

April 28, 2015

AEP-NRC-2015-34
10 CFR 50.36a

Docket Nos. 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 1 and Unit 2
2014 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

In accordance with Technical Specification 5.6.3, Indiana Michigan Power Company, the licensee for Donald C. Cook Nuclear Plant Units 1 and 2, is providing the Annual Radioactive Effluent Release Report as an enclosure to this letter. This report covers the period January 1, 2014, through December 31, 2014.

This letter contains no new or modified regulatory commitments. Should you have any questions, please contact me at (269) 466-2649.

Sincerely,



Michael K. Scarpello
Regulatory Affairs Manager

TLC/amp

Enclosure: Donald C. Cook Nuclear Plant Units 1 and 2 2014 Annual Radioactive Effluent Release Report

- c: A. W. Dietrich, NRC Washington, D.C.
J. T. King – MPSC
MDEQ – RMD/RPS
NRC Resident Inspector
C. D. Pederson, NRC Region III
A. J. Williamson, AEP Ft. Wayne, w/o enclosures

IE48
NRR

ENCLOSURE to AEP-NRC-2015-34

**DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2
2014 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

TABLE OF CONTENTS

	<u>Page</u>
Table of Contents	i
I. Introduction	1
II. Radioactive Releases and Radiological Impact on Man	1
Liquid Releases	2
Gaseous Releases	2
Solid Waste Disposition	2
III. Meteorological	3
IV. Offsite Dose Calculation Manual (ODCM) Changes	3
V. Total Dose	3
VI. Radiation Monitors Inoperable Greater Than 30 Days	4
VII. Noteworthy Conditions Identified in 2014	4
VIII. Conclusion	5

LIST OF APPENDICES

Appendix	Title
A1.1	2014 Effluent and Waste Disposal Annual Report – <u>Supplemental Information</u>
A1.2	Summary of Maximum Individual Doses: First Quarter, Second Quarter, Third Quarter, and Fourth Quarter 2014
A1.3	2014 Groundwater Protection Initiative (GPI) Sample Data
A2.1	Hours at Each Wind Speed and Direction: First Quarter, 2014
A2.2	Hours at Each Wind Speed and Direction: Second Quarter, 2014
A2.3	Hours at Each Wind Speed and Direction: Third Quarter, 2014
A2.4	Hours at Each Wind Speed and Direction: Fourth Quarter, 2014
A3.0	Offsite Dose Calculation Manual (ODCM) Changes

I. INTRODUCTION

This report discusses the radioactive discharges from Unit 1 and Unit 2 of the Donald C. Cook Nuclear Plant (CNP) during 2014. This is in accordance with the requirements of CNP Technical Specification (TS) 5.6.3.

The table below summarizes the pertinent statistics concerning the Plant's operation during the period from January 1, 2014, to December 31, 2014. The data in this table and the descriptive information on plant operation are based upon the respective unit's Monthly Operating Reports, Performance Indicators and Control Room Logs for 2014.

Parameter	Unit 1	Unit 2
Gross Electrical Energy Generation (Megawatt Hour (MWH))	8,574,834	9,631,872
Unit Service Factor (Percent (%))	91.0	97.1
Unit Capacity Factor (Maximum Dependable Capacity (MDC)) Net (%)	92.0	99.0

Unit 1 entered the reporting period in Mode 1 at Nominal Full Power (NFP). Small power adjustments were made to facilitate main turbine valve testing throughout the year. The unit performed a normal downpower and was manually tripped on September 24, 2014, entering the refueling outage U1C26. The unit attained criticality on October 23, 2014 and attained NFP on October 27, 2014. On November 1, 2014, a manual trip of the reactor was performed due to degraded cooling water intake conditions caused by severe weather. The unit attained criticality on November 3, 2014 and attained NFP on November 7, 2014. The unit exited the reporting period at NFP.

Unit 2 entered the reporting period in Mode 1 at NFP. Small power adjustments were made to facilitate main turbine valve testing throughout the year. The unit commenced a normal planned downpower to 25% on July 11, 2014 to support online maintenance work. The unit returned to NFP on July 15, 2014. On November 1, 2014, a manual trip of the reactor was performed due to degraded cooling water intake conditions caused by severe weather. The unit attained criticality on November 10, 2014 and attained NFP on November 13, 2014. The unit exited the reporting period at NFP.

II. RADIOACTIVE RELEASES AND RADIOLOGICAL IMPACT ON MAN

Since a number of release points are common to both units, the release data from both units are combined to form this two-unit, Annual Radioactive Effluent Release Report. Appendix A1.1 through A2.4 of this report present the information in accordance with Section 5.6.3 of Appendix A to the Facility Operating Licenses, as specified in the Technical Specifications, Regulatory Guide 1.21, and 10 CFR Part 50, Appendix I.

The "MIDAS System" is a computer code that calculates doses due to radionuclides that were released from the CNP.

All liquid and gaseous releases were well within Offsite Dose Calculation Manual (ODCM) limits and federal limits.

There were no abnormal liquid releases and no abnormal gaseous releases in 2014.

The Independent Spent Fuel Storage Installation (ISFSI) impacts are included with Unit 1 and Unit 2 statistics. The ISFSI cask system does not create any radioactive materials or have any radioactive waste treatment systems. Therefore, specific operating procedures for the control of radioactive effluents are not required. Specification 3.1.1, Multi-Purpose Canister (MPC), provides assurance that there are not radioactive effluents from the ISFSI.

Liquid Releases

During 2014 there were 71 liquid batch releases performed. The number of liquid batch releases for the four quarters in 2014 was 10, 10, 22, and 29, respectively.

Estimated doses (in mrem) to maximally exposed individuals via the liquid release pathways are given in Appendix A1.2 of this report.

Gaseous Releases

During the first quarter of 2014 there were two batch releases from Gas Decay Tanks (GDT) and 90 Containment Pressure Reliefs (CPR). During the second quarter there were 109 CPR. During the third quarter there were five batch releases from GDTs, one containment purge, and 108 CPR. During the fourth quarter there were two batch releases from GDTs and 104 CPR. The CPR continue to be listed as batch releases as described in Nuclear Regulatory Commission Inspections 50-315/89017 (DRSS); 50-316/89016 (DRSS) for CNP, dated June 13, 1989. Doses continue to be calculated utilizing continuous criteria as allowed by NUREG-0133. There were a total of nine GDT releases, one containment purge, and 411 CPR gaseous batch releases made during 2014.

In calculating the dose consequences for continuous and batch gaseous releases during 2014, the meteorological data measured at the time of the release were used.

The estimated doses (in mrem) to maximally exposed individuals via the gaseous release pathways are given in Appendix A1.2 of this report. For individuals that are within the site boundary, the occupancy time is sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary.

Solid Waste Disposition

There were 31 shipments of radioactive waste made during 2014. These included shipments made from the site to various radioactive waste processors for ultimate disposal.

III. METEOROLOGICAL

Appendices A2.1, A2.2, A2.3, and A2.4 of this report contain the cumulative joint frequency distribution tables of wind speed and wind direction, corresponding to the various atmospheric stability classes for the first, second, third and fourth quarters of 2014. Hourly meteorological data is available for review and/or inspection upon request.

IV. OFFSITE DOSE CALCULATION MANUAL (ODCM) CHANGES

The ODCM, PMP-6010-OSD-001, was not revised during the report period.

V. TOTAL DOSE

Section 3.2.5 of the ODCM requires that the dose or dose commitment to a real individual from all uranium fuel cycle sources in Berrien County be limited to no more than 25 mrem to the total body or any organ (except the thyroid, which is limited to no more than 75 mrem) over a period of 12 consecutive months to show conformance with the requirements of 40 CFR Part 190. The maximum cumulative dose to an individual from liquid and gaseous effluents during 2014 was well within the ODCM limits. Measurements using thermoluminescent dosimeters (TLD) at 12 onsite stations indicate that the dose due to direct radiation is consistent with preoperational and current control (background) levels. This is fully evaluated in CNP's 2014 Annual Radiological Environmental Operating Report. Additional TLD dosimetry installed by Radiation Protection department programs monitor dose received by individuals on site as visitors.

