

SEMIANNUAL RADIOACTIVE EFFLUENT  
RELEASE REPORT

OCTOBER - DECEMBER, 1984

CALLAWAY NUCLEAR PLANT  
UNION ELECTRIC COMPANY

LICENSE NPF - 30

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SCOPE

This Semi-Annual Radioactive Effluent Release Report for Union Electric Company's Callaway Plant is submitted in accordance with requirements of Technical Specification 6.9.1.7. The report covers the period from initial criticality of the plant on October 2, 1984 through December 31, 1984.

This report includes a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the plant. In addition, a summary of the Meteorological data for the reporting period is presented. An assessment of radiation doses from liquid and gaseous radioactive effluents is also included.

Information in this report is presented in the format outlined in Appendix B of Regulatory Guide 1.21.

All liquid and gaseous effluents discharged during this reporting period were in compliance with the Radiological Effluent Technical Specifications.

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

Specified as follows are the technical specification limits applicable to the release of radioactive material in liquid and gaseous effluents.

2.1.1 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.

2.1.2 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.



### 2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 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.

### 2.1.4 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

2.2.1 The maximum permissible concentration values specified in 10CFR20, Appendix B, Table II, Column 2 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 MPC for dissolved and entrained noble gases in liquid effluents. The concentration limit used to calculate the percent of limit for mixed fission and activation products in Table 2A is  $3.0E-7$  microcuries/cc. A limit of  $3.0E-3$  microcuries/ml (i.e., H-3 MPC value) is utilized in the calculation of the percent of limit for Tritium in Table 2A.

2.2.2 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.

## 2.3 Average Energy

This is not applicable to the Callaway Plant's radiological effluent technical specifications.

## 2.4 Measurements and Approximations of Total Radioactivity

The quantification of radioactivity in liquid and gaseous effluents was accomplished by performing the sampling and radiological analysis of effluents in accordance with the requirements of Table 4.11-1 and Table 4.11-2 of the Callaway Plant Technical Specifications (See attachments 1 and 2).

Gamma spectroscopy was the primary analysis technique used to determine the radionuclide composition and concentration of liquid and gaseous effluents. For Sr-89, Sr-90, and Fe-55 composite samples are collected and analysis performed by a contract laboratory. For these radionuclides the measured concentrations of the previous composite analysis are used. Tritium and alpha are measured for both liquid and gaseous effluents using liquid scintillation counting and gas flow proportional counting techniques respectively.

The measured total radioactivity in effluent releases is determined from the measured concentrations of each radionuclide present and the total volume of effluents discharged. Gross beta or gamma radioactivity measurement techniques were not utilized to approximate the total radioactivity in effluents.

## 2.5 Batch Releases

### 2.5.1 Liquid

- 2.5.1.1 Number of batch releases: 297
- 2.5.1.2 Total time period for batch releases: 33681.0 minutes
- 2.5.1.3 Maximum time period for a batch release: 335.0 minutes
- 2.5.1.4 Average time period for batch releases: 113.4 minutes
- 2.5.1.5 Minimum time period for a batch release: 38.0 minutes
- 2.5.1.6 Average stream flow during periods of release of effluent into a flowing stream: 7261.9 gpm

### 2.5.2 Gaseous

- 2.5.2.1 Number of batch releases: 19
- 2.5.2.2 Total time period for batch releases: 12470.0 minutes
- 2.5.2.3 Maximum time period for a batch release: 1994.0 minutes

2.5.2.4 Average time period for batch releases: 656.3 minutes

2.5.2.5 Minimum time period for a batch release: 60.0 minutes

## 2.6 Abnormal Releases

### 2.6.1 Liquid

2.6.1.1 Number of releases: 2

2.6.1.2 Total Activity released: 1.09E-3 Ci

### 2.6.2 Gaseous

2.6.2.1 Number of releases: 1

2.6.2.2 Total Activity released: 2.07E-6 Ci (Na-24)

## 3.0 SUMMARY OF LIQUID AND GASEOUS EFFLUENTS

### 3.1 Gaseous Effluents

The quantities of radioactive material released in gaseous effluents are summarized in Table 1A and 1B. Note that for this reporting period no gaseous effluents were considered as elevated releases.

### 3.2 Liquid Effluents

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

## 4.0 SOLID WASTES

4.1 During this reporting period no radioactive solid wastes were released from the plant.

## 5.0 METEOROLOGICAL DATA

5.1 A summary of the hourly meteorological data from October 2, 1984, through December 31, 1984, is present in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability in Table 3.

## 6.0 ASSESSMENT OF DOSES

### 6.1 Dose at the Site Boundary

6.1.1 An assessment of the doses from gaseous effluents was performed for the maximum exposed individual at the site boundary (i.e., restricted area boundary) location with the highest ground level.

concentrations of radioactive material. Based upon actual meteorological conditions existing during the reporting period, this location was determined to be the northwest sector at 2300 meters. Doses and dose rates were assessed at this location considering the noble gas exposure, inhalation, ground plane exposure, and ingestion pathways. The results of these assessments are summarized as follows:

6.1.2 Noble gases

Total body dose rate: 1.13E-2 mrem/yr  
 Skin dose rate: 2.28E-2 mrem/yr  
 Total body dose: 2.84E-3 mrem  
 Skin dose: 5.75E-3 mrem  
 Gamma air dose: 3.22E-3 mrad  
 Beta air dose: 6.21E-3 mrad

The average total body and skin dose rates are 2.3E-3% and 7.6E-4% of the technical specification instantaneous release limit. The gamma and beta air dose totals are 6.5E-2% and 6.2E-2% of the technical specifications dose limits.

6.1.3 Particulates, Radioiodines, and H-3

The total dose to the seven (7) critical organs of the four (4) applicable age groups from the inhalation and ingestion pathways is presented in the following table. The ingestion pathways considered for these dose calculations include produce, vegetables, goat's milk, meat, and cow's milk.

	<u>Dose (mrem)</u>			
	<u>Adult</u>	<u>Teen</u>	<u>Child</u>	<u>Infant</u>
Bone	1.53E-8	2.61E-8	6.20E-8	1.22E-7
Liver	3.97E-4	4.58E-4	6.64E-4	4.62E-4
Total Body	3.97E-4	4.58E-4	6.64E-4	4.62E-4
Thyroid	4.04E-4	4.69E-4	6.84E-4	5.10E-4
Kidney	3.97E-4	4.58E-4	6.64E-4	4.62E-4
Lung	3.97E-4	4.58E-4	6.64E-4	4.62E-4
GI-LLI	3.97E-4	4.58E-4	6.64E-4	4.62E-4

The ground plane exposure pathway contributions to total dose are:

Total body dose: 1.02E-9 mrem  
 Skin dose: 1.24E-9 mrem

The total body and maximum organ dose totals for the child age group represents 4.43E-3% and 4.56E-3% respectively of the technical specification annual dose limits.

