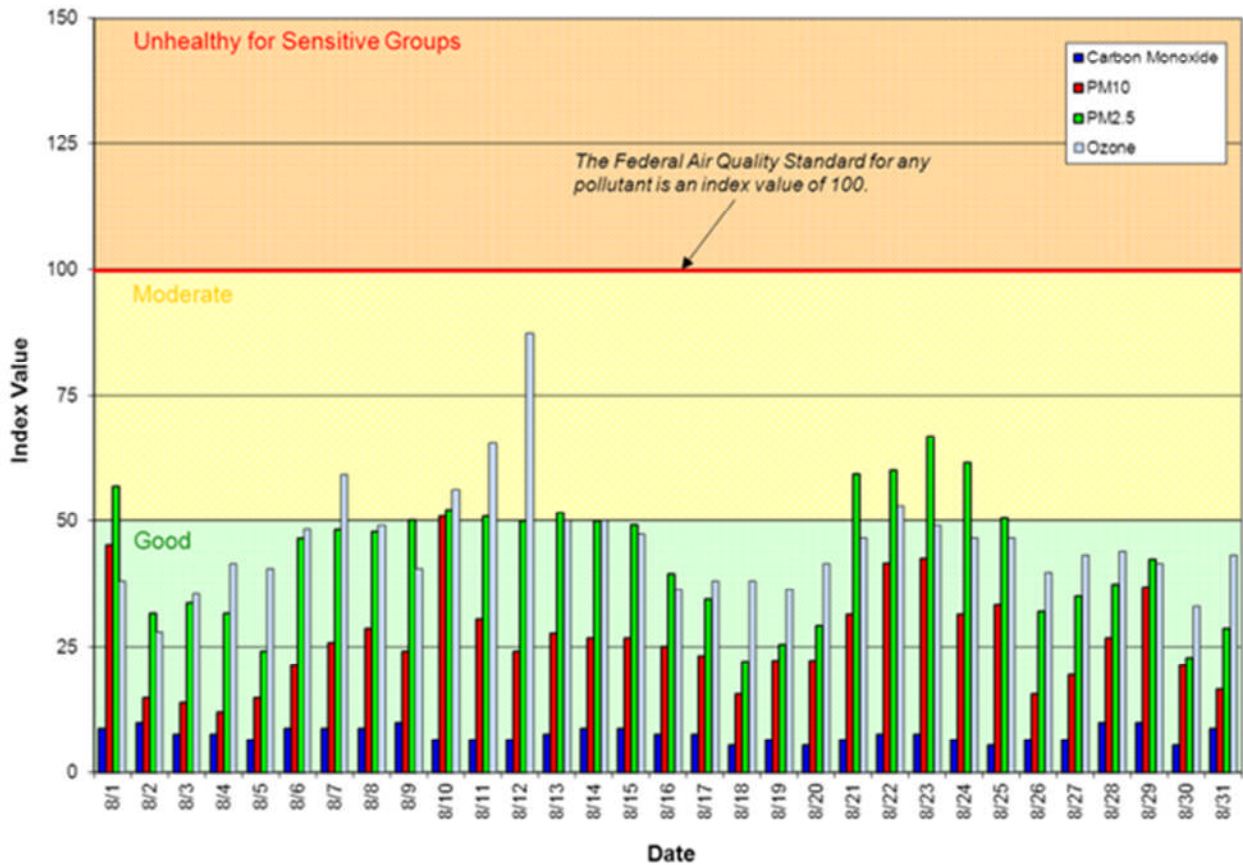


Spokane Regional Clean Air Agency Air Quality Report - August 2013

Smoke from wildfires on the east slopes of the Cascades in Washington, in central Idaho and in central California near Yosemite National Park affected air quality in August. The Air Quality Index (AQI) was in the moderate range on August 1 because of smoke from wildfires on the east slopes of the Cascades (Figure 1). A change in the

