



# 2016 Meteorology Summary

New Jersey Department of Environmental Protection

## AIR POLLUTION AND METEOROLOGY

Meteorology plays an important role in the distribution of pollution throughout the troposphere, the layer of the atmosphere closest to the earth's surface. Atmospheric processes such as wind speed and wind direction affect the transport and dispersion of air pollution. Precipitation, solar radiation, and other weather phenomena influence chemical reactions and atmospheric transformations. By studying meteorological and air pollution data together, scientists and mathematicians have developed reasonably accurate models for predicting the fate of pollutants as they go through the stages of transport, dispersion, transformation, and removal.

Scientists, engineers, and policy makers can use air pollution models as a screening tool, for comparing predicted pollutant concentrations to National Ambient Air Quality Standards (NAAQS), to determine the impacts of new and existing air pollution sources, and to design ambient air monitoring networks. The meteorological data collected by the New Jersey Department of Environmental Protection (NJDEP) can assist planners in preparing State Implementation Plans (SIPs) to reduce pollutant emissions; engineers in designing or evaluating air pollution permit applications; and scientists in siting air monitoring stations.

## CLIMATOLOGY IN NEW JERSEY

New Jersey is located about halfway between the Equator and the North Pole, on the eastern coast of the United States. Its geographic location results in the state being influenced by different air streams at different times (wet, dry, hot, cold), making for daily weather that is highly variable.

Although New Jersey is one of the smallest states in the Union, with a land area of 7,836 square miles, it has five distinct climate zones, which are classified as the Northern, Central, Pine Barrens, Southwest, and Coastal Zones. The topography of the different zones, their distance from the Atlantic Ocean, and the prevailing atmospheric flow patterns affecting them produce distinct variations in the daily weather. These climate zones are shown in Figure 9-1.

Figure 9-1  
New Jersey Climate Zones



Source: Office of the New Jersey State Climatologist

## MONITORING LOCATIONS

NJDEP collected meteorological data at nine stations in its monitoring network in 2016, although monitoring was discontinued at East Orange mid-year. Not all meteorological parameters were measured at each site. The Elizabeth Trailer site has been collecting wind data for years; additional meteorological parameters were added in May 2016. Table 9-1 lists the parameters monitored at each station, and Figure 9-2 is a map of the 2016 meteorological monitoring network. In Tables 9-2 through 9-6, the 2016 meteorological data is summarized for temperature, rain, relative humidity, solar radiation, and barometric pressure. Figure 9-3 presents the average temperature for each monitoring site compared with the statewide 30-year average. Figure 9-4 shows the monthly precipitation at each site, as well as the statewide 30-year average.

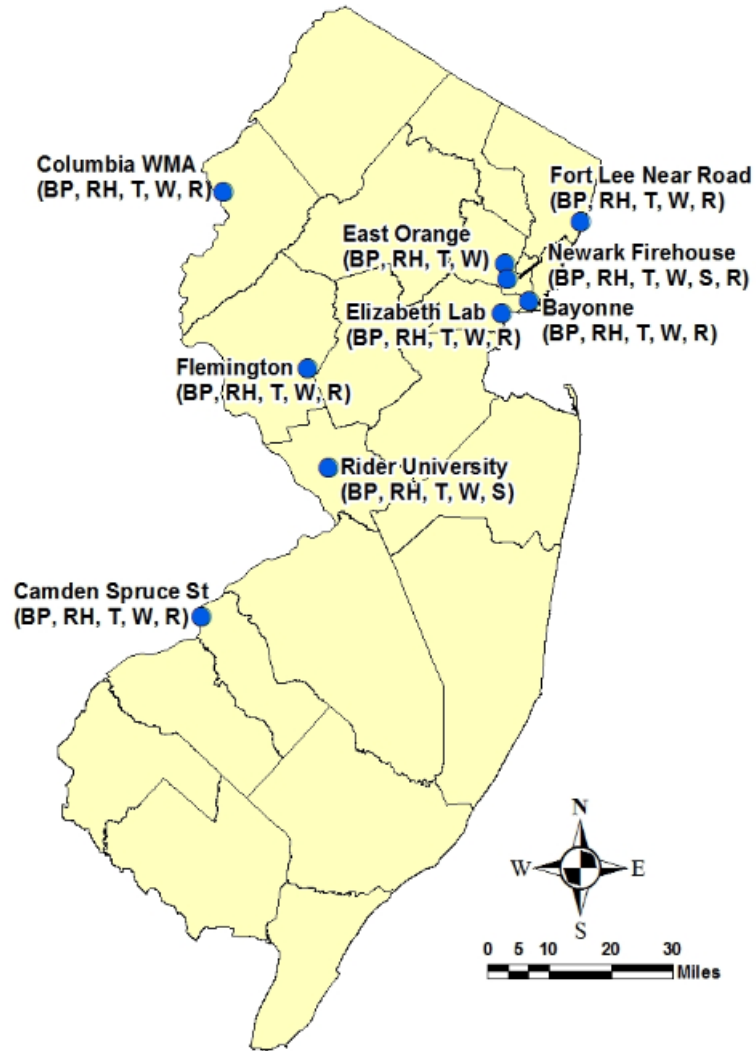
Figures 9-5 through 9-13 present annual wind roses for Bayonne, Camden Spruce Street, Columbia, Elizabeth Trailer, Flemington, Fort Lee Near Road, Newark Firehouse, and Rider University, respectively. Presented in a circular format, a wind rose shows the frequency of winds blowing *from* a specific direction for a specified period. The length of each "spoke" around the circle is related to the frequency that the wind blows from a particular direction per unit time. Each concentric circle represents a different frequency, starting with zero at the center and increasing frequencies at the outer circles. Each spoke is broken down into color-coded bands that show wind speed ranges.

