ATTACHMENT 1

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1, 2016 – DECEMBER 31, 2016

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT: JANUARY 1, 2016 – DECEMBER 31, 2016

MAY 2017

R.E. Ginna Nuclear Power Plant
1503 Lake Road
Ontario, New York 14519

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1.0 INTRODUCTION

R.E. Ginna Nuclear Power Plant (Ginna) has prepared this Annual Radioactive Effluent Release Report (ARERR) in accordance with the requirements of Technical Specification Section 5.6.3.

This report, covering the period from January 1, 2016 through December 31, 2016, provides a summary of the quantities of radioactive gaseous and liquid effluents and solid waste released from the plant presented in the format outlined in Appendix B of Regulatory Guide 1.21, Revision 1, June 1974.

All gaseous and liquid effluents discharged during this reporting period were in compliance with the limits of the Ginna Technical Specifications as defined in the Offsite Dose Calculation Manual (ODCM).

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM limits applicable to the release of radioactive material in liquid and gaseous effluents are:

2.1.1 Fission and Activation Gases

The instantaneous dose rate, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to a release rate that would yield $\leq$ 500 mrem/yr to the total body and $\leq$ 3000 mrem/yr to the skin if allowed to continue for a full year.

The air dose, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to the following:

(I) During any calendar quarter to $\leq$ 5 mrad for gamma radiation and to $\leq$ 10 mrad for beta radiation.

(ii) During any calendar year to $\leq$ 10 mrad for gamma radiation and to $\leq$ 20 mrad for beta radiation.

2.1.2 Radioiodine, Tritium, and Particulates

The instantaneous dose rate, as calculated in the ODCM, due to radioactive materials released in gaseous effluents from the site as radioiodines, radioactive materials in particulate form, and radionuclides other than noble

gases with half-lives greater than eight days shall be limited to a release rate that would yield ≤ 1500 mrem/yr to any organ if allowed to continue for a full year.

Dose to an individual from radioiodine, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than eight days released with gaseous effluents is calculated in accordance with ODCM methodology. The dose to an individual shall be limited to:

(i) During any calendar quarter to ≤ 7.5 mrem to any organ.

(ii) During any calendar year to ≤ 15 mrem to any organ.

2.1.3 Liquid Effluents

The release of radioactive liquid effluents shall be such that the concentration in the circulating water discharge does not exceed 10 times the limits specified in Appendix B, Table II, Column 2 and notes thereto of 10 CFR 20, as explained in Section 4 of the ODCM. For dissolved or entrained noble gases the total activity due to dissolved or entrained noble gases shall not exceed 2E-04 uCi/ml.

The dose or dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas is calculated according to ODCM methodology and is limited to:

(i) During any calendar quarter to ≤ 1.5 mrem to the total body and to ≤ 5 mrem to any organ, and

(ii) During any calendar year to ≤ 3 mrem to the total body and to ≤ 10 mrem to any organ.

2.2 Effluent Concentration Limits (ECLs)

2.2.1 For gaseous effluents, effluent concentration limits (ECLs) are not directly used in release rate calculations since the applicable limits are stated in terms of dose rate at the unrestricted area boundary, in accordance with Technical Specification 5.5.4.g.

2.2.2 For liquid effluents, ECLs ten times those specified in 10 CFR 20, Appendix B, Table II, column 2, are used to calculate release rates and permissible concentrations at the unrestricted area boundary as permitted by Technical Specification 5.5.4.b. A value of 2E-04 uCi/ml is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Release Rate Limits Based on Average Nuclide Energy

The release rate limits for fission and activation gases from the R.E. Ginna Nuclear Power Plant are not based on the average energy of the radionuclide mixture in gaseous effluents; therefore, this value is not applicable. However the 2016 average beta/gamma energy of the radionuclide mixture in fission and activation gases released from Ginna is available for review upon request.

2.4 Measurements and Approximations of Total Radioactivity

Gamma spectroscopy was the primary analysis method used to determine the radionuclide composition and concentration of gaseous and liquid effluents. Composite samples were analyzed for Fe-55, Ni-63, Sr-89, and Sr-90 by a contract laboratory. Tritium and alpha analysis were performed using liquid scintillation and gas flow proportional counting respectively.

The total radioactivity in effluent releases was determined from the measured concentration of each radionuclide present in a representative sample and the total volume of effluents released.

2.5 Batch Releases

2.5.1 Liquid

1. Number of batch releases:	5.5E+01
2. Total time period for batch releases (Minutes):	5.57 E+03
3. Maximum time period for a batch release (Minutes):	3.75 E+02
4. Average time period for batch releases (Minutes):	9.95 E+01
5. Minimum time period for a batch release:	3.0 E+01
6. Average effluent release flowrate into the discharge canal (Liters per Minute):	2.92 E+02
7. Average dilution flowrate of discharge canal during effluent releases (Liters per Minute):	1.26 E+06

2.5.2 Gaseous

1. Number of batch releases:	1.5 E+01
2. Total time period for batch releases (Minutes):	5.28 E+05
3. Maximum time period for a batch release (Minutes):	4.46 E+04
4. Average time period for batch releases (Minutes):	3.52 E+04
5. Minimum time period for a batch release (Minutes):	1.30 E+02

2.6 Abnormal Releases

One abnormal release occurred in 2016:

1. On 3/25/2016 Gas Decay Tank A leaked 10 – 15 lbs. pressure into the vent header and out the plant vent. This release was documented in gaseous effluent permit G-2016010.

3.0 SUMMARY OF GASEOUS RADIOACTIVE EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A and 1B. Plant Vent and Containment Vent releases are modeled as mixed mode and the Air Ejector is modeled as a ground level release.

4.0 SUMMARY OF LIQUID RADIOACTIVE EFFLUENTS

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

5.0 SOLID WASTE

The quantities of radioactive material released in shipments of solid waste transported from Ginna during the reporting period are summarized in Table 3. Principal nuclides were determined by gamma spectroscopy and non-gamma emitters were calculated from scaling factors determined by an independent laboratory from representative samples of that waste type. The majority of Dry Active Waste is processed utilizing an off-site processor that reduces the volume and then transports the waste to a permitted landfill for disposal.

6.0 LOWER LIMIT OF DETECTION

The required Lower Limit of Detection (LLD), as defined in Table 2-1 of the ODCM, was met on all effluent samples in 2016.

7.0 RADIOLOGICAL IMPACT

An assessment of doses to the hypothetical maximally exposed individual member of the public from gaseous and liquid effluents was performed for locations representing the maximum calculated dose in occupied sectors. Meteorological sectors to the north from NW through ENE are entirely over Lake Ontario, while the remaining meteorological sectors to the south (WNW through E) are over land. In all cases, doses were well below Technical Specification limits as defined in the ODCM. Doses were assessed based upon historical meteorological conditions considering the noble gas exposure, inhalation, ground plane exposure, and ingestion pathways. The ingestion pathways considered were the fruit, vegetable, fish, drinking water, goat's milk, cow's milk and cow meat pathways.

Results of this assessment are presented in Tables 4A and 4B.

7.1 Total Dose

40 CFR 190 limits the total dose to members of the public due to radiation and radioactivity from uranium fuel cycle sources to:

- $\leq$ 25 mrem total body or any organ and;
- $\leq$ 75 mrem thyroid for a calendar year.

Using the maximum exposure and uptake pathways, the maximum liquid pathways, including C-14 dose, and the maximum direct radiation measurements at the site boundary, yield the following dose summaries to the hypothetical maximally exposed individual member of the public. The maximum total body dose is determined by summing the hypothetical maximum direct radiation dose exposure and the total body dose from gaseous and liquid pathways. Dose to any real member of the public should be conservatively bounded by these calculated doses:

- Maximum Annual Total Body Dose: 12.8 mRem (Sum of 12.8 mrem direction radiation, 1.01E-03 (Total Body Liquid Dose), 2.97E-03 (Total Body Gas Dose).
- Maximum Annual Organ Dose: 2.3E-02 mrem (Child bone C-14)
- Maximum Annual Thyroid Dose: 3.74E-03 mrem (Child)

8.0 METEOROLOGICAL DATA

The annual summary report of meteorological data collected during 2016 is included with this report, as Appendix A, Annual Report on the Meteorological Monitoring Program at the Ginna Nuclear Power Plant by Murray and Trettle, Incorporated.

9.0 LAND USE CENSUS CHANGES

In September 2016, Ginna staff conducted a Land Use Survey to identify the location of the nearest milk animal, the nearest residence, and the nearest garden greater than 50 square meters in each of the nine sectors within a 5-mile radius of the power plant. The Land Use Survey is conducted in accordance with Ginna procedures.

Over the past year, the following land use observations were made within a 5-mile radius of the power plant:

- The nearest residence remains in the SSE sector, approximately 610 meters from the reactor.
- Single-family home construction is increasing over past years.
- Other single family home construction and duplexes were observed under construction within 5-miles of the plant.
- The state agriculture department confirmed that there are no milk producing animals within 5 miles of Ginna
- No new agricultural land use was identified.
- No new food producing facilities were identified.
- No new milk producing animals were identified.

10.0 CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

There were no changes to the Offsite Dose Calculation Manual (ODCM) in 2016.

11.0 CHANGES TO THE PROCESS CONTROL PROGRAM

There were no changes to the Process Control Program in 2016.

12.0 MAJOR CHANGES TO RADWASTE TREATMENT SYSTEMS

There were no significant changes to the Radwaste Treatment Systems during the reporting period.

13.0 INOPERABLE MONITORS

There was one occurrence satisfying the requirement stated in Section 3.3 and Table 3.3-1, Action 1 of the ODCM for reporting inoperable radiation monitors.

R-14A was declared out of service @ 1532 on 12/17/16 for a locked and unresponsive display screen. R-14A was repaired and returned to service @ 1630 on 12/29/16.

14.0 CHANGES TO PREVIOUS ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORTS

The Process Control Program was changed from procedure RPA-PCP to procedure RW-AA-100 on 12/16/2014. This change was not reported in the 2014 ARERR.

15.0 GROUNDWATER MONITORING

In accordance Ginna's Chemistry procedures, environmental groundwater monitoring wells are sampled on a routine frequency. In 2016, Ginna staff collected and analyzed samples collected from a total of 14 groundwater monitoring wells:

- GW01: Warehouse Access Road (Control)
- GW03: Screenhouse West, South Well
- GW04: Screenhouse West, North Well
- GW05: Screenhouse East, South
- GW06: Screenhouse East, Middle
- GW07: Screenhouse East, North
- GW08: All Volatiles Treatment Building
- GW10: Technical Support Center, South
- GW11: Southeast of Contaminated Storage Building (CSB)
- GW12: West of Orchard Access Road
- GW13: North of Independent Spent Fuel Storage Installation (ISFSI)
- GW14: South of Canister Preparation Building*
- GW15: West of Manor House
- GW16: Southeast of Manor House

Groundwater samples are analyzed for tritium to a detection limit of 500 pCi/L and for gamma emitting radionuclides to the environmental LLDs. The analytical results for groundwater monitoring well samples collected during 2016 are presented in Table 5.

All samples collected during 2016, which were analyzed for tritium and gamma emitting nuclides, did not yield a concentration greater than the calculated MDA.

16.0 OFFSITE DOSE DUE TO ISFSI

A review of direct radiation between the Ginna ISFSI facility and the nearest residents was conducted. Environmental TLD station 64 is the highest direct radiation dose offsite and is the basis for the maximum direct radiation dose reported in 7.1 A review of TLD stations 14, 15, 16 since fuel was first stored in ISFSI in 2010 indicate no change in offsite direct radiation dose as measured by TLDs.
Ginna ISFSI design is such that effluent releases of noble gases are precluded.

