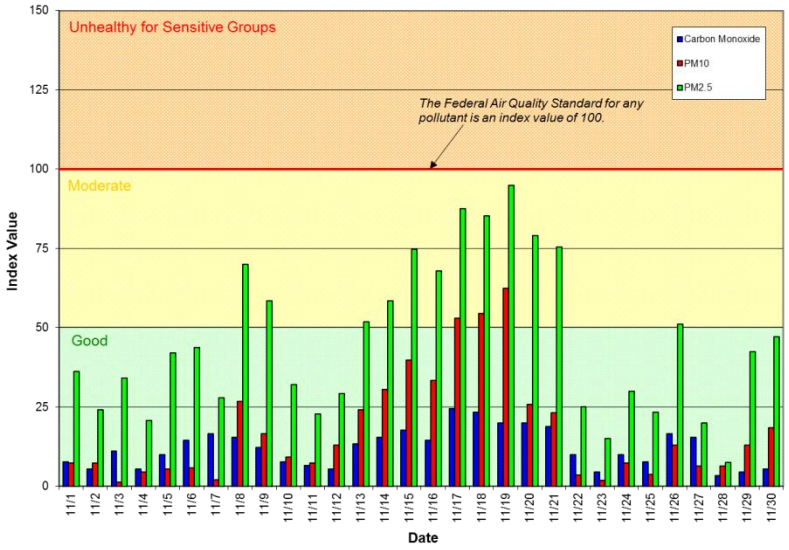
Spokane Regional Clean Air Agency
Air Quality Report - November 2014

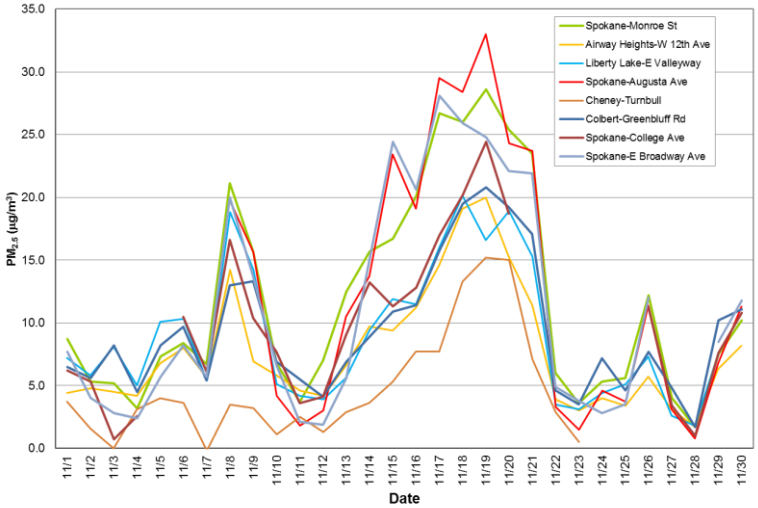
A modified arctic high pressure air mass settled over the region in mid-November. Conditions were dry and cold with weak winds. Large scale subsidence in the atmosphere and cold air at ground-level set up strong temperature inversions and deteriorating air quality across the region. Fine particulate matter ($PM_{2.5}$) concentrations rose into the "moderate" range of the Air Quality Index (AQI) between November 11 and 21. The maximum AQI value for the month occurred on the 19th when the $PM_{2.5}$ 24 hour average mass concentration was 33.0 micrograms per cubic meter of air ($\mu g/m^3$), which is equivalent to an AQI of 95 (Figure 1). Particulate matter (PM_{10}) also reached the "moderate" range of the AQI on the 17th, 18th and 19th because of rising $PM_{2.5}$ concentrations. Carbon monoxide concentrations remained within the "good" range of the AQI. See Appendix 1 of this report for information about federal air quality standards or Appendix 2 for a description of the AQI.

Figure 1: Air Quality Index (AQI) values for November 2014. The data represent the maximum AQI values across all monitoring stations within Spokane County.



Daily mass concentrations of $PM_{2.5}$ monitored in November throughout the network are shown in Figure 2. Background levels of $PM_{2.5}$ are monitored at the Cheney-Turnbull monitoring station, which is far from urban areas. All of the other stations measure a combination of regional and locally-generated air pollution in urban environments.

Figure 2: Multi-station 24-hour average $PM_{2.5}$ for November 2014; Spokane County.



