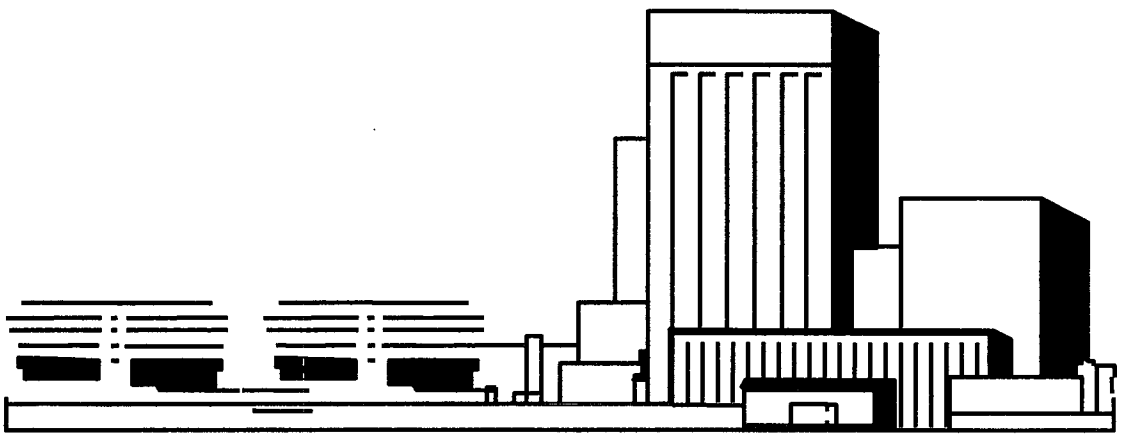
ENERGY NORTHWEST

Columbia Generating Station Annual Radioactive Effluent Release Report

January through December 2011



REFERENCES:
10 CFR 50.36a(a)(2)
10 CFR 72.44(d)(3)
CGS Technical Specification 5.6.2
ISFSI Technical Specification 5.4.c

Columbia Generating Station
Annual Radioactive Effluent Release Report

January through December 2011

Energy Northwest

Submitted
February 2012

Table of Contents

1.0 Introduction

This report has been prepared in compliance with Parts 50 and 72 of Title 10 of the Code of Federal Regulations (CFR), specifically 10 CFR 50.36a(a)(2) and 10 CFR 72.44(d)(3), Independent Spent Fuel Storage Installation (ISFSI) Technical Specification 5.4.c, and Columbia Generating Station (CGS) Technical Specification 5.6.2. It includes a summary of the quantities of radioactive liquid and gaseous effluents and solid radwaste released from Columbia Generating Station during calendar year 2011. Effluent data is summarized on a quarterly basis.

Throughout this report, units of activity and dose are as defined in 10 CFR 20.1004, 20.1005, and Nuclear Regulatory Commission (NRC) Regulatory Guide 1.109-1977.

The United States National Council on Radiation Protection published Report #160 in 2009 which can serve to put radiation dose into perspective for the reader of this report. It was determined that the average yearly dose to a person living in the United States is 620 mrem from all sources. Of this, ~50% is attributed to natural sources (radiation from gaseous radon, cosmic or space radiation, natural radioactive material in the ground, and natural radioactive materials in our bodies). About 48% is attributed to diagnostic and therapeutic medical exposure. Radiation dose from nuclear power was grouped into a category comprising <0.1% of the total.

2.0 Liquid Effluents

No planned releases of contaminated liquids from the liquid radwaste processing system were discharged to the Columbia River from Columbia Generating Station during calendar year 2011. The last planned discharge took place in 1998.

In 2011, there were no known leaks to the environment of radioactive liquids.

3.0 Gaseous Effluents

The gaseous radwaste effluents from Columbia Generating Station were released from three (3) release points:

Main Plant Vent -- mixed mode release
Turbine Building – mixed mode release
Radwaste Building -- ground level release

The gaseous source terms from each release point are listed in Tables 3-1, 3-2, and 3-3. The activation gas argon-41 is included in these tables under fission gases to allow a match with the fission and activation gas totals of Table 3-4. Table 3-4 provides a summation of the total activity released, the average release rate, gross alpha radioactivity, and the estimated total error associated with the measurements of radioactivity in the gaseous effluents.

Radioactivity measurements for gaseous effluent releases are performed for fission and activation gases by collecting the samples in a Marinelli beaker and analyzing them using gamma spectroscopy. Air is analyzed for tritium by collection of water vapor on a desiccant with subsequent distillation and liquid scintillation counting. Particulates and iodines are sampled continuously and the sample media (particulate filters and charcoal cartridges) are analyzed weekly using gamma spectroscopy. Each quarter a chemical separation process is used to isolate strontium from the composite particulate filters and quantification is accomplished with liquid scintillation detection. The average energy per disintegration of fission and activation gases is not included in this report as it is not required by Technical Specifications and is not used for gaseous effluent release rate limit calculations.

When a radioisotope is not positively identified at levels greater than the Minimum Detectable Activity (MDA), a value of zero is used for release concentrations and offsite dose assessments. Table 3-6 contains the Lower Limit of Detection (LLD) values corresponding to the sampling methods and analytical instruments used for each principal radioisotope.

Dose calculations were performed for releases using the NRC XOQDOQ and GASPAR II computer programs and parameter values as described in the Offsite Dose Calculation Manual (ODCM) with some exceptions. A Self-Assessment identified opportunities for improving the accuracy of values presented in ODCM Table 3-13 which describe the characteristics of gaseous effluent release points. The following table (3.0-A) shows values used as input to XOQDOQ which differ from those presented in the ODCM table.

Table 3.0-A; Deviations from Input Parameters in ODCM Table 3-13

		Reactor Bldg	Radwaste Bldg	Turbine Bldg
Vent Velocity (m/s)				
	Value in ODCM	10.9	3.4	19.5
	Value used in XOQDOQ	10.9	0	21.0
XOQDOQ requires the vertical exit velocity. Release from the Radwaste bldg is horizontal. Release from the Turbine bldg is vertical and was recalculated.				
Vent Inside Diameter (m)				
	Value in ODCM	2.1	3.8	3.3
	Value used in XOQDOQ	2.1	0	3.0
NUREG/CR-2919 recommends a value of 0 for ground mode release points (Radwaste bldg). The Turbine bldg value was recalculated.				
Average annual heat flow from release point [Heat Emission Rate] (cal/sec)				
	Value in ODCM	1.06E+06	2.90E+06	9.10E+05
	Value used in XOQDOQ	1.59E+05	1.04E+05	8.02E+05
The heat emission rates were recalculated				

The XOQDOQ program was also provided with updated terrain elevations out to a 25-mile radius of Columbia Generating Station in each sector. The above changes allowed better modeling of plume vertical momentum and buoyancy resulting in more accurate dispersion and deposition values from those presented in ODCM Tables 3-3, 3-10, and 3-11. The ODCM is in the process of revision to reflect the above changes.

Quarterly and annual doses to the potentially highest-exposed Member of the Public at and beyond the site boundary were calculated. In addition, quarterly and annual doses were calculated at actual resident locations identified in the annual land use census. ODCM limits are based 10 CFR 20 and Appendix I to 10 CFR 50. The threshold for air dose applies to fission and activation gases and is ten (10) mrad for beta and five (5) mrad for gamma quarterly and twenty (20) mrad for beta and ten (10) mrad for gamma annually. The threshold for organ dose applies to iodine, tritium, and particulates with half-lives greater than eight days and is seven and a half (7.5) mrem quarterly and fifteen (15) mrem annually. For fission and activation gases the dose rate limits are less than or equal to 500 mrem per year to the whole body and less than or equal to 3000 mrem per year to the skin. For iodines, particulates, and tritium the dose rate limit is less than or equal to 1500 mrem/year to any organ.

Dose calculations were also conducted for Members of the Public within the site boundary. The results are discussed and tabulated in Section 6.0.

It is estimated that approximately 9.53E-03 Curies of tritium were released through unmonitored vents of the heating steam system within and outside the main power block (Turbine, Radwaste, Reactor, and General Services buildings).

No additional spent fuel storage containers (SFSC) were added to the ISFSI facility in calendar year 2011. A total of twenty seven (27) SFSCs were in place in the ISFSI facility at the end of 2011. There were twelve SFSCs loaded in 2008 that were considered Operable (i.e. no measurable leakage) but nonconforming based

on the vendor failing to leak test the canisters during fabrication. This was communicated to the NRC via Energy Northwest letter, GO2-10-157 (ADAMS Accession Number ML 103070299), submitted October 27, 2010. Energy Northwest received a response from the NRC dated July 7, 2011, GI2-11-106 (ADAMS Accession Number ML 111880244), which indicated continued use of the affected canisters is acceptable with no further action required. Since the contents of the affected canisters and the canisters themselves meet all other storage requirements, Energy Northwest considers the nonconforming condition resolved. All SFSCs are Operable and, as such, are performing as designed. Based on compliance with ISFSI Technical Specification 3.1.1 during 2011, there are no effluents from this facility.

Incidents of effluent monitor inoperability greater than 30 days:

During 2011, the turbine building gaseous effluent flow rate monitor (ODCM RFO 6.1.2 Function 4 d) failed during ODCM surveillance activity on May 30, 2011. The monitor was out of service greater than 30 days because the flow transmitter was no longer available and did not have a recommended replacement from the original equipment manufacturer. A decision was made to repair the item using an experienced third party shop. Despite two attempts to repair the component the repair was unsuccessful and the unit was determined to be irreparable. A design change was approved and completed which took the original pneumatic signal, converted it to an electrical signal, and then converted it back into a pneumatic signal that could be transmitted to the Square Root Converter. This involved adding two new signal units and a power supply. The monitor was returned to service on December 23, 2011. The total time out of service was 207 days.

The turbine service water system gross radioactivity monitor (ODCM RFO 6.1.1 Function 3) was declared non-functional on August 10, 2011, to validate calculations of the ODCM alarm setpoint established at the time of the monitor installation in August of 2006. The initial alarm setpoint was based on estimates of instrument performance. It was returned to service on September 13, 2011, (34 days) following a statistical analysis of the observed background and a review of instrument error estimates.

The reactor building elevated discharge radiation monitor (ODCM RFO 6.1.2 Function 3 a) was taken out of service on March 15, 2011, to replace a malfunctioning regulating transformer. Although the new transformer was energized on April 1, 2011, the discharge radiation monitor was left out of service during the refueling outage. On June 26, 2011, the detectors were returned to service but within hours, power from the regulating transformer was lost. The transformer was placed in manual and the loads were energized on July 26, 2011. The monitor was finally declared functional on August 31, 2011. The total out of service time was 169 days.

Gaseous Effluent Tables

Table 3-0 10 CFR Part 50 Appendix I Dose Compliance

Report Period: January -- December 2011

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year*
Noble Gas					
Gamma Air Dose (mrad)	2.19E-02	7.73E-04	0.00E+00	3.12E-03	2.08E-02
ODCM Limit	5	5	5	5	10
% of Limit	4.38E-01	1.55E-02	0.00E+00	6.24E-02	2.08E-01
Beta Air Dose (mrad)	7.74E-03	2.74E-04	0.00E+00	1.10E-03	7.35E-03
ODCM Limit	10	10	10	10	20
% of Limit	7.74E-02	2.74E-03	0.00E+00	1.10E-02	3.68E-02
Iodine-131, Iodine-133, Tritium, and Particulates with half-lives greater than eight days.					
Organ Dose (mrem)	2.37E-02	1.25E-03	1.13E-03	3.43E-03	2.40E-02
ODCM Limit	7.5	7.5	7.5	7.5	15
% of Limit	3.16E-01	1.67E-02	1.50E-02	4.58E-02	1.60E-01

* Calculated quarterly doses cannot be directly compared to the annual doses. Each above listed quarterly dose is the highest calculated dose based on a number of variables. Variables that make comparison difficult include location, meteorological data (quarterly joint frequency distribution (JFD) tables vs. annual JFD tables), receptor age, target organ, and characteristics of the emitted radionuclides. In the above chart, all dose is calculated to a hypothetical person at the site boundary.

Table 3-1 Main Plant Vent Releases
Fission Gases and Iodines

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
A. Fission gases					
krypton-85	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-85m	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-87	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-88	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-135	<MDA	1.48E-02	<MDA	<MDA	1.48E-02
xenon-135m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-138	<MDA	<MDA	<MDA	<MDA	<MDA
Others					
argon-41	6.20E+01	2.62E+00	<MDA	1.06E+01	7.52E+01
Total for period *	6.20E+01	2.64E+00	0.00E+00	1.06E+01	7.52E+01
B. Iodines					
iodine-131	2.56E-05	4.73E-06	<MDA	<MDA	3.04E-05
iodine-132	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-133	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-134	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-135	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	2.56E-05	4.73E-06	0.00E+00	0.00E+00	3.04E-05

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

* MDA values are not included in the totals.

Table 3-1 Main Plant Vent Releases (Continued)
Particulates and Tritium

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
C. Particulates					
strontium-89	<MDA	3.75E-07	1.66E-07	4.01E-07	9.42E-07
strontium-90	<MDA	<MDA	1.18E-07	<MDA	1.18E-07
cesium-134	<MDA	<MDA	<MDA	<MDA	<MDA
cesium-137	<MDA	<MDA	<MDA	<MDA	<MDA
barium-lanthanum-140	<MDA	<MDA	<MDA	<MDA	<MDA
silver-110m	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-141	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-144	<MDA	<MDA	<MDA	<MDA	<MDA
cobalt-58	<MDA	5.90E-06	1.56E-05	<MDA	2.15E-05
cobalt-60	4.71E-06	3.75E-05	1.43E-04	3.08E-06	1.88E-04
iron-59	<MDA	<MDA	8.66E-06	<MDA	8.66E-06
manganese-54	<MDA	9.17E-06	2.28E-05	<MDA	3.20E-05
zinc-65	3.55E-06	2.12E-05	5.23E-05	<MDA	7.70E-05
chrome-51	<MDA	<MDA	9.45E-06	<MDA	9.45E-06
antimony-125	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period*	8.27E-06	7.41E-05	2.52E-04	3.48E-06	3.38E-04
Others with T 1/2 < 8 days					
arsenic-76	<MDA	<MDA	<MDA	<MDA	<MDA
bromine-82	<MDA	<MDA	<MDA	5.43E-06	5.43E-06
copper-64	<MDA	<MDA	<MDA	<MDA	<MDA
molybdenum-99	<MDA	<MDA	<MDA	<MDA	<MDA
rhenium-188	<MDA	<MDA	<MDA	<MDA	<MDA
sodium-24	<MDA	<MDA	<MDA	<MDA	<MDA
technetium-99m	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-69m	<MDA	<MDA	<MDA	<MDA	<MDA
Total with T 1/2 < 8 days*	0.00E+00	0.00E+00	0.00E+00	5.43E-06	5.43E-06
D. Tritium					
tritium	5.00E-01	4.79E-01	3.17E-01	8.21E-01	2.12E+00

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).
* MDA values are not included in the totals.

Table 3-2 Turbine Building Releases
Fission Gases and Iodines

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
A. Fission gases					
krypton-85	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-85m	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-87	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-88	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-135	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-135m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-138	<MDA	<MDA	<MDA	<MDA	<MDA
Others					
argon-41	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B. Iodines					
iodine-131	1.13E-04	1.03E-05	<MDA	<MDA	1.23E-04
iodine-132	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-133	7.93E-05	<MDA	<MDA	<MDA	7.93E-05
iodine-134	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-135	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	1.92E-04	1.03E-05	0.00E+00	0.00E+00	2.02E-04

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

* MDA values are not included in the totals.