17.0 OFFSITE DOSE DUE TO CARBON-14

A study of Carbon-14 in effluent releases from Ginna was conducted in 1982 by Charles Kunz of New York State Department of Health, Center for Laboratories and Research. Results of this study are used as the basis for current Carbon-14 production and releases at Ginna. Using the Carbon-14 releases measured in the Kunz study at 4.3 Curies, adjusted for power uprate from 490 MWe to 580 MWe, and adjusted for increased capacity factor and 18 month fuel cycles, leads to a conservative estimate of 6.8 Curies released in gaseous effluents in 2016. Kunz further determined the chemical form of the Carbon-14 at Ginna to be approximately 10% Carbon Dioxide (CO_2).

As a cross-check, the EPRI Carbon-14 Source Term Calculator was used to estimate Carbon-14 releases from Ginna, using Ginna specific reactor core data and reactor coolant chemistry to estimate the products of the activation reactions. The resulting estimate of 6.9 Curies per Equivalent Full Power Year (EFPY) agrees with the Kunz data, adjusted for current operating cycles.

17.1 Gaseous Effluents

Dose due to Carbon-14 in gaseous effluents was calculated using the following conditions:

a. 6.8 Curies of C-14 were released to atmosphere in 2016.
b. There was no refueling outage in 2016. However, according to the Kunz study it has little or no impact on the C-14 effluents and was not considered in this report.
c. 10% of the C-14 was in the chemical form of CO_2, which is the only dose contributor. The bulk of C-14 is released in the chemical form of methane (CH4). Methane would exhibit high upward velocity due to its low density relative to air. Additionally, CH4 does not have an uptake pathway for humans.
d. Meteorological dispersion factor, (X/Q), at the site boundary to the hypothetical maximally exposed member of the public is 2.43E-07 sec/m^3.
e. Dose calculations and dose factors are from Regulatory Guide 1.109 methodology.
f. Pathways considered were inhalation, milk consumption, and vegetation ingestion.
g. The critical receptor is a child at the site boundary in the ESE direction.

See Table 6 for an estimate of Carbon-14 in gaseous effluents during 2016

17.2 Liquid Effluents

Dose due to Carbon-14 in liquid effluents was calculated using the following conditions:

a. The liquid waste processing system at Ginna has not been evaluated for efficiency of removal of Carbon-14. Therefore no removal term was used in estimation of offsite dose.
b. Average concentration of C-14 in waste water as measured in the Kunz study was adjusted for current operating conditions and was 6.0E-07 uCi/cc.
c. 1.39E+06 liters of liquid waste (with the potential to contain C-14) were released with a total dilution flow of 5.06E+12 liters.
d. Average diluted concentration of C-14 released was 4.19E-13 uCi/cc.
e. Liquid effluent dilution factor for potable water pathway is 200.
f. Liquid effluent dilution factor for fish pathway is 1.
g. Dose calculations and dose factors are from Regulatory Guide 1.109 methodology.
h. The critical receptor is a child for the fish consumption pathway and the child is the critical receptor for the potable water pathway.

See Table 6 for an estimate of Carbon-14 in liquid effluents during 2016.

TABLE 1A
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
2016

Effluent Type	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases						
1. Total release	Ci	1.54E-01	1.96E-01	1.90E-01	2.19E-01	2.80E+01
2. Average release rate for period	uCi/sec	1.96E-02	2.49E-02	2.41E-02	2.77E-02	
3. Percent of technical specification limit	%	3.11E-06	3.95E-06	3.83E-06	4.40E-06	
B. Iodines						
1. Total iodine-131	Ci	3.85E-08	0.00E+00	0.00E+00	4.74E-08	2.20E+01
2. Average release rate for period	uCi/sec	4.88E-09	0.00E+00	0.00E+00	6.01E-09	
3. Percent of technical specification limit	%	1.06E-07	0.00E+00	0.00E+00	1.31E-07	
C. Particulates						
1. Particulates with half-lives > 8days	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 technical specification limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross alpha radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
D. Tritium						
1. Total release	Ci	2.54E+01	3.00E+01	2.95E+01	2.64E+01	1.50E+01
2. Average release rate for period	uCi/sec	3.22E+00	3.80E+00	3.75E+00	3.35E+00	
3. Percent of technical specification limit	%	3.77E-06	4.44E-06	4.39E-06	3.92E-06	

Notes: Isotopes for which no value is given were not identified in applicable releases.

TABLE 1B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - CONTINUOUS AND BATCH RELEASES
2016

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission Gases									
Argon-41	Ci				3.05E-01	5.19E-02	5.55E-02	5.01E-02	5.54E-02
Krypton-85	Ci								
Krypton-85m	Ci								
Krypton-87	Ci								
Krypton-88	Ci								
Xenon-131m	Ci								
Xenon-133	Ci				1.05E+00	2.53E-02	4.27E-02	4.49E-02	5.40E-02
Xenon-133m	Ci								
Xenon-135	Ci				2.45E-02				
Xenon-135m	Ci								
Xenon-138	Ci								
Total for period	Ci								
2. Iodines									
Iodine-131	Ci					1.92E-08			2.37E-08
Iodine-132	Ci								
Iodine-133	Ci								
Iodine-135	Ci								
Total for period	Ci					1.92E-08			2.37E-08

TABLE 1B (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - CONTINUOUS AND BATCH RELEASES
2016

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
3. Particulates									
strontium-89	Ci								
strontium-90	Ci								
cesium-137	Ci								
cobalt-57	Ci								
cobalt-58	Ci								
cobalt-60	Ci								
Unidentified	Ci								
Total for period	Ci								
4. Tritium									
Hydrogen-3	Ci	1.27E+01	1.49E+01	1.47E+01	1.32E+01	2.36E-02	4.34E-02	9.20E-02	4.05E-02

Note: Isotopes for which no value is given were not identified in applicable releases.

TABLE 2A
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
2016

Effluent Type	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Products						
1. Total Release (not including tritium, gases, alpha)	Ci	9.69E-04	1.09E-04	4.39E-05	0.00E+00	2.80E+01
2. Average Diluted concentration	uCi/ml	2.13E-12	2.17E-13	7.67E-14	0.00E+00	
3. Percent of applicable limit	%	2.13E-05	2.17E-06	7.67E-07	0.00E+00	
B. Tritium						
1. Total Release	Ci	9.13E+00	2.47E+01	3.91E+01	1.07E+02	9.20E+00
2. Average Diluted Concentration	uCi/ml	2.01E-07	4.88E-08	6.38E-08	2.15E-07	
3. Percent of applicable limit	%	2.01E-03	4.88E-04	6.38E-04	2.15E-03	
C. Dissolved and Entrained Gases						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E+01
2. Average Diluted Concentration	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						
1. Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
E. Vol. of Waste Released (prior to dilution)	Liters	1.20E+08	1.20E+08	1.28E+08	1.25E+08	
F. Vol. of Dilution Water Used During Period	Liters	4.55E+11	5.05E+11	5.72E+11	4.97E+11	

Note: Isotopes for which no value is given were not identified in applicable releases.

TABLE 2B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – CONTINUOUS AND BATCH RELEASES
2016

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Products									
Chromium-51	Ci								
Manganese-54	Ci								
Iron-55	Ci								
Iron-59	Ci								
Cobalt-57	Ci								
Cobalt-58	Ci					6.75E-04	0.00E+00	1.77E-05	0.00E+00
Cobalt-60	Ci								
Zinc-65	Ci								
Strontium-89	Ci								
Strontium-90	Ci								
Niobium-95	Ci								
Molybdenum-99	Ci								
Zirconium-95	Ci								
Silver-110m	Ci								
Antimony-122	Ci								
Tellurium-123m	Ci					2.94E-04	1.09E-04	2.61E-05	0.00E+00
Antimony-124	Ci								
Antimony-125	Ci								
Iodine-131	Ci								
Iodine-132	Ci								
Tellurium-132	Ci								
Iodine-135	Ci								
Cesium-134	Ci								
Cesium-136	Ci								
Cesium-137	Ci								

TABLE 2B (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – CONTINUOUS AND BATCH RELEASES
2016

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Barium/Lanthanum-140	Ci								
Cerium-141	Ci								
Total (above)	Ci					9.70E-04	1.09E-04	4.39E-05	0.00E+00
Unidentified (from total above)	Ci								
Tritium									
Hydrogen-3	Ci	0.00E+00	7.57E-02	1.06E-01	6.19E-02	9.13E+01	2.46E+01	3.89E+01	1.07E+02
Dissolved And Entrained Gases									
Xenon-133	Ci								
Xenon-135	Ci								

Note: Isotopes for which no value is given were not identified in applicable releases.

TABLE 3
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
2016

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of Waste	Units	12 Month Period	Est. total Error (%)
A – Spent Resins, Filter Sludge, Evaporator Bottoms, Etc.	m^3	5.49E+00	2.5E+01
	Ci	7.14E+01	2.5E+01
B – Dry Active Waste (DAW), Contaminated Equipment, Etc.	m^3	1.30E+02	2.5E+01
	Ci	1.68E-02	2.5E+01
C – Irradiated Components, Control Rods, Etc.	m^3	None	N/A
	Ci		
D – Other: Combined Packages	m^3	None	N/A
	Ci	None	N/A

Note: Estimated total error for solid waste shipped offsite not available.

TABLE 3 (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
2016

2. Estimate of Major Nuclide Composition By Type of Waste					
Isotope	**Unit**	**Type A**	**Type B**	**Type C**	**Type D**
Co-58	%	0.07	19.04		
Co-60	%	15.33	9.28		
Cr-51	%		12.54		
Cs-137	%	3.98	4.47		
Fe-55	%	4.46	3.34		
Mn-54	%	0.8	1.51		
Nb-95	%		10.82		
Ni-63	%	71.22	15.84		
Sb-125	%	2.54	0.71		
Zr-95	%	0.00	5.84		
Cs-134	%	0.23			
Zn-65	%		0.22		
H-3	%	0.04	13.94		
C-14	%	0.09	0.37		
Total	%	98.8	97.9		

Note: Blank cells indicate nuclide composition not at significant levels.

