

METEOROLOGICAL DATA EVALUATION TO DEMONSTRATE LONG-TERM  
REPRESENTATIVENESS AT THE LOST CREEK ISR PROJECT

LOST CREEK ISR, LLC

November 17, 2017

*BLANK PAGE*

## INTRODUCTION

Lost Creek ISR, LLC (LCI) has been collecting meteorological data from a calibrated on-site weather station at the Lost Creek ISR Project site since April 2006. Data collection has been ongoing in accordance with NRC License SUA-1598 License Condition (LC) 10.19. In an effort to have the condition removed and terminate meteorological monitoring, LCI has opted to use an alternative method for demonstrating long-term representativeness of meteorological data by providing qualitative evaluation of at least five years of valid data that includes three consecutive years. The alternative method is proposed in accordance with Section D of NRC Regulatory Guide 3.63. Data has been collected continuously for approximately ten years and over that period there are five years with three consecutive years of valid data that will be used in the evaluation. The data sets are valid if the annual data collection rate for each parameter is 90% or greater and the joint data recovery rate for wind parameters is 75% or greater.

The summary of meteorology at Lost Creek and the meteorological data collected in the pre-operational phase is detailed in the NRC License Application Technical Report (TR) Section 2.5. Weather station siting and data collection methodology was determined to be acceptable as described in the Safety Evaluation Report for the Lost Creek Project Section 2.2.4 but the data was not shown to be representative of long-term conditions and therefore LC 10.19 had been imposed.

The following evaluation presents the annual data sets and provides a comparison from year to year to show that there is little variation in the data sets. The invariable nature of the data is likely to demonstrate that the meteorological data collected thus far is representative of long-term conditions.

## PARAMETERS AND PERIOD OF RECORD

The minimum required parameters in RG 3.63 include:

- Temperature
- Precipitation
- Wind speed
- Wind direction
- Annual wind rose
- Summary of stability classification

Data for these parameters as well as others were collected since 2006 at Lost Creek. Data was originally collected and evaluated for establishment of the baseline meteorology for a period from May 2006 through April 2007 as reported in TR Section 2.5 and is referred to herein as applicable. The data collection rate for other annual data sets was evaluated to determine if they are valid based on the data recovery rate. **Table 1** shows the annual recovery rate for hourly data since 2006:

**TABLE 1: Annual Data Recovery Rates**

Year	Hours per Period	Hours of Data Collected	% Recovery	% Joint Recovery	Status	Comment
2006-2007	8688	8152	93.8%	93.8%	Acceptable	1 Year Evaluation Period for Permit Application (TR)
2006	8760	5575	63.6%	---	Reject	Not full year
2007	8760	4068	46.4%	---	Reject	Below 90%
2008	8784	7489	85.3%	---	Reject	Below 90%
<b>2009</b>	<b>8760</b>	<b>8760</b>	<b>100.0%</b>	<b>99.9%</b>	<b>Accept</b>	
<b>2010</b>	<b>8760</b>	<b>8691</b>	<b>99.2%</b>	<b>99.2%</b>	<b>Accept</b>	
2011	8760	7638	87.2%	---	Reject	Below 90%
<b>2012</b>	<b>8784</b>	<b>8209</b>	<b>93.5%</b>	<b>93.4%</b>	<b>Accept</b>	
<b>2013</b>	<b>8760</b>	<b>8249</b>	<b>94.2%</b>	<b>94.1%</b>	<b>Accept</b>	
<b>2014</b>	<b>8760</b>	<b>8026</b>	<b>91.6%</b>	<b>91.6%</b>	<b>Accept</b>	
2015	8760	6362	72.6%	---	Reject	Below 90%
2016	8784	6903	78.6%	---	Reject	Below 90%

Therefore, the established Period of Record (POR) that will be used for comparison herein includes 5 years of data (2009-2010 and 2012-2014). Additionally, for several of the data parameters, basic statistics are provided to show the relative invariability of the data to include standard deviation and a control range of plus or minus 3 standard deviations (3-sigma tolerance).

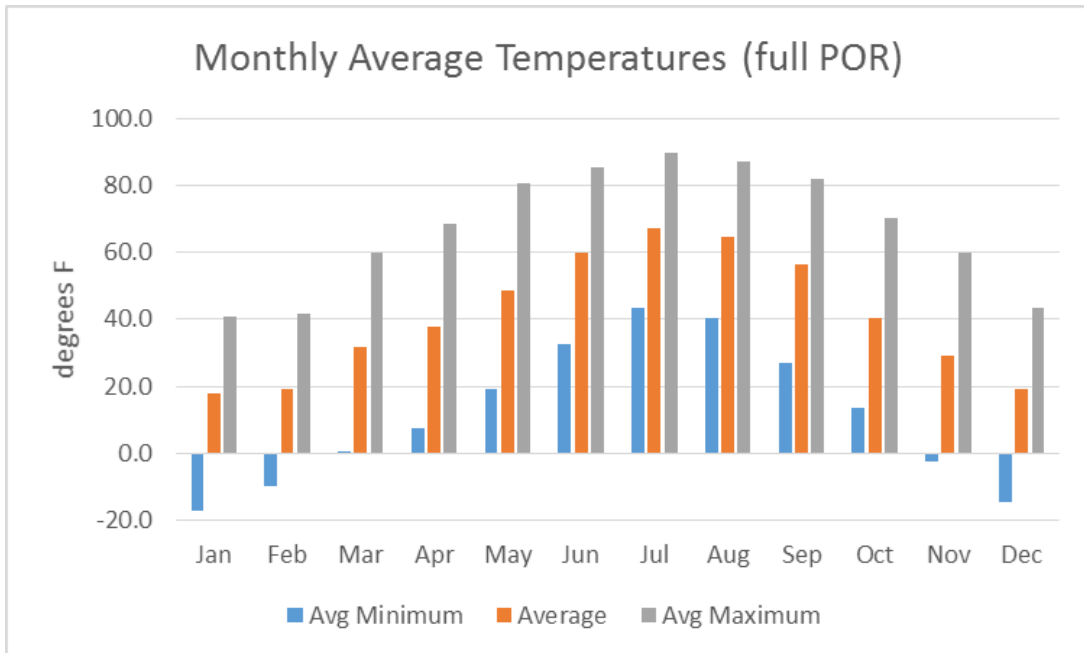
## PARAMETER EVALUATION

### Temperature

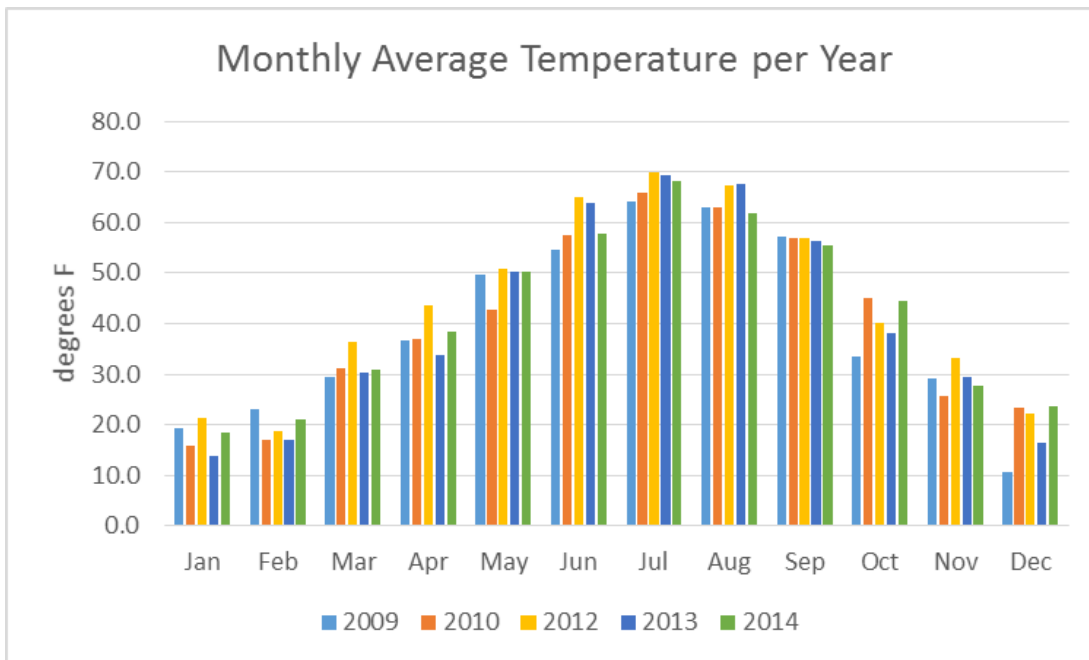
Since temperature is variable from year to year, the average values on a monthly basis are provided for qualitative comparison. The average temperatures by month averaged over the entire period are shown below for comparison.