6.1.4 The total dose received by the maximum exposed individual using the conservative assumptions that he was a resident at the site boundary for the entire quarter and consumed only food products produced at that location is as follows:

Controlling location:	NW at 2300 meters
Max. exposed age group:	Child
Total body dose:	3.50E-3 mrem
Maximum organ dose:	3.52E-3 mrem
Skin dose:	5.75E-3 mrem

6.2 Dose at Nearest Residence

6.2.1 An assessment of the dose was performed for the residential location nearest to the plant with the highest dispersion parameters. Using the 1984 land use census data and actual meteorological data for the quarter, the critical receptor location for the nearest residence was determined to be in the NW sector at a distance of 3428 meters. The dose calculations were performed assuming that all ingestion exposure pathways existed at this residential location.

6.2.2 The doses and dose rates due to noble gas exposure at the selected residential location are:

Total body dose rate	6.42E-3 mrem/yr
Skin dose rate:	1.30E-2 mrem/yr
Total body dose:	1.62E-3 mrem
Skin dose:	3.28E-3 mrem
Gamma air dose:	1.83E-3 mrad
Beta air dose:	3.54E-3 mrad

6.2.3 The doses to the seven (7) critical organs for each of the four (4) age groups are summarized in the following table. These values represent the dose from the inhalation, ground plane, and each of the five (5) applicable ingestion pathways.

	<u>Dose (mrem)</u>			
	<u>Adult</u>	<u>Teen</u>	<u>Child</u>	<u>Infant</u>
Bone	8.10E-9	1.38E-8	3.28E-8	6.45E-8
Liver	2.18E-4	2.52E-4	3.65E-4	2.54E-4
Total Body	2.18E-4	2.52E-4	3.65E-4	2.54E-4
Thyroid	2.22E-4	2.58E-4	3.76E-4	2.79E-4
Kidney	2.18E-4	2.52E-4	3.65E-4	2.54E-4
Lung	2.18E-4	2.52E-4	3.65E-4	2.54E-4
GI-LLI	2.18E-4	2.52E-4	3.65E-4	2.54E-4

The total dose resulting from ground plane deposition of radioactive material is:

Total body dose:	5.39E-10 mrem
Skin dose:	6.54E-10 mrem



6.2.4 The total dose to the maximum exposed individual living at the residence with the highest exposure to gaseous effluents is:

Residence location:	NW at 3428 meters
Age group:	Child
Total body exposure:	1.99E-3 mrem
Max. organ dose:	2.00E-3 mrem
Skin dose:	3.28E-3 mrem

6.3 Dose to the Member of the Public from Activities within the Site Boundary

6.3.1 The assessment of dose to the member of the public from activities within the site boundary was performed in accordance with Chapter 4 of the Callaway Plant Offsite Dose Calculation Manual. It was assumed that the occupancy was one-fourth of the annual average occupancy, or 112 hours during the quarter. The activity contained in outside storage tanks was insignificant during this period, and although the unit was undergoing power ascension testing, it was assumed that it was operating at 100% power for the entire quarter.

6.3.2 The direct radiation dose from operation of the unit has been previously determined to be a maximum of 9E-3 mrad per calendar year. The maximum direct radiation dose for the period would therefore be 1.3% of the calendar year dose, or 1.2E-4 mrad.

6.3.3 The dose due to gaseous effluents to the member of the public from activities within the site boundary was determined as a result of whole body gamma and beta skin dose from noble gases, whole body and organ dose from ground plane deposition, and organ dose from inhalation. The ingestion pathways do not exist within the site boundary.

The dose due to gaseous effluents was assessed at 1154 meters in the sector with the highest X/Q value; the NW sector.

The calculated dose to the member of the public from activities within the site boundary is summarized as follows:

6.3.3.1 Plume Exposure Pathway

Total body	4.73E-4 mrem
Skin dose	9.67E-4 mrem
Gamma air dose	5.37E-4 mrad
Beta air dose	1.06E-3 mrad

## 6.3.3.2

Inhalation Pathway

Bone	2.79E-11 mrem
Liver	1.28E-05 mrem
Total body	1.28E-05 mrem
Thyroid	1.28E-05 mrem
Kidney	1.28E-05 mrem
Lung	1.28E-05 mrem
GI-LLI	1.28E-05 mrem

## 6.3.3.3

Ground Plane Pathway

Total body	1.52E-10 mrem
Skin	1.85E-10 mrem

6.3.4 The total dose to the member of the public from activities within the site boundary is therefore:

<u>Organ</u>	<u>Dose (mrem)</u>
Total body	6.1E-4
Skin	9.7E-4
Bone	5.9E-4
Liver	6.1E-4
Thyroid	6.1E-4
Kidney	6.1E-4
Lung	6.1E-4
GI-LLI	6.1E-4

6.4 Total Dose Due to Uranium Fuel Cycle

Since there are no other uranium fuel cycle facilities within 8 km of the Callaway Plant, the total dose to the most likely exposed member of the public results from direct radiation and radioactive effluents from the Callaway Plant. The methodology for assessing this dose is described in Chapter 4 of the Callaway Plant Offsite Dose Calculation Manual. The location at which this dose is assessed and the doses resulting from the plume exposure pathway, inhalation pathway, and ingestion pathway are discussed in Section 6.1.

The maximum direct radiation from the plant due to reactor operation is 9.0E-3 mrem/yr at a distance of 1222 meters. Since the radioactive content of outside tanks was negligible, the direct radiation dose for the reporting period, conservatively assuming 100% power operation at all time, is 2.25E-3 mrem.

The total dose to the member of the public due to uranium fuel cycle sources is:

	<u>Dose (mrem)</u>	<u>Limit (mrem)</u>	<u>% Limit</u>
Total Body	5.75E-3	25	0.023
Skin	5.75E-3	25	0.023
Bone	5.09E-3	25	0.020
Liver	5.75E-3	25	0.023
Thyroid	5.77E-3	75	0.008
Kidney	5.75E-3	25	0.023
Lung	5.75E-3	25	0.023
GI-LLI	5.75E-3	25	0.023

The total dose from uranium fuel cycle sources is thus a small fraction of the limits of Technical Specification 3.11.4.

#### 6.5 Doses Due to Liquid Effluents

The total dose to the maximum exposed individual from liquid effluents released from the Callaway Plant is 5.12E-3 mrem total body and 5.14E-3 mrem to the maximum exposed organ (GI-LLI). These values are 1.71E-1% and 5.14E-2% respectively of the annual Technical Specifications dose limit.

#### 7.0 RELATED INFORMATION

##### 7.1 Description of Unplanned Releases

7.1.1 On December 13, 1984, at 23:13, during the performance of a steam generator moisture carryover test, the C steam generator power operated relief valve (PORV) momentarily lifted due to a defective card in a controlling circuit. Since radioactive Sodium-24 had been introduced into the secondary system as a part of the moisture carryover measurements, Na-24 was released into the air via steam from the PORV. The condition was quickly recognized by operators in the Control Room and the PORV was shut after approximately one (1) minute.

