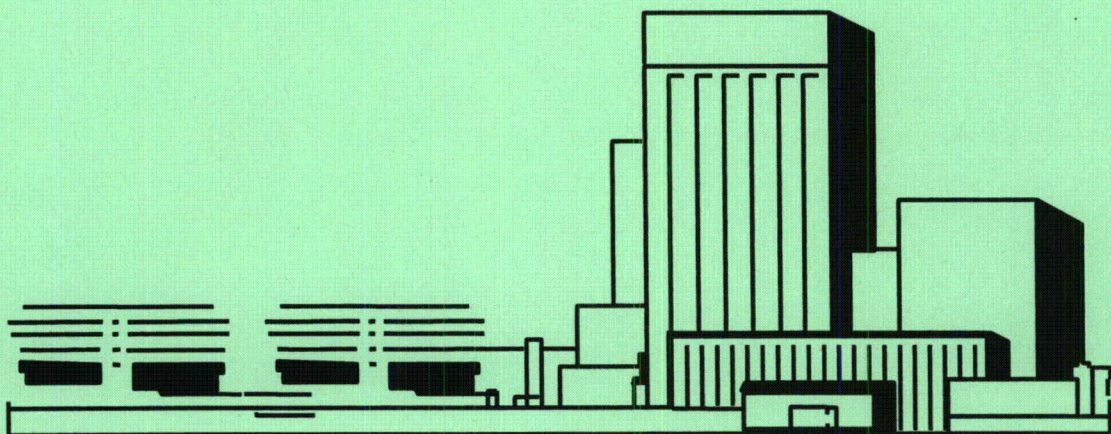


ENERGY NORTHWEST

Columbia Generating Station Annual Radioactive Effluent Release Report

January through December 2012



REFERENCES:
10 CFR 50.36a(a)(2)
CGS Technical Specification 5.6.2

Columbia Generating Station
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Energy Northwest

Submitted
April, 2013

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1.0 Introduction

This report has been prepared in compliance with Parts 50 of Title 10 of the Code of Federal Regulations (CFR), specifically 10 CFR 50.36a(a)(2) 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 2012. 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 2012. The last planned discharge took place in 1998.

In 2012, 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) or Minimum Detectable Concentration (MDC), 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. Opportunities for improving the accuracy of several values presented in ODCM Table 3-13 were self-identified. Table 3.0-A of this report shows both the values presented in ODCM Table 3-13 and the values actually used as input to XOQDOQ for dose estimates presented in this report. The values are for parameters which describe characteristics of gaseous effluent release points (vertical exit velocity, vent inside diameter, and the heat emission rate).

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 <u>vertical exit velocity</u> . 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 on 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.

Heating Steam

It is estimated that approximately $4.57\text{E-}04$ 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).

Storm Drain Pond (SDP)

Columbia Generating Station was designed with an evaporation basin (Storm Drain Pond) within the Owner Controlled Area and described in the CGS National Pollutant Discharge Elimination System (NPDES) permit as "Outfall 2". The SDP receives storm water runoff, wastewater from potable and demineralized water production, intake air wash unit blowdown, and water from non-radioactive equipment dewatering, leakage, cleaning, and flushing activities. Since discovery of residual licensed radioactive material in the soil of the SDP in 1993, the pond has been fenced and posted in accordance with 10 CFR 20 requirements.

In August and September of 2011, environmental sampling of soil downstream of the outfall to the Storm Drain Pond found very low levels of Mn-54, Co-58, Co-60, Zn-65, Cs-134, and Cs -137. The measured activity values for the known nuclides were reported in the 2011 Annual Radiological Environmental Operating Report. Fe-55, Ni-63, and Sr-90 results were less than the MDC values.

The source of this low level activity was determined to be monitored and controlled gaseous effluent releases. The recapture of activity released is from a) the precipitation washout/rainout of released activity, b) cooling tower and spray pond plume drifting north to northwest over the gaseous release ducts and scavenging activity, and c) the re-condensation of water vapor in gaseous effluents. Figure 1 shows a wind rose overlaid onto a site map showing a bimodal wind pattern with wind commonly from the S to SE taking spray pond and cooling tower water vapor plumes over gaseous effluent release points.

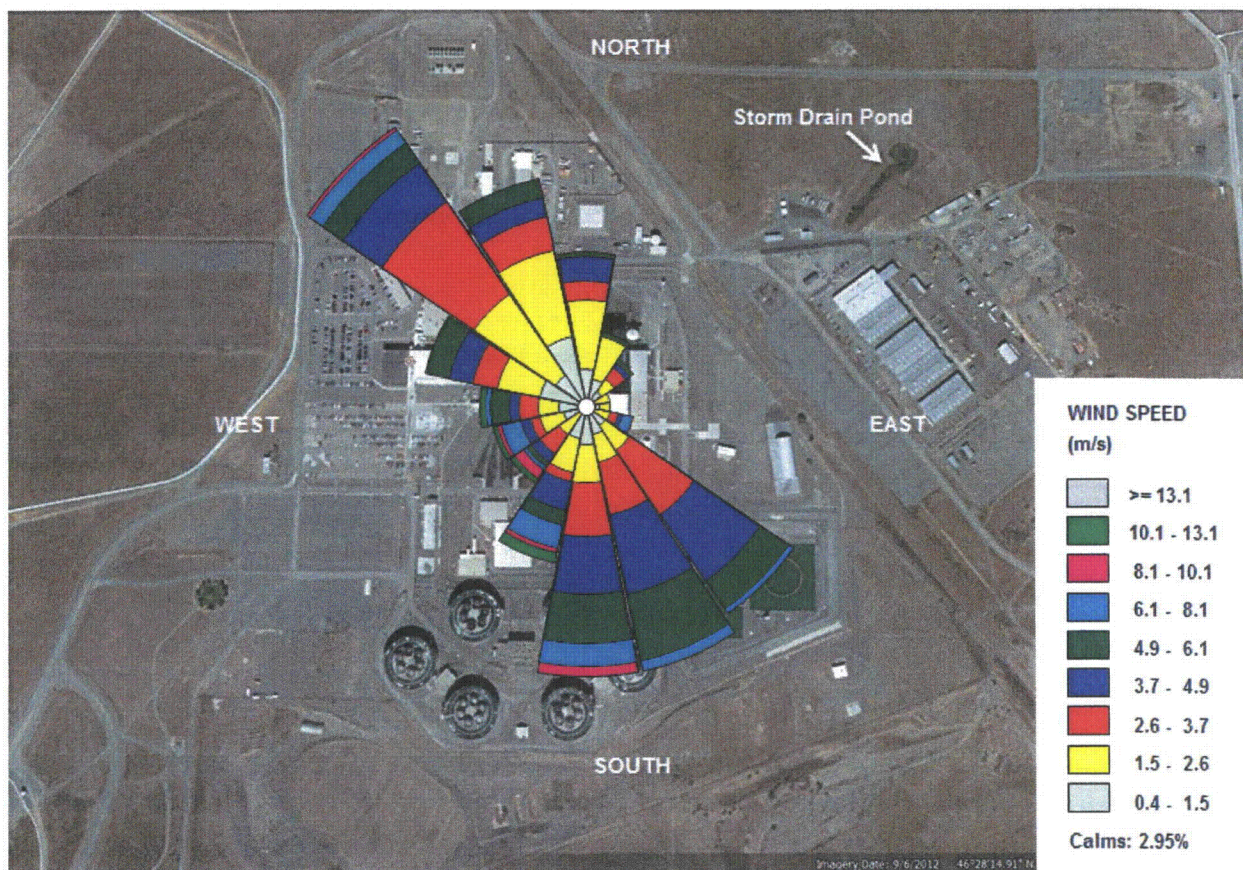


Figure 1 - Bimodal wind rose overlaid on site map.

Other sources considered were a) released activity re-entering the plant through air intake structures, scavenged by the air wash system, and ultimately released to the SDP and b) an unplanned release of waste water from turbine condenser tube cleaning during 2011. However, no positive samples have been measured from the air wash system and the relative concentration of Zr-95 in the condenser water (~10,000 times greater than Zn-65) did not correlate with the fact that Zr-95 was not detected in the SDP.

Activity at the SDP has several potential routes to a Member of the Public (MOP).

- External exposure from standing on the ground above areas contaminated from resuspended activity.
- Ingestion of food grown in areas contaminated from resuspended activity.
- Ingestion of contaminated ground or river water as a result of vertical migration to the unconfined aquifer followed by horizontal movement toward the closest surface water (Columbia River).
- Inhalation and ingestion of resuspended radioactivity.

As the Storm Drain Pond is both within the Controlled Area and is fenced and posted, external exposure from activity in the ground or internal exposure from ingestion of food grown in the soil of the Storm Drain Pond is prevented.

Ingestion of Potentially Contaminated Water

Relative to the potential ingestion of contaminated ground water, generally, the radionuclides of concern are H-3, Sr-90, and Cs-137. These three radionuclides are fairly representative in terms of sorption characteristics of those found in probable plant effluents. Tritium does not sorb onto soil particles at all, strontium is an intermediate sorber, and cesium strongly sorbs to soil particles. It was observed from previously-measured Storm Drain Pond activity that Co-60 sorption to soil is similar to that of Cs-137.

The CGS Final Safety Analysis Report calculates the transport time for these nuclides to the river for a ground release assuming no holdup or migration time through the soil to groundwater. This is a large assumption as sorption in soil has been observed to be quite high. The transport time from the unconfined aquifer to the river takes into account decay, dispersion, and sorption on the aquifer media. The transport time to the river for H-3 is 5.2 years, Sr-90 is 230 years, and Cs-137 is 2300 years. The concentration reduction factors are $7.7\text{E}5$, $1.8\text{E}8$, and $5.8\text{E}28$ respectively based on dispersion, sorption, decay, and dilution. By the time it would take to reach the river, the nuclide concentrations in Table 3.0-B would not be detectable.

Table 3.0-B shows the projected reduction in nuclide concentrations.

Table 3.0-B

	In Soil At SDP (pCi/kg)	Concentration Reduction Factor	At Columbia River (pCi/kg)
Mn-54	130	$5.80\text{E}+28$	$2.24\text{E}-27$
Co-58	57	$5.80\text{E}+28$	$9.83\text{E}-28$
Co-60	6260	$5.80\text{E}+28$	$1.08\text{E}-25$
Zn-65	670	$5.80\text{E}+28$	$1.16\text{E}-26$
Cs-134	41.3	$5.80\text{E}+28$	$7.12\text{E}-28$
Cs-137	193	$5.80\text{E}+28$	$3.33\text{E}-27$

The resultant concentration at the Columbia River would not result in dose of any significance.

Based on 2012 Radiological Environmental Monitoring Program (REMP) sampling of the water entering the SDP, Table 3.0-C was constructed to project the concentration of tritium (H-3) reaching the Columbia River should the tritium reach the groundwater instantaneously without any reduction in concentration.

Table 3.0-C

	At SDP Outfall (pCi/liter)	Concentration reduction factor	At Columbia River (pCi/liter)
Maximum H-3 Concentration	7200	7.70E+05	9.35E-03
Average H-3 Concentration	1650	7.70E+05	2.14E-03

Tritium is a naturally-occurring radionuclide produced from cosmic radiation interactions with gases in the upper atmosphere. The worldwide inventory of natural tritium is estimated at $2.6\text{E}+19$ pCi (National Council on Radiation Protection and Measurements Report #62). Levels of tritium in the Columbia River are monitored by the CGS REMP and documented in the Annual Radiological Environmental Operating Report (AREOR). The 2012 AREOR notes that tritium results for all plant intake, plant discharge, and river/drinking samples were below the analysis method *a priori* LLD (300 pCi/liter). The projected values in Table 3.0-C are 10,000 to 100,000 times lower than both the REMP LLD and the EPA standard for drinking water ($< 20,000$ pCi/liter). With further dilution of the SDP tritium with Columbia River water, there would be insignificant dose above background values from drinking water taken from the Columbia River. There are currently no wells used for drinking water in the shallow (unconfined) aquifer. Use of water from future wells in this aquifer would be restricted due to the tritium contamination from DOE activities which are currently greater than drinking water standards.

Resuspension of SDP activity

The SDP soil is normally moist due to routine water intrusion. This along with the vegetation cover reduces the resuspension of activity. To be conservative, the ground plane, inhalation, indirect ingestion and direct ingestion exposure pathways from resuspension were considered to be present at all locations. The infant and child age groups were excluded from onsite consideration as they would not be expected to be present. The onsite age group was assumed to be teen as this would be the most radiosensitive group. Based on this, the dose to a member of the public due to onsite activity was well below the Appendix I limits. The highest organ dose was found to be $2.37\text{E}-05$ mrem to the lung. The highest total body and thyroid doses were $5.42\text{E}-06$ mrem and $7.66\text{E}-07$ mrem respectively. The onsite location with the highest dose potential is at 0.5 miles in the ENE sector. This is a result of the hypothetical exposure time of 1 year (8760 hours) of continuous residence.

The offsite dose to a member of the public was evaluated at a residence located at 4.95 miles ENE. In addition to the pathways considered for onsite exposure, vegetation and cow meat were considered present at this location based on the

2012 land use census. Based on this, the offsite dose to a member of the public was found to be well below the Appendix I limits. The highest organ dose is found to be 3.60E-07 mrem to the lung. The highest total body and thyroid doses were 7.02E-08 mrem and 2.75E-09 mrem. The highest exposure pathways are inhalation and direct consumption of soil. Dose due to the consumption of produce and animal products was on the order of 4E-10 mrem or less.

During 2012, there were no ODCM-related effluent monitors out of service longer than 30 days.

Erratum:

Errors were detected in Table 3-4 of the 2011 Annual Radiological Effluent Release Report (ARERR). Six of the twenty "Percent of ODCM Limit (%)" calculations were incorrect. The percent of ODCM release rate limit for Iodines for the year was reported as 1.16E-05% rather than the correct value of 8.70E-06%. The percent of ODCM release rate limit for Particulates were also calculated in error. The reported and corrected values are shown in the below table. These errors did not affect the offsite dose estimates presented in the 2011 effluent report.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Percent of ODCM limit (%) Reported in 2011	1.41E-01	1.64E-02	1.01E-02	1.18E-01	6.41E-02
Percent of ODCM limit (%) Corrected	2.73E-06	2.79E-06	1.26E-05	3.51E-07	4.61E-06

Gaseous Effluent Tables

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

Report Period: January -- December 2012

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year*
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Noble Gas

Gamma Air Dose (mrad)	8.84E-03	4.12E-03	4.71E-03	2.84E-03	1.98E-02
ODCM Limit	5	5	5	5	10
% of Limit	1.77E-01	8.24E-02	9.42E-02	5.68E-02	1.98E-01
Beta Air Dose (mrad)	3.12E-03	1.45E-03	1.66E-03	1.00E-03	7.00E-03
ODCM Limit	10	10	10	10	20
% of Limit	3.12E-02	1.45E-02	1.66E-02	1.00E-02	3.50E-02

Iodine-131, Iodine-133, Tritium, and Particulates with half-lives greater than eight days.