Overall, as shown by both of the averages chart (**Figure 1 and Figure 2**), the warmest month is July and the coldest is January consistent with the evaluation in Technical Report Section 2.5.1.1.

**FIGURE 1**



**FIGURE 2**



The variation in the monthly averages from year-to-year are within 3 sigma tolerance. The data show (**Table 2**) that the variation between years for each month are relatively stable over the POR.

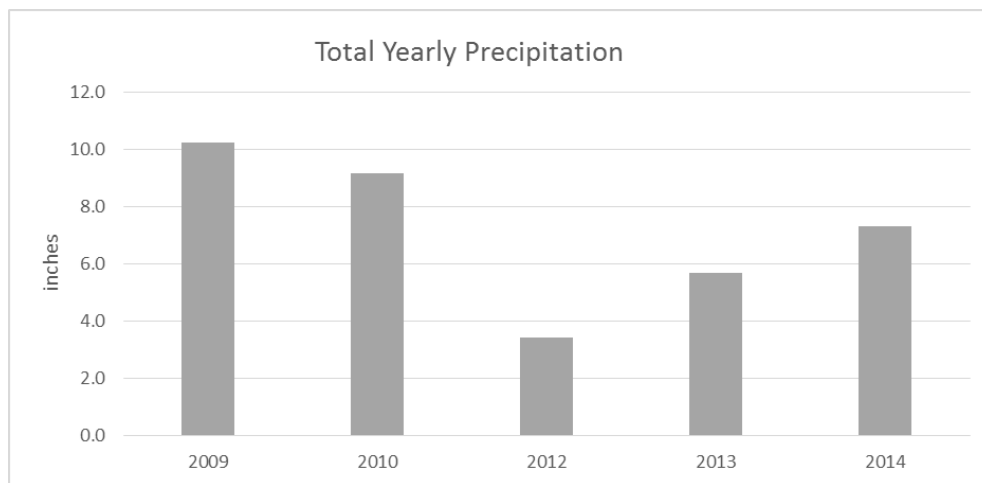
**Table 2: Monthly Average Temperatures per Year**

Deg F	2009	2010	2012	2013	2014	Mean	Std Dev	-3 Std Dev	+3 Std Dev
<b>Jan</b>	19.3	16.0	21.4	13.7	18.3	17.7	2.7	9.8	25.7
<b>Feb</b>	22.9	16.9	18.7	17.0	21.1	19.3	2.4	12.3	26.4
<b>Mar</b>	29.5	31.3	36.3	30.4	30.8	31.6	2.4	24.4	38.8
<b>Apr</b>	36.7	37.0	43.5	33.8	38.4	37.9	3.2	28.4	47.4
<b>May</b>	49.8	42.7	50.7	50.2	50.2	48.7	3.0	39.7	57.8
<b>Jun</b>	54.7	57.5	64.9	63.9	57.7	59.7	4.0	47.8	71.6
<b>Jul</b>	64.0	65.9	69.8	69.4	68.2	67.5	2.2	60.9	74.0
<b>Aug</b>	62.8	63.0	67.4	67.7	61.7	64.5	2.5	57.0	72.0
<b>Sep</b>	57.3	56.8	56.9	56.3	55.6	56.6	0.6	54.8	58.4
<b>Oct</b>	33.6	45.0	40.2	38.0	44.5	40.3	4.2	27.6	53.0
<b>Nov</b>	29.1	25.8	33.1	29.5	27.6	29.0	2.4	21.8	36.3
<b>Dec</b>	10.7	23.2	22.3	16.4	23.7	19.3	5.0	4.2	34.3

**Precipitation**

Precipitation is variable from year to year and typically low. The total precipitation by year is provided on **Figure 3** below. The average annual precipitation for the full POR is 7.2 inches. In comparison, nearby Rawlins, WY to the southeast receives 9.24 inches per year<sup>1</sup> on average and Jeffrey City, WY to the north receives 10.04 inches per year<sup>2</sup> on average.

**FIGURE 3**

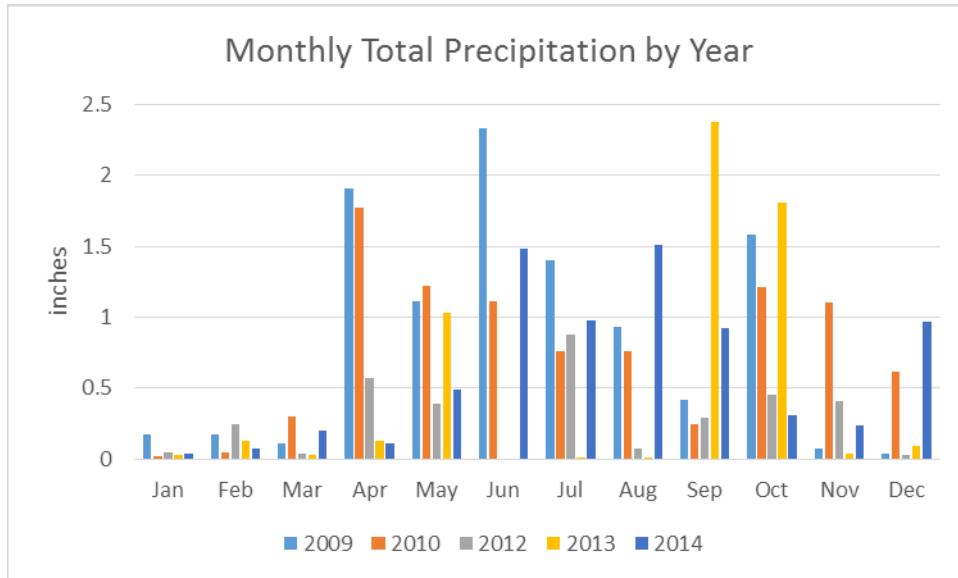


<sup>1</sup> US Climate Data - Average weather Rawlins, WY - 82301 - 1981-2010 normals

<sup>2</sup> US Climate Data - Average weather Jeffrey City, WY - 82310 - 1981-2010 normals

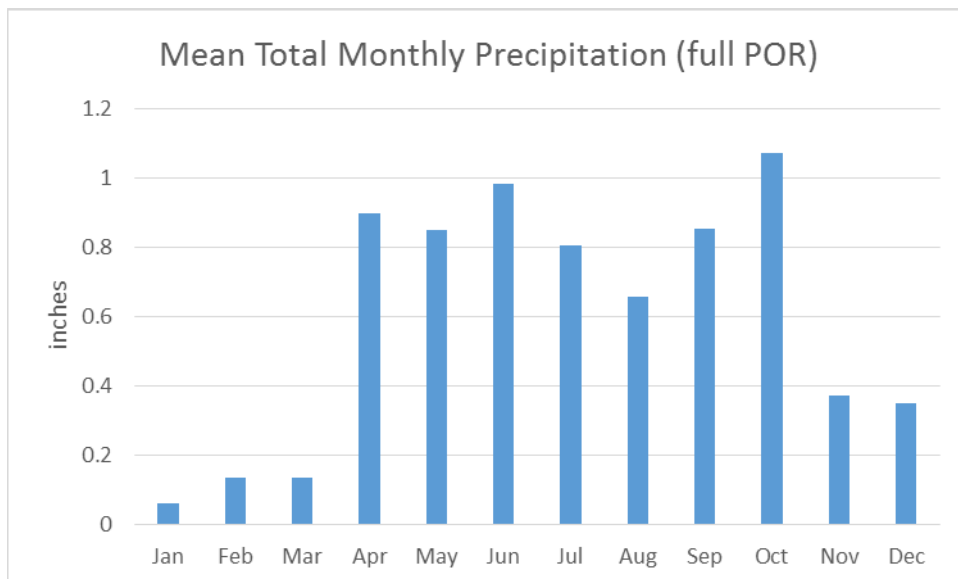
As shown on **Figure 4** below, the monthly precipitation is widely variable.