TABLE 3 (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
2016

# of Shipments	Mode of Transportation	Type of Container	Solidification Agent	Processing Destination
2	Sole Use Truck	High Integrity Containers (HICs)	None Used Onsite	Energy Solutions, BC
3	Sole Use Truck	Metal Containers	None Used Onsite	Energy Solutions, BC

B. IRRADIATED FUEL SHIPMENTS (Disposition)

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

TABLE 4A

Radiation Dose to Maximum Individual Receptor from Gaseous Effluents

First Quarter 2016

(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	1.33E-06	5.35E-07	1.58E-04	1.74E-04	2.39E-04	6.30E-05
NNE	1.12E-06	4.48E-07	1.33E-04	1.45E-04	2.00E-04	5.28E-05
NE	1.29E-06	5.17E-07	1.53E-04	1.68E-04	2.31E-04	6.08E-05
ENE	1.64E-06	6.57E-07	1.94E-04	2.13E-04	2.93E-04	7.73E-05
E	2.98E-06	1.19E-06	3.54E-04	3.87E-04	5.33E-04	1.41E-04
ESE	3.79E-06	1.52E-06	4.50E-04	4.93E-04	6.78E-04	2.96E-04
SE	2.29E-06	9.20E-07	2.72E-04	2.98E-04	4.10E-04	1.08E-04
SSE	9.44E-07	3.78E-07	1.12E-04	1.23E-04	1.69E-04	4.45E-05
S	1.65E-06	6.63E-07	1.96E-04	2.15E-04	2.96E-04	7.80E-05
SSW	1.65E-06	6.63E-07	1.96E-04	2.15E-04	2.96E-04	7.80E-05
SW	1.65E-06	6.63E-07	1.96E-04	2.15E-04	2.96E-04	7.80E-05
WSW	1.76E-06	7.07E-07	2.09E-04	2.29E-04	3.15E-04	8.32E-05
W	1.12E-06	4.50E-07	1.33E-04	1.46E-04	2.01E-04	5.29E-05
WNW	9.48E-08	3.80E-08	1.13E-05	1.23E-05	1.70E-05	4.47E-06
NW	3.11E-07	1.25E-07	3.69E-05	4.04E-05	5.56E-05	1.47E-05
NNW	9.70E-07	3.89E-07	1.15E-04	1.26E-04	1.74E-04	4.58E-05
MAX.	3.79E-06	1.52E-06	4.50E-04	4.93E-04	6.78E-04	2.96E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Second Quarter 2016
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	1.44E-06	6.16E-07	1.87E-04	2.05E-04	2.82E-04	1.23E-04
NNE	1.21E-06	5.16E-07	1.57E-04	1.72E-04	2.36E-04	1.03E-04
NE	1.39E-06	5.95E-07	1.81E-04	1.98E-04	2.72E-04	1.19E-04
ENE	1.77E-06	7.56E-07	2.30E-04	2.52E-04	3.46E-04	1.51E-04
E	3.22E-06	1.37E-06	4.18E-04	4.58E-04	6.30E-04	2.75E-04
ESE	4.10E-06	1.75E-06	5.32E-04	5.83E-04	8.01E-04	3.50E-04
SE	2.48E-06	1.06E-06	3.22E-04	3.53E-04	4.85E-04	2.12E-04
SSE	1.02E-06	4.36E-07	1.32E-04	1.45E-04	1.99E-04	8.72E-05
S	1.79E-06	7.63E-07	2.32E-04	2.54E-04	3.49E-04	1.53E-04
SSW	1.79E-06	7.63E-07	2.32E-04	2.54E-04	3.49E-04	1.53E-04
SW	1.79E-06	7.63E-07	2.32E-04	2.54E-04	3.49E-04	1.53E-04
WSW	1.90E-06	8.13E-07	2.47E-04	2.71E-04	3.72E-04	1.63E-04
W	1.21E-06	5.18E-07	1.57E-04	1.73E-04	2.37E-04	1.04E-04
WNW	1.02E-07	4.37E-08	1.33E-05	1.46E-05	2.00E-05	8.75E-06
NW	3.36E-07	1.43E-07	4.36E-05	4.78E-05	6.57E-05	2.87E-05
NNW	1.05E-06	4.48E-07	1.36E-04	1.49E-04	2.05E-04	8.96E-05
MAX.	4.10E-06	1.75E-06	5.32E-04	5.83E-04	8.01E-04	3.50E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Third Quarter 2016
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	1.31E-06	5.74E-07	1.85E-04	2.02E-04	2.78E-04	1.21E-04
NNE	1.09E-06	4.81E-07	1.55E-04	1.70E-04	2.33E-04	1.02E-04
NE	1.26E-06	5.54E-07	1.79E-04	1.96E-04	2.68E-04	1.17E-04
ENE	1.60E-06	7.04E-07	2.27E-04	2.48E-04	3.41E-04	1.49E-04
E	2.92E-06	1.28E-06	4.13E-04	4.52E-04	6.20E-04	2.71E-04
ESE	3.71E-06	1.63E-06	5.25E-04	5.75E-04	7.89E-04	3.45E-04
SE	2.24E-06	9.86E-07	3.18E-04	3.48E-04	4.77E-04	2.09E-04
SSE	9.24E-07	4.06E-07	1.31E-04	1.43E-04	1.96E-04	8.59E-05
S	1.62E-06	7.11E-07	2.29E-04	2.51E-04	3.44E-04	1.50E-04
SSW	1.62E-06	7.11E-07	2.29E-04	2.51E-04	3.44E-04	1.50E-04
SW	1.62E-06	7.11E-07	2.29E-04	2.51E-04	3.44E-04	1.50E-04
WSW	1.73E-06	7.58E-07	2.44E-04	2.67E-04	3.67E-04	1.60E-04
W	1.10E-06	4.82E-07	1.55E-04	1.70E-04	2.34E-04	1.02E-04
WNW	9.28E-08	4.08E-08	1.31E-05	1.44E-05	1.97E-05	8.63E-06
NW	3.04E-07	1.34E-07	4.31E-05	4.72E-05	6.47E-05	2.83E-05
NNW	9.50E-07	4.17E-07	1.34E-04	1.47E-04	2.02E-04	8.83E-05
MAX.	3.71E-06	1.63E-06	5.25E-04	5.75E-04	7.89E-04	3.45E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Fourth Quarter 2016
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	1.45E-06	6.48E-07	1.65E-04	1.82E-04	2.50E-04	1.11E-04
NNE	1.22E-06	5.43E-07	1.39E-04	1.52E-04	2.09E-04	9.26E-05
NE	1.40E-06	6.26E-07	1.60E-04	1.75E-04	2.41E-04	1.07E-04
ENE	1.78E-06	7.95E-07	2.03E-04	2.23E-04	3.06E-04	1.36E-04
E	3.24E-06	1.45E-06	3.69E-04	4.06E-04	5.57E-04	2.47E-04
ESE	4.12E-06	1.84E-06	4.70E-04	5.16E-04	7.09E-04	3.14E-04
SE	2.49E-06	1.11E-06	2.84E-04	3.12E-04	4.29E-04	1.90E-04
SSE	1.03E-06	4.58E-07	1.17E-04	1.28E-04	1.77E-04	7.82E-05
S	1.80E-06	8.02E-07	2.05E-04	2.25E-04	3.09E-04	1.37E-04
SSW	1.80E-06	8.02E-07	2.05E-04	2.25E-04	3.09E-04	1.37E-04
SW	1.80E-06	8.02E-07	2.05E-04	2.25E-04	3.09E-04	1.37E-04
WSW	1.92E-06	8.56E-07	2.19E-04	2.40E-04	3.30E-04	1.46E-04
W	1.22E-06	5.45E-07	1.39E-04	1.53E-04	2.10E-04	9.29E-05
WNW	1.03E-07	4.60E-08	1.18E-05	1.29E-05	1.77E-05	7.85E-06
NW	3.38E-07	1.51E-07	3.85E-05	4.23E-05	5.81E-05	2.57E-05
NNW	1.05E-06	4.71E-07	1.20E-04	1.32E-04	1.82E-04	8.04E-05
MAX.	4.12E-06	1.84E-06	4.70E-04	5.16E-04	7.09E-04	3.14E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4B
Radiation Dose To Maximum Individual Receptor
From Liquid Effluents for 2016
(Units in milliRem)

	Adult	Teen	Child	Infant
First Quarter				
T. Body	5.00E-04	3.13E-04	3.11E-04	8.68E-05
GI-LLI	5.25E-04	4.02E-04	3.43E-04	8.68E-05
Thyroid	4.11E-04	3.14E-04	3.14E-04	8.68E-05
Second Quarter				
T. Body	8.73E-05	6.66E-05	6.64E-05	1.85E-05
GI-LLI	1.17E-04	9.02E-05	7.53E-05	1.86E-05
Thyroid	8.85E-05	6.78E-05	6.76E-05	1.85E-05
Third Quarter				
T. Body	1.37E-04	1.04E-04	1.03E-04	2.92E-05
GI-LLI	1.45E-04	1.10E-04	1.06E-04	2.94E-05
Thyroid	1.37E-04	1.04E-04	1.04E-04	2.94E-05
Fourth Quarter				
T. Body	3.80E-04	2.89E-04	2.86E-04	8.17E-05
GI-LLI	3.80E-04	2.89E-04	2.86E-04	8.17E-05
Thyroid	3.80E-04	2.89E-04	2.86E-04	8.17E-05

TABLE 5
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW01: Warehouse Access Road (Control)	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW03: Screenhouse West, South Well	1/22/2016	<LLD
	2/10/2016	<LLD
	3/18/2016	<LLD
	4/22/2016	<LLD
	5/18/2016	<LLD
	6/10/2016	<LLD
	7/21/2016	<LLD
	8/31/2016	<LLD
	9/9/2016	<LLD
	10/20/2016	<LLD
	11/18/2016	<LLD
	12/21/2016	
GW04: Screenhouse West, North Well	3/18/2016	<LLD
	6/10/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW05: Screenhouse East, South (15.5')	3/18/2016	<LLD
	6/10/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD

TABLE 5 (Continued)
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW06: Screenhouse East, Middle (20.0')	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW07: Screenhouse East, North (24.0')	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW08: All Volatile Treatment Building	1/22/2016	<LLD
	2/10/2016	<LLD
	3/18/2016	<LLD
	4/22/2016	<LLD
	5/18/2016	<LLD
	6/10/2016	<LLD
	7/21/2016	<LLD
	8/31/2016	<LLD
	9/9/2016	<LLD
	10/20/2016	<LLD
	11/18/2016	<LLD
	12/21/2016	
GW10: Technical Support Center, South	3/18/2016	<LLD
	6/10/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD

TABLE 5 (Continued)
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW11: Southeast of Contaminated Service Building (CSB)	3/11/2016	<LLD
	6/10/2016	<LLD
	9/17/2016	<LLD
	12/10/2016	<LLD
GW12: West of Orchard Access Road	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW13: North of Independent Spent Fuel Storage Installation (ISFSI)	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW14: South of Canister Preparation Building	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW15: West of Manor House	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD
GW16: Southeast of Manor House	3/18/2016	<LLD
	6/24/2016	<LLD
	9/9/2016	<LLD
	12/22/2016	<LLD

LLD conservatively established at 500 pCi/L

TABLE 6
Offsite Dose Due to Carbon-14 in Gaseous and Liquid Effluents

MAXIMUM DOSE VALUES DUE TO C-14 IN GASEOUS EFFLUENTS IN 2016		
Organ	**Age Group**	**mRem/yr**
NRC Reg. Guide 1.109, Annual Bone Dose	Child	1.94E-02
NRC Reg. Guide 1.109, Annual Total Body/Organ Dose	Child	3.86E-03

MAXIMUM DOSE VALUES DUE TO C-14 IN LIQUID EFFLUENTS IN 2016		
Organ	**Age**	**mRem/yr**
NRC Reg. Guide 1.109, Annual Bone Dose	Child	1.55E-04
NRC Reg. Guide 1.109, Annual Total Body/Organ Dose	Child	3.10E-05

Appendix A

Annual Report on the Meteorological Monitoring Program at the Ginna Nuclear Power Plant

Annual Report

On the

Meteorological Monitoring Program

At the

Ginna Nuclear Power Plant

2016

prepared for

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1. Introduction

The purpose of the meteorological program being conducted at the Ginna Plant site is to provide information sufficient to assess the local weather conditions and to determine the degree of atmospheric dispersion of airborne radioactive effluent from the station.

The meteorological tower is 300 ft. high and is instrumented at three levels. Wind speed and direction, and ambient temperature are measured at 33 ft., 150 ft., and 250 ft. Differential temperatures, referenced to 33 ft., are measured at 150 ft. and 250 ft. Precipitation is measured at ground level.

Joint frequency stability wind rose tables of wind direction, wind speed, and stability are routinely tabulated from hourly measurements. The annual tables are included in this report.

Descriptions of the instruments and data computers are given in Section 3 (Data Acquisition) of this report. Data reduction and processing are described in Section 4 (Data Analysis). The results given in Section 5 of this report include X/Q and D/Q data results and site meteorology.

2. Summary

The Ginna Plant meteorological monitoring program produced 96,426 hours of valid data out of a possible 96,624 priority parameter hours during 2016, which represents an overall data recovery rate of 99.8%. Priority parameters are all parameters except precipitation.