Organ Dose (mrem)	9.67E-03	4.46E-03	5.10E-03	3.20E-03	2.17E-02
ODCM Limit	7.5	7.5	7.5	7.5	15
% of Limit	1.29E-01	5.95E-02	6.80E-02	4.27E-02	1.45E-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 for the plume exposure, ground exposure, and inhalation pathways only, and does not include dose from non-depositing Carbon-14. The highest organ (bone) dose received from all gaseous effluent releases (including Carbon-14) for 2012 by a resident (child) at 4.95 miles ENE for the plume exposure, ground exposure, garden produce ingestion, beef meat ingestion, and inhalation pathways was 3.36E-3 mrem (0.2% of the 15 mrem ODCM limit).

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

Report Period: January -- December 2012

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
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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	2.50E+01	1.59E+01	1.90E+01	7.41E+00	6.73E+01
Total for period *	2.50E+01	1.59E+01	1.90E+01	7.41E+00	6.73E+01

B. Iodines

iodine-131	<MDA	4.51E-06	<MDA	<MDA	4.51E-06
iodine-132	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-133	<MDA	5.99E-06	<MDA	<MDA	5.99E-06
iodine-134	<MDA	<MDA	<MDA	<MDA	<MDA
iodine-135	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period *	0.00E+00	1.05E-05	0.00E+00	0.00E+00	1.05E-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 2012

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
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C. Particulates

strontium-89	6.81E-06	1.06E-06	2.79E-07	<MDA	8.14E-06
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
silver-110m	<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	7.26E-06	<MDA	2.00E-06	<MDA	9.26E-06
iron-59	<MDA	<MDA	<MDA	<MDA	<MDA
manganese-54	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-65	<MDA	<MDA	<MDA	<MDA	<MDA
chromium-51	<MDA	<MDA	<MDA	<MDA	<MDA
antimony-125	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period*	1.41E-05	1.06E-06	2.28E-06	0.00E+00	1.74E-05
Others with T 1/2 < 8 days					
arsenic-76	<MDA	<MDA	<MDA	<MDA	<MDA
bromine-82	<MDA	<MDA	9.96E-06	3.10E-06	1.31E-05
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	9.96E-06	3.10E-06	1.31E-05

D. Tritium

tritium	4.79E-01	6.03E-01	7.55E-01	8.91E-01	2.73E+00
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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 2012

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	<MDA	<MDA	<MDA	<MDA	<MDA
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 *	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+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 (Continued)
Particulates and Tritium**

Report Period: January -- December 2012

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
-------------------	------------------------	------------------------	------------------------	------------------------	--------------

C. Particulates

strontium-89	9.31E-06	8.36E-06	2.72E-06	4.03E-06	2.44E-05
strontium-90	1.01E-06	<MDA	<MDA	5.04E-07	1.52E-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	2.28E-05	<MDA	2.12E-06	<MDA	2.49E-05
iron-59	<MDA	<MDA	<MDA	<MDA	<MDA
manganese-54	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-65	<MDA	<MDA	<MDA	<MDA	<MDA
chromium-51	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period*	3.31E-05	8.36E-06	4.83E-06	4.54E-06	5.09E-05
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	8.83E+00	5.38E+00	3.33E+00	1.35E+01	3.10E+01
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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 2012

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
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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	<MDA	<MDA	<MDA	<MDA	<MDA
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 *	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+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 3-3 Radwaste Building Releases (Continued)
Particulates and Tritium

Report Period: January -- December 2012

Nuclides Released	1st Quarter (Ci)	2nd Quarter (Ci)	3rd Quarter (Ci)	4th Quarter (Ci)	Year (Ci)
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C. Particulates

strontium-89	3.69E-07	1.41E-06	3.30E-07	<MDA	2.11E-06
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	9.32E-07	<MDA	<MDA	2.11E-07	1.14E-06
iron-59	<MDA	<MDA	<MDA	<MDA	<MDA
manganese-54	<MDA	<MDA	<MDA	<MDA	<MDA
zinc-65	<MDA	<MDA	<MDA	<MDA	<MDA
chromium-51	<MDA	<MDA	<MDA	<MDA	<MDA
antimony-125	<MDA	<MDA	<MDA	<MDA	<MDA
Total for period*	1.30E-06	1.41E-06	3.30E-07	2.11E-07	3.25E-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	6.80E-02	9.03E-02	1.58E-01	2.45E-01	5.61E-01
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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 2012

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year	Est* Total %Error
A. Fission and activation gases						
Total release (Ci)	2.50E+01	1.59E+01	1.90E+01	7.41E+00	6.73E+01	4.50E+01
Average release rate (μCi/s)	3.18E+00	2.02E+00	2.42E+00	8.75E-01	2.10E+00	
Percent of ODCM limit (%)	6.74E-03	3.14E-03	3.59E-03	2.01E-03	3.71E-03	
B. Iodines						
Total I-131 (Ci)	<MDA	4.51E-06	<MDA	<MDA	4.51E-06	4.80E+01
Average release rate (μCi/s)	<MDA	5.74E-07	<MDA	<MDA	1.41E-07	
Percent of ODCM limit (%)	0.00E+00	5.39E-07	0.00E+00	0.00E+00	1.5E-07	
C. Particulates						
Particulates with half-lives >8 days (Ci)	4.85E-05	1.08E-05	7.44E-06	4.75E-06	7.15E-05	4.70E+01
Average release rate (μCi/s)	6.17E-06	1.38E-06	9.46E-07	5.61E-07	2.23E-06	
Percent of ODCM limit (%)	1.75E-06	2.28E-07	1.93E-07	1.43E-07	5.32E-07	
Gross alpha radioactivity (Ci)	3.00E-06	3.02E-06	3.47E-06	3.54E-06	1.30E-05	7.40E+01
D. Tritium						
Total release (Ci)	9.38E+00	6.07E+00	4.24E+00	1.46E+01	3.43E+01	2.90E+01
Average release rate (μCi/s)	1.19E+00	7.72E-01	5.39E-01	1.72E+00	1.07E+00	
Percent of ODCM limit (%)	3.96E-05	1.47E-05	1.40E-05	3.66E-05	2.14E-05	

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. Some of the contributors of this error are measurements associated with estimating the sample volume, the exhaust duct flow rates, plateout factors, charcoal cartridge efficiencies, temperatures of sample lines, buildings, and ambient air, barometric pressure, sample line vacuum, run time estimates, anisokinetic correction factors where needed, and gravimetric, gamma spectroscopy, and liquid scintillation analysis errors.

Table 3-5 Gaseous Purges and Vents

Report Period: January -- December 2012

Type	Number	Total Time (hr.)	Maximum Time (hr.)	Minimum Time (hr.)	Mean Time (hr.)
Purge	2.00E+00	3.23E+01	2.56E+01	6.70E+00	1.62E+01
Vent	4.70E+01	6.25E+01	7.00E+00	3.83E-01	1.33E+00

Columbia Generating Station is a continuous release plant. All purges and vents are discharged through the High-Efficiency Particulate Air (HEPA) filters and charcoal beds of the Standby Gas Treatment System and released through the reactor building release duct 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 2012

Fission Gases

Nuclide	Required LLD [†] ($\mu\text{Ci/cc}$)	Achieved Analysis LLD ($\mu\text{Ci/cc}$)
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
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[†] 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 2012

Class A

1. Container Volumes

5 GAL PAIL	1.0 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-88 Steel Box	138 ft ³
ES-190 Steel Liner	170.2 ft ³
14-170 Steel Liner	180.1 ft ³

2. Total Curies

7.72E+02 Ci

3. Principal Radionuclides

Nuclide	Curies	Percent
Co-60	3.77E+02	4.88E+01
Fe-55	1.70E+02	2.20E+01
Zn-65	1.52E+02	1.97E+01
Mn-54	3.34E+01	4.33E+00
Co-58	1.74E+01	2.25E+00
Ni-63	1.49E+01	1.93E+00
C-14	2.35E+00	3.04E-01
Cr-51	1.66E+00	2.15E-01
Fe-59	1.05E+00	1.36E-01

Cs-137	8.51E-01	3.70E-01
Ag-110m	4.70E-01	6.09E-02
H-3	3.12E-01	4.04E-02
Sr-89	2.34E-01	3.03E-02
Ni-59	1.06E-01	1.37E-02
Nb-95	4.40E-02	5.70E-03
La-140	4.36E-02	5.65E-03
Ba-140	3.87E-02	5.01E-03
Sb-125	3.13E-02	4.05E-03
Zr-95	2.73E-02	3.54E-03
I-131	2.67E-02	3.48E-03
Sr-90	2.48E-02	3.21E-03
Pu-241	1.99E-02	2.58E-03
Sb-124	1.11E-02	1.44E-03
Ce-141	1.08E-03	1.40E-04
Cm-242	6.28E-04	8.13E-05
Pu-239	4.02E-04	5.21E-05
Tc-99	2.17E-04	2.81E-05
Pu-238	2.08E-04	2.69E-05
Cm-243	1.98E-04	2.56E-05
Am-241	1.69E-04	2.19E-05
Pu-242	1.11E-05	1.44E-06
I-129	5.96E-06	7.72E-07
Ra-226	1.44E-06	1.87E-07

4. Source

Resins	7.68E+02 Ci
DAW	3.74E+00 Ci
Irradiated Components	0.00E+00 Ci
Other (Sealed Source, Mixed Waste, & Liquid Waste)	8.35E-04 Ci

5. Type of Container

All containers shipped as Exempt, Limited Quantity, Low Specific Activity (LSA), Surface Contaminated Object (SCO) or Radioactive material in Industrial Package (IP) 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 2012

Class C

There were no Class C shipments made during calendar year 2012

Solid Radwaste Information Recommended by NRC Regulatory Guide 1.21

January -- December 2012

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 Ci	2.31E+02 7.68E+02	2.5E+01%
b. Dry Active Waste	m ³ Ci	1.05E+02 3.74E+00	2.5E+01%
c. Irradiated Components	m ³ Ci	0.00E+00 0.00E+00	None
d. Other Waste (Sealed Source, mixed waste, & Liquid Waste)	m ³ Ci	9.93E+00 8.35E-04	2.5E+01%

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

a. Dewatered Spent Resins -- All Classes

Nuclide	Curies	Percent
Co-60	3.76E+02	4.89E+01
Fe-55	1.70E+02	2.21E+01
Zn-65	1.51E+02	1.97E+01
Mn-54	3.33E+01	4.33E+00
Co-58	1.69E+01	2.20E+00
Ni-63	1.49E+01	1.94E+00
C-14	2.35E+00	3.06E-01
Fe-59	1.05E+00	1.37E-01
Cs-137	7.63E-01	9.93E-02
Cr-51	6.89E-01	8.97E-02
Ag-110m	4.57E-01	5.95E-02
H-3	3.11E-01	4.05E-02
Sr-89	2.27E-01	2.95E-02
Ni-59	1.06E-01	1.38E-02
La-140	4.36E-02	5.68E-03
Ba-140	3.87E-02	5.04E-03
I-131	2.67E-02	3.48E-03

Sr-90	2.46E-02	3.20E-03
Pu-241	1.99E-02	2.59E-03
Sb-125	7.48E-03	9.74E-04
Ce-141	1.08E-03	1.41E-04
Nb-95	8.99E-04	1.17E-04
Cm-242	6.11E-04	7.95E-05
Tc-99	2.15E-04	2.80E-05
Pu-239	3.86E-04	5.02E-05
Pu-238	2.07E-04	2.69E-05
Cm-243	1.98E-04	2.58E-05
Am-241	1.69E-04	2.20E-05
Pu-242	1.11E-05	1.44E-06
I-129	5.91E-06	7.69E-07

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

Nuclide	Curies	Percent
Co-60	1.09E+00	2.91E+01
Cr-51	9.69E-01	2.59E+01
Zn-65	8.88E-01	2.37E+01
Co-58	4.57E-01	1.22E+01
Mn-54	1.03E-01	2.75E+00
Cs-137	5.22E-02	1.39E+00
Nb-95	4.31E-02	1.15E+00
Fe-55	3.98E-02	1.06E+00
Zr-95	2.73E-02	7.29E-01
Sb-125	2.38E-02	6.36E-01
Ni-63	1.99E-02	5.32E-01
Ag-110m	1.34E-02	3.58E-01
Sb-124	8.61E-03	2.30E-01
Sr-89	6.52E-03	1.74E-01
C-14	4.92E-04	1.31E-02
H-3	3.14E-04	8.39E-03
Sr-90	2.01E-04	5.37E-03

Cm-242	1.69E-05	4.52E-04
Pu-239	1.60E-05	4.28E-04
Tc-99	1.82E-06	4.86E-05
Pu-238	7.27E-07	1.94E-05
I-129	5.00E-08	1.34E-06

c. Irradiated Components
None

d. Other Waste (Sealed Source & Mixed Waste)

Nuclide	Curies	Percent
H-3	7.19E-04	8.61E+01
Co-60	1.06E-04	1.27E+01
Zn-65	5.29E-06	6.34E-01
Mn-54	2.43E-06	2.91E-01
Ra-226	1.44E-06	1.73E-01
Co-58	3.72E-07	4.46E-02
Sb-125	6.54E-08	7.84E-03
Cs-137	4.68E-08	5.61E-03

3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
30	Tractor - Trailer via Public Highway	US Ecology, Inc. P.O. Box 638 Hanford Reservation Richland, WA. 99352
2*	Tractor - Trailer via Public Highway	Perma-Fix Northwest 2025 Battelle Blvd Richland, WA 99352

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

Irradiated Fuel Shipments (Disposition)

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
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 2012. Data is archived on the Energy Northwest Local Area Network.

Meteorological data recovery for 2012 was 99.2% 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 can be combined 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 2012. 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 2012. 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/m². This JFD table was used for Carbon-14 (¹⁴C) 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 2012 were snow (16.0 inches total in January, February, March, November and December), total precipitation (8.18 inches), freezing rain (3 days), dust or blowing dust (2 days), smoke (10 days), fog (39 days), and thunderstorms (15 days).

Rainfall as recorded at the Columbia Generating Station meteorological tower was 7.1 inches.

