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U.S. Nuclear Regulatory Commission
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Gentlemen:

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UNION ELECTRIC COMPANY
CALLAWAY PLANT
FACILITY OPERATING LICENSE NPF-30
1999 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Please find enclosed the 1999 Annual Radioactive Effluent Release Report for the Callaway Plant. This report is submitted in accordance with section 5.6.3 of the Technical Specification.

Sincerely,

A handwritten signature in cursive script, reading "Alan C. Passwater".

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BFH/jdg

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CALLAWAY PLANT

1999

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT



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1.0 INTRODUCTION

This report describes the Union Electric Co. Callaway Plant radioactive effluent releases for 1999. It is submitted in accordance with Section 5.6.3 of the Callaway Plant Technical Specifications.

A summary of radioactivity released in liquid and gaseous effluents and solid waste shipped from the Callaway Plant during the period from January 1, 1999 to December 31, 1999 is presented.

All liquid and gaseous effluents discharged during this reporting period complied with federal regulations and the limits in the Offsite Dose Calculation Manual (ODCM).

2.0 SUPPLEMENTAL INFORMATION

2.1 REGULATORY LIMITS

The Radiological Effluent Control (REC) limits applicable to the release of radioactive material in liquid and gaseous effluents are provided below.

FISSION AND ACTIVATION GASES (NOBLE GASES)

The dose rate due to radioactive noble gases released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

The air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the site boundary shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation and,
- b. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

RADIOIODINE, TRITIUM, AND PARTICULATES

The dose rate due to Iodine-131 and 133, tritium and all radionuclides in particulate form with half-lives greater than eight (8) days released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to 1500 mrem/yr to any organ.

The dose to a Member of the Public from Iodine-131 and 133, tritium, and all radionuclides in particulate form with half-lives greater than eight (8) days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 7.5 mrem to any organ and,
- b. During any calendar year: Less than or equal to 15 mrem to any organ.

LIQUID EFFLUENTS

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in Appendix B, Table II, Column 2 to 10CFR20.001 to 20.601 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-04 microcuries/ml total activity.

The dose or dose commitment to an Individual from radioactive materials in liquid effluents released to unrestricted areas shall be limited:

- a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ, and
- b. During any calendar year to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.

URANIUM FUEL CYCLE SOURCES

The annual (calendar year) dose or dose commitment to any Member of the Public due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem.

2.2 MAXIMUM PERMISSIBLE CONCENTRATIONS

The maximum permissible concentration values specified in Appendix B, Table II, Column 2 to 10CFR20.001 to 20.601 are used to calculate release rates and permissible concentrations of liquid radioactive effluents at the unrestricted area boundary. A value of 2.0E-4 microcuries/ml is used as the limiting concentration for dissolved and entrained noble gases in liquid effluents.

For gaseous effluents, maximum permissible concentrations are not utilized in release rate calculations since the applicable limits are based on dose rate at the site boundary. The "Percent of Tech Spec Limit" for Table 1A is therefore not applicable to the Callaway Plant.

2.3 AVERAGE ENERGY

This requirement is not applicable to the Callaway Plant radiological effluent monitoring program since the release rate limits for fission and activation gases in gaseous effluent are not based on the average energy of the radionuclide mixture.

2.4 MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

Radionuclide concentrations in liquid and gaseous effluents were obtained by effluent sampling and radiological analysis in accordance with the requirements of Final Safety Analysis Report Table 16.11-1 and Table 16.11-4.

Gamma spectroscopy was the primary analysis technique used to determine the radionuclide composition and concentration of liquid and gaseous effluents. Composite samples were analyzed for Sr-89, Sr-90, Fe-55, and transuranic nuclides by an independent laboratory. Tritium and gross alpha were measured for both liquid and gaseous effluents using liquid scintillation counting and gas flow proportional counting techniques, respectively.

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

2.5 BATCH RELEASES

Summary information relating to batch releases of gaseous and liquid effluents to the environment from the Callaway Plant during this year is presented below.

LIQUID

	UNITS	JAN-JUN	JUL-DEC
Number of batch releases:	----	128	139
Total time period for batch releases:	Minutes	61,038	69,886
Maximum time period for batch releases:	Minutes	1,076	1,370
Average time period for batch releases:	Minutes	477	503
Minimum time period for batch releases:	Minutes	3	68
Average Missouri River flow during periods of effluent release to the river ¹ :	ft ³ /sec	145,610	80,883

GASEOUS

	UNITS	JAN - JUN	JUL - DEC
Number of batch releases:	----	40	40
Total time period for batch releases:	Minutes	2740	12730
Maximum time period for batch releases:	Minutes	532	4971
Average time period for batch releases:	Minutes	69	318
Minimum time period for batch releases:	Minutes	30	26

¹ Letter, S. Ternes, United States Department of Interior - Geological Survey - Water Resource Division dated January 27, 2000.

2.6 ABNORMAL RELEASES

LIQUID

Number of releases: 0

Total Activity released: 0

GASEOUS

Number of releases: 1

Total Activity released: 2.85 E-2 curies

3.0 SUMMARY OF GASEOUS RADIOACTIVE EFFLUENTS

The quantity of radioactive material released in gaseous effluents during the year is summarized in Tables 1A and 1B. During 1999, all gaseous effluents were considered as ground level releases.

4.0 SUMMARY OF LIQUID RADIOACTIVE EFFLUENTS

The quantity of radioactive material released in liquid effluents during the year is summarized in Tables 2A and 2B. During 1999, there was no continuous release of liquid effluent from the plant.

5.0 SOLID WASTES

The quantities of radioactive material released in shipments of solid waste for burial and irradiated fuel transported from the site during the year are summarized in Table 3. The total quantity and radioactivity reported in Table 3 for each waste type was for waste buried and includes wastes buried by waste reprocesses after volume reduction. The activity and fractional abundance of each nuclide was determined for each waste type based upon radiochemical analysis by an independent laboratory. The curie concentration of each nuclide listed in Table 3 was determined as the product of the fractional abundance and the total curies shipped. Those nuclides which comprise at least 1% of the total activity for a particular waste type are presented in Table 3.