The stability wind rose tables included in this report have been generated using the 33 ft. wind data with the 150-33 ft. differential temperature data, the 150 ft. wind data with the 150-33 ft differential temperature data and the 250 ft. wind data with the 250-33 ft. differential temperature data.

3. Data Acquisition

Wind speed and direction are measured with Climatronics F460 wind sensors. The wind speed sensors have a starting speed of 0.5 mph (0.22 mps), a range of 0 to 100 mph (0 to 44.7 mps), and a system accuracy of ±1.0 mph at 100 mph (±0.45 mps at 44.7 mps). The wind direction sensors have a threshold speed of 0.5 mph (0.22 mps), a range of 0 to 540°, and a system accuracy of ±5°.

Ambient and differential temperature are measured with the Climatronics 100093 system. Ambient temperature is measured within the range of -20 to 120°F (-28.9 to 48.9°C) with an accuracy of ±0.5°F (±0.3°C). Differential temperature is measured within the range of -10 to 20°F (-5.6 to 11.1°C) with an accuracy of ±0.18°F (±0.10°C). Precipitation is measured with a Climatronics tipping bucket rain gauge and is measured in increments of one one-hundredth of an inch with a system accuracy of ±0.01" (±0.25mm).

The meteorological data are collected and stored by Campbell Scientific CR3000 and CR850 data loggers. The data loggers measure the analog voltages of the instruments and record the digital equivalent within the range of 0 to +5 volts. Data are obtained from the Campbell Scientific CR850 by a direct dial telephone hookup to an in-house computer system.

Table 1

Instrument Locations

Measurement	Sensor Type	Location	Elevation
Wind Speed	Climatronics 100075 F460	Tower	250 ft.
Wind Direction	Climatronics 100076 F460	Tower	250 ft.
Differential Temperature	Climatronics 100093	Tower	250 ft.
Wind Speed	Climatronics 100075 F460	Tower	150 ft.
Wind Direction	Climatronics 100076 F460	Tower	150 ft.
Differential Temperature	Climatronics 100093	Tower	150 ft.
Wind Speed	Climatronics 100075 F460	Tower	33 ft.
Wind Direction	Climatronics 100076 F460	Tower	33 ft.
Ambient Temperature	Climatronics 100093	Tower	33 ft.
Precipitation	Climatronics 100097-1 Tipping Bucket Rain Gage	Meteorological shelter roof	Ground

Table 2

Data Loggers

Measurement	Logger Type	Sampling Frequency
Winds, Temperatures, and Precipitation	Campbell Scientific CR3000 (A & B) and CR850	1 sec.
Winds, Temperatures, and Precipitation	Johnson Yokogawa Corp. Digital Recorder	10 sec.

4. Data Analysis

The meteorological data are collected via modem connection to a Campbell Scientific CR850 data logger. Data are sampled once per second. The data are then stored in the meteorological data base and hourly listings of the data are generated. The data listings are examined by qualified personnel and any apparent problems are brought to the attention of the Project Manager or Environmental Meteorologist and the Instrument Maintenance staff.

Hourly values of wind speed, wind direction, ambient temperature, differential temperature, and precipitation are obtained through measurements taken at the site. The standard deviation of wind direction (sigma) is derived. The wind direction variation is described in terms of the standard deviation of the direction about the mean direction. The MIDAS computer derives an hourly value of wind sigma.

The data base files are edited approximately once a week. Missing values are replaced with back up data values, when available. Invalid data are deleted from the data base.

When an hourly value is missing or invalid, the numeral 999 is entered into the computer data file in the appropriate location.

A professional meteorologist reviews the data, calibration findings, equipment maintenance reports, and other information and determines which data are valid. Only the valid data are retained in the data base.

Joint frequency stability wind rose tables of hourly data measured at the site are generated. These tables indicate the prevailing wind direction, wind speed, and stability classes measured during the period of observation as well as the joint frequencies of occurrence of the wind direction, wind speed, and stability classes. The values are also used as input to the atmospheric transport and diffusion models. Wind direction, wind speed, and stability classes are given in Tables 3, 4, and 5.

Table 3

Wind Direction Classes

IF	348.75°	<	WD	≤	11.25°	THEN	Class is	N
IF	11.25°	<	WD	≤	33.75°	THEN	Class is	NNE
IF	33.75°	<	WD	≤	56.25°	THEN	Class is	NE
IF	56.25°	<	WD	≤	78.75°	THEN	Class is	ENE
IF	78.75°	<	WD	≤	101.25°	THEN	Class is	E
IF	101.25°	<	WD	≤	123.75°	THEN	Class is	ESE
IF	123.75°	<	WD	≤	146.25°	THEN	Class is	SE
IF	146.25°	<	WD	≤	168.75°	THEN	Class is	SSE
IF	168.75°	<	WD	≤	191.25°	THEN	Class is	S
IF	191.25°	<	WD	≤	213.75°	THEN	Class is	SSW
IF	213.75°	<	WD	≤	236.25°	THEN	Class is	SW
IF	236.25°	<	WD	≤	258.75°	THEN	Class is	WSW
IF	258.75°	<	WD	≤	281.25°	THEN	Class is	W
IF	281.25°	<	WD	≤	303.75°	THEN	Class is	WNW
IF	303.75°	<	WD	≤	326.25°	THEN	Class is	NW
IF	326.25°	<	WD	≤	348.75°	THEN	Class is	NNW

Table 4

Wind Speed Classes

IF			WS	≤	0.50 m/s	THEN	Class is	1
IF	0.50 m/s	<	WS	≤	1.0 m/s	THEN	Class is	2
IF	1.1 m/s	<	WS	≤	1.5 m/s	THEN	Class is	3
IF	1.6 m/s	<	WS	≤	2.0 m/s	THEN	Class is	4
IF	2.1 m/s	<	WS	≤	3.0 m/s	THEN	Class is	5
IF	3.1 m/s	<	WS	≤	4.0 m/s	THEN	Class is	6
IF	4.1 m/s	<	WS	≤	5.0 m/s	THEN	Class is	7
IF	5.1 m/s	<	WS	≤	6.0 m/s	THEN	Class is	8
IF	6.1 m/s	<	WS	≤	8.0 m/s	THEN	Class is	9
IF	8.1 m/s	<	WS	≤	10.0 m/s	THEN	Class is	10
IF	10.0 m/s	<	WS			THEN	Class is	11

Table 5

Atmospheric Stability Classes

Class	Differential Temperature Interval (in °C/100m) [1]	Differential Temperature Interval (in °F over the 150-33ft. range) [2]	Differential Temperature Interval (in °F over the 250-33ft. range) [2]
Extremely Unstable	$\Delta T \leq -1.9$	$\Delta T \leq -1.2$	$\Delta T \leq -2.3$
Moderately Unstable	$-1.9 < \Delta T \leq -1.7$	$-1.2 < \Delta T \leq -1.1$	$-2.3 < \Delta T \leq -2.1$
Slightly Unstable	$-1.7 < \Delta T \leq -1.5$	$-1.1 < \Delta T \leq -1.0$	$-2.1 < \Delta T \leq -1.8$
Neutral	$-1.5 < \Delta T \leq -0.5$	$-1.0 < \Delta T \leq -0.3$	$-1.8 < \Delta T \leq -0.6$
Slightly Stable	$-0.5 < \Delta T \leq 1.5$	$-0.3 < \Delta T \leq 1.0$	$-0.6 < \Delta T \leq 1.8$
Moderately Stable	$1.5 < \Delta T \leq 4.0$	$1.0 < \Delta T \leq 2.6$	$1.8 < \Delta T \leq 4.8$
Extremely Stable	$4.0 < \Delta T$	$2.6 < \Delta T$	$4.8 < \Delta T$

[1] from ANSI/ANS 2.5
[2] ANSI/ANS 2.5 intervals scaled for instrument heights on the Ginna meteorological tower

5. Results

5.1 X/Q and D/Q

The ground and mixed mode values for X/Q and D/Q can be found in tables 4-9.

The following program was used to calculate X/Q and D/Q values:

1. XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations (NUREG/CR-2919).

The program is based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all receptors.

The program implements the assumptions outlined in Section C of NRC Regulatory Guide 1.111. In evaluating routine releases from nuclear power plants, it primarily is designed to calculate annual relative effluent concentrations, X/Q values and annual average relative deposition, D/Q values.

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
D/Q										
N	2.83E-09	1.38E-09	8.12E-10	5.28E-10	3.72E-10	2.78E-10	2.16E-10	1.74E-10	1.43E-10	1.19E-10
NNE	2.67E-09	1.25E-09	7.28E-10	4.73E-10	3.34E-10	2.50E-10	1.95E-10	1.56E-10	1.28E-10	1.08E-10
NE	3.37E-09	1.49E-09	8.54E-10	5.52E-10	3.88E-10	2.90E-10	2.26E-10	1.81E-10	1.49E-10	1.25E-10
ENE	4.42E-09	2.19E-09	1.30E-09	8.42E-10	5.92E-10	4.41E-10	3.43E-10	2.75E-10	2.26E-10	1.89E-10
E	4.49E-09	2.22E-09	1.32E-09	8.56E-10	6.03E-10	4.51E-10	3.53E-10	2.83E-10	2.34E-10	1.94E-10
ESE	1.01E-08	4.56E-09	2.17E-09	1.37E-09	9.62E-10	7.09E-10	5.44E-10	4.44E-10	3.71E-10	3.19E-10
SE	8.82E-09	2.99E-09	1.52E-09	9.49E-10	6.49E-10	4.77E-10	4.12E-10	3.31E-10	3.08E-10	2.73E-10
SSE	3.75E-09	1.24E-09	6.81E-10	4.37E-10	3.10E-10	2.26E-10	1.94E-10	1.84E-10	1.42E-10	1.20E-10
S	3.41E-09	1.23E-09	6.28E-10	3.97E-10	2.83E-10	2.37E-10	1.98E-10	1.74E-10	1.48E-10	1.23E-10
SSW	2.95E-09	1.10E-09	6.09E-10	3.80E-10	2.75E-10	2.03E-10	1.63E-10	1.67E-10	1.48E-10	1.29E-10
SW	4.02E-09	1.47E-09	7.63E-10	4.95E-10	3.41E-10	2.66E-10	2.18E-10	1.77E-10	1.55E-10	1.53E-10
WSW	4.40E-09	1.57E-09	8.22E-10	5.26E-10	3.61E-10	2.71E-10	2.12E-10	1.73E-10	1.49E-10	1.30E-10
W	1.77E-09	8.14E-10	4.54E-10	3.00E-10	2.14E-10	1.61E-10	1.26E-10	1.02E-10	8.40E-11	7.04E-11
WNW	3.93E-10	2.88E-10	1.88E-10	1.28E-10	9.25E-11	7.03E-11	5.54E-11	4.47E-11	3.68E-11	3.08E-11
NW	1.12E-09	6.05E-10	3.66E-10	2.42E-10	1.72E-10	1.29E-10	1.01E-10	8.14E-11	6.70E-11	5.62E-11
NNW	2.86E-09	1.43E-09	8.44E-10	5.48E-10	3.85E-10	2.87E-10	2.23E-10	1.79E-10	1.47E-10	1.23E-10

