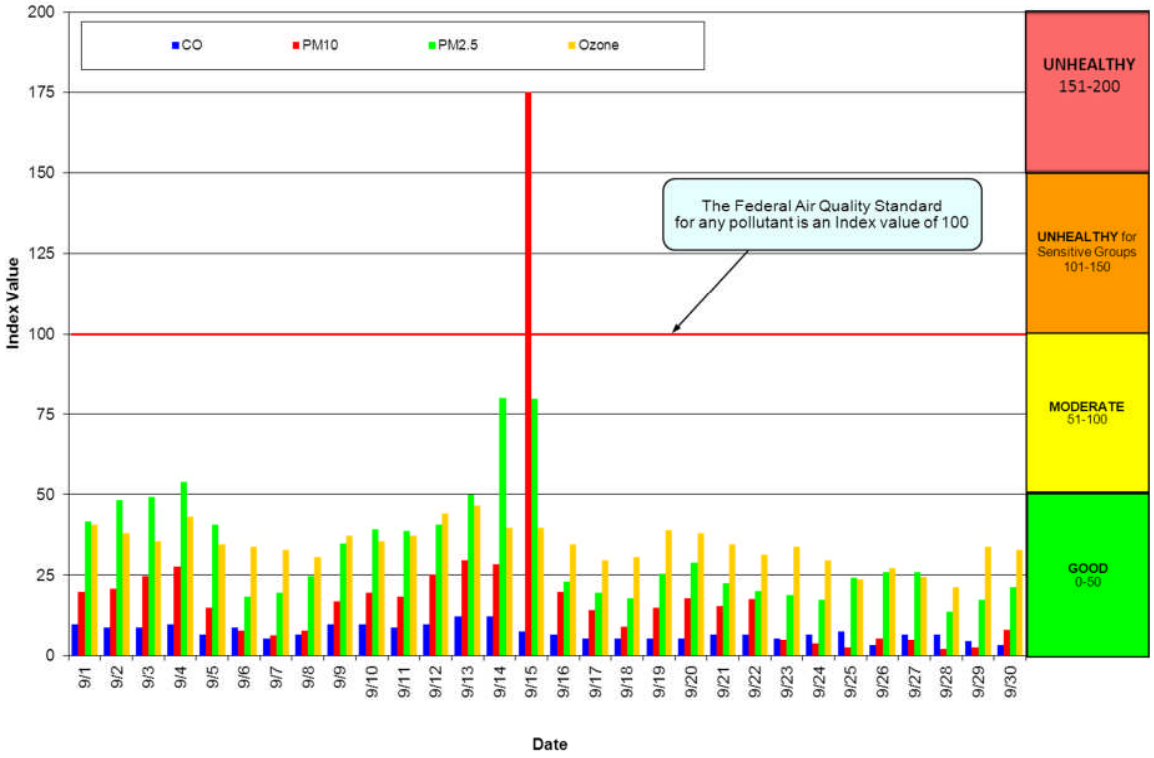
# Spokane Regional Clean Air Agency
# Air Quality Report - September 2013