Table 9-1  
2016 New Jersey Meteorological Monitoring Network  
Parameter Summary

	Site Name	Temperature	Relative Humidity	Wind Speed	Wind Direction	Barometric Pressure	Solar Radiation	Rain
1	Bayonne	X	X	X	X	X		X
2	Camden Spruce Street	X	X	X	X	X		X
3	Columbia	X	X	X	X	X		X
4	East Orange*	X	X	X	X	X		
5	Elizabeth Trailer	X	X	X	X	X		X
6	Flemington	X	X	X	X	X		X
7	Fort Lee Near Road	X	X	X	X	X		X
8	Newark Firehouse	X	X	X	X	X	X	X
9	Rider University	X	X	X	X	X	X	

\*Monitoring discontinued 7/1/2016.

Figure 9-2  
2016 Meteorological Monitoring Network



**Legend**

●	Meteorological Site
BP	Barometric Pressure
RH	Relative Humidity
S	Solar Radiation
T	Temperature
W	Wind Speed & Direction
R	Rain

Table 9-2  
2016 Temperature Data (in Degrees Fahrenheit)  
from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	Mean	33	36	46	51	60	71	77	78	70	58	48	37	55
	Minimum	11	1	26	26	41	53	65	64	53	39	34	16	1
	Maximum	63	62	76	78	91	86	92	95	89	83	69	57	95
Camden Spruce St.	Mean	33	38	49	53	62	73	79	80	72	59	49	38	57
	Minimum	12	8	27	30	43	55	67	64	52	39	34	16	8
	Maximum	64	65	80	82	89	91	95	97	94	85	72	63	97
Columbia	Mean	27	32	44	48	58	67	72	73	65	52	43	32	51
	Minimum	6	-2	22	22	37	46	54	55	40	29	25	6	-2
	Maximum	59	61	77	80	89	88	92	93	91	82	69	57	93
East Orange	Mean	32	35	47	51	61	71	ND	ND	ND	ND	ND	ND	*
	Minimum	9	0	27	25	39	51	ND	ND	ND	ND	ND	ND	*
	Maximum	62	61	78	79	91	89	ND	ND	ND	ND	ND	ND	*
Elizabeth Trailer	Mean	ND	ND	ND	ND	65	71	78	78	71	57	48	37	*
	Minimum	ND	ND	ND	ND	41	52	63	59	51	36	33	15	*
	Maximum	ND	ND	ND	ND	92	90	95	97	92	85	72	60	*
Flemington	Mean	29	33	45	49	59	69	75	74	66	54	45	34	53
	Minimum	7	2	22	19	37	46	56	52	39	24	22	10	2
	Maximum	62	64	78	80	89	90	94	94	92	84	71	59	94
Fort Lee Near Road	Mean	32	35	45	50	58	70	77	77	69	56	47	36	54
	Minimum	9	-2	24	24	40	52	63	61	52	36	33	15	-2
	Maximum	57	60	75	76	88	86	95	94	88	83	71	58	95
Newark Firehouse	Mean	32	36	46	51	61	71	77	77	70	56	48	36	55
	Minimum	10	0	25	25	39	52	63	61	52	37	33	15	0
	Maximum	62	61	78	78	90	88	94	95	90	83	71	59	95
Rider University	Mean	30	35	47	51	60	69	75	76	70	51	45	35	54
	Minimum	9	4	24	22	39	50	57	56	48	31	25	13	4
	Maximum	63	65	80	80	89	86	94	95	92	76	71	60	95

ND = no data

\*Not enough data to determine an annual statistic.

Table 9-3  
2016 Rain Data (Inches) from NJ's Air Monitoring Sites

SITE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Bayonne	2.11	3.01	0.77	1.11	2.90	2.14	6.33	0.79	1.63	1.95	4.61	1.79	29.14
Camden Spruce St.	1.14	3.44	1.65	2.08	5.96	2.23	5.53	1.72	3.39	2.33	2.11	2.39	33.97
Columbia	1.12	3.92	0.96	1.82	3.64	3.22	3.84	3.58	3.00	1.12	2.75	1.82	30.79
Elizabeth Trailer	ND	ND	ND	ND	1.66	2.47	4.65	0.78	1.79	2.22	4.76	2.09	*
Flemington	ND	1.24	1.09	1.20	2.80	1.43	8.43	2.08	1.61	0.84	3.10	1.97	*
Fort Lee Near Road	2.50	2.96	0.95	2.20	1.73	3.27	4.29	1.54	2.16	2.29	5.73	2.30	31.92
Newark Firehouse	2.66	2.94	1.05	1.65	3.61	2.88	7.75	1.20	1.86	2.46	5.51	1.93	35.51

ND = no data

\*Not able to determine an annual statistic because of missing data.