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	1.26E-07	1.11E-07	9.36E-08	7.70E-08	6.42E-08	5.44E-08	4.70E-08	4.12E-08	3.65E-08	3.28E-08
NNE	1.08E-07	9.28E-08	7.74E-08	6.32E-08	5.23E-08	4.42E-08	3.81E-08	3.33E-08	2.95E-08	2.64E-08
NE	1.20E-07	1.08E-07	9.28E-08	7.71E-08	6.47E-08	5.52E-08	4.78E-08	4.21E-08	3.74E-08	3.37E-08
ENE	1.50E-07	1.30E-07	1.05E-07	8.43E-08	6.93E-08	5.82E-08	4.99E-08	4.35E-08	3.84E-08	3.43E-08
E	1.49E-07	1.19E-07	9.31E-08	7.34E-08	5.95E-08	4.95E-08	4.40E-08	3.80E-08	3.47E-08	2.95E-08
ESE	1.76E-07	1.66E-07	8.73E-08	7.03E-08	6.71E-08	5.81E-08	4.38E-08	4.30E-08	3.89E-08	3.51E-08
SE	1.62E-07	9.26E-08	7.45E-08	5.87E-08	4.85E-08	4.51E-08	3.93E-08	3.48E-08	3.24E-08	2.91E-08
SSE	1.22E-07	6.66E-08	5.09E-08	4.37E-08	3.55E-08	2.91E-08	2.50E-08	2.35E-08	1.89E-08	1.66E-08
S	9.13E-08	7.44E-08	4.61E-08	4.04E-08	3.43E-08	3.45E-08	3.13E-08	2.87E-08	2.53E-08	2.19E-08
SSW	6.75E-08	4.32E-08	4.80E-08	4.44E-08	3.63E-08	3.12E-08	2.79E-08	2.67E-08	2.43E-08	2.19E-08
SW	7.33E-08	5.53E-08	4.86E-08	5.02E-08	4.06E-08	4.13E-08	4.09E-08	3.57E-08	3.23E-08	3.14E-08
WSW	9.24E-08	6.50E-08	4.95E-08	5.22E-08	3.97E-08	3.63E-08	3.05E-08	2.74E-08	2.60E-08	2.33E-08
W	6.17E-08	7.67E-08	5.96E-08	5.22E-08	4.52E-08	3.94E-08	3.47E-08	3.08E-08	2.77E-08	2.51E-08
WNW	1.52E-08	3.12E-08	3.21E-08	2.86E-08	2.48E-08	2.17E-08	1.90E-08	1.69E-08	1.52E-08	1.37E-08
NW	3.56E-08	4.36E-08	3.96E-08	3.34E-08	2.82E-08	2.41E-08	2.09E-08	1.83E-08	1.63E-08	1.46E-08
NNW	1.10E-07	9.25E-08	7.48E-08	6.00E-08	4.92E-08	4.13E-08	3.53E-08	3.07E-08	2.71E-08	2.42E-08

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
D/Q										
N	1.59E-08	5.06E-09	2.53E-09	1.54E-09	1.04E-09	7.55E-10	5.75E-10	4.54E-10	3.69E-10	3.06E-10
NNE	1.29E-08	4.10E-09	2.05E-09	1.25E-09	8.46E-10	6.14E-10	4.68E-10	3.69E-10	3.00E-10	2.49E-10
NE	1.61E-08	5.10E-09	2.55E-09	1.55E-09	1.05E-09	7.62E-10	5.81E-10	4.59E-10	3.73E-10	3.09E-10
ENE	1.84E-08	5.83E-09	2.91E-09	1.77E-09	1.20E-09	8.68E-10	6.61E-10	5.21E-10	4.23E-10	3.51E-10
E	1.56E-08	4.96E-09	2.48E-09	1.51E-09	1.02E-09	7.42E-10	5.69E-10	4.50E-10	3.68E-10	3.06E-10
ESE	2.10E-08	6.68E-09	3.33E-09	2.02E-09	1.37E-09	9.92E-10	7.56E-10	5.97E-10	4.93E-10	4.18E-10
SE	1.35E-08	4.21E-09	2.10E-09	1.27E-09	8.62E-10	6.73E-10	5.29E-10	4.18E-10	3.39E-10	2.80E-10
SSE	5.70E-09	1.78E-09	8.88E-10	5.48E-10	4.10E-10	3.00E-10	2.28E-10	1.80E-10	1.46E-10	1.20E-10
S	5.41E-09	1.70E-09	8.45E-10	5.22E-10	3.95E-10	2.95E-10	2.24E-10	1.77E-10	1.43E-10	1.18E-10
SSW	5.18E-09	1.72E-09	8.52E-10	5.68E-10	4.14E-10	3.06E-10	2.33E-10	1.83E-10	1.48E-10	1.23E-10
SW	7.00E-09	2.31E-09	1.15E-09	6.98E-10	4.73E-10	4.12E-10	3.19E-10	2.52E-10	2.04E-10	1.69E-10
WSW	8.42E-09	2.66E-09	1.32E-09	8.04E-10	5.45E-10	3.97E-10	3.04E-10	2.43E-10	1.99E-10	1.68E-10
W	7.53E-09	2.42E-09	1.19E-09	7.27E-10	4.94E-10	3.59E-10	2.75E-10	2.18E-10	1.77E-10	1.48E-10
WNW	3.26E-09	1.07E-09	5.42E-10	3.31E-10	2.25E-10	1.64E-10	1.26E-10	9.96E-11	8.14E-11	6.81E-11
NW	5.09E-09	1.64E-09	8.23E-10	5.01E-10	3.40E-10	2.47E-10	1.88E-10	1.49E-10	1.21E-10	1.01E-10
NNW	1.22E-08	3.85E-09	1.92E-09	1.17E-09	7.91E-10	5.74E-10	4.37E-10	3.45E-10	2.80E-10	2.32E-10

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	1.49E-06	5.37E-07	3.07E-07	2.08E-07	1.54E-07	1.20E-07	9.78E-08	8.19E-08	7.00E-08	6.09E-08
NNE	1.25E-06	4.49E-07	2.58E-07	1.75E-07	1.29E-07	1.01E-07	8.25E-08	6.91E-08	5.92E-08	5.16E-08
NE	1.58E-06	5.71E-07	3.28E-07	2.22E-07	1.65E-07	1.29E-07	1.05E-07	8.85E-08	7.58E-08	6.61E-08
ENE	1.49E-06	5.37E-07	3.08E-07	2.08E-07	1.54E-07	1.21E-07	9.82E-08	8.22E-08	7.03E-08	6.12E-08
E	1.13E-06	4.15E-07	2.37E-07	1.60E-07	1.18E-07	9.17E-08	7.55E-08	6.30E-08	5.46E-08	4.66E-08
ESE	8.77E-07	3.45E-07	1.81E-07	1.25E-07	1.01E-07	8.18E-08	6.30E-08	5.65E-08	4.91E-08	4.30E-08
SE	5.48E-07	2.16E-07	1.37E-07	9.77E-08	7.51E-08	6.36E-08	5.25E-08	4.42E-08	3.82E-08	3.31E-08
SSE	4.00E-07	1.47E-07	8.81E-08	6.39E-08	4.74E-08	3.66E-08	2.95E-08	2.43E-08	2.04E-08	1.75E-08
S	3.29E-07	1.57E-07	8.73E-08	7.28E-08	5.72E-08	4.85E-08	3.91E-08	3.22E-08	2.72E-08	2.34E-08
SSW	2.64E-07	1.16E-07	9.28E-08	7.32E-08	5.50E-08	4.38E-08	3.62E-08	3.05E-08	2.58E-08	2.22E-08
SW	3.47E-07	1.64E-07	1.13E-07	9.98E-08	7.52E-08	6.67E-08	5.76E-08	4.82E-08	4.14E-08	3.62E-08
WSW	4.75E-07	2.10E-07	1.27E-07	1.08E-07	7.76E-08	6.58E-08	5.36E-08	4.63E-08	4.19E-08	3.67E-08
W	8.72E-07	3.58E-07	2.07E-07	1.45E-07	1.10E-07	8.77E-08	7.24E-08	6.14E-08	5.30E-08	4.65E-08
WNW	4.55E-07	1.85E-07	1.12E-07	7.88E-08	5.99E-08	4.79E-08	3.97E-08	3.37E-08	2.92E-08	2.57E-08
NW	5.62E-07	2.14E-07	1.26E-07	8.63E-08	6.46E-08	5.10E-08	4.18E-08	3.51E-08	3.02E-08	2.64E-08
NNW	1.01E-06	3.66E-07	2.11E-07	1.43E-07	1.06E-07	8.31E-08	6.77E-08	5.68E-08	4.86E-08	4.24E-08

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
D/Q										
N	1.75E-08	5.52E-09	2.75E-09	1.67E-09	1.13E-09	8.18E-10	6.22E-10	4.90E-10	3.97E-10	3.28E-10
NNE	1.43E-08	4.51E-09	2.25E-09	1.37E-09	9.23E-10	6.69E-10	5.09E-10	4.01E-10	3.24E-10	2.68E-10
NE	1.79E-08	5.64E-09	2.81E-09	1.71E-09	1.15E-09	8.36E-10	6.35E-10	5.01E-10	4.05E-10	3.35E-10
ENE	1.99E-08	6.28E-09	3.13E-09	1.90E-09	1.28E-09	9.31E-10	7.08E-10	5.57E-10	4.51E-10	3.73E-10
E	1.73E-08	5.44E-09	2.71E-09	1.65E-09	1.11E-09	8.06E-10	6.13E-10	4.83E-10	3.91E-10	3.24E-10
ESE	2.23E-08	7.02E-09	3.50E-09	2.12E-09	1.44E-09	1.04E-09	7.91E-10	6.23E-10	5.04E-10	4.17E-10
SE	1.46E-08	4.61E-09	2.30E-09	1.39E-09	9.42E-10	6.82E-10	5.19E-10	4.09E-10	3.31E-10	2.74E-10
SSE	6.25E-09	1.97E-09	9.83E-10	5.96E-10	4.03E-10	2.92E-10	2.22E-10	1.75E-10	1.42E-10	1.17E-10
S	6.12E-09	1.93E-09	9.62E-10	5.83E-10	3.95E-10	2.86E-10	2.17E-10	1.71E-10	1.39E-10	1.15E-10
SSW	6.30E-09	1.99E-09	9.90E-10	6.01E-10	4.06E-10	2.94E-10	2.24E-10	1.76E-10	1.43E-10	1.18E-10
SW	8.60E-09	2.71E-09	1.35E-09	8.20E-10	5.54E-10	4.02E-10	3.05E-10	2.41E-10	1.95E-10	1.61E-10
WSW	1.00E-08	3.16E-09	1.58E-09	9.56E-10	6.46E-10	4.68E-10	3.56E-10	2.81E-10	2.27E-10	1.88E-10
W	9.96E-09	3.14E-09	1.57E-09	9.50E-10	6.42E-10	4.65E-10	3.54E-10	2.79E-10	2.26E-10	1.87E-10
WNW	4.89E-09	1.54E-09	7.69E-10	4.66E-10	3.15E-10	2.29E-10	1.74E-10	1.37E-10	1.11E-10	9.17E-11
NW	6.39E-09	2.01E-09	1.00E-09	6.09E-10	4.12E-10	2.98E-10	2.27E-10	1.79E-10	1.45E-10	1.20E-10
NNW	1.35E-08	4.25E-09	2.12E-09	1.28E-09	8.68E-10	6.29E-10	4.78E-10	3.77E-10	3.05E-10	2.52E-10