The annual dose to the maximum individual will be estimated by first, summing the quarterly total body air dose, the quarterly skin air dose, the quarterly critical organ dose from iodines and particulates (I&P), the quarterly total body dose from liquid effluents, the quarterly critical organ dose from liquid effluents, and the Radiological Environmental Monitoring Program onsite direct radiation TLD data. These quarterly values are summed with the annual Carbon-14 dose and compared to the annual total body limit for conservative reasons. The table that follows here represents the above written description:

Dose (mrem)	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
I & P	1.02E-02	1.37E-02	3.27E-02	1.28E-02
Total Body Air	3.10E-04	5.30E-04	1.70E-03	1.70E-04
Skin	5.10E-04	8.60E-04	3.30E-03	2.80E-04
Liquid TB	2.80E-03	1.00E-02	2.87E-02	2.44E-02
Liquid Organ	2.80E-03	1.00E-02	2.87E-02	2.44E-02
C14 (Annual)				2.38E+00
Direct Radiation	0	0	0	0
Total	1.66E-02	3.51E-02	9.51E-02	2.44E+00
Grand Total Dose (Total Body or any other Organ) mrem				2.59E+00
Annual Dose Limit (mrem)				25
Percent of limit				1.04E+01

The following data reflects a comparison with 2009 annual dose data (the last year without calculating C-14 dose), 2014 annual dose data, and 2014 annual dose data with C-14 added. This indicates that 2014 was a 'normal' single unit outage year with respect to radioactive effluents and allows for easier comparison. The table is presented as follows:

	Annual Dose (mrem)	% of limit
2009	2.60E-01	1.04
2014	2.09E-01	0.84
2014 with C-14	2.59	10.4

VI. **RADIATION MONITORS INOPERABLE GREATER THAN 30 DAYS**

There were no release pathways unmonitored for greater than 30 days.

VII. **NOTEWORTHY CONDITIONS IDENTIFIED IN 2014**

There were no new noteworthy conditions identified in 2014. The past year did however validate the successful repairs of the CNP 60-Meter Meteorological Tower as previously discussed in the 2012 and 2013 Annual Radiological Effluent Release Reports.

During the Fourth Quarter of 2012, an intermittent fault was identified on the CNP 60-Meter Meteorological Tower that resulted in a large number of invalid data hours collected. A Condition Report (2012-2305) was initiated and repair work performed. The issue appeared to be a connection to the Delta Temperature instrumentation. Repairs yielded better data collection results in December 2012, however the intermittent fault returned and the system yielded additional invalid data hours during the First and Second Quarters of 2013. Additional repair work was performed when conditions allowed for safe work on the tower, and this resulted in the problem being positively identified as cabling fault grounding out the 10 Meter Delta Temperature instrumentation on the Main 60-Meter Tower. The repairs on the cable and instrumentation were successful at eliminating the intermittent fault and data collection has returned to near 100% valid hours. This issue is now considered corrected and closed.

Carbon-14 Supplemental Information for the 2014 Annual Radioactive Effluent Release Report.

C-14 has a 5730 year half-life and is a naturally occurring radionuclide produced by cosmic ray interactions in the atmosphere. C-14 is a relatively low energy beta emitter. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. C-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally, from weapons testing, or coal burning power plants. The inventory of C-14 in Earth's biosphere is about 300 million Curies, of which most is in the oceans.

Since the U.S. Nuclear Regulatory Commission (NRC) published Regulatory Guide (RG) 1.21, Revision 1, in 1974, the analytical methods for determining C-14 have improved.

Coincidentally, the radioactive effluents from commercial nuclear power plants over the same period have decreased to the point that C-14 is likely to be a principal radionuclide in gaseous effluents. Based on these reasons and a desire to adjust policy to align with international standards, the nuclear industry was required to report, starting in 2010, the quantity and dose impact of C-14 here in the United States. The dose will be reported both with and without C-14 so a comparison to 2009 can be made, keeping in mind the differing standards.

The quantity of C-14 released to the environment can be estimated by use of a C-14 source term scaling factor based on power generation (Ref. RG 1.21, Revision 2). A recent study recommends a source term scaling factor of approximately 9.0 to 9.8 Curies/GWe-yr for a Westinghouse Pressurized Water Reactor (Ref. EPRI 1021106 "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents" December 23, 2010). A scaling factor of 9.4 Curies/GWe-yr was assumed for this report. Using this source term scaling factor and actual electrical generation (in MWH) produced during 2014 results in a site total of 19.54 Curies produced.

C-14 releases from PWRs occur primarily as a mix of organic carbon (methane) and inorganic carbon (carbon dioxide). As a general rule, C-14 in the primary coolant is essentially all organic with a large fraction as gas. Any time the primary coolant is exposed to an oxidizing environment (during shutdown or refueling), a slow transformation from an organic to an inorganic species occurs. Various studies documenting measured C-14 releases from PWRs suggest an average 80% organic fraction with the remainder being carbon dioxide. This equates to 3.91 Curies released as carbon dioxide which is available for the food pathway through photosynthesis to vegetation.

Dose is calculated utilizing the methodology prescribed in RG 1.109, Appendix C with the vegetation dose being the most predominant. A 'p' factor of 0.33 is determined utilizing the 185 hours of batch gaseous releases performed during 2014 and the assumption that 70% of the C-14 released is from gaseous batch releases. A further reduction to the vegetation and leafy vegetable dose is warranted due to the limited growing season in Michigan, which was conservatively limited to nine months.

The final results indicated a calculated organ dose from C-14 to a child at the site boundary of 1.88 mrem to the bone and a whole body dose of 0.499 mrem, for a combined total C-14 dose of 2.38 mrem. This is less than the dose limit of 15 mrem/unit to any organ prescribed in 10 CFR 50, Appendix I, and the 40 CFR Part 190 limit of 25 mrem for total body and for any organ (≤ 75 mrem for thyroid).

VIII. CONCLUSION

Based on the information presented in this report, it is concluded that CNP Units 1 and 2 performed their intended design function with no demonstrable adverse effect on the health and safety of the general public.

2014 Effluent and Waste Disposal Annual Report

SUPPLEMENTAL INFORMATION

Facility: Donald C. Cook Nuclear Plant
Licensee: Indiana Michigan Power Company

1 REGULATORY LIMITS

1.1 Noble Gases

The air dose in unrestricted areas due to noble gases released in gaseous effluents shall be limited to the following:

1.1.1 During any calendar quarter, to ≤ 5 mrad/unit for gamma radiation and ≤ 10 mrad/unit for beta radiation.

1.1.2 During any calendar year, to ≤ 10 mrad/unit for gamma radiation and ≤ 20 mrad/unit for beta radiation.

1.2 Iodines - Particulates

The dose to a member of the public from radioiodines, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than eight days in gaseous effluents released to unrestricted areas shall be limited to the following:

1.2.1 During any calendar quarter to ≤ 7.5 mrem/unit to any organ.

1.2.2 During any calendar year to ≤ 15 mrem/unit to any organ.

1.3 Liquid Effluents

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

1.3.1 During any calendar quarter to ≤ 1.5 mrem/unit to the total body and to ≤ 5 mrem/unit to any organ.

1.3.2 During any calendar year to ≤ 3 mrem/unit to the total body and to ≤ 10 mrem/unit to any organ.

2014 Effluent and Waste Disposal Annual Report

1.4 Total Dose

The dose or dose commitment to a real individual from all uranium fuel cycle sources is limited to ≤ 25 mrem to the total body or any organ (except the thyroid, which is limited to ≤ 75 mrem) over a period of 12 consecutive months.

2 MAXIMUM PERMISSIBLE CONCENTRATIONS

2.1 Gaseous Effluents

The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

2.1.1 For noble gases: ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin.

2.1.2 For all radioiodines and for all radioactive materials in particulate form and radionuclides (other than noble gases) with half-lives greater than eight days: ≤ 1500 mrem/yr to any organ.

The above limits are provided to insure that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area to annual average concentrations exceeding the limits in 10 CFR Part 20, Appendix B, Table 2, Column 1.

2.2 Liquid Effluents

The concentration of radioactive material released at any time from the site to unrestricted areas shall be limited to the concentrations specified in 10 CFR Part 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 2×10^{-4} $\mu\text{Ci/ml}$ total activity.

2014 Effluent and Waste Disposal Annual Report

3 AVERAGE ENERGY

The average energy (\bar{E}) of the radionuclide mixture in releases of fission and activation gases as defined in Regulatory Guide 1.21, Appendix B, Section A.3 is not applicable because the limits used for gaseous releases are based on calculated dose to members of the public. Release rates are calculated using an isotopic mix from actual samples rather than average energy.

4 MEASUREMENTS and APPROXIMATIONS of TOTAL RADIOACTIVITY

4.1 Fission and Activation Gases

Sampled and analyzed on an 8192 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counters.

4.2 Iodines

Sampled on iodine adsorbing media, and analyzed on an 8192 channel analyzer and HpGe detector.

4.3 Particulates

Sampled on a glass filter and analyzed on an 8192 channel analyzer and HpGe detector. Sr-89 and Sr-90 analyses are performed by offsite vendor.

