

V.C. Summer Nuclear Station
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April 27, 2022



ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-001

Serial No. 22-136
LIC/TS/R0
Docket No. 50-395
License No. NPF-12

DOMINION ENERGY SOUTH CAROLINA, INC. (DESC)
VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Enclosed is the DESC Annual Radioactive Effluent Release Report as required by 10 CFR 50.36a, Section 6.9.1.8 of the Virgil C. Summer Nuclear Station Technical Specifications, and Section 1.6.2.1 of the Offsite Dose Calculation Manual. This submittal covers the period of January 1 through December 31, 2021.

If there are any questions, please call Ms. Tracey Stewart at (803) 931-5663.

Sincerely,

A handwritten signature in cursive script that reads "Michael S. Moore for".

Robin R. Haselden
Director, Nuclear Station Safety and Licensing
V. C. Summer Nuclear Station

Commitments contained in this letter: None

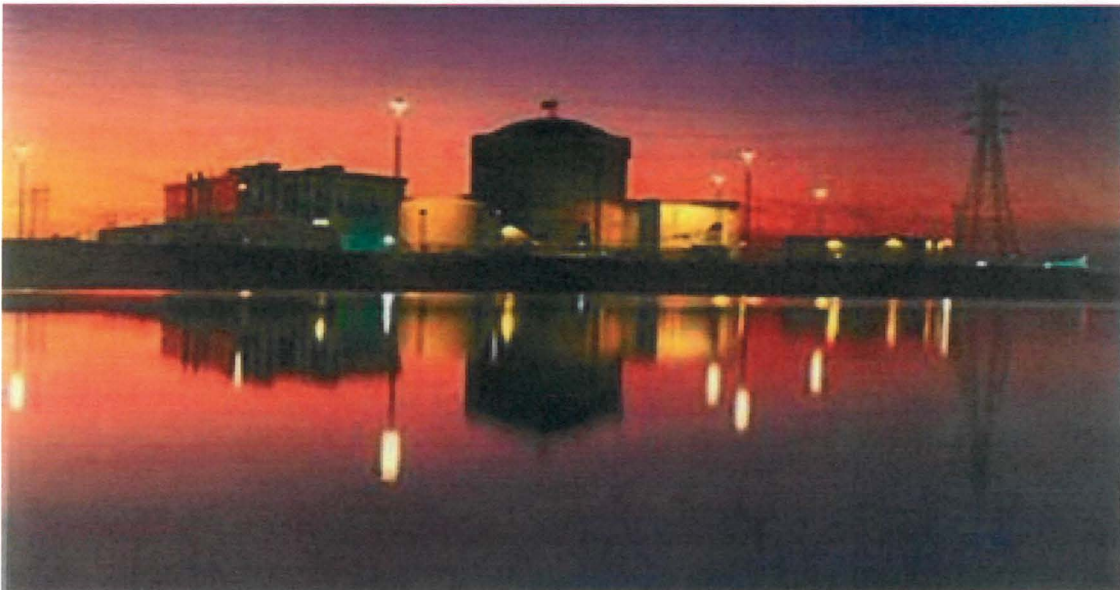
Enclosure: Annual Radioactive Effluent Release Report
Enclosure A: Meteorological Data Joint Frequency Distribution Tables

cc: w/o Enclosures unless noted
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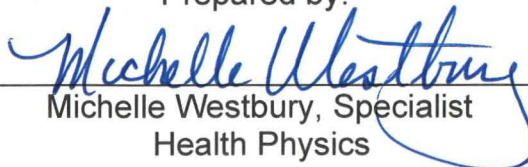


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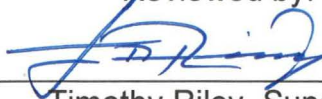
FOR THE OPERATING PERIOD
JANUARY 1, 2021 - DECEMBER 31, 2021



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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

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Introduction

This report is being submitted as a summary of quantities of radioactive liquid and gaseous effluents and solid waste released from the Virgil C. Summer Nuclear Station. This report is submitted in fulfillment of the requirements in the V. C. Summer Nuclear Station Operating License Technical Specifications Section 6.9.1.8, Offsite Dose Calculation Manual (ODCM) Section 1.6.2 and 10CFR50.36(a) and follows the reporting details specified in USNRC Regulatory Guide 1.21⁽¹⁾.

Summary information of radioactive gaseous and liquid effluents is presented along with a summary of radioactive waste disposal as well as an evaluation of the radiological impact on man due to operation of the Virgil C. Summer Nuclear Station. Supplemental information including release limits also required by USNRC Regulatory Guide 1.21 is provided as Appendix A.

A. Supplemental Information

Regulatory limits for doses, dose rate and effluent concentration limits presented in Supplemental Information are from the Virgil C. Summer Nuclear Station ODCM and 40 CFR 190. Average energy (\bar{E}) is not applicable to the method for determining release rate limits for fission and activation gaseous effluents, therefore, it has been omitted. A compilation of required supplemental information is provided in Appendix A.

B. Gaseous Effluents

Gaseous effluents released from ground level are summarized in Tables 1 and 2. An elevated release pathway does not exist at Virgil C. Summer Nuclear Station. Cumulative doses are discussed in Section E.

The error for both liquid and gaseous release totals is estimated as twenty percent for radioactive radionuclides sampled and released in effluent pathways. Error was derived using root sum of squares methodology considering known sources of error including calibration of detectors and flow measurement equipment, sample preparation, and analysis counting error.

C. Liquid Effluents

Liquid effluents are summarized in Tables 3 and 4. Estimated total errors are expressed as in Section B above.

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D. Solid Waste Shipments

Solid waste shipments are summarized in Table 5. Curie content of radioactive waste packages is determined by dose rates and/or gamma spectroscopy analysis of samples. The total error for each type of curie content determination is conservatively estimated to be the sum of a 15% systematic error and a 20% photon response error for the detector used.

E. Radiological Impact on Man

Dose to the maximum exposed individual in the unrestricted area was calculated using measured plant gaseous effluents and meteorological data in accordance with the Offsite Dose Calculation Manual. The source term involved 0 Waste Gas Decay Tank (WGDT) releases, 3.41 days of 6-inch Reactor Building purge releases, 12.55 days of 36-inch Reactor Building purge releases and a continuous 12-month Main Plant vent release. Doses are summarized in Table 6. The total gaseous activities released are presented in Tables 1 and 2. The highest quarterly air doses at the station boundary resulting from the release of noble gases were $4.07\text{E-}04$ mrad for gamma during the fourth quarter and $2.35\text{E-}04$ mrad for beta during the fourth quarter. The maximum quarterly organ dose attributed to the releases, excluding Carbon-14, was $5.57\text{E-}04$ mrem. Cumulative annual dose was $4.97\text{E-}04$ mrad, $2.68\text{E-}04$ mrad and $7.43\text{E-}04$ mrem for gamma, beta, and organ dose, respectively. Discussion of the impact of Carbon-14 is included in Section K.

Measured plant liquid effluent data was used to calculate estimates of doses to individuals in accordance with the Offsite Dose Calculation Manual. The source term consisted of the isotopic contents of 224 Waste Monitor Tank batch releases, 38 Condensate Backwash Receiver Tank batch releases, 3 NaOH Sump batch releases, 7.49 days of Steam Generator Blowdown release and a continuous Turbine Building Sump release.

Doses are summarized in Table 6 and total liquid radioactivity released is described in Tables 3 and 4. The highest quarterly total body dose to the maximum exposed individual resulting from the release of radioactive liquid was $3.06\text{E-}03$ mrem during the second quarter. The highest organ dose was $3.06\text{E-}03$ mrem to the Liver for the second quarter. Cumulative annual doses for the hypothetical maximum exposed individual were $7.89\text{E-}03$ mrem for the total body and $7.91\text{E-}3$ mrem for the GI-LLI, the maximum annual organ. The GI-LLI was the maximum exposed organ for the first, third and fourth quarter and the Liver was the maximum exposed organ for the second quarter.