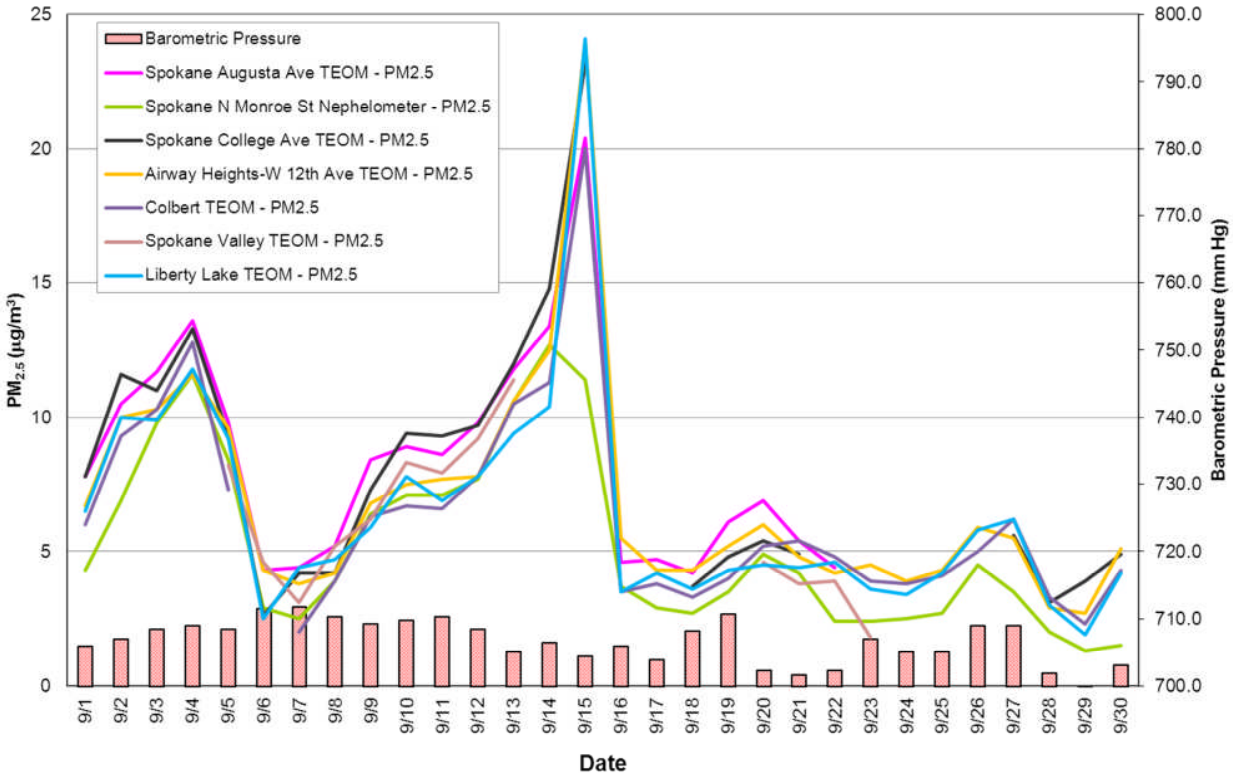
September began with a high pressure ridge over the region and rising levels of fine particulate matter ($PM_{2.5}$) in Spokane. An approaching low pressure system caused strong southerly air flow on the back side of the ridge which carried smoke from wildfires in California and central Idaho into the Spokane area and pushed the Air Quality Index (AQI) into the "moderate" category on September 4th (Figure 1). The arrival of the low brought westerly winds and improved air quality beginning on September 5th until another high pressure ridge began to build over the region on September 8th. The strong ridge brought record high temperatures, sunny skies, light winds and rising ozone and $PM_{2.5}$ concentrations. The AQI was well into the moderate range by the 14th. A thunderstorm brought 32 mph sustained winds with gusts to 45 mph and blowing dust to the region on the 15th which resulted in an exceedance of the federal air quality standard for particulate matter ($PM_{10}$; 304 μg $m^{-3}$) measured at the Spokane, Augusta & Fiske air monitoring station and pushed the AQI into the "unhealthy" category. The warm, sunny weather in the first half of the month gave way to cloudier skies with cooler daytime temperatures but relatively warm nights for the last half. Air quality remained good from September 16th until the end of the month. 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.

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



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 September throughout the network are shown in Figure 2.