4.4 Liquid Effluents

Sampled and analyzed on an 8192 channel analyzer and HpGe detector. Tritium analysis is performed using liquid scintillation counters. Fe-55, Sr-89 and Sr-90 analyses are performed by an offsite vendor. Ni-63 is also currently being analyzed by the offsite vendor in response to evaluation of the 10 CFR 61 sample results.

2014 Effluent and Waste Disposal Annual Report

5 BATCH RELEASES

5.1 Liquid

5.1.1 Number of batch releases:

10 releases in the 1st quarter, 2014
10 releases in the 2nd quarter, 2014
22 releases in the 3rd quarter, 2014
29 releases in the 4th quarter, 2014

5.1.2 Total time period for batch releases:

53,606 minutes

5.1.3 Maximum time for a batch release:

1,655 minutes

5.1.4 Average time period for batch release:

755 minutes

5.1.5 Minimum time period for a batch release:

164 minutes

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

7.13E+5 gpm circulating water

2014 Effluent and Waste Disposal Annual Report

5.2 Gaseous

5.2.1 Number of batch releases:

92 releases in the 1st quarter, 2014
109 releases in the 2nd quarter, 2014
114 releases in the 3rd quarter, 2014
106 releases in the 4th quarter, 2014

5.2.2 Total time period for batch releases:

11,090 minutes

5.2.3 Maximum time for a batch release:

355 minutes

5.2.4 Average time period for batch release:

26 minutes

5.2.5 Minimum time period for a batch release:

5 minutes

2014 Effluent and Waste Disposal Annual Report

6 ABNORMAL RELEASES

6.1 Liquid

6.1.1 Number of Releases:

<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
0	0	0	0

6.1.2 Total activity released (Ci):

<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
0	0	0	0

6.2 Gaseous

6.2.1 Number of Releases:

<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
0	0	0	0

6.2.2 Total activity released (Ci):

<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
0	0	0	0

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. FISSION GASES					
H3	Ci	2.57E+01	1.85E+01	1.75E+01	2.33E+01
XE135m	Ci	-----	-----	-----	-----
KR85	Ci	-----	-----	-----	-----
XE131m	Ci	-----	-----	-----	-----
XE133m	Ci	-----	-----	-----	-----
XE133	Ci	-----	-----	-----	1.90E-05
XE135	Ci	-----	-----	-----	-----
Total for Period	Ci	2.57E+01	1.85E+01	1.75E+01	2.33E+01
2. IODINES					
I131	Ci	3.91E-10	-----	-----	7.32E-06
I132	Ci	-----	-----	-----	-----
I133	Ci	-----	-----	-----	-----
Total for Period	Ci	3.91E-10	-----	-----	7.32E-06
3. PARTICULATES					
MN54	Ci	-----	-----	-----	-----
CO60	Ci	-----	-----	-----	-----
CS137	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	-----

* DENOTES SUPPLEMENTAL ISOTOPES

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. FISSION GASES					
H3	Ci	2.37E-02	2.95E-02	5.45E-02	3.20E-07
AR41	Ci	3.58E-01	3.60E-01	4.53E-01	1.55E-01
KR85	Ci	3.18E-01	-----	9.81E-01	2.45E-01
XE131M	Ci	-----	-----	-----	-----
XE133M	Ci	-----	-----	-----	-----
XE133	Ci	5.87E-02	7.53E-02	1.17E-01	1.46E-03
XE135	Ci	-----	-----	8.11E-07	2.56E-05
Total for Period	Ci	7.58E-01	4.65E-01	1.61E+00	4.01E-01
2. IODINES					
I131	Ci	-----	-----	-----	-----
I133	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	-----
3. PARTICULATES					
* BR80	Ci	-----	-----	-----	-----
* BR82	Ci	-----	-----	-----	-----
Total for Period	Ci	-----	-----	-----	-----

* DENOTES SUPPLEMENTAL ISOTOPES

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A.	FISSION AND ACTIVATION GASES						
1.	Total Release	Ci	7.35E-01	4.35E-01	1.55E+00	4.01E-01	11.5
2.	Average release rate for period	uCi/sec	9.45E-02	5.54E-02	1.95E-01	5.05E-02	
3.	Percent of applicable limit*	% Gamma Beta	1.03E-02 6.12E-03	1.80E-02 3.35E-03	6.02E-02 3.90E-02	5.54E-03 3.19E-03	
B.	IODINES						
1.	Total I-131	Ci	3.91E-10	0.00E+00	0.00E+00	7.32E-06	18.9
2.	Average release rate for period	uCi/sec	5.03E-11	0.00E+00	0.00E+00	9.21E-07	
3.	Percent of applicable limit*	%	1.43E-10	0.00E+00	0.00E+00	2.62E-06	
C.	PARTICULATES						
1.	Particulates with half lives>8 days	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
2.	Average release rate for period	uCi/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	
4.	Gross alpha radioactivity	Ci	<7.06E-07	<6.46E-07	<7.67E-07	<8.46E-07	
D.	TRITIUM						
1.	Total Release	Ci	2.57E+01	1.85E+01	1.75E+01	2.33E+01	13.7
2.	Average release rate for period	uCi/sec	3.31E+00	2.36E+00	2.20E+00	2.93E+00	
3.	Percent of applicable limit*	%	1.89E-02	1.34E-02	1.26E-02	1.67E-02	

* Applicable limits are expressed in terms of dose. See Appendices A1.2-1 through A1.2-4

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS
CONTINUOUS MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	7.26E-02	2.02E-02	1.25E-02	8.13E-02
CS137	Ci	-----	-----	-----	-----

BATCH MODE

Nuclides Released	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
H3	Ci	1.03E+02	3.85E+02	1.11E+03	7.29E+02
CR51	Ci	-----	-----	-----	-----
MN54	Ci	-----	-----	1.46E-06	-----
FE55	Ci	-----	-----	-----	-----
CO58	Ci	4.52E-05	3.29E-05	3.98E-05	1.53E-04
CO60	Ci	4.41E-05	5.70E-05	1.66E-04	7.87E-05
NI63	Ci	-----	-----	-----	-----
*KR85	Ci	-----	-----	-----	-----
ZR95	Ci	-----	-----	-----	-----
NB95	Ci	-----	-----	-----	-----
MO99	Ci	-----	-----	-----	-----
TC99m	Ci	-----	-----	-----	7.01E-07
AG110m	Ci	8.81E-06	1.43E-05	1.58E-04	4.23E-05
*XE131m	Ci	-----	-----	-----	-----
SB125	Ci	2.20E-06	-----	2.79E-05	5.08E-06
CS134	Ci	-----	-----	-----	-----
CS137	Ci	7.93E-07	8.51E-07	2.25E-06	-----
*XE135	Ci	-----	-----	-----	-----
I131	Ci	-----	-----	-----	-----
*XE133	Ci	-----	-----	1.76E-04	4.65E-05
*XE133m	Ci	-----	-----	-----	-----

* DENOTES SUPPLEMENTAL ISOTOPES

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

BATCH MODE

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A.	FISSION AND ACTIVATION PRODUCTS						
1.	Total Release	Ci	1.01E-04	1.05E-04	3.96E-04	2.80E-04	12.4
2.	Average diluted concentration during period	uCi/ml	1.44E-11	4.79E-12	6.24E-12	5.35E-12	
3.	Percent of applicable limit	%	2.74E-04	1.09E-04	1.37E-04	7.86E-05	
B.	TRITIUM						
1.	Total Release	Ci	1.03E+02	3.86E+02	1.11E+03	7.29E+02	10.1
2.	Average diluted concentration during period	uCi/ml	1.47E-05	1.76E-05	1.75E-05	1.39E-05	
3.	Percent of applicable limit	%	1.47E+00	1.76E+00	1.75E+00	1.39E+00	
C.	DISSOLVED AND ENTRAINED GASES						
1.	Total Release	Ci	-----	-----	1.76E-04	4.65E-05	13.0
2.	Average diluted concentration during period	uCi/ml	-----	-----	2.77E-12	8.88E-13	
3.	Percent of applicable limit	%	-----	-----	1.39E-06	4.44E-07	
D.	GROSS ALPHA RADIOACTIVITY TOTAL RELEASE	Ci	<5.85E-05	<5.85E-05	<1.29E-04	<1.70E-04	N/A
E.	VOLUME OF WASTE RELEASED	Liters	6.09E+05	6.09E+05	1.34E+06	1.77E+06	2.00
F.	VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	7.04E+09	2.19E+10	6.34E+10	5.23E+10	3.48