Joint Frequency Distribution Tables for 2012

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: 1/1/2012	Total number of Periods: 2184
Period: 1st Quarter	Stop Date: 4/1/2012	Periods of No Data Recovery: 14
		System Percent Data Recovery: 99.4%

Stability Class: A																		
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	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	1	1	1	3
4.5	6.7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
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	1	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	1	2	0	1	0	0	0	0	4
17.9	22.4	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	4
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	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	1	0	0	0	0	0	0	1	5	2	1	0	1	1	3	15

Stability Class: B																		
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	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
2.2	4.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.5	6.7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4
6.7	8.9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8.9	11.2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	6
11.2	13.4	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	4	9
13.4	17.9	0	0	0	0	0	0	0	0	4	1	1	1	0	2	0	2	11
17.9	22.4	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
22.4	29.1	0	0	0	0	0	0	0	0	0	0	5	0	0	0	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		4	0	0	0	0	0	0	0	8	5	7	1	0	2	2	12	41

Stability Class: C																		
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	0	0	0	0	0	0	0	0	0	0	0	2	3
2.2	4.5	4	0	0	0	0	0	1	0	0	0	0	0	1	1	0	2	9
4.5	6.7	2	0	0	0	0	0	0	1	1	0	0	0	0	1	0	5	10
6.7	8.9	2	0	0	0	0	0	0	2	1	1	0	0	0	1	2	2	11
8.9	11.2	1	0	0	0	0	0	2	1	3	0	0	0	0	1	1	2	11
11.2	13.4	0	0	0	0	0	0	0	1	4	0	0	1	2	0	1	2	11
13.4	17.9	1	0	0	0	0	0	0	3	6	3	2	0	0	5	2	0	22
17.9	22.4	0	0	0	0	0	0	0	0	1	3	1	1	1	0	0	0	7
22.4	29.1	0	0	0	0	0	0	0	0	0	3	6	1	2	0	0	0	12
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	2	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		11	0	0	0	0	0	3	8	16	10	10	3	8	9	6	15	99

Stability Class: D																		
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	5	8	0	1	1	3	1	8	2	3	3	2	1	5	5	57
2.2	4.5	12	5	3	0	2	0	5	15	8	5	3	5	5	4	18	13	103
4.5	6.7	9	10	2	0	1	1	6	20	11	6	3	3	1	9	17	12	111
6.7	8.9	7	1	0	0	0	0	6	18	10	4	1	1	3	10	13	6	80
8.9	11.2	1	2	0	0	0	1	3	14	9	2	2	6	6	5	11	2	64
11.2	13.4	1	1	0	0	0	0	7	8	11	9	4	2	2	9	12	0	66
13.4	17.9	0	0	0	0	0	2	9	15	19	6	2	1	3	9	1	0	69
17.9	22.4	0	0	0	0	0	0	4	0	8	12	7	4	2	1	0	0	38
22.4	29.1	0	0	0	0	0	0	0	0	3	14	10	4	2	0	0	0	33
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	2	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		39	24	13	0	4	5	36	85	83	73	39	30	26	42	85	39	623

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

Stability Class: E

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	3	4	3	0	0	2	4	6	7	7	5	3	4	3	10	4	65
2.2	4.5	3	7	2	1	0	3	11	11	10	11	10	6	8	12	30	9	134
4.5	6.7	4	5	0	0	0	2	13	16	11	8	8	1	11	14	10	6	109
6.7	8.9	0	3	1	1	0	1	16	20	12	3	1	6	3	7	12	1	87
8.9	11.2	0	1	1	0	0	5	10	18	8	11	8	6	2	7	2	0	79
11.2	13.4	0	0	2	0	0	2	5	12	14	10	3	3	3	5	0	0	62
13.4	17.9	0	0	0	0	0	3	5	14	14	26	11	2	4	2	1	1	83
17.9	22.4	0	0	0	0	0	0	0	1	3	12	5	1	1	2	0	0	25
22.4	29.1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
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		10	20	9	2	0	18	64	98	80	90	51	28	36	50	70	21	647

Stability Class: F

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	3	3	1	0	2	2	1	4	3	1	6	5	4	8	9	5	57
2.2	4.5	4	1	1	1	0	4	5	16	8	10	4	5	9	6	8	12	94
4.5	6.7	2	0	0	0	0	1	5	15	15	6	0	2	6	6	15	6	79
6.7	8.9	0	0	1	0	0	0	5	19	12	4	2	2	2	9	9	0	65
8.9	11.2	0	0	0	0	0	0	9	15	6	2	1	1	2	7	3	0	46
11.2	13.4	0	0	0	0	0	0	2	2	2	0	3	1	0	0	0	0	12
13.4	17.9	0	0	0	0	0	0	2	3	5	5	0	0	0	0	0	0	15
17.9	22.4	0	0	0	0	0	0	0	0	4	2	1	0	0	0	0	0	7
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		9	4	3	1	2	7	29	74	55	32	14	18	24	36	44	23	375

Stability Class: G

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	2	2	1	1	1	1	1	3	5	2	1	3	5	5	7	9	49
2.2	4.5	1	1	0	0	0	0	1	7	4	3	3	1	4	9	12	8	54
4.5	6.7	0	0	0	0	0	0	1	7	4	0	1	0	1	3	10	5	32
6.7	8.9	0	0	0	0	0	0	0	9	4	0	0	1	0	2	10	0	26
8.9	11.2	0	0	0	0	0	0	1	5	2	1	0	0	0	2	0	0	11
11.2	13.4	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
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		3	3	1	1	1	1	5	31	20	6	5	5	10	21	39	22	174

Stability Class: All

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	18	14	13	1	4	6	9	14	23	12	15	14	15	17	32	26	233
2.2	4.5	25	14	6	2	2	7	23	49	30	29	20	17	27	33	69	45	398
4.5	6.7	18	16	2	0	1	4	25	59	42	20	12	6	19	33	53	36	346
6.7	8.9	10	4	2	1	0	1	27	68	39	12	4	10	8	29	46	9	270
8.9	11.2	3	3	1	0	0	6	25	53	29	16	11	13	10	22	17	9	218
11.2	13.4	1	1	2	0	0	2	15	23	35	23	7	9	8	12	18	6	162
13.4	17.9	1	0	0	0	0	5	9	29	45	56	20	6	5	12	12	4	204
17.9	22.4	0	0	0	0	0	0	4	1	16	34	16	6	4	3	0	0	84
22.4	29.1	0	0	0	0	0	0	0	0	4	18	22	5	4	0	0	0	53
29.1	40.3	0	0	0	0	0	0	0	0	0	1	1	0	4	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		76	52	26	4	7	31	137	296	263	221	128	86	104	161	247	135	1974

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
1	0	0	47	55	69	24	196

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

Hours at each wind speed and direction during time period

Elevation: 245	Start Date: 1/1/2012	Total number of Periods: 2184
Period: 1st Q 2012	Stop Date: 4/1/2012	Periods of No Data Recovery: 14
		System Percent Data Recovery: 99.4%

Stability Class: A

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
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	2	1	3
4.5	6.7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	4	0	1	0	0	0	0	5
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	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		0	1	0	0	0	0	0	0	0	5	3	1	0	0	2	3	15

Stability Class: B

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
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	0	1
4.5	6.7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6.7	8.9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
8.9	11.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
11.2	13.4	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	4	7
13.4	17.9	2	0	0	0	0	0	0	0	2	4	0	1	0	1	1	2	13
17.9	22.4	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	5
22.4	29.1	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4
29.1	40.3	0	0	0	0	0	0	0	0	0	0	2	1	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		8	0	0	0	0	0	0	0	4	8	7	2	0	1	2	8	40

Stability Class: C

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2.2	4.5	3	2	0	0	0	0	0	1	0	0	0	0	0	1	1	1	9
4.5	6.7	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	7
6.7	8.9	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	2	7
8.9	11.2	2	0	0	0	0	0	0	2	2	1	1	0	0	1	1	3	13
11.2	13.4	0	0	0	0	0	0	1	0	3	2	0	0	0	1	1	0	8
13.4	17.9	1	0	0	0	0	0	0	0	6	5	0	1	2	1	1	3	20
17.9	22.4	0	0	0	0	0	0	0	0	1	4	2	0	0	4	1	0	12
22.4	29.1	0	0	0	0	0	0	0	0	0	3	1	1	3	0	0	0	8
29.1	40.3	0	0	0	0	0	0	0	0	0	2	7	1	3	0	0	0	13
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		10	4	0	0	0	0	1	4	12	18	11	3	8	9	6	12	98

Stability Class: D

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	2	7	2	1	3	1	2	2	2	5	2	0	1	2	6	4	42
2.2	4.5	5	8	3	3	1	1	2	7	10	4	4	4	5	5	7	8	77
4.5	6.7	2	6	2	0	0	1	3	16	18	4	1	1	1	4	6	16	81
6.7	8.9	14	6	2	0	0	1	2	9	6	3	6	3	2	0	13	7	74
8.9	11.2	3	3	1	0	0	0	5	6	8	3	2	0	2	6	13	2	54
11.2	13.4	2	1	0	0	0	0	2	3	10	6	2	3	6	3	18	5	61
13.4	17.9	0	1	2	0	0	0	4	13	17	14	7	4	5	9	16	6	98
17.9	22.4	0	0	0	0	0	1	0	2	6	20	8	3	1	3	1	4	49
22.4	29.1	0	0	0	0	0	0	4	0	5	19	8	6	4	0	3	1	50
29.1	40.3	0	0	0	0	0	0	0	0	2	13	12	7	3	0	0	0	37
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
TOTALS		28	32	12	4	4	5	24	58	84	91	52	31	31	32	83	53	624

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

Stability Class: E

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	4	4	2	3	1	3	4	5	3	2	2	1	2	6	6	2	50
2.2	4.5	3	2	4	3	0	0	5	2	8	8	6	3	3	3	3	4	57
4.5	6.7	3	6	1	3	0	0	5	4	7	7	7	3	2	5	14	6	73
6.7	8.9	4	3	3	0	0	1	8	11	7	6	2	3	3	4	14	5	74
8.9	11.2	1	0	1	0	0	0	5	8	11	9	2	4	4	5	18	4	72
11.2	13.4	0	0	3	0	0	1	7	17	9	10	3	3	3	6	9	2	73
13.4	17.9	0	1	3	1	2	3	2	13	15	14	9	6	6	12	10	2	99
17.9	22.4	0	0	1	1	0	2	4	10	15	21	12	7	7	7	5	2	94
22.4	29.1	0	0	0	0	0	0	0	2	5	21	19	3	6	5	0	0	61
29.1	40.3	0	0	0	0	0	0	0	0	2	6	8	2	1	0	0	0	19
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS		15	16	18	11	3	10	40	72	82	105	70	35	37	53	79	27	673

Stability Class: F

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	2	1	0	2	2	1	1	1	2	5	3	3	3	0	0	1	27
2.2	4.5	8	4	5	4	1	5	4	12	4	7	3	3	5	1	6	7	79
4.5	6.7	5	3	5	1	1	0	4	4	10	6	4	1	2	6	3	3	58
6.7	8.9	2	0	1	0	0	0	4	9	10	8	1	3	2	4	6	4	54
8.9	11.2	0	1	1	0	0	0	2	10	5	6	4	0	0	7	2	2	40
11.2	13.4	1	0	0	0	0	0	3	9	9	7	0	1	2	1	4	4	41
13.4	17.9	1	0	0	1	0	0	5	7	10	9	4	2	4	8	17	5	73
17.9	22.4	0	0	0	0	0	0	0	4	3	3	1	2	1	7	4	0	25
22.4	29.1	0	0	0	0	0	0	1	2	1	6	3	1	1	1	0	0	16
29.1	40.3	0	0	0	0	0	0	0	0	0	5	2	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		19	9	12	8	4	6	24	58	54	62	25	16	20	35	42	26	420

Stability Class: G

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	1	3	2	0	0	0	0	1	3	3	1	1	2	0	0	1	18
2.2	4.5	5	2	1	1	0	1	1	5	8	2	2	2	1	0	2	4	37
4.5	6.7	1	7	0	0	1	0	3	6	9	5	5	1	0	0	1	4	43
6.7	8.9	3	0	2	0	0	0	2	6	2	5	2	1	0	1	2	2	28
8.9	11.2	2	0	0	0	0	0	2	3	6	3	1	0	1	0	4	1	23
11.2	13.4	0	0	0	0	0	0	0	3	0	1	0	0	0	1	3	3	11
13.4	17.9	0	0	0	0	0	0	0	2	2	4	1	0	0	2	4	5	20
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	5
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		12	12	5	1	1	1	8	26	30	24	12	5	5	7	17	20	186

Stability Class: All

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	9	16	6	6	6	5	7	9	10	15	8	5	8	8	12	8	138
2.2	4.5	25	18	13	11	2	7	12	27	30	21	15	12	14	10	21	25	263
4.5	6.7	16	23	8	4	2	1	15	30	44	23	17	6	5	15	24	33	266
6.7	8.9	25	10	8	0	0	2	16	36	25	22	11	10	7	10	37	21	240
8.9	11.2	9	4	3	0	0	0	14	29	32	22	10	4	7	19	38	14	205
11.2	13.4	4	1	3	0	0	1	13	32	32	27	5	7	11	12	35	18	201
13.4	17.9	4	2	5	2	2	3	11	35	52	50	21	14	17	33	49	23	323
17.9	22.4	0	0	1	1	0	3	4	16	26	55	24	13	10	24	12	6	195
22.4	29.1	0	0	0	0	0	0	5	4	11	51	37	11	14	6	3	1	143
29.1	40.3	0	0	0	0	0	0	0	0	4	26	32	11	7	0	0	0	80
40.3	90.0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
TOTALS		92	74	47	24	12	22	97	218	266	313	180	93	101	137	231	149	2056

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
1	1	1	46	29	24	12	114

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

Hours at each wind speed and direction during time period

Elevation: 33	Start Date: 4/1/2012	Total number of Periods: 2184
Period: 2nd Quarter	Stop Date: 7/1/2012	Periods of No Data Recovery: 10
		System Percent Data Recovery: 99.5%

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	0	0
4.5	6.7	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
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	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3	5
11.2	13.4	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
13.4	17.9	2	1	0	0	0	0	0	0	3	2	1	2	0	0	0	0	11
17.9	22.4	0	5	0	0	0	0	0	0	1	1	4	2	0	0	0	1	14
22.4	29.1	0	0	0	0	0	0	0	0	0	0	3	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		3	10	0	1	0	0	0	1	5	4	8	4	0	0	0	4	40

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
2.2	4.5	3	3	0	0	0	0	0	0	0	0	1	0	0	0	0	2	9
4.5	6.7	7	7	4	0	0	0	0	1	0	0	0	1	0	0	0	4	24
6.7	8.9	2	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	6
8.9	11.2	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	4
11.2	13.4	1	0	0	0	0	0	0	2	2	3	1	0	0	1	1	1	12
13.4	17.9	1	1	0	0	0	0	0	0	6	3	0	0	0	1	1	1	14
17.9	22.4	0	2	0	0	0	0	0	0	1	0	1	1	0	0	1	0	6
22.4	29.1	0	0	0	0	0	0	0	0	0	0	1	3	1	0	1	0	6
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		16	14	4	0	0	0	0	5	10	7	4	5	1	2	4	11	83

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	2	2	1	0	0	0	0	0	2	0	0	0	0	2	3	13	
2.2	4.5	9	14	3	4	5	0	0	0	2	1	0	0	0	2	1	9	50	
4.5	6.7	1	5	7	1	3	1	1	3	7	1	4	2	0	3	1	2	42	
6.7	8.9	2	2	0	0	0	0	1	5	3	4	2	2	0	1	1	0	23	
8.9	11.2	1	1	0	0	0	0	3	12	8	5	5	1	1	3	0	2	42	
11.2	13.4	0	1	0	0	0	0	2	4	6	3	6	3	1	2	0	0	28	
13.4	17.9	1	2	0	0	0	0	0	1	3	6	3	2	1	2	0	1	22	
17.9	22.4	0	1	0	0	0	0	0	0	1	2	3	1	1	4	0	0	13	
22.4	29.1	0	1	0	0	0	0	0	0	0	0	0	1	0	2	1	0	5	
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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		15	29	12	6	8	1	7	25	30	24	23	12	4	20	7	17	240	