Table 9-4  
2016 Relative Humidity Data (%) from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	Mean	56	59	55	50	60	56	62	61	62	65	58	58	58
	Minimum	23	29	22	11	23	22	27	29	21	27	24	31	11
	Maximum	89	91	89	87	90	88	89	86	88	89	89	90	91
Camden Spruce St	Mean	54	56	52	50	61	54	60	59	59	62	54	54	56
	Minimum	21	25	17	13	18	15	26	28	24	23	21	26	13
	Maximum	90	91	90	88	90	88	91	90	88	90	90	90	91
Columbia	Mean	59	59	55	53	67	66	72	75	72	71	64	63	65
	Minimum	21	25	18	13	18	25	30	33	25	26	20	28	13
	Maximum	92	92	91	90	92	92	92	93	92	92	92	91	93
East Orange	Mean	52	55	51	47	58	52	ND	ND	ND	ND	ND	ND	*
	Minimum	15	22	19	10	19	19	ND	ND	ND	ND	ND	ND	*
	Maximum	90	90	88	86	89	89	ND	ND	ND	ND	ND	ND	*
Elizabeth Trailer	Mean	ND	ND	ND	ND	55	55	62	61	61	64	57	56	*
	Minimum	ND	ND	ND	ND	18	20	27	30	21	22	20	22	18
	Maximum	ND	ND	ND	ND	93	92	92	89	91	91	91	92	93
Flemington	Mean	61	62	56	55	67	61	69	72	69	69	62	63	64
	Minimum	29	28	20	14	22	20	25	33	26	24	20	27	14
	Maximum	92	93	92	90	93	92	93	93	93	92	92	93	93
Fort Lee Near Road	Mean	54	56	53	50	57	53	60	59	61	65	56	57	57
	Minimum	20	22	21	9	18	18	23	30	24	33	18	23	9
	Maximum	92	93	91	89	92	92	90	88	90	91	90	91	93
Newark Firehouse	Mean	53	55	53	49	60	55	62	61	61	65	56	56	57
	Minimum	20	22	19	11	20	18	27	32	19	22	21	25	11
	Maximum	93	94	91	89	93	92	92	90	90	91	90	92	94
Rider University	Mean	63	66	58	56	70	68	72	67	63	67	67	64	65
	Minimum	20	25	17	13	20	27	28	34	27	43	25	24	13
	Maximum	99	100	99	97	99	98	95	94	88	95	96	95	100

ND = no data

\* Not able to determine an annual statistic because of missing data.

Table 9-5  
2016 Solar Radiation Data (in Langleys) from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Newark Firehouse	Mean	0.110	0.133	0.225	0.293	0.265	0.368	0.337	0.326	0.238	0.151	0.116	0.081	0.220
	Maximum	0.737	0.929	1.188	1.324	1.391	1.421	1.375	1.345	1.255	0.976	0.749	0.639	1.421
Rider University	Mean	0.106	0.122	0.219	0.274	0.265	0.369	0.336	0.312	0.226	0.159	0.110	0.070	0.214
	Maximum	0.698	0.887	1.137	1.246	1.345	1.338	1.287	1.296	1.136	0.926	0.721	0.547	1.345

Table 9-6  
 2016 Average Barometric Pressure Data (in inches of Hg)  
 from NJ's Air Monitoring Sites

SITE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	29.97	29.98	30.00	30.00	29.94	29.90	29.92	30.01	30.06	30.07	30.01	30.08	30.00
Camden Spruce St	29.99	29.99	30.00	29.99	29.95	29.91	29.93	30.01	30.05	30.09	30.05	30.11	30.01
Columbia	29.46	29.46	29.48	29.48	29.44	29.42	29.45	29.51	29.57	29.58	29.52	29.56	29.49
East Orange	29.80	29.81	29.84	29.83	29.77	29.74	ND	ND	ND	ND	ND	ND	*
Elizabeth Trailer	ND	ND	ND	ND	29.97	29.89	29.91	30.00	30.05	30.07	30.00	30.08	*
Flemington	29.77	29.83	29.85	29.85	29.79	29.76	29.78	29.87	29.91	29.93	29.87	29.94	29.85
Fort Lee Near Road	29.64	29.66	29.68	29.68	29.62	29.59	29.62	29.71	29.76	29.74	29.69	29.75	29.68
Newark Firehouse	29.86	29.87	29.89	29.88	29.83	29.79	29.82	29.90	29.95	29.97	29.91	29.98	29.89
Rider University	30.23	30.23	30.25	30.25	30.19	29.99	29.83	29.92	29.96	29.93	29.92	29.99	30.06

ND = no data

\* Not able to determine an annual statistic because of missing data.

Figure 9-3  
 2016 Average Temperatures at NJDEP Air Monitoring Sites  
 Compared to the Statewide 30-Year Average