2014 EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES
CONTINUOUS MODE

		Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A.	FISSION AND ACTIVATION PRODUCTS						
1.	Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
2.	Average diluted concentration during period	uCi/ml	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	
B.	TRITIUM						
1.	Total Release	Ci	7.26E-02	2.02E-02	1.25E-02	8.13E-07	22.2
2.	Average diluted concentration during period	uCi/ml	1.08E-10	3.77E-11	1.57E-11	4.93E-12	
3.	Percent of applicable limit	%	1.08E-03	3.77E-04	1.57E-04	4.93E-05	
C.	DISSOLVED AND ENTRAINED GASES						
1.	Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
2.	Average diluted concentration during period	uCi/ml	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	
D.	GROSS ALPHA RADIOACTIVITY TOTAL RELEASE	Ci	0.00E+00	0.00E+00	0.00E+00	<5.08E-05	N/A
E.	VOLUME OF WASTE RELEASED	Liters	2.29E+06	4.81E+06	3.08E+06	0.00E+00	2.00
F.	VOLUME OF DILUTION WATER USED DURING PERIOD	Liters	7.07E+11	5.36E+11	7.95E+11	1.65E+08	3.48

2014 Effluent and Waste Disposal Annual Report Solid Waste and Irradiated Fuel Shipments

Solid Waste Shipped Offsite for Burial or Disposal

1) Type of Waste	Unit	Estimated amount	Estimated Total Error, %
a) Spent resins, filters, sludge, evaporator bottoms, etc.	m ³ Curies	3.98E+01 2.82E+02	1.00E+00 3.75E+00
b) Dry compressible waste, contaminated equipment, etc.	m ³ Curies	7.39E+02 2.09E+00	1.00E+00 6.48E+00
c) Irradiated components, control rods, etc.	m ³ Curies		
d) Other (contaminated soil)	m ³ Curies		

2) Estimate of Principle Radionuclide Composition

a)	H-3	9 %	Co-58	1 %	Sb-125	1 %	Cs-137	5 %
	Mn-54	1 %	Co-60	12 %	Cs-134	3 %		
	Fe-55	9.5 %	Ni-63	58 %	Ni-59	0.5 %		
b)	Ni-59	1 %	Co-58	3 %	Sb-125	5 %		
	Mn-54	2.5 %	Co-60	39 %	Zr/Nb-95	1 %		
	Fe-55	35 %	Ni-63	12 %	Zn-65	1 %	C-14	0.5 %

3) Solid Waste Disposition

No. of Shipments	Mode of Transportation	Destination
8	Truck	Memphis, TN
18	Truck	Oak Ridge, TN
2	Truck	Erwin, TN
3	Truck	Kingston, TN

4) Type of Containers used for Shipment: Containers used are excepted packages, Type A, Sea Land, metal boxes, drums, tankers, and high integrity containers (HICs).

5) Solidification Agent: There were no solidifications performed during this report period.

2014 Effluent and Waste Disposal Annual Report Yearly Release Rates

GASES		
Fission and Activation Gases	Total Release	3.12E+00 Curies
	Average Release Rate	9.89E-02 μ Ci/sec
	% of Applicable Limits*	γ 4.70E-02 % β 2.11E-02 %
Iodines	Total I-131 Release	7.32E-06 Curies
	Average Release Rate	2.30E-07 μ Ci/sec
	% of Applicable Limit*	4.57E-01 %
Particulates	Total Release	0.00 Curies
	Average Release Rate	0.00 μ Ci/sec
	% of Applicable Limit*	0.00 %
LIQUIDS		
Fission and Activation Products	Total Release	8.82E-04 Curies
	Average Diluted Concentration	8.10E-12 μ Ci/ml
	% of Applicable Limits*	Total Body 2.20E+00 % Organ 6.59E-01 %

* Applicable limits are expressed in terms of the annual 10 CFR 50, Appendix I, dose limits.

Site Boundary and Nearest Residence Listing

The following distances were used in the calculation of the maximum individual doses:

<u>Sector</u>	<u>Direction</u>	<u>Boundary (Meters)</u>	<u>Nearest Residence (Meters)</u>
A	N	651	659
B	NNE	617	660
C	NE	789	943
D	ENE	1497	1747
E	E	1274	1716
F	ESE	972	1643
G	SE	629	1640
H	SSE	594	964
J	S	594	997
K	SSW	629	942

Summary of Maximum Individual Doses

First Quarter 2014

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	2.80E-03	Child	Receptor 1	1.86E-01	1.5E+0
Liquid	Liver	2.80E-03	Child	Receptor 1	5.60E-02	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	5.14E-04	Any Age	651 (N)	1.03E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	6.12E-04	Any Age	789 (NE)	6.12E-03	1.0E+1
Iodines and Particulates	Total Body	1.02E-02	Child	659 (N)	1.36E-01	7.5E+0

Summary of Maximum Individual Doses

Second Quarter 2014

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	1.00E-02	Child	Receptor 1	6.67E-01	1.5E+0
Liquid	Liver	1.00E-02	Child	Receptor 1	2.00E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	8.99E-04	Any Age	651 (N)	1.80E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	3.35E-04	Any Age	651 (N)	3.35E-03	1.0E+1
Iodines and Particulates	Total Body	1.37E-02	Child	659 (N)	1.83E-01	7.5E+0

Summary of Maximum Individual Doses

Third Quarter 2014

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	2.87E-02	Child	Receptor 1	1.91E+00	1.5E+0
Liquid	Liver	2.87E-02	Child	Receptor 1	5.74E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	3.01E-03	Any Age	651 (N)	6.02E-02	5.0E+0
Noble Gas	Air dose (Beta-mrad)	3.90E-03	Any Age	617 (NNE)	3.90E-02	1.0E+1
Iodines and Particulates	Total Body	3.27E-02	Child	659 (N)	4.36E-01	7.5E+0

Summary of Maximum Individual Doses

Fourth Quarter 2014

EFFLUENT	APPLICABLE ORGAN	ESTIMATED DOSE (mrem)	AGE GROUP	LOCATION DIST DIR (M) (Toward)	% OF APPLICABLE LIMIT	LIMIT (mrem) QTR
Liquid	Total Body	2.44E-02	Child	Receptor 1	1.63E+00	1.5E+0
Liquid	GI-LLI	2.44E-02	Child	Receptor 1	4.89E-01	5.0E+0
Noble Gas	Air Dose (Gamma-mrad)	2.77E-04	Any Age	651 (N)	5.54E-03	5.0E+0
Noble Gas	Air dose (Beta-mrad)	3.19E-04	Any Age	594 (SSE)	3.19E-03	1.0E+1
Iodines and Particulates	Thyroid	1.28E-02	Child	659 (N)	1.71E-01	7.5E+0

2014 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)
Lower Limit of Detection = LLD

Date	MW-22D	MW-22M	MW-22S	MW-24D	MW-24M	MW-24S	MW-25D	MW-25M
02/17/2014				<LLD	<LLD	<LLD		
02/24/2014							<LLD	<LLD
03/07/2014							<LLD	<LLD
03/08/2014				<LLD	<LLD	<LLD		
03/10/2014	2.21E-6	1.89E-6	2.26E-6					
04/23/2014				<LLD	<LLD	<LLD	<LLD	<LLD
04/28/2014	<LLD	<LLD	<LLD					
05/20/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
06/02/2014	<LLD	<LLD	<LLD					
06/13/2014				<LLD	<LLD	<LLD	<LLD	<LLD
07/22/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
07/29/2014							<LLD	<LLD
08/11/2014							<LLD	<LLD
08/14/2014				<LLD	<LLD	<LLD		
09/15/2014							<LLD	<LLD
09/17/2014				<LLD	<LLD	<LLD		
09/28/2014	<LLD	<LLD	<LLD					
10/28/2014							<LLD	<LLD
10/29/2014				<LLD	<LLD	<LLD		
11/20/2014				<LLD	<LLD	<LLD	<LLD	<LLD
12/12/2014				<LLD	<LLD	<LLD	<LLD	<LLD

(Note: Wells MW-22 through MW- 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2014 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)
Lower Limit of Detection = LLD

Date	MW-25S	MW-26D	MW-26M	MW-26S	MW-27D	MW-27M	MW-27S	EW-19
01/13/2014								<LLD
02/24/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
03/07/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
04/22/2014								<LLD
04/23/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
05/20/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
06/13/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
07/22/2014								<LLD
07/29/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
08/01/2014								<LLD
08/11/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
09/15/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
10/28/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
11/20/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	
12/12/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	

(Note: Wells MW-22 through MW- 27 are multi-port wells installed in the Fall of 2009, with three sample points placed at different depths. S= Shallow M= Middle D= Deep.)