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	3	4	3	1	2	3	6	2	3	2	1	1	2	1		38	
2.2	4.5	7	14	9	3	2	2	25	11	12	8	8	9	8	2	3	2	125	
4.5	6.7	7	7	9	5	2	7	31	31	22	11	7	9	8	9	4	7	176	
6.7	8.9	3	2	3	0	0	5	18	18	17	8	10	10	5	13	9	1	122	
8.9	11.2	0	1	0	1	0	1	8	16	18	14	5	11	9	9	5	1	99	
11.2	13.4	1	0	0	0	0	1	3	12	16	10	6	4	4	10	4	0	71	
13.4	17.9	1	4	0	0	0	0	3	5	8	13	10	13	13	29	6	0	105	
17.9	22.4	0	1	0	0	0	0	0	0	1	1	5	1	0	16	1	0	26	
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	1	0	9	0	0	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		22	32	25	12	5	18	91	99	96	68	53	59	48	98	34	12	772	

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

Stability Class: E

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	4	1	1	2	0	1	3	5	2	4	2	2	1	3	7	2	40
2.2	4.5	7	2	4	0	0	2	10	6	15	11	6	6	9	5	14	8	105
4.5	6.7	4	2	2	1	0	0	5	7	8	12	9	7	5	5	8	11	86
6.7	8.9	1	1	0	0	0	1	15	17	9	9	5	9	10	10	7	3	97
8.9	11.2	0	3	0	0	0	1	5	10	12	10	4	7	9	12	7	5	85
11.2	13.4	0	1	0	0	0	0	2	10	8	3	3	2	8	10	8	1	56
13.4	17.9	1	1	0	0	0	0	0	1	5	1	2	2	0	17	7	0	37
17.9	22.4	0	0	0	0	0	0	0	0	2	0	0	0	0	11	0	0	13
22.4	29.1	0	0	0	0	0	0	0	0	0	2	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		17	11	7	3	0	5	40	56	61	52	31	35	42	73	58	30	521

Stability Class: F

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	1	3	1	0	0	2	1	3	3	2	1	1	3	1	3	3	28
2.2	4.5	10	6	5	3	0	1	6	22	11	7	3	2	3	5	11	11	106
4.5	6.7	1	8	2	0	0	0	8	16	12	2	3	2	2	5	11	3	75
6.7	8.9	0	2	1	0	0	0	9	11	8	5	2	3	2	3	1	0	47
8.9	11.2	0	0	0	0	0	0	4	10	0	1	0	0	0	0	2	1	18
11.2	13.4	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	0	5
13.4	17.9	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
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	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		12	19	9	3	0	3	28	63	36	21	9	8	10	14	30	18	283

Stability Class: G

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	3	8	1	2	0	1	2	3	4	2	1	2	1	1	2	1	34
2.2	4.5	8	4	2	2	0	1	2	6	2	1	1	0	0	3	7	6	45
4.5	6.7	1	2	1	0	0	0	2	6	3	2	0	0	0	1	15	7	40
6.7	8.9	0	0	1	0	0	0	0	4	2	1	0	0	0	3	3	2	16
8.9	11.2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	3
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	1	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		12	14	6	4	0	2	6	19	11	7	3	2	1	8	28	16	139

Stability Class: All

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	13	17	9	8	1	6	9	17	11	13	6	6	6	6	16	11	155
2.2	4.5	44	43	23	12	7	6	43	45	42	28	19	17	20	17	36	38	440
4.5	6.7	22	33	25	8	5	8	47	64	52	28	23	21	15	23	39	34	447
6.7	8.9	8	8	5	0	0	6	43	56	40	27	19	24	17	30	21	7	311
8.9	11.2	2	6	1	1	0	2	20	50	38	32	14	19	19	24	15	13	256
11.2	13.4	2	3	0	0	0	1	7	28	34	22	16	9	13	23	15	2	175
13.4	17.9	6	9	0	0	0	0	3	8	26	25	17	19	14	49	14	2	192
17.9	22.4	0	9	0	0	0	0	0	0	6	5	13	5	1	31	2	1	73
22.4	29.1	0	1	0	0	0	0	0	0	0	3	4	5	1	11	2	0	27
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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		97	129	63	29	13	29	172	268	249	183	131	125	106	215	161	108	2078

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	0	1	23	26	23	23	96

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

Hours at each wind speed and direction during time period

Elevation: 245	Start Date: 4/1/2012	Total number of Periods: 2184
Period: 2nd Quarter	Stop Date: 7/1/2012	Periods of No Data Recovery: 15
		System Percent Data Recovery: 99.3%

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	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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
8.9 11.2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
11.2 13.4	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2
13.4 17.9	0	3	0	0	0	0	0	0	1	1	0	0	0	0	0	1	6
17.9 22.4	3	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	5
22.4 29.1	0	5	0	0	0	0	0	0	2	2	2	6	0	0	0	0	17
29.1 40.3	0	0	0	0	0	0	0	0	0	2	1	2	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		6	10	0	1	0	0	0	4	6	4	8	0	0	0	1	40

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	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
4.5 6.7	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2	10
6.7 8.9	3	7	6	0	0	0	0	0	1	0	0	1	0	0	0	2	20
8.9 11.2	3	2	1	0	0	0	0	0	1	2	0	0	0	0	0	0	9
11.2 13.4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
13.4 17.9	3	1	0	0	0	0	0	0	2	5	2	0	0	1	2	0	16
17.9 22.4	0	1	0	0	0	0	0	0	2	0	0	0	0	0	1	1	5
22.4 29.1	0	1	1	0	0	0	0	0	1	2	3	1	0	0	2	0	11
29.1 40.3	0	0	0	0	0	0	0	0	0	1	1	3	1	1	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		14	14	10	0	0	0	0	9	10	6	6	1	2	5	6	83

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	2	1	0	0	0	0	0	0	0	0	1	0	1	2	8
2.2 4.5	2	5	4	2	1	2	0	0	0	0	1	0	1	0	1	4	23
4.5 6.7	5	8	5	0	1	1	0	1	1	5	0	1	0	1	1	2	32
6.7 8.9	2	6	5	1	3	3	1	1	5	3	4	1	0	2	0	3	40
8.9 11.2	2	1	3	0	0	0	1	2	6	3	1	1	0	3	0	0	23
11.2 13.4	1	1	0	0	0	1	1	6	10	2	4	0	1	1	0	0	28
13.4 17.9	0	2	0	0	0	0	1	2	6	6	9	9	2	4	0	2	43
17.9 22.4	0	2	0	0	0	0	1	0	2	4	2	1	1	1	0	0	14
22.4 29.1	0	0	2	0	0	0	0	0	2	5	3	3	1	1	1	0	18
29.1 40.3	0	0	0	0	0	0	0	0	0	1	0	1	1	3	2	0	8
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
TOTALS		12	26	21	4	5	7	5	12	32	29	24	17	8	18	6	239

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	3	1	0	1	0	3	1	1	2	1	2	1	0	0	19
2.2 4.5	2	3	5	3	5	2	9	6	5	6	6	5	4	2	2	2	67
4.5 6.7	3	6	4	4	1	3	9	18	14	8	8	5	4	4	1	2	94
6.7 8.9	8	6	14	3	1	6	18	20	17	7	5	4	8	9	1	0	127
8.9 11.2	2	1	3	1	1	3	10	16	14	10	9	12	7	7	4	2	102
11.2 13.4	3	1	0	0	0	4	8	4	16	6	4	6	5	5	4	2	68
13.4 17.9	1	1	0	1	0	0	10	14	25	19	13	10	11	18	9	0	132
17.9 22.4	0	4	0	0	0	1	3	2	7	18	10	12	8	20	3	1	89
22.4 29.1	0	1	0	0	0	0	0	0	0	6	6	6	8	20	3	0	50
29.1 40.3	0	0	0	0	0	0	0	0	0	0	0	1	0	25	0	0	26
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTALS		20	25	29	13	8	20	67	83	99	81	63	62	57	112	27	775

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	2	0	2	0	0	0	0	2	1	0	1	1	1	2	1	0	13
2.2 4.5	0	2	0	3	0	4	0	3	3	5	6	4	5	3	1	2	41
4.5 6.7	2	1	2	1	1	0	2	2	5	1	4	6	0	5	5	2	39
6.7 8.9	2	2	2	2	0	0	1	4	1	7	1	6	4	6	7	8	53
8.9 11.2	3	1	0	3	0	0	4	3	4	2	5	5	12	9	5	2	58
11.2 13.4	6	1	0	0	0	0	1	4	8	9	6	4	5	7	10	2	63
13.4 17.9	4	3	1	0	0	1	8	10	19	15	8	9	12	16	3	7	116
17.9 22.4	0	2	2	0	0	0	1	3	12	8	7	5	13	27	5	1	86
22.4 29.1	0	1	0	0	0	0	0	0	3	9	1	2	6	27	6	0	55
29.1 40.3	0	0	0	0	0	0	0	0	0	1	2	0	0	11	2	0	16
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	19	13	9	9	1	5	17	31	56	57	41	42	58	113	45	24	540

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	0	0	0	1	1	0	2	0	2	3	1	0	1	0	11
2.2 4.5	6	1	2	1	2	1	1	5	3	4	2	1	1	1	3	0	34
4.5 6.7	3	3	5	1	1	3	3	1	3	7	4	3	5	2	3	3	50
6.7 8.9	3	4	1	0	0	1	0	3	3	4	1	1	4	3	2	3	33
8.9 11.2	2	3	3	0	0	0	1	4	9	3	4	5	4	6	1	7	52
11.2 13.4	1	0	1	0	0	0	1	4	3	3	1	1	2	2	4	1	24
13.4 17.9	1	1	3	1	0	0	3	9	8	4	3	3	4	12	4	5	61
17.9 22.4	0	0	1	0	0	0	0	1	4	3	0	1	0	5	3	2	20
22.4 29.1	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
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	16	12	16	3	3	6	10	27	35	31	18	18	21	33	21	21	291

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	3	1	0	0	1	0	1	0	1	0	0	0	7
2.2 4.5	1	2	1	3	1	0	1	4	1	4	1	3	0	0	1	1	24
4.5 6.7	5	2	4	0	1	1	2	3	3	1	2	1	0	1	2	3	31
6.7 8.9	1	5	1	4	1	1	2	1	0	1	2	0	0	0	2	1	22
8.9 11.2	2	2	2	0	0	0	0	2	3	1	0	0	1	1	2	6	22
11.2 13.4	0	1	3	0	0	0	0	2	3	1	1	0	0	0	8	5	24
13.4 17.9	0	1	0	0	0	0	1	4	0	0	0	0	0	1	8	6	21
17.9 22.4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	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	9	13	11	7	6	3	6	16	11	8	8	4	2	3	25	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	3	3	7	2	3	3	1	5	5	1	6	5	6	3	3	3	59
2.2 4.5	12	13	12	12	9	9	11	18	12	19	16	14	11	6	8	9	191
4.5 6.7	22	22	22	6	5	8	16	25	26	22	18	16	9	13	12	14	256
6.7 8.9	19	32	29	10	5	11	22	29	27	22	13	13	16	20	12	17	297
8.9 11.2	17	10	12	4	1	3	16	27	37	21	19	23	24	26	12	17	269
11.2 13.4	11	4	4	1	0	5	11	20	43	21	16	11	13	15	26	10	211
13.4 17.9	9	12	4	2	0	1	23	39	61	50	35	31	29	52	26	21	395
17.9 22.4	3	9	3	0	0	1	5	6	27	34	21	19	22	53	14	5	222
22.4 29.1	0	8	3	0	0	0	0	0	8	26	15	18	15	50	12	0	155
29.1 40.3	0	0	0	0	0	0	0	0	0	6	5	7	2	40	4	0	64
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
TOTALS	96	113	96	37	23	41	105	169	246	222	164	157	147	281	129	96	2122

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	0	2	17	7	14	7	47

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

Hours at each wind speed and direction during time period

Elevation: 33	Start Date: 7/1/2012	Total number of Periods: 2208
Period: 3rd Quarter	Stop Date: 10/1/2012	Periods of No Data Recovery: 5
		System Percent Data Recovery: 99.8%

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
2.2	4.5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	5
4.5	6.7	4	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	9
6.7	8.9	14	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	24
8.9	11.2	4	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	1	9
11.2	13.4	3	1	0	0	0	0	0	0	4	1	0	1	0	0	0	0	1	11
13.4	17.9	6	1	0	0	0	0	0	1	3	3	0	1	0	0	1	0	0	16
17.9	22.4	1	0	0	0	0	0	0	0	1	2	0	1	2	0	3	1	0	11
22.4	29.1	0	0	0	0	0	0	0	0	0	0	0	2	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	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS			33	9	0	0	0	0	1	11	8	0	5	2	0	4	5	11	89

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	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2.2	4.5	9	5	2	0	1	0	0	0	0	0	0	0	0	0	0	5	6	28
4.5	6.7	9	4	1	0	0	0	0	0	0	0	1	1	0	0	0	0	4	20
6.7	8.9	17	3	1	0	0	0	1	2	2	2	0	0	0	0	0	0	2	28
8.9	11.2	1	1	0	0	1	0	1	8	5	0	0	0	0	0	0	0	0	17
11.2	13.4	1	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	5
13.4	17.9	0	0	0	0	0	0	2	1	4	0	0	1	2	2	0	1	13	13
17.9	22.4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
22.4	29.1	0	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	0
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS			39	14	5	0	2	0	4	12	14	2	1	1	2	3	5	13	117

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	6	5	7	4	0	1	1	0	0	2	0	1	1	2	2	4	36	
2.2	4.5	4	24	19	5	7	1	4	7	3	4	1	0	0	2	4	4	89	
4.5	6.7	3	7	11	6	2	5	11	16	11	3	0	0	0	0	2	6	83	
6.7	8.9	6	6	2	4	1	5	9	14	9	1	3	1	0	2	1	2	66	
8.9	11.2	2	0	0	2	2	0	1	7	4	0	1	0	0	1	0	2	22	
11.2	13.4	1	0	1	0	0	1	0	2	3	0	0	1	3	3	0	0	15	
13.4	17.9	1	0	0	0	0	1	0	0	1	0	1	1	1	1	1	0	8	
17.9	22.4	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	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	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	42	40	21	12	14	26	46	31	11	6	4	6	13	10	18	323

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	2	12	7	4	13	6	5	3	2	1	1	2	1	0	2	64	
2.2	4.5	4	11	13	10	7	12	23	19	7	5	4	4	0	3	8	3	133	
4.5	6.7	10	3	9	14	11	16	31	21	8	0	2	3	0	3	3	0	134	
6.7	8.9	3	1	10	6	2	13	15	11	3	1	2	2	1	1	0	3	74	
8.9	11.2	0	0	1	2	2	3	6	4	3	4	2	2	0	1	1	2	33	
11.2	13.4	0	1	0	0	0	0	3	1	3	3	1	0	2	2	1	0	17	
13.4	17.9	1	1	0	0	0	0	0	0	0	1	0	1	1	10	7	0	22	
17.9	22.4	0	0	0	0	0	0	0	0	0	1	0	0	0	2	8	4	15	
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			21	19	45	39	26	57	84	61	28	16	12	13	8	32	24	10	495