**Figure 2: $PM_{2.5}$ multi-station time series for September 2013.**




The September 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 | 12/1.1 ppm (8 hour) | Spokane, 3rd & Washington | 9/13 and 9/14 |
| $O_3$ | 47/0.055 ppm (8 hour) | Spokane, Greenbluff | 9/13 |
| $PM_{10}$ | 175/304 µg/m$^3$ | Spokane, Augusta & Fiske | 9/15 |
| $PM_{2.5}$ | 80/24.1 µg/m$^3$ | Liberty Lake, E. Valleyway | 9/15 |

**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 |
| $PM_{10}$ | 175/304 µg/$m^3$ | Spokane, Augusta & Fiske | 9/15 |
| $PM_{2.5}$ | 102/36.6 µg/m3 | Spokane Valley, E. Broadway Ave | 1/18 |

**Table 3: AQI summary as of September 30, 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) | 217 (226) | 236 |
| Moderate (51-100) | 54 (45) | 34 |
| Unhealthy for Sensitive Groups (101-150) | 1 (1) | 3 |
| Unhealthy (151-200) | 1 (1) | 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 usually 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 September.**

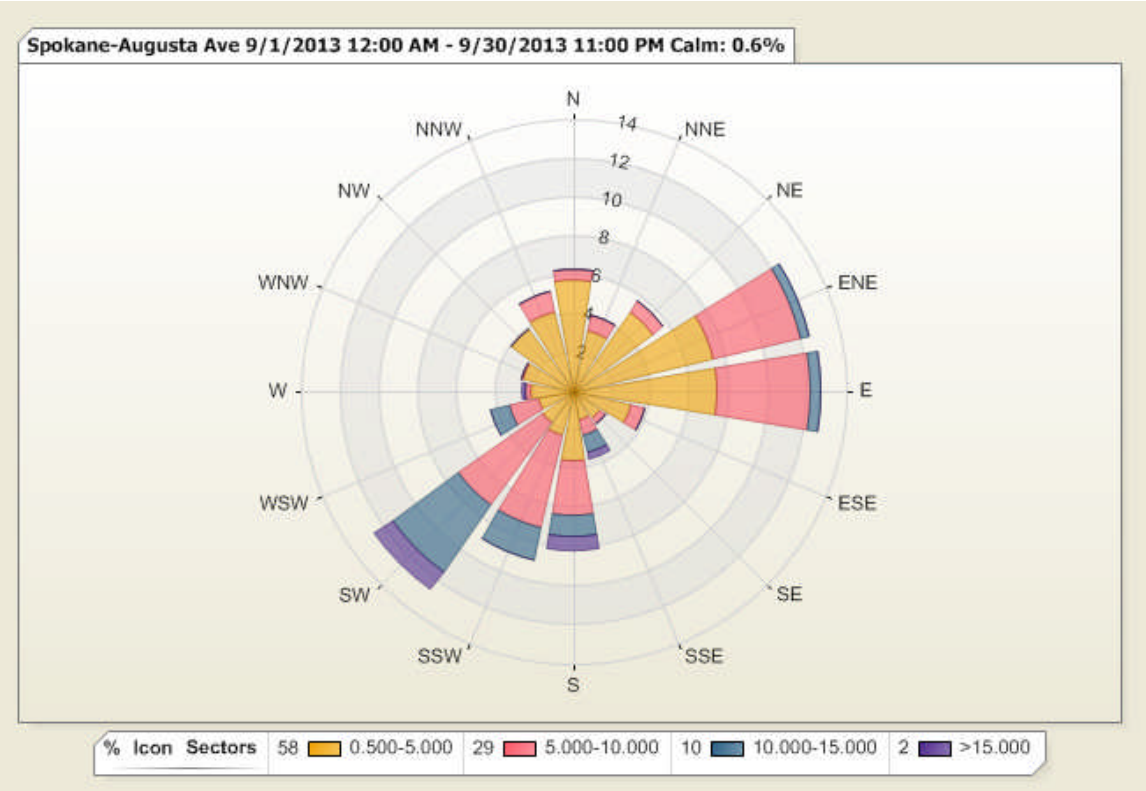
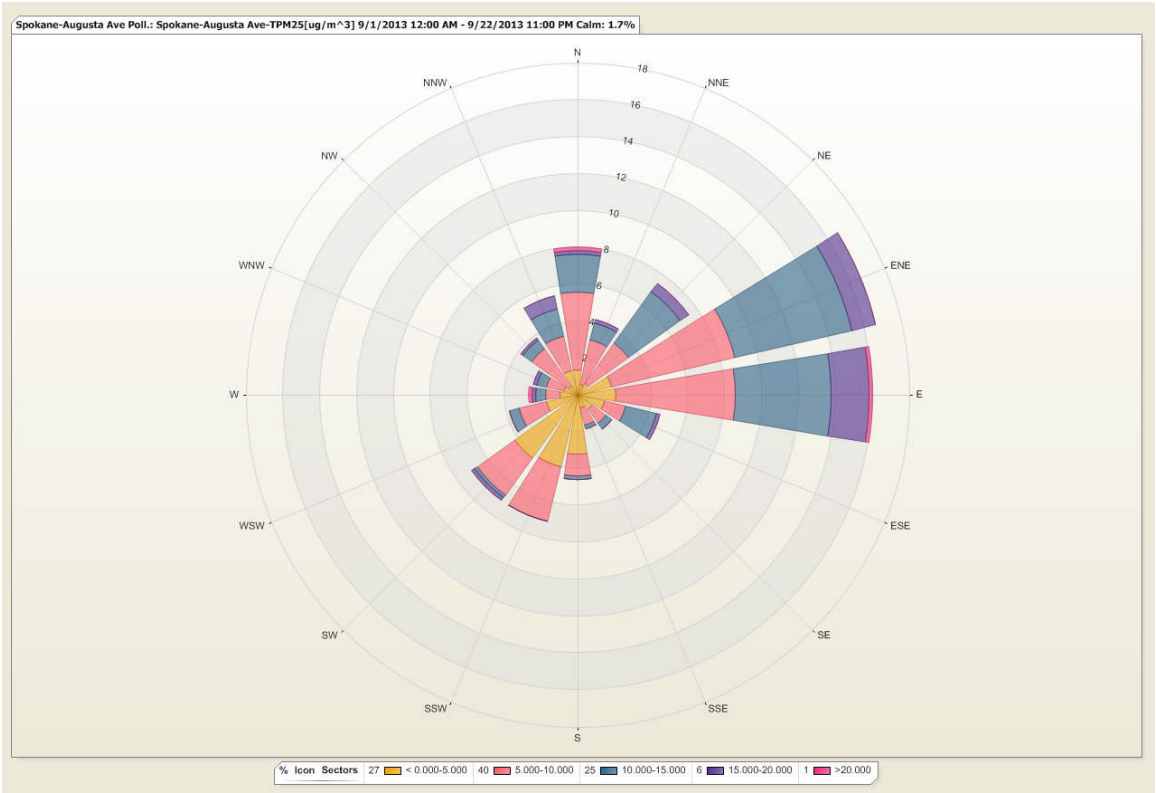