(Note: A "***" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2014 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)
Lower Limit of Detection = LLD

Date	SG-1	SG-2	SG-4	SG-5	OW-2	MW-20	MW-21	EW-18
02/17/2014						<LLD	<LLD	
02/24/2014	<LLD	<LLD	<LLD	<LLD				
03/10/2014	<LLD	<LLD	<LLD	<LLD		1.11E-6	9.74E-7	
04/28/2014						<LLD	<LLD	
04/30/2014	<LLD	<LLD	<LLD	<LLD				
05/23/2014	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	<LLD
06/13/2014	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	
07/21/2014						<LLD	<LLD	
07/22/2014	<LLD	<LLD	<LLD	<LLD				
08/14/2014	<LLD	<LLD	<LLD	<LLD		<LLD	<LLD	
09/28/2014						<LLD	<LLD	
10/05/2014								<LLD
10/17/2014						<LLD	<LLD	
10/20/2014		<LLD		<LLD				
10/23/2014					<LLD			
10/30/2014	<LLD		<LLD					
11/21/2014						<LLD	<LLD	

(Note: A "*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2014 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)
Lower Limit of Detection = LLD

Date	W-9	W-10	W-11	W-12	W-13	W-14	W-15	OW-1
01/13/2014		<LLD					<LLD	
01/14/2014					<LLD	<LLD		
01/30/2014							<LLD	
02/17/2014		<LLD	<LLD	<LLD	<LLD	<LLD		
02/19/2014	<LLD							
03/10/2014		1.49E-6	1.65E-6					
03/11/2014					<LLD	<LLD	<LLD	1.78E-6
03/31/2014				<LLD				
04/22/2014		<LLD			<LLD		<LLD	
04/28/2014		<LLD	<LLD	<LLD	<LLD	<LLD		
04/29/2014							<LLD	<LLD
04/30/2014	<LLD							
05/20/2014			<LLD	<LLD				
05/23/2014					<LLD	<LLD	<LLD	
05/30/2014								<LLD
06/02/2014			<LLD	<LLD	<LLD	<LLD		
06/16/2014							<LLD	<LLD
07/21/2014	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD		
08/14/2014			<LLD	<LLD	<LLD	<LLD	<LLD	
09/28/2014			<LLD	<LLD				
09/29/2014					<LLD	<LLD	<LLD	
09/30/2014								<LLD
10/17/2014		<LLD	<LLD	<LLD	<LLD	<LLD		
10/20/2014	<LLD						<LLD	
10/29/2014								<LLD
11/21/2014			<LLD	<LLD	<LLD			

(Note: A "*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2014 GPI Sample Data

Samples analyzed for tritium. Values noted are in microcuries per milliliter (uCi/mL)

Lower Limit of Detection = LLD

Date	W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8
01/13/2014			<LLD					
01/30/2014				<LLD	<LLD	<LLD		
02/03/2014	<LLD		<LLD					
02/04/2014								<LLD
02/17/2014							<LLD	
02/19/2014		<LLD						
04/22/2014	<LLD							<LLD
04/28/2014							<LLD	<LLD
04/29/2014				<LLD	<LLD	<LLD		
04/30/2014	<LLD	<LLD	<LLD					
07/21/2014	<LLD						<LLD	
07/22/2014		<LLD	<LLD					<LLD
07/23/2014				<LLD	<LLD	<LLD		
10/17/2014	<LLD						<LLD	
10/18/2014								<LLD
10/20/2014		<LLD	<LLD					
10/21/2014				<LLD	<LLD	<LLD	<LLD	

(Note: A "*" symbol following a sample result denotes a gamma count was performed. Any gamma results above LLD will be additionally flagged and documented in the analysis section.)

2014 GPI Sample Data

Analysis of the Sample Data

The Groundwater Protection Initiative (GPI) Sample Data for 2014 indicates no groundwater contamination in excess of the reporting threshold of $2.00\text{E-}5$ uCi/mL for tritium. Gamma spectroscopy was performed on all Radiological Environmental Monitoring Program wells quarterly. Those results are not actual GPI results so are not included in the ARERR, but are part of CNP's 2014 Annual Radiological Environmental Operating Report. There were no positively identified radionuclides from plant effluents detected in any of the GPI well samples.

The LLD value used for tritium counting of the samples varied between $9.42\text{E-}7$ and $9.63\text{E-}7$ uCi/mL, depending on which scintillation counter was used. This is well below the required maximum LLD value of $2.00\text{E-}6$ uCi/mL per the ODCM.

A set of samples obtained in March 2014 were found to have detectable tritium above the LLD, but these results appeared suspect as they were unusually distributed across the site, having had no prior indications of any previous groundwater tritium present in recent sampling. An investigation was initiated and documented via AR#2014-7010, to identify a cause. Subsequent samples did not indicate detectable tritium present. It was determined that the sample results were not accurate, due to a combination of factors. The samples were counted in the Plant's Hot Lab where high airborne concentrations of tritium are possible from reactor coolant samples, causing potential contamination of the samples. This lab is not the normal location used for environmental samples due to this potential. Additionally, the background in the Hot Lab was found to have changed significantly during this period, creating an environment for false positives to occur in samples with low LLDs. Corrective actions were completed to minimize the likelihood of this occurring again, including training via a Crew Event Notice to ensure personnel were aware of the condition and know how to avoid a repeat situation.

While no valid unsuspected tritium values were found above LLD for 2014, values found above the LLD are not abnormal, unexpected, or inconsistent with past sampling history. The samples observed above LLD historically were expected results from the release of tritiated water into the Absorption Pond, a licensed pathway and part of plant design, or the result of recapture deposition of tritium from licensed radioactive gaseous release points. The 2014 results were expected considering the reduction in tritium released to the Absorption Pond and a below average rainfall experienced.

Wells located inside the Protected Area of the plant are subject to recapture deposition of tritium and may show occasional sample results above LLD values following rainfalls and snow melt. The results observed in 2014 continue to reflect normal expectations and behaviors as they relate to recaptured tritium for the weather conditions observed in 2014.

The sample data indicates that no radioactive spills or unidentified leaks have occurred in 2014 impacting groundwater. The sample results indicate proper well placement to ensure the protection of the groundwater and early identification of any abnormal conditions involving groundwater. This is validated by the demonstrated ability to monitor percolation from the Absorption Pond and recaptured tritium in precipitation, with flow direction and behavior acting as described in the plant licensing documents.

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class A

Delta Temperature Extremely Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	0	5	20	17	10	0	52
NNE	0	3	4	4	0	0	11
NE	0	5	3	6	1	0	15
ENE	0	6	6	6	0	0	18
E	0	0	4	0	0	0	4
ESE	0	1	9	9	0	0	19
SE	3	2	16	13	1	0	35
SSE	0	10	28	17	11	0	66
S	0	4	6	17	3	0	30
SSW	0	3	4	3	2	2	14
SW	0	1	7	31	10	7	56
WSW	0	11	11	24	4	3	53
W	0	7	23	18	14	1	63
WNW	0	14	14	19	2	0	49
NW	0	5	12	15	6	3	41
NNW	0	3	18	11	6	1	39
Total	3	80	185	210	70	17	565
Calm Hours not Included above for :							Total Period 0
Valid Hours for this Stability Class for:							Total Period 565
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class B

Delta Temperature Moderately Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	0	4	6	8	2	0	20
NNE	1	2	11	6	1	0	21
NE	0	7	5	0	0	0	12
ENE	0	6	7	2	0	0	15
E	0	2	1	0	0	0	3
ESE	0	2	3	0	2	0	7
SE	0	2	2	4	0	0	8
SSE	0	2	4	1	4	0	11
S	0	0	2	4	3	0	9
SSW	0	1	3	3	3	1	11
SW	0	0	5	9	6	1	21
WSW	1	2	2	1	2	2	10
W	0	0	2	3	4	4	13
WNW	0	1	1	8	2	1	13
NW	0	1	5	2	1	0	9
NNW	0	2	8	2	1	0	13
Total	2	34	67	53	31	9	196
Calm Hours not Included above for :							0
Valid Hours for this Stability Class for:							196
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class C

Delta Temperature Slightly Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	1	2	8	6	0	1	18
NNE	0	2	4	6	0	0	12
NE	1	4	6	14	0	0	25
ENE	0	3	6	6	0	0	15
E	1	2	1	0	0	0	4
ESE	0	0	3	2	3	0	8
SE	1	4	8	2	1	0	16
SSE	0	3	10	5	5	0	23
S	0	2	16	3	6	1	28
SSW	0	0	10	3	2	0	15
SW	0	3	5	11	6	2	27
WSW	0	1	5	6	6	5	23
W	0	1	7	13	7	5	33
WNW	0	1	6	13	22	2	44
NW	1	1	6	5	5	2	20
NNW	0	2	7	5	0	0	14
Total	5	31	108	100	63	18	325

Calm Hours not Included above for :