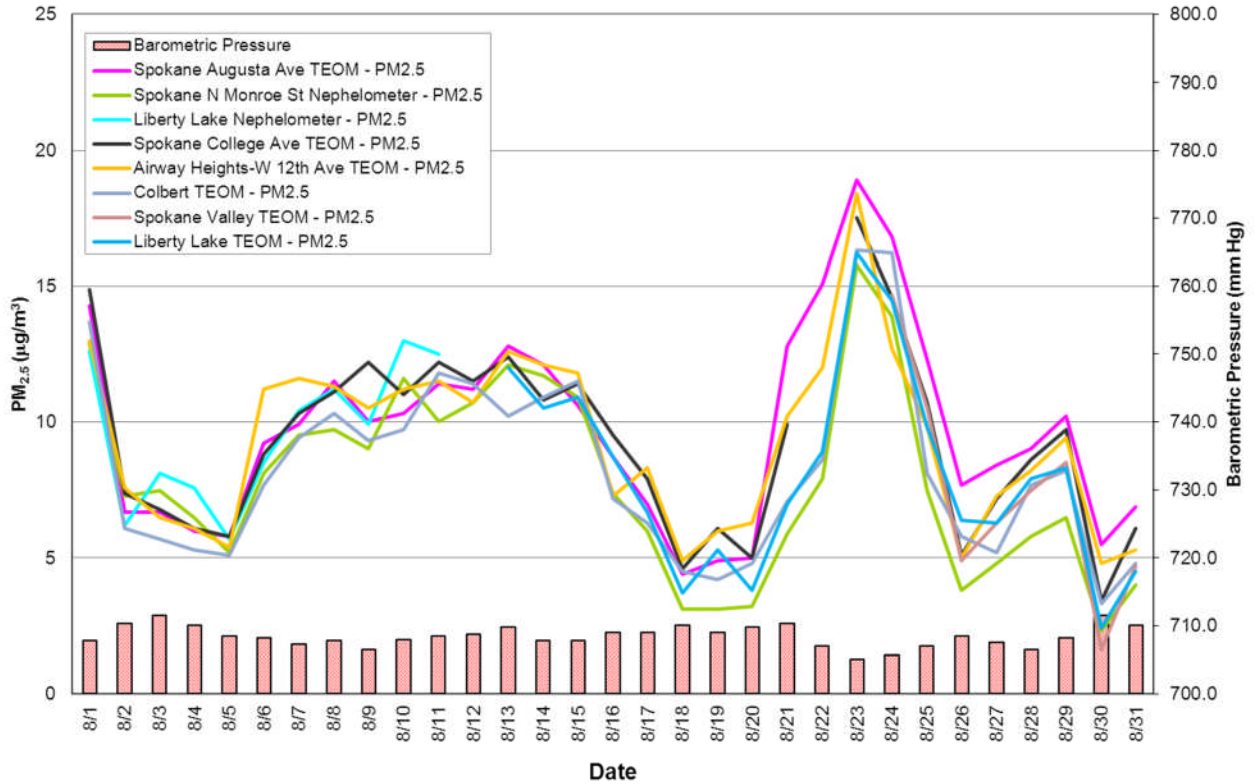
Figure 1: Air Quality Index (AQI) values for August 2013



weather pattern and rain on August 2 helped clear the smoke out of the Spokane area. The AQI rose into the moderate or near-moderate range again for the period of August 6 through 15. A high pressure ridge inhibited atmospheric ventilation, allowing ground-level ozone and fine particulate matter (PM_{2.5}) concentrations to build. Southerly atmospheric flow carried smoke from wildfires in central California and central Idaho into the Inland Northwest until the air flow shifted to westerly on August 16. Another high pressure ridge was over the region during the period of August 21 through 25, inhibiting atmospheric ventilation and allowing fine particulate matter. Carbon monoxide remained well within the good range of the AQI throughout the month. See Appendix 1 of this report for information about federal air quality standards or Appendix 2 for a description of the AQI.