The November daily air quality data for all monitoring stations in the Spokane region are provided in Appendix 3. Current and historical air quality data can be obtained electronically from Ecology's air monitoring data website, https://fortress.wa.gov/ecy/enviwa/Default.htm.

Tables 1 and 2 contain the maximum AQI values for each pollutant for the month and for the year to date. Table 3 summarizes the year to date daily AQIs by category and compares them to last year's AQIs.

Table 1: Maximum AQI values and pollutant concentrations for this reporting period

Pollutant	AQI/Concentration	Location	Date
CO	24/2.2 ppm (8 hour)	Spokane, 3rd & Washington	11/17
PM_{10}	63/79 µg/m3	Spokane, Augusta & Fiske	11/19
$PM_{2.5}$	95/33.0 µg/m3	Spokane, Augusta & Fiske	11/19

Table 2: Maximum AQI values and pollutant concentrations to date this year

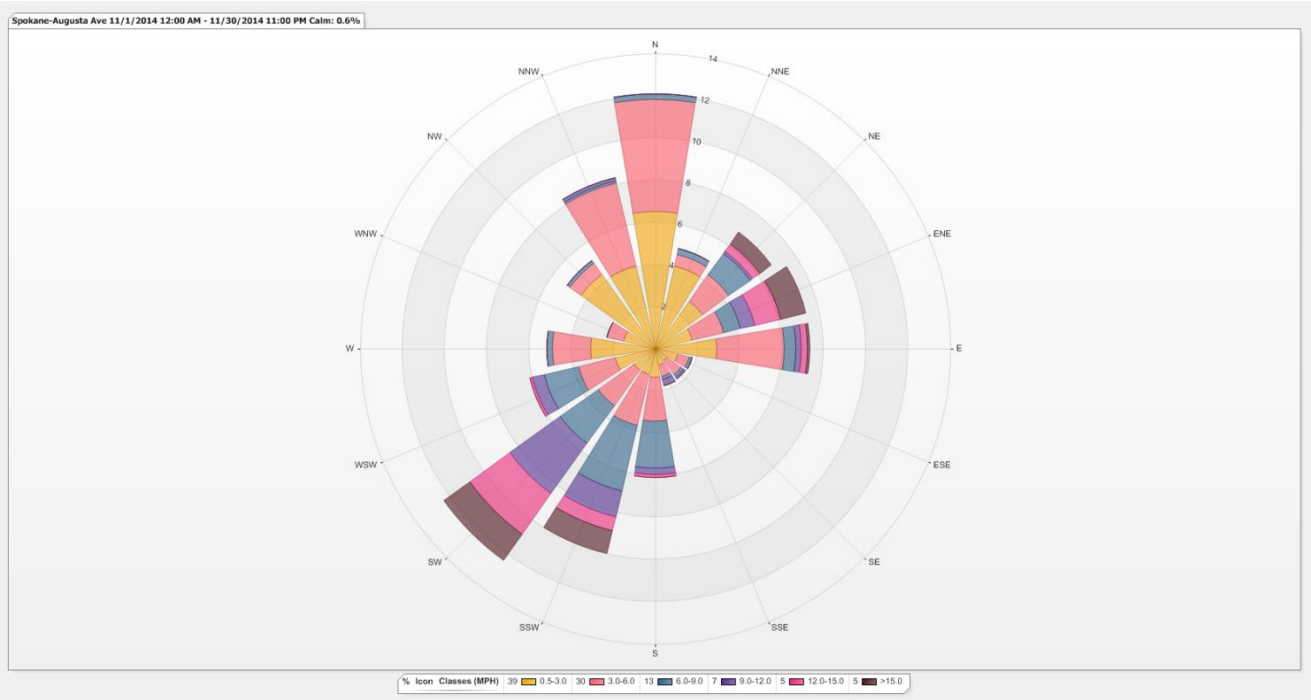
Pollutant	AQI/Concentration	Location	Date
CO	24/2.2 ppm (8 hour)	Spokane, 3rd & Washington	11/17
O_3	84/0.070 ppm (8 hour)	Spokane, Augusta & Fiske	8/11
PM_{10}	64/81 µg/m3	Spokane, Augusta & Fiske	7/19
$PM_{2.5}$	105/37.3 µg/m3	Colbert, Greenbluff Rd.	7/18

