.26E-03	2.70E-03	1.51E-02
Direct Radiation	0.2	0.2	1.8	0.1	2.3

*Measurement units are mrad

IV. OFFSITE DOSE CALCULATION MANUAL/PROCESS CONTROL PROGRAM/RADIOACTIVE WASTE TREATMENT SYSTEM CHANGES

A. Offsite Dose Calculation Manual (ODCM)

No changes were made during the report period.

B. Process Control Program (PCP)

No changes were made during the report period.

C. Radioactive Waste Treatment Systems

No major changes were made during the report period.

TABLE 1A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1991

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

JULY - DECEMBER 1991

	Unit	Quarter	Quarter	Est Total
Grand Gulf Nuclear Station UNIT 1		3	4	Error %
A. Fission & Activation Gases				
1. Total release	Ci	9.11E+00	1.09E+01	6.90E+01
2. Average release rate for period	uCi/sec	1.16E+00	1.39E+00	
3. % of Technical specification limit	%	7.26E-02	4.82E-02	
B. Iodines				
1. Total iodine-131	Ci	7.49E-05	1.86E-03	7.10E+01
2. Average release rate for period	uCi/sec	9.53E-06	2.36E-04	
3. % of Technical specification limit	%	3.75E-03	9.29E-02	
C. Particulates				
1. Particulates with half-lives>8 days	Ci	7.83E-03	6.91E-05	6.90E+01
2. Average release rate for period	uCi/sec	9.96E-04	8.79E-06	
3. % of Technical specification limit	%	9.63E-02	1.06E-01	
4. Gross alpha radioactivity	Ci	1.15E-11	1.82E-08	
D. Tritium				
1. Total release	Ci	1.55E+00	1.93E+00	6.60E+01
2. Average release rate for period	uCi/sec	1.97E-01	2.45E-01	
3. % of Technical specification limit	%	1.34E-02	1.67E-02	
E. Tritium,radioiodines and particulates				
1. % of Technical specification limit	%	1.10E-01	1.23E-01	

TABLE 1B

Grand Gulf Nuclear Station

JULY - DECEMBER 1991

GASEOUS EFFLUENTS - ELEVATED RELEASES

(Not Applicable - GGNS releases are considered ground level)

TABLE 1C

Grand Gulf Nuclear Station UNIT 1

JULY - DECEMBER 1991

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1991

GASEOUS EFFLUENTS-GROUND-LEVEL RELEASE

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission gases					
KR-85	Ci	4.63E-01	0.00E+00	0.00E+00	0.00E+00
KR-89	Ci	6.36E-01	0.00E+00	0.00E+00	0.00E+00
XE-133	Ci	3.38E+00	5.63E+00	0.00E+00	0.00E+00
KR-88	Ci	1.38E-01	1.82E-01	0.00E+00	0.00E+00
XE-135	Ci	3.69E+00	4.43E+00	0.00E+00	0.00E+00
XE-138	Ci	1.31E-01	2.05E-01	0.00E+00	0.00E+00
XE-135M	Ci	6.19E-01	4.80E-01	0.00E+00	0.00E+00
AR-41	Ci	5.77E-02	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	9.11E+00	1.09E+01	0.00E+00	0.00E+00
2. Iodines					
I-131	Ci	7.49E-05	1.84E-03	0.00E+00	0.00E+00
I-132	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	Ci	4.40E-05	9.94E-04	0.00E+00	0.00E+00
I-134	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	1.19E-04	2.84E-03	0.00E+00	0.00E+00
3. Particulates					
H-3	Ci	1.55E+00	1.93E+00	0.00E+00	0.00E+00
Sr-89	Ci	3.84E-06	8.68E-06	0.00E+00	0.00E+00
Sr-90	Ci	6.42E-08	0.00E+00	0.00E+00	0.00E+00
CO-60	Ci	8.33E-05	7.82E-06	0.00E+00	0.00E+00
MN-54	Ci	6.30E-05	7.67E-06	0.00E+00	0.00E+00
CO-58	Ci	4.15E-05	0.00E+00	0.00E+00	0.00E+00
I-131	Ci	0.00E+00	1.60E-05	0.00E+00	0.00E+00
I-133	Ci	0.00E+00	2.89E-05	0.00E+00	0.00E+00
TC-99M	Ci	4.59E-03	0.00E+00	0.00E+00	0.00E+00
CR-51	Ci	1.67E-03	0.00E+00	0.00E+00	0.00E+00
AS-76	Ci	4.28E-04	0.00E+00	0.00E+00	0.00E+00
NA-24	Ci	8.47E-04	0.00E+00	0.00E+00	0.00E+00
RU-106	Ci	6.57E-05	0.00E+00	0.00E+00	0.00E+00
MO-99	Ci	4.49E-05	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	1.56E+00	1.93E+00	0.00E+00	0.00E+00

