Memorandum on Air Quality in the RMAP Region

This data relates to and expounds upon the information found in Section 12, Environmental and Green Planning, in the Rockford Metropolitan Agency for Planning's 2040 Long-Range Transportation Plan. Contained herein are the historical measurements taken for various air pollutants from within the RMAP Metropolitan Planning Area (MPA). The ozone and carbon monoxide data are Eight-Hour Sample Results, and the Particulate Matter data are 24-Hour Sample Results. The data and some of the information present in this document are supplied by the United States' Environmental Protection Agency. For more data or information, please visit www.epa.gov/air/

There are currently three monitors in service in the RMAP region. The first is an ozone monitor at Maple Elementary School, 1405 Maple Avenue, Loves Park IL. The second is a particulate matter monitor at the Health Department, 201 Division Street, Rockford, IL. The last is a carbon monoxide monitor at Rockford City Hall, 425 E. State Street, Rockford, IL. Until 2007, there was a second monitor in the RMAP region for ozone, located at Walker Elementary School, 1500 Post Avenue, Rockford, IL. This monitor was discontinued in 2008. A map of these monitor locations is attached at the end of this memorandum.

Ozone

Ground-level ozone is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC.

Breathing ozone, a primary component of smog, can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level ozone also can reduce lung function and inflame the linings of the lungs. Repeated exposure may cause permanent lung damage, scarring lung tissue. Ground-level ozone also damages vegetation and ecosystems. In the United States alone, ozone is responsible for an estimated $500 million in reduced crop production each year.

The Environmental Protection Agency (EPA) standard for ozone is no greater than 0.075 parts per million (ppm) for an 8-hour average concentration. When tabulating results, the worst value is referred to as the "First Maximum", the next the "Second Maximum" and so on. In the timeframe of one year, the Fourth Maximum value is compared to the standard of 0.075 ppm. If the Fourth Maximum is greater than the standard, the region is said to be in violation. Thus, if the "Days > Standard" column in the ozone charts below is 4 or more, that year was in violation of the ozone standard. It is worth noting that the ozone eight-hour standard was strengthened by the EPA in 2008 to its current level. The 2008 standard applies retroactively to monitoring data for prior years.

In the charts for ozone sample results, the data colored **red** exceeds the standard, the data colored **yellow** is under the standard by .010 ppm or less, and the data colored **green** is under the standard by more than .010 ppm. These ranges are chosen based upon proposed changes in the ozone eight-hour standard, which are discussed in more detail below. The 'Design Value' is the rating of pollution that, in the upcoming year, would make the region a 'Non-Attainment' area, or one that fails to meet the air quality standards. The 'Design Value' for each chart is the rating for a pollutant that would cause the

region to become 'Non-Attainment'; thus any value lower than this will not change the region's status in that year, though it could have an effect on the needs of the next year, as the three most recent years of data are averaged to make the determination on compliance.

The data from both monitors regarding ozone is very encouraging. There has not been a year in violation of the standard on either monitor since 2003. As the Rockford monitor was discontinued in 2008, the future data will come solely from the Loves Park location, which has not had a year in violation since 2002.

However, the impending changes in the ozone standard bear consideration on this topic. The EPA has issued a notice that it intends to further strengthen the ozone standard from where it was moved to in 2008. The three proposals for the standard are 0.070 ppm, 0.065 ppm, or 0.060 ppm. Since the EPA looks at the most recent three years of data to determine a region's average ozone rating, the data from the Loves Park ozone monitor suggests that the RMAP region is likely to be in compliance, or in the EPA's terms, an 'attainment area' using either the .065 or the .070 standards. In the event the EPA selects the stricter 0.060 standard, the RMAP region will face a difficult challenge in maintaining its attainment status, as will much of the State of Illinois and metropolitan areas around the country. While the 2008 data alone would represent a year of acceptable levels of ozone even at the 0.060 standard, the 2008 data was a spectacularly low year for such data, and is unlikely to be the consistent level of ozone in the RMAP region.

Ozone Eight-Hour Sample Results (parts per million) from Rockford Location

Year	1st Max	2nd Max	3rd Max	4th Max	Days > Std
1998	0.076	0.076	0.074	**0.073**	***2***
1999	0.085	0.084	0.082	**0.082**	***7***
2000	0.078	0.076	0.075	**0.069**	***2***
2001	0.082	0.082	0.078	**0.078**	***4***
2002	0.092	0.084	0.084	**0.079**	***5***
2003	0.081	0.079	0.078	**0.076**	***4***
2004	0.074	0.073	0.071	**0.064**	***0***
2005	0.08	0.079	0.076	**0.075**	***3***
2006	0.068	0.065	0.064	**0.063**	***0***
2007	0.074	0.072	0.071	**0.071**	***0***
2008	Monitor Discontinued				