Table 3-2 Turbine Building Releases (Continued)
Particulates and Tritium

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
C. Particulates					
strontium-89	8.97E-06	<MDA	1.17E-06	4.41E-06	1.45E-05
strontium-90	<MDA	<MDA	<MDA	<MDA	<MDA
cesium-134	<MDA	<MDA	<MDA	<MDA	<MDA
cesium-137	<MDA	<MDA	<MDA	<MDA	<MDA
barium-lanthanum-140	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-141	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-144	<MDA	<MDA	<MDA	<MDA	<MDA
cobalt-58	<MDA	<MDA	<MDA	<MDA	<MDA
cobalt-60	5.58E-05	5.64E-06	8.48E-06	6.65E-06	7.66E-05
iron-59	<MDA	<MDA	<MDA	<MDA	<MDA
manganese-54	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-65	3.67E-04	2.45E-05	<MDA	<MDA	3.91E-04
chrome-51	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period*	4.31E-04	3.01E-05	9.65E-06	1.11E-05	4.82E-04
Others with T 1/2 < 8 days molybdenum-99	<MDA	<MDA	<MDA	<MDA	<MDA
Total with T 1/2 < 8 days*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
tritium	5.90E+00	1.74E+00	6.66E-02	3.16E+00	1.09E+01

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

* MDA values are not included in the totals.

Table 3-3 Radwaste Building Releases
Fission Gases and Iodines

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
A. Fission gases					
krypton-85	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-85m	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-87	<MDA	<MDA	<MDA	<MDA	<MDA
krypton-88	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-133m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-135	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-135m	<MDA	<MDA	<MDA	<MDA	<MDA
xenon-138	<MDA	<MDA	<MDA	<MDA	<MDA
Others					
argon-41	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B. Iodines					
iodine-131	2.69E-05	2.97E-06	<MDA	<MDA	2.99E-05
iodine-132	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-133	3.73E-06	<MDA	<MDA	<MDA	3.73E-06
iodine-134	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-135	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	3.06E-05	2.97E-06	0.00E+00	0.00E+00	3.36E-05

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

* MDA values are not included in the totals.

Table 3-3 Radwaste Building Releases (Continued)
Particulates and Tritium

Report Period: January -- December 2011

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
C. Particulates					
strontium-89	6.71E-07	<MDA	5.84E-06	1.32E-07	6.65E-06
strontium-90	<MDA	<MDA	1.47E-06	<MDA	1.47E-06
cesium-134	<MDA	<MDA	<MDA	<MDA	<MDA
cesium-137	<MDA	<MDA	<MDA	<MDA	<MDA
barium-lanthanum-140	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-141	<MDA	<MDA	<MDA	<MDA	<MDA
cerium-144	<MDA	<MDA	<MDA	<MDA	<MDA
cobalt-58	<MDA	<MDA	<MDA	<MDA	<MDA
cobalt-60	9.01E-07	<MDA	<MDA	<MDA	9.01E-07
iron-59	<MDA	<MDA	<MDA	<MDA	<MDA
manganese-54	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-65	8.02E-07	<MDA	<MDA	<MDA	8.02E-07
Total for period*	2.37E-06	0.00E+00	7.31E-06	1.32E-07	9.82E-06
Others with T 1/2 < 8 days					
molybdenum-99	<MDA	<MDA	<MDA	<MDA	<MDA
Total with T 1/2 < 8 days*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium					
tritium	9.90E-02	6.01E-02	6.15E-02	1.21E-01	3.41E-01

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

* MDA values are not included in the totals.

Table 3-4 Summation of Releases
Gaseous Effluents

Report Period: January -- December 2011

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year	Est* Total %Error
A. Fission and activation gases						
Total release (Ci)	6.20E+01	2.64E+00	<MDA	1.06E+01	7.52E+01	4.30E+01
Average release rate (µCi/s)	7.89E+00	3.36E-01	<MDA	1.35E+00	2.39E+00	
Percent of ODCM limit (%)	1.67E-02	5.91E-04	0.00E+00	2.38E-03	3.98E-03	
B. Iodines						
Total I-131 (Ci)	1.65E-04	1.80E-05	<MDA	<MDA	1.83E-04	4.60E+01
Average release rate (µCi/s)	2.10E-05	2.29E-06	<MDA	<MDA	5.83E-06	
Percent of ODCM limit (%)	2.46E-05	2.48E-06	0.00E+00	0.00E+00	1.16E-05	
C. Particulates						
Particulates with half-lives >8 days (Ci)	4.42E-04	1.04E-04	2.69E-04	1.47E-05	8.30E-04	4.50E+01
Average release rate (µCi/s)	5.62E-05	1.33E-05	3.42E-05	1.87E-06	2.64E-05	
Percent of ODCM limit (%)	1.41E-01	1.64E-02	1.01E-02	1.18E-01	6.41E-02	
Gross alpha radioactivity (Ci)	7.97E-07	4.36E-07	5.03E-07	1.41E-06	3.15E-06	7.30E+01
D. Tritium						
Total release (Ci)	6.50E+00	2.28E+00	4.45E-01	4.10E+00	1.33E+01	2.60E+01
Average release rate (µCi/s)	8.27E-01	2.90E-01	5.66E-02	5.22E-01	4.24E-01	
Percent of ODCM limit (%)	3.09E-05	6.97E-06	4.07E-06	1.50E-05	9.93E-06	

MDA = Less than the "a posteriori" minimal detectable activity (microcuries per unit mass or volume).

ODCM release rate limits are based on dose rate. For fission and activation gases the dose rate limits are less than or equal to 500 mrem/year to the whole body and less than or equal to 3000 mrem/year to the skin. For I-131, particulates, and tritium the dose rate limit is less than or equal to 1500 mrem/year to any organ. The ODCM dose factors and the highest site boundary dispersion value for each period were used in the calculation.

* Measurement errors are sample-specific. The values reported represent an approximate overall error. The major contributors of this error are measurements associated with sample volume, release point flow rates, and estimates of plateout factors.

Table 3-5 Gaseous Purges and Vents

Report Period: January -- December 2011

Type	Number	Total Time (hr.)	Maximum Time (hr.)	Minimum Time (hr.)	Mean Time (hr.)
Purge	3.00E+00	4.97E+01	4.39E+01	2.37E+00	1.66E+01
Vent	2.20E+01	3.20E+01	5.92E+00	4.33E-01	1.45E+00

Columbia Generating Station is a continuous release plant. All purges and vents are discharged through the Standby Gas Treatment System and released through the reactor building stack which is, by procedure and design, sampled and continuously monitored for radioactive gaseous waste.

Table 3-6 Lower Limits of Detection
Gaseous Effluents

Report Period: January -- December 2011

Fission Gases

Nuclide	Required LLD† (μCi/cc)	Achieved Analysis LLD (μCi/cc)
krypton-87	1.00E-04	1.05E-08
krypton-88	1.00E-04	1.29E-08
xenon-133	1.00E-04	1.00E-08
xenon-133m	1.00E-04	3.25E-08
xenon-135	1.00E-04	3.77E-09
xenon-138	1.00E-04	4.48E-08

Iodines

iodine-131	1.00E-12	5.79E-14
iodine-133	1.00E-10	1.10E-12

Particulates

strontium-89	1.00E-11	1.16E-14
strontium-90	1.00E-11	5.12E-15
cesium-134	1.00E-11	4.63E-14
cesium-137	1.00E-11	3.91E-14
molybdenum-99	1.00E-11	7.97E-13
cerium-141	1.00E-11	4.70E-14
cerium-144	1.00E-11	1.78E-13
cobalt-58	1.00E-11	4.27E-14
cobalt-60	1.00E-11	7.75E-14
iron-59	1.00E-11	1.01E-13
manganese-54	1.00E-11	3.68E-14
zinc-65	1.00E-11	1.10E-13
Gross Alpha	1.00E-11	9.01E-16

Tritium

hydrogen-3	1.00E-06	5.85E-11

† From ODCM Table 6.2.2.1-1

4.0 Solid Radwaste

This section of the annual effluent report provides information required by the Columbia Generating Station Offsite Dose Calculation Manual and recommended by Nuclear Regulatory Commission Regulatory Guide 1.21-1974.

Solid Radwaste Information required by the Offsite Dose Calculation Manual

January -- December 2011

Class A

1. Container Volumes

8 GAL DRUM	1.6 ft^3
30 GAL DRUM	4.0 ft^3
55 GAL DRUM	7.5 ft^3
Liquid Tote	42.8 ft^3
B-25 Steel Box	96 ft^3
PL8-120 Polyethylene HIC	120.3 ft^3
EL-142 Polyethylene HIC	132.4 ft^3
B-25 Overpack Steel Box	138 ft^3
ES-190 Steel Liner	170.2 ft^3
PL14-170 Polyethylene HIC	170.8 ft^3
14-170 Steel Liner	180.1 ft^3
Intermodal Container	675 ft^3
Water Box Bag	887 ft^3
20' SeaLand Container	1280 ft^3
Condenser Mod Bag	6310 ft^3

2. Total Curies

2.89E+02 Ci

3. Principal Radionuclides

Nuclide	Curies	Percent
Co-60	1.09E+02	3.77E+01
Zn-65	8.61E+01	2.98E+01
Fe-55	4.70E+01	1.63E+01
Mn-54	1.24E+01	4.30E+00
Cr-51	1.04E+01	3.61E+00
Co-58	8.38E+00	2.91E+00
Ni-63	7.76E+00	2.69E+00
C-14	1.95E+00	6.76E-01
Nb-95	1.54E+00	5.35E-01
Zr-95	1.07E+00	3.70E-01
Sb-125	7.37E-01	2.56E-01

Cs-137	6.77E-01	2.35E-01
Fe-59	5.42E-01	1.88E-01
Ag-110m	5.16E-01	1.79E-01
Ni-59	2.70E-01	9.35E-02
Sb-124	1.48E-01	5.13E-02
Sr-89	9.91E-02	3.44E-02
H-3	8.26E-02	2.86E-02
La-140	2.30E-02	7.97E-03
Ba-140	2.10E-02	7.29E-03
Sr-90	1.56E-02	5.42E-03
I-131	1.07E-02	3.72E-03
Pu-241*	4.39E-03	1.52E-03
Cm-242	3.97E-04	1.38E-04
Pu-239	3.44E-04	1.19E-04
Ce-141	3.06E-04	1.06E-04
Tc-99	1.39E-04	4.82E-05

*This isotope was erroneously reported as Pu-231 in the 2010 effluent report.

4. Source

Resins	2.71E+02 Ci
DAW	1.83E+01 Ci
Irradiated Components	0.00E+00 Ci
Other (Sealed Source, Mixed Waste, & Liquid Waste)	1.39E-01 Ci

5. Type of Container

All containers shipped as Limited Quantity, LSA, SCO or Radioactive material in IP-1, IP-2, Type A, or Type B (including casks) as appropriate.

6. Solidification Agent

None

Class B

There were no Class B shipments made during calendar year 2011

Class C

1. Container Volumes

EL-142 Polyethylene HIC 132.4 ft3

2. Total Curies

3.57E+01 Ci

3. Principal Radionuclides

Nuclide	Curies	Percent
Co-60	1.68E+01	4.71E+01
Zn-65	8.66E+00	2.43E+01
Fe-55	7.19E+00	2.01E+01
Ni-63	1.92E+00	5.38E+00
Mn-54	7.99E-01	2.24E+00
Cs-137	1.45E-01	4.07E-01
Co-58	1.03E-01	2.89E-01
Ag-110m	3.37E-02	9.44E-02
H-3	1.60E-02	4.48E-02
C-14	8.05E-03	2.26E-02
Sr-90	3.29E-03	9.22E-03
Ni-59	3.19E-03	8.94E-03
Sr-89	8.75E-04	2.45E-03
Pu-241	7.73E-04	2.17E-03
Tc-99	3.01E-05	8.44E-05
Cm-243	9.35E-06	2.62E-05
Cm-242	7.23E-06	2.03E-05
Am-241	6.66E-06	1.87E-05
Pu-238	6.57E-06	1.84E-05
Pu-239	4.51E-06	1.26E-05
I-129	8.29E-07	2.32E-06

4. Source

Resins	3.55E+01 Ci
DAW	0.00E+00 Ci
Irradiated Components	0.00E+00 Ci
Other (Sealed Sources)	1.42E-01 Ci

5. Type of Container

All containers shipped as Type B (including casks).

6. Solidification Agent

None

Solid Radwaste Information Recommended by NRC Regulatory Guide 1.21
January -- December 2011

Solid waste shipped offsite for burial or disposal (not irradiated fuel).

1. Type of Waste

Waste Stream	Unit	Annual Cumulative	Est. Total Error %
a. Spent resins, filter sludge, evaporator bottoms, etc.	m^3	9.77E+01	
	Ci	3.06E+02	2.5E+01%
b. Dry Active Waste	m^3	3.58E+03	
	Ci	1.83E+01	2.5E+01%
c. Irradiated Components	m^3	0.00E+00	
	Ci	0.00E+00	None
d. Other Waste (Sealed Source, mixed waste, & Liquid Waste)	m^3	6.48E+01	
	Ci	2.81E-01	2.5E+01%

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

   a. Dewatered Spent Resins -- All Classes

Nuclide	Curies	Percent
Co-60	1.20E+02	3.93E+01
Zn-65	9.03E+01	2.95E+01
Fe-55	5.40E+01	1.77E+01
Mn-54	1.27E+01	4.16E+00
Ni-63	9.49E+00	3.11E+00
Co-58	6.26E+00	2.05E+00
Cr-51	5.80E+00	1.90E+00
C-14	1.96E+00	6.40E-01
Nb-95	1.33E+00	4.35E-01
Zr-95	9.36E-01	3.06E-01
Sb-125	6.18E-01	2.02E-01
Fe-59	5.42E-01	1.77E-01
Cs-137	5.06E-01	1.66E-01
Ag-110m	4.83E-01	1.58E-01
Ni-59	2.73E-01	8.93E-02
Sb-124	1.06E-01	3.47E-02
H-3	9.33E-02	3.05E-02
Sr-89	6.83E-02	2.24E-02
La-140	2.30E-02	7.52E-03

Ba-140	2.10E-02	6.88E-03
Sr-90	1.79E-02	5.86E-03
I-131	1.07E-02	3.51E-03
Pu-241	5.16E-03	1.69E-03

b. Dry Active Waste (DAW) -- All Classes

Nuclide	Curies	Percent
Co-60	5.38E+00	2.95E+01
Cr-51	4.59E+00	2.51E+01
Zn-65	4.41E+00	2.42E+01
Co-58	2.21E+00	1.21E+01
Mn-54	5.05E-01	2.77E+00
Cs-137	2.62E-01	1.43E+00
Nb-95	2.13E-01	1.17E+00
Fe-55	1.89E-01	1.03E+00
Zr-95	1.32E-01	7.22E-01
Sb-125	1.18E-01	6.48E-01
Ni-63	9.81E-02	5.37E-01
Ag-110m	6.60E-02	3.62E-01
Sb-124	4.16E-02	2.28E-01
Sr-89	3.14E-02	1.72E-01
H-3	5.30E-03	2.90E-02
C-14	2.43E-03	1.33E-02
Sr-90	1.01E-03	5.52E-03
Cm-242	8.05E-05	4.41E-04
Pu-239	7.93E-05	4.34E-04

c. Irradiated Components
None

d. Other Waste (Sealed Source & Mixed Waste)

Nuclide	Curies	Percent
Ni-63	9.02E-02	3.21E+01
Cs-137	5.43E-02	1.93E+01
Co-60	4.03E-02	1.43E+01
Cr-51	3.72E-02	1.32E+01
Zn-65	3.27E-02	1.16E+01

Co-58	1.69E-02	6.01E+00
Mn-54	3.74E-03	1.33E+00
Nb-95	1.61E-03	5.74E-01
Fe-55	1.39E-03	4.93E-01
Zr-95	1.01E-03	3.60E-01
Sb-125	8.70E-04	3.09E-01
Ag-110m	4.90E-04	1.74E-01
Sb-124	3.20E-04	1.14E-01
Sr-89	2.44E-04	8.67E-02
H-3	4.96E-05	1.76E-02
C-14	1.78E-05	6.34E-03
Ra-226	1.08E-05	3.84E-03
Sr-90	7.40E-06	2.63E-03
Cm-242	6.02E-07	2.14E-04

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
30	Tractor - Trailer via Public Highway	US Ecology, Inc. P.O. Box 638 Hanford Reservation Richland, WA. 99352
75*	Tractor - Trailer via Public Highway	Perma-Fix Northwest 2025 Battelle Blvd Richland, WA 99352
1*	Tractor - Trailer via Public Highway	Perma-Fix of Fla 1940 N.W. 67th Pl Gainesville, FL 32653

(* After processing, portions of these shipments will be forwarded for disposal.)