DIRECTION	804m	1609m	2416m	3218m	4022m	4827m	5632m	6436m	7240m	8045m
X/Q										
N	2.06E-06	7.15E-07	3.95E-07	2.61E-07	1.90E-07	1.47E-07	1.18E-07	9.83E-08	8.35E-08	7.22E-08
NNE	1.79E-06	6.16E-07	3.41E-07	2.26E-07	1.64E-07	1.27E-07	1.03E-07	8.52E-08	7.24E-08	6.27E-08
NE	2.32E-06	8.03E-07	4.45E-07	2.94E-07	2.15E-07	1.66E-07	1.34E-07	1.11E-07	9.46E-08	8.19E-08
ENE	2.15E-06	7.45E-07	4.10E-07	2.70E-07	1.96E-07	1.51E-07	1.21E-07	1.01E-07	8.53E-08	7.37E-08
E	1.73E-06	5.88E-07	3.20E-07	2.09E-07	1.51E-07	1.16E-07	9.27E-08	7.66E-08	6.48E-08	5.58E-08
ESE	1.36E-06	4.52E-07	2.47E-07	1.62E-07	1.17E-07	9.04E-08	7.26E-08	6.01E-08	5.09E-08	4.40E-08
SE	1.02E-06	3.35E-07	1.82E-07	1.19E-07	8.61E-08	6.62E-08	5.31E-08	4.39E-08	3.72E-08	3.21E-08
SSE	6.10E-07	1.98E-07	1.05E-07	6.74E-08	4.80E-08	3.65E-08	2.90E-08	2.38E-08	2.00E-08	1.71E-08
S	7.05E-07	2.32E-07	1.26E-07	8.24E-08	5.95E-08	4.57E-08	3.67E-08	3.03E-08	2.57E-08	2.22E-08
SSW	6.59E-07	2.19E-07	1.19E-07	7.82E-08	5.66E-08	4.36E-08	3.51E-08	2.90E-08	2.46E-08	2.13E-08
SW	9.68E-07	3.26E-07	1.82E-07	1.21E-07	8.86E-08	6.88E-08	5.57E-08	4.64E-08	3.96E-08	3.43E-08
WSW	1.24E-06	4.22E-07	2.35E-07	1.56E-07	1.14E-07	8.83E-08	7.14E-08	5.94E-08	5.06E-08	4.39E-08
W	1.86E-06	6.45E-07	3.57E-07	2.36E-07	1.72E-07	1.33E-07	1.07E-07	8.91E-08	7.57E-08	6.55E-08
WNW	1.08E-06	3.77E-07	2.11E-07	1.40E-07	1.02E-07	7.94E-08	6.42E-08	5.34E-08	4.55E-08	3.94E-08
NW	1.02E-06	3.51E-07	1.94E-07	1.28E-07	9.28E-08	7.17E-08	5.77E-08	4.79E-08	4.07E-08	3.52E-08
NNW	1.53E-06	5.26E-07	2.90E-07	1.91E-07	1.39E-07	1.07E-07	8.60E-08	7.13E-08	6.05E-08	5.23E-08

Direction	Distance to Nearset Residence (m)	Air Ejector		Containment Vent		Plant Vent	
		X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})
E	1170	9.54E-07	9.34E-09	6.53E-07	8.48E-09	1.34E-07	3.15E-09
ESE	1660	4.32E-07	6.66E-09	3.28E-07	6.34E-09	1.57E-07	4.32E-09
SE	840	9.47E-07	1.36E-08	5.12E-07	1.26E-08	1.48E-07	8.29E-09
SSE	610	9.63E-07	9.73E-09	5.39E-07	8.77E-09	1.21E-07	4.80E-09
S	1500	2.58E-07	2.18E-09	1.66E-07	1.91E-09	7.62E-08	1.38E-09
SSW	620	1.02E-06	9.56E-09	3.91E-07	7.75E-09	8.50E-08	3.96E-09
SW	740	1.12E-06	9.84E-09	3.93E-07	7.99E-09	7.63E-08	4.48E-09
WSW	1470	4.81E-07	3.69E-09	2.28E-07	3.11E-09	6.32E-08	1.82E-09
W	2420	3.56E-07	1.56E-09	2.07E-07	1.19E-09	5.95E-08	4.53E-10

Direction	Distance to Nearest Milk Producing Animal (m)	Air Ejector		Containment Vent		Plant Vent	
		X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})	X/Q (sec/m^3)	D/Q (m^{-2})
SE	8270	3.09E-08	2.61E-10	3.18E-08	2.67E-10	2.81E-08	2.61E-10

5.2 Instrument Maintenance

In January-March, At the Primary Tower, the 33' bravo wind direction began reading too high compared to the alpha wind direction and then went out. All 33' bravo wind direction data from December 20th to the end of the month was replaced with 33' alpha wind direction data. On March 22 the issued was fixed.

Also in March, A calibration of the Primary Tower was performed. At the Backup Tower, the logger is reading an incorrect time and date. No data has been collected because of this issue. Site IT is aware of the issue and has yet to fix it.

In April-May, the Backup Towers logger issued continued until May 12 once it was fixed.

In August, a calibration of the Primary Tower and Backup Tower was performed on August 17.

In November, a calibration of the Primary Tower and Backup Tower was performed on November 15.

No other problems were encountered with the equipment, and at the end of the year, no problems were evident at the site.

5.3 Data Recovery

The record of data recovery for the year is summarized in Table 12.

Table 12

Ginna Site

Data Recovery Summary

2016

Measurement	Elevation	Recovered Hours	Recovered Percent	Lost Hours	Percent Changed
Wind Speed	33 ft.	8766	99.8	18	0.7
Wind Speed	150 ft.	8766	99.8	18	0.7
Wind Speed	250 ft.	8766	99.8	18	0.7
Wind Direction	33 ft.	8766	99.8	18	0.7
Wind Direction	150 ft.	8766	99.8	18	0.7
Wind Direction	250 ft.	8766	99.8	18	0.8
Ambient Temperature	33 ft.	8766	99.8	18	0.7
Ambient Temperature	150 ft.	8766	99.8	18	0.7
Ambient Temperature	250 ft.	8766	99.8	18	0.7
Differential Temperature	150-33 ft.	8766	99.8	18	0.9
Differential Temperature	250-33 ft.	8766	99.8	18	1.5
Precipitation	10 ft.	8757	99.7	27	0.9
AVERAGE*			99.8		

* average of priority parameters (all except precipitation)

	Valid Hours	Recovered Percent	Lost Hours
Lower Level Joint Frequency %	8766	99.8	18
Middle Level Joint Frequency %	8766	99.8	18
Upper Level Joint Frequency %	8766	99.8	18

5.4 Stability Wind Rose Data

The annual stability wind roses are given at the end of this report. Wind speed classes have been altered to reflect the sensor threshold.

For the year, winds measured at 33 ft. most frequently came from the south-southwest (11.91%) and most frequently fell into the 2.1-3.0 m/s wind speed class (23.42%). Calms (wind speeds at or below the sensor threshold) were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (2.54%) of the time. Winds measured at 150 ft. most frequently came from the west-northwest (11.37%) and most frequently fell into the 6.1-8.0 m/s wind speed class (20.19%). Calms were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (11.54%) of the time. Winds measured at 250 ft. most frequently came from the west-northwest (12.00%) and most frequently fell into the 6.1-8.1 m/s wind speed class (22.77%). Calms were measured 0.00% of the time and speeds greater than 10.0 m/s were measured (16.74%) of the time.

Stability based on the 150-33 ft. differential temperature most frequently fell into the neutral classification (33.69%) and stability based on the 250-33 ft. differential temperature most frequently fell into the neutral classification (43.57%).

5.5 Precipitation

Table 13

Precipitation Totals (Inches) - 2016
Ginna Site

Month	Total
January	1.14
February	3.59
March	2.02
April	1.46
May	2.05
June	1.90
July	0.63
August	2.67
September	2.03
October	4.71
November	3.40
December	2.42
TOTAL:	28.02*

*Indicates some precipitation missing.

2016

Joint Frequency Tables

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

All Stabilities

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	9	19	42	63	52	27	11	6	0	0	229
NNE	0	3	14	30	131	98	68	52	44	16	7	463
NE	0	4	20	36	59	58	72	24	31	36	30	370
ENE	0	9	37	46	107	104	85	55	51	40	24	558
E	0	13	23	36	150	78	44	24	8	0	0	376
ESE	0	6	21	30	50	37	15	1	0	0	0	160
SE	0	15	21	19	75	51	26	6	4	0	0	217
SSE	0	11	23	37	103	67	63	56	52	10	6	428
S	0	15	49	64	191	198	145	85	85	21	24	877
SSW	1	21	74	145	325	217	155	57	44	5	0	1044
SW	0	17	54	138	300	165	102	66	32	1	0	875
WSW	0	8	31	44	102	173	129	148	200	82	28	945
W	0	12	17	27	125	136	112	118	154	34	4	739
WNW	0	8	21	36	149	170	130	107	153	141	78	993
NW	0	12	21	53	95	46	30	27	61	23	22	390
NNW	0	9	21	29	28	10	5	0	0	0	0	102
Tot	1	172	466	812	2053	1660	1208	837	925	409	223	8766

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 8766
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	6	12	9	8	6	4	0	0	45
NNE	0	0	0	0	20	27	18	32	36	14	7	154
NE	0	0	1	5	9	29	44	15	22	28	29	182
ENE	0	0	0	1	13	41	48	27	33	27	23	213
E	0	0	0	0	5	0	0	3	2	0	0	10
ESE	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	4	6	4	0	0	0	0	14
SSE	0	0	0	1	12	7	8	5	2	0	0	35
S	0	0	0	0	7	6	8	1	1	0	0	23
SSW	0	0	0	0	6	9	17	5	1	0	0	38
SW	0	0	0	1	8	20	5	5	2	0	0	41
WSW	0	0	0	0	1	8	6	7	11	2	1	36
W	0	0	0	1	6	10	20	11	8	1	0	57
WNW	0	0	2	10	67	85	72	50	50	46	24	406
NW	0	0	2	21	54	11	9	9	11	9	2	128
NNW	0	0	3	10	12	3	0	0	0	0	0	28
Tot	0	0	8	56	237	271	267	176	183	127	86	1411

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 1411
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	5	7	10	8	9	2	2	0	0	43
NNE	0	0	0	9	32	18	10	9	5	0	0	83
NE	0	0	0	3	12	7	12	3	5	6	0	48
ENE	0	0	3	2	13	15	16	7	6	5	0	67
E	0	0	1	0	2	2	5	2	2	0	0	14
ESE	0	0	0	0	2	0	0	0	0	0	0	2
SE	0	0	0	0	6	3	1	2	1	0	0	13
SSE	0	0	0	2	6	6	2	3	1	1	0	21
S	0	0	0	0	13	8	7	3	2	0	0	33
SSW	0	0	3	5	7	6	10	3	2	0	0	36
SW	0	0	0	1	8	6	11	10	7	0	0	43
WSW	0	0	1	0	2	2	6	8	14	9	0	42
W	0	0	1	0	11	11	8	2	10	4	0	47
WNW	0	0	2	7	4	9	3	9	17	32	16	99
NW	0	0	1	4	4	1	3	5	10	2	10	40
NNW	0	0	2	3	2	0	2	0	0	0	0	9
Tot	0	0	19	43	134	102	105	68	84	59	26	640

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 640
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	1	5	3	6	7	4	1	0	0	0	27
NNE	0	1	2	3	12	9	11	2	2	0	0	42
NE	0	0	0	0	4	5	3	1	0	1	0	14
ENE	0	0	0	1	10	11	0	3	4	3	1	33
E	0	0	0	0	2	4	6	4	4	0	0	20
ESE	0	0	0	0	1	2	0	0	0	0	0	3
SE	0	0	0	0	2	2	1	0	0	0	0	5
SSE	0	0	0	1	3	2	1	2	0	0	1	10
S	0	0	1	1	2	3	3	1	1	2	0	14
SSW	0	0	0	3	6	5	4	2	4	0	0	24
SW	0	0	3	1	5	6	6	5	2	0	0	28
WSW	0	0	0	1	1	6	6	4	5	5	1	29
W	0	1	1	1	5	5	3	2	4	3	1	26
WNW	0	0	0	0	4	3	6	6	9	15	8	51
NW	0	0	2	3	2	2	4	3	12	3	4	35
NNW	0	0	2	1	1	1	0	0	0	0	0	5
Tot	0	3	16	19	66	73	58	36	47	32	16	366