Dose rates and concentrations were below station limits as specified in Supplemental Information, Section II A, B, and C during all the effluent releases.

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Radiation exposure total dose to members of the public is limited by 40CFR190 and 10CFR72.104 to less than 25 mrem to the total body and all organs except the thyroid which is limited to 75 mrem. This dose limit applies to effluents as well as Independent Spent Fuel Storage Installation (ISFSI). Radiation exposure within the site boundary was assessed through calculation of gamma and beta air dose at 0.25 miles of the gaseous effluent release point and direct measurement of exposure using thermoluminescent dosimeters. Onsite air dose for this reporting period was $1.62\text{E-}03$ mrad gamma and $8.73\text{E-}04$ mrad beta, well below levels that can be distinguished above background. Quarterly thermoluminescent dosimetry (TLD) data from four onsite monitoring locations within 0.2 miles of the Reactor Building and eight locations at the site boundary were analyzed. Results from 2021 do not show a significant increase in dose rates above 2020 levels or historic operational average.

Radiation doses from radioactive effluents to workers at the Fairfield Hydro Station for this reporting period were calculated to be $2.35\text{E-}05$ and $1.27\text{E-}05$ mrad for gamma and beta, respectively.

Radiation doses from radioactive effluents to workers at the New Nuclear Site for this reporting period were calculated to be $2.02\text{E-}04$ and $1.09\text{E-}04$ mrad for gamma and beta, respectively.

The impact of Independent Spent Fuel Storage Installation (ISFSI) operation, located within the VCSNS Protected Area, which began cask storage on March 26, 2016, was assessed using six TLD locations monitoring the perimeter of the ISFSI site. The TLD locations were monitored for three quarters prior to fuel storage and continued to be monitored through 2021 during which fuel storage casks were stored. Analysis of monitoring results show a statistically significant increase in ISFSI perimeter dose as a result of fuel storage. The highest location shows an increase of 7.3 mrem/calendar quarter compared to pre-operation. Although the applicable limit for a member of the public applies to a real individual, a conservative analysis was used to demonstrate compliance with 40CFR190 and 10CFR72.104 by assuming an individual is located at the perimeter of the ISFSI Protected Area for 2000 hours per year. In this case, the hypothetical individual would have received 6.6 mrem.

Based on review of gaseous effluent dose calculations, analysis of onsite TLD monitoring including ISFSI perimeter monitoring, it can be concluded that total dose to any member of the public does not exceed the dose limits of 40CFR190 and 10CFR72.104.

Radiation doses from nearby uranium fuel cycle sources were not assessed. The ODCM, Sections 1.3.1 and B/1.3 establish a five (5) mile limit beyond which doses from nearby plants are insignificant. There are no uranium fuel cycle plants within a five (5) mile radius of Virgil C. Summer Nuclear Station.

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F. Abnormal Releases

None

G. Meteorology

The meteorological data for 2021 was collected and analyzed. An annual meteorological summary report of joint frequency distributions of wind direction and speed by atmospheric stability class for each quarter is included as Enclosure A.

The wind direction and wind speed data used were acquired from the 10-meter level of the primary monitoring tower. Stability was determined by the primary differential temperature (61 to 10 meter).

The combined annual data recovery for wind direction, wind speed and stability was 98.70%. Primary variable recovery rates were as follows: wind direction (10 m) – 98.70%, wind speed (10 m) – 98.70%, and differential temperature (61 - 10 m) – 98.70%.

H. Offsite Dose Calculation Manual

The Virgil C. Summer Nuclear Station ODCM was not revised in 2021.

I. Offsite Dose Calculation Manual Reportable Incidents

The Turbine Building Sump Effluent Line Radiation Monitor RM-L8 required by ODCM Control 1.1.1.1 was out of service from February 2, 2021 at 1145 and presently remains out of service. The out of service condition was the result of spurious high rad alarms on the monitor. Significant troubleshooting efforts on the system was performed. The ratemeter, detector and pre-amp were replaced and tested, but the monitor would still spike. A replacement radiation monitor unit is currently in the procurement process. Compensatory actions are being implemented during this time period in accordance with the requirements of the ODCM.

The Condensate Backwash Receiver Tank Radiation Monitor RM-L11 required by ODCM Control 1.1.1.1 was out of service from April 27, 2021 at 0915 to September 20, 2021 at 08:30. The out of service condition was the result of intermittent high rad alarms. The system was restored by replacing the old power supply with a newer style power supply. No effluent releases were made during the out of service period.

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Steam Generator Blowdown Header Flow Transmitter IFI04705 was out of service from June 10, 2021 at 1244 to September 13, 2021 at 0824. The cam drive motor was replaced, and new fuses were installed to the integrator circuit. All indications were verified normal upon restoration. An alternate calibrated computer point was used to obtain flow data for Steam Generator effluent during this period.

J. Major Changes to Radioactive Waste Treatment Systems

During 2021, there were no major changes to the Radioactive Waste Treatment System.

K. Carbon-14 Gaseous Effluents

Carbon-14 production and release estimates were calculated using EPRI Report 1021106⁽²⁾, "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents". This calculation uses active core coolant mass, average neutron flux by energy and reactor coolant nitrogen concentrations to determine Carbon-14 generation based upon an effective full power year. The estimated generation for VC Summer Nuclear station for 2021 was 8.24 curies.

Public dose estimates were performed using Regulatory Guide 1.109⁽³⁾ methodology. Carbon dioxide is assumed to make up 20% of the Carbon-14 gaseous emissions from the station based upon available references and on-site testing. Carbon-14 is the highest dose contributor of all radionuclides released in gaseous effluents. Annual dose resulting from Carbon-14 releases in gaseous effluents is estimated to be 1.46E-01 mrem total body and 7.32E-01 mrem to the maximum organ (bone).

L. Errata/Correction to Previous ARERR

Total Iodine-131 reported in Table 1 for gaseous effluents in the annual report for 2020 included both Iodine-131 and Iodine-132 instead of only Iodine-131. A corrected Table 1 is included as Enclosure B.

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References

1. Regulatory Guide 1.21, *"Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents From Light Water Cooled Nuclear Power Plants"*, Revision 1, US Nuclear Regulatory Commission, Washington D.C., 1974.
2. EPRI Report 1021106, *"Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents"*, Electric Power Research Institute, Palo Alto, CA, 2010.
3. Regulatory Guide 1.109, *"Calculation of Annual Doses to Man from Routine Releases of Reactor effluents for the Purpose of Demonstrating compliance with 10 CFR50, Appendix I"*, US Nuclear Regulatory Commission, Washington D.C., 1976.

APPENDIX A
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SUPPLEMENTAL INFORMATION

I. Regulatory Dose Limits:

A. Fission and Activation Gases:

The air dose to an individual due to noble gases released in gaseous effluents shall be limited to less than or equal to 5 mrad for gamma radiation and 10 mrad for beta radiation during any calendar quarter and 10 mrad for gamma radiation and 20 mrad for beta radiation during any calendar year (ODCM, Section 1.2.3.1).

B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose to an individual from radioiodine, tritium and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents shall be limited to less than or equal to 7.5 mrem to any organ during any calendar quarter and 15 mrem to any organ during any calendar year (ODCM, Section 1.2.4.1).

C. Liquid Effluents:

The dose or dose commitment to an individual from radioactive materials in liquid effluents released shall be limited to less than or equal to 1.5 mrem to the total body and 5 mrem to any organ during any calendar quarter and 3 mrem to the total body and 10 mrem to any organ during any calendar year (ODCM, Section 1.1.3.1).

D. All Sources:

The annual dose equivalent shall not exceed 25 mrem to the whole body, 75 mrem to the thyroid and 25 mrem to any other organ (40 CFR 190).