Irradiated Fuel Shipments (Disposition)

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

5.0 Meteorological Data

The meteorological data contained in Tables 5-1 through 5-11 was obtained from a meteorological tower located 762 meters (2500 feet) west of Columbia Generating Station. Data was recovered from two sets of redundant instruments on the tower at the 10 meter (33-foot) and 75 meter (245- foot) levels. The meteorological data is a composite file generated from the automated data recovery systems for the calendar year 2011. Data is archived on the Energy Northwest Local Area Network.

Meteorological data recovery for 2011 was 91.3% from both the 33-foot and the 245-foot levels. Redundant wind and temperature sensors are installed at both levels of the meteorological tower. Data from the two systems is mixed to permit maximum data recovery for defined date ranges.

The data in Tables 5-1 through 5-8 provide joint frequency distributions (JFD) at the 10-meter and 75-meter levels by quarter for 2011. These tables show the total hours at various wind speeds for each sector and stability class. The NRC stability classes A through G and eleven wind speed categories along with the 16 wind direction sectors were used to prepare each joint frequency table. Tables 5-9 and 5-10 provide the annual joint frequency distributions at the specified heights for 2011. Table 5-11 provides a joint frequency distribution from the 10 meter wind instruments during daylight hours of the growing season. The threshold value for daylight was chosen at solar irradiance of greater than 5 watts/m^2. This JFD table was used for Carbon-14 (^{14}C) dose estimates from ingestion pathways.

Wind speed is measured in miles per hour in the tables and speeds below 1.0 MPH were recorded as calms.

There are a number of atmospheric factors which affect dispersivity but which are not modeled in the CGS estimates of dispersion and deposition. Those conditions which were measured or documented at the Hanford Meteorological Station during 2011 were snow (3.1 inches total which fell in January, November and December), total precipitation (4.45 inches), dust or blowing dust (2 day), fog (40 days), and thunderstorms (11 days).

Rainfall as recorded at the Columbia Generating Station meteorological tower was 2.96 inches.

Joint Frequency Distribution Tables for 2011

Table 5-1 1st Quarter Average, 33 Ft Above Ground Level (AGL)

Hours at each wind speed and direction during time period

Elevation: 33 Start Date: 1/1/2011 Total number of Periods: 2159
Period: 1st Quarter Stop Date: 4/1/2011 Periods of No Data Recovery: 8
System Percent Data Recovery: 99.6%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	11.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.2	13.4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
8.9	11.2	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
11.2	13.4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
13.4	17.9	3	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	6
17.9	22.4	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		5	0	0	0	0	0	0	1	3	3	0	0	0	0	1	8	21

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7
2.2	4.5	1	1	1	0	0	0	0	0	1	0	0	0	0	0	8	6	18
4.5	6.7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10
6.7	8.9	2	0	0	0	0	0	1	0	3	1	1	1	0	1	0	4	14
8.9	11.2	3	0	0	0	0	0	0	2	6	3	0	0	0	0	1	3	18
11.2	13.4	0	0	0	0	0	0	0	0	10	6	0	0	0	1	1	1	19
13.4	17.9	3	0	0	0	0	0	1	1	9	4	0	1	0	1	2	3	25
17.9	22.4	1	0	0	0	0	0	0	2	0	5	0	0	1	1	0	3	13
22.4	29.1	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	4
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		14	3	1	0	0	0	2	5	29	21	2	2	1	5	12	31	128

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	11	3	1	4	5	4	8	5	5	7	3	5	1	4	5	7	78
2.2	4.5	6	4	8	0	2	3	8	20	8	4	4	5	4	8	15	9	108
4.5	6.7	3	4	3	0	0	0	11	13	2	3	2	2	2	10	17	11	83
6.7	8.9	9	2	3	0	1	1	5	10	14	4	2	5	4	9	12	10	91
8.9	11.2	10	1	3	0	0	0	3	12	11	3	2	2	2	13	19	10	91
11.2	13.4	2	0	0	0	0	0	3	5	13	9	2	1	1	5	5	6	52
13.4	17.9	2	1	0	0	0	0	1	8	22	13	5	4	0	5	3	3	67
17.9	22.4	0	0	0	0	0	0	1	1	5	13	4	2	3	3	0	0	32
22.4	29.1	0	0	0	0	0	0	0	0	0	12	5	0	0	0	0	0	17
29.1	40.3	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	5
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		43	15	18	4	8	8	40	74	80	71	31	26	17	57	76	56	624

Table 5-1 1st Quarter Average, 33 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	5	4	2	2	1	0	3	5	2	3	1	3	7	6	5	52
2.2	4.5	1	9	11	2	2	2	8	8	6	9	7	1	11	8	17	17	119
4.5	6.7	3	4	2	0	0	0	7	11	3	4	5	5	5	10	18	12	89
6.7	8.9	1	2	6	0	0	0	13	8	7	4	3	3	4	4	22	11	88
8.9	11.2	0	0	1	0	0	3	5	31	13	12	3	3	3	7	12	6	99
11.2	13.4	0	0	0	0	0	1	2	17	10	10	2	3	4	1	8	2	60
13.4	17.9	0	0	0	0	0	0	3	5	16	19	14	3	3	5	0	2	70
17.9	22.4	0	0	0	0	0	0	0	0	4	19	4	2	0	1	0	0	30
22.4	29.1	0	0	0	0	0	0	0	0	1	13	1	0	0	0	0	0	15
29.1	40.3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	20	24	4	4	7	38	83	65	93	42	21	33	43	83	55	623

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	5	7	2	4	1	1	1	1	5	5	4	3	4	5	8	6	62
2.2	4.5	8	15	7	3	0	3	5	11	12	9	4	3	3	14	23	16	136
4.5	6.7	4	2	4	1	0	0	4	11	8	10	7	3	2	8	24	4	92
6.7	8.9	0	0	4	0	0	0	3	16	11	8	1	2	1	6	15	1	68
8.9	11.2	0	0	2	0	0	0	1	20	10	3	4	2	3	3	4	0	52
11.2	13.4	0	0	0	0	0	0	1	9	4	5	1	0	1	0	0	0	21
13.4	17.9	0	0	0	0	0	0	1	0	5	7	0	0	0	0	0	0	13
17.9	22.4	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		17	24	19	8	1	4	16	68	55	49	21	13	14	36	74	27	446

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	6	0	0	0	0	0	0	0	1	3	0	3	2	3	6	9	33
2.2	4.5	4	4	0	0	1	0	1	3	1	4	5	4	2	4	16	8	57
4.5	6.7	0	0	2	0	0	0	1	4	2	4	1	2	0	1	12	5	34
6.7	8.9	0	0	1	0	0	0	2	5	3	0	0	0	0	0	5	0	16
8.9	11.2	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	4
11.2	13.4	0	0	1	0	0	0	0	5	0	0	0	0	0	0	0	0	6
13.4	17.9	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	4
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	4	4	0	1	0	4	23	8	12	6	9	4	8	39	22	154

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	27	17	7	10	8	6	9	9	16	17	10	12	10	19	25	31	233
2.2	4.5	20	33	27	5	5	8	22	42	28	26	20	13	20	34	80	56	439
4.5	6.7	12	10	11	1	0	0	23	39	15	21	15	12	9	29	71	41	309
6.7	8.9	12	4	14	0	1	1	24	39	38	17	7	11	9	20	54	28	279
8.9	11.2	15	1	6	0	0	3	9	68	42	21	9	7	8	23	36	19	267
11.2	13.4	3	0	1	0	0	1	6	36	38	30	5	4	6	7	14	10	161
13.4	17.9	8	1	0	0	0	0	6	17	53	46	19	8	3	11	5	8	185
17.9	22.4	1	0	0	0	0	0	1	4	9	40	8	4	4	5	0	5	81
22.4	29.1	0	0	0	0	0	0	0	0	1	27	7	0	0	1	0	3	39
29.1	40.3	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		98	66	66	16	14	19	100	254	240	249	102	71	69	149	285	201	1999

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	0	4	50	40	43	15	152

Table 5-2 1st Quarter Average, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245 Start Date: 1/1/2011 Total number of Periods: 2159
Period: 1st Quarter Stop Date: 4/1/2011 Periods of No Data Recovery: 8
System Percent Data Recovery: 99.6%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	11.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
8.9	11.2	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	4
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	1	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	7
17.9	22.4	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
22.4	29.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		5	3	0	0	0	0	0	0	2	5	0	0	0	0	0	6	21

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	2	6
2.2	4.5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	7	7	17
4.5	6.7	2	0	0	0	0	0	0	0	1	0	0	0	0	0	1	5	9
6.7	8.9	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	6	10
8.9	11.2	1	0	0	0	0	0	0	1	3	2	2	1	0	1	1	2	14
11.2	13.4	1	0	0	0	0	0	0	0	4	4	0	0	0	0	1	3	13
13.4	17.9	1	1	0	0	0	0	1	0	8	13	1	0	0	2	1	2	30
17.9	22.4	3	0	0	0	0	0	0	0	3	4	1	0	2	0	1	1	15
22.4	29.1	0	0	0	0	0	0	0	0	2	3	2	0	0	2	0	3	12
29.1	40.3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		12	3	2	0	0	0	1	2	22	27	7	1	2	5	13	31	128

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	6	5	2	4	2	4	4	5	7	4	4	2	7	4	4	68
2.2	4.5	8	5	6	3	2	5	7	13	7	3	4	1	2	6	7	11	90
4.5	6.7	3	5	5	1	0	1	5	16	6	4	5	4	3	5	10	16	89
6.7	8.9	2	4	2	0	0	0	4	5	9	3	2	1	3	2	16	7	60
8.9	11.2	10	1	0	1	1	1	2	12	7	12	0	6	3	8	9	4	77
11.2	13.4	11	0	4	0	0	0	0	4	6	4	2	2	1	6	14	10	64
13.4	17.9	5	0	0	0	0	0	2	4	22	19	7	1	1	15	8	10	94
17.9	22.4	0	3	0	0	0	0	0	2	6	16	6	2	2	2	3	4	46
22.4	29.1	0	0	0	0	0	0	0	3	2	20	6	2	3	2	0	0	38
29.1	40.3	0	0	0	0	0	0	0	0	0	10	12	0	0	2	0	0	24
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		43	24	22	7	7	9	24	63	70	98	48	23	20	55	71	66	650

Table 5-2 1st Quarter Average, 245 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	2	3	1	2	2	3	4	1	5	1	1	0	1	2	1	31
2.2	4.5	7	6	11	6	6	5	4	5	6	2	3	2	2	6	8	3	82
4.5	6.7	11	6	6	0	1	2	3	1	5	2	1	4	8	4	4	9	67
6.7	8.9	2	1	5	2	0	0	5	8	2	3	2	2	0	3	6	7	48
8.9	11.2	4	1	5	0	0	1	5	9	3	5	4	0	8	5	7	13	70
11.2	13.4	3	0	4	0	0	0	4	6	8	7	2	1	1	4	6	16	62
13.4	17.9	3	0	0	1	1	1	5	8	29	20	6	4	4	9	6	22	119
17.9	22.4	1	0	0	0	0	0	1	3	16	21	13	5	3	10	5	5	83
22.4	29.1	2	0	0	0	0	0	0	0	5	20	16	7	1	6	1	1	59
29.1	40.3	0	0	0	0	0	0	0	0	0	19	12	2	0	1	0	0	34
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS		35	16	34	10	10	11	30	44	75	105	60	28	27	49	45	77	656

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	2	4	3	3	5	2	4	3	2	4	1	0	4	1	3	43
2.2	4.5	4	3	6	7	4	4	9	3	2	6	6	6	3	2	8	11	84
4.5	6.7	11	12	5	3	1	4	5	11	4	0	4	1	1	6	10	11	89
6.7	8.9	4	4	2	3	0	0	3	5	7	1	2	4	2	3	5	4	49
8.9	11.2	2	1	3	1	0	1	4	8	5	6	4	1	0	3	4	5	48
11.2	13.4	0	0	2	1	1	0	3	4	4	8	3	0	2	1	7	4	40
13.4	17.9	1	0	0	1	0	0	0	9	14	13	4	4	4	8	9	10	77
17.9	22.4	0	0	0	0	0	0	0	1	6	12	7	2	0	6	0	1	35
22.4	29.1	0	0	0	0	0	0	0	0	3	2	2	0	0	1	0	0	8
29.1	40.3	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	0	7
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		24	22	22	19	9	14	26	45	48	56	37	19	12	34	44	49	480

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	2	0	2	0	0	3	0	1	0	1	1	2	0	2	15
2.2	4.5	4	3	3	2	1	2	2	2	2	2	1	3	1	2	2	4	36
4.5	6.7	5	2	2	1	1	1	3	3	3	0	2	0	1	1	2	2	29
6.7	8.9	2	4	2	0	0	0	2	1	2	5	2	3	0	1	1	5	30
8.9	11.2	2	0	1	1	0	0	2	2	0	3	2	1	0	1	3	4	22
11.2	13.4	0	0	0	0	0	0	2	2	0	2	1	0	0	0	1	3	11
13.4	17.9	0	0	0	0	0	0	1	4	4	2	0	0	2	3	1	0	17
17.9	22.4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
22.4	29.1	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		14	9	10	4	4	3	12	17	14	17	8	8	5	10	10	20	165

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	10	11	15	6	11	9	9	15	9	15	9	7	3	14	8	12	163
2.2	4.5	25	18	27	18	13	16	22	23	17	13	14	12	8	16	32	37	311
4.5	6.7	32	25	18	5	3	8	16	31	19	6	12	9	13	16	27	44	284
6.7	8.9	12	13	11	5	0	0	14	20	21	12	8	10	5	9	28	30	198
8.9	11.2	21	3	9	3	1	3	13	32	19	28	12	9	11	18	24	29	235
11.2	13.4	15	0	10	1	1	0	9	16	22	25	8	3	4	11	29	36	190
13.4	17.9	12	4	0	2	1	1	9	25	77	70	18	9	11	37	25	44	345
17.9	22.4	4	3	0	0	0	0	1	6	34	55	27	9	7	18	9	11	184
22.4	29.1	5	0	0	0	0	0	0	3	13	47	26	9	4	11	1	6	125
29.1	40.3	0	0	0	0	0	0	0	0	0	36	26	2	0	3	0	0	67
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS		136	77	90	40	30	37	93	171	231	308	160	79	66	153	183	249	2103

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	0	4	24	7	9	4	48

Table 5-3 2nd Quarter Average, 33 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 33 Start Date: 4/1/2011 Total number of Periods: 2184
Period: 2nd Quarter Stop Date: 7/1/2011 Periods of No Data Recovery: 339
System Percent Data Recovery: 84.5%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.5	6.7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4
6.7	8.9	1	6	0	0	0	0	0	0	1	0	0	0	1	0	0	0	9
8.9	11.2	2	3	0	0	0	0	0	2	0	0	0	1	1	0	0	3	12
11.2	13.4	1	0	0	0	0	0	0	1	2	0	0	1	0	0	0	0	5
13.4	17.9	6	0	0	0	0	0	0	3	7	3	2	0	1	1	0	1	24
17.9	22.4	0	0	0	0	0	0	0	0	3	1	5	3	1	0	1	0	14
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	11	0	0	0	0	0	6	13	4	7	5	4	1	2	6	69