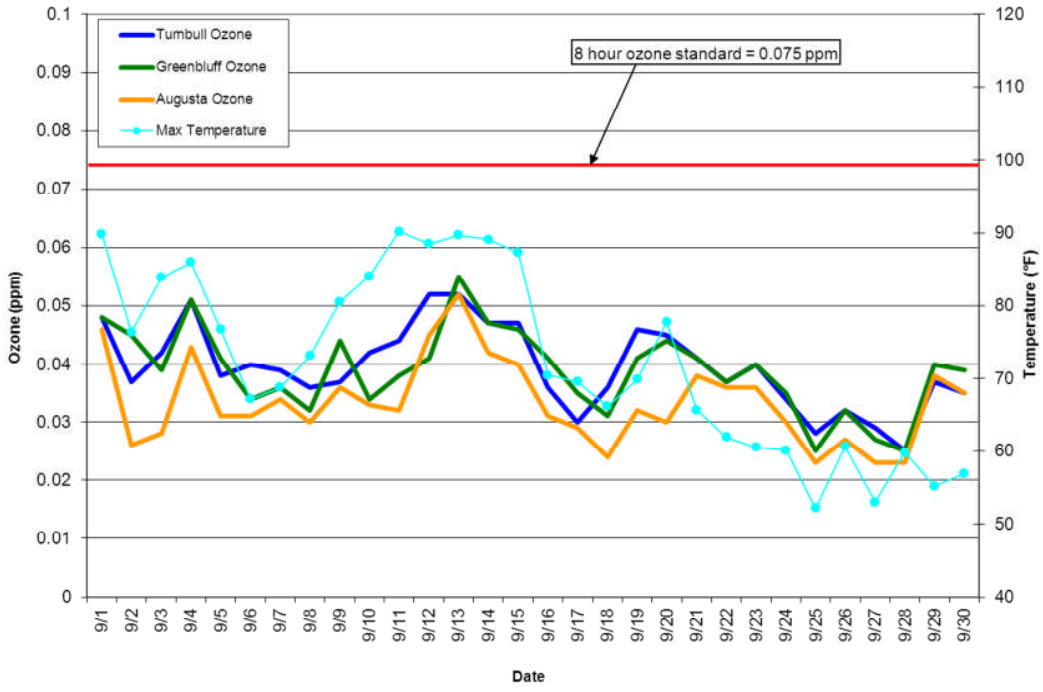

**Figure 4: The $PM_{2.5}$ pollution rose depicts the variation of hourly average $PM_{2.5}$ ($\mu g/m^3$) with the direction from which the wind was blowing in September.**



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.

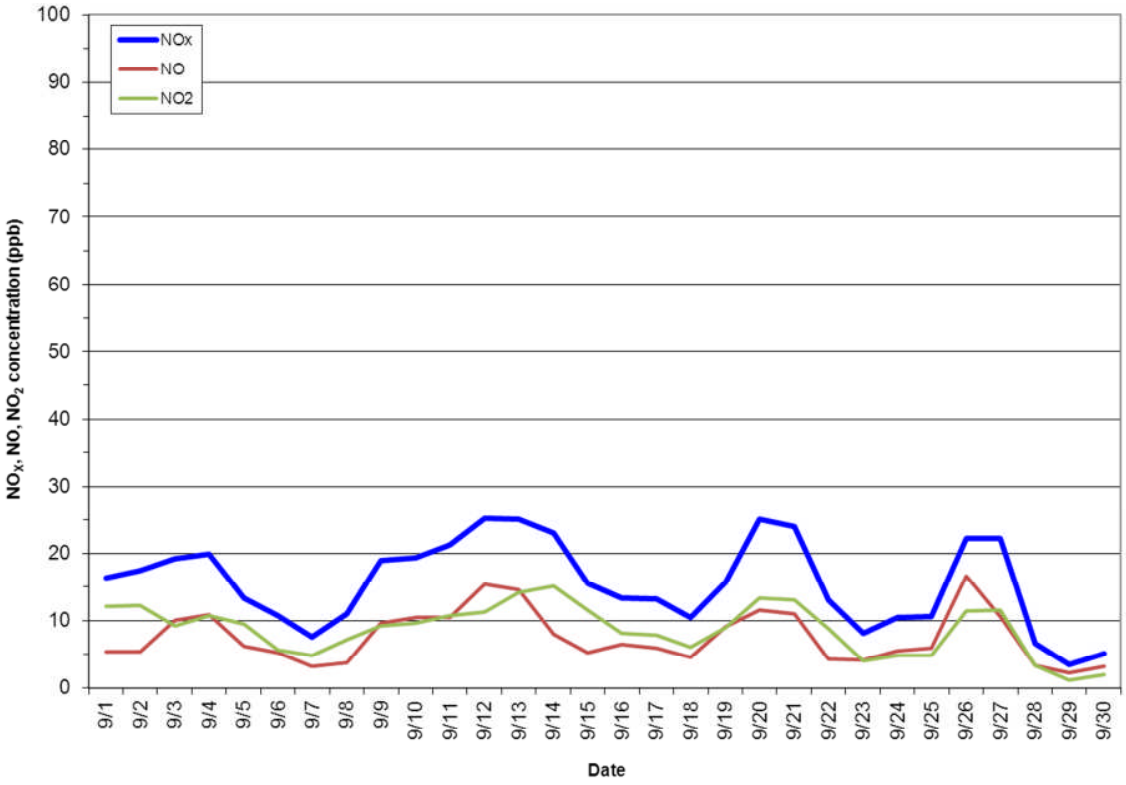
Ground-level ozone remained in the "good" category of the Air Quality Index (AQI) throughout the month (Figure 1). The maximum 8-hour running average was 0.055 ppm (September 13; Figure 5). Eight hour average ozone concentrations in the range 0.060 to 0.075 ppm are considered "moderate" air quality by the AQI.