II. Dose Rate and Effluent Concentration Limits:

A. Fission and Activation Gases

The dose rate in unrestricted areas due to radioactive materials released in gaseous effluents shall be limited to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin (ODCM, Section 1.2.2.1).

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B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose rate in unrestricted areas due to radioactive materials in effluents shall be limited to less than or equal to 1500 mrem/year to any organ (ODCM, Section 1.2.2.1).

C. Liquid Effluents:

The concentration of radioactive materials released from the site shall be limited to 10 times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2E-04 $\mu\text{Ci/ml}$ total activity (ODCM, Section 1.1.2.1).

III. Average Energy:

Not Applicable

IV. Measurements and Approximations of Total Radioactivity:

- A. Fission and activation gases: Gamma spectrometry (HPGe)
- B. Iodines: Gamma spectrometry (HPGe)
- C. Particulates: Gamma spectrometry (HPGe), beta proportional counting, alpha proportional counting
- D. Tritium: Liquid scintillation
- E. Liquid effluents: Gamma spectrometry (HPGe), liquid scintillation (H-3), beta proportional counting, alpha proportional counting.

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V. Batch Releases:

A. Gaseous:

1. Number of batch releases: 0
2. Total time period for batch releases: 0 min
3. Maximum time period for a batch release: 0 min
4. Average time period for a batch release: 0 min
5. Minimum time period for a batch release: 0 min

B. Liquid:

1. Number of batch releases:

37	For first quarter, 2021
41	For second quarter, 2021
73	For third quarter, 2021
114	For fourth quarter, 2021

2. Total time period for batch releases:

2.81E+03	min. for first quarter, 2021
3.08E+03	min. for second quarter, 2021
5.35E+03	min. for third quarter, 2021
7.53E+03	min. for fourth quarter 2021

3. Maximum time period for a batch release:

8.30E+01	min. for second quarter, 2021
1.04E+02	min. for second quarter, 2021
8.50E+01	min. for third quarter, 2021
9.50E+01	min. for fourth quarter, 2021

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4. Average time period for batch releases:

7.58E+01	min. for first quarter, 2021
7.51E+01	min. for second quarter, 2021
7.33E+01	min. for third quarter, 2021
6.61E+01	min. for fourth quarter, 2021

5. Minimum time period for a batch release:

7.00E+01	min. for first quarter, 2021
2.00E+00	min. for second quarter, 2021
1.20E+01	min. for third quarter, 2021
1.00E+00	min. for fourth quarter, 2021

6. Average stream flow during periods of release of effluent into a flowing stream:

4.16E+06	gpm for first quarter, 2021
4.80E+06	gpm for second quarter, 2021
5.96E+06	gpm for third quarter, 2021
5.39E+06	gpm for fourth quarter, 2021

VI. Abnormal Releases:

A. Gaseous:

1. Number of releases: 0
2. Total activity released: 0

B. Liquid:

1. Number of releases: 0
2. Total activity released: 0

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TABLE 1

Gaseous Effluents-Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Error, %
<u>A. Fission & Activation Gases</u>						
1. Total Release	Curies	5.56E-02	6.24E-04	0.00E+00	4.22E-01	2.00E+01
2. Average Release Rate for Period	μCi/sec	7.15E-03	7.94E-05	0.00E+00	5.31E-02	
3. Percent of Applicable Limit	%	1.78E-03	1.81E-05	0.00E+00	8.14E-03	
<u>B. Iodines</u>						
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E-00	2.50E+01
2. Average Release Rate for Period	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E-00	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E-00	
<u>C. Particulates</u>						
1. Total Particulates (Half-lives > 8 days)	Curies	1.04E-05	0.00E+00	0.00E+00	0.00E+00	2.50E+01
2. Average Release Rate for Period	μCi/sec	1.34E-06	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross Alpha Activity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	00E+00
<u>D. Tritium</u>						
1. Total Release	Curies	3.24E-01	2.09E-03	0.00E+00	9.77E-01	2.00E+01
2. Average Release Rate for Period	μCi/sec	4.17E-02	2.66E-04	0.00E+00	1.23E-01	
3. Percent of Applicable Limit	%	2.46E-03	1.59E-05	0.00E+00	7.42E-03	
<u>E. Carbon-14</u>						
1. Total Release	Curies	2.03E+00	2.05E+00	2.08E+00	2.08E+00	N/A
2. Average Release Rate for Period	μCi/sec	2.61E-01	2.61E-01	2.61E-01	2.61E-01	

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TABLE 2

Gaseous Effluents-Ground Level Releases

		Continuous Mode				Batch Mode			
Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1. Fission and Activation Gases									
Ar-41	Curies	4.72E-02	4.79E-04	0.00E+00	1.66E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-133	Curies	6.56E-03	1.23E-04	0.00E+00	8.30E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	Curies	1.85E-03	2.24E-05	0.00E+00	2.56E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	5.56E-02	6.24E-04	0.00E+00	4.22E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Iodines									
I-132	Curies	0.00E+00	0.00E+00	0.00E+00	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates									
As-76	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Be-7	Curies	1.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Br-82	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	1.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Tritium									
H-3	Curies	3.24E-01	2.09E-03	0.00E+00	9.77E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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TABLE 3

Liquid Effluents-Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Error, %
<u>A. Fission & Activation Products</u>						
1. Total Release (not including Tritium, Gases, and Alpha)	Curies	4.87E-05	3.40E-04	1.06E-03	3.94E-04	2.00E+01
2. Average Diluted Concentration During Period	μCi/ml	1.03E-12	5.61E-12	8.09E-12	3.02E-12	
3. Percent of Applicable Limit	%	9.73E-04	6.81E-03	2.11E-02	7.88E-03	
<u>B. Tritium</u>						
1. Total Release	Curies	2.40E+02	3.03E+02	2.06E+02	5.15E+01	2.00E+01
2. Average Diluted Concentration During Period	μCi/ml	5.07E-06	5.00E-06	1.58E-06	3.94E-07	
3. Percent of Applicable Limit	%	5.07E-01	5.00E-01	1.58E-01	3.94E-02	
<u>C. Dissolved and Entrained Gases</u>						
1. Total Release	Curies	6.88E-07	2.29E-03	5.01E-04	2.79E-04	2.00E+01
2. Average Diluted Concentration During Period	μCi/ses	1.45E-14	3.78E-11	3.84E-12	2.14E-12	
3. Percent of Applicable Limit	%	7.27E-09	1.89E-05	1.92E-06	1.07E-06	
<u>D. Gross Alpha Radioactivity</u>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>E. Waste Volume Released (Pre-Dilution)</u>						
	Liters	1.01E+07	1.15E+07	1.10E+07	7.06E+07	3.00E+00
<u>F. Volume of Dilution Water Used</u>						
	Liters	4.73E+10	6.07E+10	1.31E+11	1.30E+11	4.30E+00

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TABLE 4

Liquid Effluents

Nuclides Released	Units	Continuous Mode				Batch Mode			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-04	2.08E-06	1.88E-06
Co-58	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-05
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.81E-05	3.34E-05	2.90E-04	2.50E-04
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.31E-06
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.36E-07	4.28E-08	0.00E+00	2.67E-08
H-3	Curies	4.45E-03	0.00E+00	0.00E+00	0.00E+00	2.40E+02	3.03E+02	2.06E+02	5.15E+01
Kr-85M	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.15E-06	0.00E+00	0.00E+00
Kr-88	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-06	0.00E+00	0.00E+00
Mn-54	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-05	1.16E-05
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-05
Ni-63	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-04	7.40E-04	0.00E+00
Sb-125	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.86E-05	1.04E-05	5.96E-06
Te-123M	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.00E-06
Xe-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.88E-07	1.91E-03	4.32E-04	2.71E-04
Xe-133m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-05	0.00E+00	0.00E+00
Xe-135	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-04	6.74E-05	6.26E-06
Zr-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-06
Total for Period	Curies	4.45E-03	0.00E+00	0.00E+00	0.00E+00	2.40E+02	3.03E+02	2.06E+02	5.15E+01

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
January - December 2021

Virgil C. Summer Nuclear Station
Dominion Energy

Table 5
SOLID WASTE SHIPMENTS

1. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel)

Type of Waste	Unit	2021 Total	Est. Total Error, %
a. Spent resins, filters, sludge, evaporator bottoms, etc.	m ³ Ci	2.98E+01 1.79E+02	2.5E+01
b. Dry compressible waste, metals, contaminated equipment, etc.	m ³ Ci	2.93E+02 6.95E-02	2.5E+01
c. Irradiated components, control rods, etc.	m ³ Ci	0.00E+00 0.00E+00	N/A
d. Other waste, oil, etc.	m ³ Ci	3.80E-02 6.77E-05	2.5E+01

2. Estimate of major nuclide composition for the year (by type of waste) for concentrations above 1.0%

a.