An assessment of this release was performed in accordance with the methods of the ODCM and is presented as follows:

Activity released: 2.07 microcuries  
 Activity release rate: 2.30E-2 microcuries/sec  
 Dose rate at site boundary: 3.25E-4 mrem/yr  
 Total body dose at nearest residence: 4.03E-9 mrem  
 Na-24 Concentration at site boundary: 2.023-14 microcuries/cc

No technical specifications were violated as a result of this release. The dose rate at the site boundary was 2.0E-5% of the limit of technical specification 3.11.2.1. The dose rate at the nearest residence was 5.0E-8% of the limit of technical specification 3.11.2.3.



7.1.2 On December 14, 1984, at 19:57, temporary secondary liquid waste monitor tank A, which is located outside of the Radwaste Building, overflowed onto the ground while being filled. The tank was being filled at approximately 140 gpm and it was estimated that the tank overflowed for four (4) minutes before it was isolated.

Samples of the tank's contents and the drainage ditch adjacent to the tank were collected. Gamma isotopic analysis and tritium analysis of the samples indicated Na-24 present at a concentration of  $2.26E-4$  microcuries/ml and H-3 present at a concentration of  $1.39E-6$  microcuries/ml. No other radionuclides were detected. Using the conservative assumption that the overflowed volume from the tank was directly released into the Missouri River without any dispersion or dilution, the concentration of radioactive material discharged to the unrestricted area was 7.6% of the maximum permissible concentration. The total body dose to the maximum exposed individual due to this release was calculated to be  $1.03E-6$  mrem. This is  $6.87E-5\%$  of the quarterly total body dose limit of technical specification 3.11.1.2. No technical specification or 10CFR20 requirements were violated as a result of this release.

7.1.3 On December 28, 1984, steam generator blowdown to the Missouri River was initiated under liquid effluent release permit CAL-84-L458. Shortly after the release started, the steam generator blowdown radioactivity monitor BM-RE-52 alarmed and isolated the release. A second attempt to initiate blowdown also resulted in a BM-RE-52 high alarm and termination of the discharge. Samples of the steam generator blowdown surge tank were collected and analyzed. Results of the gamma isotopic analysis indicated fission and activation radionuclides which were not present in the sample collected prior to initiation of the release.

Subsequent investigation revealed a valve on a cross connecting line between the radwaste systems and the blowdown surge tank had been left open after clearing a workman's protection tag. This open valve allowed distillate from the secondary liquid waste evaporator to drain into the blowdown surge tank. It was determined that a total of 250 gallons had been discharged from the surge tank prior to termination for both of the attempted initiations. The release rate was 70 gpm with 8300 gpm dilution flow occurring at the time.

An assessment of the incident was performed to determine the resulting radiological consequences. The results of that assessment are summarized as follows:

Total Concentration at unrestricted area:  $9.45E-6$  microcuries/ml  
Activity released:  $1.08E-3$  curies  
Percent of MPC: 18.6%  
Total body dose:  $2.75E-7$  mrem  
Percent of quarterly total body dose limit:  $1.83E-5\%$   
Maximum organ dose:  $2.55E-6$  mrem (Thyroid)  
Percent of quarterly organ dose limit:  $5.10E-5\%$

No technical specification or 10CFR20 limits were exceeded as a result of this release. Corrective actions have been taken to prevent recurrence.

## 7.2 Changes to the Process Control Program

On December 21, 1984, revision 2 of the Callaway Plant Process Control Program was reviewed and approved for issue by the Onsite Review Committee. This revision was the first revision/change from the previously NRC-approved revision dated February 28, 1984. The major portion and context of this revision was to provide a generic document approach by which Callaway Plant would meet the requirements and regulations governing waste solidification and packaging with any specific actions/operations as to how to perform/accomplish these requirements to be covered in plant operating procedures.

This generic document approach is consistent with the concept of providing the basis by which solidification is to be assured as covered in a controlling document and associated program with specific detailed instructions as to how to accomplish same in program implementing procedures. These implementing procedures provide the specific methodology to be performed in order to accomplish the requirements covered in the PCP.

A summarization of the major changes to the Callaway Plant Process Control Program is as listed below. It should be noted that none of the previously approved methodology as to what is to be performed was removed from this document. Generic wording/format was included to state what must be performed in lieu of specific instructions as to how to perform particular programmatic evolutions covered in the program. In no case did this change reduce the overall conformance of the program to the requirements governing its intended use.

1. Specific proceduralized steps and/or procedure references were removed from the PCP with generic statements as to what is to be performed inserted in their place, or, as in the case of procedure references, wording relative to methodology as to how to perform a particular evolution are covered/described in plant operating procedures.

2. Added wording allowing the use of NRC-approved topical reports for meeting specific requirements of 10CFR61. This addition enables Callaway to make use of vendor provided programs governing waste classification verification (10CFR61.55) and waste form verification (10CFR61.56) in order to provide assurance in meeting the requirements of 10CFR61 and related Branch Technical Positions.
3. Incorporated wording relative to establishment of effective administrative controls governing the use and disposal of oils, greases, and chelating agents as a means to control and/or limit the production of wastes containing these substances.
4. Specific references as to where information is to be documented has been removed from the program. Those items requiring documentation are now covered procedurally in implementing and/or operating procedures governing waste solidification and packaging methodology.
5. The requirement governing pH of waste to be solidified has been modified to 7 to 9 pH. This is consistent with current requirements as determined by the supplier of our installed liquid waste solidification system in order to achieve acceptable waste solidification results.
6. Wording relative to test solidification evolutions has been revised to a generic format (consistent with item 1, above).
7. Formulation recipes and nomograms have been updated to show current vendor-approved formulation determinations to be followed in order to achieve acceptable waste solidification. Concurrent with this is the change to Portland Cement Type II as the primary solidification agent to be utilized to achieve acceptable solidification results.
8. Removal from the PCP document the "Waste Solidification Data Sheet". This data sheet and instructions for use are not covered in Process Control Program Implementing Procedures.
9. For those specific proceduralized steps removed from the PCP, a set of Process Control Program Implementing Procedures has been developed, approved, and issued. Additionally, previously referenced operating procedures utilized in the "implementation" of the PCP remain in effect. (Copies of these procedures are available for inspection at the plant site by the NRC inspectors).