**Figure 5: Eight hour maximum ozone concentrations for the Spokane region in September. 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 September. The federal standard daily 1-hour maximum for nitrogen dioxide ($NO_2$) 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 ($NO_2$), 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 ($\geq$ 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 September 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 (µg/$m^3$).

| 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 (µg/m3) | PM2.5 College Ave TEOM (µg/m3) | PM2.5 Colbert TEOM (µg/m3) | PM2.5 Spokane Valley TEOM (µg/m3) | PM2.5 Airway Heights TEOM (µg/m3) | PM2.5 Turnbull NWR TEOM (µg/m3) | PM2.5 Monroe & Wellesley nephelometer (µg/m3) | PM2.5 Liberty Lake TEOM (µg/m3) | PM10 Augusta & Fiske TEOM (µg/m3) | PM10 Turnbull NWR TEOM (µg/m3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/1 | 0.9 | 0.048 | 0.048 | 0.046 | 7.8 | 7.8 | 6.0 | | 6.7 | 4.9 | 4.3 | 6.5 | 22 | 16 |
| 9/2 | 0.8 | 0.045 | 0.037 | 0.026 | 10.5 | 11.6 | 9.3 | | 10.0 | 5.2 | 6.9 | 10.0 | 22 | 14 |
| 9/3 | 0.8 | 0.039 | 0.042 | 0.028 | 11.7 | 11.0 | 10.3 | | 10.3 | 4.9 | 9.8 | 9.9 | 27 | 14 |
| 9/4 | 0.9 | 0.051 | 0.051 | 0.043 | 13.6 | 13.3 | 12.8 | | 11.6 | 7.8 | 11.6 | 11.8 | 30 | 17 |
| 9/5 | 0.6 | 0.041 | 0.038 | 0.031 | 9.8 | 9.3 | 7.3 | 8.2 | 9.6 | 5.1 | 8.4 | 9.2 | 16 | 8 |
| 9/6 | 0.8 | 0.034 | 0.040 | 0.031 | 4.3 | 2.6 | | 4.6 | 4.3 | 2.6 | 2.9 | 2.5 | 9 | 5 |
| 9/7 | 0.5 | 0.036 | 0.039 | 0.034 | 4.4 | 4.2 | 2.0 | 3.1 | 3.8 | 2.3 | 2.5 | 4.4 | 7 | 4 |
| 9/8 | 0.6 | 0.032 | 0.036 | 0.030 | 5.2 | 4.2 | 3.9 | 5.2 | 4.2 | 2.7 | 3.9 | 4.7 | 9 | 4 |
| 9/9 | 0.9 | 0.044 | 0.037 | 0.036 | 8.4 | 7.3 | 6.3 | 6.2 | 6.8 | 4.0 | 6.4 | 5.9 | 18 | 10 |
| 9/10 | 0.9 | 0.034 | 0.042 | 0.033 | 8.9 | 9.4 | 6.7 | 8.3 | 7.5 | 4.6 | 7.1 | 7.8 | 21 | 13 |
| 9/11 | 0.8 | 0.038 | 0.044 | 0.032 | 8.6 | 9.3 | 6.6 | 7.9 | 7.7 | | 7.1 | 6.9 | 20 | |