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

Stability Class: E

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	3	4	2	0	2	5	1	1	2	2	1	1	1	0	0	0	25
2.2	4.5	2	7	4	3	3	7	5	5	4	5	5	2	3	5	5	3	68
4.5	6.7	3	2	6	1	1	8	5	8	3	1	6	1	5	10	4	6	70
6.7	8.9	1	1	4	0	0	2	14	8	1	2	5	2	3	6	5	6	60
8.9	11.2	0	1	0	0	0	1	2	2	0	0	1	0	5	8	5	0	25
11.2	13.4	1	0	0	0	0	0	2	0	0	1	0	0	4	10	3	0	21
13.4	17.9	0	0	0	0	0	0	1	1	0	2	1	2	5	18	3	0	33
17.9	22.4	0	0	0	0	0	0	0	0	0	1	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		10	15	16	4	6	23	30	25	10	14	19	8	27	57	25	15	304

Stability Class: F

Wind Speed		Calgary Class																	
Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
1.0	2.2	3	6	3	1	1	2	5	7	1	4	3	2	1	1	8	49		
2.2	4.5	9	7	8	0	2	3	13	13	10	5	1	3	2	5	4	13	98	
4.5	6.7	5	8	3	2	0	2	19	24	10	3	1	1	3	9	12	8	110	
6.7	8.9	0	0	1	1	1	4	19	14	4	6	3	1	1	6	4	2	67	
8.9	11.2	0	0	0	0	0	0	10	3	2	0	0	0	3	0	0	0	18	
11.2	13.4	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	
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		17	21	15	4	4	11	66	62	27	18	8	7	11	21	21	31	344	

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	17	16	12	3	3	2	9	7	11	3	4	2	2	4	7	7	109
2.2	4.5	39	32	12	1	0	2	15	13	7	5	1	1	1	5	12	16	162
4.5	6.7	8	27	10	1	0	1	7	14	5	3	2	0	0	1	10	6	95
6.7	8.9	0	0	5	3	0	0	5	13	0	1	0	0	0	0	5	0	32
8.9	11.2	0	0	0	1	0	0	3	2	0	0	0	0	0	0	0	0	6
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		64	75	39	9	3	5	39	49	23	13	7	3	3	10	34	29	405

Stability Class: All

Wind Speed		Frequency Class, All																	
Min	Max	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
1.0	2.2	35	34	37	15	10	23	22	20	17	13	9	7	7	8	11	21	289	
2.2	4.5	67	88	58	19	20	25	60	57	31	24	12	10	6	20	40	46	583	
4.5	6.7	42	52	40	24	14	32	73	84	37	11	12	5	8	23	31	33	521	
6.7	8.9	41	15	23	14	4	24	63	62	20	11	13	6	5	15	15	20	351	
8.9	11.2	7	2	1	5	5	4	23	28	15	4	4	2	8	10	7	5	130	
11.2	13.4	6	2	1	0	0	1	5	9	10	5	2	1	10	15	4	1	72	
13.4	17.9	8	2	0	0	0	1	4	5	8	3	3	5	9	32	11	1	92	
17.9	22.4	1	0	0	0	0	0	0	1	3	2	1	2	4	14	5	0	33	
22.4	29.1	0	0	0	0	0	0	0	0	0	1	2	0	0	3	0	0	6	
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		207	195	160	77	53	110	250	266	141	74	58	38	57	140	124	127	2077	

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	1	7	18	16	23	61	126

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

Hours at each wind speed and direction during time period

Elevation: 245	Start Date: 7/1/2012	Total number of Periods: 2208
Period: 3rd Quarter	Stop Date: 10/1/2012	Periods of No Data Recovery: 5
		System Percent Data Recovery: 99.8%

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	1	0	1
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	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
6.7 8.9	2	3	1	0	0	0	0	0	1	0	0	0	0	0	0	1	8
8.9 11.2	10	10	1	0	0	0	0	0	2	0	0	0	0	0	0	1	24
11.2 13.4	0	6	0	0	0	0	0	0	2	0	0	0	0	0	1	0	9
13.4 17.9	2	2	0	0	0	0	0	1	4	1	1	0	0	0	1	0	12
17.9 22.4	0	6	1	0	0	0	0	1	2	2	1	0	0	0	2	0	15
22.4 29.1	0	0	0	0	0	0	0	0	2	2	1	2	0	0	2	0	9
29.1 40.3	0	0	0	0	0	0	0	0	0	0	2	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	17	31	3	0	0	0	0	2	13	5	5	2	0	0	7	4	89

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	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3
2.2 4.5	4	3	1	1	0	0	0	0	0	0	0	0	0	0	1	3	13
4.5 6.7	9	5	2	0	1	0	0	0	0	0	0	1	0	0	1	3	22
6.7 8.9	4	8	2	1	0	0	0	1	0	0	1	0	0	0	0	1	18
8.9 11.2	4	12	1	1	0	0	0	2	6	0	0	0	0	0	0	1	27
11.2 13.4	1	1	0	0	0	0	0	3	4	1	0	0	0	0	0	0	10
13.4 17.9	1	0	0	0	0	0	0	4	2	2	0	0	2	0	0	0	11
17.9 22.4	1	0	0	0	0	0	1	2	2	1	0	0	1	1	1	0	10
22.4 29.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
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	25	29	7	4	1	0	1	12	14	4	2	1	3	1	4	8	116

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	4	2	3	1	0	0	3	1	0	1	1	0	3	1	26
2.2 4.5	2	6	16	11	3	2	2	2	1	4	3	0	0	1	2	2	57
4.5 6.7	3	9	13	14	2	4	2	2	9	2	0	0	0	0	2	7	69
6.7 8.9	4	3	4	5	3	3	6	9	22	10	1	0	0	0	4	3	77
8.9 11.2	3	2	2	2	2	1	8	3	12	1	5	1	0	0	1	0	43
11.2 13.4	4	0	0	2	0	2	2	5	7	1	0	0	0	0	2	1	26
13.4 17.9	0	0	0	1	0	0	1	1	1	1	0	2	2	2	0	0	11
17.9 22.4	0	0	1	0	0	0	1	0	2	0	1	1	1	1	1	0	9
22.4 29.1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	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	19	23	40	37	13	13	22	22	57	21	10	5	5	4	17	14	322

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	0	1	4	3	5	4	6	3	3	3	0	0	2	0	0	2	36
2.2 4.5	5	5	7	11	8	9	10	18	12	5	4	5	0	0	3	7	109
4.5 6.7	1	8	5	8	3	12	18	19	17	4	4	1	1	1	2	4	108
6.7 8.9	3	6	2	11	8	9	24	11	18	2	3	0	0	2	0	2	101
8.9 11.2	4	0	0	3	7	4	14	4	2	4	2	3	0	1	1	1	50
11.2 13.4	2	0	0	3	0	2	4	3	4	3	4	1	0	1	0	1	28
13.4 17.9	1	1	1	1	0	0	1	3	5	2	3	2	0	1	1	0	22
17.9 22.4	0	1	0	0	0	0	1	1	0	2	0	0	3	2	6	2	18
22.4 29.1	0	0	0	0	0	0	0	0	0	1	0	0	1	6	12	0	20
29.1 40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0	8
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	16	22	19	40	31	40	78	62	61	26	20	12	7	16	31	19	500

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

Stability Class: E

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	0	0	1	2	0	1	2	1	2	2	0	1	0	1	0	1	14
2.2	4.5	3	2	6	1	1	3	1	3	2	4	2	1	1	1	2	2	35
4.5	6.7	0	2	1	5	3	2	6	5	1	2	0	0	2	5	2	1	37
6.7	8.9	4	3	4	2	0	2	3	5	3	0	0	2	1	3	5	4	41
8.9	11.2	1	0	0	1	0	1	4	3	5	2	0	2	4	6	4	3	36
11.2	13.4	0	0	3	0	1	0	2	3	6	4	0	2	3	4	2	4	34
13.4	17.9	1	0	1	0	0	0	2	3	2	4	3	0	3	15	8	6	48
17.9	22.4	0	1	1	0	0	0	0	2	1	0	0	0	1	12	12	6	36
22.4	29.1	0	0	0	0	0	0	1	0	1	2	1	2	0	9	17	1	34
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		9	8	17	11	5	9	21	25	23	20	6	10	15	56	53	28	316

Stability Class: F

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	1	1	1	2	1	2	1	1	1	2	2	0	3	1	2	2	23
2.2	4.5	3	1	2	4	3	3	6	4	9	6	2	1	2	0	3	1	50
4.5	6.7	2	2	2	4	1	2	3	10	7	4	4	1	6	4	1	5	58
6.7	8.9	4	2	2	0	0	0	6	7	8	4	2	1	3	2	8	10	59
8.9	11.2	0	1	2	1	0	0	9	9	4	8	1	1	0	2	8	4	50
11.2	13.4	0	0	1	0	0	0	0	12	5	3	3	1	1	2	8	7	43
13.4	17.9	3	1	1	0	0	0	6	7	6	5	4	0	0	8	9	3	53
17.9	22.4	1	0	0	0	0	0	0	0	3	1	0	0	0	6	3	1	15
22.4	29.1	0	0	0	1	0	0	0	0	0	0	0	0	0	5	1	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		14	8	11	12	5	7	31	50	43	33	18	5	15	30	43	33	358

Stability Class: G

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	2	1	2	5	4	5	2	2	4	6	4	2	2	5	2	2	50
2.2	4.5	6	13	16	8	2	4	4	11	10	6	4	6	3	6	0	3	102
4.5	6.7	19	6	12	10	4	1	3	8	19	8	0	2	0	0	1	5	98
6.7	8.9	9	7	10	5	0	1	3	14	14	3	3	2	0	3	2	9	85
8.9	11.2	1	0	10	2	0	0	0	19	9	1	3	0	0	0	2	4	51
11.2	13.4	2	1	0	2	0	0	2	7	3	1	0	1	0	0	3	6	28
13.4	17.9	0	0	0	0	0	0	1	7	5	4	2	0	0	0	7	6	32
17.9	22.4	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	2	5
22.4	29.1	0	0	0	1	0	0	0	0	0	0	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		39	28	50	34	10	11	15	68	64	29	16	13	5	15	18	37	452

Stability Class: All

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	7	6	13	15	13	13	11	7	13	14	6	4	8	7	8	8	153
2.2	4.5	23	31	48	36	17	21	23	38	34	25	15	13	6	8	11	20	369
4.5	6.7	37	35	35	41	14	21	32	44	53	20	8	5	9	10	9	25	398
6.7	8.9	30	32	25	24	11	15	42	47	66	19	10	5	4	10	19	30	389
8.9	11.2	23	25	16	10	9	6	35	40	40	16	11	7	4	9	16	14	281
11.2	13.4	9	8	4	7	1	4	10	33	31	13	7	5	4	7	16	19	178
13.4	17.9	8	4	3	2	0	0	11	26	25	19	13	4	7	26	26	15	189
17.9	22.4	2	8	3	1	0	0	3	6	10	6	2	1	6	23	26	11	108
22.4	29.1	0	0	0	2	0	0	1	0	3	6	2	4	2	20	35	1	76
29.1	40.3	0	0	0	0	0	0	0	0	0	0	3	0	0	2	7	0	12
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		139	149	147	138	65	80	168	241	275	138	77	48	50	122	173	143	2153

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	2	8	13	4	9	14	50

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

Hours at each wind speed and direction during time period

Elevation: 33	Start Date: 10/1/2012	Total number of Periods: 2208
Period: 4th Quarter	Stop Date: 12/31/2012	Periods of No Data Recovery: 38
		System Percent Data Recovery: 98.3%

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	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	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
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	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	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4

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	0	0	0	0	0	0	0	0	0	0	1	1
4.5 6.7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2
6.7 8.9	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9
8.9 11.2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
11.2 13.4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
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	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	8	3	1	0	0	0	0	0	0	0	0	0	0	1	0	5	18

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	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	7
2.2 4.5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
4.5 6.7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6.7 8.9	0	1	3	0	0	0	0	0	0	0	0	1	0	0	0	1	6
8.9 11.2	2	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	7
11.2 13.4	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	4
13.4 17.9	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
17.9 22.4	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
22.4 29.1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	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	7	5	4	0	0	0	0	4	1	2	2	1	3	0	1	4	34

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	5	6	9	2	4	5	7	5	1	3	5	3	6	10	2	81
2.2 4.5	10	17	11	1	4	0	11	21	10	2	5	9	7	11	25	22	166
4.5 6.7	17	10	2	1	0	2	6	16	9	2	2	1	1	20	35	19	143
6.7 8.9	10	2	2	0	0	0	11	11	10	2	1	2	5	4	18	2	80
8.9 11.2	0	0	0	0	0	1	6	12	8	1	0	3	3	2	9	6	51
11.2 13.4	0	0	0	0	0	0	2	8	9	1	0	0	3	4	2	2	31
13.4 17.9	0	0	0	0	0	2	2	6	10	7	3	0	0	1	1	2	34
17.9 22.4	1	0	0	0	0	0	1	1	2	10	7	1	0	0	0	0	23
22.4 29.1	0	0	0	0	0	0	0	0	1	14	9	0	0	0	0	1	25
29.1 40.3	0	0	0	0	0	0	0	0	0	3	1	0	0	0	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	46	34	21	11	6	9	44	82	64	43	31	21	22	48	100	56	638

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	6	3	2	2	2	0	3	4	5	6	10	8	4	8	11	9	83		
2.2	4.5	10	11	4	0	0	4	14	21	13	8	13	10	14	21	27	11	181		
4.5	6.7	2	0	2	0	0	1	15	25	21	3	6	5	9	16	23	13	141		
6.7	8.9	1	1	1	1	0	3	17	31	18	8	4	4	5	6	14	3	117		
8.9	11.2	0	0	1	0	1	2	37	34	17	5	1	0	2	4	0	1	105		
11.2	13.4	0	0	0	0	0	5	9	24	18	5	2	3	3	2	3	0	74		
13.4	17.9	0	0	0	0	0	5	17	9	15	21	5	1	3	3	0	2	81		
17.9	22.4	0	0	0	0	0	1	3	6	13	1	0	1	1	1	0	0	32		
22.4	29.1	0	0	0	0	0	0	3	3	0	4	0	0	0	0	0	0	10		
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		19	15	10	3	3	21	118	157	113	73	43	31	41	61	78	39	825		

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	7	5	5	2	1	3	0	4	3	4	4	4	5	5	3	5	60		
2.2	4.5	13	5	2	0	0	0	8	6	17	7	6	4	9	12	25	17	131		
4.5	6.7	2	2	3	0	0	1	5	16	9	6	3	1	5	6	17	8	84		
6.7	8.9	1	1	0	0	0	0	9	11	9	5	2	1	1	2	4	0	46		
8.9	11.2	0	0	1	0	0	0	5	11	8	2	1	0	1	2	0	0	31		
11.2	13.4	0	0	0	0	0	0	0	9	3	0	0	0	0	0	0	0	12		
13.4	17.9	0	0	0	0	0	0	1	1	1	2	0	0	0	0	0	0	5		
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	13	11	2	1	4	28	58	50	26	16	10	21	27	49	30	369		