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	3	2	1	1	0	1	0	1	0	0	0	0	0	0	2	2	13
4.5	6.7	2	1	0	0	1	2	1	1	1	0	3	2	0	1	2	2	19
6.7	8.9	2	1	0	0	1	1	2	3	3	1	2	0	1	0	0	1	18
8.9	11.2	4	2	1	0	0	0	1	1	3	2	1	1	1	0	1	1	19
11.2	13.4	1	0	0	0	0	0	0	3	10	2	0	1	0	0	1	0	18
13.4	17.9	1	0	0	0	0	0	1	1	5	1	3	2	1	2	0	1	18
17.9	22.4	0	0	0	0	0	0	0	0	0	6	4	2	1	3	0	0	16
22.4	29.1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	4
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		13	6	2	1	2	4	5	10	23	13	13	8	4	7	7	7	125

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	2	0	1	0	1	1	0	0	0	2	0	1	1	0	10
2.2	4.5	5	3	5	10	5	4	3	4	4	1	2	6	2	2	4	5	65
4.5	6.7	2	0	2	2	0	0	7	7	8	5	4	8	3	1	1	4	54
6.7	8.9	3	2	1	3	2	2	4	9	12	1	4	4	2	3	1	1	54
8.9	11.2	0	0	0	0	0	1	0	2	7	4	1	4	1	5	1	5	31
11.2	13.4	2	0	0	0	0	0	0	3	6	5	1	1	5	2	1	0	26
13.4	17.9	0	0	0	0	0	0	0	2	10	12	3	7	3	6	2	0	45
17.9	22.4	0	0	0	0	0	0	0	0	2	3	4	3	2	1	1	0	16
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		13	5	10	15	8	7	15	28	49	31	19	35	18	23	12	15	303

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	1	3	2	4	4	6	4	2	1	2	1	0	1	1	1	35
2.2	4.5	3	6	3	7	9	10	14	12	4	9	4	3	0	2	4	7	97
4.5	6.7	1	3	2	4	3	6	7	11	10	2	2	4	3	5	7	6	76
6.7	8.9	1	2	1	1	3	7	7	11	6	4	4	3	2	5	2	3	62
8.9	11.2	1	0	0	0	0	0	4	6	9	5	2	2	5	7	6	4	51
11.2	13.4	1	0	0	0	0	0	2	3	8	4	3	3	4	10	4	1	43
13.4	17.9	0	0	0	0	0	0	0	7	5	15	12	4	8	23	5	2	81
17.9	22.4	0	0	0	0	0	0	0	1	1	9	6	4	4	16	1	0	42
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		9	12	9	14	19	27	40	55	45	49	35	24	26	71	30	24	489

Table 5-3 2nd Quarter Average, 33 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	2	2	3	0	3	1	1	3	6	2	3	1	3	2	2	36
2.2	4.5	6	3	1	1	1	4	5	12	9	5	2	4	4	7	8	4	76
4.5	6.7	2	2	3	2	3	6	7	3	7	5	11	8	6	11	13	6	95
6.7	8.9	1	1	1	0	0	0	5	9	5	3	8	4	7	15	4	2	65
8.9	11.2	0	0	0	0	0	0	1	5	4	3	5	3	9	24	9	1	64
11.2	13.4	0	0	1	0	0	0	2	3	2	10	0	4	6	23	1	1	53
13.4	17.9	0	0	0	0	0	0	0	0	1	9	6	2	1	13	3	0	35
17.9	22.4	0	0	0	0	0	0	0	0	0	1	1	0	2	2	0	0	6
22.4	29.1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		11	8	8	6	4	13	21	33	31	43	35	28	36	98	40	16	431

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	5	1	0	3	1	3	3	2	2	1	0	2	0	3	5	31
2.2	4.5	2	8	7	0	0	1	18	11	5	3	0	5	2	5	8	5	80
4.5	6.7	2	0	3	0	0	0	14	23	3	5	5	2	3	6	9	4	79
6.7	8.9	0	1	0	0	0	0	4	10	4	3	4	0	1	7	3	2	39
8.9	11.2	0	0	0	0	0	0	0	1	1	2	0	0	3	6	3	0	16
11.2	13.4	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	4
13.4	17.9	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		4	14	11	0	3	2	39	48	15	17	10	7	12	25	27	16	250

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	3	2	0	1	0	1	1	0	1	0	0	1	2	1	1	16
2.2	4.5	7	5	1	0	0	0	8	9	2	0	0	2	0	0	9	3	46
4.5	6.7	1	2	3	0	0	0	10	15	3	1	0	0	0	2	4	3	44
6.7	8.9	0	0	0	0	0	0	2	1	0	1	0	0	0	2	3	1	10
8.9	11.2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	10	6	0	1	0	21	26	5	4	0	2	1	6	17	8	117

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	7	11	10	5	9	8	12	10	7	10	5	6	4	7	8	9	128
2.2	4.5	26	28	18	19	15	20	48	49	24	18	8	20	8	16	35	26	378
4.5	6.7	10	9	13	8	7	14	46	60	32	18	25	24	15	26	37	27	371
6.7	8.9	8	13	3	4	6	10	24	43	31	13	22	11	14	32	13	10	257
8.9	11.2	7	5	1	0	0	1	6	17	24	17	9	11	20	42	20	14	194
11.2	13.4	5	0	1	0	0	0	4	13	28	22	4	10	16	36	8	2	149
13.4	17.9	7	0	0	0	0	0	1	13	28	41	26	15	14	45	10	4	204
17.9	22.4	0	0	0	0	0	0	0	1	6	20	20	12	10	22	3	0	94
22.4	29.1	0	0	0	0	0	0	0	0	1	2	0	0	0	5	1	0	9
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		70	66	46	36	37	53	141	206	181	161	119	109	101	231	135	92	1784

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	1	5	13	18	15	9	61

Table 5-4 2nd Quarter Average, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245 Start Date: 4/1/2011 Total number of Periods: 2184
Period: 2nd Quarter Stop Date: 7/1/2011 Periods of No Data Recovery: 339
System Percent Data Recovery: 84.5%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
6.7	8.9	0	2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	5
8.9	11.2	2	5	1	0	0	0	0	0	0	1	0	0	0	0	0	3	12
11.2	13.4	2	2	0	0	0	0	0	2	1	0	0	1	1	0	0	0	9
13.4	17.9	6	0	0	0	0	0	0	0	5	0	0	1	0	0	0	0	12
17.9	22.4	0	0	0	0	0	0	0	0	6	6	1	1	0	2	0	2	18
22.4	29.1	0	0	0	0	0	0	0	0	0	2	5	3	1	0	0	0	11
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	10	1	0	0	0	0	2	12	9	6	6	3	2	1	7	69

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
2.2	4.5	1	1	0	2	0	0	0	1	0	0	0	0	0	0	1	2	8
4.5	6.7	4	2	0	0	0	1	0	1	0	1	0	0	0	0	2	1	12
6.7	8.9	2	1	0	0	0	2	2	0	4	0	0	3	2	0	1	1	18
8.9	11.2	2	3	1	0	1	1	1	0	4	1	2	0	1	0	0	2	19
11.2	13.4	1	0	0	0	0	1	1	2	1	2	1	1	0	1	1	0	12
13.4	17.9	2	0	0	0	0	0	0	1	12	6	2	1	0	0	0	2	26
17.9	22.4	0	0	0	0	0	0	0	0	1	1	5	1	2	2	0	0	12
22.4	29.1	0	0	0	0	0	0	0	0	0	4	6	1	2	4	1	0	18
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		12	7	1	2	1	5	4	5	22	15	16	7	7	7	6	9	126

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	1	0	0	0	0	0	1	1	0	0	0	1	2	0	0	6
2.2	4.5	3	3	3	4	5	3	0	2	4	2	0	5	5	1	2	2	44
4.5	6.7	3	1	0	3	6	4	5	1	2	7	3	4	1	2	4	1	47
6.7	8.9	2	1	1	4	1	0	3	9	9	3	5	5	3	0	1	3	50
8.9	11.2	3	1	0	2	0	2	3	1	11	4	1	3	5	4	0	4	44
11.2	13.4	0	0	0	0	0	3	0	1	8	2	2	3	2	2	1	1	25
13.4	17.9	1	1	0	0	0	0	0	2	8	12	6	2	7	5	1	0	45
17.9	22.4	0	0	0	0	0	0	0	0	4	8	2	5	3	3	2	1	28
22.4	29.1	0	0	0	0	0	0	0	0	1	2	4	2	3	2	1	0	15
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		12	8	4	13	12	12	11	17	48	40	23	29	30	22	12	12	305

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	1	3	2	2	3	1	1	2	1	1	1	0	0	1	1	22
2.2	4.5	2	3	2	2	5	6	16	8	5	3	6	3	2	3	3	6	75
4.5	6.7	3	2	2	6	7	5	6	10	3	7	3	1	4	3	3	3	68
6.7	8.9	2	1	1	2	2	3	7	8	13	2	2	2	2	4	6	2	59
8.9	11.2	1	1	1	0	1	3	3	4	7	5	2	3	0	3	3	5	42
11.2	13.4	1	0	0	0	0	6	5	0	2	6	2	4	3	2	2	4	37
13.4	17.9	0	2	0	0	0	1	3	5	9	16	5	4	10	11	4	3	73
17.9	22.4	0	0	0	0	0	0	0	0	6	13	6	3	5	18	6	1	58
22.4	29.1	0	0	0	0	0	0	0	0	2	4	10	8	4	21	7	0	56
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	5
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		11	10	9	12	17	27	41	36	49	57	37	30	30	69	35	25	495

Table 5-4 2nd Quarter Average, 245 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	1	2	1	0	1	0	0	1	2	0	0	2	0	0	11
2.2	4.5	3	1	2	2	2	2	1	1	3	2	1	3	5	5	4	2	39
4.5	6.7	0	1	0	3	0	1	3	2	2	1	6	7	4	1	3	4	38
6.7	8.9	4	2	1	0	0	2	4	2	2	3	5	4	7	9	5	1	51
8.9	11.2	1	2	2	3	1	2	3	0	4	2	2	7	6	9	8	1	53
11.2	13.4	2	1	1	0	0	0	1	1	7	3	6	2	6	11	5	0	46
13.4	17.9	1	0	0	1	1	2	2	1	9	9	10	8	7	20	12	6	89
17.9	22.4	0	0	0	0	0	0	0	1	1	7	8	2	2	42	10	1	74
22.4	29.1	0	0	0	0	0	0	0	0	1	4	3	3	1	25	4	0	41
29.1	40.3	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	0	4
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		12	7	7	11	5	9	15	8	29	32	45	36	39	125	51	15	446

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	0	0	1	2	1	0	3	3	2	0	0	0	0	1	14
2.2	4.5	4	1	0	2	0	1	3	2	7	3	6	3	3	1	3	1	40
4.5	6.7	3	2	0	2	0	2	2	3	4	6	2	3	2	2	2	1	36
6.7	8.9	0	1	2	3	0	2	1	6	1	1	3	6	2	4	1	5	38
8.9	11.2	2	3	4	0	0	1	0	5	10	3	2	2	4	1	4	2	43
11.2	13.4	0	0	2	2	0	0	2	1	6	4	5	2	1	4	1	2	32
13.4	17.9	1	0	0	0	0	0	0	0	3	4	2	0	1	13	11	0	35
17.9	22.4	0	0	0	0	0	0	0	0	0	0	2	0	2	9	4	1	18
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		11	7	8	9	1	8	9	17	34	24	24	16	16	35	26	13	258

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	4
2.2	4.5	5	1	1	1	1	0	1	1	2	1	2	2	0	0	1	2	21
4.5	6.7	1	5	0	0	2	1	2	2	2	2	3	4	0	0	0	2	26
6.7	8.9	2	6	3	1	0	1	2	5	6	4	2	1	0	0	0	1	34
8.9	11.2	0	1	2	1	0	0	0	4	2	1	1	1	0	0	2	4	19
11.2	13.4	0	0	0	0	0	0	0	2	1	1	1	0	0	0	3	5	13
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	13	6	3	3	2	5	14	14	9	9	10	1	2	9	15	123

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	2	4	4	4	5	3	2	7	5	5	3	2	4	1	3	58
2.2	4.5	18	11	8	13	13	12	21	15	21	11	15	16	15	10	14	15	228
4.5	6.7	14	13	2	14	15	14	18	19	13	24	17	19	11	8	14	13	228
6.7	8.9	12	14	8	10	3	10	19	30	35	13	17	21	17	17	15	14	255
8.9	11.2	11	16	11	6	3	9	10	14	38	17	10	16	16	17	17	21	232
11.2	13.4	6	3	3	2	0	10	9	9	26	18	17	13	13	20	13	12	174
13.4	17.9	11	3	0	1	1	3	5	9	46	47	25	16	25	49	30	12	283
17.9	22.4	0	0	0	0	0	0	0	1	18	35	24	12	14	78	23	6	211
22.4	29.1	0	0	0	0	0	0	0	0	4	16	28	17	12	53	13	0	143
29.1	40.3	0	0	0	0	0	0	0	0	0	0	2	1	1	6	0	0	10
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		76	62	36	50	39	63	85	99	208	186	160	134	126	262	140	96	1822

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	0	3	7	3	7	3	23

Table 5-5 3rd Quarter Average, 33 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 33 Start Date: 7/1/2011 Total number of Periods: 2208
Period: 3rd Quarter Stop Date: 10/1/2011 Periods of No Data Recovery: 75
System Percent Data Recovery: 96.6%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4.5	6.7	3	0	0	0	0	0	0	0	1	0	0	1	0	0	1	2	8
6.7	8.9	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	4
8.9	11.2	2	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	7
11.2	13.4	0	0	0	0	0	0	0	1	5	1	0	0	0	0	0	0	7
13.4	17.9	0	0	0	0	0	0	0	2	7	1	1	0	0	0	0	0	11
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		6	1	0	0	0	0	0	5	16	3	1	1	1	2	2	4	42

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2.2	4.5	2	1	1	0	0	1	0	0	0	0	0	0	0	0	2	5	12
4.5	6.7	8	5	0	0	0	0	0	4	1	1	2	0	0	1	0	8	30
6.7	8.9	3	1	1	1	0	3	1	11	3	0	1	0	0	1	0	3	29
8.9	11.2	1	1	0	1	0	1	0	13	9	3	0	1	0	0	0	0	30
11.2	13.4	1	1	0	0	0	0	0	5	5	2	0	0	0	0	0	0	14
13.4	17.9	0	0	0	0	0	0	0	1	5	1	1	0	0	0	2	0	10
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		15	9	2	2	0	5	1	34	23	7	4	1	0	4	4	16	127

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	5	5	1	6	3	1	1	0	1	0	2	1	1	1	0	7	35
2.2	4.5	7	7	7	16	11	12	8	7	5	5	0	1	0	2	7	5	100
4.5	6.7	5	5	7	5	3	9	7	19	9	3	2	5	2	0	3	2	86
6.7	8.9	1	8	0	2	5	1	3	24	10	3	2	2	1	3	4	3	72
8.9	11.2	1	1	1	1	0	0	1	7	10	2	0	0	1	0	2	0	27
11.2	13.4	0	0	0	0	0	0	0	2	5	2	0	2	1	2	1	2	17
13.4	17.9	0	0	0	0	0	0	0	1	6	1	0	0	2	1	3	0	14
17.9	22.4	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		19	26	16	30	22	23	20	60	47	16	6	12	8	11	21	19	356