TABLE 1D

Grand Gulf Nuclear Station

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

		Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection Required (LLD) (μCi/ml)[a]	Lower Limit of Detection (Worst Case) Capability (μCi/ml)[a]
A.	(1)	Radwaste Building Ventilation Exhaust	M Grab Sample	M	Principal Gamma Emitters[b,e]	1E-04	1.5E-07
					H-3	1E-06	1.8E-10
	(2)	Fuel Handling Area Ventilation Exhaust	Continuous[d]	W[c] Charcoal Sample	I-131	1E-12	6.0E-13
					I-133	1E-10	9.0E-13
	(3)	Containment Ventilation Exhaust	Continuous[d]	W[c] Particulate Sample	Principal Gamma Emitters[e] (I-131, Others)	1E-11	9.6E-13
	(4)	Turbine Building Ventilation Exhaust	Continuous[d]	M Composite Particulate Sample	Gross Alpha	1E-11	1.8E-14
			Continuous[d]	Q Composite Particulate Sample	Sr-89, Sr-90	1E-11	1.1E-14
			Continuous	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1E-06	4.4E-07

Note: Footnotes indicated are listed in GGNS Technical Specifications, Table 4.11.2.1.2-1.

TABLE 1D (Continued)

Grand Gulf Nuclear Station

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

		Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection Required (LLD) (μCi/ml)[a]	Lower Limit of Detection (Worst Case) Capability (μCi/ml)[a]
B.	(1)	Offgas Post Treatment Exhaust, whenever there is flow	M Grab Sample	M	Principal Gamma Emitters[e]	1E-04	5.4E-05
	(2)	Standby Gas Treatment A Exhaust, whenever there is flow					
	(3)	Standby Gas Treatment B Exhaust, whenever there is flow					

Note: Footnotes indicated are listed in GGNS Technical Specifications, Table 4.11.2.1.2-1.

TABLE 2A

Grand Gulf Nuclear Station

JULY - DECEMBER 1991

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est Total Error %
A. Fission & activation products				
1. Total release (not including H3, gases,alpha)	Ci	1.63E-01	7.66E-02	7.30E+01
2. Average diluted concentration during period	uCi/ml	2.43E-07	1.33E-07	
3. Percent of applicable limit	%	6.92E-02	1.71E-01	
B. Tritium				
1. Total release	Ci	4.44E+00	6.57E+00	7.00E+01
2. Average diluted concentration during period	uCi/ml	6.62E-06	1.14E-05	
3. Percent of applicable limit	%	2.21E-01	3.80E-01	
C. Dissolved and entrained gases				
1. Total release	Ci	5.73E-04	2.57E-04	6.60E+01
2. Average diluted concentration during period	uCi/ml	8.56E-10	4.45E-10	
3. Percent of applicable limit	%	8.56E-03	4.45E-03	
D. Gross alpha radioactivity				
1. Total release	Ci	0.00E+00	0.00E+00	9.50E+01
E. Volume of waste (prior to dilution)	liters	8.90E+06	7.80E+06	5.00E+00
F. Volume of dilution water used	liters	6.61E+08	5.69E+08	5.00E+00