Ni-63	81.64 %	1.46E+02 Ci
Co-60	9.08%	1.62E+01 Ci
Fe-55	4.81%	8.61E+00 Ci
Mn-54	1.85%	3.23E+00 Ci

b.

Co-60	32.14 %	2.23E-02 Ci
Fe-55	27.02%	1.88E-02 Ci
Ni-63	10.09%	7.01E-03 Ci
Co-58	8.17%	5.68E-03 Ci
Nb-95	7.24%	5.03E-03 Ci
Cr-51	5.11%	3.55E-03 Ci
Zr-95	3.85 %	2.67E-03 Ci
Mn-54	2.67%	1.85E-03 Ci
Sb-125	1.42%	9.89E-04 Ci

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
January - December 2021

Virgil C. Summer Nuclear Station
Dominion Energy
Table 5
SOLID WASTE SHIPMENTS

c.

None	N/A	N/A
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d.

Am-241 (Smoke Detectors)	100%	6.77E-05 Ci
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3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
2	Hittman Transport	Energy Solutions, LLC - Barnwell Processing Facility Barnwell, SC
7	Landstar/Miller Transfer/FedEx	Alaron Nuclear Services Wampum, PA
2	Specialty Transport, Inc.	UniTech Services Group, Inc. Oakridge, TN

Notes:

- Two** shipments by Hittman Transport containing (1) 10-160 FR SEDS High Integrity Container of Dewatered Primary Resin; (1) 8-120 FR High Integrity Container were shipped to the Barnwell Processing facility for processing.
- Four** shipments by Landstar, **one** Shipment by Miller Transfer, and **two shipments** by FedEx containing (6) 20-foot Sealands of Dry Active Waste; (11) B-25 Boxes of Gross Dewatered Resin and DAW, and (2) drums of smoke detectors were shipped to Alaron in Wampum, PA for processing/waste disposal.
- Two** shipments by Specialty Transport, Inc. containing (3) 20-foot Sealands of Green-is-Clean (GIC) waste was shipped to Oakridge, TN for processing.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY – DECEMBER 2021
Virgil C. Summer Nuclear Station

TABLE 6

Gaseous Effluents

	Parameter	Location	Dose	Dose Limit	% of Limit
<u>Qtr 1</u>	Gamma Air Dose (mrad)	1.61 km ENE	8.89E-05	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	3.32E-05	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	8.44E-05	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	1.24E-04	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	1.85E-04	7.50E+00	0.00
	Child - Liver				
<u>Qtr 2</u>	Gamma Air Dose (mrad)	1.61 km ENE	9.07E-07	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	3.51E-07	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	8.61E-07	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	1.27E-06	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	1.19E-06	7.50E+00	0.00
	Child - Liver				
<u>Qtr 3</u>	Gamma Air Dose (mrad)	1.61 km ENE	0.00E+00	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	0.00E+00	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	0.00E+00	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	0.00E+00	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	0.00E+00	7.50E+00	0.00
	None - None				
<u>Qtr 4</u>	Gamma Air Dose (mrad)	1.61 km ENE	4.07E-04	5.00E+00	0.01
	Beta Air Dose (mrad)	1.61 km ENE	2.35E-04	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	3.86E-04	5.00E+00	0.01
	Skin Dose (mrem)	1.61 km ENE	6.32E-04	7.50E+00	0.01
	Max Organ Dose (mrem)	1.77 km E	5.57E-04	7.50E+00	0.01
	Child - Thyroid				
<u>Year</u>	Gamma Air Dose (mrad)	1.61 km ENE	4.97E-04	1.00E+01	0.00
	Beta Air Dose (mrad)	1.61 km ENE	2.68E-04	2.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	4.71E-04	1.00E+01	0.00
	Skin Dose (mrem)	1.61 km ENE	7.57E-04	1.50E+01	0.01
	Max Organ Dose (mrem)*	1.77 km E	7.43E-04	1.50E+01	0.00
	Child - Thyroid				

(* Includes dose from all nuclides excluding Carbon-14. See Section K for C-14)

Liquid Effluents

	Parameter	Max Receptor	Dose	Dose Limit	% of Limit
<u>Qtr 1</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	2.63E-03	5.00E+00	0.05
	Total Body Dose (mrem)	Adult - Total Body	2.63E-03	1.50E+00	0.18
<u>Qtr 2</u>	Max Organ Dose (mrem)	Adult - Liver	3.06E-03	5.00E+00	0.06
	Total Body Dose (mrem)	Adult - Total Body	3.06E-03	1.50E+00	0.20
<u>Qtr 3</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	1.75E-03	5.00E+00	0.03
	Total Body Dose (mrem)	Adult - Total Body	1.75E-03	1.50E+00	0.12
<u>Qtr 4</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	4.76E-04	5.00E+00	0.01
	Total Body Dose (mrem)	Adult - Total Body	4.57E-04	1.50E+00	0.03
<u>Year</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	7.91E-03	1.00E+01	0.08
	Total Body Dose (mrem)	Adult - Total Body	7.89E-03	3.00E+00	0.26

NOTE: See Section E for max organ for each quarter

ENCLOSURE A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY - DECEMBER 2021

VIRGIL C. SUMMER NUCLEAR STATION

METEOROLOGICAL DATA

**JOINT FREQUENCY DISTRIBUTION
TABLES**

Quarterly Summaries

Annual Summary

Quarterly Summaries

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: A **Delta Temperature** **Extremely Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	7	9	1	2	0	0	19
NNE	2	4	0	4	0	0	10
NE	0	5	1	10	0	0	16
ENE	0	1	2	1	0	0	4
E	0	3	1	1	0	0	5
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	1	0	0	0	1
S	1	1	1	1	0	0	4
SSW	0	7	0	0	1	0	8
SW	3	20	7	1	0	0	31
WSW	7	26	4	0	0	0	37
W	6	25	9	0	0	0	40
WNW	7	14	0	0	0	0	21
NW	6	14	7	0	0	0	27
NNW	5	8	5	1	0	0	19
Total	44	137	39	21	1	0	242

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	242
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: B **Delta Temperature** **Moderately Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	9	7	6	0	0	27
NNE	3	6	20	25	2	0	56
NE	2	5	20	23	0	0	50
ENE	0	4	2	0	0	0	6
E	1	4	3	0	0	0	8
ESE	0	2	0	0	0	0	2
SE	0	1	0	0	0	0	1
SSE	0	1	2	0	0	0	3
S	0	3	6	1	0	0	10
SSW	1	3	1	1	2	0	8
SW	1	3	3	0	0	0	7
WSW	1	4	0	0	0	0	5
W	0	4	0	0	0	0	4
WNW	0	1	0	0	0	0	1
NW	3	3	2	0	0	0	8
NNW	2	3	4	1	0	0	10
Total	19	56	70	57	4	0	206