The particulate matter data used to determine the AQI and for other day-to-day operations are obtained using a network of automated particulate matter monitors consisting of Tapered Element Oscillating Microbalances (TEOM) and nephelometers. Daily mass concentrations of PM_{2.5} monitored in August throughout the network are shown in Figure 2.

Figure 2: PM_{2.5} multi-station time series for August 2013.



The August 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 via their 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	10/0.9 ppm (8 hour)	Spokane, 3 rd & Washington	8/2, 8/9, 8/28 and 8/29
O ₃	88/0.071 ppm (8 hour)	Spokane, Augusta & Fiske	8/12
PM ₁₀	51/56 µg/m ³	Cheney, Turnbull NWR	8/10
PM _{2.5}	67/18.9 µg/m ³	Spokane, Augusta & Fiske	8/23

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

Pollutant	AQI/Concentration	Location	Date
CO	27/2.4 ppm (8 hour)	Spokane, 3rd & Washington	1/25
O ₃	88/0.071 ppm (8 hour)	Spokane, Augusta & Fiske	8/12
PM ₁₀	58/69 µg/m ³	Spokane, Augusta & Fiske	2/15
PM _{2.5}	102/36.6 µg/m ³	Spokane Valley, E. Broadway Ave	1/18

Table 3: AQI summary as of August 31, 2013. The numbers in parentheses are the number of days that would have fallen into each category had the AQI good-to-moderate breakpoint for PM_{2.5} not been reduced on March 18, 2013 (see Appendix 2). Otherwise the numbers here depict the number of days in each category as they were originally reported.

Category	Number of Days This Year	Last Year to Date
Good (0-50)	190 (197)	223
Moderate (51-100)	52 (45)	19
Unhealthy for Sensitive Groups (101-150)	1 (1)	1
Unhealthy (151-200)	0	0
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. In the Spokane area, stronger southerly (S) to southwesterly (SW) surface winds are associated with more active weather regimes and storm systems promote better air quality than light easterly (E) to northeasterly (NE) winds, which are often terrain-driven at the SRCAA location and occur along with poor atmospheric ventilation (Figures 3 and 4).