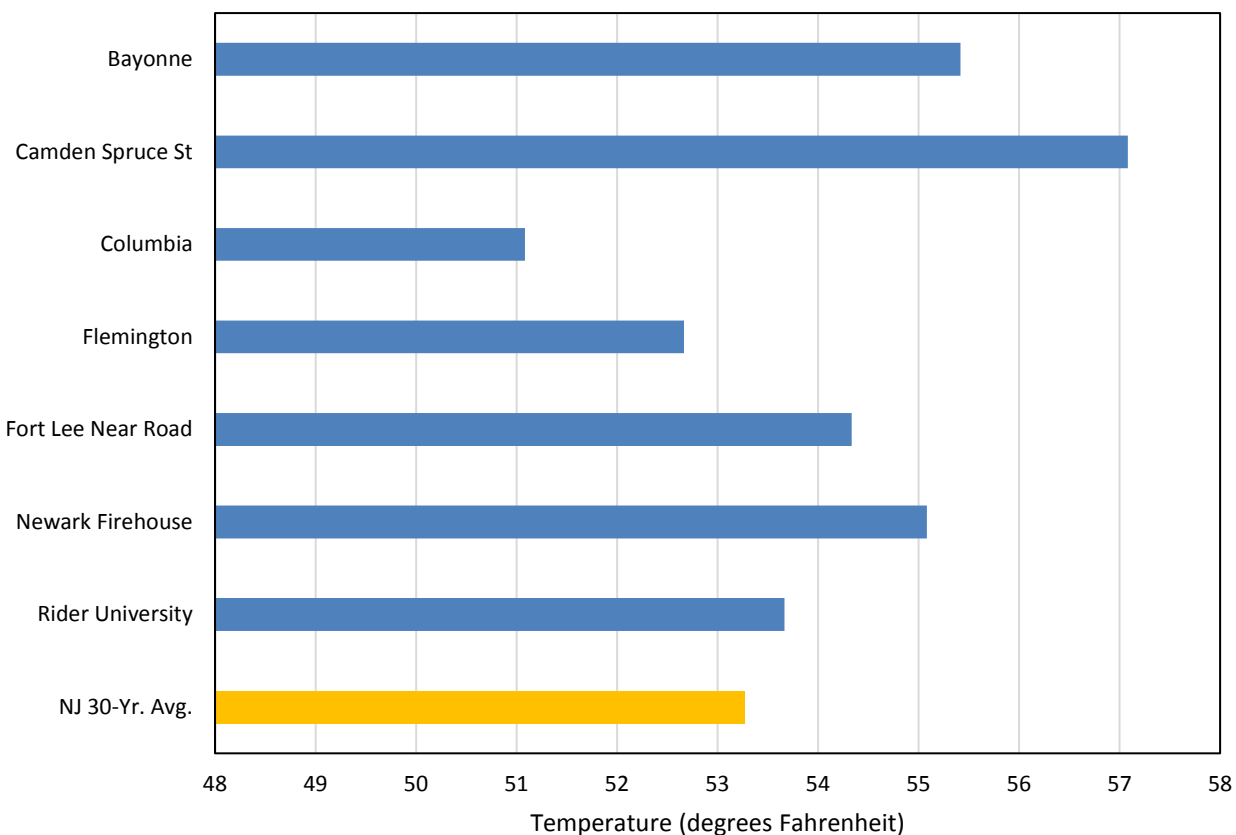
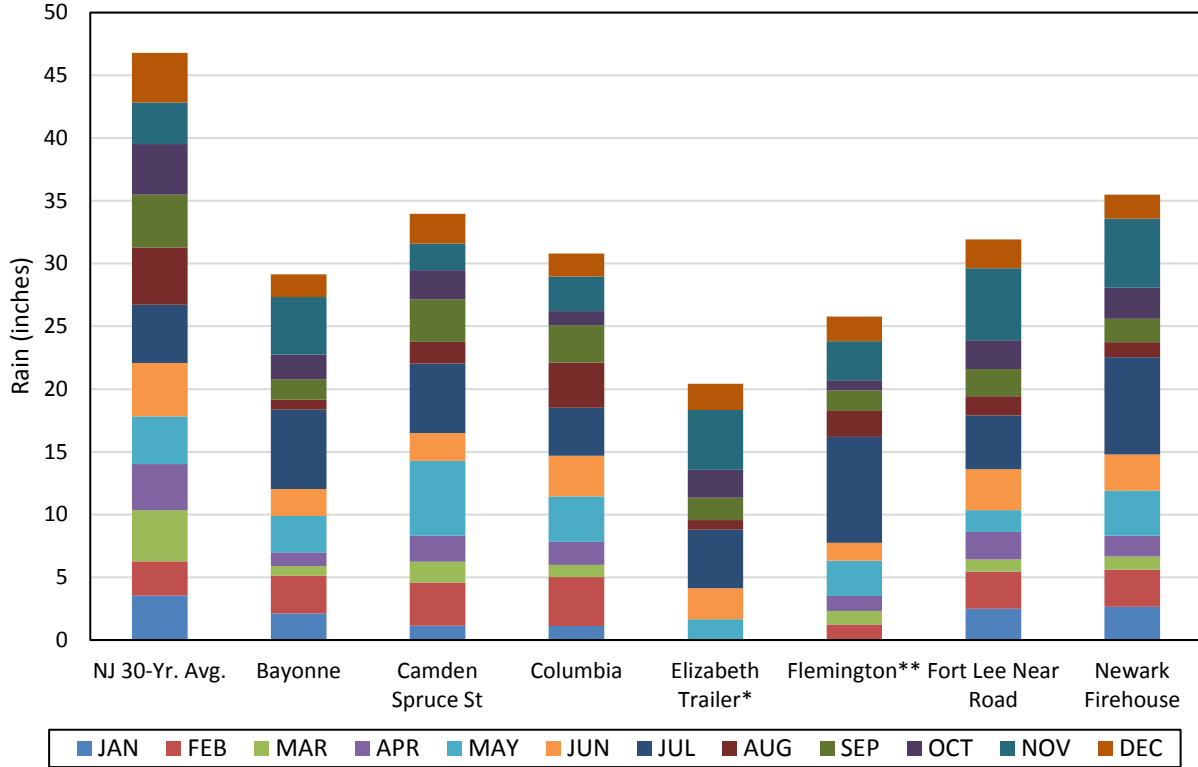


Figure 9-4  
 2016 Total Rainfall at NJDEP Air Monitoring Sites  
 Compared to the Statewide 30-Year Average



\*Elizabeth Trailer missing data from January through April.

\*\*Flemington missing January data.