6.0 RELATED INFORMATION

6.1 UNPLANNED RELEASES

Unplanned releases are:

- 1) Inadvertent or accidental releases of radioactive material.
- 2) Releases of radioactive material via normal pathways without a release permit, proper authorization, or proper sampling and analysis.
- 3) Releases which are conducted in such a manner as to result in significant deviation from the requirements of the release permit.

AUXILIARY BOILER CONTAMINATION

On April 10, 1998, radioactivity was detected in the Auxiliary Boiler feed water system. The plant was performing a refueling outage during this time. The boiler was flushed and cleaned several times in an attempt to decontaminate the unit. Small amounts of contamination remained in the sludge. During subsequent operation of the boiler small amounts of contamination leached from the sludge and were detected in the boiler water.

An investigation was performed to locate the source of the contamination. No miss-positioned valves or leaks were identified. The results of sampling different system components were inconclusive, but may indicate a small leak in the SLWE heat exchanger. During refueling operations, the concentration of radioactive nuclides in the SLWE system can be a factor of 1000 higher than normal operations. The size of the leak may be small enough to only be recognized when these high concentrations are present. Increased monitoring was initiated in an attempt to identify the source of the contamination. No additional contamination was identified.

A 10CFR50.59 evaluation concluded that the resulting dose to a Member of the Public from the release of radioactive material to the environment would be a small fraction of the regulatory dose limits. Therefore, continued operation of the Auxiliary Boiler would not pose any significant safety or environmental concern.

The Auxiliary Boiler was operated intermittently during 1999. The maximum total body dose to a Member of the Public from these releases was $1.4E-03$ mrem during 1999. This is negligible compared to the quarterly and annual effluent control limits. The activity released from the Auxiliary Boiler during 1999 is included in Tables 1A, 1B, 5, 6 and 7. A description of this event is documented in the plant Corrective Action Program¹

¹ SOS 99-0119, 99-0308, 99-0743, 99-0890, 99-1869.

6.2 CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

No revisions were made to APA-ZZ-01003, "Callaway Plant Off-Site Dose Calculation Manual".

6.3 MAJOR CHANGES TO RADWASTE TREATMENT SYSTEMS¹

During 1999, there were no plant modifications that would be considered a major change to the gaseous or solid radwaste treatment system. There were also no major changes to the Liquid Radwaste Treatment system.

6.4 LAND USE CENSUS CHANGES

No changes were identified that required a change to the location of the nearest resident yielding the highest calculated dose commitment.

6.5 INOPERABILITY OF EFFLUENT MONITORING INSTRUMENTATION

During 1999 all effluent monitoring instrumentation was OPERABLE within the limits specified in Radioactive Effluent Controls 16.11.1.3 and 16.11.2.4 with the following exceptions.

On August 11, 1999 at 0925, Callaway Plant experienced a secondary piping failure (LER 99-003-00). The steam caused a voltage spike in Inverter SP01 that supplies power to several radiation monitors. The voltage spike caused varistors and fuses to fail in radiation monitors GT-RE-21A and GT-RE-21B (Unit Vent) and GE-RE-10A and GE-RE-10B (Radwaste Vent). Alternate sampling was established for the Unit Vent within one hour and for the Radwaste Vent within two hours. A description of this event is documented in the plant Corrective Action Program².

On February 4, 1999, it was discovered that the dilution flow switch FSDB1017 was set to a low dilution flow setpoint of 3,000 gpm when it should have been set to 5,000 gpm. This setpoint is used to automatically terminate a liquid discharge if the dilution flow falls below the desired set point. Discharge Monitor Tank B was released with the non-conservative set point installed under permit number RP10-

¹ Plant Memo NES 00-008

² SOS 99-1606

below 5,000 gpm during the release of the Discharge Monitor Tank. A description of this event is documented in the plant Corrective Action Program¹.

6.6 INSTANCES OF LIQUID HOLDUP TANKS OR WASTE GAS DECAY TANKS EXCEEDING TECHNICAL SPECIFICATION LIMITS

All liquid tanks and waste gas decay tanks were within limits specified in Radioactive Effluent Controls 16.11.1 and 16.11.2 during the reporting period.

¹ SOS 99-0247

7.0 METEOROLOGICAL DATA

The on-site meteorological data for this reporting period is presented in Table 4. The data is presented as Cumulative Joint Frequency Distributions of wind speed and wind direction by atmospheric stability class for the 10 and 60 meter tower elevations. Valid data recovery for 1999 was greater than 90% for all required parameters.

8.0 ASSESSMENT OF DOSES

Assessment of doses to the maximum exposed individual from gaseous and liquid effluents released was performed in accordance with the ODCM as described in the following sections. For all effluents released from the Callaway Plant during this year, the annual dose to the maximum exposed individual was less than 1% of the Radiological Effluent Control Limits presented in Section 2.1 of this report.

8.1 DOSE AT THE SITE BOUNDARY FROM GASEOUS EFFLUENTS

The dose at the Site Boundary was due to plume exposure from noble gases, ground plane exposure, and inhalation. It was conservatively assumed that a hypothetical maximum exposed individual was present at the Site Boundary location with the most limiting atmospheric dispersion (based on actual meteorological conditions for the year). Dose was conservatively calculated using a child as the critical age group.

The dose from gaseous effluents at the Site Boundary for 1999 is presented in Table 5.

8.2 DOSE TO THE MEMBER OF THE PUBLIC

The Member of the Public is considered to be a real individual, not occupationally associated with the plant, who uses portions of the plant site for recreational or other purposes not associated with plant operation. This individual's utilization of areas both inside and outside the Site Boundary was characterized for this calculation and is described in the ODCM.

To evaluate total dose from the Uranium Fuel Cycle to any Member of the Public, the critical Member of the Public within the Site Boundary, and the Nearest Resident were each evaluated.

DOSE AT THE NEAREST RESIDENT FROM GASEOUS EFFLUENT

The dose to the Nearest Resident was due to plume exposure from noble gases, ground plane exposure, and inhalation and ingestion. Dose was calculated at the nearest actual residence with the most limiting atmospheric dispersion (based on actual meteorological conditions for the year). It was conservatively assumed that each ingestion pathway (meat, milk, and vegetation) existed at this location. Dose was conservatively calculated assuming the child as the critical age group. Dose from activities within the Site Boundary was negligible and not included in this calculation.

The doses to the Nearest Resident for 1999 are presented in Table 5.