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

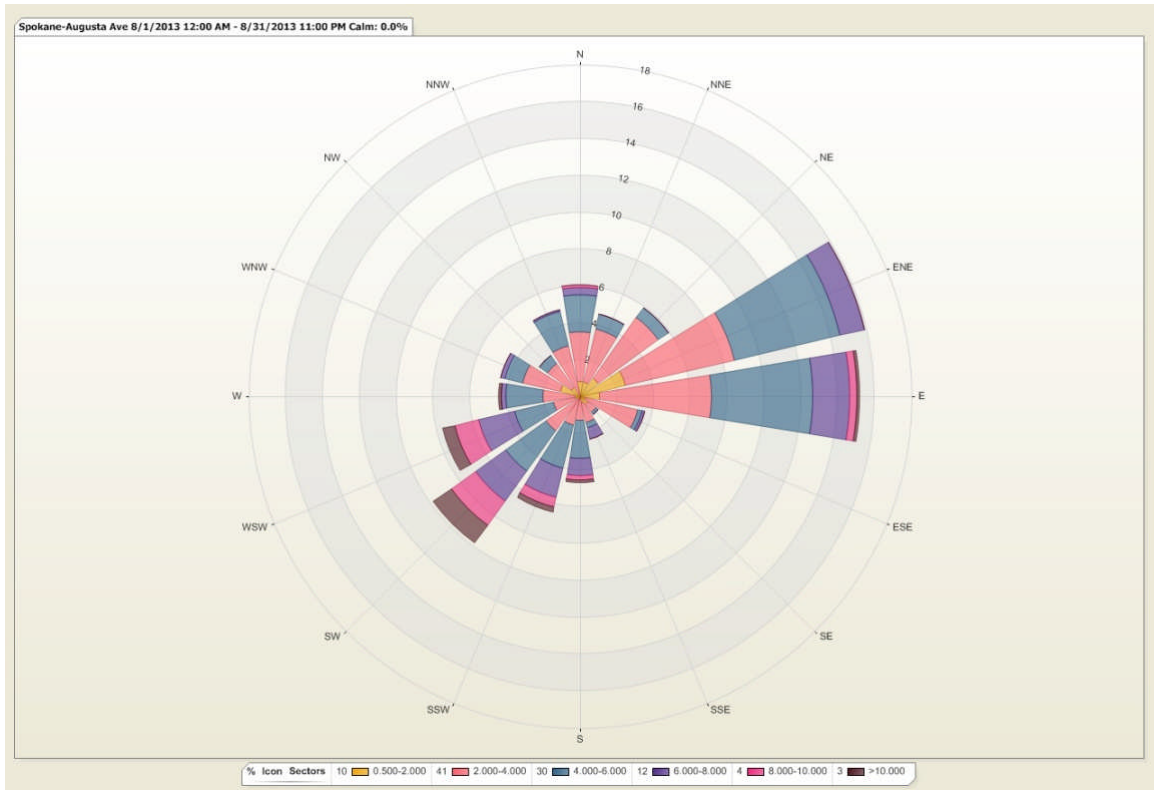
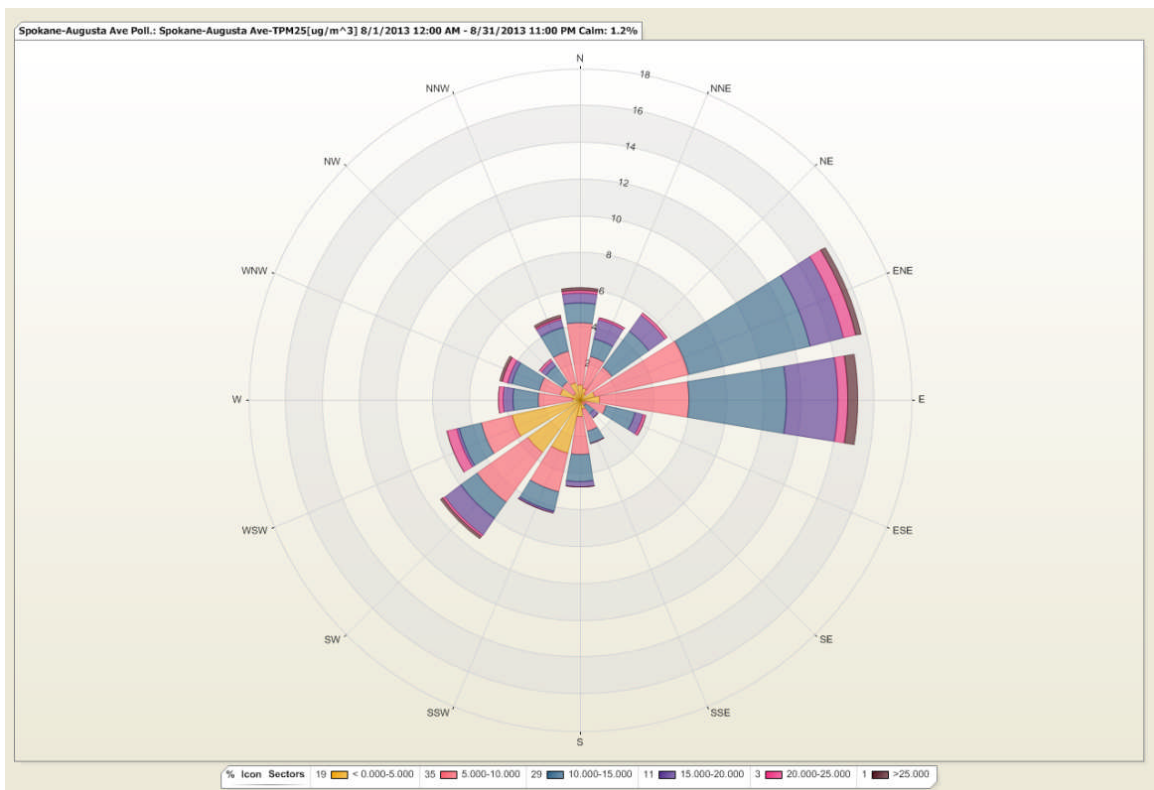