**FIGURE 4**



Oddly, the mean total monthly precipitation (**Figure 5**) shows that October has been the wettest month, compared to the original evaluation (see TR Figure 2.5-2b) showing that from 2007-2009, June was the wettest month. However, even though the monthly totals per year are variable, the monthly mean precipitation over the full POR (**Figure 5**) is relatively consistent with the LC precipitation shown on TR Figure 2.5-2b. The local precipitation shows variability compared to regional precipitation (i.e. Rawlins, Jeffrey City) typically for which May is the wettest month overall.

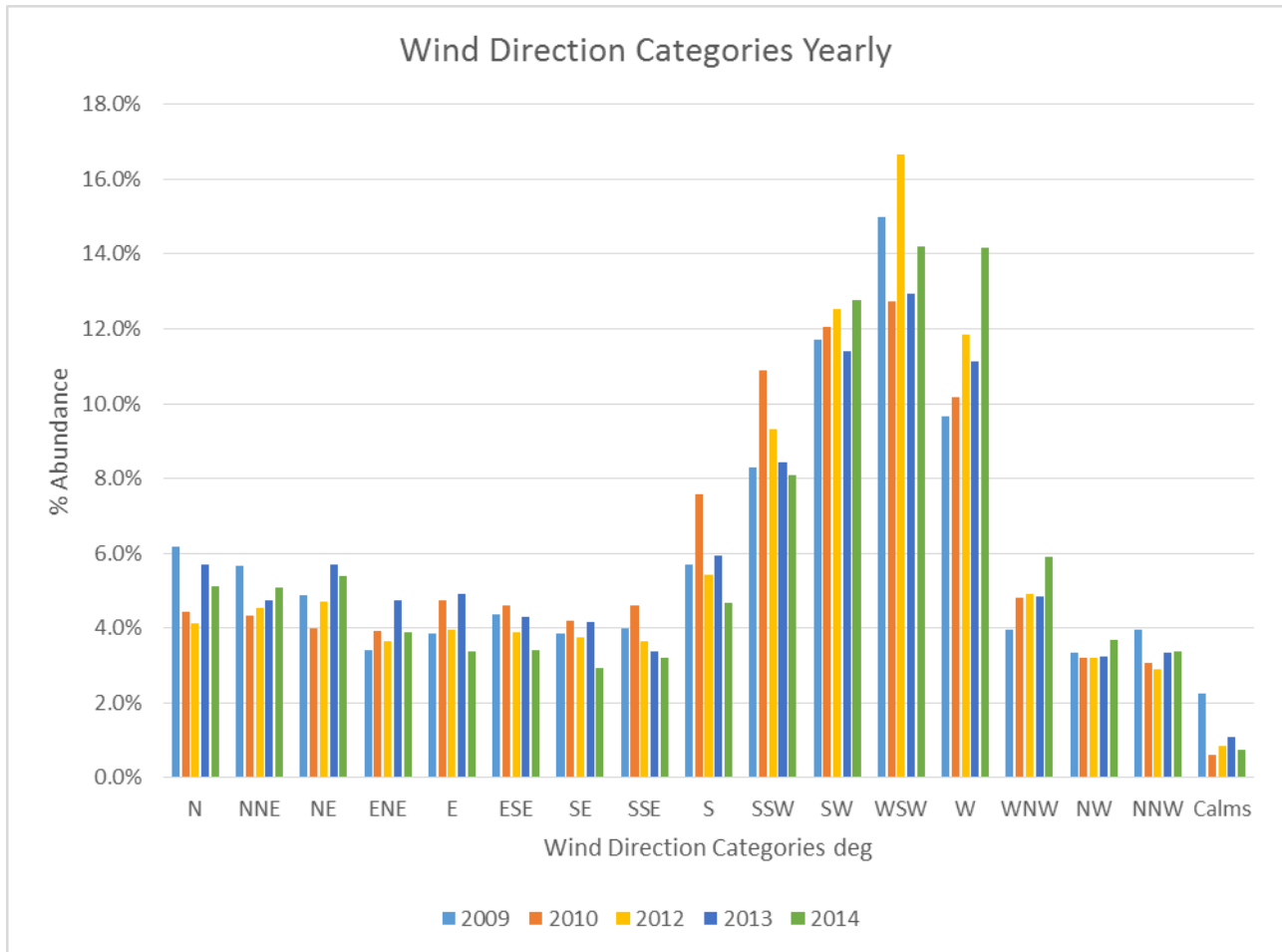
**FIGURE 5**



**Wind Speed and Direction**

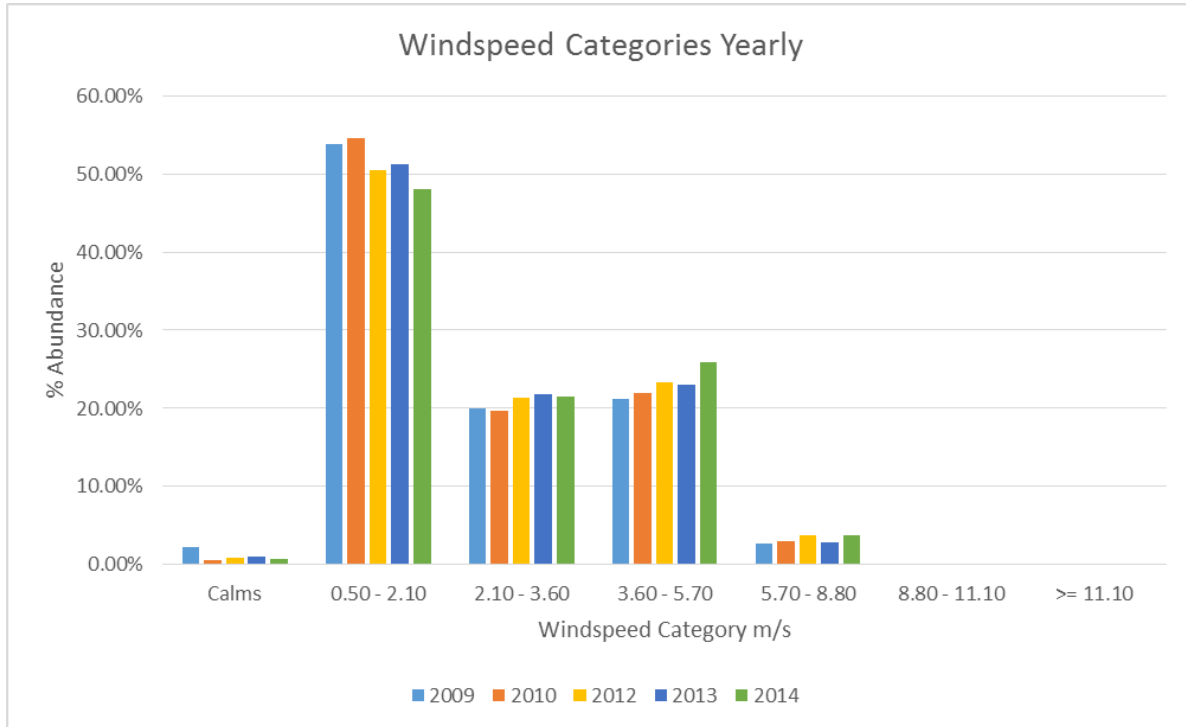
Wind speed and direction are the primary parameters for determining dispersion of material and are evaluated together categorically. In addition to the wind direction category chart, the data are presented in wind rose format included in **Appendix A**. The data are charted (**Figure 6** and **Figure 7**) and compared by year for the Period of Record:

**FIGURE 6**





**FIGURE 7**



Both the wind direction and windspeed category abundances (**Table 3** and **Table 4**) are very similar between years and show little variation.