DOSE TO THE MEMBER OF THE PUBLIC FROM ACTIVITIES WITHIN THE SITE BOUNDARY

Based on the land use within the Site Boundary, the Member of the Public with the highest dose was a farmer. Dose from farming activities within the Site Boundary was due to direct radiation exposure, plume exposure from noble gases, ground plane exposure, and inhalation. The current tenant farmer estimates spending 1100 hours per year working within the Site Boundary area. Dose was calculated using the adult as the critical age group.

Dose to the Member of the Public from activities within the Site Boundary is presented in Table 6.

8.3 TOTAL DOSE DUE TO THE URANIUM FUEL CYCLE

Since there are no other Uranium Fuel Cycle facilities within 8 kilometers of the Callaway Plant, the total dose to the most likely exposed Member of the Public resulted from direct radiation exposure and radioactive effluents from the Callaway Plant itself.

The total dose to the Member of the Public (Table 7) was the sum of the dose due to activities within the Site Boundary (Table 6) and the dose due to gaseous effluents at his residence. It was conservatively assumed that each food ingestion pathway exists at his residence and that the adult is the critical age group.

The total dose from the Uranium Fuel Cycle is presented in Table 7.

8.4 DOSE DUE TO LIQUID EFFLUENTS

Dose due to liquid effluents includes contributions from the maximum exposed individual's consumption of fish and recreational activities. An adult was considered to be the maximum exposed individual in this assessment.

It is conservatively assumed that the hypothetical maximum exposed individual obtained his entire annual fish intake from near the plant discharge.

Total dose due to liquid effluents from Callaway Plant during the year is presented in Table 8.

TABLE 1A

SEMIANNUAL SUMMATION OF GASEOUS RELEASES
ALL AIRBORNE EFFLUENTS

QUARTERS 1 AND 2, 1999

TYPE OF EFFLUENT	UNITS	FIRST QUARTER	SECOND QUARTER	EST TOTAL ERROR % (a)
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A. FISSION AND ACTIVATION GASES

1. TOTAL RELEASE	CURIES	2.94E+00	1.07E+00	20
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	3.78E-01	1.35E-01	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

B. RADIOIODINES

1. TOTAL IODINE-131	CURIES	2.48E-07	3.76E-08	23
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	3.19E-08	4.79E-09	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

C. PARTICULATES

1. PARTICULATE (HALF-LIVES > 8 DAYS)	CURIES	1.36E-05	1.47E-06	30
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.74E-06	1.87E-07	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
4. GROSS ALPHA RADIOACTIVITY	CURIES	5.00E-09	0.00E+00	

D. TRITIUM

1. TOTAL RELEASE	CURIES	1.67E+01	2.31E+01	14
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.14E+00	2.94E+00	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

TABLE 1A

SEMIANNUAL SUMMATION OF GASEOUS RELEASES
ALL AIRBORNE EFFLUENTS

QUARTERS 3 AND 4, 1999

TYPE OF EFFLUENT	UNITS	THIRD QUARTER	FOURTH QUARTER	EST TOTAL ERROR % (a)
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A. FISSION AND ACTIVATION GASES

1. TOTAL RELEASE	CURIES	1.04E+01	2.77E+01	20
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.31E+00	3.49E+00	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

B. RADIOIODINES

1. TOTAL IODINE-131	CURIES	3.36E-06	1.30E-05	23
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	4.23E-07	1.64E-06	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

C. PARTICULATES

1. PARTICULATE (HALF-LIVES > 8 DAYS)	CURIES	2.10E-04	4.61E-04	30
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.64E-05	5.79E-05	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	
4. GROSS ALPHA RADIOACTIVITY	CURIES	0.00E+00	8.50E-08	

D. TRITIUM

1. TOTAL RELEASE	CURIES	2.53E+01	2.13E+01	14
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	3.18E+00	2.68E+00	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 1 AND 2, 1999

NUCLIDE	UNITS	CONTINUOUS RELEASES		BATCH RELEASES	
		FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER

1. FISSION GASES

AR-41	CURIES	0.00E+00	0.00E+00	4.61E-02	5.36E-02
XE-133	CURIES	4.01E-01	9.31E-01	6.02E-03	1.01E-02
XE-135	CURIES	1.46E-01	4.38E-02	7.26E-04	9.83E-04
XE-138	CURIES	1.80E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	CURIES	0.00E+00	0.00E+00	5.40E-01	2.51E-02
TOTAL FOR PERIOD	CURIES	2.35E+00	9.75E-01	5.93E-01	8.97E-02

2. IODINES

I-133	CURIES	4.69E-07	0.00E+00	0.00E+00	0.00E+00
I-131	CURIES	2.48E-07	3.76E-08	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	7.18E-07	3.76E-08	0.00E+00	0.00E+00

3. PARTICULATES

CS-134	CURIES	0.00E+00	0.00E+00	3.27E-06	3.25E-07
CS-137	CURIES	0.00E+00	0.00E+00	5.27E-06	7.82E-07
CO-58	CURIES	1.80E-06	0.00E+00	0.00E+00	0.00E+00
CO-60	CURIES	2.72E-06	0.00E+00	0.00E+00	3.15E-07
MN-54	CURIES	4.07E-07	0.00E+00	0.00E+00	0.00E+00
NB-95	CURIES	9.78E-08	0.00E+00	0.00E+00	0.00E+00
CO-57	CURIES	0.00E+00	4.61E-08	0.00E+00	0.00E+00
ALPHA	CURIES	5.00E-09	0.00E+00	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	5.03E-06	4.61E-08	8.53E-06	1.42E-06

4. TRITIUM

H-3	CURIES	1.64E+01	2.27E+01	2.59E-01	4.59E-01
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TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 3 AND 4, 1999