Total Period

0

Valid Hours for this Stability Class for:

Total Period

325

Total Hours for Period

2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class D

Delta Temperature Neutral

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	2	5	5	1	1	0	14
NNE	1	4	8	5	2	0	20
NE	2	4	16	13	1	0	36
ENE	1	6	14	4	0	0	25
E	1	3	10	2	1	0	17
ESE	0	1	6	7	0	0	14
SE	0	5	17	10	4	0	36
SSE	0	6	8	11	14	4	43
S	2	13	17	24	36	5	97
SSW	1	9	18	16	10	1	55
SW	0	3	9	26	26	11	75
WSW	1	1	6	19	17	4	48
W	0	1	12	33	20	4	70
WNW	0	2	9	41	23	16	91
NW	2	3	8	16	4	4	37
NNW	2	2	11	2	0	0	17
Total	15	68	174	230	159	49	695
Calm Hours not Included above for :					Total Period		0
Valid Hours for this Stability Class for:					Total Period		695
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 01/01/2014 - 03/31/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class E Delta Temperature Slightly Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	1	3	3	1	0	8
NNE	0	3	2	1	0	0	6
NE	0	1	3	1	0	0	5
ENE	1	6	6	0	0	0	13
E	0	0	1	2	0	0	3
ESE	0	1	8	3	2	0	14
SE	0	3	16	8	0	0	27
SSE	0	4	10	7	2	0	23
S	1	1	9	12	3	1	27
SSW	0	1	11	7	3	0	22
SW	0	3	4	8	4	1	20
WSW	0	3	6	12	2	0	23
W	0	5	2	5	4	0	16
WNW	0	1	0	1	1	1	4
NW	0	2	1	2	0	2	7
NNW	0	0	2	1	0	0	3
Total	2	35	84	73	22	5	221
Calm Hours not Included above for :							Total Period 0
Valid Hours for this Stability Class for:							Total Period 221
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class F

Delta Temperature

Moderately Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	0	0	0	1	0	1
NNE	0	1	0	0	0	0	1
NE	0	3	1	0	0	0	4
ENE	1	0	3	0	0	0	4
E	0	1	1	0	0	0	2
ESE	0	3	3	0	0	0	6
SE	0	1	6	1	0	0	8
SSE	1	3	10	12	1	0	27
S	0	3	8	3	1	0	15
SSW	0	1	4	0	0	0	5
SW	2	0	7	0	0	0	9
WSW	0	0	1	0	0	0	1
W	1	1	0	0	0	0	2
WNW	0	0	0	0	0	1	1
NW	1	0	0	0	0	1	2
NNW	0	1	0	0	0	0	1
Total	6	18	44	16	3	2	89
Calm Hours not Included above for :							0
Valid Hours for this Stability Class for:							89
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class G

Delta Temperature Extremely Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	0	0	0	0	0	0
NNE	1	0	0	0	0	0	1
NE	1	0	0	0	0	0	1
ENE	0	2	0	0	0	0	2
E	0	4	0	0	0	0	4
ESE	0	1	2	1	0	0	4
SE	0	5	3	1	0	0	9
SSE	0	2	7	1	0	0	10
S	0	5	7	0	0	0	12
SSW	0	6	4	0	0	0	10
SW	0	3	1	0	0	0	4
WSW	1	2	0	0	0	0	3
W	1	1	0	0	0	0	2
WNW	1	2	0	0	0	0	3
NW	0	0	1	0	0	0	1
NNW	0	0	0	0	0	0	0
Total	5	33	25	3	0	0	66
Calm Hours not Included above for :					Total Period		0
Valid Hours for this Stability Class for:					Total Period		66
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record =

01/01/2014 - 03/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Delta Temperature

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	3	17	42	35	15	1	113
NNE	3	15	29	22	3	0	72
NE	4	24	34	34	2	0	98
ENE	3	29	42	18	0	0	92
E	2	12	18	4	1	0	37
ESE	0	9	34	22	7	0	72
SE	4	22	68	39	6	0	139
SSE	1	30	77	54	37	4	203
S	3	28	65	63	52	7	218
SSW	1	21	54	32	20	4	132
SW	2	13	38	85	52	22	212
WSW	3	20	31	62	31	14	161
W	2	16	46	72	49	14	199
WNW	1	21	30	82	50	21	205
NW	4	12	33	40	16	12	117
NNW	2	10	46	21	7	1	87
Total	38	299	687	685	348	100	2157
Calm Hours not Included above for :				Total Period			0
Variable Direction Hours for:				Total Period			0
Invalid Hours for:				Total Period			3
Valid Hours for this Stability Class for:				Total Period			2157
Total Hours for Period							2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 04/01/2014 - 06/30/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class A **Delta Temperature** **Extremely Unstable**

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	16	31	17	3	0	67
NNE	2	6	4	0	0	0	12
NE	1	4	1	0	0	0	6
ENE	1	2	6	2	0	0	11
E	1	5	14	9	1	5	35
ESE	0	2	10	14	10	2	38
SE	2	3	16	6	4	1	32
SSE	1	12	36	24	3	0	76
S	1	3	27	13	2	0	46
SSW	0	2	5	7	2	0	16
SW	2	4	29	20	2	0	57
WSW	0	13	44	22	9	1	89
W	0	24	22	9	4	0	59
WNW	5	30	13	9	1	0	58
NW	2	25	17	16	1	0	61
NNW	2	33	66	26	15	0	142
Total	20	184	341	194	57	9	805
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		805
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class B

Delta Temperature Moderately Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	2	3	6	1	2	0	14
NNE	0	2	2	1	0	0	5
NE	2	1	0	0	0	0	3
ENE	1	1	1	0	0	0	3
E	0	0	3	0	0	1	4
ESE	0	1	1	1	0	1	4
SE	0	1	1	1	1	0	4
SSE	0	0	2	1	1	0	4
S	0	1	0	1	1	0	3
SSW	0	0	2	2	1	0	5
SW	0	2	3	7	1	0	13
WSW	0	3	0	0	3	0	6
W	1	3	1	1	0	0	6
WNW	1	2	2	0	0	0	5
NW	0	3	0	0	0	0	3
NNW	0	3	0	0	2	1	6
Total	7	26	24	16	12	3	88
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		88
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class C

Delta Temperature Slightly Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	2	3	5	5	2	0	17
NNE	1	4	1	0	0	0	6
NE	0	1	2	0	0	0	3
ENE	0	1	3	1	0	0	5
E	0	1	2	0	2	1	6
ESE	0	0	1	0	2	0	3
SE	0	1	1	0	0	0	2
SSE	0	0	3	3	0	0	6
S	0	3	4	5	4	0	16
SSW	0	1	2	0	1	1	5
SW	2	0	5	1	0	1	9
WSW	0	0	0	2	3	1	6
W	1	2	0	0	0	0	3
WNW	2	3	0	1	0	0	6
NW	0	3	0	0	0	0	3
NNW	0	3	1	0	0	0	4
Total	8	26	30	18	14	4	100
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		100
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class D

Delta Temperature Neutral

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	6	8	18	11	8	0	51
NNE	4	9	8	6	0	0	27
NE	2	5	5	0	0	0	12
ENE	0	2	5	1	0	0	8
E	2	4	11	13	16	9	55
ESE	1	3	4	9	16	1	34
SE	1	2	9	17	6	0	35
SSE	2	1	3	14	1	0	21
S	0	4	23	33	10	0	70
SSW	0	4	8	25	8	0	45
SW	0	6	3	9	3	0	21
WSW	1	5	4	10	1	2	23
W	5	0	7	3	5	0	20
WNW	0	2	3	1	3	0	9
NW	2	4	7	3	3	0	19
NNW	5	4	6	4	3	0	22
Total	31	63	124	159	83	12	472
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		472
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class E

Delta Temperature Slightly Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	1	4	7	2	1	0	15
NNE	0	7	7	1	0	0	15
NE	1	6	17	2	0	0	26
ENE	0	8	7	5	0	0	20
E	0	2	14	2	1	0	19
ESE	2	4	18	6	0	0	30
SE	1	7	30	15	0	0	53
SSE	1	6	21	17	3	0	48
S	1	5	18	12	5	0	41
SSW	1	2	7	6	1	1	18
SW	2	4	5	10	1	0	22
WSW	0	2	3	4	0	0	9
W	0	0	2	5	0	0	7
WNW	0	2	9	5	4	0	20
NW	0	4	4	3	0	0	11
NNW	0	4	1	1	0	0	6
Total	10	67	170	96	16	1	360
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		360
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class F