**TABLE 3: Wind Direction Category Abundances (%) per Year**

	2009	2010	2012	2013	2014	Mean	Std Dev	-3 Std Dev	+3 Std Dev
<b>N</b>	6.2%	4.4%	4.1%	5.7%	5.1%	5.1%	0.853%	2.6%	7.7%
<b>NNE</b>	5.7%	4.3%	4.5%	4.8%	5.1%	4.9%	0.516%	3.3%	6.4%
<b>NE</b>	4.9%	4.0%	4.7%	5.7%	5.4%	4.9%	0.665%	2.9%	6.9%
<b>ENE</b>	3.4%	3.9%	3.7%	4.7%	3.9%	3.9%	0.497%	2.4%	5.4%
<b>E</b>	3.8%	4.7%	4.0%	4.9%	3.4%	4.2%	0.642%	2.2%	6.1%
<b>ESE</b>	4.4%	4.6%	3.9%	4.3%	3.4%	4.1%	0.469%	2.7%	5.5%
<b>SE</b>	3.8%	4.2%	3.8%	4.1%	2.9%	3.8%	0.505%	2.3%	5.3%
<b>SSE</b>	4.0%	4.6%	3.7%	3.4%	3.2%	3.8%	0.552%	2.1%	5.4%
<b>S</b>	5.7%	7.6%	5.4%	6.0%	4.7%	5.9%	1.078%	2.6%	9.1%
<b>SSW</b>	8.3%	10.9%	9.3%	8.4%	8.1%	9.0%	1.155%	5.5%	12.5%
<b>SW</b>	11.7%	12.0%	12.5%	11.4%	12.8%	12.1%	0.562%	10.4%	13.8%
<b>WSW</b>	15.0%	12.7%	16.7%	12.9%	14.2%	14.3%	1.610%	9.5%	19.1%
<b>W</b>	9.7%	10.2%	11.9%	11.1%	14.2%	11.4%	1.769%	6.1%	16.7%
<b>WNW</b>	4.0%	4.8%	4.9%	4.8%	5.9%	4.9%	0.686%	2.8%	6.9%
<b>NW</b>	3.3%	3.2%	3.2%	3.2%	3.7%	3.3%	0.203%	2.7%	3.9%
<b>NNW</b>	4.0%	3.1%	2.9%	3.4%	3.4%	3.3%	0.398%	2.1%	4.5%
<b>Calms</b>	2.2%	0.6%	0.9%	1.1%	0.7%	1.1%	0.659%	-0.9%	3.1%

**TABLE 4: Wind Speed (m/s) Category Abundances (%) per Year**

m/s	2009	2010	2012	2013	2014	Mean	Std Dev	-3 Std Dev	+3 Std Dev
<b>Calms</b>	2.25%	0.62%	0.87%	1.08%	0.74%	1.1%	0.659%	-0.9%	3.1%
<b>0.50 - 2.10</b>	53.8%	54.6%	50.5%	51.3%	48.0%	51.6%	2.637%	43.7%	59.5%
<b>2.10 - 3.60</b>	20.0%	19.7%	21.4%	21.7%	21.5%	20.9%	0.942%	18.0%	23.7%
<b>3.60 - 5.70</b>	21.3%	22.0%	23.4%	23.1%	26.0%	23.1%	1.794%	17.7%	28.5%
<b>5.70 - 8.80</b>	2.7%	3.1%	3.8%	2.8%	3.8%	3.3%	0.538%	1.6%	4.9%
<b>8.80 - 11.10</b>	0.03%	0.04%	0.06%	0.02%	0.01%	0.0%	0.018%	0.0%	0.1%
<b>&gt;= 11.10</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.000%	0.0%	0.0%

### Wind Rose

Wind roses by year are provided as **Appendix A**. Roses were plotted using WRPLOT freeware. The charts reveal that the predominant wind direction is from the west-southwest. The joint frequency distribution tables are also provided with the wind roses.

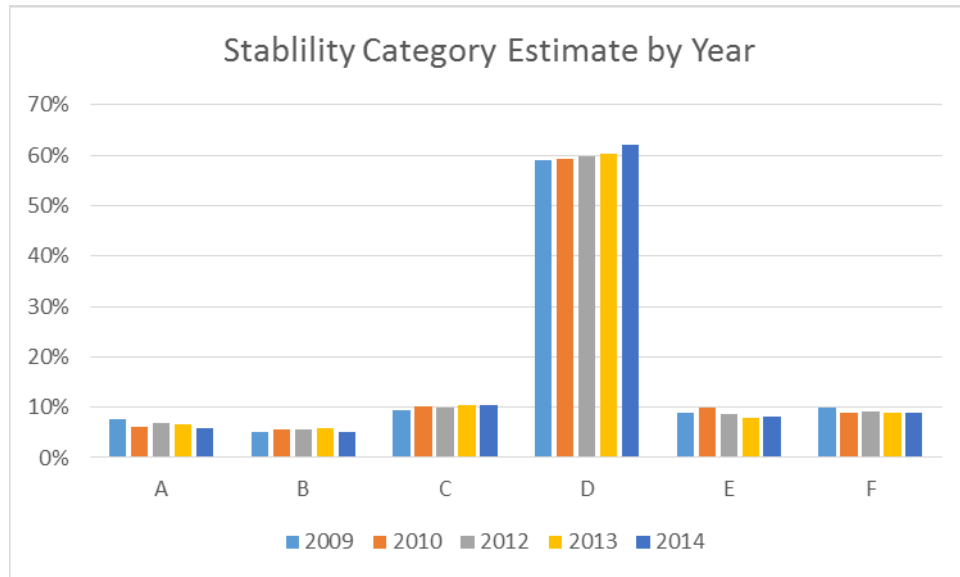
Comparing the wind roses from year to year as well as to the composite, all of the roses are very similar with the predominant wind direction as west-southwest with a significant contribution from the west and southwest. This is consistent with the pre-operational evaluation for the LC Station as described in TR Section 2.5.1.4. The wind rose (see TR Figure 2.5-3b) shows the primary wind direction from the west and west-southwest.

### Atmospheric Stability

The atmospheric stability was categorized in to the Pasquill Stability Categories A-E (**Figure 8**) and are based on sigma theta with wind speed adjustments<sup>3</sup> and are displayed as the percent abundance on a yearly basis. The most predominant is Class D which is indicative of relatively stable atmospheric conditions.

<sup>3</sup> USEPA, *Meteorological Monitoring Guidance for Regulatory Modeling Applications, 2000*

**FIGURE 8**



As shown by the chart, the variation in year-to-year percent abundance for stability is very consistent. The stability is consistent with the classification described in TR Section 2.5.1.4 (see TR Figure 2.5-4). Evaluating the percentages (**Table 5**) statistically show very little variation (i.e. within 3-sigma threshold) between the data sets from year-to-year.

**TABLE 5: Stability Category Abundances (%) per Year**

	2009	2010	2012	2013	2014	Mean	Std Dev	-3 Std Dev	+3 Std Dev
<b>A</b>	7.5%	6.2%	6.9%	6.6%	5.8%	6.6%	0.7%	4.6%	8.6%
<b>B</b>	5.1%	5.6%	5.6%	5.8%	5.0%	5.4%	0.3%	4.4%	6.4%
<b>C</b>	9.5%	10.1%	10.0%	10.4%	10.3%	10.1%	0.4%	9.0%	11.2%
<b>D</b>	59.0%	59.2%	59.9%	60.4%	62.0%	60.1%	1.2%	56.5%	63.7%
<b>E</b>	8.8%	9.9%	8.6%	7.9%	8.1%	8.7%	0.8%	6.3%	11.0%
<b>F</b>	10.0%	9.0%	9.1%	8.9%	8.9%	9.2%	0.5%	7.8%	10.6%

**CONCLUSION**

A valid POR was established and the data were compared from year-to-year as well as to the initial baseline evaluation for the original permit application. The consistency in five years of meteorological data should provide conclusive evidence that the data collected is representative of long-term conditions at the Lost Creek ISR Project site without resorting to the tedious process of statistically comparing one or more years of onsite data to long-term data collected

from an off-site weather station. Moreover, the stability of data confirms the suitability of the siting of the data collection station.