NUCLIDE	UNITS	CONTINUOUS RELEASES		BATCH RELEASES	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER

1. FISSION GASES

AR-41	CURIES	0.00E+00	0.00E+00	1.29E-01	1.98E-01
XE-133	CURIES	9.03E+00	2.44E+01	1.59E-02	5.65E-01
XE-135	CURIES	7.19E-01	1.54E+00	1.47E-03	7.64E-03
XE-138	CURIES	0.00E+00	5.22E-01	0.00E+00	5.33E-04
KR-85	CURIES	0.00E+00	0.00E+00	2.50E-01	3.20E-01
KR-85M	CURIES	6.03E-03	0.00E+00	0.00E+00	7.22E-04
XE-131M	CURIES	0.00E+00	0.00E+00	1.24E-03	1.64E-04
KR-88	CURIES	2.80E-01	0.00E+00	0.00E+00	4.90E-04
KR-87	CURIES	1.81E-03	0.00E+00	0.00E+00	0.00E+00
XE-133M	CURIES	0.00E+00	1.32E-01	0.00E+00	1.45E-03
TOTAL FOR PERIOD	CURIES	1.00E+01	2.66E+01	3.98E-01	1.09E+00

2. IODINES

I-133	CURIES	1.80E-07	0.00E+00	5.37E-06	8.79E-06
I-131	CURIES	1.48E-06	8.61E-06	1.88E-06	4.43E-06
I-132	CURIES	0.00E+00	9.85E-05	0.00E+00	4.64E-07
TOTAL FOR PERIOD	CURIES	1.66E-06	1.07E-04	7.25E-06	1.37E-05

3. PARTICULATES

CS-134	CURIES	0.00E+00	0.00E+00	1.91E-05	5.59E-05
CS-137	CURIES	0.00E+00	0.00E+00	6.66E-05	2.07E-04
CO-58	CURIES	1.52E-06	2.83E-05	0.00E+00	5.78E-06
CO-60	CURIES	6.24E-07	0.00E+00	8.58E-05	1.25E-04
MN-54	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB-95	CURIES	0.00E+00	0.00E+00	2.87E-07	7.22E-06
CO-57	CURIES	0.00E+00	3.10E-08	0.00E+00	0.00E+00
SB-125	CURIES	0.00E+00	0.00E+00	3.57E-05	1.73E-05
BA-139	CURIES	0.00E+00	0.00E+00	4.01E-08	0.00E+00
CE-141	CURIES	0.00E+00	0.00E+00	3.21E-07	8.09E-06
TE-132	CURIES	0.00E+00	0.00E+00	0.00E+00	3.71E-07
CE-144	CURIES	0.00E+00	0.00E+00	0.00E+00	5.08E-06
ALPHA	CURIES	0.00E+00	8.50E-08	0.00E+00	0.00E+00
TOTAL FOR PERIOD	CURIES	2.14E-06	2.84E-05	2.08E-04	4.32E-04

TABLE 1B (continued)

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES
GROUND LEVEL RELEASES
FISSION GASES, IODINES, AND PARTICULATES

QUARTERS 3 AND 4, 1999

NUCLIDE	UNITS	CONTINUOUS RELEASES		BATCH RELEASES	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER

4. TRITIUM

H-3	CURIES	2.47E+01	2.08E+01	5.60E-01	5.06E-01
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TABLE 2A

SEMIANNUAL SUMMATION OF LIQUID RELEASES
ALL LIQUID EFFLUENTS

QUARTERS 1 AND 2, 1999

TYPE OF EFFLUENT	UNITS	FIRST QUARTER	SECOND QUARTER	EST TOTAL ERROR % (a)
------------------	-------	------------------	-------------------	--------------------------

A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE [NOT INCLUDING TRITIUM, GASES, ALPHA]	CURIES	5.32E-03	2.10E-02	20
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	1.24E-08	4.38E-08	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	

B. TRITIUM

1. TOTAL RELEASE	CURIES	2.63E+02	3.25E+02	14
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	6.10E-04	6.79E-04	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	

C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	CURIES	3.18E-04	7.15E-04	27
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	7.40E-10	1.49E-09	

D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	CURIES	0.00E+00	0.00E+00	29
------------------	--------	----------	----------	----

E. WASTE VOLUME RELEASED (PRE-DILUTION)	GAL	5.56E+06	5.93E+06	10
---	-----	----------	----------	----

F. VOLUME OF DILUTION WATER USED	GAL	1.08E+08	1.20E+08	10
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(a) Safety Analysis Calculation 87-063-00, January 6, 1988

TABLE 2A

SEMIANNUAL SUMMATION OF LIQUID RELEASES
ALL LIQUID EFFLUENTS

QUARTERS 3 AND 4, 1999

TYPE OF EFFLUENT	UNITS	THIRD QUARTER	FOURTH QUARTER	EST TOTAL ERROR % (a)
------------------	-------	------------------	-------------------	--------------------------

A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE [NOT INCLUDING TRITIUM, GASES, ALPHA]	CURIES	2.16E-02	2.60E-02	20
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	2.71E-08	8.09E-08	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	

B. TRITIUM

1. TOTAL RELEASE	CURIES	8.07E+02	8.58E+01	14
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	1.01E-03	2.66E-04	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	N/A	

C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	CURIES	3.83E-02	1.39E-02	27
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ML	4.80E-08	4.32E-08	

D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	CURIES	0.00E+00	0.00E+00	29
------------------	--------	----------	----------	----

E. WASTE VOLUME RELEASED (PRE-DILUTION)	GAL	6.99E+06	5.52E+06	10
---	-----	----------	----------	----

F. VOLUME OF DILUTION WATER USED	GAL	2.04E+08	7.95E+07	10
----------------------------------	-----	----------	----------	----

(a) Safety Analysis Calculation 87-063-00, January 6, 1988

TABLE 2B

SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
TOTALS FOR EACH NUCLIDE RELEASED