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	206
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: C **Delta Temperature** **Slightly Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	3	12	14	2	0	0	31
NNE	1	7	53	23	0	0	84
NE	1	11	59	18	2	0	91
ENE	0	11	30	8	0	0	49
E	0	3	16	0	0	0	19
ESE	0	3	3	0	0	0	6
SE	1	8	0	0	0	0	9
SSE	1	9	1	0	0	0	11
S	1	13	3	0	0	0	17
SSW	3	9	4	0	0	0	16
SW	0	4	1	0	0	0	5
WSW	1	8	0	0	0	0	9
W	2	3	1	0	0	0	6
WNW	2	2	0	0	0	0	4
NW	3	5	2	0	0	0	10
NNW	1	11	3	2	0	0	17
Total	20	119	190	53	2	0	384

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	384
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: D **Delta Temperature** **Neutral**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	11	11	2	0	0	29
NNE	11	12	10	7	0	0	40
NE	3	23	34	7	0	0	67
ENE	3	36	27	4	0	0	70
E	1	46	17	0	0	0	64
ESE	4	18	3	0	0	0	25
SE	5	27	7	0	0	0	39
SSE	9	22	2	0	0	0	33
S	7	14	4	0	0	0	25
SSW	11	12	16	0	0	0	39
SW	17	30	3	0	0	0	50
WSW	10	26	2	0	0	0	38
W	21	24	1	0	0	0	46
WNW	12	18	1	0	0	0	31
NW	12	16	10	1	0	0	39
NNW	3	6	13	4	0	0	26
Total	134	341	161	25	0	0	661

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	661
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: E **Delta Temperature** **Slightly Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	6	9	4	0	0	0	19
NNE	7	14	3	0	0	0	24
NE	2	8	2	0	0	0	12
ENE	3	5	0	0	0	0	8
E	3	6	1	0	0	0	10
ESE	7	4	0	0	0	0	11
SE	7	5	0	0	0	0	12
SSE	9	18	1	0	0	0	28
S	8	9	1	0	0	0	18
SSW	17	35	3	0	0	0	55
SW	35	23	1	0	0	0	59
WSW	33	16	0	0	0	0	49
W	21	13	1	0	0	0	35
WNW	14	8	0	0	0	0	22
NW	9	13	0	0	0	0	22
NNW	8	11	4	0	0	0	23
Total	189	197	21	0	0	0	407

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	407
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: F **Delta Temperature** **Moderately Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	6	2	0	0	0	0	8
NNE	3	0	0	0	0	0	3
NE	1	0	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	2	0	0	0	0	0	2
ESE	4	0	0	0	0	0	4
SE	4	11	0	0	0	0	15
SSE	11	9	0	0	0	0	20
S	6	13	0	0	0	0	19
SSW	13	9	0	0	0	0	22
SW	14	7	0	0	0	0	21
WSW	8	6	0	0	0	0	14
W	6	4	0	0	0	0	10
WNW	11	1	0	0	0	0	12
NW	13	6	0	0	0	0	19
NNW	2	0	0	0	0	0	2
Total	105	68	0	0	0	0	173

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	173
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	1	0	0	0	0	1
NNE	2	0	0	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	1	0	0	0	0	0	1
SSE	4	1	0	0	0	0	5
S	5	4	0	0	0	0	9
SSW	6	2	0	0	0	0	8
SW	11	4	0	0	0	0	15
WSW	18	1	0	0	0	0	19
W	7	0	0	0	0	0	7
WNW	7	0	0	0	0	0	7
NW	7	2	0	0	0	0	9
NNW	2	0	0	0	0	0	2
Total	71	15	0	0	0	0	86

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	86
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 04/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: ALL **Delta Temperature**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	32	53	37	12	0	0	134
NNE	29	43	86	59	2	0	219
NE	10	52	116	58	2	0	238
ENE	7	57	61	13	0	0	138
E	7	62	38	1	0	0	108
ESE	15	27	6	0	0	0	48
SE	18	52	7	0	0	0	77
SSE	34	60	7	0	0	0	101
S	28	57	15	2	0	0	102
SSW	51	77	24	1	3	0	156
SW	81	91	15	1	0	0	188
WSW	78	87	6	0	0	0	171
W	63	73	12	0	0	0	148
WNW	53	44	1	0	0	0	98
NW	53	59	21	1	0	0	134
NNW	23	39	29	8	0	0	99
Total	582	933	481	156	7	0	2159
Calm Hours not Included above for:		Total Period		All Hours		1	
Variable Direction Hours for:		Total Period		All Hours		0	
Invalid Hours for:		Total Period		All Hours		0	
Number of Valid Hours for this Table:		Total Period		All Hours		2159	
Total Hours for the Period:						2160	

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 04/01/2021 01:00 - 07/01/2021 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	17	28	12	6	2	1	66
NNE	16	32	10	2	0	0	60
NE	8	32	27	3	0	0	70
ENE	0	20	18	2	0	0	40
E	0	6	10	0	0	0	16
ESE	0	3	2	0	0	0	5
SE	0	1	0	0	0	0	1
SSE	0	2	3	0	0	0	5
S	1	1	5	0	0	0	7
SSW	0	11	13	0	0	0	24
SW	4	46	14	0	0	0	64
WSW	8	51	12	0	0	0	71
W	12	24	10	0	0	0	46
WNW	5	14	0	0	0	0	19
NW	3	6	13	1	0	0	23
NNW	7	16	4	6	1	0	34
Total	81	293	153	20	3	1	551

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	551
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	4	4	6	0	0	19
NNE	2	2	9	6	0	0	19
NE	2	3	9	5	4	0	23
ENE	1	3	1	1	0	0	6
E	1	2	3	0	0	0	6
ESE	0	2	1	0	0	0	3
SE	1	1	1	0	0	0	3
SSE	0	3	4	0	0	0	7
S	2	3	4	0	0	0	9
SSW	0	9	5	1	0	0	15
SW	2	23	2	0	0	0	27
WSW	4	11	3	0	0	0	18
W	2	6	0	0	0	0	8
WNW	4	2	1	0	0	0	7
NW	4	3	0	0	0	0	7
NNW	3	5	4	3	1	0	16
Total	33	82	51	22	5	0	193
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Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		113		
Number of Valid Hours for this Table:	Total Period		All Hours		193		
Total Hours for the Period:					2184		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: C **Delta Temperature** Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	3	3	9	4	0	0	19
NNE	2	3	9	1	0	0	15
NE	0	6	14	2	0	0	22
ENE	1	3	4	2	0	0	10
E	1	2	8	0	0	0	11
ESE	0	4	2	0	0	0	6
SE	1	4	3	0	0	0	8
SSE	1	7	2	1	0	0	11
S	0	4	12	0	0	0	16
SSW	1	8	5	1	0	0	15
SW	5	6	1	0	0	0	12
WSW	2	11	1	0	0	0	14
W	0	8	0	0	0	0	8
WNW	3	0	0	0	0	0	3
NW	2	1	1	0	0	0	4
NNW	2	1	1	2	0	0	6
Total	24	71	72	13	0	0	180

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	180
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: D **Delta Temperature** **Neutral**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	5	8	1	0	0	15
NNE	4	4	9	0	0	0	17
NE	1	6	15	0	2	0	24
ENE	6	14	14	1	0	0	35
E	2	25	12	0	0	0	39
ESE	1	5	1	0	0	0	7
SE	1	22	4	0	0	0	27
SSE	9	10	2	0	0	0	21
S	8	19	6	1	0	0	34
SSW	13	36	14	0	0	0	63
SW	22	39	5	0	0	0	66
WSW	18	35	3	0	0	0	56
W	13	13	0	0	0	0	26
WNW	9	3	2	0	0	0	14
NW	4	10	2	0	0	0	16
NNW	4	3	0	0	0	0	7
Total	116	249	97	3	2	0	467