The only issue with consistency in the meteorological data at the Lost Creek site is with the precipitation record which is variable both in annual totals and monthly total from year-to-year. As stated in TR 2.5.1.2, the variability in precipitation is likely due to localized thunderstorms and variations in regional precipitation and moisture.

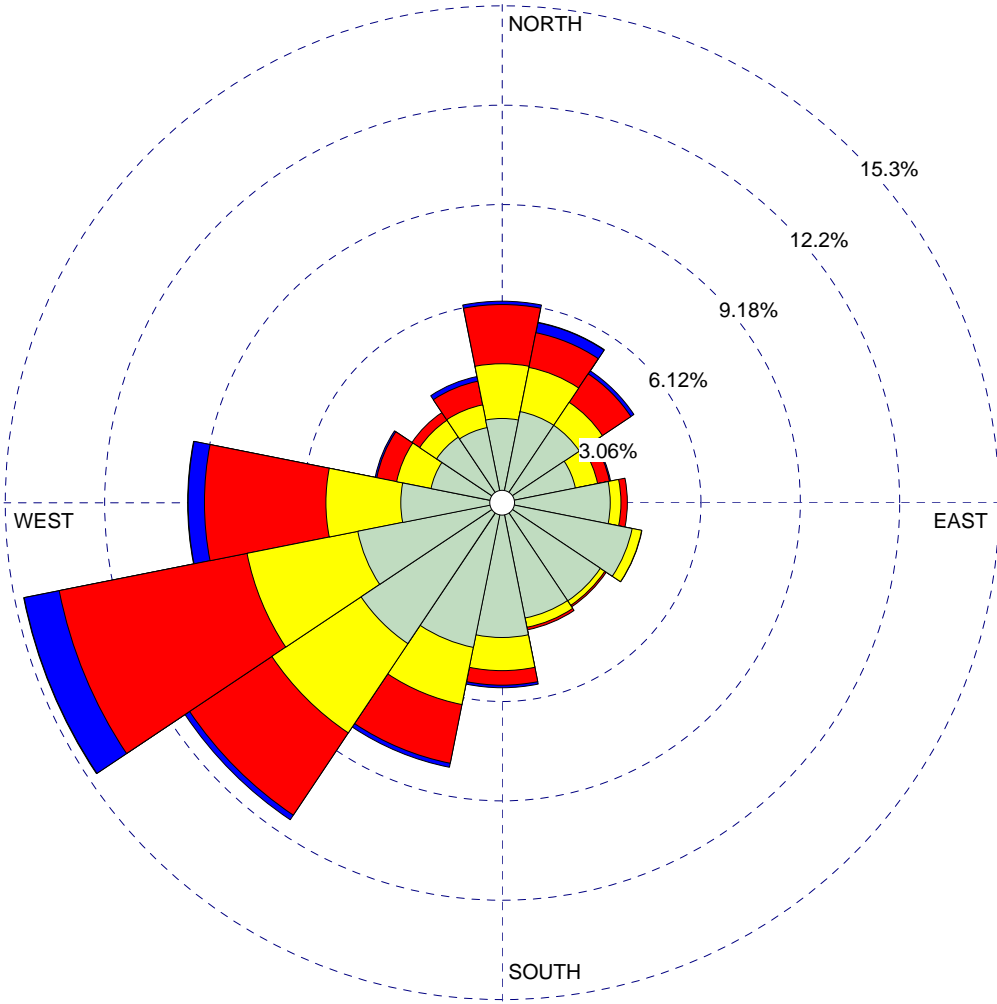
Furthermore, the consistency in the data demonstrates that the siting of monitoring locations for radon, gamma exposure, and radiological air particulates useful in demonstrating compliance with requirements for doses to members of the public (10 CFR 20) remains valid as established in the baseline evaluation provided in the Technical Report. The placement of the monitoring locations is consistent with Regulatory Guide 4.14 and pre-operational MILDOS modeling. No adjustments to monitoring locations are required and no revisions to the MILDOS-based monitor siting is necessary since the meteorological data are consistent. The data collection process will continue with reporting provided in the Semi-Annual Effluent and Environmental Monitoring Report.

## **APPENDIX A**

*BLANK PAGE*

WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 2.25%

COMMENTS:  <b>2009</b>	DATA PERIOD: <b>Start Date: 1/1/2009 - 00:00</b> <b>End Date: 12/31/2009 - 23:00</b>	COMPANY NAME: <b>Lost Creek ISR, LLC</b>	
		MODELER:	
	CALM WINDS: <b>2.25%</b>	TOTAL COUNT: <b>8760 hrs.</b>	
	AVG. WIND SPEED: <b>2.45 m/s</b>	DATE: <b>10/11/2017</b>	PROJECT NO.:

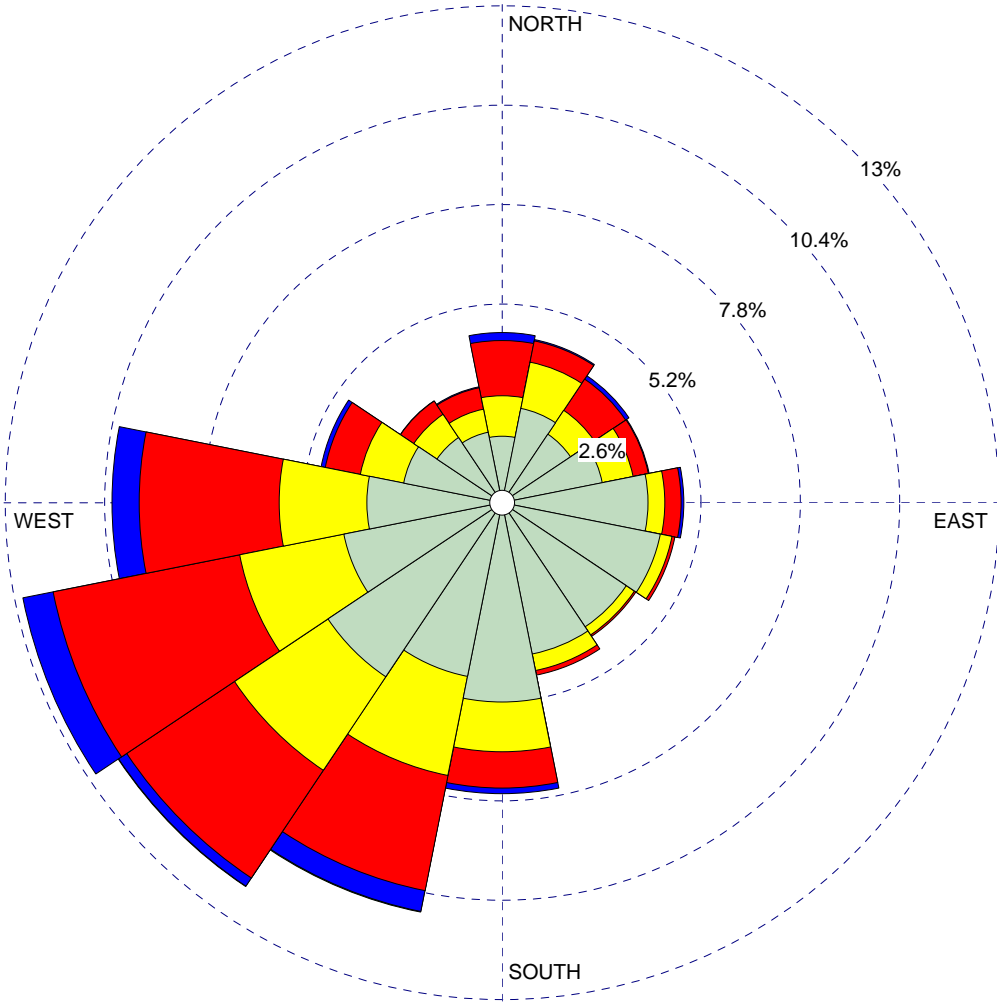
**Joint Frequency Distribution  
Lost Creek ISR Project**