Delta Temperature Moderately Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	1	5	5	0	0	0	11
NNE	0	4	1	0	0	0	5
NE	1	3	10	1	0	0	15
ENE	1	6	5	5	0	0	17
E	1	1	7	1	0	0	10
ESE	1	3	16	2	0	0	22
SE	0	5	9	4	0	0	18
SSE	0	3	10	13	0	0	26
S	1	2	9	18	0	0	30
SSW	0	3	7	4	0	0	14
SW	0	0	0	0	0	0	0
WSW	0	2	1	0	0	0	3
W	0	2	2	1	0	0	5
WNW	0	2	2	0	0	0	4
NW	1	1	2	0	0	0	4
NNW	0	1	3	2	0	0	6
Total	7	43	89	51	0	0	190
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		190
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 04/01/2014 - 06/30/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class G **Delta Temperature** **Extremely Stable**

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	4	4	0	0	0	8
NNE	0	2	1	0	0	0	3
NE	1	5	1	0	0	0	7
ENE	0	6	14	4	0	0	24
E	1	2	9	1	0	0	13
ESE	0	6	17	1	0	0	24
SE	2	5	15	1	0	0	23
SSE	0	3	3	3	0	0	9
S	0	1	4	1	0	0	6
SSW	0	0	10	2	0	0	12
SW	0	1	2	1	0	0	4
WSW	0	1	2	1	0	0	4
W	1	1	0	0	0	0	2
WNW	1	1	0	0	0	0	2
NW	1	3	0	0	0	0	4
NNW	0	3	0	0	0	0	3
Total	7	44	82	15	0	0	148
Calm Hours not Included above for :					Total Period		6
Valid Hours for this Stability Class for:					Total Period		148
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record =

04/01/2014 - 06/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Delta Temperature

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	12	43	76	36	16	0	183
NNE	7	34	24	8	0	0	73
NE	8	25	36	3	0	0	72
ENE	3	26	41	18	0	0	88
E	5	15	60	26	20	16	142
ESE	4	19	67	33	28	4	155
SE	6	24	81	44	11	1	167
SSE	4	25	78	75	8	0	190
S	3	19	85	83	22	0	212
SSW	1	12	41	46	13	2	115
SW	6	17	47	48	7	1	126
WSW	1	26	54	39	16	4	140
W	8	32	34	19	9	0	102
WNW	9	42	29	16	8	0	104
NW	6	43	30	22	4	0	105
NNW	7	51	77	33	20	1	189
Total	90	453	860	549	182	29	2163
Calm Hours not Included above for :					Total Period		6
Variable Direction Hours for:					Total Period		0
Invalid Hours for:					Total Period		15
Valid Hours for this Stability Class for:					Total Period		2163
Total Hours for Period							2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class A

Delta Temperature Extremely Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	4	6	27	22	1	0	60
NNE	1	0	2	0	0	0	3
NE	1	6	5	0	0	0	12
ENE	2	5	9	0	0	0	16
E	0	8	10	0	0	0	18
ESE	1	7	10	0	0	0	18
SE	2	10	2	0	0	0	14
SSE	3	3	14	7	0	0	27
S	1	6	11	5	0	0	23
SSW	0	3	6	0	0	0	9
SW	0	3	7	6	0	0	16
WSW	1	23	29	6	1	1	61
W	4	22	27	6	0	0	59
WNW	2	29	18	0	0	0	49
NW	3	15	22	2	1	0	43
NNW	9	24	37	12	1	1	84
Total	34	170	236	66	4	2	512
Calm Hours not Included above for :							Total Period
							26
Valid Hours for this Stability Class for:							Total Period
							512
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class B

Delta Temperature Moderately Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	1	1	3	3	1	0	9
NNE	0	0	0	0	0	0	0
NE	0	1	1	0	0	0	2
ENE	2	1	0	0	0	0	3
E	0	0	0	0	0	0	0
ESE	0	4	1	0	0	0	5
SE	1	1	1	1	0	0	4
SSE	1	4	6	2	0	0	13
S	0	5	4	3	0	0	12
SSW	0	4	6	2	1	0	13
SW	1	3	3	7	0	0	14
WSW	3	7	4	1	0	0	15
W	2	3	2	1	0	0	8
WNW	0	3	0	0	0	0	3
NW	0	2	2	1	0	0	5
NNW	1	2	2	3	0	0	8
Total	12	41	35	24	2	0	114

Calm Hours not Included above for :

Total Period

26

Valid Hours for this Stability Class for:

Total Period

114

Total Hours for Period

2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class C

Delta Temperature Slightly Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	0	2	4	1	0	7
NNE	0	1	0	1	0	0	2
NE	0	1	0	0	0	0	1
ENE	0	1	1	0	0	0	2
E	0	1	2	0	0	0	3
ESE	0	2	0	0	0	0	2
SE	2	1	0	0	0	0	3
SSE	0	3	1	2	0	0	6
S	0	6	3	1	0	0	10
SSW	0	4	5	1	0	0	10
SW	1	1	5	2	0	0	9
WSW	2	3	3	3	0	0	11
W	1	1	0	0	0	0	2
WNW	2	3	0	0	1	0	6
NW	1	3	0	0	0	1	5
NNW	1	3	3	4	0	0	11
Total	10	34	25	18	2	1	90
Calm Hours not Included above for :							Total Period
							26
Valid Hours for this Stability Class for:							Total Period
							90
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class D

Delta Temperature Neutral

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	1	14	15	26	6	0	62
NNE	0	2	5	4	1	0	12
NE	0	6	6	0	0	0	12
ENE	0	4	7	0	0	0	11
E	0	5	5	0	0	0	10
ESE	1	0	6	0	0	0	7
SE	0	7	12	0	0	0	19
SSE	0	1	10	5	1	0	17
S	3	6	12	8	0	0	29
SSW	2	8	13	14	2	0	39
SW	0	10	17	21	2	0	50
WSW	1	7	10	7	3	1	29
W	0	6	3	0	0	0	9
WNW	1	6	1	2	5	1	16
NW	3	0	1	2	7	0	13
NNW	2	10	7	20	10	1	50
Total	14	92	130	109	37	3	385
Calm Hours not Included above for :					Total Period		26
Valid Hours for this Stability Class for:					Total Period		385
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class E

Delta Temperature

Slightly Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	3	11	11	1	0	0	26
NNE	3	6	8	0	0	0	17
NE	0	7	16	0	0	0	23
ENE	0	5	8	0	0	0	13
E	0	5	5	0	0	0	10
ESE	0	4	14	3	0	0	21
SE	0	6	24	2	0	0	32
SSE	1	6	13	9	0	0	29
S	3	11	32	14	0	0	60
SSW	1	7	24	9	0	0	41
SW	1	3	13	8	0	0	25
WSW	0	2	5	6	0	0	13
W	1	4	3	0	0	0	8
WNW	1	7	3	0	0	0	11
NW	2	5	5	1	1	0	14
NNW	0	3	5	1	0	0	9
Total	16	92	189	54	1	0	352
Calm Hours not Included above for :							Total Period 26
Valid Hours for this Stability Class for:							Total Period 352
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class F

Delta Temperature Moderately Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	2	4	1	1	0	0	8
NNE	1	6	4	1	0	0	12
NE	1	5	12	0	0	0	18
ENE	0	4	14	0	0	0	18
E	1	4	9	1	0	0	15
ESE	0	4	17	5	0	0	26
SE	2	1	15	1	1	0	20
SSE	0	6	18	0	0	0	24
S	0	3	23	3	0	0	29
SSW	0	4	8	1	0	0	13
SW	0	4	6	1	0	0	11
WSW	1	1	2	0	0	0	4
W	1	1	3	0	0	0	5
WNW	0	1	0	0	0	0	1
NW	0	1	0	0	0	0	1
NNW	1	0	1	0	0	0	2
Total	10	49	133	14	1	0	207
Calm Hours not Included above for :							26
Valid Hours for this Stability Class for:							207
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class G

Delta Temperature Extremely Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	5	1	0	0	0	6
NNE	3	4	3	0	0	0	10
NE	7	7	8	0	0	0	22
ENE	1	15	10	1	0	0	27
E	2	9	13	4	0	0	28
ESE	2	4	16	6	0	0	28
SE	6	9	19	2	0	0	36
SSE	3	8	25	2	0	0	38
S	1	6	18	14	0	0	39
SSW	2	6	17	11	0	0	36
SW	3	7	17	0	0	0	27
WSW	0	9	7	0	0	0	16
W	2	7	0	0	0	0	9
WNW	1	9	0	0	0	0	10
NW	3	3	1	0	0	0	7
NNW	2	7	0	0	0	0	9
Total	38	115	155	40	0	0	348
Calm Hours not Included above for :					Total Period		26
Valid Hours for this Stability Class for:					Total Period		348
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record =

07/01/2014 - 09/30/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Delta Temperature