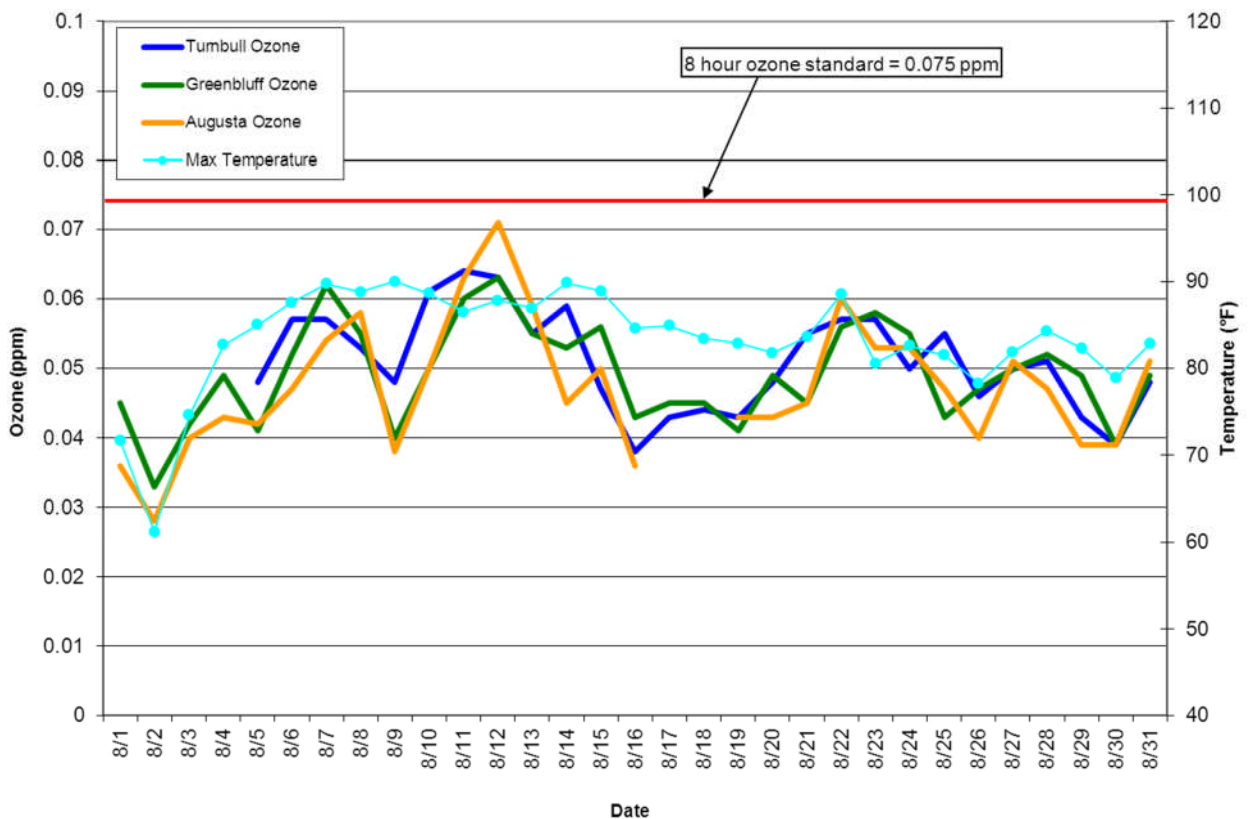
Figure 4: The PM_{2.5} pollution rose depicts the variation of hourly average PM_{2.5} ($\mu\text{g}/\text{m}^3$) with the direction from which the wind was blowing in August.