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 366
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	3	4	20	28	25	6	2	0	0	0	88
NNE	0	1	6	9	48	38	22	9	0	2	0	135
NE	0	0	8	5	18	11	6	4	3	0	1	56
ENE	0	1	9	7	20	24	7	13	5	5	0	91
E	0	3	6	10	51	38	19	9	0	0	0	136
ESE	0	0	3	6	19	22	15	1	0	0	0	66
SE	0	1	2	5	33	31	20	4	3	0	0	99
SSE	0	0	3	4	22	34	42	36	44	9	5	199
S	0	2	5	8	37	48	43	43	63	16	22	287
SSW	0	0	1	13	42	58	57	27	27	4	0	229
SW	0	1	9	7	35	48	46	32	14	0	0	192
WSW	0	1	5	4	21	71	67	95	149	60	23	496
W	0	3	5	5	37	55	53	93	126	26	3	406
WNW	0	2	5	8	28	35	30	30	73	48	30	289
NW	0	6	8	14	14	28	13	10	28	9	6	136
NNW	0	6	12	13	11	3	3	0	0	0	0	48
Tot	0	30	91	138	464	569	449	408	535	179	90	2953

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 2953
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	4	4	6	5	2	0	0	0	0	0	21
NNE	0	0	3	4	14	5	4	0	1	0	0	31
NE	0	2	5	10	12	5	3	0	0	0	0	37
ENE	0	5	9	11	24	9	10	5	1	0	0	74
E	0	5	8	15	47	14	13	6	0	0	0	108
ESE	0	2	6	20	22	10	0	0	0	0	0	60
SE	0	4	9	6	17	5	0	0	0	0	0	41
SSE	0	5	6	11	40	16	10	10	5	0	0	103
S	0	3	20	17	43	93	83	37	18	3	2	319
SSW	0	4	12	23	82	67	56	18	10	1	0	273
SW	0	4	14	38	106	71	34	13	7	1	0	288
WSW	0	1	14	24	40	77	43	34	21	6	3	263
W	0	7	7	13	61	54	28	10	6	0	0	186
WNW	0	3	9	7	35	34	18	12	4	0	0	122
NW	0	5	6	7	14	3	1	0	0	0	0	36
NNW	0	2	1	1	1	1	0	0	0	0	0	6
Tot	0	56	133	213	563	466	303	145	73	11	5	1968

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 1968
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	1	0	0	0	0	0	0	0	0	0	1
NNE	0	1	1	5	3	1	2	0	0	0	0	13
NE	0	0	2	8	3	1	3	1	1	1	0	20
ENE	0	2	3	6	17	3	4	0	2	0	0	37
E	0	5	7	6	23	6	1	0	0	0	0	48
ESE	0	4	9	3	3	3	0	0	0	0	0	22
SE	0	4	6	5	11	4	0	0	0	0	0	30
SSE	0	4	9	11	12	2	0	0	0	0	0	38
S	0	4	7	14	37	32	1	0	0	0	0	95
SSW	0	8	16	19	45	47	5	2	0	0	0	142
SW	0	6	13	43	65	12	0	1	0	0	0	140
WSW	0	4	4	12	27	9	1	0	0	0	0	57
W	0	0	2	5	3	1	0	0	0	0	0	11
WNW	0	2	1	1	7	1	1	0	0	0	0	13
NW	0	0	1	2	3	0	0	0	0	0	0	6
NNW	0	1	1	1	0	2	0	0	0	0	0	5
Tot	0	46	82	141	259	124	18	4	3	1	0	678

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	678
Hours of Missing Data . . .	18
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 33ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	1	0	2	1	0	0	0	0	0	4
NNE	0	0	2	0	2	0	1	0	0	0	0	5
NE	0	2	4	5	1	0	1	0	0	0	0	13
ENE	0	1	13	18	10	1	0	0	0	0	0	43
E	0	0	1	5	20	14	0	0	0	0	0	40
ESE	0	0	3	1	2	0	0	0	0	0	0	6
SE	0	6	4	3	2	0	0	0	0	0	0	15
SSE	0	2	5	7	8	0	0	0	0	0	0	22
S	0	6	16	24	52	8	0	0	0	0	0	106
SSW	1	9	42	82	137	25	6	0	0	0	0	302
SW	0	6	15	47	73	2	0	0	0	0	0	143
WSW	0	2	7	3	10	0	0	0	0	0	0	22
W	0	1	1	2	2	0	0	0	0	0	0	6
WNW	0	1	2	3	4	3	0	0	0	0	0	13
NW	0	1	1	2	4	1	0	0	0	0	0	9
NNW	0	0	0	0	1	0	0	0	0	0	0	1
Tot	1	37	117	202	330	55	8	0	0	0	0	750

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 750
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

All Stabilities

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	2	4	13	16	42	35	24	25	62	23	28	274
NNE	0	4	10	23	49	30	22	32	61	17	34	282
NE	0	6	14	22	58	62	77	31	35	36	44	385
ENE	1	8	20	16	57	106	83	59	54	25	20	449
E	0	8	16	30	77	114	110	54	33	4	0	446
ESE	0	4	10	16	46	63	46	23	11	0	0	219
SE	1	2	4	10	47	73	84	43	19	3	0	286
SSE	0	6	2	12	46	68	80	95	167	94	33	603
S	0	1	7	9	59	91	113	149	254	55	46	784
SSW	1	2	7	12	54	78	120	140	171	48	8	641
SW	0	8	9	14	51	101	192	174	188	56	8	801
WSW	0	7	11	7	37	70	138	160	213	141	108	892
W	0	6	12	8	53	82	77	120	175	152	88	773
WNW	0	3	8	21	41	84	86	109	176	139	330	997
NW	0	7	15	23	80	62	47	31	92	64	233	654
NNW	0	3	11	25	40	30	19	31	59	30	32	280
Tot	5	79	169	264	837	1149	1318	1276	1770	887	1012	8766

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 8766
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	3	10	8	5	20	8	15	69
NNE	0	0	0	4	6	7	4	8	37	15	31	112
NE	0	0	1	2	9	26	40	20	20	25	41	184
ENE	0	0	0	0	7	37	43	31	36	19	18	191
E	0	0	0	0	8	4	3	2	2	0	0	19
ESE	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	1	5	4	6	0	0	0	16
SSE	0	0	0	0	9	6	4	7	7	1	0	34
S	0	0	0	0	5	3	7	4	3	0	0	22
SSW	0	0	0	0	4	5	6	14	5	1	0	35
SW	0	0	0	1	3	9	16	6	9	2	1	47
WSW	0	0	0	0	0	2	6	3	9	8	3	31
W	0	0	0	0	4	5	2	11	17	3	5	47
WNW	0	0	0	3	9	29	38	39	72	57	88	335
NW	0	0	1	4	45	45	19	15	28	12	54	223
NNW	0	0	0	3	14	6	5	6	4	2	6	46
Tot	0	0	2	17	127	199	205	177	269	153	262	1411

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 1411
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	6	9	3	3	5	8	5	4	43
NNE	0	0	1	3	19	8	4	3	8	1	1	48
NE	0	0	2	2	7	6	13	4	5	6	1	46
ENE	0	0	2	2	10	14	10	8	5	0	1	52
E	0	0	0	0	0	8	9	2	5	0	0	24
ESE	0	0	0	0	2	0	0	0	0	0	0	2
SE	0	0	0	1	4	2	5	1	4	0	0	17
SSE	0	0	0	0	7	5	2	1	5	2	1	23
S	0	0	0	0	5	9	5	4	4	0	0	27
SSW	0	0	0	4	5	5	5	7	4	2	0	32
SW	0	0	2	0	2	5	8	6	16	6	3	48
WSW	0	0	0	0	1	3	0	6	9	7	10	36
W	0	0	0	2	2	8	7	8	6	9	1	43
WNW	0	0	0	2	3	3	3	2	9	7	58	87
NW	0	0	0	3	7	0	2	2	4	2	44	64
NNW	0	0	1	7	7	4	2	5	6	7	9	48
Tot	0	0	8	32	90	83	78	64	98	54	133	640

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 640
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	5	2	6	2	5	3	9	2	2	36
NNE	0	0	0	1	4	3	3	4	4	0	0	19
NE	0	0	0	0	3	3	4	2	0	0	0	12
ENE	0	0	0	0	8	6	1	1	3	2	1	22
E	0	0	0	0	4	5	11	6	2	2	0	30
ESE	0	0	0	0	1	1	1	0	0	0	0	3
SE	0	0	0	0	2	1	2	1	0	0	0	6
SSE	0	0	0	1	1	2	3	0	3	1	1	12
S	0	0	0	1	2	1	2	3	1	0	2	12
SSW	0	0	0	1	3	3	4	4	2	4	0	21
SW	0	1	1	2	4	2	4	6	7	4	0	31
WSW	0	0	1	0	1	1	4	2	9	2	7	27
W	0	1	0	1	1	3	3	3	3	2	3	20
WNW	0	0	0	2	1	3	2	2	7	6	26	49
NW	0	0	1	1	4	0	0	1	3	5	34	49
NNW	0	0	0	2	2	2	0	0	5	2	4	17
Tot	0	2	8	14	47	38	49	38	58	32	80	366

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 366
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	1	0	4	5	12	15	6	10	22	6	6	87
NNE	0	0	2	5	11	5	5	10	7	1	2	48
NE	0	1	1	9	13	12	8	3	5	3	1	56
ENE	0	0	4	2	11	18	9	9	4	4	0	61
E	0	3	2	8	19	35	28	15	14	2	0	126
ESE	0	0	2	4	14	19	22	12	9	0	0	82
SE	0	0	1	4	10	33	35	22	10	3	0	118
SSE	0	0	0	2	4	16	28	37	71	69	28	255
S	0	1	0	2	16	23	35	41	51	32	39	240
SSW	0	1	0	1	18	26	32	37	50	24	6	195
SW	0	2	1	3	9	17	30	48	68	26	1	205
WSW	0	0	3	1	6	12	38	52	109	106	77	404
W	0	3	5	3	11	12	17	45	111	129	77	413
WNW	0	0	3	6	9	17	14	21	46	50	149	315
NW	0	3	6	9	5	4	12	5	33	33	99	209
NNW	0	1	6	10	11	12	9	18	42	18	12	139
Tot	1	15	40	74	179	276	328	385	652	506	497	2953

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 2953
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	1	10	4	2	2	3	0	1	23
NNE	0	2	4	2	5	5	5	4	2	0	0	29
NE	0	1	2	3	13	10	7	1	3	0	0	40
ENE	0	1	5	9	9	11	12	4	2	0	0	53
E	0	3	4	7	16	40	34	16	8	0	0	128
ESE	0	1	4	6	11	20	16	5	0	0	0	63
SE	0	2	1	2	11	13	19	9	4	0	0	61
SSE	0	2	1	5	12	18	22	29	59	21	3	172
S	0	0	0	2	10	25	33	54	128	22	5	279
SSW	0	0	3	3	9	21	38	38	64	14	2	192
SW	0	2	0	2	13	33	70	61	70	17	3	271
WSW	0	2	3	3	14	19	37	62	68	18	11	237
W	0	1	3	0	12	31	22	44	38	9	2	162
WNW	0	2	0	3	8	14	20	41	40	19	9	156
NW	0	0	4	2	12	11	9	8	23	12	2	83
NNW	0	1	2	2	3	5	3	1	0	1	1	19
Tot	0	20	36	52	168	280	349	379	512	133	39	1968