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	467
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: E **Delta Temperature** **Slightly Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	4	4	1	0	0	0	9
NNE	3	2	3	0	0	0	8
NE	5	5	2	0	0	0	12
ENE	2	11	2	0	0	0	15
E	4	15	1	0	0	0	20
ESE	0	9	0	0	0	0	9
SE	7	23	0	0	0	0	30
SSE	15	23	0	0	0	0	38
S	19	13	1	0	0	0	33
SSW	18	34	3	0	0	0	55
SW	24	13	0	0	0	0	37
WSW	23	7	0	0	0	0	30
W	14	7	0	0	0	0	21
WNW	15	2	0	0	0	0	17
NW	7	7	1	0	0	0	15
NNW	3	3	1	0	0	0	7
Total	163	178	15	0	0	0	356

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	356
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	2	0	0	0	0	0	2
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	1	0	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	2	0	0	0	0	0	2
SE	6	5	0	0	0	0	11
SSE	16	12	0	0	0	0	28
S	8	15	0	0	0	0	23
SSW	16	12	0	0	0	0	28
SW	24	3	0	0	0	0	27
WSW	17	6	0	0	0	0	23
W	11	0	0	0	0	0	11
WNW	11	0	0	0	0	0	11
NW	3	0	0	0	0	0	3
NNW	2	3	0	0	0	0	5
Total	120	56	0	0	0	0	176

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	176
Total Hours for the Period:			2184

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: G **Delta Temperature** **Extremely Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	0	0	0	0	0	1
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	1	1	0	0	0	0	2
SSE	9	8	0	0	0	0	17
S	15	3	0	0	0	0	18
SSW	16	2	0	0	0	0	18
SW	16	4	0	0	0	0	20
WSW	24	5	0	0	0	0	29
W	24	3	0	0	0	0	27
WNW	8	0	0	0	0	0	8
NW	4	1	0	0	0	0	5
NNW	2	0	0	0	0	0	2
Total	121	27	0	0	0	0	148

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	148
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 04/01/2021 01:00 - 07/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: ALL **Delta Temperature**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	33	44	34	17	2	1	131
NNE	29	43	40	9	0	0	121
NE	16	52	67	10	6	0	151
ENE	11	51	39	6	0	0	107
E	8	50	34	0	0	0	92
ESE	3	23	6	0	0	0	32
SE	17	57	8	0	0	0	82
SSE	50	65	11	1	0	0	127
S	53	58	28	1	0	0	140
SSW	64	112	40	2	0	0	218
SW	97	134	22	0	0	0	253
WSW	96	126	19	0	0	0	241
W	76	61	10	0	0	0	147
WNW	55	21	3	0	0	0	79
NW	27	28	17	1	0	0	73
NNW	23	31	10	11	2	0	77
Total	658	956	388	58	10	1	2071

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	113
Number of Valid Hours for this Table:	Total Period	All Hours	2071
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: A **Delta Temperature** **Extremely Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	25	28	7	1	0	0	61
NNE	16	28	9	1	0	0	54
NE	12	27	12	2	0	0	53
ENE	1	13	8	1	0	0	23
E	1	5	1	0	0	0	7
ESE	3	2	0	0	0	0	5
SE	0	2	2	0	0	0	4
SSE	1	0	2	0	0	0	3
S	0	7	10	2	0	0	19
SSW	1	6	6	0	0	0	13
SW	12	29	1	0	0	0	42
WSW	13	20	0	0	0	0	33
W	10	15	1	0	0	0	26
WNW	8	8	0	0	0	0	16
NW	5	5	3	0	0	0	13
NNW	7	8	1	0	0	0	16
Total	115	203	63	7	0	0	388

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	388
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: B **Delta Temperature** **Moderately Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	11	9	3	0	2	1	26
NNE	5	11	7	6	1	0	30
NE	1	7	9	1	0	0	18
ENE	1	1	6	0	0	0	8
E	0	4	4	0	0	0	8
ESE	0	2	1	0	0	0	3
SE	2	1	2	0	0	0	5
SSE	1	15	1	0	0	0	17
S	0	11	4	0	0	0	15
SSW	2	25	3	0	0	0	30
SW	12	25	0	0	0	0	37
WSW	9	2	0	0	0	0	11
W	2	2	0	0	0	0	4
WNW	5	2	1	0	0	0	8
NW	7	2	1	0	0	0	10
NNW	8	1	1	1	1	0	12
Total	66	120	43	8	4	1	242

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	242
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 07/01/2021 01:00 - 10/01/2021 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	4	2	5	0	0	16
NNE	2	4	15	4	0	0	25
NE	0	12	18	0	0	0	30
ENE	0	4	13	0	0	0	17
E	1	7	7	0	0	0	15
ESE	1	3	3	0	0	0	7
SE	2	10	1	0	0	0	13
SSE	1	20	0	1	0	0	22
S	2	12	8	0	0	0	22
SSW	1	26	0	0	0	0	27
SW	9	20	0	0	0	0	29
WSW	7	5	0	0	0	0	12
W	5	2	0	0	0	0	7
WNW	4	1	0	0	0	0	5
NW	0	2	0	0	0	0	2
NNW	2	4	0	1	0	0	7
Total	42	136	67	11	0	0	256

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	256
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	6	3	6	0	0	0	15
NNE	6	7	5	0	1	1	20
NE	4	19	5	1	1	0	30
ENE	3	25	13	1	0	0	42
E	7	29	21	0	0	0	57
ESE	5	10	0	0	0	0	15
SE	8	23	2	0	0	0	33
SSE	12	31	3	0	0	0	46
S	16	44	5	0	0	0	65
SSW	17	91	7	1	0	0	116
SW	31	24	1	0	0	0	56
WSW	22	10	0	0	0	0	32
W	21	3	0	0	0	0	24
WNW	20	0	0	0	0	0	20
NW	11	6	0	0	0	0	17
NNW	4	6	0	0	0	0	10
Total	193	331	68	3	2	1	598
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Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		0		
Number of Valid Hours for this Table:	Total Period		All Hours		598		
Total Hours for the Period:					2208		

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: E **Delta Temperature** Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	2	8	2	0	0	0	12
NNE	1	1	0	0	0	0	2
NE	1	0	1	0	0	0	2
ENE	0	1	0	0	0	0	1
E	2	2	0	0	0	0	4
ESE	1	0	0	0	0	0	1
SE	6	16	1	0	0	0	23
SSE	38	37	1	0	0	0	76
S	29	31	0	0	0	0	60
SSW	40	39	0	0	0	0	79
SW	55	4	0	0	0	0	59
WSW	36	2	0	0	0	0	38
W	17	4	0	0	0	0	21
WNW	19	0	0	0	0	0	19
NW	22	3	1	0	0	0	26
NNW	4	4	1	0	0	0	9
Total	273	152	7	0	0	0	432

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	432
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	2	4	0	0	0	0	6
SSE	13	13	0	0	0	0	26
S	19	6	0	0	0	0	25
SSW	22	7	0	0	0	0	29
SW	34	3	0	0	0	0	37
WSW	20	0	0	0	0	0	20
W	16	1	0	0	0	0	17
WNW	10	1	0	0	0	0	11
NW	7	1	0	0	0	0	8
NNW	1	4	0	0	0	0	5
Total	144	40	0	0	0	0	184

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	184
Total Hours for the Period:			2208

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: G **Delta Temperature** **Extremely Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	2	1	0	0	0	0	3
S	6	1	0	0	0	0	7
SSW	17	1	1	0	0	0	19
SW	28	6	0	0	0	0	34
WSW	19	0	0	0	0	0	19
W	18	0	0	0	0	0	18
WNW	6	0	0	0	0	0	6
NW	2	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0
Total	98	9	1	0	0	0	108