TABLE 1A

SEMIANNUAL SUMMATION OF GASEOUS RELEASES BY QUARTER  
ALL AIRBORNE EFFLUENTS  
QUARTERS 3 AND 4, 1984

TYPE OF EFFLUENT	UNIT	QUARTER 3	QUARTER 4	EST TOTAL ERROR %
<b>A. FISSION AND ACTIVATION PRODUCTS</b>				
1. TOTAL RELEASE	CURIES	0.00E-01	1.99E 02	3.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	0.00E-01	1.07E 02	
3. PERCENT OF TECH SPEC LIMIT	%	0.00E-01	6.15E-03	
<b>B. RADIOIODINES</b>				
1. TOTAL IODINE-131	CURIES	0.00E-01	2.73E-07	3.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	0.00E-01	3.48E-08	
3. PERCENT OF TECH SPEC LIMIT	%	0.00E-01	3.31E-08	
<b>C. PARTICULATES</b>				
1. PARTICULATES (HALF-LIVES > 8 DAYS)	CURIES	0.00E-01	0.00E-01	0.00E-01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	0.00E-01	0.00E-01	
3. PERCENT OF TECH SPEC LIMIT	%	0.00E-01	0.00E-01	
4. GROSS ALPHA RADIOACTIVITY	CURIES	0.00E-01	0.00E-01	
<b>D. TRITIUM</b>				
1. TOTAL RELEASE	CURIES	0.00E-01	1.10E 00	2.50E 01
2. AVERAGE RELEASE RATE FOR PERIOD	UCI/SEC	0.00E-01	1.43E 00	
3. PERCENT OF TECH SPEC LIMIT	%	0.00E-01	9.41E-05	



TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES  
GROUND LEVEL RELEASES  
FISSION GASES, IODINES, AND PARTICULATES  
QUARTERS 3 AND 4, 1984

NUCLIDE	UNIT	CONTINUOUS RELEASES		BATCH RELEASES	
		QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
<b>1. FISSION GASES</b>					
KR-85M	CURIES	0.00E-01	0.00E-01	0.00E-01	1.65E-01
KR-85	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E 00
KR-87	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
KR-88	CURIES	0.00E-01	0.00E-01	0.00E-01	7.76E-02
XE-133M	CURIES	0.00E-01	1.64E 00	0.00E-01	6.28E-01
XE-133	CURIES	0.00E-01	1.30E 02	0.00E-01	5.70E 01
XE-135M	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
XE-135	CURIES	0.00E-01	3.35E 00	0.00E-01	1.67E-00
XE-138	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
AR-41	CURIES	0.00E-01	0.00E-01	0.00E-01	4.27E-00
TOTAL FOR PERIOD	CURIES	0.00E-01	1.35E 02	0.00E-01	6.38E 01
<b>2. IODINES</b>					
I-131	CURIES	0.00E-01	2.73E-07	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
I-135	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	2.73E-07	0.00E-01	0.00E-01
<b>3. PARTICULATES</b>					
H-3	CURIES	0.00E-01	8.56E-02	0.00E-01	1.01E 00
NA-24	CURIES	0.00E-01	0.00E-01	0.00E-01	2.07E-06
MN-54	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-60	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	*	0.00E-01	*
MO-99	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01

TABLE 1B

SEMIANNUAL AIRBORNE CONTINUOUS AND BATCH RELEASES  
GROUND LEVEL RELEASES  
FISSION GASES, IODINES, AND PARTICULATES  
QUARTERS 3 AND 4, 1984

NUCLIDE	UNIT	CONTINUOUS RELEASES		BATCH RELEASES	
		QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
PARTICULATES CONTINUED					
CS-137	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
BA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
IA-140	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-90	CURIES	0.00E-01	*	0.00E-01	*
G ALPHA	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
UNIDENTIFIED	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	8.56E-02	0.00E 00	1.01E 00

\* ANALYTICAL RESULTS FOR COMPOSITE SAMPLES NOT AVAILABLE AT THIS TIME. SUPPLEMENTAL INFORMATION WILL BE PROVIDED UPON RECEIPT OF DATA FROM OFFSITE CONTRACTOR.

TABLE 2A

SEMIANNUAL SUMMATION OF LIQUID RELEASES BY QUARTER  
ALL LIQUID EFFLUENTS  
QUARTERS 3 AND 4, 1984

TYPE OF EFFLUENT	UNIT	QUARTER 3	QUARTER 4	EST TOTAL ERROR %
<b>A. FISSION AND ACTIVATION PRODUCTS</b>				
1. TOTAL RELEASE (NOT INCLUDING TRITIUM, GASES, ALPHA)	CURIES	0.00E-01	7.86E-04	2.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	0.00E-01	4.35E-10	
3. PERCENT OF APPLICABLE LIMIT	%	0.00E-01	1.45E-01	
<b>B. TRITIUM</b>				
1. TOTAL RELEASE	CURIES	0.00E-01	1.63E 01	2.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	0.00E-01	9.01E-06	
3. PERCENT OF APPLICABLE LIMIT	%	0.00E-01	3.00E-01	
<b>C. DISSOLVED AND ENTRAINED GASES</b>				
1. TOTAL RELEASE	CURIES	0.00E-01	3.03E-03	2.50E 01
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	UCI/ML	0.00E-01	8.07E-08	
3. PERCENT OF APPLICABLE LIMIT	%	0.00E-01	4.03E-02	
<b>D. GROSS ALPHA RADIOACTIVITY</b>				
1. TOTAL RELEASE	CURIES	0.00E-01	2.89E-04	2.50E 01
<b>E. WASTE VOL RELEASED (PRE-DILUTION)</b>				
E. WASTE VOL RELEASED (PRE-DILUTION)	GAL	0.00E-01	9.69E 06	1.00E 01
<b>F. VOLUME OF DILUTION WATER USED</b>				
F. VOLUME OF DILUTION WATER USED	GAL	0.00E-01	4.57E 08	1.00E 01

TABLE 2B

SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES  
 TOTALS FOR EACH NUCLIDE RELEASED  
 QUARTER 3 AND 4, 1984

NUCLIDE	UNIT	CONTINUOUS RELEASES		BATCH RELEASES	
		QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
ALL NUCLIDES					
H-3	CURIES	0.00E-01	5.81E-03	0.00E-01	1.63E 01
NA-24	CURIES	0.00E-01	1.23E-06	0.00E-01	5.89E-04
CR-51	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MN-54	CURIES	0.00E-01	2.13E-05	0.00E-01	0.00E-01
FE-55	CURIES	0.00E-01	*	0.00E-01	*
FE-59	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CO-58	CURIES	0.00E-01	1.55E-04	0.00E-01	9.75E-06
CO-60	CURIES	0.00E-01	2.19E-07	0.00E-01	0.00E-01
ZN-65	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SR-89	CURIES	0.00E-01	*	0.00E-01	*
ZN-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NB-95	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
MO-99	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TC-99M	CURIES	0.00E-01	3.77E-07	0.00E-01	0.00E-01
I-131	CURIES	0.00E-01	6.04E-06	0.00E-01	0.00E-01
I-133	CURIES	0.00E-01	8.24E-07	0.00E-01	0.00E-01
CS-134	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CS-137	CURIES	0.00E-01	1.26E-07	0.00E-01	0.00E-01
LA-140	CURIES	0.00E-01	5.98E-07	0.00E-01	0.00E-01
CE-141	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
CE-144	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W-187	CURIES	0.00E-01	2.73E-07	0.00E-01	0.00E-01
XE-133	CURIES	0.00E-01	4.88E-07	0.00E-01	2.84E-03
XE-133M	CURIES	0.00E-01	0.00E-01	0.00E-01	6.01E-06
XE-135	CURIES	0.00E-01	0.00E-01	0.00E-01	1.69E-04
BA-140	CURIES	0.00E-01	9.32E-07	0.00E-01	0.00E-01
SR-90	CURIES	0.00E-01	*	0.00E-01	*
G ALPHA	CURIES	0.00E-01	0.00E-01	0.00E-01	2.89E-04
UNIDENTIFIED	CURIES	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOTAL FOR PERIOD	CURIES	0.00E-01	6.00E-03	0.00E-01	1.63E 01

\* ANALYTICAL RESULTS FOR COMPOSITE SAMPLES NOT AVAILABLE AT THIS TIME. SUPPLEMENTAL INFORMATION WILL BE PROVIDED UPON RECEIPT OF DATA FROM OFFSITE CONTRACTOR.