Table 3: AQI summary as of November 30, 2014

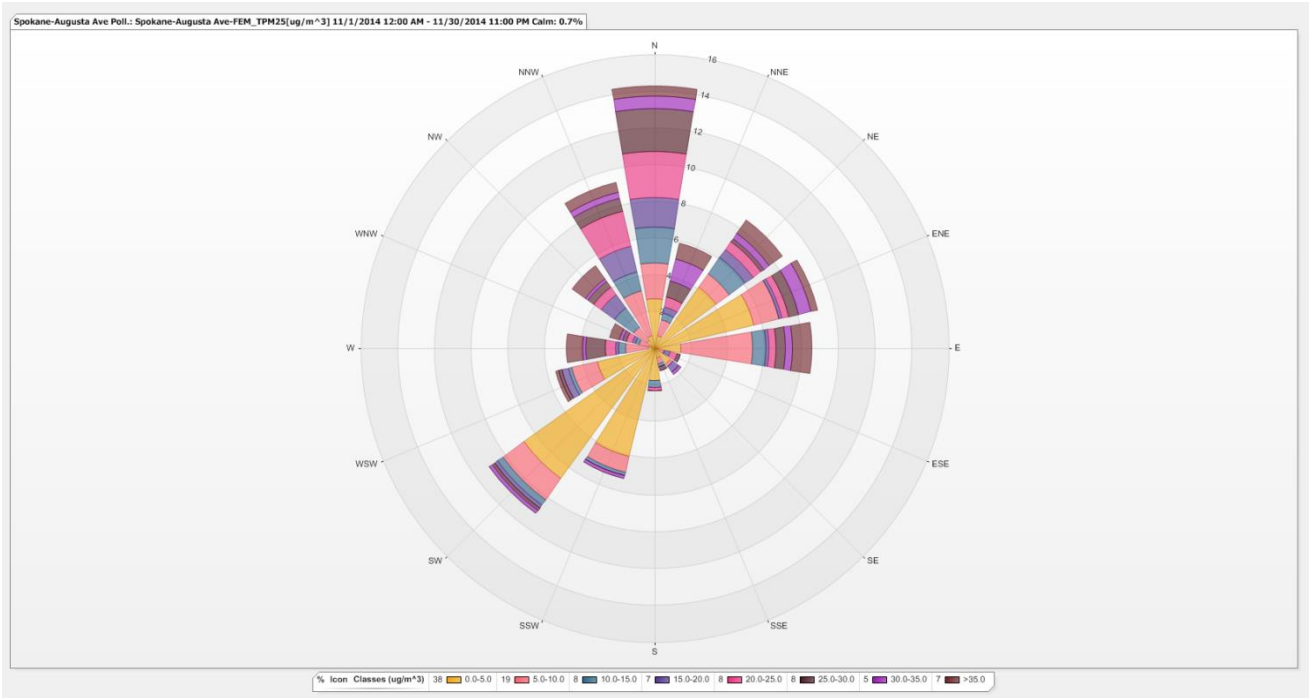
Category	Number of Days This Year	Last Year to Date (using post-3/18/2013 AQI)
Good (0-50)	258	226
Moderate (51-100)	75	105
Unhealthy for Sensitive Groups (101-150)	1	2
Unhealthy (151-200)	0	1
Very Unhealthy (201-300)	0	0
Hazardous (>300)	0	0

Wind speed and direction are measured at the SRCAA's office, located near the intersection of Mission Ave and Greene St in Spokane. At this site, stronger southerly (S) to southwesterly (SW) surface winds are associated with more active weather regimes and usually promote better air quality than light easterly (E) to northeasterly (NE) winds, which typically occur during periods of poor atmospheric ventilation. In November, light Northerly and easterly winds predominated during periods of poor pollution dispersion. Figures 3 and 4 show the variation of hourly average wind speed with wind direction and the variation of $PM_{2.5}$ with wind direction, respectively.

<u>Figure 3</u>: The wind rose depicts the variation of hourly average wind speed (mph) with the direction from which the wind was blowing in November.



<u>Figure 4</u>: The $PM_{2.5}$ pollution rose depicts the variation of hourly average $PM_{2.5}$ ($\mu g/m^3$) with the direction from which the wind was blowing in November.



Appendix 1 – National Ambient Air Quality Standards

The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), ground-level ozone (O_3) and sulfur dioxide (SO_2; Table A-1). These are known as "criteria" pollutants because the US EPA established regulatory limits to concentrations in ambient air using human health or environmentally based criteria. Carbon monoxide, particulate matter and ozone are monitored in Spokane County by the Spokane Regional Clean Air Agency (SRCAA) and the Washington State Department of Ecology (Ecology).