TABLE 2B

Grand Gulf Nuclear Station

JULY - DECEMBER 1991

LIQUID EFFLUENTS - CONTINUOUS AND BATCH MODES

Nuclides Released	Unit	CONTINUOUS MODE		BATCH MODE	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
strontium-89	Ci	0.00E+00	0.00E+00	0.00E+00	9.01E-04
strontium-90	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cesium-134	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cesium-137	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
iodine-131	Ci	0.00E+00	0.00E+00	4.56E-06	0.00E+00
cobalt-58	Ci	0.00E+00	0.00E+00	5.10E-04	6.53E-04
cobalt-60	Ci	0.00E+00	0.00E+00	5.71E-03	1.11E-02
iron-59	Ci	0.00E+00	0.00E+00	7.69E-05	5.64E-03
zinc-65	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
manganese-54	Ci	0.00E+00	0.00E+00	4.15E-03	1.52E-02
chromium-51	Ci	0.00E+00	0.00E+00	2.73E-02	1.70E-02
zirconium-niobium-95	Ci	0.00E+00	0.00E+00	0.00E+00	1.22E-04
molybdenum-99	Ci	0.00E+00	0.00E+00	5.73E-05	0.00E+00
technetium-99m	Ci	0.00E+00	0.00E+00	1.88E-04	3.04E-05
barium-lanthanum-140	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
cerium-141	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cu-64	Ci	0.00E+00	0.00E+00	8.80E-04	2.02E-04
I-133	Ci	0.00E+00	0.00E+00	4.51E-06	0.00E+00
As-76	Ci	0.00E+00	0.00E+00	6.19E-04	2.45E-05
Mn-56	Ci	0.00E+00	0.00E+00	0.00E+00	5.95E-06
Ag-110m	Ci	0.00E+00	0.00E+00	2.62E-06	8.39E-06
Na-24	Ci	0.00E+00	0.00E+00	2.35E-05	9.27E-06
Sb-124	Ci	0.00E+00	0.00E+00	0.00E+00	4.37E-05
Re-188	Ci	0.00E+00	0.00E+00	2.48E-05	0.00E+00
Fe-55	Ci	0.00E+00	0.00E+00	1.23E-01	2.57E-02
Total for period (above)	Ci	0.00E+00	0.00E+00	1.63E-01	7.66E-02
xenon-133	Ci	0.00E+00	0.00E+00	7.41E-05	1.31E-04
xenon-135	Ci	0.00E+00	0.00E+00	4.99E-04	1.26E-04

TABLE 2C

Grand Gulf Nuclear Station

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

	Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection Required (LLD) (μCi/ml)[a]	Lower Limit of Detection (Worst Case) Capability (μCi/ml)[a]
A.	Batch Waste Release Tanks[c]	P Each Batch	P Each Batch	Principal Gamma Emitters[d]	5E-07	1.6E-07
				I-131	1E-06	2.3E-08
		P One Batch/M	M	Dissolved and Entrained Gases (gamma emitters)	1E-05	7.1E-08
		P Each Batch	M Composite[b]	H-3	1E-05	4.4E-06
				Gross Alpha	1E-07	3.8E-08
		P Each Batch	Q Composite[b]	Sr-89, Sr-90	5E-08	2.6E-08
				Fe-55	1E-06	1.4E-07
B.	SSW Basin (prior to blowdown)	Each Blowdown	Each Batch	Principal Gamma Emitters[d]	5E-07	1.6E-07
				I-131	1E-06	2.3E-08

Note: Footnotes indicated are listed in GGNS Technical Specifications, Table 4.11.1.1.1-1.

TABLE 3

Grand Gulf Nuclear Station

JULY - DECEMBER 1991

SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipments for Burial or Disposal

1. Type of Waste	Unit	6-Month Period	Estimate Total Error, %
a. Spent resins, filter sludges, oil, evaporator bottoms, etc.	m^3	1.02E+02	
	*Ci	1.94E+03	7.2E+01
b. Dry compressible waste, contaminated equipment, etc.	m^3	3.70E+00	
	*Ci	6.92E+00	6.9E+01
c. Irradiated components, control rods, etc.	m^3	None	N/A
	*Ci		
d. Other	m^3	None	N/A
	*Ci		

*Total curie quantity determined by measurement. Total volume used is burial container volume.

2. Estimate of major radionuclide composition (by type of waste as identified above).

a.	Fe-55	65%
	Co-60	14%
	Mn-54	13%
	Cr-51	5%
	All Others	3%
b.	Fe-55	82%
	Fe-59	1%
	Co-60	6%
	Mn-54	7%
	Cr-51	2%
	All Others	2%
c.	N/A	N/A
d.	N/A	N/A

TABLE 3 (Continued)

Grand Gulf Nuclear Station

JULY - DECEMBER 1991

SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS

3. Solid Waste Disposition

a. Resins were dewatered in steel liners or High Integrity Containers according to the requirements of the GGNS PCP and shipped to Barnwell, SC for burial. Some resin was shipped to Scientific Ecology Group (SEG) of Oak Ridge, TN for volume reduction. SEG shipped reduced waste to Barnwell, SC. Reduced volume was used in providing information given in A.1.a.

b. DAW was packaged in 20' sealands or B-25 boxes and shipped to Scientific Ecology Group (SEG) of Oak Ridge, TN for volume reduction. SEG shipped reduced waste to Barnwell, SC. Reduced volume was used in providing information given in A.1.b.

c. No irradiated components were shipped.

Number of Shipments	Mode of Transportation	Destination
20	Truck	Barnwell, SC

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

C. Annual Sewage Sludge Summary

Number of Shipments	Total Gallons	Average Co-60 Activity (pCi/l)	Average Mn-54 Activity (pCi/l)
0	0	0	0