REPORT CATEGORY : METEROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : A  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ENE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
E	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ESE	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SSE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
S	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SSW	0.00E-01	1.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
SW	0.00E-01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
WSW	1.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	4.00E 00
W	0.00E-01	0.00E-01	2.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
WNW	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOT	2.00E 00	8.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	1.40E 01

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 4.000E 00

APPROVED BY:

TITLE:

DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : B  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ENE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
E	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ESE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SSE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
S	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SSW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WSW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WNW	0.00E-01	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	1.00E 00
NW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
TOT	0.00E-01	1.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	5.00E 00

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 1.000E 01

APPROVED BY: TITLE: DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : C  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNE	0.00E-01	0.00E-01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	3.00E 00
NE	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
ENE	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
E	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
ESE	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SE	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SSE	0.00E-01	1.00E 00	3.00E 00	1.00E 00	0.00E-01	0.00E-01	5.00E 00
S	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SSW	0.00E-01	3.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
SW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WSW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W	0.00E-01	2.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	4.00E 00
WNW	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOT	3.00E 00	1.20E 01	1.10E 01	2.00E 00	0.00E-01	0.00E-01	2.80E 01

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 3.200E 01

APPROVED BY:

TITLE:

DATE:

REPORT CATEGORY : METEOROLOGICAL DATA QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : D  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1.00E 00	3.00E 00	8.00E 00	1.00E 00	0.00E-01	0.00E-01	1.30E 01
NNE	0.00E-01	2.00E 00	1.10E 01	0.00E-01	0.00E-01	0.00E-01	1.30E 01
NE	0.00E-01	9.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	1.30E 01
ENE	0.00E-01	5.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	9.00E 00
E	3.00E 00	7.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	1.30E 01
ESE	2.00E 00	1.50E 01	6.00E 00	0.00E-01	0.00E-01	0.00E-01	2.30E 01
SE	7.00E 00	2.10E 01	2.10E 01	2.00E 00	0.00E-01	0.00E-01	5.10E 01
SSE	5.00E 00	8.00E 00	8.00E 00	8.00E 00	0.00E-01	0.00E-01	2.90E 01
S	7.00E 00	1.90E 01	7.00E 00	1.20E 01	0.00E-01	0.00E-01	4.50E 01
SSW	0.00E-01	9.00E 00	8.00E 00	5.00E 00	2.00E 00	0.00E-01	2.40E 01
SW	5.00E 00	6.00E 00	6.00E 00	5.00E 00	3.00E 00	1.00E 00	2.60E 01
WSW	4.00E 00	5.00E 00	2.00E 01	5.00E 00	0.00E-01	0.00E-01	3.40E 01
W	2.00E 00	1.40E 01	1.30E 01	1.00E 01	1.00E 00	0.00E-01	4.00E 01
WNW	5.00E 00	5.00E 00	1.60E 01	1.20E 01	0.00E-01	0.00E-01	3.80E 01
NW	0.00E-01	7.00E 00	9.00E 00	1.40E 01	3.00E 00	0.00E-01	3.30E 01
NNW	0.00E-01	4.00E 00	1.50E 01	5.00E 00	0.00E-01	0.00E-01	2.40E 01
TOT	4.10E 01	1.39E 02	1.59E 02	7.90E 01	9.00E 00	1.00E 00	4.28E 02

PERIODS OF CALM(HOURS): 1.000E 00  
 HOURS OF INVALID DATA : 2.250E 02

APPROVED BY: TITLE: DATE:



REPORT CATEGORY : METEROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : E  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3.00E 00	6.00E 00	1.00E 01	5.00E 00	0.00E-01	0.00E-01	2.40E 01
NNE	5.00E 00	2.10E 01	1.30E 01	4.00E 00	0.00E-01	0.00E-01	4.30E 01
NE	5.00E 00	1.00E 01	7.00E 00	1.00E 00	0.00E-01	0.00E-01	2.30E 01
ENE	3.00E 00	7.00E 00	4.00E 00	7.00E 00	0.00E-01	0.00E-01	2.10E 01
E	2.00E 00	1.00E 01	1.00E 01	2.00E 00	0.00E-01	0.00E-01	2.40E 01
ESE	4.00E 00	3.90E 01	2.30E 01	1.00E 00	0.00E-01	0.00E-01	6.70E 01
SE	1.20E 01	3.70E 01	4.50E 01	4.00E 00	0.00E-01	0.00E-01	9.80E 01
SSE	6.00E 00	1.60E 01	4.60E 01	8.00E 00	0.00E-01	0.00E-01	7.60E 01
S	6.00E 00	2.00E 01	5.30E 01	6.00E 00	1.00E 00	0.00E-01	8.60E 01
SSW	4.00E 00	1.40E 01	1.30E 01	2.80E 01	4.00E 00	0.00E-01	6.30E 01
SW	4.00E 00	4.00E 00	7.00E 00	5.00E 00	1.00E 00	1.00E 00	2.20E 01
WSW	6.00E 00	5.00E 00	1.10E 01	1.00E 00	0.00E-01	1.00E 00	2.40E 01
W	5.00E 00	8.00E 00	7.00E 00	2.00E 00	0.00E-01	1.00E 00	2.30E 01
WNW	0.00E-01	1.00E 01	1.70E 01	4.00E 00	0.00E-01	0.00E-01	3.10E 01
NW	0.00E-01	6.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	8.00E 00
NNW	4.00E 00	2.00E 00	1.00E 00	1.00E 00	1.00E 00	0.00E-01	9.00E 00
TOT	6.90E 01	2.15E 02	2.69E 02	7.90E 01	7.00E 00	3.00E 00	6.42E 02

PERIODS OF CALM(HOURS): 5.000E 00  
 HOURS OF INVALID DATA : 2.750E 02

APPROVED BY:

TITLE:

DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : F  
 ELEVATION : 10 METERS

## WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
NNE	1.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	5.00E 00
NE	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
ENE	0.00E-01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
E	0.00E-01	4.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	5.00E 00
ESE	0.00E-01	1.00E 01	2.00E 00	0.00E-01	0.00E-01	0.00E-01	1.20E 01
SE	1.00E 01	2.20E 01	8.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 01
SSE	3.00E 00	1.70E 01	1.10E 01	0.00E-01	0.00E-01	0.00E-01	3.10E 01
S	3.00E 00	1.70E 01	9.00E 00	0.00E-01	0.00E-01	0.00E-01	2.90E 01
SSW	4.00E 00	1.00E 01	5.00E 00	0.00E-01	0.00E-01	0.00E-01	1.90E 01
SW	3.00E 00	5.00E 00	1.10E 01	0.00E-01	0.00E-01	0.00E-01	1.90E 01
WSW	7.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 01
W	2.00E 00	5.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	7.00E 00
WNW	4.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
NW	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNW	3.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	00E 00
TOT	4.60E 01	1.05E 02	4.80E 01	0.00E-01	0.00E-01	0.00E-01	1.99E 02

PERIODS OF CALM(HOURS): 3.000E 00  
 HOURS OF INVALID DATA : 7.700E 01

APPROVED BY:

TITLE:

DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : G  
 ELEVATION : 10 METERS

WIND SPEED(MPH) AT 10 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ENE	1.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.00E 00
E	2.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.00E 00
ESE	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
SE	4.00E 00	1.30E 01	4.00E 00	0.00E-01	0.00E-01	0.00E-01	2.10E 01
SSE	0.00E-01	1.10E 01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.20E 01
S	7.00E 00	3.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	1.20E 01
SSW	5.00E 00	5.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 01
SW	1.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
WSW	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
W	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
WNW	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOT	2.40E 01	3.60E 01	7.00E 00	0.00E-01	0.00E-01	0.00E-01	6.70E 01

PERIODS OF CALM(HOURS): 2.000E 00  
 HOURS OF INVALID DATA : 3.600E 01  
 HOURS OF GOOD DATA : 1.394E 03 = 63.2% OF TOTAL HOURS

APPROVED BY: TITLE: DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : A  
 ELEVATION : 60 METERS

WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ENE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
E	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ESE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SSE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
S	0.00E-01	1.00E 00	0.00E-01	2.00E 00	0.00E-01	0.00E-01	3.00E 00
SSW	0.00E-01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
SW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WSW	0.00E-01	2.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.00E 00
W	0.00E-01	2.00E 00	0.00E-01	2.00E 00	0.00E-01	0.00E-01	4.00E 00
WNW	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
NW	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOT	2.00E 00	1.10E 01	0.00E-01	4.00E 00	0.00E-01	0.00E-01	1.70E 01

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 1.000E 00

APPROVED BY:

TITLE:

DATE:



REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : B  
 ELEVATION : 60 METERS

WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ENE	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
E	3.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	3.00E 00
ESE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SSE	0.00E-01	1.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
S	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SSW	0.00E-01	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	1.00E 00
SW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WSW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
W	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
WNW	0.00E-01	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	1.00E 00
NW	0.00E-01	0.00E-01	1.00E 00	2.00E 00	0.00E-01	0.00E-01	3.00E 00
NNW	0.00E-01	0.00E-01	2.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
TOT	3.00E 00	2.00E 00	5.00E 00	4.00E 00	0.00E-01	0.00E-01	1.40E 01

PERIODS OF CALM(HOURS): 1.000E 00  
 HOURS OF INVALID DATA : 0.000E-01

APPROVED BY:

TITLE:

DATE:

REPORT CATEGORY : METEOROLOGICAL DATA QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : C  
 ELEVATION : 60 METERS

WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
NNE	0.00E-01	0.00E-01	4.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 00
NE	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
ENE	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
E	0.00E-01	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	3.00E 00
ESE	0.00E-01	2.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	3.00E 00
SE	1.00E 00	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
SSE	0.00E-01	2.00E 00	5.00E 00	1.00E 00	0.00E-01	0.00E-01	8.00E 00
S	0.00E-01	0.00E-01	6.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
SSW	0.00E-01	0.00E-01	1.00E 00	2.00E 00	0.00E-01	0.00E-01	3.00E 00
SW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
WSW	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
W	0.00E-01	1.00E 00	3.00E 00	2.00E 00	0.00E-01	0.00E-01	6.00E 00
WNW	0.00E-01	1.00E 00	1.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
NW	0.00E-01	0.00E-01	3.00E 00	2.00E 00	2.00E 00	0.00E-01	7.00E 00
NNW	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 00
TOT	2.00E 00	8.00E 00	3.00E 01	7.00E 00	2.00E 00	0.00E-01	4.90E 01

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 1.100E 01

APPROVED BY: TITLE: DATE:

REPORT CATEGORY : METEOROLOGICAL DATA QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : D  
 ELEVATION : 60 METERS

WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	8.00E 00	1.20E 01	4.00E 00	1.00E 00	1.00E 00	2.60E 01
NNE	0.00E-01	6.00E 00	2.80E 01	2.00E 00	0.00E-01	0.00E-01	3.60E 01
NE	1.00E 00	1.20E 01	1.30E 01	1.00E 00	0.00E-01	0.00E-01	2.70E 01
ENE	0.00E-01	1.30E 01	9.00E 00	1.00E 00	0.00E-01	0.00E-01	2.30E 01
E	0.00E-01	7.00E 00	7.00E 00	1.00E 00	0.00E-01	0.00E-01	1.50E 01
ESE	1.00E 00	5.00E 00	1.40E 01	0.00E-01	0.00E-01	0.00E-01	2.00E 01
SE	0.00E-01	1.60E 01	1.40E 01	9.00E 00	0.00E-01	0.00E-01	3.90E 01
SSE	1.00E 00	9.00E 00	1.90E 01	1.50E 01	1.00E 00	0.00E-01	4.50E 01
S	0.00E-01	9.00E 00	1.20E 01	1.90E 01	1.10E 01	1.00E 00	5.20E 01
SSW	1.00E 00	1.00E 01	1.00E 01	4.00E 00	1.00E 00	1.00E 00	2.70E 01
SW	1.00E 00	5.00E 00	1.10E 01	8.00E 00	3.00E 00	8.00E 00	3.60E 01
WSW	1.00E 00	6.00E 00	9.00E 00	3.00E 00	0.00E-01	1.00E 00	2.00E 01
W	2.00E 00	1.10E 01	1.10E 01	1.50E 01	4.00E 00	1.00E 00	4.40E 01
WNW	2.00E 00	6.00E 00	1.40E 01	2.00E 01	4.00E 00	0.00E-01	4.60E 01
NW	0.00E-01	1.00E 00	9.00E 00	2.00E 01	1.20E 01	6.00E 00	4.80E 01
NNW	0.00E-01	4.00E 00	1.80E 01	1.20E 01	0.00E-01	0.00E-01	3.40E 01
TOT	1.00E 01	1.28E 02	2.10E 02	1.34E 02	3.70E 01	1.90E 01	5.38E 02