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	1	12	15	18	9	4	3	1	2	2	3	0	3	2	1	79
2.2	4.5	2	6	15	19	30	13	25	11	6	3	1	2	3	2	2	1	141
4.5	6.7	2	2	5	11	16	11	11	13	8	4	3	0	7	3	3	2	101
6.7	8.9	1	4	4	5	4	11	10	11	4	2	1	3	5	1	0	2	68
8.9	11.2	0	0	1	0	0	1	5	7	9	3	4	0	3	5	3	0	41
11.2	13.4	0	0	0	0	0	0	1	1	7	4	1	2	5	5	3	0	29
13.4	17.9	0	0	0	0	0	0	0	2	3	4	2	2	3	18	8	0	42
17.9	22.4	0	0	0	0	0	0	0	0	0	1	1	4	0	4	6	0	16
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	13	37	50	68	45	56	48	38	23	15	17	26	42	27	6	519

Table 5-5 3rd Quarter Average, 33 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	5	2	3	3	5	0	4	6	3	3	1	0	0	2	2	3	42
2.2	4.5	1	1	2	3	4	7	10	8	3	3	4	3	8	4	2	7	70
4.5	6.7	0	2	4	0	0	7	11	12	1	6	2	3	8	9	9	4	78
6.7	8.9	1	0	1	0	0	5	9	11	3	0	4	4	6	8	11	1	64
8.9	11.2	0	0	0	0	0	0	5	10	2	1	0	1	4	10	9	0	42
11.2	13.4	0	0	0	0	0	0	1	7	0	2	0	0	1	11	4	0	26
13.4	17.9	0	0	0	0	0	0	0	1	1	1	2	0	0	10	3	0	18
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		7	5	10	6	9	19	40	55	13	16	13	11	27	55	40	15	341

Stability Class: F

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	4	4	3	3	4	6	9	5	4	3	1	3	3	3	1	60
2.2	4.5	2	9	6	1	1	7	21	11	13	5	3	3	4	2	9	5	102
4.5	6.7	2	1	3	1	0	2	15	19	4	3	1	3	2	5	9	4	74
6.7	8.9	0	0	0	0	0	1	8	9	6	1	1	1	0	3	2	0	32
8.9	11.2	0	0	0	0	0	0	3	3	4	0	0	1	0	0	1	0	12
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	14	13	5	4	14	53	51	32	13	8	9	9	13	24	10	280

Stability Class: G

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	9	16	17	6	4	9	13	3	2	1	1	1	2	1	6	7	98
2.2	4.5	11	17	28	1	0	1	12	13	7	0	0	0	1	0	4	8	103
4.5	6.7	3	0	11	1	0	0	12	11	1	2	0	0	0	0	3	3	47
6.7	8.9	0	0	1	0	0	0	2	5	0	1	1	0	0	0	0	1	11
8.9	11.2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	3
11.2	13.4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		23	33	57	8	4	10	39	34	10	6	2	1	3	1	13	19	263

Stability Class: All

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	26	28	37	33	33	23	28	21	12	10	9	6	6	11	13	19	315
2.2	4.5	25	41	59	40	46	41	76	50	34	16	8	9	16	10	26	32	529
4.5	6.7	23	15	30	18	19	29	56	78	25	19	10	12	19	18	28	25	424
6.7	8.9	7	14	7	8	9	21	33	72	26	7	10	10	12	16	17	11	280
8.9	11.2	4	2	2	2	0	2	14	43	37	11	4	3	8	15	15	0	162
11.2	13.4	1	1	0	0	0	0	2	16	22	12	1	4	7	18	8	2	94
13.4	17.9	0	0	0	0	0	0	0	7	22	8	6	2	5	29	16	0	95
17.9	22.4	0	0	0	0	0	0	0	0	1	1	1	4	0	7	8	0	22
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	2	1	4	0	0	7
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		86	101	135	101	107	116	209	287	179	84	49	52	74	128	131	89	1928

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	1	4	34	23	46	97	205

Table 5-6 3rd Quarter Average, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245 Start Date: 7/1/2011 Total number of Periods: 2208
Period: 3rd Quarter Stop Date: 10/1/2011 Periods of No Data Recovery: 75
System Percent Data Recovery: 96.6%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5	6.7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
6.7	8.9	2	1	0	0	0	0	0	0	1	0	0	0	1	0	0	1	6
8.9	11.2	4	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	6
11.2	13.4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
13.4	17.9	0	0	0	0	0	0	0	0	11	5	0	0	0	0	0	0	16
17.9	22.4	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	1	0	0	0	0	0	0	17	7	1	0	2	2	2	2	42

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	4	0	1	0	0	1	0	0	0	0	0	0	0	0	1	2	9
4.5	6.7	8	3	0	0	0	0	0	2	0	1	0	1	0	0	0	8	23
6.7	8.9	6	4	1	1	0	0	0	2	2	1	0	1	1	0	0	1	20
8.9	11.2	0	1	1	1	0	2	1	8	9	2	1	0	0	1	0	1	28
11.2	13.4	2	0	1	0	0	1	1	2	14	3	2	1	0	0	0	0	27
13.4	17.9	0	0	0	0	0	0	0	1	9	5	0	0	0	0	0	0	15
17.9	22.4	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2	0	4
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		20	8	4	2	0	4	2	15	35	12	4	3	1	2	3	12	127

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	2	0	1	6	1	0	1	0	0	1	0	1	0	2	3	21
2.2	4.5	9	5	5	15	8	7	3	5	5	1	2	0	1	3	4	5	78
4.5	6.7	3	6	3	7	4	10	7	13	11	4	1	5	0	0	3	4	81
6.7	8.9	2	6	4	3	2	5	1	21	10	5	1	3	1	0	6	2	72
8.9	11.2	1	3	1	0	2	3	0	8	19	2	2	1	2	3	1	0	48
11.2	13.4	1	0	0	1	3	1	0	2	6	4	1	0	0	1	1	1	22
13.4	17.9	0	0	0	0	0	0	0	0	10	5	0	2	1	3	1	0	22
17.9	22.4	0	0	0	0	0	0	0	0	0	1	1	0	1	1	3	0	7
22.4	29.1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		19	22	13	27	25	27	11	50	61	23	9	12	7	12	23	15	356

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	2	5	10	9	4	6	3	2	1	2	3	2	2	0	0	52
2.2	4.5	4	5	8	17	27	12	10	12	7	3	3	2	1	4	3	0	118
4.5	6.7	1	2	4	9	7	16	6	11	7	5	1	2	2	1	2	0	76
6.7	8.9	2	3	4	8	9	9	4	8	12	4	1	3	6	2	3	2	80
8.9	11.2	0	1	2	3	5	14	3	9	9	4	1	3	3	3	0	1	61
11.2	13.4	0	0	1	0	0	5	2	3	3	6	1	1	3	0	3	0	28
13.4	17.9	0	0	0	0	0	0	2	3	9	7	3	2	6	5	8	0	45
17.9	22.4	0	0	0	0	0	0	0	1	1	3	4	3	3	5	9	0	29
22.4	29.1	0	0	0	0	0	0	0	0	0	0	2	3	1	11	11	0	28
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	3
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		8	13	24	47	57	60	33	50	50	33	18	22	28	33	41	3	520

Table 5-6 3rd Quarter Average, 245 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	2	1	2	0	1	1	0	2	0	0	1	0	0	0	11
2.2	4.5	1	0	0	3	1	2	4	4	2	4	3	4	0	3	1	0	32
4.5	6.7	0	2	0	2	3	2	4	8	1	2	1	1	1	6	8	2	43
6.7	8.9	0	1	2	1	1	3	2	6	7	1	2	2	5	5	1	2	41
8.9	11.2	0	0	1	0	1	2	1	9	8	5	1	3	2	10	8	2	53
11.2	13.4	2	0	0	0	0	2	4	5	8	0	1	2	5	12	10	0	51
13.4	17.9	0	0	0	0	0	1	1	5	9	5	0	1	3	16	22	0	63
17.9	22.4	0	0	0	0	0	0	0	1	6	2	0	0	1	17	12	0	39
22.4	29.1	0	0	0	0	0	0	0	0	1	2	2	0	0	10	2	0	17
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		4	3	5	7	8	12	17	39	42	23	10	13	18	79	64	6	350

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	3	1	0	2	0	2	2	3	0	2	1	1	2	0	19
2.2	4.5	7	5	2	1	2	0	4	4	5	0	2	3	3	5	6	5	54
4.5	6.7	5	3	4	1	2	3	6	8	7	3	3	5	8	3	3	2	66
6.7	8.9	0	0	1	2	1	2	3	12	10	4	2	2	2	2	8	3	54
8.9	11.2	1	0	0	0	0	0	1	8	7	3	2	0	2	5	9	1	39
11.2	13.4	1	0	0	0	0	0	4	9	3	3	0	1	3	5	4	0	33
13.4	17.9	0	0	0	0	0	0	4	6	4	3	0	0	5	10	4	1	37
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		14	8	10	5	5	7	22	49	38	19	9	13	24	33	37	12	305

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	6	3	1	2	2	4	5	7	2	4	3	1	1	0	3	2	46
2.2	4.5	5	8	5	2	2	7	10	9	7	5	3	0	0	2	5	3	73
4.5	6.7	9	7	3	0	3	4	11	10	9	6	2	0	1	0	3	10	78
6.7	8.9	5	5	2	1	1	2	5	11	6	7	1	0	1	2	2	10	61
8.9	11.2	1	1	2	4	0	0	0	7	4	3	0	1	0	0	4	6	33
11.2	13.4	0	0	0	2	0	0	1	7	1	3	1	0	0	1	5	4	25
13.4	17.9	0	0	0	0	0	0	0	1	3	1	2	0	1	2	1	0	11
17.9	22.4	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		26	24	13	11	8	17	32	52	33	29	12	2	5	7	23	35	329

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	11	7	11	15	19	11	12	14	6	10	6	6	6	3	7	5	149
2.2	4.5	30	23	21	38	40	29	31	34	26	13	13	9	5	17	20	15	364
4.5	6.7	28	23	14	19	19	35	34	52	35	21	8	14	12	10	20	27	371
6.7	8.9	17	20	14	16	14	21	15	60	48	22	7	11	17	11	20	21	334
8.9	11.2	7	6	7	8	8	21	6	49	57	20	7	8	9	22	22	11	268
11.2	13.4	6	0	2	3	3	9	12	28	39	19	6	5	11	19	23	5	190
13.4	17.9	0	0	0	0	0	1	7	16	55	31	5	5	16	36	36	1	209
17.9	22.4	0	0	0	0	0	0	0	2	9	7	7	3	6	25	27	0	86
22.4	29.1	0	0	0	0	0	0	0	0	1	3	4	3	2	23	15	0	51
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	1	1	2	3	0	7
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		99	79	69	99	103	127	117	255	276	146	63	65	85	168	193	85	2029

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	1	4	33	14	21	31	104

Table 5-7 4th Quarter Average, 33 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 33 Start Date: 10/1/2011 Total number of Periods: 2208
Period: 4th Quarter Stop Date: 1/1/2012 Periods of No Data Recovery: 342
System Percent Data Recovery: 84.5%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	11.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
4.5	6.7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
6.7	8.9	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
8.9	11.2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	3
11.2	13.4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
22.4	29.1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		1	0	0	0	0	1	1	3	0	2	2	0	0	0	0	2	12

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	5
2.2	4.5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	12
4.5	6.7	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7	9
6.7	8.9	0	0	0	0	0	0	0	3	0	0	1	0	0	2	0	1	7
8.9	11.2	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	2	6
11.2	13.4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2
13.4	17.9	0	0	0	0	0	0	0	1	3	0	1	0	1	0	1	0	7
17.9	22.4	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	5
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		6	0	0	0	0	1	0	7	3	1	6	0	2	4	6	17	53

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	8	10	7	4	5	4	5	5	6	4	6	0	13	7	12	20	116
2.2	4.5	7	13	5	2	3	2	5	12	8	4	8	7	12	17	21	16	142
4.5	6.7	0	4	2	1	1	3	15	9	6	6	5	0	4	13	9	11	89
6.7	8.9	0	0	0	0	0	3	13	22	15	2	1	2	5	3	10	4	80
8.9	11.2	0	0	0	0	0	0	4	8	6	2	1	2	2	2	1	1	29
11.2	13.4	0	0	0	0	0	0	0	7	8	4	0	2	2	5	1	0	29
13.4	17.9	0	0	0	0	0	0	0	1	5	8	2	3	2	3	3	0	27
17.9	22.4	0	0	0	0	0	0	0	0	3	4	1	1	1	1	1	0	12
22.4	29.1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		15	27	14	7	9	12	42	64	57	35	24	17	41	51	58	52	525

Table 5-7 4th Quarter Average, 33 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	4	6	0	1	1	2	6	3	5	3	3	0	6	2	4	50
2.2	4.5	2	3	2	0	3	1	7	9	5	12	8	10	7	9	10	12	100
4.5	6.7	1	0	1	0	0	0	6	15	13	6	6	6	7	11	3	4	79
6.7	8.9	0	0	0	0	0	1	12	15	8	3	0	0	4	6	2	0	51
8.9	11.2	0	0	0	0	0	2	8	7	6	4	1	2	3	6	0	1	40
11.2	13.4	0	0	0	0	0	1	1	13	7	4	3	2	5	6	2	0	44
13.4	17.9	0	0	0	0	0	0	3	10	20	8	2	0	2	10	1	0	56
17.9	22.4	0	0	0	0	0	0	0	1	6	6	4	1	2	0	0	0	20
22.4	29.1	0	0	0	0	0	0	0	0	2	7	2	2	1	0	0	0	14
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		7	7	9	0	4	6	39	76	70	55	29	26	31	54	20	21	454

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	6	6	6	0	2	3	3	6	1	3	3	1	2	5	7	6	60
2.2	4.5	4	3	3	0	0	2	1	11	7	6	4	5	3	11	20	9	89
4.5	6.7	4	1	4	0	0	0	7	16	11	3	6	1	2	4	14	6	79
6.7	8.9	0	0	0	0	0	0	4	14	7	3	1	1	2	1	3	0	36
8.9	11.2	0	0	0	0	0	0	2	3	1	3	0	2	1	4	2	0	18
11.2	13.4	0	0	0	0	0	0	0	1	0	3	0	0	0	1	0	0	5
13.4	17.9	0	0	0	0	0	0	2	1	1	4	0	0	0	0	0	0	8
17.9	22.4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		14	10	13	0	2	5	19	52	28	26	14	10	10	26	46	21	296

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	8	7	0	0	1	1	3	4	3	2	6	7	14	13	15	88
2.2	4.5	6	4	2	0	0	0	4	10	7	3	3	8	5	6	19	12	89
4.5	6.7	0	0	1	0	0	0	1	8	3	5	1	0	1	3	7	5	35
6.7	8.9	0	0	0	0	0	0	0	11	2	1	8	0	0	1	5	2	30
8.9	11.2	0	0	0	0	0	0	0	1	0	2	1	1	0	0	0	0	5
11.2	13.4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	12	10	0	0	1	6	33	16	15	15	15	13	24	44	34	248

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	24	28	26	4	8	10	11	20	14	15	14	10	22	32	34	47	319
2.2	4.5	22	23	12	2	6	6	17	42	27	25	23	30	27	43	74	56	435
4.5	6.7	6	5	8	1	1	3	29	49	33	20	18	7	14	32	33	33	292
6.7	8.9	0	0	0	0	0	4	30	65	32	9	11	3	11	13	20	7	205
8.9	11.2	1	0	0	0	0	2	14	23	13	11	3	7	7	12	3	5	101
11.2	13.4	0	0	0	0	0	1	1	22	15	12	4	4	7	12	4	0	82
13.4	17.9	0	0	0	0	0	0	5	13	29	20	5	3	5	13	5	0	98
17.9	22.4	0	0	0	0	0	0	0	1	9	13	8	2	3	2	1	0	39
22.4	29.1	0	0	0	0	0	0	0	0	2	9	4	2	1	0	0	0	18
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		53	56	46	7	15	26	107	235	174	134	90	68	97	159	174	148	1589