Directions	2009 Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.026	0.017	0.018	0.001	0	0	0.062
NNE	0.029	0.014	0.011	0.003	0	0	0.057
NE	0.029	0.009	0.011	0.001	0	0	0.049
ENE	0.023	0.007	0.004	0	0	0	0.034
E	0.033	0.003	0.002	0	0	0	0.038
ESE	0.041	0.003	0	0	0	0	0.044
SE	0.036	0.002	0.001	0	0	0	0.038
SSE	0.036	0.003	0.001	0	0	0	0.040
S	0.041	0.010	0.004	0.001	0	0	0.057
SSW	0.045	0.018	0.018	0.001	0	0	0.083
SW	0.052	0.033	0.030	0.002	0	0	0.117
WSW	0.045	0.035	0.059	0.011	0	0	0.150
W	0.031	0.023	0.037	0.005	0	0	0.097
WNW	0.022	0.011	0.006	0	0	0	0.040
NW	0.024	0.006	0.003	0	0	0	0.033
NNW	0.024	0.007	0.007	0.001	0	0	0.040
Sub-Total	0.538	0.200	0.213	0.027	0	0	0.978
Calms							0.022
Missing/Incomplete							0
Total							1



WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 0.62%

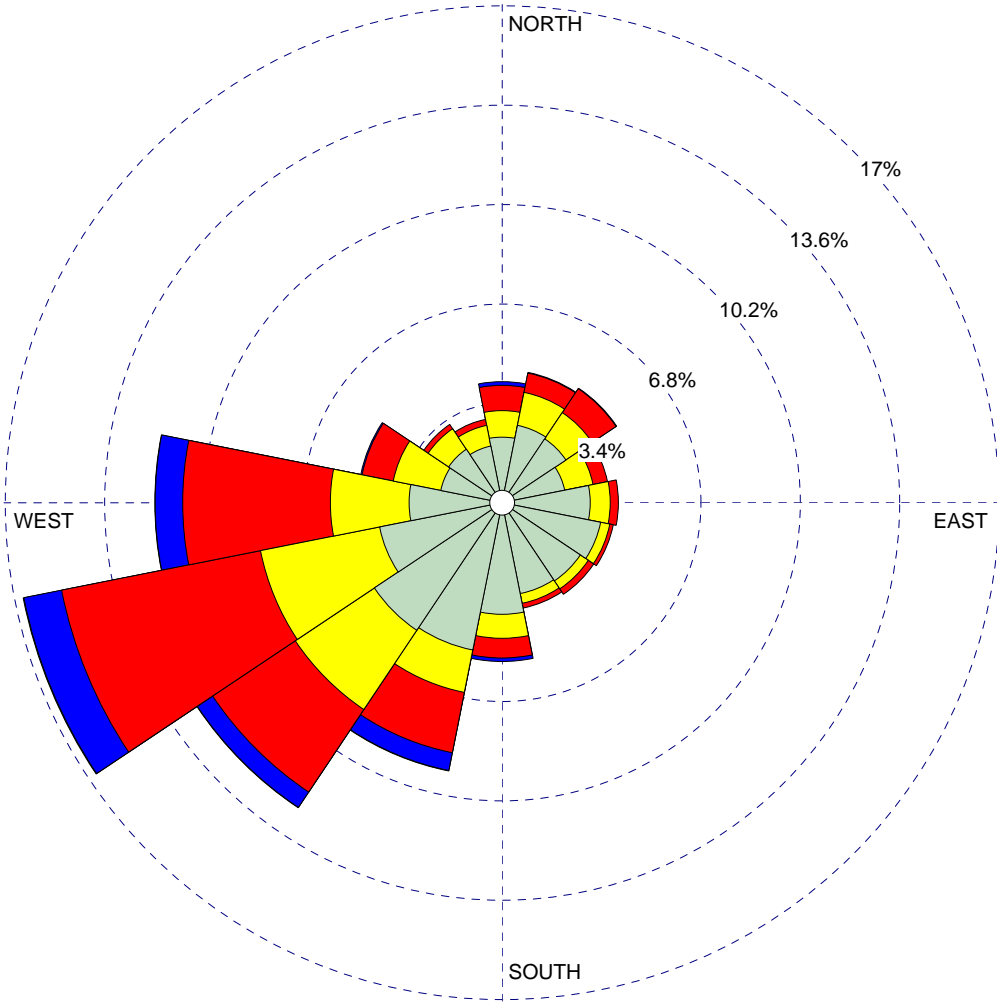
<b>COMMENTS:</b>  <b>2010</b>	<b>DATA PERIOD:</b> Start Date: 1/1/2010 - 00:00 End Date: 12/29/2010 - 16:00	<b>COMPANY NAME:</b> Lost Creek ISR, LLC	
		<b>MODELER:</b>	
	<b>CALM WINDS:</b> 0.62%	<b>TOTAL COUNT:</b> 8691 hrs.	
	<b>AVG. WIND SPEED:</b> 2.49 m/s	<b>DATE:</b> 10/11/2017	<b>PROJECT NO.:</b>

**Joint Frequency Distribution  
Lost Creek ISR Project**

Directions	2010 Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.017	0.011	0.014	0.002	0	0	0.044
NNE	0.025	0.012	0.006	0	0	0	0.043
NE	0.022	0.007	0.010	0.001	0	0	0.040
ENE	0.027	0.008	0.004	0	0	0	0.039
E	0.038	0.004	0.004	0.001	0	0	0.047
ESE	0.042	0.003	0.001	0	0	0	0.046
SE	0.039	0.003	0	0	0	0	0.042
SSE	0.040	0.004	0.001	0	0	0	0.046
S	0.052	0.013	0.009	0.002	0	0	0.076
SSW	0.046	0.026	0.031	0.006	0	0	0.109
SW	0.055	0.029	0.034	0.003	0	0	0.120
WSW	0.042	0.028	0.050	0.008	0	0	0.127
W	0.035	0.023	0.036	0.007	0	0	0.102
WNW	0.026	0.012	0.009	0.001	0	0	0.048
NW	0.020	0.007	0.004	0	0	0	0.032
NNW	0.019	0.006	0.006	0	0	0	0.031
Sub-Total	0.546	0.197	0.220	0.031	0	0	0.994
Calms							0.006
Missing/Incomplete							0
Total							1

WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 0.86%

COMMENTS:

**2012**

DATA PERIOD:

**Start Date: 1/1/2012 - 00:00**  
**End Date: 12/31/2012 - 23:00**

COMPANY NAME:

**Lost Creek ISR, LLC**

MODELER:

CALM WINDS:

**0.86%**

TOTAL COUNT:

**8209 hrs.**

AVG. WIND SPEED:

**2.64 m/s**

DATE:

**9/22/2017**

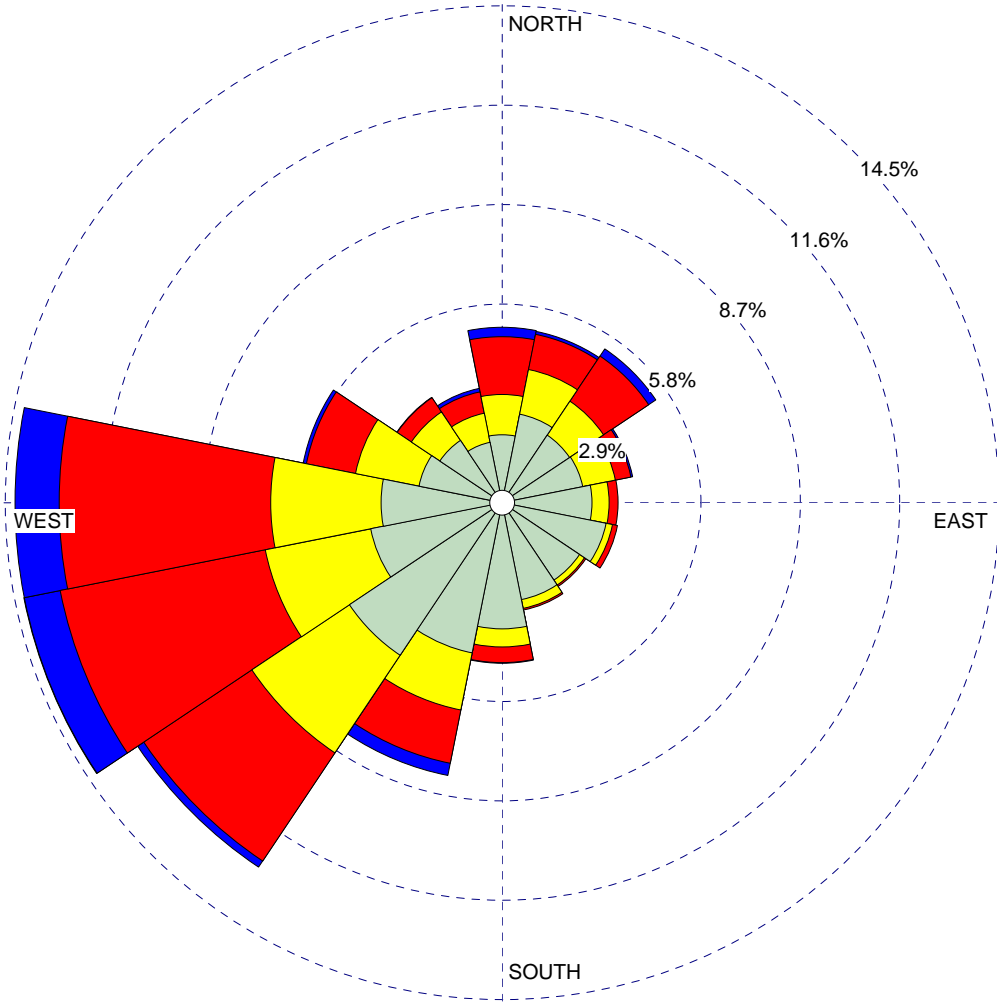
PROJECT NO.:

**Joint Frequency Distribution  
Lost Creek ISR Project**

Directions	2012 Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.022	0.009	0.009	0.001	0	0	0.041
NNE	0.027	0.011	0.007	0	0	0	0.045
NE	0.026	0.011	0.010	0	0	0	0.047
ENE	0.022	0.010	0.005	0	0	0	0.037
E	0.030	0.007	0.003	0	0	0	0.040
ESE	0.034	0.003	0.001	0	0	0	0.039
SE	0.032	0.003	0.002	0	0	0	0.038
SSE	0.032	0.003	0.002	0	0	0	0.037
S	0.038	0.008	0.007	0.001	0	0	0.054
SSW	0.051	0.015	0.021	0.006	0.00012	0	0.093
SW	0.052	0.033	0.034	0.006	0.00012	0	0.125
WSW	0.043	0.041	0.069	0.013	0.00024	0	0.167
W	0.032	0.027	0.050	0.009	0.00012	0	0.119
WNW	0.021	0.017	0.011	0	0	0	0.049
NW	0.022	0.008	0.002	0	0	0	0.032
NNW	0.020	0.007	0.002	0	0	0	0.029
Sub-Total	0.505	0.214	0.234	0.038	0.0006	0	0.991
Calms							0.009
Missing/Incomplete							0
Total							1

WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



WIND SPEED  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 0.74%

COMMENTS:

**2013**

DATA PERIOD:

**Start Date: 1/1/2014 - 00:00**  
**End Date: 12/31/2014 - 23:00**

COMPANY NAME:

**Lost Creek ISR, LLC**

MODELER:

CALM WINDS:

**0.74%**

TOTAL COUNT:

**8026 hrs.**

AVG. WIND SPEED:

**2.69 m/s**

DATE:

**9/22/2017**

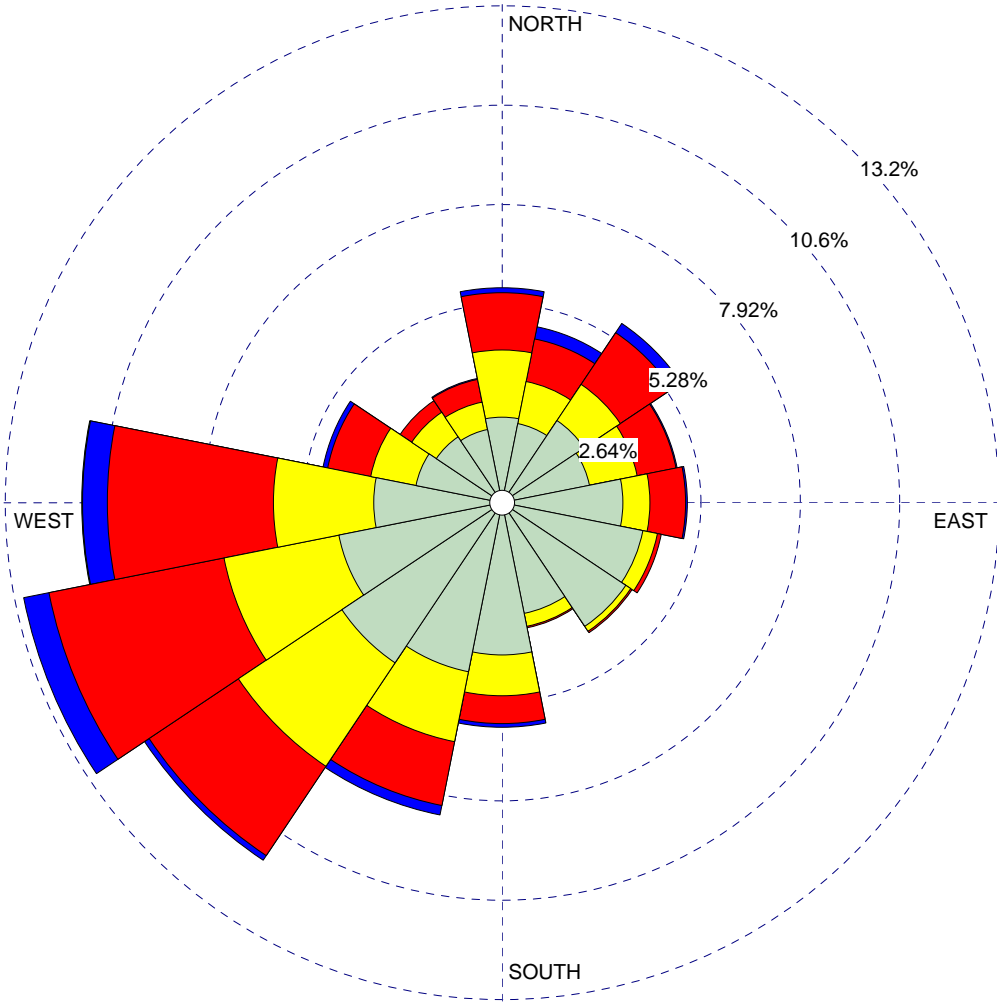
PROJECT NO.:

**Joint Frequency Distribution  
Lost Creek ISR Project**

Directions	2013 Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.023	0.018	0.015	0.001	0	0	0.057
NNE	0.021	0.011	0.012	0.003	0	0	0.048
NE	0.026	0.012	0.016	0.003	0	0	0.057
ENE	0.024	0.013	0.011	0	0	0	0.047
E	0.032	0.007	0.009	0	0	0	0.049
ESE	0.038	0.004	0.001	0	0	0	0.043
SE	0.039	0.002	0	0	0	0	0.041
SSE	0.030	0.004	0	0	0	0	0.034
S	0.040	0.011	0.007	0.001	0	0	0.060
SSW	0.046	0.019	0.017	0.003	0	0	0.084
SW	0.051	0.033	0.028	0.001	0	0	0.114
WSW	0.044	0.031	0.047	0.007	0	0	0.129
W	0.034	0.027	0.044	0.007	0	0	0.111
WNW	0.023	0.012	0.012	0.001	0	0	0.048
NW	0.021	0.008	0.004	0	0	0	0.032
NNW	0.020	0.007	0.006	0	0	0	0.034
Sub-Total	0.513	0.217	0.231	0.028	0	0	0.989
Calms							0.011
Missing/Incomplete							0
Total							1

WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.08%

COMMENTS:

**2014**

DATA PERIOD:

**Start Date: 1/1/2013 - 00:00**  
**End Date: 12/31/2013 - 23:00**

COMPANY NAME:

**Lost Creek ISR, LLC**

MODELER:

CALM WINDS:

**1.08%**

TOTAL COUNT:

**8249 hrs.**

AVG. WIND SPEED:

**2.55 m/s**

DATE:

**9/22/2017**

PROJECT NO.:

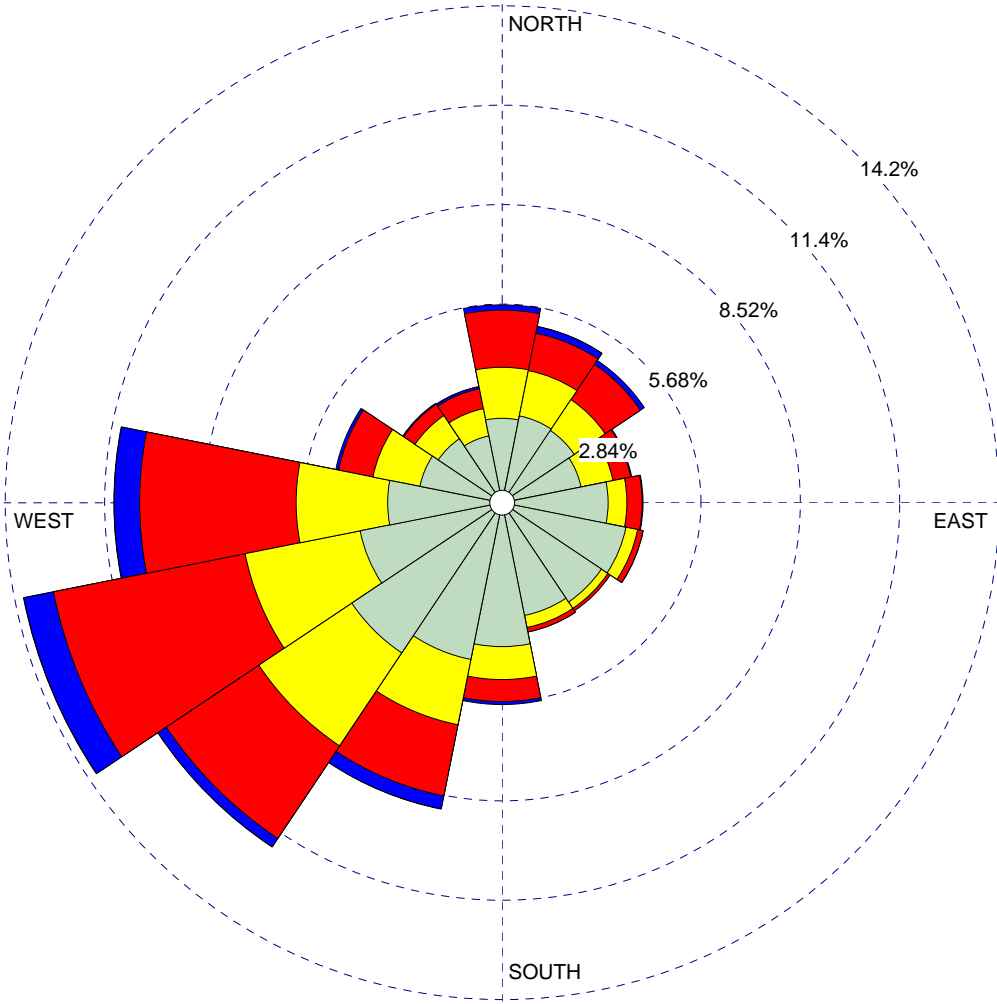
**Joint Frequency Distribution  
Lost Creek ISR Project**

Directions	2014 Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.020	0.012	0.017	0.003	0	0	0.051
NNE	0.026	0.013	0.010	0.001	0	0	0.051
NE	0.024	0.012	0.016	0.002	0	0	0.054
ENE	0.024	0.010	0.005	0.001	0	0	0.039
E	0.026	0.005	0.003	0	0	0	0.034
ESE	0.031	0.002	0.002	0	0	0	0.034
SE	0.027	0.002	0.001	0	0	0	0.029
SSE	0.029	0.003	0.001	0	0	0	0.032
S	0.037	0.005	0.005	0	0	0	0.047
SSW	0.045	0.017	0.016	0.004	0	0	0.081
SW	0.053	0.034	0.038	0.002	0	0	0.128
WSW	0.039	0.031	0.061	0.011	0	0	0.142
W	0.035	0.032	0.062	0.013	0	0	0.142
WNW	0.025	0.019	0.015	0.001	0	0	0.059
NW	0.022	0.010	0.005	0	0	0	0.037
NNW	0.018	0.009	0.006	0.001	0	0	0.034
Sub-Total	0.480	0.215	0.260	0.038	0	0	0.993
Calms							0.007
Missing/Incomplete							0
Total							1



WIND ROSE PLOT: **Station**  
**Lost Creek**

DISPLAY:  
**Wind Speed**  
**Direction (blowing from)**



**WIND SPEED**  
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 1.94%

COMMENTS:  
  
**Composite for  
Period of  
Record  
(2009-2010,  
2012-2014)**

DATA PERIOD:  
**Start Date: 1/1/2009 - 00:00**  
**End Date: 12/31/2015 - 23:00**

CALM WINDS:  
**1.94%**

AVG. WIND SPEED:  
**2.54 m/s**

COMPANY NAME:  
**Lost Creek ISR, LLC**

MODELER:

TOTAL COUNT:  
**55935 hrs.**

DATE:  
**11/14/2017**

PROJECT NO.:

**Joint Frequency Distribution  
Lost Creek ISR Project**

POR Composite Directions	Wind Classes (m/s)						Total
	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	
N	0.024	0.015	0.016	0.002	0	0	0.06
NNE	0.025	0.013	0.011	0.002	0.00002	0	0.05
NE	0.025	0.011	0.012	0.001	0	0	0.05
ENE	0.023	0.009	0.005	0.00021	0	0	0.04
E	0.030	0.005	0.004	0.00020	0	0	0.04
ESE	0.036	0.003	0.002	0.00002	0	0	0.04
SE	0.034	0.002	0.001	0	0	0	0.04
SSE	0.033	0.004	0.001	0.00004	0	0	0.04
S	0.041	0.009	0.006	0.001	0	0	0.06
SSW	0.046	0.019	0.021	0.004	0.00007	0	0.09
SW	0.052	0.032	0.032	0.003	0.00004	0	0.12
WSW	0.041	0.033	0.056	0.009	0.00009	0	0.14
W	0.033	0.026	0.045	0.007	0.00013	0	0.11
WNW	0.024	0.014	0.010	0.001	0	0	0.05
NW	0.022	0.008	0.004	0.0004	0	0	0.03
NNW	0.019	0.008	0.006	0.001	0.00002	0	0.03
Sub-Total	0.50741	0.21116	0.23114	0.03055	0.00036	0	0.98
Calms							0.02
Missing/Incomplete							0
Total							1