# Wind Roses - Distribution of Wind Speed & Wind Direction

Figure 9-5. 2016 Wind Rose for Bayonne

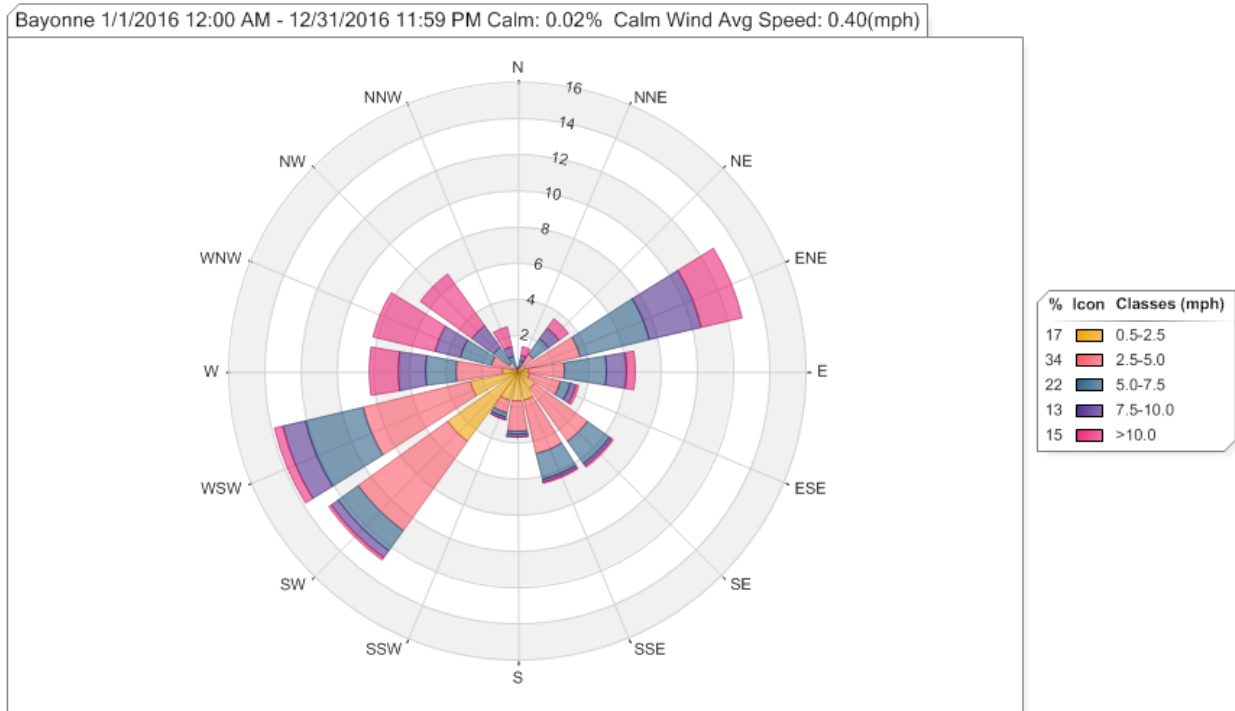


Figure 9-6. 2016 Wind Rose for Camden Spruce Street