Ground-level ozone (O_3), a component of smog, is formed when nitrogen oxides and volatile organic compounds chemically react in the presence of sunlight. It is measured in units of parts per million (ppm) in ambient air. Ozone is a strong oxidizer and can damage lung tissue, thereby impairing respiratory function. The main sources of ozone precursors are motor vehicle emissions and refueling, gasoline storage and transport, paints, solvents and industry.

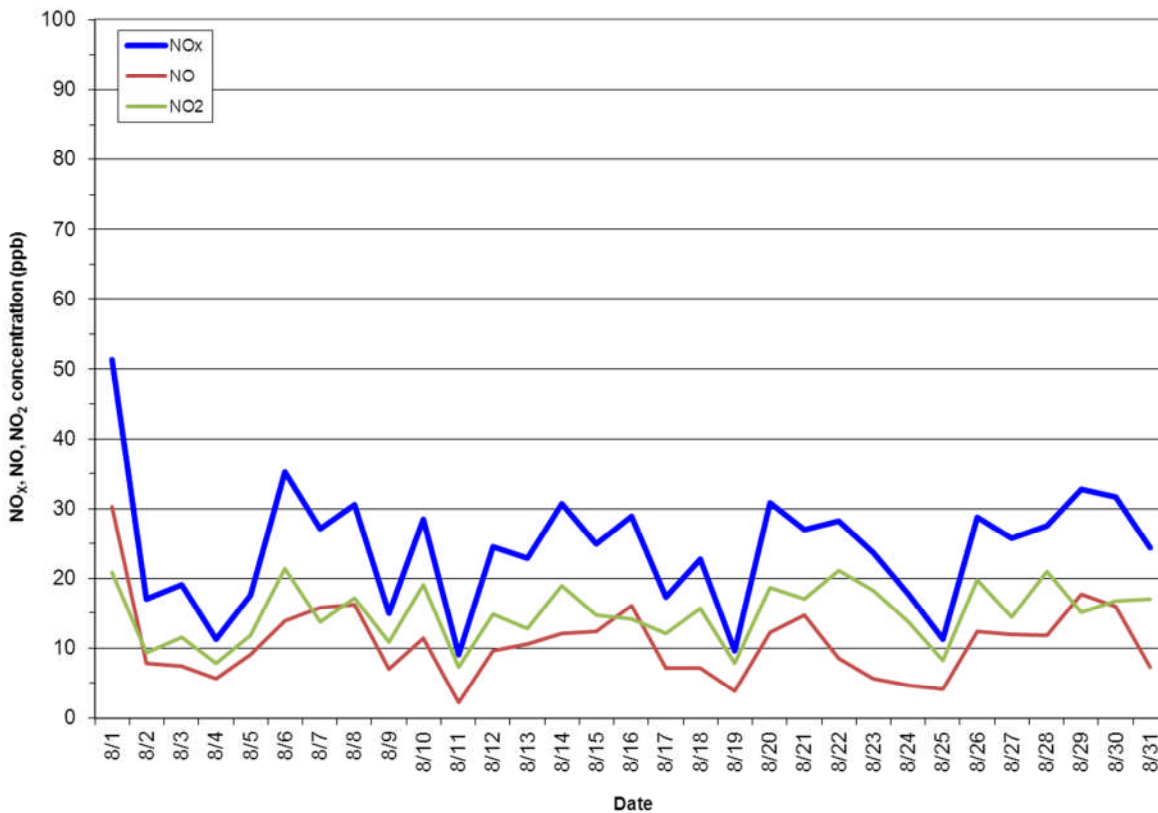
Ground-level ozone reached the moderate category of the Air Quality Index (AQI) on five days (Figure 1). The maximum 8-hour running average was 0.071 ppm (August 12; Figure 5). Eight hour average ozone concentrations in the range 0.06 to 0.075 ppm are considered “moderate” air quality by the AQI. AQI moderate levels of ground-level ozone were measured mostly during warmer periods with high atmospheric pressure over the region (Figure 5).