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	0	2	93	50	57	75	277

Table 5-8 4th Quarter Average, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245 Start Date: 10/1/2011 Total number of Periods: 2208
Period: 4th Quarter Stop Date: 1/1/2012 Periods of No Data Recovery: 342
System Percent Data Recovery: 84.5%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	11.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11.2	13.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
4.5	6.7	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
6.7	8.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.9	11.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11.2	13.4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	3
13.4	17.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
29.1	40.3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		2	0	0	0	0	0	2	1	2	0	4	0	0	0	0	1	12

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
2.2	4.5	3	1	0	0	0	1	0	0	0	0	0	0	0	0	2	5	12
4.5	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	8
6.7	8.9	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	2	6
8.9	11.2	2	0	0	0	0	0	0	1	1	0	0	0	0	2	0	1	7
11.2	13.4	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	1	4
13.4	17.9	0	0	0	0	0	0	0	0	2	0	0	1	0	0	2	0	5
17.9	22.4	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	4
22.4	29.1	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	5
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		7	1	0	1	0	1	0	4	5	2	4	2	2	3	6	16	54

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	5	4	3	3	1	4	8	7	7	4	5	3	9	9	9	85
2.2	4.5	6	9	8	3	3	4	1	9	7	5	7	3	3	8	11	6	93
4.5	6.7	4	6	2	1	1	1	10	10	6	6	4	7	4	9	10	9	90
6.7	8.9	2	1	2	1	0	1	8	11	8	4	2	5	3	4	10	9	71
8.9	11.2	0	0	0	0	0	1	3	14	14	5	1	0	5	4	11	3	61
11.2	13.4	0	0	0	0	0	0	1	7	4	1	1	1	3	2	6	1	27
13.4	17.9	0	0	0	0	0	0	1	2	10	12	3	3	2	5	1	1	40
17.9	22.4	0	0	0	0	0	0	0	0	3	8	3	2	2	3	4	1	26
22.4	29.1	0	0	0	0	0	0	0	0	0	3	7	2	0	4	1	0	17
29.1	40.3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		16	21	16	8	7	8	28	61	59	54	32	28	25	48	63	39	513

Table 5-8 4th Quarter Average, 245 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	4	3	0	0	0	1	2	3	2	0	1	0	1	2	1	2	22
2.2	4.5	4	7	1	0	4	3	6	6	8	2	4	6	2	4	0	5	62
4.5	6.7	4	3	2	2	1	1	2	9	5	4	4	6	3	3	8	3	60
6.7	8.9	2	1	1	1	0	0	4	6	6	5	3	5	4	7	9	1	55
8.9	11.2	0	1	1	1	0	0	3	13	7	7	3	1	5	5	6	2	55
11.2	13.4	0	0	0	0	0	0	1	9	7	1	1	0	2	5	2	0	28
13.4	17.9	0	0	0	0	0	2	2	4	14	10	3	0	2	3	4	2	46
17.9	22.4	0	0	0	0	0	0	0	4	14	14	6	0	4	9	0	1	52
22.4	29.1	0	0	0	0	0	0	1	1	8	17	9	2	1	17	1	0	57
29.1	40.3	0	0	0	0	0	0	0	0	4	12	3	4	3	1	0	0	27
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS		14	15	5	4	5	7	21	55	75	72	37	25	27	56	31	16	465

Stability Class: F

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	1	3	2	2	2	2	5	2	2	3	3	1	0	2	0	30
2.2	4.5	10	5	3	5	1	1	5	2	10	5	3	1	1	4	5	3	64
4.5	6.7	16	9	0	4	4	1	3	5	4	6	2	1	1	2	7	8	73
6.7	8.9	0	1	2	0	0	0	1	5	5	4	1	5	1	4	3	7	39
8.9	11.2	0	0	2	0	0	0	1	6	5	2	1	1	2	0	11	4	35
11.2	13.4	1	0	0	1	0	0	4	7	2	3	2	1	3	4	0	3	31
13.4	17.9	0	0	0	0	0	0	0	6	4	7	2	1	0	3	4	1	28
17.9	22.4	0	0	0	0	0	0	0	0	2	2	2	0	1	4	1	2	14
22.4	29.1	0	0	0	0	0	0	0	1	2	1	3	0	1	4	0	0	12
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		27	16	10	12	7	4	16	37	36	32	20	13	11	25	33	28	327

Stability Class: G

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	1	4	3	2	2	3	9	4	2	1	0	3	3	0	1	41
2.2	4.5	7	4	2	7	2	2	1	12	5	5	6	3	2	5	2	2	67
4.5	6.7	2	2	3	6	0	0	4	9	18	3	4	2	2	2	7	10	74
6.7	8.9	1	3	3	0	0	0	7	8	6	2	0	0	1	1	1	6	39
8.9	11.2	0	0	2	0	0	0	3	3	3	2	1	0	0	0	8	3	25
11.2	13.4	0	0	0	0	0	0	2	4	2	0	2	0	1	1	3	4	19
13.4	17.9	0	0	0	0	0	0	0	1	0	0	1	0	0	2	5	2	11
17.9	22.4	0	0	0	0	0	0	0	0	1	0	4	0	0	1	3	0	9
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		13	10	14	16	4	4	20	46	39	14	19	5	9	15	29	28	285

Stability Class: All

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	13	10	11	9	7	6	11	25	15	11	9	8	8	14	12	12	181
2.2	4.5	31	26	14	15	10	11	14	29	30	17	20	13	8	21	20	22	301
4.5	6.7	26	20	7	13	6	3	20	34	33	19	14	16	10	16	33	37	307
6.7	8.9	5	6	8	2	0	1	20	31	26	15	7	15	9	16	24	25	210
8.9	11.2	3	1	5	1	0	1	10	37	30	16	6	2	12	11	36	13	184
11.2	13.4	1	0	0	1	0	0	8	29	17	5	6	2	10	12	11	10	112
13.4	17.9	0	0	0	0	0	2	3	13	30	29	9	5	4	13	16	6	130
17.9	22.4	0	0	0	0	0	0	0	4	21	25	15	3	8	17	8	4	105
22.4	29.1	0	0	0	0	0	0	1	2	10	22	23	4	2	26	2	0	92
29.1	40.3	0	0	0	0	0	0	0	0	4	15	7	4	3	1	0	0	34
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS		79	63	45	41	23	24	87	204	216	174	116	73	74	147	162	129	1657

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	0	1	105	39	26	38	209

Table 5-9 Year 2011, 33 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 33 Start Date: 1/1/2011 Total number of Periods: 8759
Period: Annual Stop Date: 1/1/2012 Periods of No Data Recovery: 764
System Percent Data Recovery: 91.3%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
4.5	6.7	3	1	0	0	0	0	0	0	1	0	0	1	0	0	2	4	12
6.7	8.9	2	7	0	0	0	0	0	1	1	0	0	0	1	0	0	1	13
8.9	11.2	4	3	0	0	0	0	0	3	3	1	0	1	1	0	0	3	19
11.2	13.4	2	0	0	0	0	0	0	2	7	1	0	1	0	0	0	0	13
13.4	17.9	6	0	0	0	0	0	0	5	14	4	3	0	1	1	0	1	35
17.9	22.4	0	0	0	0	0	0	0	0	3	1	5	3	1	1	2	1	17
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		17	12	0	0	0	0	0	11	29	7	8	6	5	3	4	13	115

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
2.2	4.5	5	3	2	1	0	3	0	1	0	0	0	0	0	0	5	8	28
4.5	6.7	10	6	0	0	1	2	1	6	2	1	5	2	0	2	2	11	51
6.7	8.9	5	2	1	1	1	4	4	14	6	1	3	0	1	1	0	6	50
8.9	11.2	8	3	1	1	0	1	1	15	13	5	1	2	1	0	1	2	55
11.2	13.4	2	1	0	0	0	0	0	9	16	4	0	1	0	0	1	1	35
13.4	17.9	4	0	0	0	0	0	1	2	11	4	4	2	1	2	2	1	34
17.9	22.4	0	0	0	0	0	0	0	1	0	8	4	2	1	3	0	1	20
22.4	29.1	0	0	0	0	0	0	0	0	1	2	2	0	0	2	1	2	10
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		34	15	4	3	2	10	7	48	49	25	19	9	4	11	12	33	285

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	10	7	3	6	4	2	2	1	1	0	2	3	1	2	1	12	57
2.2	4.5	16	11	13	26	16	16	11	11	10	6	2	7	2	4	23	21	195
4.5	6.7	10	5	9	7	3	9	14	26	17	8	6	13	5	2	4	21	159
6.7	8.9	6	10	1	5	7	3	8	36	25	5	8	7	3	9	5	9	147
8.9	11.2	4	1	1	1	0	1	1	14	23	9	1	4	3	5	4	10	82
11.2	13.4	2	0	0	0	0	0	0	5	21	13	2	3	6	5	4	3	64
13.4	17.9	3	0	0	0	0	0	1	5	28	17	4	8	6	8	8	3	91
17.9	22.4	1	0	0	0	0	0	0	2	3	9	7	3	3	4	2	3	37
22.4	29.1	0	0	0	0	0	0	0	0	0	2	1	1	0	4	0	0	8
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		52	34	27	45	30	31	37	100	128	69	33	49	29	43	51	82	840

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	24	15	23	25	32	21	23	17	14	14	13	9	14	15	20	29	308
2.2	4.5	18	29	31	28	44	28	52	55	26	20	17	17	19	29	42	33	488
4.5	6.7	6	13	12	16	20	20	44	46	26	15	12	6	16	31	36	30	349
6.7	8.9	11	8	8	6	8	22	35	54	39	12	8	13	16	18	24	19	301
8.9	11.2	11	1	4	0	0	1	16	33	35	13	9	6	12	27	29	15	212
11.2	13.4	3	0	0	0	0	0	6	16	36	21	6	8	12	25	13	7	153
13.4	17.9	2	1	0	0	0	0	1	18	35	40	21	13	13	49	19	5	217
17.9	22.4	0	0	0	0	0	0	1	2	9	27	12	11	8	24	8	0	102
22.4	29.1	0	0	0	0	0	0	0	0	0	13	5	1	0	3	0	0	22
29.1	40.3	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	5
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		75	67	78	75	104	92	178	241	220	178	105	84	110	221	191	138	2157

Table 5-9 Year 2011, 33 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	14	13	15	8	8	5	7	16	14	16	9	7	4	18	12	14	180
2.2	4.5	10	16	16	6	10	14	30	37	23	29	21	18	30	28	37	40	365
4.5	6.7	6	8	10	2	3	13	31	41	24	21	24	22	26	41	43	26	341
6.7	8.9	3	3	8	0	0	6	39	43	23	10	15	11	21	33	39	14	268
8.9	11.2	0	0	1	0	0	5	19	53	25	20	9	9	19	47	30	8	245
11.2	13.4	0	0	1	0	0	2	6	40	19	26	5	9	16	41	15	3	183
13.4	17.9	0	0	0	0	0	0	6	16	38	37	24	5	6	38	7	2	179
17.9	22.4	0	0	0	0	0	0	0	1	10	26	9	3	4	4	0	0	57
22.4	29.1	0	0	0	0	0	0	0	0	3	21	3	2	1	0	0	0	30
29.1	40.3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		33	40	51	16	21	45	138	247	179	207	119	86	127	250	183	107	1849

Stability Class: F

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	15	22	13	7	9	9	13	19	13	14	11	5	11	13	21	18	213
2.2	4.5	16	35	23	4	1	13	45	44	37	23	11	16	12	32	60	35	407
4.5	6.7	12	4	14	2	0	2	40	69	26	21	19	9	9	23	56	18	324
6.7	8.9	0	1	4	0	0	1	19	49	28	15	7	4	4	17	23	3	175
8.9	11.2	0	0	2	0	0	0	6	27	16	8	4	5	7	13	10	0	98
11.2	13.4	0	0	0	0	0	0	1	10	4	9	1	0	2	2	1	0	30
13.4	17.9	0	0	0	0	0	0	3	1	6	12	0	0	0	0	0	0	22
17.9	22.4	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		43	62	56	13	10	25	127	219	130	105	53	39	45	100	171	74	1272

Stability Class: G

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	21	27	26	6	5	10	15	7	7	8	3	10	12	20	26	32	235
2.2	4.5	28	30	31	1	1	1	25	35	17	7	8	14	8	10	48	31	295
4.5	6.7	4	2	17	1	0	0	24	38	9	12	2	2	1	6	26	16	160
6.7	8.9	0	0	2	0	0	0	6	22	5	3	9	0	0	3	13	4	67
8.9	11.2	0	0	0	0	0	0	0	6	1	4	1	1	0	0	0	0	13
11.2	13.4	0	0	1	0	0	0	0	5	0	2	0	0	0	0	0	0	8
13.4	17.9	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	4
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		53	59	77	8	6	11	70	116	39	37	23	27	21	39	113	83	782

Stability Class: All

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	84	84	80	52	58	47	60	60	49	52	38	34	42	69	80	106	995
2.2	4.5	93	125	116	66	72	75	163	183	113	85	59	72	71	103	215	170	1781
4.5	6.7	51	39	62	28	27	46	154	226	105	78	68	55	57	105	169	126	1396
6.7	8.9	27	31	24	12	16	36	111	219	127	46	50	35	46	81	104	56	1021
8.9	11.2	27	8	9	2	0	8	43	151	116	60	25	28	43	92	74	38	724
11.2	13.4	9	1	2	0	0	2	13	87	103	76	14	22	36	73	34	14	486
13.4	17.9	15	1	0	0	0	0	12	50	132	115	56	28	27	98	36	12	582
17.9	22.4	1	0	0	0	0	0	1	6	25	74	37	22	17	36	12	5	236
22.4	29.1	0	0	0	0	0	0	0	0	4	38	11	4	2	10	1	3	73
29.1	40.3	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		307	289	293	160	173	214	557	982	774	628	360	300	341	667	725	530	7300

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	2	15	190	131	161	196	695

Table 5-10 Year 2011, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245 Start Date: 1/1/2010 Total number of Periods: 8759
Period: Annual Stop Date: 12/31/2010 Periods of No Data Recovery: 272
System Percent Data Recovery: 96.9%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	3
4.5	6.7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6.7	8.9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8.9	11.2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	6
11.2	13.4	7	2	0	0	0	0	0	0	4	0	0	0	0	0	0	2	15
13.4	17.9	0	3	2	0	0	0	0	0	7	3	0	0	0	0	2	2	19
17.9	22.4	0	2	0	0	0	0	0	0	1	3	2	0	0	0	2	0	10
22.4	29.1	0	0	0	0	0	0	0	0	0	1	0	0	2	2	1	0	6
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	0	8	3	0	12
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	5
TOTALS		11	7	2	1	0	0	0	2	12	7	3	1	6	10	8	9	79

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	3
2.2	4.5	4	1	0	0	1	0	1	0	1	0	0	1	0	0	0	1	10
4.5	6.7	3	1	0	0	0	0	0	0	0	0	0	1	0	1	0	6	12
6.7	8.9	6	8	1	0	0	0	0	0	1	2	0	0	0	0	2	3	23
8.9	11.2	5	4	1	0	0	0	0	2	5	1	1	0	2	0	1	11	33
11.2	13.4	3	4	2	0	0	0	0	0	5	6	0	0	1	1	0	0	22
13.4	17.9	2	3	1	0	0	0	0	1	9	4	3	1	1	2	6	2	35
17.9	22.4	1	1	0	0	0	0	1	0	1	6	3	3	0	2	1	0	19
22.4	29.1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	1	1	2	0	1	2	0	7
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
TOTALS		24	22	6	0	1	0	2	3	22	22	10	9	4	9	12	23	169