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 1968
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	1	1	0	1	1	0	0	0	0	0	4
NNE	0	0	1	5	2	1	1	2	3	0	0	15
NE	0	0	1	5	4	0	3	1	1	2	1	18
ENE	0	2	3	3	7	13	7	5	3	0	0	43
E	0	0	4	9	15	10	14	4	2	0	0	58
ESE	0	0	2	0	5	14	3	4	2	0	0	30
SE	0	0	0	2	7	11	7	3	1	0	0	31
SSE	0	3	0	0	5	7	9	10	14	0	0	48
S	0	0	2	4	7	15	11	27	43	1	0	110
SSW	0	0	2	1	3	6	16	15	20	2	0	65
SW	0	1	1	0	7	13	31	27	14	1	0	95
WSW	0	4	2	0	4	17	25	19	9	0	0	80
W	0	0	2	1	12	10	11	7	0	0	0	43
WNW	0	0	1	3	1	8	5	2	2	0	0	22
NW	0	2	1	2	1	1	3	0	1	0	0	11
NNW	0	0	2	0	2	0	0	0	1	0	0	5
Tot	0	13	25	35	83	127	146	126	116	6	1	678

Hours of Calm	0
Hours of Variable Direction	0
Hours of Valid Data	678
Hours of Missing Data . . .	18
Hours in Period	8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 150ft Stability 150ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	1	3	3	2	1	0	0	0	0	2	0	12
NNE	0	2	2	3	2	1	0	1	0	0	0	11
NE	0	4	7	1	9	5	2	0	1	0	0	29
ENE	1	5	6	0	5	7	1	1	1	0	0	27
E	0	2	6	6	15	12	11	9	0	0	0	61
ESE	0	3	2	6	13	9	4	2	0	0	0	39
SE	1	0	2	1	12	8	12	1	0	0	0	37
SSE	0	1	1	4	8	14	12	11	8	0	0	59
S	0	0	5	0	14	15	20	16	24	0	0	94
SSW	1	1	2	2	12	12	19	25	26	1	0	101
SW	0	2	4	6	13	22	33	20	4	0	0	104
WSW	0	1	2	3	11	16	28	16	0	0	0	77
W	0	1	2	1	11	13	15	2	0	0	0	45
WNW	0	1	4	2	10	10	4	2	0	0	0	33
NW	0	2	2	2	6	1	2	0	0	0	0	15
NNW	0	1	0	1	1	1	0	1	1	0	0	6
Tot	4	29	50	40	143	146	163	107	65	3	0	750

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 750
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

All Stabilities

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	1	4	11	22	33	33	28	27	64	24	33	280
NNE	0	6	4	16	52	32	26	25	55	13	34	263
NE	0	10	11	24	57	64	71	33	50	38	44	402
ENE	0	6	11	24	82	99	105	58	81	20	19	505
E	0	5	12	17	71	85	85	54	35	4	0	368
ESE	0	4	5	10	31	44	53	49	40	6	0	242
SE	0	3	8	11	27	38	54	73	76	22	2	314
SSE	0	4	5	5	32	37	48	49	142	135	138	595
S	0	2	1	6	23	51	59	80	176	160	82	640
SSW	0	6	5	12	33	45	69	89	193	115	37	604
SW	0	4	14	11	32	38	75	108	244	175	26	727
WSW	0	8	9	7	31	38	71	138	286	178	151	917
W	0	5	11	12	39	62	82	91	235	168	190	895
WNW	0	6	9	14	35	70	70	91	186	167	404	1052
NW	0	2	8	19	56	68	54	37	89	75	264	672
NNW	0	4	13	20	44	27	19	26	44	50	43	290
Tot	1	79	137	230	678	831	969	1028	1996	1350	1467	8766

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 8766
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class A Extremely Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	0	0	2	1	1	0	7	11
NNE	0	0	0	0	0	0	1	0	2	2	17	22
NE	0	0	0	0	0	0	3	4	3	6	14	30
ENE	0	0	0	0	0	1	7	1	3	1	4	17
E	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	1	0	0	0	1
S	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	1	0	0	0	1
SW	0	0	0	0	0	0	0	1	1	1	0	3
WSW	0	0	0	0	0	0	0	0	0	1	0	1
W	0	0	0	0	0	0	1	3	1	0	0	5
WNW	0	0	0	0	0	6	12	10	29	33	37	127
NW	0	0	0	0	12	32	21	9	19	7	24	124
NNW	0	0	0	0	1	3	4	3	1	1	2	15
Tot	0	0	0	0	13	42	51	34	60	52	105	357

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 357
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class B Moderately Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	0	1	4	2	4	3	3	17
NNE	0	0	0	0	0	0	3	2	6	3	9	23
NE	0	0	0	0	0	5	7	0	5	9	11	37
ENE	0	0	0	0	2	2	6	0	13	7	8	38
E	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	2	0	0	0	2
SSE	0	0	0	0	0	0	2	0	2	0	0	4
S	0	0	0	0	0	0	1	1	0	0	0	2
SSW	0	0	0	0	0	0	0	2	4	0	0	6
SW	0	0	0	0	1	0	4	1	0	1	0	7
WSW	0	0	0	0	0	0	2	0	0	3	0	5
W	0	0	0	0	1	0	0	0	3	0	0	4
WNW	0	0	0	0	0	1	2	4	8	7	13	35
NW	0	0	0	1	9	0	1	0	5	1	11	28
NNW	0	0	0	0	8	1	1	1	2	1	3	17
Tot	0	0	0	1	21	10	33	15	52	35	58	225

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 225
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class C Slightly Unstable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	0	0	0	7	2	3	12	5	5	34
NNE	0	0	0	1	1	3	1	5	20	3	4	38
NE	0	0	0	0	2	9	18	3	11	10	11	64
ENE	0	0	0	0	4	18	18	8	25	3	5	81
E	0	0	0	0	3	0	2	1	1	0	0	7
ESE	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	0	1	3	5	3	0	0	12
SSE	0	0	0	0	1	1	1	4	5	3	0	15
S	0	0	0	0	1	2	3	1	2	0	0	9
SSW	0	0	0	0	0	4	4	8	4	0	0	20
SW	0	0	0	0	1	2	7	3	9	2	0	24
WSW	0	0	0	0	0	1	1	3	5	4	3	17
W	0	0	0	0	0	2	2	1	7	3	3	18
WNW	0	0	0	0	2	3	3	4	6	13	26	57
NW	0	0	0	2	6	7	1	1	2	0	30	49
NNW	0	0	0	1	5	0	0	1	7	1	4	19
Tot	0	0	0	4	27	60	66	51	119	47	91	465

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 465
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class D Neutral based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	1	4	12	20	20	18	18	44	13	17	167
NNE	0	0	2	6	33	19	9	13	21	4	4	111
NE	0	0	3	6	31	23	29	14	17	9	5	137
ENE	0	1	3	10	45	42	34	21	24	6	1	187
E	0	1	5	4	19	34	29	20	12	2	0	126
ESE	0	1	1	5	8	13	23	22	20	6	0	99
SE	0	0	0	2	10	10	24	38	39	9	2	134
SSE	0	0	0	2	15	12	22	23	64	54	82	274
S	0	0	0	1	8	25	20	31	42	29	45	201
SSW	0	0	1	5	14	17	22	24	61	25	12	181
SW	0	0	6	4	10	13	31	37	81	62	10	254
WSW	0	2	2	1	7	9	28	50	95	117	125	436
W	0	0	6	1	7	19	26	29	104	128	175	495
WNW	0	2	4	8	13	15	18	20	60	72	281	493
NW	0	0	2	5	13	11	18	12	37	50	190	338
NNW	0	1	9	10	17	15	12	14	32	44	32	186
Tot	0	9	48	82	270	297	363	386	753	630	981	3819

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 3819
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class E Slightly Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	0	3	4	8	5	1	2	3	1	0	27
NNE	0	2	1	5	7	9	8	5	6	0	0	43
NE	0	4	2	9	12	17	9	8	9	4	1	75
ENE	0	2	4	6	15	19	18	19	8	2	0	93
E	0	2	5	5	26	24	25	22	16	2	0	127
ESE	0	2	0	1	7	14	16	16	8	0	0	64
SE	0	0	4	4	6	9	11	19	17	3	0	73
SSE	0	2	3	2	5	9	10	10	36	42	42	161
S	0	0	0	3	3	9	16	22	68	78	32	231
SSW	0	0	1	2	4	11	20	31	67	48	19	203
SW	0	0	5	1	3	14	22	42	89	71	12	259
WSW	0	2	4	1	12	13	22	48	119	50	23	294
W	0	3	3	4	11	14	26	22	82	35	12	212
WNW	0	1	2	4	12	23	22	33	71	36	40	244
NW	0	1	3	7	11	12	9	8	23	15	8	97
NNW	0	0	1	4	2	5	1	5	0	2	1	21
Tot	0	21	41	62	144	207	236	312	622	389	190	2224

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 2224
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class F Moderately Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	1	2	2	4	3	0	1	1	0	1	0	15
NNE	0	1	1	3	7	0	4	0	0	1	0	17
NE	0	3	4	3	5	7	3	3	2	0	1	31
ENE	0	2	3	5	11	11	21	7	8	1	1	70
E	0	1	2	7	15	19	18	8	6	0	0	76
ESE	0	1	2	2	4	11	8	7	10	0	0	45
SE	0	1	1	4	6	4	9	6	11	7	0	49
SSE	0	0	0	0	4	6	6	6	22	26	10	80
S	0	2	0	0	7	9	6	13	29	29	2	97
SSW	0	0	2	1	2	6	11	8	17	20	2	69
SW	0	3	1	3	5	3	2	13	39	24	2	95
WSW	0	0	3	3	3	7	4	27	42	2	0	91
W	0	1	1	4	13	12	17	27	23	2	0	100
WNW	0	1	1	1	6	11	8	18	9	6	7	68
NW	0	0	3	2	2	4	3	6	3	2	1	26
NNW	0	2	2	2	6	1	1	2	2	1	0	19
Tot	1	20	28	44	99	111	122	152	223	122	26	948

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 948
Hours of Missing Data . . . 18
Hours in Period 8784

Joint Frequency Distribution

Site:: Ginna Primary

Period:: Months Jan - Dec for years 2016 - 2016

Stability Class G Extremely Stable based on Lapse Rate

Elevations:: Winds 250ft Stability 250ft

Wind Direction Sector	Wind Speed Range (m/s) <0.50	0.5-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	6.1-8.0	8.1-10.0	>10.00	Total
N	0	1	2	2	2	0	0	0	0	1	1	9
NNE	0	3	0	1	4	1	0	0	0	0	0	9
NE	0	3	2	6	7	3	2	1	3	0	1	28
ENE	0	1	1	3	5	6	1	2	0	0	0	19
E	0	1	0	1	8	8	11	3	0	0	0	32
ESE	0	0	2	2	11	6	6	4	2	0	0	33
SE	0	2	3	1	5	14	7	3	6	3	0	44
SSE	0	2	2	1	7	9	7	5	13	10	4	60
S	0	0	1	2	4	6	13	12	35	24	3	100
SSW	0	6	1	4	13	7	12	15	40	22	4	124
SW	0	1	2	3	12	6	9	11	25	14	2	85
WSW	0	4	0	2	9	8	14	10	25	1	0	73
W	0	1	1	3	7	15	10	9	15	0	0	61
WNW	0	2	2	1	2	11	5	2	3	0	0	28
NW	0	1	0	2	3	2	1	1	0	0	0	10
NNW	0	1	1	3	5	2	0	0	0	0	1	13
Tot	0	29	20	37	104	104	98	78	167	75	16	728

Hours of Calm 0
Hours of Variable Direction 0
Hours of Valid Data 728
Hours of Missing Data . . . 18
Hours in Period 8784