Figure 5: Eight hour maximum ozone concentrations for the Spokane region in August. Daily maximum temperatures are also shown. Daily maximum temperature can be used as a surrogate for solar radiation (ozone is formed through a photochemical reaction) for determining potential ozone maximum concentrations. The threshold for the moderate category for the AQI for ozone is 0.06 ppm averaged over eight hours. An ozone measurement above 0.075 ppm, averaged over eight hours, is the threshold value for the federal ozone standard. It is not a violation of the standard to exceed this level on a given day because determination of attainment status is based on averaging data over a period of years. See Appendix 1 for more detailed information about attainment of federal air quality standards.



Nitrogen oxides monitored at the Spokane Augusta Ave station remained low through the month (Figure 6).

Figure 6: One hour maximum concentrations of nitrogen oxides for Spokane Augusta Ave monitoring station in August. The federal standard daily 1-hour maximum for nitrogen dioxide (NO₂) is 100 ppb. The NAAQS does not set limits on the other air pollutants shown here.



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 (NO₂), particulate matter (PM₁₀ and PM_{2.5}), ground-level ozone (O₃) and sulfur dioxide (SO₂; 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

Pollutant	Primary Standards		Secondary Standards	
	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 (PM₁₀)	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 NO₂ 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 ≤ 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 (µg/m³).

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} (µg/m ³) 24-hour	PM ₁₀ (µg/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.

¹Areas 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.

²8-hour O₃ values do not define higher AQI values (≥ 301). AQI values of 301 or greater are calculated with 1-hour O₃ concentrations.

³There is no AQI for 1-hour O₃ concentrations below the Unhealthy for Sensitive Groups level.

Appendix 3

Table A-3: Summary air quality data for August for air monitoring stations in Spokane County. The carbon monoxide and ozone data are 8-hour maximums in parts per million (ppm) and the PM data are 24-hour averages in micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). There are data missing for Turnbull NWR and Spokane Valley because of electronic data communications malfunctions. The Liberty Lake nephelometer was replaced with a TEOM on August 12.