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	10	8	2	4	0	2	3	3	1	1	1	2	3	3	8	3	54		
2.2	4.5	11	16	3	1	0	0	2	3	9	5	3	4	2	6	9	11	85		
4.5	6.7	3	3	2	0	0	0	1	1	2	0	0	2	0	2	9	8	33		
6.7	8.9	0	1	0	0	0	0	2	3	2	0	0	0	0	0	4	0	12		
8.9	11.2	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	4		
11.2	13.4	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2		
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		24	28	7	5	0	2	8	14	14	6	6	8	5	11	30	22	190		

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	34	22	16	17	5	9	11	18	14	12	18	19	15	22	32	21	285		
2.2	4.5	45	50	20	2	4	4	35	51	49	22	27	27	32	50	86	63	567		
4.5	6.7	25	15	10	1	0	4	27	58	41	11	11	9	15	44	84	49	404		
6.7	8.9	20	8	6	1	0	3	39	56	39	15	7	8	11	12	40	8	273		
8.9	11.2	5	0	2	0	1	3	48	63	33	8	3	3	8	8	9	8	202		
11.2	13.4	0	4	0	0	0	5	11	42	30	7	4	3	6	6	5	2	125		
13.4	17.9	0	0	0	0	0	7	20	16	27	30	9	1	3	4	1	4	122		
17.9	22.4	1	0	0	0	0	1	4	8	8	24	8	1	1	2	0	0	58		
22.4	29.1	0	0	0	0	0	0	3	3	1	18	9	0	1	0	1	1	37		
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		130	99	54	21	10	36	198	315	242	150	98	71	92	148	258	156	2078		

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	0	0	20	33	19	20	92

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

Hours at each wind speed and direction during time period

Elevation: 245	Start Date: 10/1/2012	Total number of Periods: 2208
Period: 4th Quarter	Stop Date: 1/1/2013	Periods of No Data Recovery: 38
		System Percent Data Recovery: 98.3%

Stability Class: A

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
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	1	0	1	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	0	0	0	0	0	0	0	0	0	1
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	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	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4

Stability Class: B

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
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	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
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	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	8
8.9	11.2	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
11.2	13.4	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
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	1	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		10	5	2	0	0	0	0	0	0	0	0	0	0	0	1	0	18

Stability Class: C

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6
2.2	4.5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4
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	1	2	1	0	0	0	0	0	0	0	0	1	0	0	0	5
8.9	11.2	1	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	5
11.2	13.4	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	4
13.4	17.9	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	4
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	1	0	0	1	0	1	0	0	0	3
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS		4	7	5	2	0	0	0	3	1	2	3	0	3	1	1	1	33

Stability Class: D

Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	6	7	6	5	2	5	1	5	4	3	2	1	5	2	7	8	69
2.2	4.5	11	14	10	4	4	2	5	18	10	7	3	4	4	5	17	13	131
4.5	6.7	12	8	12	1	0	1	3	12	11	2	1	2	3	12	23	23	126
6.7	8.9	11	4	0	0	0	0	2	6	13	6	2	3	1	5	14	6	73
8.9	11.2	4	4	1	0	0	0	3	10	8	3	0	1	3	4	20	6	67
11.2	13.4	0	1	1	0	0	0	5	3	9	4	1	0	3	4	7	5	43
13.4	17.9	0	0	0	0	0	0	1	8	10	8	1	0	2	4	2	3	39
17.9	22.4	1	0	0	0	0	0	0	0	4	7	3	2	0	0	1	0	18
22.4	29.1	1	0	0	0	0	1	1	3	0	7	11	2	1	0	0	0	27
29.1	40.3	0	0	0	0	0	1	0	0	0	8	19	2	0	0	0	1	31
40.3	90.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTALS		46	38	30	10	6	10	21	65	69	55	44	17	22	36	91	65	625

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	5	4	5	1	2	2	6	6	10	2	1	5	3	6	7	6	71	
2.2	4.5	7	12	4	2	1	5	3	9	16	6	4	7	3	7	6	17	109	
4.5	6.7	5	3	5	3	0	0	8	15	15	6	1	0	3	10	9	8	91	
6.7	8.9	3	5	5	0	0	0	7	13	7	9	4	2	2	7	9	5	78	
8.9	11.2	0	2	1	1	0	1	6	8	15	6	3	3	2	9	13	4	74	
11.2	13.4	1	0	2	0	0	0	13	9	23	18	5	1	3	5	12	4	96	
13.4	17.9	0	0	0	0	2	0	12	21	40	23	8	2	4	8	8	4	132	
17.9	22.4	1	0	0	0	0	1	10	8	19	22	5	2	2	6	1	1	78	
22.4	29.1	0	0	0	0	0	2	11	11	9	22	8	5	1	5	0	0	74	
29.1	40.3	0	0	0	0	0	0	1	9	0	9	4	1	1	1	0	0	26	
40.3	90.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	
TOTALS		22	26	22	7	5	11	77	109	154	123	44	28	24	64	65	49	830	

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	0	2	2	3	2	2	2	1	3	2	0	0	2	2	4	29	
2.2	4.5	7	4	7	4	0	3	3	9	8	4	7	5	1	5	7	3	77	
4.5	6.7	17	13	3	0	0	1	6	4	7	6	4	4	3	5	0	8	81	
6.7	8.9	2	7	1	2	0	0	4	9	3	7	2	1	4	2	6	7	57	
8.9	11.2	1	1	4	1	0	0	5	6	6	3	1	1	0	0	4	9	42	
11.2	13.4	0	2	2	0	0	0	2	6	4	5	1	0	2	1	6	1	32	
13.4	17.9	0	0	0	0	0	0	3	0	12	16	7	0	3	4	0	1	46	
17.9	22.4	0	0	0	0	0	0	0	6	2	4	1	0	0	0	0	0	13	
22.4	29.1	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	3	
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		29	27	19	9	3	6	25	44	43	48	27	11	13	19	25	33	381	

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	0	2	3	2	1	4	5	0	3	2	1	1	1	1	1	29	
2.2	4.5	6	1	2	4	1	2	3	4	7	5	5	4	2	1	0	3	50	
4.5	6.7	4	5	2	1	2	0	4	8	1	4	3	2	0	1	1	8	46	
6.7	8.9	2	3	4	2	0	0	2	4	1	4	3	1	0	1	3	3	33	
8.9	11.2	2	4	2	0	0	0	2	2	2	0	0	0	0	1	1	1	17	
11.2	13.4	0	1	2	0	0	0	1	1	3	0	0	0	0	1	2	7	18	
13.4	17.9	0	0	0	0	0	0	2	0	2	0	1	0	3	2	2	0	12	
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		16	14	14	10	5	3	18	24	16	16	14	8	6	8	10	23	205	

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	17	13	16	12	9	10	13	18	15	11	7	7	9	11	17	19	204	
2.2	4.5	34	32	24	14	6	12	14	40	41	22	19	20	10	18	30	37	373	
4.5	6.7	38	29	22	5	2	2	21	39	34	18	9	8	9	28	33	47	344	
6.7	8.9	23	23	14	5	0	0	15	32	24	26	11	7	8	15	32	21	256	
8.9	11.2	13	13	8	2	0	1	16	27	31	12	4	5	6	15	38	20	211	
11.2	13.4	2	6	9	0	0	0	21	20	40	27	7	1	8	11	27	17	196	
13.4	17.9	0	1	0	0	2	0	18	29	64	48	19	2	12	18	12	8	233	
17.9	22.4	2	0	0	0	0	1	10	14	25	34	9	4	2	6	3	1	111	
22.4	29.1	1	0	0	0	0	3	12	17	9	29	21	7	3	5	0	0	107	
29.1	40.3	0	0	0	0	0	1	1	9	0	17	24	3	1	1	1	1	59	
40.3	90.0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	
TOTALS		130	117	93	38	19	30	141	245	283	244	132	64	68	128	193	171	2096	

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	0	1	33	28	7	5	74

Table 5-9 Year 2012, 33 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 33	Start Date: 1/1/2012	Total number of Periods: 8784
Period: Annual 2012	Stop Date: 1/1/2013	Periods of No Data Recovery: 67
		System Percent Data Recovery: 99.2%

Stability Class: A

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	0	0	0	0	0	0	0	0	0	0	1	1	3
2.2	4.5	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	2	8
4.5	6.7	5	4	0	1	0	0	0	1	0	0	0	0	0	0	0	3	14
6.7	8.9	16	5	0	0	0	0	0	0	1	0	0	0	0	0	0	5	27
8.9	11.2	5	1	0	0	0	0	0	3	1	0	0	0	0	0	1	5	16
11.2	13.4	3	2	0	0	0	0	0	4	2	1	1	0	0	0	0	1	14
13.4	17.9	8	2	0	0	0	0	1	3	7	4	2	3	0	1	0	0	31
17.9	22.4	1	5	0	0	0	0	0	1	3	4	6	4	0	3	1	1	29
22.4	29.1	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6
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		39	21	0	1	0	0	1	12	14	9	15	7	0	5	6	18	148

Stability Class: B

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	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	7
2.2	4.5	13	8	2	0	1	0	0	0	0	0	1	0	0	0	5	9	39
4.5	6.7	17	11	6	0	0	0	0	1	0	1	1	1	0	0	1	11	50
6.7	8.9	26	5	1	0	0	0	1	3	3	0	0	0	0	0	0	5	44
8.9	11.2	5	1	0	0	1	0	1	9	6	1	0	0	0	0	0	6	30
11.2	13.4	2	2	0	0	0	0	0	3	8	5	1	0	0	1	1	5	28
13.4	17.9	1	1	0	0	0	0	2	1	14	4	1	2	2	5	1	4	38
17.9	22.4	0	2	0	0	0	0	0	0	1	2	2	1	0	2	1	0	11
22.4	29.1	0	0	0	0	0	0	0	0	0	1	6	3	1	0	1	0	12
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		67	31	10	0	2	0	4	17	32	14	12	7	3	8	11	41	259

Stability Class: C

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	11	8	10	5	0	1	1	0	0	4	0	1	1	2	4	11	59
2.2	4.5	18	39	22	9	12	1	5	7	5	5	1	0	1	5	5	16	151
4.5	6.7	7	12	18	7	5	6	12	20	19	4	4	2	0	4	3	13	136
6.7	8.9	10	9	5	4	1	5	10	21	13	6	5	4	0	4	4	5	106
8.9	11.2	6	1	0	2	2	0	6	23	15	5	6	1	3	5	1	6	82
11.2	13.4	1	3	1	0	0	1	2	7	13	4	7	5	6	5	1	2	58
13.4	17.9	3	2	0	0	0	1	0	4	11	9	7	3	2	8	3	1	54
17.9	22.4	0	1	0	0	0	0	0	1	2	7	4	2	3	6	0	0	26
22.4	29.1	0	1	0	0	0	0	0	0	0	3	6	2	3	2	2	0	19
29.1	40.3	0	0	0	0	0	0	0	0	0	0	1	0	2	1	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		56	76	56	27	20	15	36	83	78	47	41	20	21	42	24	54	696

Stability Class: D

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	23	15	30	19	8	20	17	19	18	8	9	10	8	9	17	10	240
2.2	4.5	33	47	36	14	15	14	64	66	37	20	20	27	20	20	54	40	527
4.5	6.7	43	30	22	20	14	26	74	88	50	19	14	16	10	41	59	38	564
6.7	8.9	23	6	15	6	2	18	50	58	40	15	14	15	14	28	40	12	356
8.9	11.2	1	3	1	3	2	6	23	46	38	21	9	22	18	17	26	11	247
11.2	13.4	2	2	0	0	0	1	15	29	39	23	11	6	11	25	19	2	185
13.4	17.9	2	5	0	0	0	4	7	20	33	40	19	16	15	43	23	3	230
17.9	22.4	1	1	0	0	0	0	5	1	12	23	19	6	4	25	5	0	102
22.4	29.1	0	0	0	0	0	0	0	0	4	28	19	5	2	12	0	1	71
29.1	40.3	0	0	0	0	0	0	0	0	0	3	1	0	2	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		128	109	104	62	41	89	255	327	271	200	135	123	104	220	243	117	2528

Table 5-9 Year 2012, 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	16	12	8	4	4	8	11	16	16	19	18	14	10	14	28	15	213
2.2 4.5	22	27	14	4	3	16	40	43	42	35	34	24	34	43	76	31	488
4.5 6.7	13	9	10	2	1	11	38	56	43	24	29	14	30	45	45	36	406
6.7 8.9	3	6	6	2	0	7	62	76	40	22	15	21	21	29	38	13	361
8.9 11.2	0	5	2	0	1	9	54	64	37	26	14	13	18	31	14	6	294
11.2 13.4	1	1	2	0	0	7	18	46	40	19	8	8	18	25	19	1	213
13.4 17.9	1	1	0	0	0	8	23	25	34	50	19	7	12	40	11	3	234
17.9 22.4	0	0	0	0	0	1	3	7	11	26	6	1	3	14	0	0	72
22.4 29.1	0	0	0	0	0	0	3	3	1	7	0	0	0	0	0	0	14
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	56	61	42	12	9	67	252	336	264	229	144	102	146	241	231	105	2297

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	14	17	10	3	4	9	7	18	10	11	14	12	13	15	16	21	194
2.2 4.5	36	19	16	4	2	8	32	57	46	29	14	14	23	28	48	53	429
4.5 6.7	10	18	8	2	0	4	37	71	46	17	7	6	16	26	55	25	348
6.7 8.9	1	3	3	1	1	4	42	55	33	20	9	7	6	20	18	2	225
8.9 11.2	0	0	1	0	0	0	28	39	16	5	2	1	6	9	5	1	113
11.2 13.4	0	0	0	0	0	0	2	12	6	4	0	3	2	0	2	0	31
13.4 17.9	0	0	0	0	0	0	3	5	7	7	0	0	0	0	0	0	22
17.9 22.4	0	0	0	0	0	0	0	0	4	3	1	0	0	0	0	0	8
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	61	57	38	10	7	25	151	257	168	97	47	43	66	98	144	102	1371

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	32	34	16	10	4	6	15	16	21	8	7	9	11	13	24	20	246
2.2 4.5	59	53	17	4	0	3	20	29	22	14	8	6	7	23	40	41	346
4.5 6.7	12	32	13	1	0	1	11	28	14	5	3	2	1	7	44	26	200
6.7 8.9	0	1	6	3	0	0	7	29	8	2	0	1	0	5	22	2	86
8.9 11.2	0	0	1	1	0	0	4	10	2	2	1	0	0	2	1	0	24
11.2 13.4	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	5
13.4 17.9	0	0	0	0	0	0	0	0	0	0	1	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	103	120	53	19	4	10	58	113	68	32	21	18	19	50	131	89	908