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	108
Total Hours for the Period:			2208

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 07/01/2021 01:00 - 10/01/2021 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: ALL Delta Temperature

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	49	52	20	6	2	1	130
NNE	30	51	36	11	2	1	131
NE	18	65	45	4	1	0	133
ENE	5	44	40	2	0	0	91
E	11	47	33	0	0	0	91
ESE	10	17	4	0	0	0	31
SE	20	56	8	0	0	0	84
SSE	68	117	7	1	0	0	193
S	72	112	27	2	0	0	213
SSW	100	195	17	1	0	0	313
SW	181	111	2	0	0	0	294
WSW	126	39	0	0	0	0	165
W	89	27	1	0	0	0	117
WNW	72	12	1	0	0	0	85
NW	54	19	5	0	0	0	78
NNW	26	27	3	2	1	0	59
Total	931	991	249	29	6	2	2208

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	2208
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 10/01/2021 01:00 - 01/01/2022 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: A **Delta Temperature** **Extremely Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	15	14	15	11	0	60
NNE	3	10	15	13	7	1	49
NE	0	15	30	14	0	0	59
ENE	2	3	4	0	0	0	9
E	1	6	1	0	0	0	8
ESE	0	4	2	0	0	0	6
SE	0	1	0	0	0	0	1
SSE	0	0	0	0	0	0	0
S	0	2	0	0	0	0	2
SSW	0	7	8	3	0	0	18
SW	3	40	6	0	0	0	49
WSW	5	23	8	0	0	0	36
W	2	10	2	0	0	0	14
WNW	4	10	0	0	0	0	14
NW	4	14	3	0	0	0	21
NNW	11	11	7	4	1	0	34
Total	40	171	100	49	19	1	380

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	380
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	8	5	11	4	0	29
NNE	2	6	14	14	2	0	38
NE	3	7	27	13	0	0	50
ENE	0	9	11	1	0	0	21
E	2	9	2	0	0	0	13
ESE	1	5	3	0	0	0	9
SE	0	0	0	0	0	0	0
SSE	1	0	0	0	0	0	1
S	2	3	0	0	0	0	5
SSW	0	2	4	1	0	0	7
SW	0	15	1	0	0	0	16
WSW	4	12	0	0	0	0	16
W	4	4	1	0	0	0	9
WNW	5	3	0	0	0	0	8
NW	4	6	0	0	0	0	10
NNW	5	8	5	3	0	0	21
Total	34	97	73	43	6	0	253

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	253
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 10/01/2021 01:00 - 01/01/2022 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	2	4	4	5	0	0	15
NNE	2	4	11	4	0	0	21
NE	0	8	23	4	0	0	35
ENE	3	6	23	0	0	0	32
E	0	10	3	0	0	0	13
ESE	1	3	1	0	0	0	5
SE	2	2	2	0	0	0	6
SSE	0	4	0	0	0	0	4
S	0	8	0	0	0	0	8
SSW	2	7	2	0	0	0	11
SW	4	21	1	0	0	0	26
WSW	7	4	1	0	0	0	12
W	3	1	0	0	0	0	4
WNW	5	2	0	0	0	0	7
NW	1	5	0	0	0	0	6
NNW	2	2	1	5	0	0	10
Total	34	91	72	18	0	0	215

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	215
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	10	8	3	1	0	0	22
NNE	5	6	3	1	0	0	15
NE	8	19	11	5	0	0	43
ENE	3	12	3	0	0	0	18
E	2	31	21	0	0	0	54
ESE	3	8	3	0	0	0	14
SE	2	9	1	0	0	0	12
SSE	5	12	0	0	0	0	17
S	6	25	6	0	0	0	37
SSW	10	64	5	0	0	0	79
SW	17	58	1	0	0	0	76
WSW	30	28	1	0	0	0	59
W	23	14	0	0	0	0	37
WNW	10	6	0	0	0	0	16
NW	7	9	2	0	0	0	18
NNW	3	5	5	2	0	0	15
Total	144	314	65	9	0	0	532

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	532
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	10	5	0	0	0	0	15
NNE	6	2	1	0	0	0	9
NE	7	4	0	0	0	0	11
ENE	0	1	0	0	0	0	1
E	2	2	0	0	0	0	4
ESE	5	1	1	0	0	0	7
SE	5	5	0	0	0	0	10
SSE	10	8	0	0	0	0	18
S	11	29	0	0	0	0	40
SSW	17	35	1	0	0	0	53
SW	35	28	0	0	0	0	63
WSW	20	10	0	0	0	0	30
W	17	8	0	0	0	0	25
WNW	9	4	0	0	0	0	13
NW	5	9	0	0	0	0	14
NNW	5	4	2	0	0	0	11
Total	164	155	5	0	0	0	324
<hr/>							
Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		1		
Number of Valid Hours for this Table:	Total Period		All Hours		324		
Total Hours for the Period:					2208		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	4	2	0	0	0	0	6
NNE	0	3	0	0	0	0	3
NE	3	0	0	0	0	0	3
ENE	3	0	0	0	0	0	3
E	2	0	0	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	5	4	0	0	0	0	9
SSE	6	8	0	0	0	0	14
S	23	28	0	0	0	0	51
SSW	27	12	0	0	0	0	39
SW	41	3	0	0	0	0	44
WSW	24	1	0	0	0	0	25
W	16	1	0	0	0	0	17
WNW	17	0	0	0	0	0	17
NW	6	3	0	0	0	0	9
NNW	2	0	0	0	0	0	2
Total	179	65	0	0	0	0	244

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	244
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 10/01/2021 01:00 - 01/01/2022 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	3	0	0	0	0	0	3
SE	0	0	0	0	0	0	0
SSE	8	2	0	0	0	0	10
S	19	4	0	0	0	0	23
SSW	20	3	0	0	0	0	23
SW	57	3	0	0	0	0	60
WSW	65	0	0	0	0	0	65
W	34	2	0	0	0	0	36
WNW	27	1	0	0	0	0	28
NW	6	2	0	0	0	0	8
NNW	0	0	0	0	0	0	0
Total	242	17	0	0	0	0	259

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	259
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: ALL Delta Temperature

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	32	42	26	32	15	0	147
NNE	20	31	44	32	9	1	137
NE	22	53	91	36	0	0	202
ENE	11	31	41	1	0	0	84
E	9	58	27	0	0	0	94
ESE	13	21	10	0	0	0	44
SE	14	21	3	0	0	0	38
SSE	30	34	0	0	0	0	64
S	61	99	6	0	0	0	166
SSW	76	130	20	4	0	0	230
SW	157	168	9	0	0	0	334
WSW	155	78	10	0	0	0	243
W	99	40	3	0	0	0	142
WNW	77	26	0	0	0	0	103
NW	33	48	5	0	0	0	86
NNW	28	30	20	14	1	0	93
Total	837	910	315	119	25	1	2207

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	1
Number of Valid Hours for this Table:	Total Period	All Hours	2207
Total Hours for the Period:			2208

Annual Summary

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 01/01/2022 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: A **Delta Temperature** **Extremely Unstable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	54	80	34	24	13	1	206
NNE	37	74	34	20	7	1	173
NE	20	79	70	29	0	0	198
ENE	3	37	32	4	0	0	76
E	2	20	13	1	0	0	36
ESE	3	9	4	0	0	0	16
SE	0	4	2	0	0	0	6
SSE	1	2	6	0	0	0	9
S	2	11	16	3	0	0	32
SSW	1	31	27	3	1	0	63
SW	22	135	28	1	0	0	186
WSW	33	120	24	0	0	0	177
W	30	74	22	0	0	0	126
WNW	24	46	0	0	0	0	70
NW	18	39	26	1	0	0	84
NNW	30	43	17	11	2	0	103
Total	280	804	355	97	23	2	1561

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	1561
Total Hours for the Period:			8760