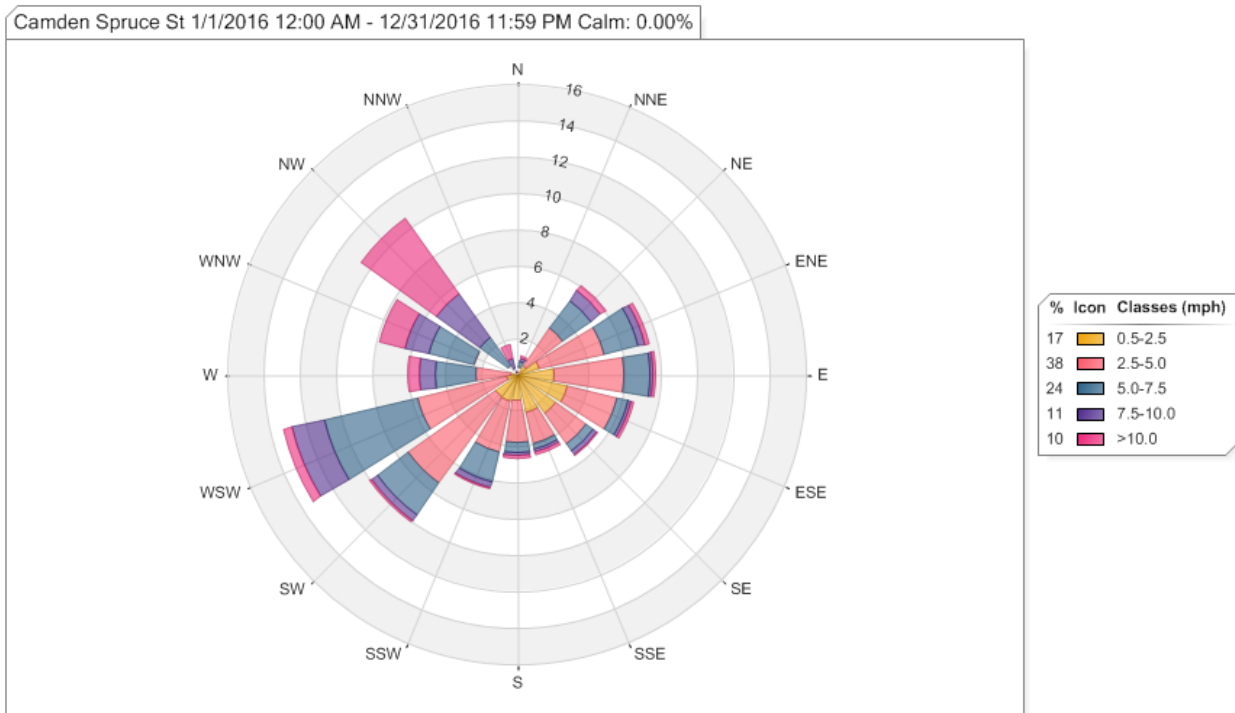




Figure 9-7. 2016 Wind Rose for Columbia

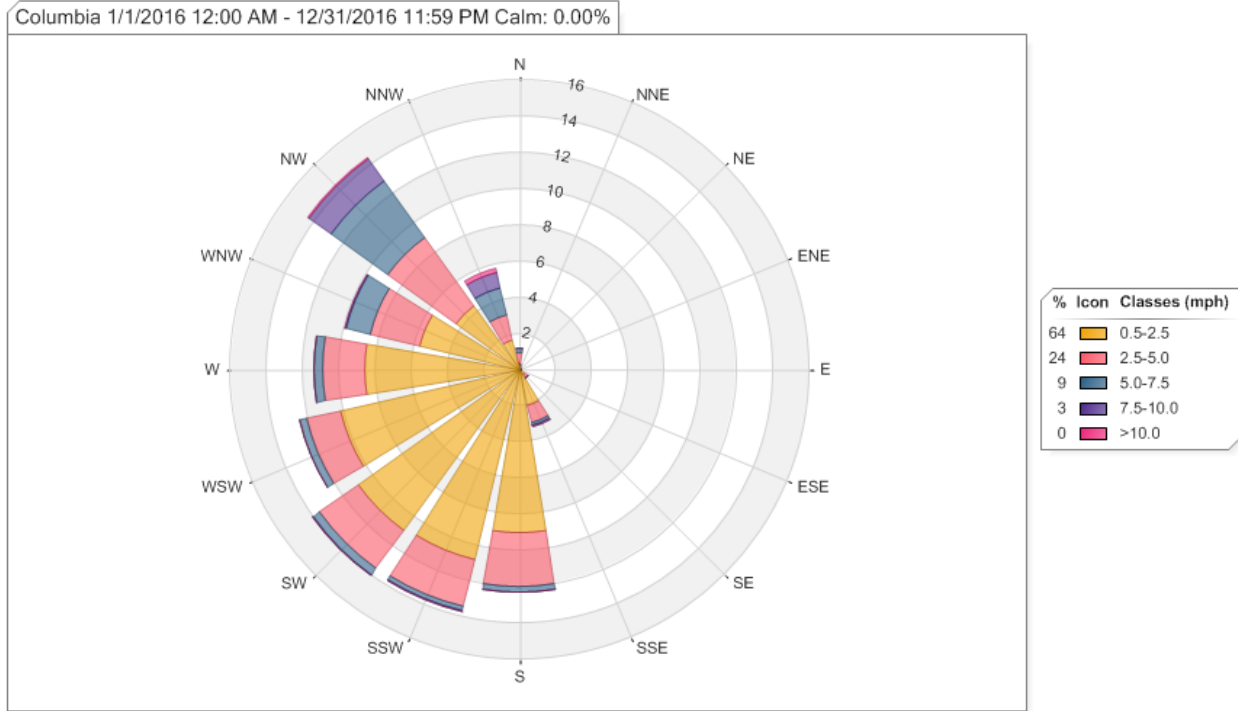


Figure 9-8. 2016 Wind Rose for Elizabeth Trailer

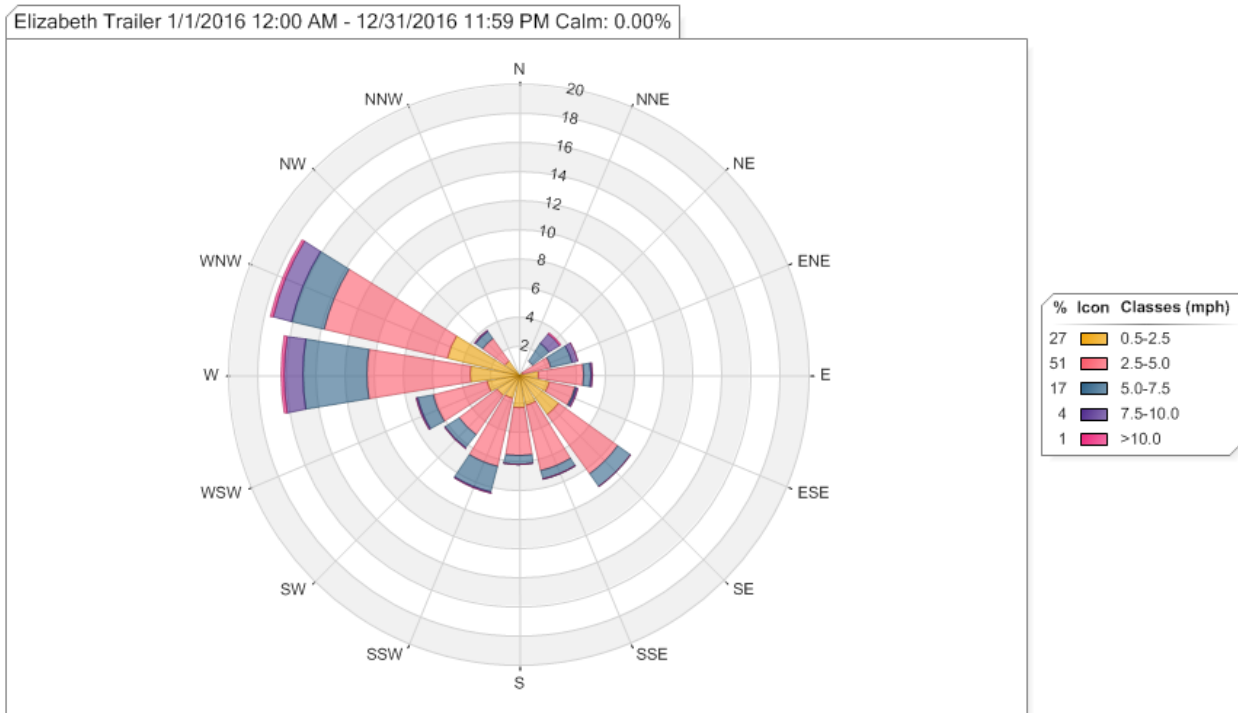