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	100	87	75	41	20	44	51	69	65	50	48	46	43	53	91	79	962
2.2 4.5	181	195	107	35	33	42	161	202	152	103	78	71	85	120	231	192	1988
4.5 6.7	107	116	77	33	20	48	172	265	172	70	58	41	57	123	207	152	1718
6.7 8.9	79	35	36	16	4	34	172	242	138	65	43	48	41	86	122	44	1205
8.9 11.2	17	11	5	6	6	15	116	194	115	60	32	37	45	64	48	35	806
11.2 13.4	9	10	3	0	0	9	38	102	109	57	29	22	37	56	42	11	534
13.4 17.9	15	11	0	0	0	13	36	58	106	114	49	31	31	97	38	11	610
17.9 22.4	2	9	0	0	0	1	8	10	33	65	38	14	10	50	7	1	248
22.4 29.1	0	1	0	0	0	0	3	3	5	40	37	10	6	14	3	1	123
29.1 40.3	0	0	0	0	0	0	0	0	0	4	3	0	4	1	1	0	13
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	510	475	303	131	83	206	757	1145	895	628	415	320	359	664	790	526	8207

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
1	1	8	108	130	134	128	510

Table 5-10 Year 2012, 245 Ft AGL

Hours at each wind speed and direction during time period

Elevation: 245	Start Date: 1/1/2012	Total number of Periods: 8784
Period: Annual 2012	Stop Date: 1/1/2013	Periods of No Data Recovery: 72
		System Percent Data Recovery: 99.2%

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	1	0	1
2.2 4.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	3	6
4.5 6.7	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
6.7 8.9	3	5	2	0	0	0	0	0	1	0	0	0	0	0	0	1	12
8.9 11.2	14	10	1	0	0	0	0	0	2	0	0	0	0	0	0	2	29
11.2 13.4	1	6	0	1	0	0	0	0	3	0	0	0	0	0	1	0	12
13.4 17.9	2	5	0	0	0	0	0	1	5	2	1	0	0	0	1	1	18
17.9 22.4	3	6	1	0	0	0	0	1	2	7	2	1	0	0	2	0	25
22.4 29.1	0	5	0	0	0	0	0	0	4	5	5	8	0	0	2	0	29
29.1 40.3	0	0	0	0	0	0	0	0	0	2	4	2	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	26	42	4	1	0	0	0	2	17	16	12	11	0	0	9	8	148

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	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	4
2.2 4.5	8	3	1	1	0	0	0	0	0	0	0	1	0	0	1	3	18
4.5 6.7	15	7	4	0	1	0	0	0	0	0	0	1	0	0	1	5	34
6.7 8.9	12	18	9	1	0	0	0	1	1	0	1	1	0	0	1	4	49
8.9 11.2	12	15	2	1	0	0	0	2	7	2	0	0	0	0	0	2	43
11.2 13.4	2	2	1	0	0	0	0	3	7	2	0	0	0	0	0	4	21
13.4 17.9	6	1	0	0	0	0	0	4	6	11	2	1	2	2	3	2	40
17.9 22.4	1	1	0	0	0	0	1	2	5	4	1	0	1	1	3	1	21
22.4 29.1	0	1	1	0	0	0	0	0	1	2	7	1	0	0	3	0	16
29.1 40.3	0	0	0	0	0	0	0	0	0	1	4	4	1	1	0	0	11
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	57	48	19	4	1	0	1	12	27	22	15	9	4	4	12	22	257

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	7	7	4	3	1	0	0	3	1	0	1	2	0	4	3	41
2.2 4.5	8	14	21	13	4	4	2	3	1	4	4	0	1	2	4	8	93
4.5 6.7	11	17	18	14	3	5	2	3	10	8	0	1	0	1	3	12	108
6.7 8.9	7	11	11	7	6	6	7	11	27	13	5	1	1	3	5	8	129
8.9 11.2	8	4	5	2	2	1	9	8	20	5	7	2	1	5	2	3	84
11.2 13.4	5	2	1	2	0	3	4	12	21	5	4	0	1	2	3	1	66
13.4 17.9	1	3	0	1	0	0	2	3	13	13	11	12	6	7	1	5	78
17.9 22.4	0	2	1	0	0	0	2	0	5	9	5	2	2	6	2	0	36
22.4 29.1	0	0	2	0	0	0	0	1	2	9	5	4	6	1	3	0	33
29.1 40.3	0	0	0	0	0	0	0	0	0	3	7	2	4	3	3	0	22
40.3 90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
TOTALS	45	60	66	43	18	20	28	41	102	70	48	25	24	32	30	40	692

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	9	17	15	10	10	11	9	13	10	12	6	2	10	5	13	14	166
2.2 4.5	23	30	25	21	18	14	26	49	37	22	17	18	13	12	29	30	384
4.5 6.7	18	28	23	13	4	17	33	65	60	18	14	9	9	21	32	45	409
6.7 8.9	36	22	18	14	9	16	46	46	54	18	16	10	11	16	28	15	375
8.9 11.2	13	8	5	4	8	7	32	36	32	20	13	16	12	18	38	11	273
11.2 13.4	7	3	1	3	0	6	19	13	39	19	11	10	14	13	29	13	200
13.4 17.9	2	3	3	2	0	0	16	38	57	43	24	16	18	32	28	9	291
17.9 22.4	1	5	0	0	0	2	4	5	17	47	21	17	12	25	11	7	174
22.4 29.1	1	1	0	0	0	1	5	3	5	33	25	14	14	26	18	1	147
29.1 40.3	0	0	0	0	0	1	0	0	2	21	31	10	3	27	6	1	102
40.3 90.0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	3
TOTALS	110	117	90	67	49	75	190	268	313	253	179	122	117	196	232	146	2524

Table 5-10 Year 2012, 245 Ft AGL (Continued)

Stability Class: E																		
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	11	8	10	6	3	6	12	14	16	6	4	8	6	15	14	9	148
2.2	4.5	13	18	14	9	2	12	9	17	29	23	18	15	12	14	12	25	242
4.5	6.7	10	12	9	12	4	2	21	26	28	16	12	9	7	25	30	17	240
6.7	8.9	13	13	14	4	0	3	19	33	18	22	7	13	10	20	35	22	246
8.9	11.2	5	3	2	5	0	2	19	22	35	19	10	14	22	29	40	13	240
11.2	13.4	7	1	8	0	1	1	23	33	46	41	14	10	14	22	33	12	266
13.4	17.9	5	4	5	1	4	4	24	47	76	56	28	17	25	51	29	19	395
17.9	22.4	1	3	4	1	0	3	15	23	47	51	24	14	23	52	23	10	294
22.4	29.1	0	1	0	0	0	2	12	13	18	54	29	12	13	46	23	1	224
29.1	40.3	0	0	0	0	0	0	1	9	2	16	14	3	2	12	3	0	62
40.3	90.0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
TOTALS		65	63	66	38	14	35	155	237	315	305	161	115	134	286	242	128	2359

Stability Class: F																		
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	5	2	3	6	6	6	5	4	6	10	9	6	7	3	5	7	90
2.2	4.5	24	10	16	13	6	12	14	30	24	21	14	10	9	7	19	11	240
4.5	6.7	27	21	15	6	3	6	16	19	27	23	16	9	16	17	7	19	247
6.7	8.9	11	13	5	2	0	1	14	28	24	23	6	6	13	11	22	24	203
8.9	11.2	3	6	10	2	0	0	17	29	24	20	10	7	4	15	15	22	184
11.2	13.4	2	2	4	0	0	0	6	31	21	18	5	3	7	6	22	13	140
13.4	17.9	5	2	4	2	0	0	17	23	36	34	18	5	11	32	30	14	233
17.9	22.4	1	0	1	0	0	0	0	11	12	11	2	3	1	18	10	3	73
22.4	29.1	0	0	0	1	0	0	1	4	1	8	4	1	1	8	1	0	30
29.1	40.3	0	0	0	0	0	0	0	0	0	6	4	0	0	0	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		78	56	58	32	15	25	90	179	175	174	88	50	69	117	131	113	1450

Stability Class: G																		
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	5	4	6	8	9	7	6	8	8	12	8	4	6	6	3	4	104
2.2	4.5	18	18	20	16	4	7	9	24	26	17	12	15	6	7	3	11	213
4.5	6.7	29	20	18	11	8	2	12	25	32	18	10	6	0	2	5	20	218
6.7	8.9	15	15	17	11	1	2	9	25	17	13	10	4	0	5	9	15	168
8.9	11.2	7	6	14	2	0	0	4	26	20	5	4	0	2	2	9	12	113
11.2	13.4	2	3	5	2	0	0	3	13	9	3	1	1	0	2	16	21	81
13.4	17.9	0	1	0	0	0	0	4	13	9	8	4	0	3	5	21	17	85
17.9	22.4	0	0	0	1	0	0	0	0	0	0	1	0	1	4	4	2	13
22.4	29.1	0	0	0	1	0	0	0	0	0	1	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		76	67	80	52	22	18	47	134	121	77	50	30	18	33	70	102	997

Stability Class: All																		
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
Min	Max																	
1.0	2.2	36	38	42	35	31	31	32	39	43	41	27	21	31	29	40	38	554
2.2	4.5	94	94	97	73	34	49	60	123	117	87	65	59	41	42	70	91	1196
4.5	6.7	113	109	87	56	23	32	84	138	157	83	52	35	32	66	78	119	1264
6.7	8.9	97	97	76	39	16	28	95	144	142	89	45	35	35	55	100	89	1182
8.9	11.2	62	52	39	16	10	10	81	123	140	71	44	39	41	69	104	65	966
11.2	13.4	26	19	20	8	1	10	55	105	146	88	35	24	36	45	104	64	786
13.4	17.9	21	19	12	6	4	4	63	129	202	167	88	51	65	129	113	67	1140
17.9	22.4	7	17	7	2	0	5	22	42	88	129	56	37	40	106	55	23	636
22.4	29.1	1	8	3	2	0	3	18	21	31	112	75	40	34	81	50	2	481
29.1	40.3	0	0	0	0	0	1	1	9	4	49	64	21	10	43	12	1	215
40.3	90.0	0	0	0	0	0	0	0	0	0	1	2	0	1	3	0	0	7
TOTALS		457	453	383	237	119	173	511	873	1070	917	553	362	366	668	726	559	8427

Periods of Calm while in Stability Class:							
A	B	C	D	E	F	G	Total
1	3	12	109	68	54	38	285

Table 5-11 Year 2012 Growing Season - Daylight Hours
(Solar Irradiance > 5 watts/m²; 33 Ft AGL)

Elevation: 245	Start Date: 4/15/2012	Total number of Periods: 2638
Period: Growing Season	Stop Date: 10/16/2012	Periods of No Data Recovery: 18
Daylight hours		System Percent Data Recovery: 99.3%

Stability Class: A																			
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
Min	Max																		
1.0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
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	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
6.7	8.9	3	5	2	0	0	0	0	0	1	0	0	0	0	0	0	1	12	
8.9	11.2	12	10	1	0	0	0	0	0	2	0	0	0	0	0	0	1	26	
11.2	13.4	1	6	0	1	0	0	0	0	3	0	0	0	0	0	1	0	12	
13.4	17.9	2	5	0	0	0	0	0	1	5	1	1	0	0	0	1	1	17	
17.9	22.4	1	6	1	0	0	0	0	1	2	2	2	0	0	0	2	0	17	
22.4	29.1	0	5	0	0	0	0	0	0	4	4	2	6	0	0	2	0	23	
29.1	40.3	0	0	0	0	0	0	0	0	0	2	2	2	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		22	41	4	1	0	0	0	2	17	9	7	8	0	0	7	5	123	

Stability Class: B																			
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
Min	Max																		
1.0	2.2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	4	
2.2	4.5	5	3	1	1	0	0	0	0	0	0	0	0	0	0	1	3	14	
4.5	6.7	10	6	4	0	1	0	0	0	0	0	0	1	0	0	1	4	27	
6.7	8.9	10	17	9	1	0	0	0	1	1	0	1	1	0	0	0	3	44	
8.9	11.2	10	15	2	1	0	0	0	2	7	2	0	0	0	0	0	1	40	
11.2	13.4	1	2	1	0	0	0	0	3	6	1	0	0	0	0	0	0	14	
13.4	17.9	2	0	0	0	0	0	0	4	4	6	1	0	2	0	1	0	20	
17.9	22.4	1	1	0	0	0	0	1	2	4	1	0	0	1	1	2	0	14	
22.4	29.1	0	1	1	0	0	0	0	0	1	2	3	1	0	0	3	0	12	
29.1	40.3	0	0	0	0	0	0	0	0	0	1	1	3	1	1	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		40	45	19	4	1	0	1	12	23	13	6	6	4	2	8	12	196	

Stability Class: C																			
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
Min	Max																		
1.0	2.2	4	6	7	4	3	1	0	0	3	1	0	1	1	0	4	2	37	
2.2	4.5	3	9	20	13	4	4	2	2	1	4	3	0	1	1	2	5	74	
4.5	6.7	8	15	17	14	3	5	2	3	10	7	0	1	0	0	2	7	94	
6.7	8.9	6	8	10	7	6	6	7	10	26	13	3	0	1	2	4	6	115	
8.9	11.2	5	4	5	2	2	1	9	5	18	4	6	2	1	4	1	0	69	
11.2	13.4	4	2	1	2	0	3	3	12	16	3	4	0	1	1	2	1	55	
13.4	17.9	0	3	0	1	0	0	2	3	7	7	8	10	3	6	0	1	51	
17.9	22.4	0	2	1	0	0	0	2	0	4	5	2	2	2	2	1	0	23	
22.4	29.1	0	0	2	0	0	0	0	0	2	5	1	3	2	0	2	0	17	
29.1	40.3	0	0	0	0	0	0	0	0	0	1	0	1	1	3	2	0	8	
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
TOTALS		30	49	63	43	18	20	27	35	87	50	27	20	13	21	20	22	545	

Stability Class: D																			
Wind Speed		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
Min	Max																		
1.0	2.2	2	5	9	6	6	8	6	8	5	5	2	1	4	1	1	2	71	
2.2	4.5	8	8	9	14	13	11	19	29	17	13	9	9	3	2	5	9	178	
4.5	6.7	4	12	9	9	4	14	28	37	32	9	11	5	4	3	3	5	189	
6.7	8.9	9	10	13	14	9	14	40	30	34	8	8	3	7	8	1	2	210	
8.9	11.2	7	1	2	4	8	7	24	20	18	14	10	11	8	7	5	3	149	
11.2	13.4	5	2	0	3	0	6	14	5	20	9	7	5	5	7	3	4	95	
13.4	17.9	2	2	1	2	0	0	10	16	33	24	15	11	10	18	10	0	154	
17.9	22.4	0	5	0	0	0	1	2	2	9	17	4	12	10	10	7	2	81	
22.4	29.1	1	1	0	0	0	0	0	0	0	5	5	5	8	15	10	0	50	
29.1	40.3	0	0	0	0	0	0	0	0	0	0	0	1	0	21	2	1	25	
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
TOTALS		38	46	43	52	40	61	143	147	168	104	71	63	59	93	47	28	1203	