Table A-1: National Ambient Air Quality Standards

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 µg/m^3 [2]	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour [5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	12.0 µg/m^3	Annual [6] (Arithmetic Average)	Same as Primary	
	35 µg/m^3	24-hour [7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm	24-hour [1]		
	75 ppb [11]	1-hour	None	

[1] Not to be exceeded more than once per year.
[2] Final rule signed October 15, 2008.
[3] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard
[4] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
[5] Not to be exceeded more than once per year on average over 3 years.
[6] On March 18, 2013, EPA strengthened the annual fine particle standard by revising the level from 15.0 micrograms per cubic meter (µg/m3) to 12.0µg/m3 . An area will meet the standard if the three-year average of its annual average $PM_{2.5}$ concentration (at each monitoring site in the area) is less than or equal to 12.0 µg/m3 .
[7] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
[8] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
[9] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).
[10] (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.
[11] (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Appendix 2 – Air Quality Index

The Air Quality Index (AQI) is EPA's color-coded tool for communicating daily air quality to the public and can be calculated for any of the criteria pollutants except lead, provided monitoring data are available. An index value above 100 indicates that the concentration of a criteria pollutant exceeded the limit established in the NAAQS. Categories of the AQI are "good" (green, 0-50), "moderate" (yellow, 51-100), "unhealthy for sensitive groups" (orange, 101-150), "unhealthy" (red, 151-200), "very unhealthy" (purple, 201-300) and "hazardous" (maroon, 301-500; Table A-2). On March 18, 2013, EPA reduced the good to moderate breakpoint for $PM_{2.5}$ from 15.0 to 12.0 micrograms per cubic meter of air ($\mu g/m^3$).

Table A-2: Air pollutant breakpoints for the Air Quality Index.

Air Quality Index Levels of Health Concern	Color Code	Index Numerical Value	Breakpoints					Health Effects
			O_3 (ppm) 8-hour	O_3 (ppm) 1-hour[1]	$PM_{2.5}$ ($\mu g/m^3$) 24-hour	PM_{10} ($\mu g/m^3$) 24-hour	CO (ppm) 8-hour	
Good	Green	0-50	0.000-0.059	[3]	0.0-12.0	0-54	0.0-4.4	Air quality is considered satisfactory and air pollution poses little or no risk.
Moderate	Yellow	51-100	0.060-0.075	[3]	12.1-35.4	55-154	4.5-9.4	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	Orange	101-150	0.076-0.095	0.125-0.164	35.5-65.4	155-254	9.5-12.4	People especially sensitive to air pollution may experience health effects. The general public is not likely to be affected. An AQI in this category or above indicates that air pollution exceeds levels acceptable under federal air quality standards.
Unhealthy	Red	151-200	0.096-0.115	0.165-0.204	65.5-150.4	255-354	12.5-15.4	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	Purple	201-300	0.116-0.374	0.205-0.404	150.5-250.4	355-424	15.5-30.4	Health alert: everyone may experience more serious health effects.
Hazardous	Maroon	>300	[2]	0.405+	250.5+	425+	30.5+	Health warnings of emergency conditions. The entire population is more likely to be affected.

[1]Areas are generally required to report the AQI based on 8-hour ozone values. However, there are a small number of areas where an AQI based on 1-hour ozone values would be more precautionary. In these cases, in addition to calculating the 8-hour ozone index value, the 1-hour ozone index value may be calculated, and the maximum of the two values reported.

[2]8-hour O_3 values do not define higher AQI values (≥ 301). AQI values of 301 or greater are calculated with 1-hour O_3 concentrations.

[3]There is no AQI for 1-hour O_3 concentrations below the Unhealthy for Sensitive Groups level.

Appendix 3

Table A-3: Summary air quality data for November for air monitoring stations in Spokane County. The carbon monoxide data are maximum 8-hour running averages in parts per million (ppm) and the PM data are 24-hour averages in micrograms per cubic meter of air ($\mu g/m^3$). Equipment malfunction following a quality control check on the 28th caused a loss of $PM_{2.5}$ data for the Augusta station from October 28th through November 7th. Negative $PM_{2.5}$ values on the 27th and 28th for Broadway were removed. Monitor repair and calibration resulted in lost $PM_{2.5}$ data for College Ave on the 21st, 22nd, 24th and 25th. Very low particulate matter pollution levels on the 7th, 25th, and 28th at Turnbull led to slight negative $PM_{2.5}$ mass concentration measurements within the monitor's margin of error for $PM_{2.5}$ reporting. The Liberty Lake $PM_{2.5}$ monitor was offline for routine maintenance on the 30th. The PM_{10} monitor at Augusta was offline on the 3rd through the 7th following seasonal adjustments to the monitor.