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	5	1	1	0	0	1	0	1	0	2	1	1	0	0	5	2	20
2.2	4.5	20	15	9	3	0	0	2	1	6	2	4	2	0	3	5	21	93
4.5	6.7	11	11	9	7	1	2	1	9	14	9	2	1	3	2	8	21	111
6.7	8.9	21	17	3	2	1	1	6	21	18	7	2	10	7	4	6	25	151
8.9	11.2	12	11	4	3	1	2	2	10	23	7	2	3	3	1	3	10	97
11.2	13.4	8	4	1	0	3	0	0	0	21	16	9	2	8	2	0	6	80
13.4	17.9	6	2	2	2	5	1	3	4	18	26	9	5	8	8	2	6	107
17.9	22.4	1	0	0	0	0	0	1	0	1	10	14	2	3	6	3	3	44
22.4	29.1	0	0	0	0	0	0	0	0	0	3	4	3	0	1	2	1	14
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	1	2	2	0	6
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	3
TOTALS		84	61	29	17	11	7	15	46	101	83	48	29	34	30	36	95	726

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	12	12	24	17	13	10	13	8	17	13	6	10	3	9	10	13	190
2.2	4.5	36	28	41	22	12	10	32	63	35	25	29	18	20	19	28	43	461
4.5	6.7	22	23	39	20	8	16	46	62	45	21	19	16	14	16	21	48	436
6.7	8.9	15	27	24	21	8	8	21	41	48	18	16	20	7	10	33	34	351
8.9	11.2	8	12	9	14	4	7	29	24	40	25	13	14	7	17	37	25	285
11.2	13.4	12	9	4	4	4	6	10	12	35	21	10	6	5	24	46	32	240
13.4	17.9	24	3	4	0	3	4	18	24	38	32	21	13	12	31	37	21	285
17.9	22.4	1	3	3	0	0	2	5	4	10	41	12	5	7	26	16	16	151
22.4	29.1	0	0	0	0	0	2	0	4	6	29	22	8	10	32	25	3	141
29.1	40.3	0	0	0	0	0	0	0	0	0	12	15	3	6	34	11	0	81
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		130	117	148	98	52	65	174	242	274	237	163	113	91	218	264	235	2621

Table 5-10 Year 2011, 245 Ft AGL (Continued)

Stability Class: E

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	8	5	6	4	5	3	7	8	3	8	4	1	2	5	3	3	75
2.2	4.5	15	14	14	11	13	12	15	16	19	10	11	15	9	18	13	10	215
4.5	6.7	15	12	8	7	5	6	12	20	13	9	12	18	16	14	23	18	208
6.7	8.9	8	5	9	4	1	5	15	22	17	12	12	13	16	24	21	11	195
8.9	11.2	5	4	9	4	2	5	12	31	22	19	10	11	21	29	29	18	231
11.2	13.4	7	1	5	0	0	2	10	21	30	11	10	5	14	32	23	16	187
13.4	17.9	4	0	0	2	2	6	10	18	61	44	19	13	16	48	44	30	317
17.9	22.4	1	0	0	0	0	0	1	9	37	44	27	7	10	78	27	7	248
22.4	29.1	2	0	0	0	0	0	1	1	15	43	30	12	3	58	8	1	174
29.1	40.3	0	0	0	0	0	0	0	0	4	31	17	6	4	3	0	0	65
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2
TOTALS		65	41	51	32	28	39	83	146	221	232	152	102	111	309	191	114	1917

Stability Class: F

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	3	10	6	6	11	5	11	10	10	9	6	2	5	5	4	106
2.2	4.5	25	14	11	15	7	6	21	11	24	14	17	13	10	12	22	20	242
4.5	6.7	35	26	9	10	7	10	16	27	19	15	11	10	12	13	22	22	264
6.7	8.9	4	6	7	8	1	4	8	28	23	10	8	17	7	13	17	19	180
8.9	11.2	5	4	9	1	0	2	6	27	27	14	9	4	8	9	28	12	165
11.2	13.4	2	0	4	4	1	0	13	21	15	18	10	4	9	14	12	9	136
13.4	17.9	2	0	0	1	0	0	4	21	25	27	8	5	10	34	28	12	177
17.9	22.4	0	0	0	0	0	0	0	1	8	14	11	2	3	21	6	4	70
22.4	29.1	0	0	0	0	0	0	0	1	5	3	5	0	2	6	0	0	22
29.1	40.3	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0	8
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		76	53	50	45	22	33	73	148	156	131	90	61	63	127	140	102	1370

Stability Class: G

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	10	4	7	5	6	6	8	19	7	7	4	4	6	5	3	5	106
2.2	4.5	21	16	11	12	6	11	14	24	16	13	12	8	3	9	10	11	197
4.5	6.7	17	16	8	7	6	6	20	24	32	11	11	6	4	3	12	24	207
6.7	8.9	10	18	10	2	1	3	16	25	20	18	5	4	2	4	4	22	164
8.9	11.2	3	2	7	6	0	0	5	16	9	9	4	3	0	1	17	17	99
11.2	13.4	0	0	0	2	0	0	5	15	4	6	5	0	1	2	12	16	68
13.4	17.9	0	0	0	0	0	0	1	6	7	3	3	0	3	7	9	3	42
17.9	22.4	0	0	0	0	0	0	0	0	4	0	4	0	1	3	4	0	16
22.4	29.1	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		61	56	43	34	19	26	69	129	100	69	48	25	20	34	71	98	902

Stability Class: All

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	38	30	41	34	41	31	35	56	37	41	29	24	19	35	28	32	551
2.2	4.5	104	78	70	84	76	68	88	101	94	54	62	50	36	64	86	89	1204
4.5	6.7	100	81	41	51	43	60	88	136	100	70	51	58	46	50	94	121	1190
6.7	8.9	46	53	41	33	17	32	68	141	130	62	39	57	48	53	87	90	997
8.9	11.2	42	26	32	18	12	34	39	132	144	81	35	35	48	68	99	74	919
11.2	13.4	28	3	15	7	4	19	38	82	104	67	37	23	38	62	76	63	666
13.4	17.9	23	7	0	3	2	7	24	63	208	177	57	35	56	135	107	63	967
17.9	22.4	4	3	0	0	0	0	1	13	82	122	73	27	35	138	67	21	586
22.4	29.1	5	0	0	0	0	0	1	5	28	88	81	33	20	113	31	6	411
29.1	40.3	0	0	0	0	0	0	0	0	4	51	35	8	5	12	3	0	118
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2
TOTALS		390	281	240	230	195	251	382	729	931	814	499	351	351	730	678	559	7611

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	1	12	169	63	63	76	384

Table 5-11 Year 2011 Growing Season - Daylight Hours

(Solar Irradiance > 5 watts/m^2; 33 Ft AGL)

Hours at each wind speed and direction during time period

Elevation: 33 | Start Date: 4/15/2011 | Total number of Periods: 2647
Period: Growing season | Stop Date: 10/16/2011 | Periods of No Data Recovery: 307
Daylight hours | System Percent Data Recovery: 88.4%

Stability Class: A

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.2	4.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.5	6.7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	5
6.7	8.9	2	3	0	0	0	0	0	0	1	0	0	0	2	0	1	1	10
8.9	11.2	6	4	1	0	0	0	0	0	1	2	0	0	0	0	0	3	17
11.2	13.4	0	2	0	0	0	0	0	2	5	0	0	1	1	0	0	0	11
13.4	17.9	6	0	0	0	0	0	0	0	16	5	0	1	0	0	0	0	28
17.9	22.4	0	0	0	0	0	0	0	0	6	7	2	1	0	2	0	2	20
22.4	29.1	0	0	0	0	0	0	0	0	0	1	5	1	2	1	1	0	11
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		16	10	1	0	0	0	0	2	29	15	7	4	5	4	3	8	104

Stability Class: B

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
2.2	4.5	5	1	1	2	0	1	0	1	0	0	0	0	0	0	2	3	16
4.5	6.7	12	5	0	0	0	1	0	3	0	2	0	1	0	0	1	8	33
6.7	8.9	7	5	1	1	0	2	2	2	6	1	0	4	3	0	1	1	36
8.9	11.2	1	4	1	1	1	3	2	8	13	3	3	0	1	1	0	3	45
11.2	13.4	2	0	1	0	0	2	2	4	17	5	3	2	0	1	1	0	40
13.4	17.9	2	0	0	0	0	0	0	2	20	9	1	1	0	0	0	2	37
17.9	22.4	0	0	0	0	0	0	0	0	2	0	5	1	1	2	2	0	13
22.4	29.1	0	0	0	0	0	0	0	0	0	1	6	1	0	4	1	0	13
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		29	15	4	4	1	9	6	20	58	21	19	10	5	9	8	18	236

Stability Class: C

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	3	0	2	6	1	0	2	1	0	1	0	1	2	2	3	27
2.2	4.5	12	9	7	18	13	10	3	7	9	3	2	5	6	4	6	7	121
4.5	6.7	5	7	3	9	10	14	12	14	13	10	3	9	1	2	6	5	123
6.7	8.9	4	7	5	7	3	5	4	30	19	8	7	8	4	0	7	4	122
8.9	11.2	4	4	1	2	2	5	3	10	29	6	3	3	7	7	1	3	90
11.2	13.4	1	0	0	1	3	4	0	4	12	6	2	2	3	3	2	2	45
13.4	17.9	1	1	0	0	0	0	0	2	16	14	5	3	6	8	2	0	58
17.9	22.4	0	0	0	0	0	0	0	0	4	6	3	3	3	4	5	1	29
22.4	29.1	0	0	0	0	0	0	0	0	1	2	3	0	1	4	2	0	13
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	3
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		30	31	16	39	37	39	22	69	104	55	29	34	32	35	34	25	631

Stability Class: D

Wind Speed Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	3	4	7	11	11	7	9	6	5	2	3	4	1	2	1	2	78
2.2	4.5	6	10	10	20	31	16	25	23	12	6	8	5	2	6	5	5	190
4.5	6.7	3	6	8	15	14	21	16	23	9	12	5	5	5	4	5	2	153
6.7	8.9	3	3	6	11	11	13	15	16	25	6	4	8	7	6	9	3	146
8.9	11.2	1	2	3	3	6	17	6	12	17	11	3	5	5	4	1	5	101
11.2	13.4	1	0	1	0	0	11	8	4	4	10	3	4	7	2	4	2	61
13.4	17.9	0	0	0	0	0	1	5	4	13	15	5	5	14	8	8	3	81
17.9	22.4	0	0	0	0	0	0	0	1	4	6	7	6	6	11	10	1	52
22.4	29.1	0	0	0	0	0	0	0	0	2	0	6	9	3	17	11	0	48
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	5
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		17	25	35	60	73	86	84	89	91	68	44	51	51	63	55	23	915

Table 5-11 Year 2011 Growing Season – Daylight Hours (Continued)

(Solar Irradiance > 5 watts/m^2; 33 Ft AGL)

Stability Class: E

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	3	1	1	0	1	1	0	0	0	0	0	0	0	0	8
2.2	4.5	1	2	1	2	3	2	4	3	3	1	1	0	0	1	1	3	28
4.5	6.7	0	3	0	0	3	2	4	5	4	1	1	3	0	1	1	2	30
6.7	8.9	3	3	2	1	0	2	5	3	5	3	1	0	0	1	1	0	30
8.9	11.2	0	1	2	2	2	4	2	5	5	4	0	2	2	1	4	1	37
11.2	13.4	2	1	0	0	0	2	2	3	6	1	4	1	1	0	2	0	25
13.4	17.9	0	0	0	0	0	3	3	1	5	3	2	1	1	1	5	3	28
17.9	22.4	0	0	0	0	0	0	0	1	3	1	2	0	0	1	1	0	9
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		7	10	8	6	9	15	21	22	31	14	11	7	4	9	15	9	198

Stability Class: F

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	0	0	2	1	0	1	0	0	1	0	1	1	1	0	0	0	8
2.2	4.5	3	1	2	3	1	0	3	3	3	1	2	0	1	1	1	0	25
4.5	6.7	1	1	2	1	0	3	3	3	4	5	0	0	3	0	0	0	26
6.7	8.9	0	0	0	1	1	0	0	3	2	2	2	3	0	1	0	2	17
8.9	11.2	1	1	1	0	0	0	0	2	2	2	0	0	0	0	0	1	10
11.2	13.4	0	0	0	0	0	0	0	4	2	1	1	1	0	0	0	0	9
13.4	17.9	0	0	0	0	0	0	0	2	2	0	1	0	1	1	2	0	9
17.9	22.4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		5	3	7	6	2	4	6	17	16	11	8	5	6	3	4	3	106

Stability Class: G

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	1	0	0	0	1	2	0	4	0	1	0	0	0	1	0	0	10
2.2	4.5	0	1	1	1	1	3	1	2	3	1	1	1	0	0	0	0	16
4.5	6.7	2	0	0	0	1	1	2	3	2	1	1	2	0	0	0	0	15
6.7	8.9	0	1	0	1	0	0	0	2	1	2	2	1	0	0	1	2	13
8.9	11.2	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	2	8
11.2	13.4	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	1	5
13.4	17.9	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		3	2	1	2	3	6	3	18	7	7	4	4	0	1	2	5	68

Stability Class: All

Wind Speed Min	Wind Speed Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.0	2.2	8	7	12	15	19	11	10	13	7	3	5	5	3	5	3	6	132
2.2	4.5	27	25	22	46	49	32	36	39	30	12	14	11	9	12	15	18	397
4.5	6.7	25	22	13	25	28	42	37	51	32	31	10	20	9	7	14	19	385
6.7	8.9	19	22	14	22	15	22	26	56	59	22	16	24	16	8	20	13	374
8.9	11.2	13	16	9	8	11	29	13	42	68	28	9	10	15	13	6	18	308
11.2	13.4	6	3	2	1	3	19	12	22	46	25	13	11	12	6	10	5	196
13.4	17.9	9	1	0	0	0	4	8	12	72	46	14	11	22	18	17	8	242
17.9	22.4	0	0	0	0	0	0	0	2	19	20	20	11	10	20	19	4	125
22.4	29.1	0	0	0	0	0	0	0	0	3	4	20	11	6	29	15	0	88
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	1	1	6	2	0	11
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		107	96	72	117	125	159	142	237	336	191	122	115	103	124	121	91	2258

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
0	1	7	43	14	13	4	82

6.0 DOSE ASSESSMENT -- IMPACT ON MAN

Liquid Effluents - There were no liquid discharges from the radwaste processing system to the Columbia River during calendar year 2011.

Gaseous Effluents - The NRC GASPAR II computer code was used to calculate doses at and beyond the site boundary using quarterly and annual meteorological data and site-specific variables as required and defined in the ODCM. Table 6-1 shows the highest calculated doses at the site boundary and beyond the site boundary. Table 6-1 also shows the quarterly and annual dose for the nearest and highest exposed resident identified in the land use census. Table 6-2 provides the population collective dose within a 50-mile radius. These values were obtained from the ALARA annual integrated population dose summary (in person-rem) of the GASPAR computer code output file. Table 6-2 also provides the annual average individual doses associated with each pathway. These values were obtained by dividing the ALARA integrated dose (person-rem) by the estimated year 2000 50-mile population (356,993) and converting to mrem.