| 9/12 | 0.9 | 0.041 | 0.052 | 0.045 | 9.8 | 9.7 | 7.8 | 9.2 | 7.8 | 5.9 | 7.7 | 7.8 | 27 | |
| 9/13 | 1.1 | 0.055 | 0.052 | 0.052 | 11.8 | 12.0 | 10.5 | 11.4 | 10.6 | 6.5 | 10.6 | 9.4 | 32 | 23 |
| 9/14 | 1.1 | 0.047 | 0.047 | 0.042 | 13.4 | 14.8 | 11.3 | | 12.5 | 7.6 | 12.7 | 10.4 | 31 | 21 |
| 9/15 | 0.7 | 0.046 | 0.047 | 0.040 | 20.4 | 23.2 | 20.0 | | 24.0 | 13.9 | 11.4 | 24.1 | 304 | 216 |
| 9/16 | 0.6 | 0.041 | 0.036 | 0.031 | 4.6 | | 3.5 | | 5.5 | 2.1 | 3.7 | 3.5 | 21 | 9 |
| 9/17 | 0.5 | 0.035 | 0.030 | 0.029 | 4.7 | | 3.8 | 6.2 | 4.3 | 1.8 | 2.9 | 4.2 | 16 | 6 |
| 9/18 | 0.5 | 0.031 | 0.036 | 0.024 | 4.2 | 3.7 | 3.3 | | 4.3 | 2.0 | 2.7 | 3.6 | 10 | 6 |
| 9/19 | 0.5 | 0.041 | 0.046 | 0.032 | 6.1 | 4.8 | 4.0 | | 5.2 | 3.7 | 3.5 | 4.3 | 16 | 9 |
| 9/20 | 0.5 | 0.044 | 0.045 | 0.030 | 6.9 | 5.4 | 5.2 | 4.6 | 6.0 | 3.6 | 4.9 | 4.5 | 19 | 12 |
| 9/21 | 0.6 | 0.041 | 0.041 | 0.038 | 5.4 | 4.9 | 5.4 | 3.8 | 4.8 | 2.2 | 4.2 | 4.4 | 17 | 8 |
| 9/22 | 0.6 | 0.037 | 0.037 | 0.036 | 4.4 | | 4.8 | 3.9 | 4.2 | 1.1 | 2.4 | 4.6 | 19 | 9 |
| 9/23 | 0.5 | 0.040 | 0.040 | 0.036 | | | 3.9 | 1.8 | 4.5 | 1.6 | 2.4 | 3.6 | | 5 |
| 9/24 | 0.6 | 0.035 | 0.034 | 0.030 | | 4.0 | 3.8 | | 3.9 | 1.9 | 2.5 | 3.4 | | 4 |
| 9/25 | 0.7 | 0.025 | 0.028 | 0.023 | | | 4.1 | | 4.3 | 1.7 | 2.7 | 4.2 | | 3 |
| 9/26 | 0.3 | 0.032 | 0.032 | 0.027 | | | 5.0 | | 5.9 | 2.2 | 4.5 | 5.8 | 20 | 6 |
| 9/27 | 0.6 | 0.027 | 0.029 | 0.023 | | 5.6 | 6.2 | | 5.5 | 2.4 | 3.5 | 6.2 | 16 | 5 |
| 9/28 | 0.6 | 0.025 | 0.025 | 0.023 | | 3.1 | 3.3 | | 2.9 | 1.5 | 2.0 | 3.0 | 6 | 2 |
| 9/29 | 0.4 | 0.040 | 0.037 | 0.038 | | 3.9 | 2.3 | | 2.7 | 1.9 | 1.3 | 1.9 | 6 | 3 |
| 9/30 | 0.3 | 0.039 | 0.035 | 0.035 | | 4.9 | 4.3 | | 5.1 | 1.8 | 1.5 | 4.2 | 17 | 9 |
| | | | | | | | | | | | | | | |
| AVG | 0.7 | 0.039 | 0.039 | 0.033 | 8.4 | 7.9 | 6.3 | 6.0 | 6.9 | 3.8 | 5.3 | 6.4 | 29 | 16 |
| MAX | 1.1 | 0.055 | 0.052 | 0.052 | 20.4 | 23.2 | 20.0 | 11.4 | 24.0 | 13.9 | 12.7 | 24.1 | 304 | 216 |