PERIODS OF CALM(HOURS) : 1.000E 00  
 HOURS OF INVALID DATA : 1.150E 02

APPROVED BY: \_\_\_\_\_ TITLE: \_\_\_\_\_ DATE: \_\_\_\_\_

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : E  
 ELEVATION : 60 METERS

## WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	2.00E 00	9.00E 00	5.00E 00	4.00E 00	0.00E-01	2.00E 01
NNE	0.00E-01	6.00E 00	1.80E 01	6.00E 00	2.00E 00	0.00E-01	3.20E 01
NE	2.00E 00	1.30E 01	1.50E 01	0.00E-01	0.00E-01	0.00E-01	3.00E 01
ENE	0.00E-01	4.00E 00	6.00E 00	6.00E 00	2.00E 00	0.00E-01	1.80E 01
E	0.00E-01	6.00E 00	1.30E 01	2.00E 00	0.00E-01	0.00E-01	2.10E 01
ESE	0.00E-01	1.10E 01	3.30E 01	3.00E 00	0.00E-01	0.00E-01	4.70E 01
SE	0.00E-01	9.00E 00	3.10E 01	4.20E 01	0.00E-01	0.00E-01	8.20E 01
SSE	3.00E 00	9.00E 00	3.30E 01	6.80E 01	1.00E 01	0.00E-01	1.23E 02
S	2.00E 00	3.00E 00	3.20E 01	8.40E 01	6.00E 00	2.00E 00	1.29E 02
SSW	2.00E 00	7.00E 00	1.70E 01	3.50E 01	2.20E 01	7.00E 00	9.00E 01
SW	2.00E 00	7.00E 00	9.00E 00	2.10E 01	2.00E 00	2.00E 00	4.30E 01
WSW	0.00E-01	2.00E 00	9.00E 00	7.00E 00	2.00E 00	3.00E 00	2.30E 01
W	1.00E 00	3.00E 00	6.00E 00	1.00E 01	1.00E 00	3.00E 00	2.40E 01
WNW	0.00E-01	2.00E 00	1.10E 01	2.00E 01	5.00E 00	0.00E-01	3.80E 01
NW	2.00E 00	3.00E 00	8.00E 00	1.50E 01	1.00E 00	1.00E 00	3.00E 01
NNW	1.00E 00	2.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	5.00E 00
TOT	1.50E 01	8.90E 01	2.51E 02	3.25E 02	5.70E 01	1.80E 01	7.55E 02

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 1.670E 02

APPROVED BY:

TITLE:

DATE:



REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 : EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : F  
 ELEVATION : 60 METERS

WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	1.00E 00	0.00E-01	1.00E 00	0.00E-01	0.00E-01	2.00E 00
NNE	0.00E-01	2.00E 00	3.00E 00	5.00E 00	0.00E-01	0.00E-01	1.00E 01
NE	0.00E-01	3.00E 00	7.00E 00	0.00E-01	0.00E-01	0.00E-01	1.00E 01
ENE	0.00E-01	0.00E-01	3.00E 00	1.00E 00	0.00E-01	0.00E-01	4.00E 00
E	0.00E-01	0.00E-01	3.00E 00	0.00E-01	0.00E-01	0.00E-01	3.00E 00
ESE	0.00E-01	2.00E 00	6.00E 00	0.00E-01	0.00E-01	0.00E-01	8.00E 00
SE	0.00E-01	0.00E-01	1.20E 01	4.00E 00	0.00E-01	0.00E-01	1.60E 01
SSE	0.00E-01	3.00E 00	2.30E 01	2.30E 01	2.00E 00	0.00E-01	5.10E 01
S	0.00E-01	3.00E 00	1.00E 01	2.20E 01	0.00E-01	0.00E-01	3.50E 01
SSW	0.00E-01	2.00E 00	6.00E 00	1.60E 01	1.00E 00	0.00E-01	2.50E 01
SW	2.00E 00	5.00E 00	9.00E 00	2.70E 01	1.00E 00	0.00E-01	4.40E 01
WSW	3.00E 00	2.00E 00	3.00E 00	3.00E 00	0.00E-01	0.00E-01	1.10E 01
W	2.00E 00	1.00E 00	4.00E 00	4.00E 00	0.00E-01	0.00E-01	1.10E 01
WNW	1.00E 00	2.00E 00	8.00E 00	5.00E 00	0.00E-01	0.00E-01	1.60E 01
NW	0.00E-01	1.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 00
NNW	0.00E-01	1.00E 00	3.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 00
TOT	8.00E 00	2.80E 01	1.03E 02	1.11E 02	4.00E 00	0.00E-01	2.54E 02

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 2.500E 01

APPROVED BY: TITLE: DATE:

REPORT CATEGORY : METEOROLOGICAL DATA. QUARTERLY TOTALS OF HOURS AT  
 EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD : QUARTER # 4  
 REPORT START TIME : 6577:00 HRS = 01:00AM OCTOBER 1, 1984  
 REPORT END TIME : 8783:00 HRS = 11:00PM DECEMBER 31, 1984  
 STABILITY CLASS : G  
 ELEVATION : 60 METERS

## WIND SPEED(MPH) AT 60 METER LEVEL

	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.00E-01	0.00E-01	0.00E-01	1.00E 00	0.00E-01	0.00E-01	1.00E 00
NNE	0.00E-01	0.00E-01	4.00E 00	0.00E-01	0.00E-01	0.00E-01	4.00E 00
NE	0.00E-01	1.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	5.00E 00
ENE	0.00E-01	0.00E-01	2.00E 00	0.00E-01	0.00E-01	0.00E-01	2.00E 00
E	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
ESE	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
SE	0.00E-01	1.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	3.00E 00
SSE	0.00E-01	3.00E 00	5.00E 00	1.10E 01	1.00E 00	0.00E-01	2.00E 01
S	0.00E-01	1.00E 00	6.00E 00	9.00E 00	0.00E-01	0.00E-01	1.60E 01
SSW	0.00E-01	0.00E-01	9.00E 00	6.00E 00	0.00E-01	0.00E-01	1.50E 01
SW	2.00E 00	1.00E 00	1.10E 01	0.00E-01	0.00E-01	0.00E-01	1.40E 01
WSW	0.00E-01	1.00E 00	1.00E 00	1.00E 00	0.00E-01	0.00E-01	3.00E 00
W	0.00E-01	3.00E 00	2.00E 00	0.00E-01	0.00E-01	0.00E-01	5.00E 00
WNW	1.00E 00	1.00E 00	4.00E 00	0.00E-01	0.00E-01	0.00E-01	6.00E 00
NW	0.00E-01	1.00E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01	1.00E 00
NNW	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01
TOT	3.00E 00	1.30E 01	5.00E 01	2.80E 01	1.00E 00	0.00E-01	9.50E 01

PERIODS OF CALM(HOURS): 0.000E-01  
 HOURS OF INVALID DATA : 1.000E 01  
 HOURS OF GOOD DATA : 1.724E 03 = 78.1% OF TOTAL HOURS