QUARTERS 1 AND 2, 1999

NUCLIDE	UNITS	CONTINUOUS RELEASES		BATCH RELEASES	
		FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER

1. ALL NUCLIDES

CO-58	CURIES	0.00E+00	0.00E+00	1.47E-03	4.78E-03
CO-60	CURIES	0.00E+00	0.00E+00	1.89E-03	8.84E-03
H-3	CURIES	0.00E+00	0.00E+00	2.63E+02	3.25E+02
MN-54	CURIES	0.00E+00	0.00E+00	3.29E-04	1.39E-03
SB-125	CURIES	0.00E+00	0.00E+00	5.09E-04	3.56E-03
XE-133	CURIES	0.00E+00	0.00E+00	2.42E-04	7.15E-04
CS-137	CURIES	0.00E+00	0.00E+00	8.13E-04	1.40E-03
NB-95	CURIES	0.00E+00	0.00E+00	3.22E-05	1.68E-04
CO-57	CURIES	0.00E+00	0.00E+00	2.51E-05	1.07E-04
ZR-95	CURIES	0.00E+00	0.00E+00	1.86E-05	4.67E-05
CS-134	CURIES	0.00E+00	0.00E+00	2.25E-04	4.09E-04
TC-99M	CURIES	0.00E+00	0.00E+00	1.82E-06	0.00E+00
I-131	CURIES	0.00E+00	0.00E+00	2.69E-06	3.43E-05
XE-131M	CURIES	0.00E+00	0.00E+00	7.66E-05	0.00E+00
HF-181	CURIES	0.00E+00	0.00E+00	0.00E+00	6.79E-06
RU-103	CURIES	0.00E+00	0.00E+00	0.00E+00	1.36E-05
CE-144	CURIES	0.00E+00	0.00E+00	0.00E+00	4.98E-05
PR-144	CURIES	0.00E+00	0.00E+00	0.00E+00	4.98E-05
RU-106	CURIES	0.00E+00	0.00E+00	0.00E+00	8.04E-05
SN-113	CURIES	0.00E+00	0.00E+00	0.00E+00	7.79E-06
SB-124	CURIES	0.00E+00	0.00E+00	0.00E+00	2.34E-05
TOTALS FOR PERIOD	CURIES	0.00E+00	0.00E+00	2.63E+02	3.25E+02

TABLE 2B

SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
TOTALS FOR EACH NUCLIDE RELEASED

QUARTERS 3 AND 4, 1999

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNITS	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. ALL NUCLIDES					
CO-58	CURIES	0.00E+00	0.00E+00	2.91E-03	1.37E-02
CO-60	CURIES	0.00E+00	0.00E+00	1.39E-02	4.92E-03
H-3	CURIES	0.00E+00	0.00E+00	8.07E+02	8.58E+01
MN-54	CURIES	0.00E+00	0.00E+00	1.94E-03	1.01E-03
SB-125	CURIES	0.00E+00	0.00E+00	1.31E-03	7.72E-04
XE-133	CURIES	0.00E+00	0.00E+00	3.80E-02	1.36E-02
CS-137	CURIES	0.00E+00	0.00E+00	9.12E-04	3.40E-04
NB-95	CURIES	0.00E+00	0.00E+00	1.21E-04	1.45E-03
CO-57	CURIES	0.00E+00	0.00E+00	1.01E-04	3.00E-05
ZR-95	CURIES	0.00E+00	0.00E+00	6.50E-05	9.36E-04
CS-134	CURIES	0.00E+00	0.00E+00	2.49E-04	1.87E-05
TC-99M	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	CURIES	0.00E+00	0.00E+00	0.00E+00	2.09E-05
XE-131M	CURIES	0.00E+00	0.00E+00	0.00E+00	1.07E-04
HF-181	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU-103	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CE-144	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PR-144	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU-106	CURIES	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SN-113	CURIES	0.00E+00	0.00E+00	2.78E-05	5.49E-05
SB-124	CURIES	0.00E+00	0.00E+00	1.90E-05	0.00E+00
XE-135	CURIES	0.00E+00	0.00E+00	9.64E-05	1.60E-04
ZN-65	CURIES	0.00E+00	0.00E+00	1.04E-05	0.00E+00
XE-133M	CURIES	0.00E+00	0.00E+00	2.50E-04	7.89E-05
EU-154	CURIES	0.00E+00	0.00E+00	2.89E-05	0.00E+00
SR-92	CURIES	0.00E+00	0.00E+00	5.67E-06	0.00E+00
CR-51	CURIES	0.00E+00	0.00E+00	0.00E+00	2.62E-03
CE-141	CURIES	0.00E+00	0.00E+00	0.00E+00	6.43E-06
FE-59	CURIES	0.00E+00	0.00E+00	0.00E+00	1.34E-04
BA-139	CURIES	0.00E+00	0.00E+00	0.00E+00	1.39E-05
I-133	CURIES	0.00E+00	0.00E+00	0.00E+00	5.94E-06
BA-140	CURIES	0.00E+00	0.00E+00	0.00E+00	1.25E-05
TOTALS FOR PERIOD	CURIES	0.00E+00	0.00E+00	8.07E+02	8.58E+01

TABLE 3
SOLID WASTE & IRRADIATED FUEL SHIPMENTS

1999

A. SOLID WASTE BURIED (Does not include irradiated fuel)

1. TYPE OF WASTE	UNITS	PERIOD JAN - JUN	PERIOD JUL - DEC	EST. TOTAL ERROR (%)
a. Spent resins, filter sludges evaporator bottoms, etc.	m ³ Ci	6.02 163.78	3.85 271.00	±25%
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	9.09 1.44	1.13 7.6E-08	±25%
c. Irradiated components, control rods, etc.	m ³ Ci			
d. Other	m ³ Ci			

2. Estimate of major nuclide composition (By type of waste)

PERIOD JAN - JUN			PERIOD JUL - DEC		
Nuclide	Percent Abundance	Curies	Nuclide	Percent Abundance	Curies
a. Sr-90	33.48%	54.60	Fe-55	31.49%	85.30
Fe-55	28.69%	46.80	Ni-63	28.02%	75.90
Ni-63	21.95%	35.80	Cs-137	14.62%	39.60
Co-60	5.11%	8.34	Co-58	8.12%	22.00
Cs-137	4.17%	6.80	Cs-134	7.94%	21.50
Sb-125	1.72%	2.80	Co-60	6.28%	17.00
Sr-89	1.12%	1.83	Mn-54	1.77%	4.79
Cs-134	1.09%	1.77			
b. Fe-55	34.86%	0.502	Fe-55	34.86%	2.65E-8
Co-58	27.20%	0.391	Co-58	27.20%	2.07E-08
Ni-63	9.86%	0.142	Ni-63	9.86%	7.49E-09
Co-60	8.53%	0.123	Co-60	8.53%	6.48E-09
Nb-95	8.25%	0.119	Nb-95	8.25%	6.27E-09
Zr-95	5.04%	0.072	Zr-95	5.04%	3.83E-09
Mn-54	2.75%	0.040	Mn-54	2.75%	2.09E-09
Cr-51	1.56%	0.022	Cr-51	1.56%	1.19E-09

TABLE 3
SOLID WASTE & IRRADIATED FUEL SHIPMENTS

1999

2. Estimate of major nuclide composition (By type of waste)

Nuclide	PERIOD JAN - JUN		PERIOD JUL - DEC	
	Percent Abundance	Curies	Percent Abundance	Curies
c. None				
d. None				

3. Solid waste disposition

Number of Shipments	Mode of Transportation	Destination	Class of Solid Waste Shipped	Type of Container
1*	Truck	F. W. Hake	A	LSA
3*	Truck	GTS-Duratek	A	LSA
4*	Truck	Allied Technologies Group	A	LSA
1**	Cask	Allied Technologies Group	C	LSA
12*	Truck	Alaron	A	LSA
1	Cask	Barnwell	B	LSA
1*	Truck	Envirocare	A	LSA

*Sent to waste processors for volume reduction before burial.