Date	CO 3rd & Washington (8 hour max, ppm)	$PM_{2.5}$ Augusta & Fiske TEOM ($\mu g/m^3$)	$PM_{2.5}$ E. Broadway Ave. ($\mu g/m^3$)	$PM_{2.5}$ College Ave TEOM ($\mu g/m^3$)	$PM_{2.5}$ Airway Heights TEOM ($\mu g/m^3$)	$PM_{2.5}$ Turnbull NWR TEOM ($\mu g/m^3$)	$PM_{2.5}$ Monroe & Wellesley nephelometer ($\mu g/m^3$)	$PM_{2.5}$ Liberty Lake TEOM ($\mu g/m^3$)	$PM_{2.5}$ Colbert TEOM ($\mu g/m^3$)	PM_{10} Augusta & Fiske TEOM ($\mu g/m^3$)	PM_{10} Turnbull NWR TEOM ($\mu g/m^3$)
11/1	0.7		7.7	6.2	4.4	3.7	8.7	7.2	6.5	8	5
11/2	0.5		4.0	5.3	4.8	1.6	5.3	5.8	5.6	8	3
11/3	1.0		2.8	0.7	4.5	0.0	5.2	8.1	8.2		1
11/4	0.5		2.4	2.6	4.2	3.1	3.2	5.0	4.5		5
11/5	0.9		5.7		6.8	4.0	7.3	10.1	8.2		6
11/6	1.3		8.2	10.5	8.0	3.6	8.4	10.3	9.7		6
11/7	1.5		5.7	6.1	5.6		6.7	5.4	5.4		2
11/8	1.4	19.7	20.0	16.6	14.2	3.5	21.1	18.8	13.0	29	7
11/9	1.1	15.6	13.7	10.4	6.9	3.2	15.7	14.2	13.3	18	6
11/10	0.7	4.2	6.6	7.7	5.8	1.1	6.8	5.1	6.9	10	3
11/11	0.6	1.8	2.1	3.6	4.6	2.5	3.7	4.2	5.5	8	5
11/12	0.5	3.0	1.9	4.1	4.2	1.3	7.0	3.9	4.1	14	4
11/13	1.2	10.5	5.6	9.1	6.6	2.9	12.5	5.6	6.9	26	7
11/14	1.4	13.7	15.1	13.2	9.7	3.6	15.7	9.4	8.9	33	9
11/15	1.6	23.4	24.4	11.3	9.4	5.3	16.7	11.9	10.9	43	8
11/16	1.3	19.1	20.6	12.8	11.2	7.7	20.1	11.5	11.4	36	11
11/17	2.2	29.5	28.1	17.0	14.6	7.7	26.7	16.0	15.8	60	12
11/18	2.1	28.4	25.9	20.2	19.1	13.3	26.0	20.1	19.5	63	20
11/19	1.8	33.0	24.8	24.4	20.0	15.2	28.6	16.6	20.8	79	26
11/20	1.8	24.3	22.1	18.7	15.2	15.0	25.4	18.9	19.2	28	17
11/21	1.7	23.7	21.9		11.4	7.1	23.5	15.3	17.1	25	8
11/22	0.9	3.3	4.9		3.9	2.9	6.0	3.5	4.6	3	4
11/23	0.4	1.5	3.8	2.7	3.0	0.5	3.6	3.1	3.5	2	1
11/24	0.9	4.6	2.8		4.0		5.3	4.4	7.2	8	
11/25	0.7	3.7	3.5		3.4		5.6	5.1	4.6	4	
11/26	1.5	11.4	12.0	11.2	5.7		12.2	7.3	7.7	14	
11/27	1.4	3.1		3.4	3.1		4.0	2.6	4.8	7	
11/28	0.3	0.8		1.0	1.7		1.7	1.8	1.7	7	
11/29	0.4	6.8	8.5	7.6	6.3		7.5	7.5	10.2	14	
11/30	0.5	11.3	11.8	10.8	8.2		10.2		11.1	20	
AVG	1.1	12.9	11.3	9.5	7.7	4.9	11.7	8.9	9.2	23	8
MAX	2.2	33.0	28.1	24.4	20.0	15.2	28.6	20.1	20.8	79	26