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	11	41	60	57	9	0	178
NNE	8	19	22	6	1	0	56
NE	9	33	48	0	0	0	90
ENE	5	35	49	1	0	0	90
E	3	32	44	5	0	0	84
ESE	4	25	64	14	0	0	107
SE	13	35	73	6	1	0	128
SSE	8	31	87	27	1	0	154
S	8	43	103	48	0	0	202
SSW	5	36	79	38	3	0	161
SW	6	31	68	45	2	0	152
WSW	8	52	60	23	4	2	149
W	11	44	38	7	0	0	100
WNW	7	58	22	2	6	1	96
NW	12	29	31	6	9	1	88
NNW	16	49	55	40	11	2	173
Total	134	593	903	325	47	6	2008
Calm Hours not Included above for :					Total Period		26
Variable Direction Hours for:					Total Period		0
Invalid Hours for:					Total Period		174
Valid Hours for this Stability Class for:					Total Period		2008
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

10/01/2014 - 12/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class A

Delta Temperature Extremely Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	1	15	3	0	0	19
NNE	0	0	3	1	0	0	4
NE	0	2	5	1	0	0	8
ENE	0	3	3	0	0	0	6
E	0	2	1	0	0	0	3
ESE	0	4	6	0	0	0	10
SE	0	1	11	8	0	0	20
SSE	0	2	8	8	2	1	21
S	0	2	8	7	0	0	17
SSW	0	0	2	2	0	0	4
SW	0	2	6	5	0	0	13
WSW	0	5	9	7	4	0	25
W	0	4	11	15	8	0	38
WNW	0	3	16	12	4	0	35
NW	0	1	10	5	1	0	17
NNW	0	1	13	3	0	0	17
Total	0	33	127	77	19	1	257
Calm Hours not Included above for :							Total Period
							0
Valid Hours for this Stability Class for:							Total Period
							257
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/01/2014 - 12/31/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class B Delta Temperature Moderately Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	0	1	2	6	0	0	9
NNE	1	0	2	4	0	0	7
NE	1	2	0	0	0	0	3
ENE	0	1	1	0	0	0	2
E	0	4	2	0	0	0	6
ESE	0	3	1	1	0	0	5
SE	2	1	0	1	0	0	4
SSE	2	4	4	6	1	0	17
S	0	0	9	5	0	0	14
SSW	0	0	10	6	1	0	17
SW	0	1	8	3	0	0	12
WSW	0	2	13	3	2	1	21
W	0	3	7	12	7	4	33
WNW	1	1	4	10	3	0	19
NW	0	0	3	1	0	1	5
NNW	0	1	1	3	1	0	6
Total	7	24	67	61	15	6	180
Calm Hours not Included above for :					Total Period		0
Valid Hours for this Stability Class for:					Total Period		180
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

10/01/2014 - 12/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class C

Delta Temperature Slightly Unstable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	0	0	5	3	0	1	9
NNE	0	0	2	4	0	0	6
NE	0	3	0	0	0	0	3
ENE	0	1	1	0	0	0	2
E	0	7	1	0	0	0	8
ESE	0	5	5	2	0	0	12
SE	0	2	8	3	0	0	13
SSE	1	6	8	6	1	0	22
S	0	3	22	5	1	0	31
SSW	1	5	17	6	0	0	29
SW	0	4	10	3	1	2	20
WSW	1	3	14	6	15	10	49
W	1	1	4	11	23	17	57
WNW	0	1	8	33	8	3	53
NW	0	1	6	13	8	0	28
NNW	1	2	4	6	5	0	18
Total	5	44	115	101	62	33	360
Calm Hours not Included above for :					Total Period		0
Valid Hours for this Stability Class for:					Total Period		360
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/01/2014 - 12/31/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class D **Delta Temperature** **Neutral**

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	4	26	24	3	3	60
NNE	0	1	17	5	1	5	29
NE	0	12	10	8	5	0	35
ENE	1	3	4	0	0	0	8
E	0	6	7	0	0	0	13
ESE	0	8	8	11	0	0	27
SE	1	6	29	26	1	0	63
SSE	0	11	20	46	6	0	83
S	1	17	53	55	3	0	129
SSW	0	13	54	72	14	0	153
SW	1	1	18	19	5	2	46
WSW	1	6	12	31	9	1	60
W	0	1	20	48	43	10	122
WNW	0	8	19	42	31	4	104
NW	0	2	20	28	17	2	69
NNW	1	2	9	17	18	11	58
Total	6	101	326	432	156	38	1059
Calm Hours not Included above for :					Total Period		0
Valid Hours for this Stability Class for:					Total Period		1059
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

10/01/2014 - 12/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class E

Delta Temperature Slightly Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	2	1	1	0	0	0	4
NNE	1	8	3	0	0	0	12
NE	0	7	5	0	0	0	12
ENE	2	2	5	0	0	0	9
E	0	1	8	1	0	0	10
ESE	1	1	1	3	0	0	6
SE	0	2	9	15	1	0	27
SSE	0	2	5	9	1	1	18
S	1	2	25	11	0	0	39
SSW	1	1	13	3	0	0	18
SW	0	2	0	1	0	0	3
WSW	0	0	1	3	0	0	4
W	0	0	2	2	0	0	4
WNW	0	2	0	3	1	0	6
NW	0	2	5	6	2	0	15
NNW	0	0	13	2	1	0	16
Total	8	33	96	59	6	1	203
Calm Hours not Included above for :							0
Valid Hours for this Stability Class for:							203
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record =

10/01/2014 - 12/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Stability Class F

Delta Temperature Moderately Stable

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	0	0	0	0	0	0	0
NNE	0	1	3	0	0	0	4
NE	0	2	2	0	0	0	4
ENE	0	0	4	0	0	0	4
E	0	1	4	1	0	0	6
ESE	1	1	3	0	0	0	5
SE	0	1	6	1	0	0	8
SSE	0	1	2	5	0	0	8
S	0	1	3	1	0	0	5
SSW	0	1	2	1	0	0	4
SW	0	1	0	1	0	0	2
WSW	1	1	0	0	0	0	2
W	1	2	0	0	0	0	3
WNW	0	0	0	0	0	0	0
NW	0	1	1	0	0	0	2
NNW	0	0	0	0	0	0	0
Total	3	14	30	10	0	0	57
Calm Hours not Included above for :							0
Valid Hours for this Stability Class for:							57
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period

Period of Record = 10/01/2014 - 12/31/2014
Elevation: **Speed:** SPD60M **Direction:** DIR60M **Lapse:** DT60M
Stability Class G **Delta Temperature** **Extremely Stable**

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>≥ 25</u>	<u>Total</u>
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	4	0	0	0	5
ENE	2	1	11	0	0	0	14
E	1	3	7	1	0	0	12
ESE	0	4	7	0	0	0	11
SE	0	1	5	2	0	0	8
SSE	0	2	2	1	0	0	5
S	0	1	4	1	0	0	6
SSW	1	0	1	2	0	0	4
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	1	0	0	0	0	1
Total	4	14	41	7	0	0	66
Calm Hours not Included above for :							Total Period 0
Valid Hours for this Stability Class for:							Total Period 66
Total Hours for Period							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record =

10/01/2014 - 12/31/2014

Elevation: Speed: SPD60M

Direction: DIR60M

Lapse: DT60M

Delta Temperature

Wind Speed (mph)

<u>Wind Direction</u>	<u>1 - 4</u>	<u>4 - 8</u>	<u>8 - 13</u>	<u>13 - 19</u>	<u>19 - 25</u>	<u>> 25</u>	<u>Total</u>
N	2	7	49	36	3	4	101
NNE	2	10	30	14	1	5	62
NE	1	29	26	9	5	0	70
ENE	5	11	29	0	0	0	45
E	1	24	30	3	0	0	58
ESE	2	26	31	17	0	0	76
SE	3	14	68	56	2	0	143
SSE	3	28	49	81	11	2	174
S	2	26	124	85	4	0	241
SSW	3	20	99	92	15	0	229
SW	1	11	42	32	6	4	96
WSW	3	17	49	50	30	12	161
W	2	11	44	88	81	31	257
WNW	1	15	47	100	47	7	217
NW	0	7	45	53	28	3	136
NNW	2	7	40	31	25	11	116
Total	33	263	802	747	258	79	2182
Calm Hours not Included above for :					Total Period		0
Variable Direction Hours for:					Total Period		0
Invalid Hours for:					Total Period		26
Valid Hours for this Stability Class for:					Total Period		2182
Total Hours for Period							2208

OFF-SITE DOSE CALCULATION MANUAL CHANGES

The Off-Site Dose Calculation Manual, PMP-6010-OSD-001, was not revised during this reporting period.