**Sent to ATG for HIC inspection prior to burial at Barnwell.

4. Solidification agent

None used.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None		

TABLE 4

Meteorological Data
Averages Using Hourly Averaged Data

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

		UNITS	VALUES	% GOOD DATA
Stability Class		A - G	E	97%
Total Precipitation		CM.	1.02E+02	98%
10 Meter Level:	Wind Speed	Meter/Sec	3.82E+00	98%
	Wind Direction	Degrees	1.85E+02	96%
	Wind Direction Variability	Degrees	1.24E+01	94%
	Reference Temperature	Degrees C	1.35E+01	96%
	Dewpoint	Degrees C	5.44E+00	94%
60 Meter Level:	Wind Speed	Meter/Sec	5.84E+00	98%
	Wind Direction	Degrees	1.94E+02	96%
	Wind Direction Variability	Degrees	8.07E+00	98%
	Dewpoint	Degrees C	NONE	0%
	Temperature Difference 60 - 10	Degrees C	1.87E-01	97%

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: A

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	11	2	3	0	0	17
NNE	1	16	1	1	0	0	19
NE	2	9	4	0	0	0	15
ENE	0	11	3	0	0	0	14
E	0	9	3	0	0	0	12
ESE	0	16	6	0	0	0	22
SE	6	54	39	7	0	0	106
SSE	7	62	35	14	0	0	118
S	5	57	48	12	1	0	123
SSW	2	79	71	9	0	0	161
SW	1	46	40	3	0	0	90
WSW	1	11	9	1	1	0	23
W	1	13	20	4	0	0	38
WNW	0	12	20	12	0	0	44
NW	4	6	21	11	0	0	42
NNW	1	5	6	1	0	0	13
TOT	32	417	328	78	2	0	857

Hours of Calm Data: 1
Hours of Invalid Data: 11

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: B

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	9	11	5	0	0	26
NNE	0	9	5	0	0	0	14
NE	1	11	7	0	0	0	19
ENE	0	11	6	0	0	0	17
E	0	4	4	0	0	0	8
ESE	0	8	1	0	0	0	9
SE	1	18	11	7	0	0	37
SSE	1	12	9	3	0	0	25
S	2	11	10	11	1	0	35
SSW	0	7	8	3	0	0	18
SW	4	14	9	1	0	0	28
WSW	2	7	1	3	1	0	14
W	1	14	7	3	1	0	26
WNW	1	7	11	5	0	0	24
NW	0	9	12	5	0	0	26
NNW	1	15	23	2	0	0	41
TOT	15	166	135	48	3	0	367

Hours of Calm Data: 0
Hours of Invalid Data: 15

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: C

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	17	15	4	0	0	37
NNE	0	11	3	0	0	0	14
NE	2	19	10	0	0	0	31
ENE	1	18	10	0	0	0	29
E	0	2	4	0	0	0	6
ESE	1	4	2	1	0	0	8
SE	4	19	19	5	0	0	47
SSE	0	9	8	3	0	0	20
S	1	11	17	11	1	0	41
SSW	1	10	6	2	0	0	19
SW	0	16	9	3	0	0	28
WSW	1	5	3	1	0	0	10
W	1	8	6	3	2	0	20
WNW	1	10	16	2	1	0	30
NW	3	9	8	2	0	0	22
NNW	0	5	15	0	0	0	20
TOT	17	173	151	37	4	0	382

Hours of Calm Data: 2
Hours of Invalid Data: 11

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: D

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	5	56	72	20	3	0	156
NNE	9	57	18	5	0	0	89
NE	13	68	46	6	0	0	133
ENE	12	59	59	4	0	0	134
E	7	29	23	10	0	0	69
ESE	10	44	19	13	0	0	86
SE	10	48	46	16	0	0	120
SSE	10	34	60	12	3	0	119
S	11	31	42	25	6	0	115
SSW	4	35	32	14	0	0	85
SW	6	26	28	6	0	0	66
WSW	5	21	23	9	1	0	59
W	12	22	34	59	8	0	135
WNW	12	39	69	30	4	0	154
NW	3	37	60	13	1	0	114
NNW	7	54	75	13	6	0	155
TOT	136	660	706	255	32	0	1789

Hours of Calm Data: 3
Hours of Invalid Data: 64

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: E

	Wind Speed at 10.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	14	68	60	28	1	0	171
NNE	11	81	41	10	0	0	143
NE	33	96	41	0	0	0	170
ENE	10	53	48	16	0	0	127
E	15	62	50	19	0	0	146
ESE	15	73	65	11	1	0	165
SE	22	104	112	41	1	0	280
SSE	12	112	123	74	4	0	325
S	18	72	89	38	8	0	225
SSW	14	58	44	16	0	0	132
SW	15	39	47	29	0	0	130
WSW	17	43	16	16	7	0	99
W	7	38	65	34	1	0	145
WNW	14	55	81	28	0	0	178
NW	14	55	89	34	1	0	193
NNW	13	76	104	42	5	0	240
TOT	244	1085	1075	436	29	0	2869

Hours of Calm Data: 8
Hours of Invalid Data: 65

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: F

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	7	37	18	3	1	0	66
NNE	14	31	12	3	0	0	60
NE	16	25	12	0	0	0	53
ENE	16	20	24	0	0	0	60
E	9	23	27	1	0	0	60
ESE	21	33	35	1	0	0	90
SE	25	77	119	25	0	0	246
SSE	18	99	105	26	0	0	248
S	18	63	62	19	0	0	162
SSW	23	39	41	1	0	0	104
SW	17	37	49	10	0	0	113
WSW	11	10	15	2	0	0	38
W	6	9	19	2	0	0	36
WNW	3	23	23	2	0	0	51
NW	7	24	36	0	0	0	67
NNW	7	34	51	5	1	0	98
TOT	218	584	648	100	2	0	1552