APPROVED BY:

TITLE:

DATE:

TABLE 4.11-1  
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup> (µCi/ml)	
1. Batch Waste Release Tanks <sup>(2)</sup>	P Each Batch	P Each Batch	Principal Gamma Emitters <sup>(3)</sup>	$5 \times 10^{-7}$	
			I-131	$1 \times 10^{-6}$	
	a. Waste Monitor Tank	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	$1 \times 10^{-5}$
	b. Secondary Liquid Waste Monitor Tank	P Each Batch	M Composite <sup>(4)</sup>	H-3	$1 \times 10^{-5}$
				Gross Alpha	$1 \times 10^{-7}$
	c. Discharge Monitor Tank	P Each Batch	Q Composite <sup>(4)</sup>	Sr-89, Sr-90	$5 \times 10^{-8}$
				Fe-55	$1 \times 10^{-6}$
	2. Continuous Releases <sup>(5)</sup>	Daily <sup>(6)</sup> Grab Sample	W Composite <sup>(4)</sup>	Principal Gamma Emitters <sup>(3)</sup>	$5 \times 10^{-7}$
				I-131	$1 \times 10^{-6}$
		Steam Generator Blowdown	M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)
Daily <sup>(6)</sup> Grab Sample			M Composite <sup>(4)</sup>	H-3	$1 \times 10^{-5}$
				Gross Alpha	$1 \times 10^{-7}$
Daily <sup>(6)</sup> Grab Sample			Q Composite <sup>(4)</sup>	Sr-89, Sr-90	$5 \times 10^{-8}$
				Fe-55	$1 \times 10^{-6}$

TABLE 4.11-1 (Continued)

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCuries per unit mass or volume),

$s_b$  = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),

$2.22 \times 10^6$  = the number of disintegrations per minute per microCurie,

Y = the fractional radiochemical yield; when applicable,

$\lambda$  = the radioactive decay constant for the particular radionuclide ( $s^{-1}$ ), and

$\Delta t$  = the elapsed time between the midpoint of sample collection and the time of counting (s).

Typical values of E, V, Y, and  $\Delta t$  should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(2) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed by a method described in the ODCM to assure representative sampling.



TABLE 4.11-1 (Continued)TABLE NOTATIONS (Continued)

- (3) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.1.7, in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.
- (4) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released. Prior to analysis, all samples taken for the composite shall be thoroughly mixed in order for the composite samples to be representative of the effluent release.
- (5) A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.
- (6) Samples shall be taken at the initiation of effluent flow and at least once per 24 hours thereafter while the release is occurring. To be representative of the liquid effluent, the sample volume shall be proportioned to the effluent stream discharge volume. The ratio of sample volume to effluent discharge volume shall be maintained constant for all samples taken for the composite sample.

TABLE 4.11-2

## RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) <sup>(1)</sup> ( $\mu\text{Ci/ml}$ )
1. Waste Gas Decay Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-4}$
2. Containment Purge or Vent <sup>(3)</sup>	P Each PURGE <sup>(3)</sup> Grab Sample	P Each PURGE <sup>(3)</sup>	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-4}$
		M	H-3 (oxide)	$1 \times 10^{-6}$
3. Unit Vent	M <sup>(3),(4)</sup> Grab Sample	M <sup>(3)</sup>	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-4}$
		M <sup>(4)</sup>	H-3 (oxide)	$1 \times 10^{-6}$
4. Spent Fuel Building Exhaust	M <sup>(5)</sup> Grab Sample	M	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-4}$
		M <sup>(5)</sup>	H-3 (oxide)	$1 \times 10^{-6}$
5. Radwaste Building Vent	M Grab Sample	M	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-4}$
6. All Release Types as listed in 1., 2., 3., 4., and 5. above	Continuous <sup>(6) (8)</sup>	W <sup>(7)</sup> Charcoal Sample	I-131	$1 \times 10^{-12}$
			I-333	$1 \times 10^{-10}$
	Continuous <sup>(6) (8)</sup>	W <sup>(7)</sup> Particulate Sample	Principal Gamma Emitters <sup>(2)</sup>	$1 \times 10^{-11}$
			M Composite Particulate Sample	Gross Alpha
Continuous <sup>(6) (8)</sup>	Q Composite Particulate Sample	Sr-89, Sr-90	$1 \times 10^{-11}$	

CALLAWAY - UNIT 1

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PAGE 1 of 3

ATTACHMENT 2

REVISION 1

TABLE 4.11-2 (Continued)

## TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCuries per unit mass or volume),

$s_b$  = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),

$2.22 \times 10^6$  = the number of disintegrations per minute per microCurie,

Y = the fractional radiochemical yield, when applicable,

$\lambda$  = the radioactive decay constant for the particular radionuclide ( $s^{-1}$ ), and

$\Delta t$  = the elapsed time between the midpoint of sample collection and the time of counting (s).

Typical values of E, V, Y, and  $\Delta t$  should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

TABLE 4.11-2 (Continued)TABLE NOTATIONS (Continued)

- (2) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, I-131, Cs-134, Cs-137, Ce-141, and Ce-144 in iodine and particulate releases. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.1.7, in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.
- (3) Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within 1 hour period.
- (4) Tritium grab samples shall be taken and analyzed at least once per 24 hours when the refueling canal is flooded.
- (5) Tritium grab samples shall be taken and analyzed at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool. Grab samples need to be taken only when spent fuel is in the spent fuel pool.
- (6) The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 3.11.2.1, 3.11.2.2, and 3.11.2.3.
- (7) Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from sampler. For unit vent, sampling shall also be performed at least once per 24 hours for at least 7 days following each shutdown, STARTUP or THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1-hour period and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3, and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.
- (8) Continuous sampling of the spent fuel building exhaust needs to be performed only when spent fuel is in the spent fuel pool.



**UNION ELECTRIC COMPANY**

1901 Gratiot Street, St. Louis

Donald F. Schnell  
Vice President

DMB

PRIORITY ROUTING	
First	Second
RA	RC
URA	ETC
ORP	SGA
DRS	ML
DRSS	OL
DRNA	OT
	PAQ

orig 1

FILE

February 28, 1985

Mr. James G. Keppler  
Regional Administrator  
Office of Inspection & Enforcement  
U.S. Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, IL 60137

ULNRC-1050

Dear Mr. Keppler:

DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
FACILITY OPERATING LICENSE NPF-30  
SEMI-ANNUAL RADIOACTIVE EFFLUENT REPORT

The enclosed Semi-Annual Effluent Report for the second half of 1984 is submitted pursuant to section 6.9.1.7 of the Callaway Unit 1 Technical Specifications.

Very truly yours,

Donald F. Schnell

DFS/bjp  
Enclosure

cc: Distribution attached

JE25  
||



cc distribution for ULNRC-1050

with enclosures

Director, Resource Management  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

Director  
Office of Inspection & Enforcement  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

NRC Resident Inspector  
Missouri Public Service Commission