During the growing season, Columbia Generating Station conducts a five-mile land use census to determine the locations of nearest residents, gardens, and milk animals or other livestock out to five miles in each sector. The 2011 Land Use Census did not identify broad leaf vegetable gardens or milk animals within the 5-mile radius. Cattle, goats, and horses were observed within 5-miles. Although it was not determined if the nearest residents were actually consuming meat from these animals, the beef and goat meat pathways were assumed in the sectors where these animals were observed. The NRC computer code GASPAR was used for dose estimates. IAEA Technical Series Report 472[1] was used to derive Stable Element Transfer ratios to convert the GASPAR beef meat dose output to dose from goat meat. As substantial commercial fruit orchards and corn crops were observed in all eastern sectors with residents, it was assumed that these crops were being consumed by the residents. The GASPAR code consumption rates were revised to reflect these differences.

An estimate of Carbon-14 (^{14}C) releases in units of Curies (Ci) was made based on thermal power generation in units of gigawatts-thermal (GW_{th}).

^{14}C Production Rate	5.1 ± 0.6	Ci/GW_{th} - yr
Rated Thermal Power	3.486	GWth
CGS Production Rate	17.8 ± 2.1	Ci/yr at rated power

	GW_{th}-hrs	Ci of ^{14}C	Ci of $^{14}CO_2$
1st Quarter	7488.9	4.4	4.2
2nd Quarter	95.0	0.056	0.053
3rd Quarter	87.9	0.051	0.048
4th Quarter	7460.2	4.3	4.1
Total Year 2011	15132.0	8.8	8.4
Growing Season	1205.8	1.4	1.3

[1] *Handbook Of Parameter Values For The Prediction Of Radionuclide Transfer In Terrestrial And Freshwater Environments*, IAEA Technical Series Report 472, 2010

The ^{14}C production rate was estimated in Electric Power Research Institute (EPRI) Technical Report 1021106 which also estimated that 95% of ^{14}C production is released as $^{14}CO_2$

As ^{14}C in the form of $^{14}CO_2$ is a non-depositing, gaseous effluent, it enters the food chain through plant photosynthesis. Since Columbia Generating Station is a continuous release plant, normally, offsite dose is based on meteorological data throughout the year. For ^{14}C dose analysis, however, a Joint Frequency Distribution (JFD) table of atmospheric data was developed based on daylight hours (solar irradiance > 5 watts per square meter) during the growing season of both vegetables and pasture grass for beef (April 15th through October 15th). The JFD table was used as input into the NRC XOQDOQ computer code from which dispersion estimates were obtained. This method provides a more accurate method of determining the average air concentration of $^{14}CO_2$ during times of photosynthesis.

Both inhalation and ingestion pathways contribute to dose from ^{14}C. The inhalation dose estimate assumes a full year ^{14}C inhalation of both $^{14}CH_4$ and $^{14}CO_2$. The ingestion pathway assumes ^{14}C ingestion from $^{14}CO_2$ incorporation into vegetation and meat during daylight hours of the growing season.

The highest dose calculated was for the resident at 4.24 miles in the ESE sector due to higher dispersion and deposition in that sector. The annual dose to the potential maximally exposed individual (child living at resident location 4.24 miles ESE) from gaseous releases of ^{14}C is 5.34E-03 mrem to the critical organ (bone) and 1.06E-03 mrem to the total body. The available dose pathways at this location were inhalation and the ingestion of garden produce (fruits, grains, and non-leafy vegetables). Nearby sectors with beef and goat meat ingestion pathways had lower total body and bone dose due to lower dispersion values. Dose from ^{14}C is only included in Table 6.0-C of this section.

For all other gaseous releases, the highest calculated dose to a child living at locations identified in the most recent land use census was 1.90E-03 mrem to the total body, 2.23E-03 mrem to the thyroid, and 2.88E-03 mrem to the skin. This location was at 4.24 miles in the East South East sector.

Periodically, Columbia Generating Station offers public tours of selected locations within the site boundary. Calculations assumed an eight (8) hour per year exposure to the plume, ground shine, and inhalation pathways. The organ with the highest dose was the skin at 5.41E-04 mrem.

During 2011, Members of the Public worked within the owner controlled area at the Industrial Development area in the E and ESE sectors and at the DOE 618-11 burial site in the W and WNW sectors. The maximum dose from gaseous effluents to these individuals was also estimated assuming adult exposure to the plume, inhalation, and ground deposition pathways.

The following table (6.0-A) shows estimated dose to Members of the Public from gaseous effluents and direct radiation exposure within the site boundary of Columbia Generating Station for the total indicated hours spent at each location.

Table 6.0-A; Estimated Dose to Members of the Public within the Site Boundary

Location	Hours Spent	Total Body Dose (mrem)	Thyroid Dose (mrem)	Highest Other Organ Dose (mrem)	Beta Air Dose (mrad)	Gamma Air Dose (mrad)	Direct Radiation (mrem)
Tour Visitors	8.00E+00	3.45E-04	3.65E-04	5.41E-04	1.72E-04	4.86E-04	1.35E-02
Firing Range	8.00E+00	2.93E-06	2.95E-06	4.53E-06	1.36E-06	3.84E-06	0.00E+00
618-11 DOE Site	2.00E+03	1.89E-03	1.93E-03	2.89E-03	8.56E-04	2.42E-03	6.19E+00
WNP-4 Whse.2-4	2.60E+03	3.83E-03	3.88E-03	5.85E-03	1.70E-03	4.83E-03	0.00E+00
WNP-1 Bldg 121	2.60E+03	1.11E-02	1.11E-02	1.71E-02	5.10E-03	1.45E-02	0.00E+00

Table 6.0-B provides the results of annual dose calculations for the highest dose age group for each identified land use census location from gaseous effluents. The highest 'Other Organ' in all cases was the skin.

Table 6.0-B; Estimated Dose to Residents identified in the 2011 Land Use Census

Location	Total Body Dose (mrem)	Thyroid Dose (mrem)	Highest Other Organ Dose (mrem)	Beta Air Dose (mrad)	Gamma Air Dose (mrad)	Age Group
Resident (4.47 miles NE)	2.89E-04	3.91E-04	4.14E-04	1.10E-04	3.12E-04	Child
Resident (4.01 miles ENE)	2.85E-04	3.88E-04	4.01E-04	1.04E-04	2.94E-04	Child
Resident (4.59 miles E)	9.83E-04	1.15E-03	1.44E-03	4.03E-04	1.14E-03	Child
Resident (4.65 miles E)	1.02E-03	1.18E-03	1.49E-03	4.16E-04	1.18E-03	Child
Resident (4.24 miles ESE)	1.90E-03	2.23E-03	2.88E-03	8.60E-04	2.44E-03	Child

Based on the available exposure pathways and the highest dispersion and deposition values, the critical receptor is the resident at 4.24 miles ESE. Table 6.0-C adds the potential dose from Carbon-14 to the above dose estimate.

Table 6.0-C; Total Potential Dose to Critical Receptor (4.24 miles ESE)

	Total Body	Bone	Thyroid	Skin
Dose from Carbon-14	1.06E-03	5.34E-03	1.06E-03	1.06E-03
Dose from Other Nuclides	1.90E-03	1.80E-03	2.23E-03	2.88E-03
Total Dose	2.96E-03	7.14E-03	3.29E-03	3.93E-03

For environmental thermoluminescent dosimeter (TLD) stations at or beyond the site boundary where preoperational (background) data was acquired, no increase in the average ambient exposure was observed in 2011 from the preoperational values.

Dose Tables

Dose from Carbon-14 is not included in these tables for reasons discussed earlier in this report.

Table 6-1 Summary of Doses from Gaseous Effluents

The first six tables in this section show maximum estimated exposure and dose at and beyond the site boundary although no real person is resident at the site boundary. The maximum exposure and dose beyond the site boundary is estimated for locations with actual residents.

1. Maximum Air Dose at the Site Boundary (1.2 miles)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta air dose (mrad)	7.74E-03	2.74E-04	0.00E+00	1.10E-03	7.35E-03
Gamma air dose (mrad)	2.19E-02	7.73E-04	0.00E+00	3.12E-03	2.08E-02

2. Maximum Air Dose Beyond the Site Boundary

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta air dose (mrad)	2.55E-04	3.01E-05	0.00E+00	1.87E-04	8.60E-04
Gamma air dose (mrad)	7.22E-04	8.51E-05	0.00E+00	5.31E-04	2.44E-03

3. Maximum Annual Dose at the Site Boundary

	Annual Dose
Annual total body dose (mrem)	1.55E-02
Annual skin dose (mrem)	2.40E-02

4. Maximum Annual Dose Beyond the Site Boundary

	Annual Dose
Annual total body dose (mrem)	1.90E-03
Annual skin dose (mrem)	2.88E-03

Table 6-1 Summary of Doses from Gaseous Effluents (Continued)

5. Maximum Organ Dose at the Site Boundary (1.2 miles)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Maximum Organ dose (mrem)	2.37E-02	1.25E-03	1.13E-03	3.43E-03	2.40E-02

6. Maximum Organ Dose Beyond the Site Boundary

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Maximum Organ dose (mrem)	8.74E-04	1.59E-04	7.91E-05	6.71E-04	2.88E-03

7. Dose to Nearest Residents within 5-Miles in each Sector with Residents

4.47 Miles NE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	1.17E-04	9.85E-06	0.00E+00	2.65E-05	1.10E-04
Gamma Air Dose (mrad)	3.31E-04	2.78E-05	0.00E+00	7.50E-05	3.12E-04
Maximum Organ dose (mrem)	3.90E-04	5.19E-05	2.48E-05	1.03E-04	4.14E-04

4.01 Miles ENE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	2.13E-04	5.42E-06	0.00E+00	4.41E-05	1.04E-04
Gamma Air Dose (mrad)	6.03E-04	1.53E-05	0.00E+00	1.25E-04	2.94E-04
Maximum Organ dose (mrem)	6.78E-04	4.93E-05	3.30E-05	1.58E-04	4.01E-04

4.59 Miles E

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	2.49E-04	9.76E-06	0.00E+00	3.12E-05	4.03E-04
Gamma Air Dose (mrad)	7.07E-04	2.75E-05	0.00E+00	8.84E-05	1.14E-03
Maximum Organ dose (mrem)	8.52E-04	6.60E-05	4.80E-05	1.90E-04	1.44E-03

Table 6-1 Summary of Doses from Gaseous Effluents (Continued)

7. Dose to Nearest Residents within 5-Miles in each Sector with Residents (Continued)

4.65 Miles E

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	2.55E-04	9.76E-06	0.00E+00	1.87E-04	4.16E-04
Gamma Air Dose (mrad)	7.22E-04	2.75E-05	0.00E+00	5.31E-04	1.18E-03
Maximum Organ dose (mrem)	8.74E-04	6.65E-05	4.59E-05	6.71E-04	1.49E-03

4.24 Miles ESE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	4.23E-05	3.01E-05	0.00E+00	1.65E-04	8.60E-04
Gamma Air Dose (mrad)	1.20E-04	8.51E-05	0.00E+00	4.69E-04	2.44E-03
Maximum Organ dose (mrem)	4.77E-04	1.59E-04	7.91E-05	5.96E-04	2.88E-03

* Rather than the sum of the quarters, the Annual Cumulative values are based on annual meteorological data and total annual effluents. For each time period, the dose estimate uses the radionuclide mix and release rate for that period along with an estimate of the dispersion in air and deposition on ground and vegetation calculated by the NRC computer code XOQDOQ using actual meteorological conditions during the respective quarters. The dose estimate of the NRC computer code GASPAR uses, as base methodology, NRC Regulatory Guide 1.109 (1974) which includes the prospective dose component arising from retention in the body beyond the period of environmental exposure.

Table 6-2 50-Mile Population Dose from Gaseous Effluents

A. 50-mile population collective dose

Exposure Pathway	Total Body (person-rem)	Max. Organ (person-rem)
Plume	2.65E-03	4.70E-03
Ground	1.04E-03	1.22E-03
Inhalation	1.64E-03	1.63E-03
Vegetables	1.79E-03	1.72E-03
Milk	7.11E-04	6.01E-04
Meat	3.42E-04	3.08E-04
Total	8.17E-03	1.02E-02

B. Average Individual*

Exposure Pathway	Total Body (mrem)	Max. Organ (mrem)
Plume	7.42E-06	1.32E-05
Ground	2.91E-06	3.42E-06
Inhalation	4.59E-06	4.57E-06
Vegetables	5.01E-06	4.82E-06
Milk	1.99E-06	1.68E-06
Meat	9.58E-07	8.63E-07
Total	2.29E-05	2.85E-05

* These values are derived by dividing the 50-mile population collective doses by the population within 50 miles of Columbia Generating Station (356,993). The population estimate is based on the 2000 census conducted by the United States Census Bureau and documented in the Columbia Generating Station Final Safety Analysis Report. The Maximum Organ was the skin.

7.0 REVISIONS TO THE ODCM

One revision was made to the ODCM which involved Requirement For Operability 6.1.2 Radioactive Gaseous Effluent Monitoring Instrumentation. The previous revision only required one channel of the Offgas Post Treatment Radiation Monitors to be Operable and had Required Compensatory Actions to take if that one channel was Inoperable (Condition C). The Required Compensatory Measure was to take a noble gas grab sample every eight hours. The revision created Required Compensatory Measures to take if even one of the two available channels is not available. The revised Required Compensatory Measure ensures that the plant design described in the Final Safety Analysis Report Section 11.5.2.2.1.2 is maintained by verification that Inoperable channels are placed in a trip condition or by implementing administrative controls to prevent exceeding effluent limits. The frequency of noble gas grab samples for the Required Compensatory Measure was extended from once every eight hours to once every twelve hours consistent with the guidance of NUREG-1302.

8.0 REVISIONS TO THE PROCESS CONTROL PROGRAM (PCP)

The Process Control Program, SWP-RMP-02 was changed in November 2011 to update the descriptions of the processing systems used to prepare spent resin for disposal. These changes were needed because the casks that were available to ship "Type B" resin, the processed RWCU resin for disposal, from our previous system lost their certification.

The frequency of the scaling factors, 10 CFR 61 required analysis was changed from annual to biennial, from every year to every two years to coincide with the Columbia Generating Station fuel cycle. The waste classification branch technical position (BTP) provided acceptable approaches for the development of facility and waste stream specific scaling factors. The guidance calls for reasonable efforts to be conducted for waste characterization. An acceptable sample frequency associated with these reasonable efforts was stated in the BTP as annually for Class B and Class C waste and every two years for Class A wastes. There is also some latitude to lengthen these sample frequencies based on plant conditions remaining stable. In practice, plant operations are typically conducted to minimize perturbations during the fuel cycle making changes in waste characteristics minimal during that time.

9.0 NEW OR DELETED LOCATIONS FOR DOSE ASSESSMENTS AND/OR ENVIRONMENTAL MONITORING LOCATIONS

9.1 The 2011 Five-Mile Land Use Census showed no new pathways of exposure. The following table summarizes the assumed dose pathways:

				Ingestion		
Location	Plume	Ground Shine	Inhalation	Fruit or Vegetation	Beef Meat	Goat Meat
Resident (4.47 miles NE)	X	X	X	X		
Resident (4.01 miles ENE)	X	X	X	X	X	
Resident (4.59 miles E)	X	X	X	X		
Resident (4.65 miles E)	X	X	X	X		X
Resident (4.24 miles ESE)	X	X	X	X		

9.2 There were no new locations for environmental monitoring formally adopted into the program based on the 2011 Land Use Census.

9.3 No dose assessment or environmental monitoring locations were deleted.

10.0 MAJOR CHANGES TO RADIOACTIVE LIQUID, GASEOUS, AND SOLID WASTE TREATMENT SYSTEMS

No major changes (as defined by ODCM Section 6.4.3) were made to the radioactive waste systems (liquid, gaseous, or solid) during this reporting period.