Hours of Calm Data: 20
Hours of Invalid Data: 41

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: G

	Wind Speed at 10.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	15	10	7	0	0	0	32
NNE	8	5	7	0	0	0	20
NE	5	7	7	0	0	0	19
ENE	4	11	6	0	0	0	21
E	5	7	11	0	0	0	23
ESE	5	8	3	0	0	0	16
SE	9	17	23	3	0	0	52
SSE	9	41	61	5	0	0	116
S	14	10	21	1	0	0	46
SSW	6	6	14	0	0	0	26
SW	1	8	28	0	0	0	37
WSW	3	1	8	0	0	0	12
W	1	6	13	0	0	0	20
WNW	3	9	14	0	0	0	26
NW	2	7	23	0	0	0	32
NNW	7	5	22	0	0	0	34
TOT	97	158	268	9	0	0	532

Hours of Calm Data: 15
 Hours of Invalid Data: 17
 Hours of Good Data: 8397 = 95.9% of Total Hours

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: A

	Wind Speed at 60.00 Meter Level (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	1	6	4	1	2	0	14
NNE	0	14	5	0	1	0	20
NE	0	10	6	0	0	0	16
ENE	0	9	5	0	0	0	14
E	0	9	3	1	0	0	13
ESE	1	11	9	0	0	0	21
SE	0	35	42	15	1	0	93
SSE	1	45	47	28	2	0	123
S	1	42	47	25	6	3	124
SSW	0	36	78	35	8	0	157
SW	1	26	40	35	3	0	105
WSW	1	6	9	6	1	1	24
W	0	10	10	16	3	1	40
WNW	0	5	8	18	15	1	47
NW	0	6	5	19	4	4	38
NNW	0	3	7	5	0	0	15
TOT	6	273	325	204	46	10	864

Hours of Calm Data: 0
Hours of Invalid Data: 5

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: B

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	5	16	6	2	0	29
NNE	0	6	8	0	0	0	14
NE	0	11	8	2	0	0	21
ENE	0	8	6	1	0	0	15
E	0	1	3	2	0	0	6
ESE	0	6	4	0	0	0	10
SE	0	14	12	9	0	0	35
SSE	1	8	12	8	2	0	31
S	0	10	8	10	7	1	36
SSW	1	2	6	7	3	0	19
SW	1	5	10	6	1	1	24
WSW	0	10	3	1	1	3	18
W	0	9	8	5	3	1	26
WNW	2	5	5	10	4	1	27
NW	0	4	8	7	4	1	24
NNW	0	9	12	14	1	0	36
TOT	5	113	129	88	28	8	371

Hours of Calm Data: 0
Hours of Invalid Data: 11

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: C

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4	19	5	4	0	32
NNE	1	8	8	0	0	0	17
NE	0	18	13	2	0	0	33
ENE	1	13	10	3	0	0	27
E	0	2	3	1	0	0	6
ESE	0	4	3	0	1	0	8
SE	2	12	16	9	3	0	42
SSE	1	6	7	4	2	0	20
S	0	5	15	9	9	1	39
SSW	0	7	10	8	2	0	27
SW	0	8	9	7	3	0	27
WSW	1	4	4	2	1	0	12
W	1	6	5	5	0	4	21
WNW	1	6	14	9	1	3	34
NW	0	3	6	5	2	0	16
NNW	0	5	12	3	0	0	20
TOT	8	111	154	72	28	8	381

Hours of Calm Data: 0
Hours of Invalid Data: 14

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: D

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	27	82	31	10	3	155
NNE	6	35	45	13	1	0	100
NE	5	50	62	19	0	0	136
ENE	8	37	68	22	1	0	136
E	4	14	27	15	7	0	67
ESE	6	30	37	14	6	0	93
SE	2	29	33	33	5	0	102
SSE	4	17	49	35	6	2	113
S	2	16	44	35	18	5	120
SSW	2	22	27	28	14	3	96
SW	4	15	22	25	9	0	75
WSW	1	15	17	15	9	3	60
W	6	17	24	31	34	36	148
WNW	2	22	31	69	25	8	157
NW	1	20	42	39	9	5	116
NNW	4	28	55	36	11	7	141
TOT	59	394	665	460	165	72	1815

Hours of Calm Data:
Hours of Invalid Data:

0
41

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: E

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	9	74	76	17	1	178
NNE	1	24	81	57	4	0	167
NE	3	39	110	21	1	0	174
ENE	5	15	60	55	10	0	145
E	3	10	56	62	14	0	145
ESE	0	15	79	92	4	1	191
SE	0	22	66	136	23	2	249
SSE	2	24	76	134	54	0	290
S	1	15	52	121	57	10	256
SSW	2	16	36	61	18	0	133
SW	5	16	35	61	30	4	151
WSW	2	6	26	32	16	15	97
W	3	10	32	61	38	15	159
WNW	3	7	43	89	24	11	177
NW	0	12	42	103	29	5	191
NNW	4	10	56	90	25	2	187
TOT	35	250	924	1251	364	66	2890

Hours of Calm Data: 0
Hours of Invalid Data: 52

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: F

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	23	40	5	1	69
NNE	0	7	24	35	3	0	69
NE	0	14	35	18	0	0	67
ENE	1	9	24	17	0	0	51
E	3	7	27	41	2	0	80
ESE	0	5	36	76	4	0	121
SE	0	10	43	92	19	0	164
SSE	3	10	49	141	20	0	223
S	0	11	47	85	18	0	161
SSW	4	9	44	85	30	0	172
SW	0	4	41	55	26	0	126
WSW	0	4	24	22	5	1	56
W	0	1	8	12	4	0	25
WNW	1	1	10	30	9	1	52
NW	0	0	20	36	3	0	59
NNW	1	6	18	34	4	0	63
TOT	13	98	473	819	152	3	1558