Date	CO 3rd & Washington (8 hour max, ppm)	O3 Greenbluff (8 hour max, ppm)	O3 Turnbull (8 hour max, ppm)	O3 Augusta & Fiske (8 hour max, ppm)	PM2.5 Augusta & Fiske TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 College Ave TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 Colbert TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 Spokane Valley TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 Airway Heights TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 Turnbull NWR TEOM ($\mu\text{g}/\text{m}^3$)	PM2.5 Monroe & Wellesley nephelometer ($\mu\text{g}/\text{m}^3$)	PM2.5 Liberty Lake nephelometer ($\mu\text{g}/\text{m}^3$)	PM2.5 Liberty Lake TEOM ($\mu\text{g}/\text{m}^3$)	PM10 Augusta & Fiske TEOM ($\mu\text{g}/\text{m}^3$)	PM10 Turnbull NWR TEOM ($\mu\text{g}/\text{m}^3$)
8/1	0.8	0.045	0.036	0.036	14.3	14.9	13.7		13.0		12.9	12.6		49	
8/2	0.9	0.033		0.028	6.7	7.4	6.1		7.6		7.3	6.2		16	
8/3	0.7	0.042		0.040	6.7	6.8	5.7		6.5		7.5	8.1		15	
8/4	0.7	0.049		0.043	6.0	6.1	5.3		6.1		6.5	7.6		13	
8/5	0.6	0.041	0.048	0.042	5.8	5.8	5.1		5.4		5.2	5.7		16	
8/6	0.8	0.052	0.057	0.047	9.2	8.8	7.7		11.2	5.5	8.1	8.5		23	13
8/7	0.8	0.062	0.057	0.054	9.9	10.3	9.4		11.6	6.8	9.5	10.4		28	16
8/8	0.8	0.055	0.053	0.058	11.5	11.1	10.3		11.3	6.6	9.7	11.2		31	19
8/9	0.9	0.040	0.048	0.038	10.0	12.2	9.3		10.5	7.6	9.0	9.9		26	19
8/10	0.6	0.050	0.061	0.050	10.3	11.0	9.7		11.2	10.6	11.6	13.0		27	56
8/11	0.6	0.060	0.064	0.063	11.4	12.2	11.8		11.5	6.9	10.0	12.5		33	15
8/12	0.6	0.063	0.063	0.071	11.2	11.5	11.4		10.7	7.3	10.7			26	17
8/13	0.7	0.055	0.055	0.059	12.8	12.4	10.2		12.6		12.1		12.0	30	
8/14	0.8	0.053	0.059	0.045	12.1	10.8	10.9		12.1		11.7		10.5	29	
8/15	0.8	0.056	0.047	0.050	10.6	11.4	11.5		11.8	7.9	10.9		10.9	29	25
8/16	0.7	0.043	0.038	0.036	8.7	9.5	7.2		7.3	4.1	7.4		8.7	27	12
8/17	0.7	0.045	0.043		7.0	7.9	6.3		8.3	3.9	6.0		6.7	25	11
8/18	0.5	0.045	0.044		4.4	4.6	4.5		4.9	2.4	3.1		3.7	17	8
8/19	0.6	0.041	0.043	0.043	4.9	6.1	4.2		6.0	1.9	3.1		5.3	24	11
8/20	0.5	0.049	0.048	0.043	5.0	5.0	4.8		6.3	2.4	3.2		3.8	24	16
8/21	0.6	0.045	0.055	0.045	12.8	9.9	7.1		10.2	15.9	5.9		7.0	29	34
8/22	0.7	0.056	0.057	0.060	15.1		8.6		12.0	6.9	7.9		8.9	45	25
8/23	0.7	0.058	0.057	0.053	18.9	17.5	16.3		18.4	9.4	15.8		16.2	46	21
8/24	0.6	0.055	0.050	0.053	16.8	14.6	16.2	14.7	12.7	7.4	13.9		14.5	34	17
8/25	0.5	0.043	0.055	0.047	12.3	10.7	8.1	10.5	9.8	3.4	7.5		9.8	36	10
8/26	0.6	0.047	0.046	0.040	7.7	5.1	5.8	4.9	5.0	2.6	3.8		6.4	17	9
8/27	0.6	0.050	0.050	0.051	8.4	7.2	5.2	6.3	7.3	3.1	4.8		6.3	21	10
8/28	0.9	0.052	0.051	0.047	9.0	8.6	7.7	7.5	8.2	4.9	5.8		7.9	29	22
8/29	0.9	0.049	0.043	0.039	10.2	9.7	8.2	8.5	9.4	5.6	6.5		8.3	40	23
8/30	0.5	0.039	0.039	0.039	5.5	3.4	3.3	1.6	4.8	1.8	2.3		2.4	23	10
8/31	0.8	0.049	0.048	0.051	6.9	6.1	4.8	4.7	5.3	2.9	4.0		4.5	18	10
AVG	0.7	0.049	0.051	0.047	9.7	9.3	8.3	7.3	9.3	5.7	7.9	9.6	8.1	27	18
MAX	0.9	0.063	0.064	0.071	18.9	17.5	16.3	14.7	18.4	15.9	15.8	13.0	16.2	49	56