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 01/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	22	30	19	23	6	1	101
NNE	12	25	50	51	5	0	143
NE	8	22	65	42	4	0	141
ENE	2	17	20	2	0	0	41
E	4	19	12	0	0	0	35
ESE	1	11	5	0	0	0	17
SE	3	3	3	0	0	0	9
SSE	2	19	7	0	0	0	28
S	4	20	14	1	0	0	39
SSW	3	39	13	3	2	0	60
SW	15	66	6	0	0	0	87
WSW	18	29	3	0	0	0	50
W	8	16	1	0	0	0	25
WNW	14	8	2	0	0	0	24
NW	18	14	3	0	0	0	35
NNW	18	17	14	8	2	0	59
Total	152	355	237	130	19	1	894

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	894
Total Hours for the Period:			8760

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 01/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	13	23	29	16	0	0	81
NNE	7	18	88	32	0	0	145
NE	1	37	114	24	2	0	178
ENE	4	24	70	10	0	0	108
E	2	22	34	0	0	0	58
ESE	2	13	9	0	0	0	24
SE	6	24	6	0	0	0	36
SSE	3	40	3	2	0	0	48
S	3	37	23	0	0	0	63
SSW	7	50	11	1	0	0	69
SW	18	51	3	0	0	0	72
WSW	17	28	2	0	0	0	47
W	10	14	1	0	0	0	25
WNW	14	5	0	0	0	0	19
NW	6	13	3	0	0	0	22
NNW	7	18	5	10	0	0	40
Total	120	417	401	95	2	0	1035
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Calm Hours not Included above for:	Total Period		All Hours		1		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		114		
Number of Valid Hours for this Table:	Total Period		All Hours		1035		
Total Hours for the Period:					8760		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 01/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	22	27	28	4	0	0	81
NNE	26	29	27	8	1	1	92
NE	16	67	65	13	3	0	164
ENE	15	87	57	6	0	0	165
E	12	131	71	0	0	0	214
ESE	13	41	7	0	0	0	61
SE	16	81	14	0	0	0	111
SSE	35	75	7	0	0	0	117
S	37	102	21	1	0	0	161
SSW	51	203	42	1	0	0	297
SW	87	151	10	0	0	0	248
WSW	80	99	6	0	0	0	185
W	78	54	1	0	0	0	133
WNW	51	27	3	0	0	0	81
NW	34	41	14	1	0	0	90
NNW	14	20	18	6	0	0	58
Total	587	1235	391	40	4	1	2258

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	2258
Total Hours for the Period:			8760

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 01/01/2022 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	22	26	7	0	0	0	55
NNE	17	19	7	0	0	0	43
NE	15	17	5	0	0	0	37
ENE	5	18	2	0	0	0	25
E	11	25	2	0	0	0	38
ESE	13	14	1	0	0	0	28
SE	25	49	1	0	0	0	75
SSE	72	86	2	0	0	0	160
S	67	82	2	0	0	0	151
SSW	92	143	7	0	0	0	242
SW	149	68	1	0	0	0	218
WSW	112	35	0	0	0	0	147
W	69	32	1	0	0	0	102
WNW	57	14	0	0	0	0	71
NW	43	32	2	0	0	0	77
NNW	20	22	8	0	0	0	50
Total	789	682	48	0	0	0	1519

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	1519
Total Hours for the Period:			8760

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** 01/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	12	4	0	0	0	0	16
NNE	4	3	0	0	0	0	7
NE	4	0	0	0	0	0	4
ENE	5	0	0	0	0	0	5
E	4	0	0	0	0	0	4
ESE	6	0	0	0	0	0	6
SE	17	24	0	0	0	0	41
SSE	46	42	0	0	0	0	88
S	56	62	0	0	0	0	118
SSW	78	40	0	0	0	0	118
SW	113	16	0	0	0	0	129
WSW	69	13	0	0	0	0	82
W	49	6	0	0	0	0	55
WNW	49	2	0	0	0	0	51
NW	29	10	0	0	0	0	39
NNW	7	7	0	0	0	0	14
Total	548	229	0	0	0	0	777

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	777
Total Hours for the Period:			8760

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 01/01/2021 01:00 - 01/01/2022 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	1	0	0	0	0	2
NNE	5	0	0	0	0	0	5
NE	2	0	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	3	0	0	0	0	0	3
SE	2	1	0	0	0	0	3
SSE	23	12	0	0	0	0	35
S	45	12	0	0	0	0	57
SSW	59	8	1	0	0	0	68
SW	112	17	0	0	0	0	129
WSW	126	6	0	0	0	0	132
W	83	5	0	0	0	0	88
WNW	48	1	0	0	0	0	49
NW	19	5	0	0	0	0	24
NNW	4	0	0	0	0	0	4
Total	532	68	1	0	0	0	601

Calm Hours not Included above for:	Total Period	All Hours	1
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	114
Number of Valid Hours for this Table:	Total Period	All Hours	601
Total Hours for the Period:			8760

Joint Frequency Distribution**Hours at Each Wind Speed and Direction**

Period of Record = **Total Period** **All Hours**
 01/01/2021 01:00 - 01/01/2022 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: ALL **Delta Temperature**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	146	191	117	67	19	2	542
NNE	108	168	206	111	13	2	608
NE	66	222	319	108	9	0	724
ENE	34	183	181	22	0	0	420
E	35	217	132	1	0	0	385
ESE	41	88	26	0	0	0	155
SE	69	186	26	0	0	0	281
SSE	182	276	25	2	0	0	485
S	214	326	76	5	0	0	621
SSW	291	514	101	8	3	0	917
SW	516	504	48	1	0	0	1069
WSW	455	330	35	0	0	0	820
W	327	201	26	0	0	0	554
WNW	257	103	5	0	0	0	365
NW	167	154	48	2	0	0	371
NNW	100	127	62	35	4	0	328
Total	3008	3790	1433	362	48	4	8645
<hr/>							
Calm Hours not Included above for:	Total Period		All Hours		1		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		114		
Number of Valid Hours for this Table:	Total Period		All Hours		8645		
Total Hours for the Period:					8760		

ENCLOSURE B
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER 2021
VIRGIL C. SUMMER NUCLEAR STATION

Errata/Correction to Previous ARERR

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER 2020
Virgil C. Summer Nuclear Station

TABLE 1

Gaseous Effluents-Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Error %
<u>A. Fission & Activation Gases</u>						
1. Total Release	Curies	0.00E+00	8.28E-01	1.45E-02	0.00E+00	2.00E+01
2. Average Release Rate for Period	µCi/sec	0.00E+00	1.05E-01	1.83E-03	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	2.00E-02	3.23E-05	0.00E+00	
<u>B. Iodines</u>						
1. Total Iodine-131	Curies	0.00E+00	3.32E-06	0.00E+00	0.00E+00	2.50E+01
2. Average Release Rate for Period	µCi/sec	0.00E+00	4.23E-07	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	3.32E-04	0.00E+00	0.00E+00	
<u>C. Particulates</u>						
1. Total Particulates (Half-lives > 8 days)	Curies	9.49E-06	0.00E+00	3.47E-06	1.05E-05	2.50E+01
2. Average Release Rate for Period	µCi/sec	1.21E-06	0.00E+00	4.36E-07	1.32E-06	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross Alpha Activity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>D. Tritium</u>						
1. Total Release	Curies	0.00E+00	1.82E+00	0.00E+00	0.00E+00	2.00E+01
2. Average Release Rate for Period	µCi/sec	0.00E+00	2.32E-01	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	1.38E-02	0.00E+00	0.00E+00	
<u>E. Carbon-14</u>						
1. Total Release	Curies	2.26E+00	2.26E+00	2.28E+00	2.28E+00	N/A
2. Average Release Rate for Period	µCi/sec	2.87E-01	2.87E-01	2.87E-01	2.87E-01	