Hours of Calm Data: 0
Hours of Invalid Data: 55

TABLE 4

Meteorological Data
Totals of Hours at Each Wind Speed & Direction

1-JAN-1999 00:00:00.00 to 31-DEC-1999 23:00:00.00

Stability Class: G

	Wind Speed at 60.00 Meter Level (MPH)						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	4	10	5	0	19
NNE	0	1	4	22	4	0	31
NE	1	2	21	8	0	0	32
ENE	0	1	10	12	0	0	23
E	0	1	13	10	1	0	25
ESE	0	3	11	15	0	0	29
SE	0	5	15	19	0	0	39
SSE	0	4	17	32	2	0	55
S	0	3	33	32	6	0	74
SSW	0	1	19	29	3	0	52
SW	2	1	8	24	6	0	41
WSW	1	0	8	14	2	0	25
W	1	0	5	3	4	0	13
WNW	0	3	4	13	6	0	26
NW	1	2	3	10	1	0	17
NNW	0	1	6	14	6	0	27
TOT	6	28	181	267	46	0	528

Hours of Calm Data: 0
 Hours of Invalid Data: 36
 Hours of Good Data: 8407 = 96.0% of Total Hours

TABLE 5

DOSE AT THE SITE BOUNDARY AND TO THE NEAREST RESIDENT
FROM GASEOUS EFFLUENTS

		SITE BOUNDARY		NEAREST RESIDENT	
		LOCATION: 2.20 km NNW		LOCATION: 2.90 km NNW	
		AGE GROUP: CHILD		AGE GROUP: CHILD	
ORGAN	UNITS	DOSE	% LIMIT(a)	DOSE	% LIMIT(b)
1. GAMMA AIR DOSE *	MRAD	1.01E-03	0.01	6.63E-04	N/A
2. BETA AIR DOSE *	MRAD	1.26E-03	0.01	8.33E-04	N/A
3. WHOLE BODY ***	MREM	2.08E-03	N/A	1.34E-03	N/A
4. SKIN ***	MREM	2.86E-03	N/A	1.86E-03	N/A
5. BONE **	MREM	1.15E-03	N/A	5.33E-03	0.04
6. LIVER **	MREM	2.92E-03	N/A	1.59E-02	0.11
7. TOTAL BODY **	MREM	2.92E-03	N/A	1.19E-02	0.08
8. THYROID **	MREM	2.92E-03	N/A	1.25E-02	0.08
9. KIDNEY **	MREM	2.92E-03	N/A	1.26E-02	0.08
10. LUNG **	MREM	2.95E-03	N/A	1.16E-02	0.08
11. GI-LLI **	MREM	2.92E-03	N/A	1.11E-02	0.07

* Dose from Noble Gases only

** Dose from Tritium, Radioiodines, and Particulates only

*** Dose from Noble Gases plus Ground Plane dose

(a) Annual dose limits of Offsite Dose Calculation Manual (APA-ZZ-01003)
of 10 mrad gamma air dose and 20 mrad beta air dose.

(b) Annual dose limits of Offsite Dose Calculation Manual (APA-ZZ-01003)
of 15 mrem to any organ from I-131, I-133, H-3 and particulate
radionuclides with half-lives greater than 8 days.

TABLE 6

DOSE TO THE MEMBER OF THE PUBLIC FROM ACTIVITIES
WITHIN THE SITE BOUNDARY

ORGAN	UNITS	EFFLUENT DOSE WITHIN THE SITE BOUNDARY	DIRECT RADIATION FROM THE UNIT	DIRECT RADIATION FROM OUTSIDE TANKS	TOTAL DOSE FOR THE YEAR
1. SKIN	MREM	6.60E-04	N/A	N/A	6.60E-04
2. BONE	MREM	3.41E-04	8.79E-03	1.30E-03	1.04E-02
3. LIVER	MREM	1.17E-03	8.79E-03	1.30E-03	1.13E-02
4. TOTAL BODY	MREM	1.53E-03	8.79E-03	1.30E-03	1.16E-02
5. THYROID	MREM	1.17E-03	8.79E-03	1.30E-03	1.13E-02
6. KIDNEY	MREM	1.17E-03	8.79E-03	1.30E-03	1.13E-02
7. LUNG	MREM	1.18E-03	8.79E-03	1.30E-03	1.13E-02
8. GI-LLI	MREM	1.17E-03	8.79E-03	1.30E-03	1.13E-02

TABLE 7

TOTAL DOSE DUE TO THE URANIUM FUEL CYCLE
(MEMBER OF THE PUBLIC)

ORGAN	UNITS	DOSE AT THE RESIDENCE LOCATION	DOSE FROM ACTIVITIES WITHIN SITE BOUNDARY	TOTAL DOSE TO THE MEMBER OF THE PUBLIC	% LIMITS *
1. SKIN	MREM	3.78E-04	6.60E-04	1.04E-03	0.00
2. BONE	MREM	6.72E-04	1.04E-02	1.11E-02	0.04
3. LIVER	MREM	2.92E-03	1.13E-02	1.42E-02	0.06
4. TOTAL BODY	MREM	2.94E-03	1.16E-02	1.46E-02	0.06
5. THYROID	MREM	2.48E-03	1.13E-02	1.37E-02	0.02
6. KIDNEY	MREM	2.50E-03	1.13E-02	1.38E-02	0.06
7. LUNG	MREM	2.37E-03	1.13E-02	1.36E-02	0.05
8. GI-LLI	MREM	2.35E-03	1.13E-02	1.36E-02	0.05

* Annual dose limits from 40CFR190.10(a) of 25 mrem whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.

TABLE 8

DOSE DUE TO LIQUID EFFLUENTS
(MEMBER OF THE PUBLIC)

1999

ORGAN	UNITS	DOSE	LIMIT *	% LIMIT
1. BONE	MREM	1.92E-02	10.00	1.92E-01
2. LIVER	MREM	3.37E-02	10.00	3.37E-01
3. TOTAL BODY	MREM	2.48E-02	3.00	8.26E-01
4. THYROID	MREM	4.06E-03	10.00	4.06E-02
5. KIDNEY	MREM	1.39E-02	10.00	1.39E-01
6. LUNG	MREM	7.28E-03	10.00	7.28E-02
7. GI-LLI	MREM	3.98E-02	10.00	3.98E-01

* Annual dose limits of APA-ZZ-01003, Section 9.4.1.1.