Figure 9-9. 2016 Wind Rose for Flemington

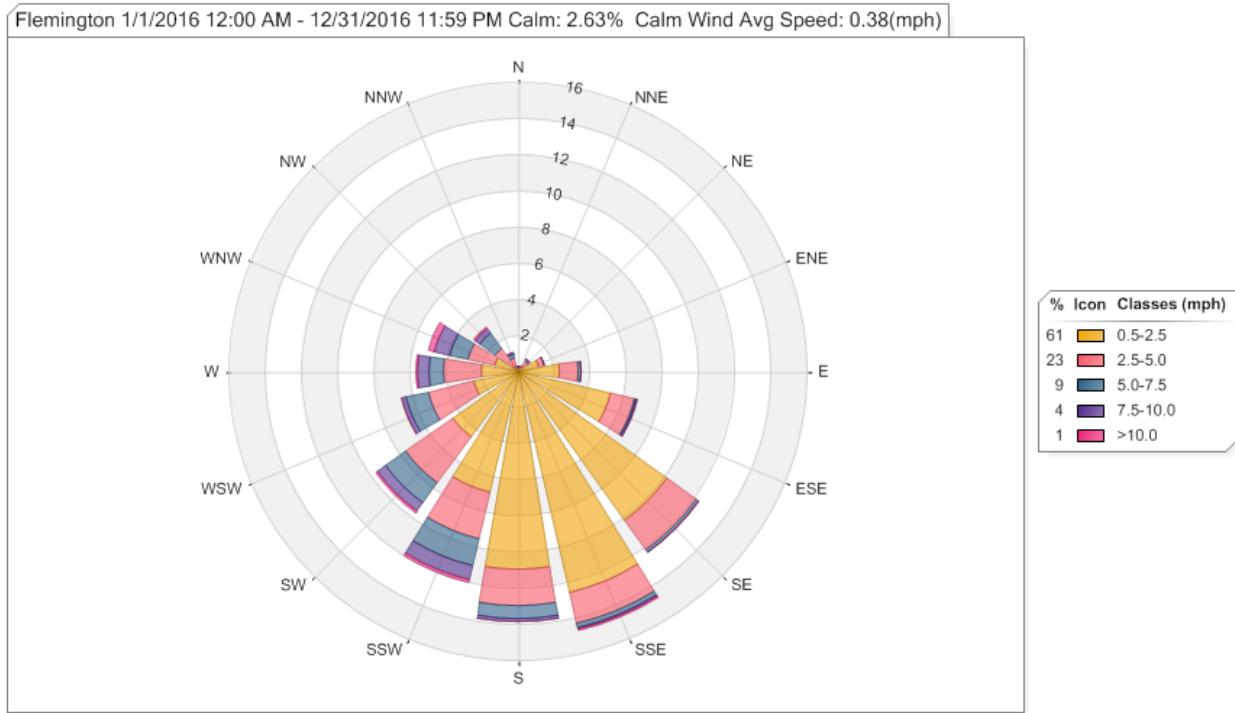


Figure 9-10. 2016 Wind Rose for Fort Lee Near Road

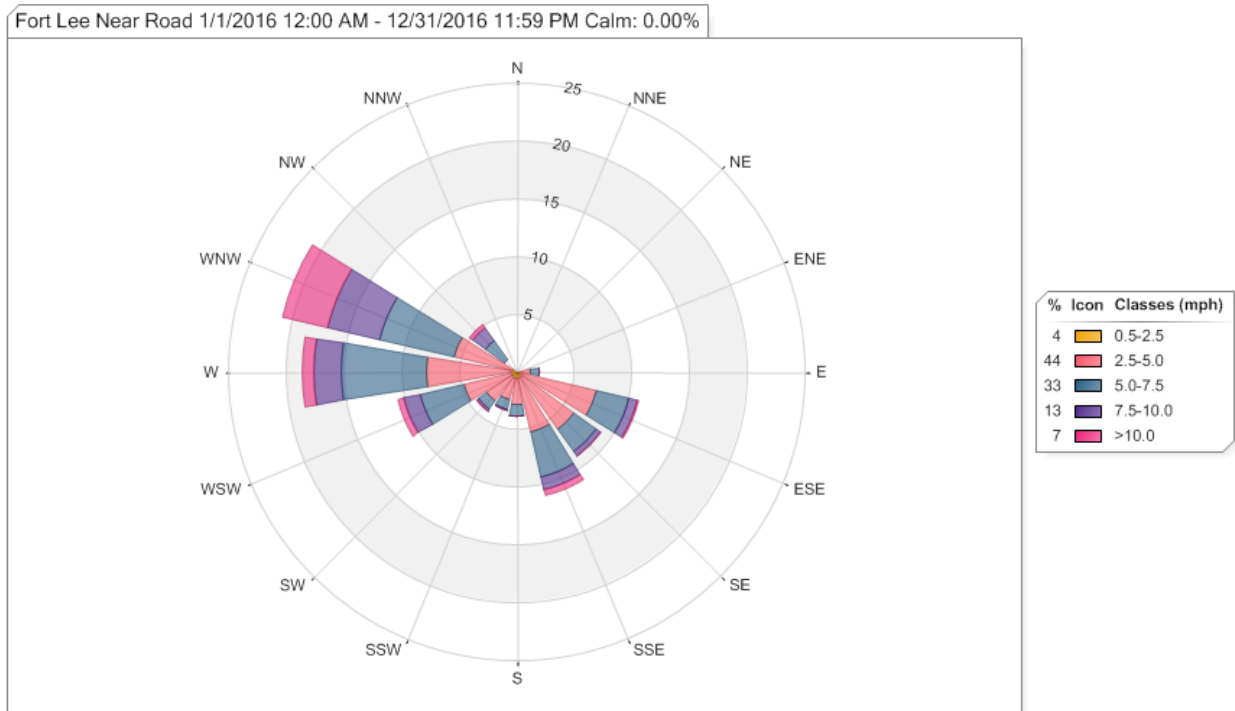


Figure 9-11. 2016 Wind Rose for Newark Firehouse