Table 5-11 Year 2012 Growing Season – Daylight Hours (Continued)
(Solar Irradiance > 5 watts/m²; 33 Ft AGL)

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	0	0	2	1	0	1	3	0	2	1	0	1	1	0	0	1	13
2.2	4.5	3	1	3	3	1	4	1	3	3	3	4	2	1	1	1	1	35
4.5	6.7	1	3	1	7	1	1	7	5	5	1	0	1	0	4	0	0	37
6.7	8.9	4	4	5	2	0	2	4	5	3	4	0	2	0	1	4	3	43
8.9	11.2	2	1	0	4	0	1	5	5	7	4	0	0	3	1	3	1	37
11.2	13.4	3	0	2	0	1	0	1	4	3	7	3	1	2	1	2	1	31
13.4	17.9	1	0	0	0	0	1	4	7	7	8	4	2	0	2	1	2	39
17.9	22.4	0	1	0	0	0	0	0	1	6	0	1	2	2	3	1	1	18
22.4	29.1	0	0	0	0	0	0	0	0	0	6	3	2	0	0	2	0	13
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		14	10	13	17	3	10	25	30	36	34	16	13	9	13	14	10	267

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	1	0	1	1	0	1	0	1	1	0	0	0	1	0	8
2.2	4.5	3	2	3	3	3	3	2	6	2	3	1	0	1	1	0	0	33
4.5	6.7	2	2	2	1	0	2	1	4	2	1	0	2	2	2	0	1	24
6.7	8.9	2	2	1	0	0	0	5	2	4	3	0	0	0	1	1	1	22
8.9	11.2	0	0	2	1	0	0	3	3	3	3	0	1	0	2	0	3	21
11.2	13.4	0	1	0	0	0	0	0	5	2	2	1	0	0	1	1	2	15
13.4	17.9	1	0	1	1	0	0	4	1	2	1	1	1	0	2	0	1	16
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	8	10	6	4	6	15	22	15	14	4	4	3	9	3	8	139

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	1	1	0	2	2	0	1	0	0	1	0	0	0	0	1	9
2.2	4.5	1	1	0	2	0	2	2	3	3	1	1	0	1	0	0	2	19
4.5	6.7	4	0	5	3	0	1	2	1	3	0	1	1	0	0	0	0	21
6.7	8.9	0	2	0	1	1	0	2	3	1	1	2	1	0	0	0	1	15
8.9	11.2	0	1	3	1	0	0	0	6	2	0	0	0	0	0	0	0	13
11.2	13.4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	3	6
13.4	17.9	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	3
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		5	5	9	7	3	5	6	18	9	2	5	2	1	0	1	8	86

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	13	21	12	12	13	9	10	10	8	4	3	6	1	7	7	143
2.2	4.5	23	25	36	36	21	24	26	43	26	24	18	11	7	5	9	22	356
4.5	6.7	32	41	38	34	9	23	40	50	52	18	12	11	6	9	6	17	398
6.7	8.9	34	48	40	25	16	22	58	51	70	29	14	7	8	12	10	17	461
8.9	11.2	36	32	15	13	10	9	41	41	57	27	16	14	12	14	9	9	355
11.2	13.4	14	13	4	6	1	9	18	31	50	22	15	6	8	10	10	11	228
13.4	17.9	8	10	2	4	0	1	20	34	58	47	30	24	15	28	13	6	300
17.9	22.4	2	15	2	0	0	1	5	6	25	25	9	16	15	16	13	3	153
22.4	29.1	1	7	3	0	0	0	0	0	7	22	14	17	10	15	19	0	115
29.1	40.3	0	0	0	0	0	0	0	0	4	4	7	2	25	4	1	47	47
40.3	90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
TOTALS		157	204	161	130	69	102	217	266	355	226	136	116	89	138	100	93	2559

Periods of Calm while in Stability Class:

A	B	C	D	E	F	G	Total
0	2	10	34	5	5	5	61

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 2012.

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 As Low As Reasonably Achievable (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 2012 Land Use Census did not identify broad leaf vegetable gardens or milk animals within the 5-mile radius. Cattle 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 meat pathway is assumed in the sectors where these animals were observed. The NRC computer code GASPAR was used for dose estimates. 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	GW_{th}
CGS Production Rate	17.8 ± 2.1	Ci/yr at rated power

	GW_{th} -hrs	Ci of ^{14}C	Ci of $^{14}\text{CO}_2$
1st Quarter	7,580	4.43E+00	4.21E+00
2nd Quarter	6,271	3.66E+00	3.48E+00
3rd Quarter	7,513	4.34E+00	4.12E+00
4th Quarter	7,684	4.43E+00	4.21E+00
Total Year 2012	29,049	1.69E+01	1.60E+01
Growing Season	13,897	8.09E+00	7.69E+00

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 $^{14}\text{CO}_2$ and the remainder assumed to be $^{14}\text{CH}_3$.

^{14}C in the form of $^{14}\text{CO}_2$ is a non-depositing, gaseous effluent, and 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 garden produce 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 $^{14}\text{CO}_2$ at locations of interest 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 $^{14}\text{CH}_4$ and $^{14}\text{CO}_2$. The ingestion pathway assumes ^{14}C ingestion from $^{14}\text{CO}_2$ incorporation into vegetation and meat during daylight hours of the growing season.

The highest dose from ^{14}C calculated was for the resident at 4.95 miles in the ENE sector. The annual dose to the potential maximally exposed individual (child living at this location) from gaseous releases of ^{14}C is 3.32E-02 mrem to the critical organ (bone) and 6.63E-03 mrem to the total body. The available dose pathways at this location from ^{14}C were inhalation and the ingestion of both beef meat and garden produce (fruits, grains, and non-leafy vegetables). 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 1.28E-03 mrem to the total body, 1.28E-03 mrem to the thyroid, and 1.83E-03 mrem to the skin. This location was at 4.26 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 2.80E-04 mrem.

During 2012, 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	1.79E-04	1.79E-04	2.80E-04	8.94E-05	2.54E-04	3.15E-02
Firing Range	8.00E+00	2.29E-06	2.29E-06	3.60E-06	1.15E-06	3.26E-06	0.00E+00
DOE Site 618-11	3.80E+02	7.33E-06	7.33E-06	1.16E-05	1.76E-04	4.99E-04	2.07E+00
WNP-4 Whse.2-4	2.60E+03	3.98E-03	3.98E-03	6.31E-03	2.03E-03	5.75E-03	0.00E+00
WNP-1 Bldg 121	2.60E+03	8.14E-03	8.14E-03	1.29E-02	4.15E-03	1.18E-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 all gaseous effluents except ^{14}C . The highest 'Other Organ' in all cases was the skin.

Table 6.0-B; Estimated Dose to Residents identified in the 2012 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 (4.50 miles NE)	5.56E-04	5.58E-04	8.26E-04	2.38E-04	6.75E-04	Child
Resident (3.88 miles ENE)	5.55E-04	5.58E-04	8.25E-04	2.38E-04	6.75E-04	Child
Resident (4.95 miles E)	6.31E-04	6.33E-04	8.48E-04	1.91E-04	5.42E-04	Child
Resident (4.64 miles E)	9.51E-04	9.55E-04	1.31E-03	3.12E-04	8.85E-04	Child
Resident (4.26 miles ESE)	1.28E-03	1.28E-03	1.83E-03	4.86E-04	1.38E-03	Child

Based on the available exposure pathways and the highest dispersion and deposition values, the critical receptor is a child resident at 4.95 miles ENE. Table 6.0-C adds the potential dose from Carbon-14 to the dose estimated from all other nuclides.

Table 6.0-C; Total Potential Dose (mrem) to Critical Receptor (4.95 miles ENE)

PATHWAY	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
Plume Exposure	3.61E-04	3.61E-04	3.61E-04	3.61E-04	3.61E-04	3.61E-04	3.61E-04	5.78E-04
Plume Exposure - C-14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ground Exposure	5.16E-06	5.16E-06	5.16E-06	5.16E-06	5.16E-06	5.16E-06	5.16E-06	6.07E-06
Ground Exposure - C-14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Garden Produce	2.00E-04	2.00E-04	3.21E-05	1.99E-04	1.99E-04	2.02E-04	1.99E-04	1.99E-04
Garden Produce - C-14	5.50E-03	5.50E-03	2.75E-02	5.50E-03	5.50E-03	5.50E-03	5.50E-03	5.50E-03
Beef Meat Ingestion	1.24E-05	1.25E-05	1.44E-07	1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05
Beef Meat Ingestion - C-14	8.85E-04	8.85E-04	4.42E-03	8.85E-04	8.85E-04	8.85E-04	8.85E-04	8.85E-04
Inhalation	5.21E-05	5.21E-05	1.81E-07	5.21E-05	5.21E-05	5.23E-05	5.29E-05	5.21E-05
Inhalation - C-14	2.42E-04	2.42E-04	1.29E-03	2.42E-04	2.42E-04	2.42E-04	2.42E-04	2.42E-04
Total	7.26E-03	7.26E-03	3.36E-02	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.47E-03
Total from C-14	6.63E-03	6.63E-03	3.32E-02	6.63E-03	6.63E-03	6.63E-03	6.63E-03	6.63E-03
Total from Other Nuclides	6.31E-04	6.31E-04	3.99E-04	6.30E-04	6.30E-04	6.33E-04	6.30E-04	8.48E-04
Total from All Nuclides	7.26E-03	7.26E-03	3.36E-02	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.47E-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 2012 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)	3.12E-03	1.45E-03	1.66E-03	1.00E-03	7.00E-03
Gamma air dose (mrad)	8.84E-03	4.12E-03	4.71E-03	2.84E-03	1.98E-02

2. Maximum Air Dose Beyond the Site Boundary

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta air dose (mrad)	1.04E-04	9.90E-05	1.28E-04	8.48E-05	4.86E-04
Gamma air dose (mrad)	2.95E-04	2.81E-04	3.64E-04	2.40E-04	1.38E-03

3. Maximum Annual Dose at the Site Boundary

	Annual Dose
Annual total body dose (mrem)	1.37E-02
Annual skin dose (mrem)	2.17E-02

4. Maximum Annual Dose Beyond the Site Boundary

	Annual Dose
Annual total body dose (mrem)	1.28E-03
Annual skin dose (mrem)	1.83E-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)	9.67E-03	4.46E-03	5.10E-03	3.20E-03	2.17E-02

6. Maximum Organ Dose Beyond the Site Boundary

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Maximum Organ dose (mrem)	4.61E-04	3.56E-04	4.16E-04	4.52E-04	1.83E-03

7. Dose to Nearest Residents within 5-Miles in each Sector with Residents**4.50 Miles NE**

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	5.57E-05	5.79E-05	3.56E-05	3.00E-05	2.38E-04
Gamma Air Dose (mrad)	1.58E-04	1.64E-04	1.01E-04	8.52E-05	6.75E-04
Maximum Organ dose (mrem)	2.20E-04	1.96E-04	1.16E-04	1.47E-04	8.26E-04

3.88 Miles ENE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	1.04E-04	3.97E-05	2.96E-05	2.77E-05	2.38E-04
Gamma Air Dose (mrad)	2.95E-04	1.13E-04	8.40E-05	7.86E-05	6.75E-04
Maximum Organ dose (mrem)	3.58E-04	1.47E-04	9.63E-05	1.34E-04	8.25E-04

4.95 Miles ENE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	9.96E-05	6.18E-05	3.25E-05	2.54E-05	1.91E-04
Gamma Air Dose (mrad)	2.82E-04	1.75E-04	9.22E-05	7.19E-05	5.42E-04
Maximum Organ dose (mrem)	4.61E-04	2.33E-04	1.16E-04	2.20E-04	8.48E-04

Table 6-1 Summary of Doses from Gaseous Effluents (Continued)**7. Dose to Nearest Residents within 5-Miles in each Sector with Residents
(Continued)****4.64 Miles E**

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	4.06E-05	5.31E-05	5.09E-05	3.83E-05	3.12E-04
Gamma Air Dose (mrad)	1.15E-04	1.50E-04	1.44E-04	1.09E-04	8.85E-04
Maximum Organ dose (mrem)	3.54E-04	2.16E-04	1.75E-04	3.00E-04	1.31E-03

4.26 Miles ESE

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Cumulative*
Beta Air Dose (mrad)	3.17E-05	9.90E-05	1.28E-04	8.48E-05	4.86E-04
Gamma Air Dose (mrad)	8.98E-05	2.81E-04	3.64E-04	2.40E-04	1.38E-03
Maximum Organ dose (mrem)	2.84E-04	3.56E-04	4.16E-04	4.52E-04	1.83E-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 (1977) 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	3.15E-03	5.59E-03
Ground	1.38E-04	1.62E-04
Inhalation	3.63E-03	3.63E-03
Vegetables	3.48E-03	3.47E-03
Milk	1.21E-03	1.21E-03
Meat	6.21E-04	6.20E-04
Total	1.22E-02	1.47E-02

B. Average Individual*

Exposure Pathway	Total Body (mrem)	Max. Organ (mrem)
Plume	8.82E-06	1.57E-05
Ground	3.87E-07	4.54E-07
Inhalation	1.02E-05	1.02E-05
Vegetables	9.75E-06	9.72E-06
Milk	3.39E-06	3.39E-06
Meat	1.74E-06	1.74E-06
Total	3.43E-05	4.11E-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

There were no changes to the ODCM during 2012.

8.0 REVISIONS TO THE PROCESS CONTROL PROGRAM (PCP)

There were no revisions to the Process Control Program, SWP-RMP-02 in 2012.

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

9.1 There were a number of changes observed in the 2012 Five-Mile Land Use Census (LUC).

9.1.1 Distances to existing sites of interest were revised for improved accuracy.

9.1.2 The goats previously observed at 4.64 miles E were not present, but cattle were observed. Although it is not known if the goats or beef are being consumed by the resident, the previously assumed goat meat ingestion pathway was revised to a beef meat pathway.

9.1.3 The owner of 25 – 30 head of cattle grazing near the 5-mile limit of the ENE sector was previously unknown. The meat pathway was assumed for the nearest resident in that sector. However, following publication of the 2012 LUC, the owner was ascertained and the meat pathway assigned to the resident at 4.95 miles ENE.

9.1.4 No broad leaf vegetation was observed in any gardens or fields within the 5-mile radius. However, because of the fruit, corn, and other crops being grown in the area, the garden produce pathway is assumed for all residents.

Location	Plume	Ground Shine	Inhalation	Ingestion		
				Garden Produce	Beef Meat	Goat Meat
Resident (4.50 miles NE)	X	X	X	X		
Resident (3.88 miles ENE)	X	X	X	X		
Resident (4.95 miles ENE)	X	X	X	X	X	
Resident (4.64 miles E)	X	X	X	X	X	
Resident (4.26 miles ESE)	X	X	X	X		

9.2 There were no new locations for environmental monitoring formally adopted into the program based on the 2012 Land Use Census.

- 9.3 No dose assessment or environmental monitoring locations were deleted. Some years ago, a garden with broad leaf vegetation was started onsite for the purpose of validating effluent program estimates of dispersion and deposition values. The garden was discontinued in 2012.

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.