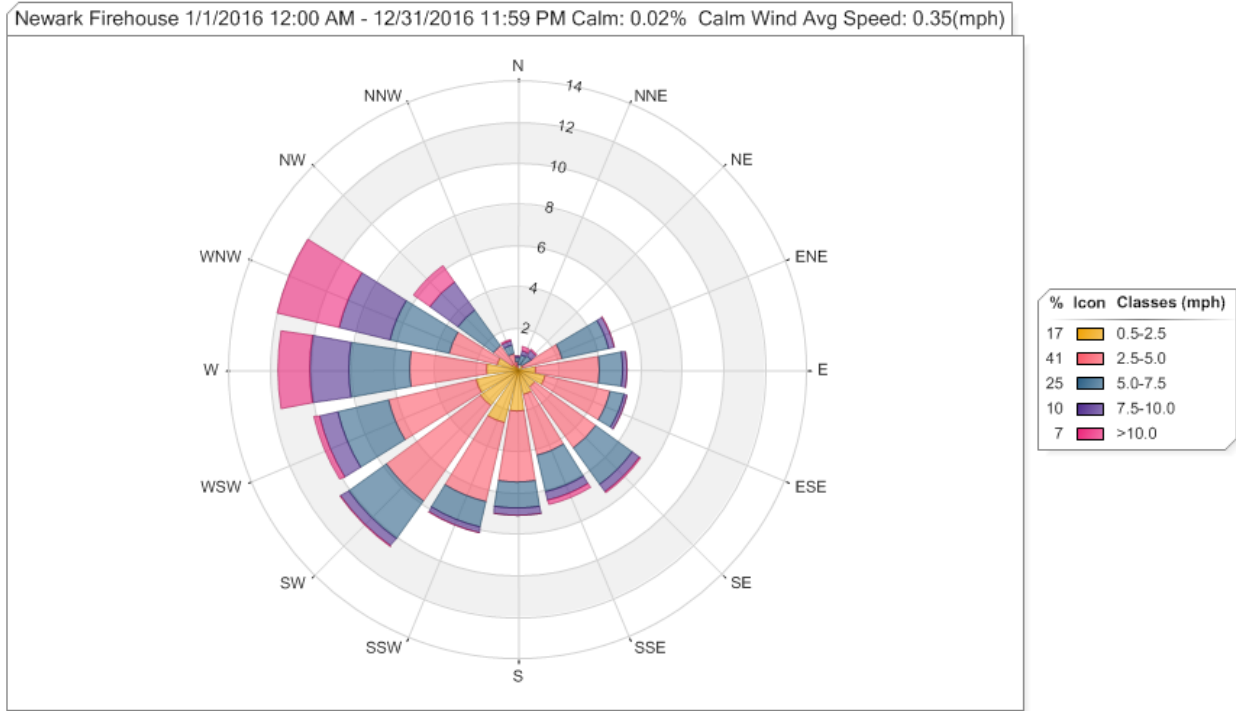
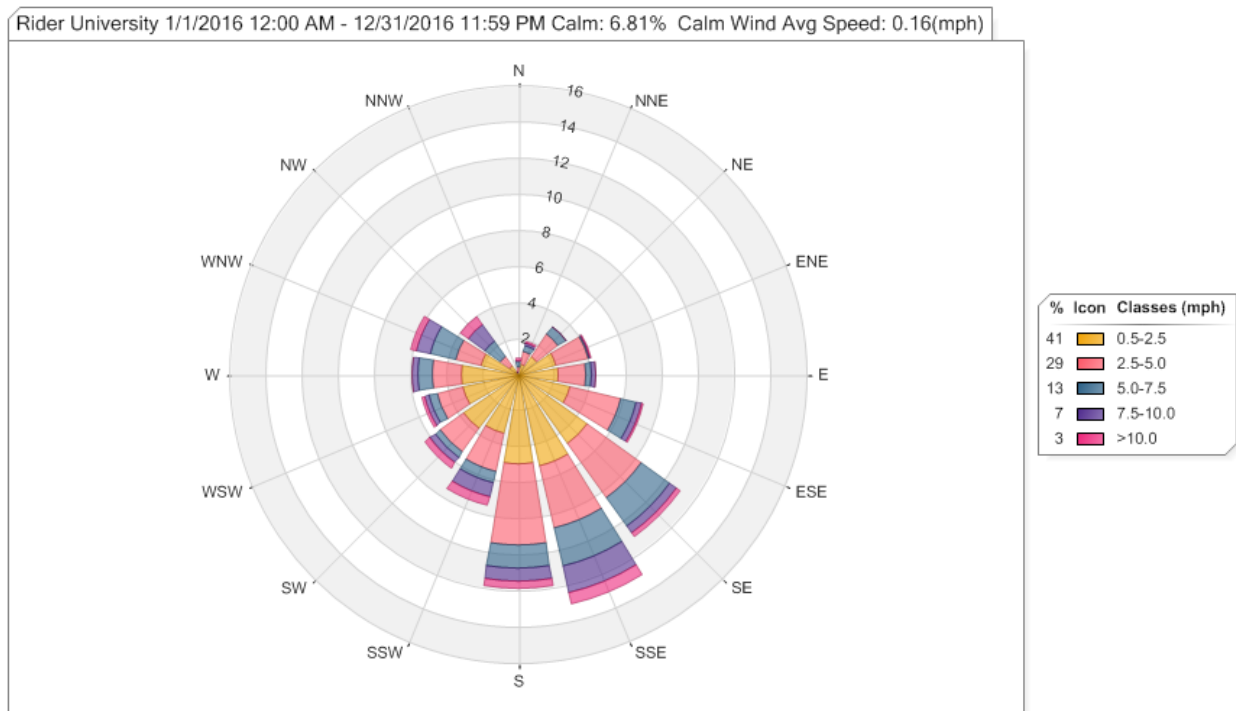


Figure 9-12. 2016 Wind Rose for Rider University



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