Ozone Eight-Hour Sample Results (parts per million) from Loves Park Location

Year	1st Max	2nd Max	3rd Max	4th Max	Days > Std
1998	0.077	0.076	0.074	**0.071**	***2***
1999	0.083	0.079	0.078	**0.077**	***5***
2000	0.076	0.075	0.075	**0.070**	***1***
2001	0.081	0.081	0.076	**0.075**	***3***
2002	0.088	0.086	0.084	**0.078**	***6***
2003	0.077	0.075	0.074	**0.071**	***1***
2004	0.072	0.070	0.067	**0.061**	***0***
2005	0.079	0.079	0.076	**0.075**	***3***
2006	0.066	0.066	0.064	**0.063**	***0***
2007	0.077	0.075	0.075	**0.073**	***1***
2008	0.061	0.061	0.060	**0.060**	***0***
2009 Design Value = 0.092					
2009 Design Value if Standard is .070 = .077					
2009 Design Value if Standard is .065 = .062					
2009 Design Value if Standard is .060 = .047					

Although the Design Value indicates what is permissible, it is RMAP's and the region's goal to move further towards a healthy environment with fewer pollutants. Continuing to have data similar to that of 2008 would be a tremendous start towards a healthier region.

Carbon Monoxide

Carbon monoxide results from incomplete combustion of fuel and is emitted directly from vehicle tailpipes. Incomplete combustion is most likely to occur at low air-to-fuel ratios in the engine. Nationwide, two-thirds of the carbon monoxide emissions come from transportation sources, with the largest contribution coming from highway motor vehicles. In urban areas, the motor vehicle contribution to carbon monoxide pollution can exceed 90 percent.

The Environmental Protection Agency (EPA) standard for carbon monoxide is no greater than nine parts per million (ppm) for an 8-hour average concentration, and this value is not to be exceeded more than once per year. Thus, if the "Second Maximum" value is greater than 9 ppm, the region is said to be in violation. The 'Design Value' is the rating for a pollutant that would cause the region to become Non-Attainment.

Carbon Monoxide Eight-Hour Sample Results (parts per million) from Rockford Location

Year	1st Max	2nd Max	Days > Std
1998	4.2	3.6	***0***
1999	4.4	3.8	***0***
2000	2.9	2.9	***0***
2001	2.9	2.9	***0***
2002	2.5	2.4	***0***
2003	2.7	2.4	***0***
2004	2.9	2.7	***0***
2005	2.4	2.3	***0***
2006	1.9	1.9	***0***
2007	1.4	1.4	***0***
2008	1.9	1.7	***0***
2009 Design Value = 23.9			

As can be seen in the chart, the Rockford monitor for carbon monoxide has never had a higher value for its second maximum than 3.8 ppm, which is less than half of the standard. Since 2001, the Rockford monitor has shown values of 2.9 or below, less than a third of the standard, with values getting ever lower as time goes on. There is very little concern over the RMAP region losing its attainment status with regard to carbon monoxide, even if the EPA should choose to reduce the standard in the future. This does not mean that the Rockford Region or RMAP should become lax on tracking and eliminating carbon monoxide where possible, but it does show that the existing efforts have been successful in driving down levels of the potentially harmful pollutant.

Related to this issue is the amount of congestion that is in the RMAP region. From a statistical relationship, there is a cause and effect impact by higher levels of congestion and higher measurements of carbon monoxide. On the other hand, if the street/highway network had low levels of congestion, then carbon monoxide levels would be low. Over the past several years, RMAP has undertaken some additional planning steps to monitor this situation. The first is the adoption of the Management & Operations Plan (M&O) for the MPO. Another is updating transportation modeling software programs which allows the MPO to better compare existing traffic data with current modeling data. Yet a third factor is improved average daily traffic (ADT), peak-hour traffic, vehicle classification and speed data from IDOT'S website and other counting programs that are being done in the MPA.

Lastly, RMAP hired a consultant to measure current traffic flow data to measure and determine existing traffic conditions and levels of service. This is one of the objectives in the M&O Plan. Based upon the preliminary information from the data that has been collected at this time indicates that less than 1% of the arterial and interstate/expressway roadway classifications have a level-of-service of "D or lower". In the 2010 RMAP LRTP, Table 2-6 displays base-year volume to congestion ratios by the functional classification system used in the modeling process. The information produce from the model data is

consistent with the data being gathered the consultant in the M&O Plan. In other words, the model data produced from the VISUM software modeling program for the base-year is verified by the existing traffic data that is being gathered by RMAP (with consultant assistances).

Particulate Matter

Particulate Matter is the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small that they can only be detected using an electron microscope.

These particles can be made up of hundreds of different chemicals. Some particles, known as *primary particles* are emitted directly from a source, such as construction sites, unpaved roads, agricultural fields (especially during harvest times), smokestacks or fires. Others form in complicated reactions in the atmosphere of chemicals such as sulfur dioxides and nitrogen oxides that are emitted from power plants, industries and automobiles. These particles, known as *secondary particles*, make up most of the fine particle pollution in the country.

There are two categories of Particulate Matter regulated by the Environmental Protection Agency (EPA), Particulate Matter smaller than 10 micrometers (PM10) and Particulate Matter smaller than 2.5 micrometers (PM2.5). In the Rockford Region, only PM2.5 is measured. The EPA standard for PM2.5 for a 24-hour average concentration is 35 micrograms per cubic meter of air. The 98th percentile of 24-hour values for a year may not exceed this level. Additionally, the annual average concentration may not rise above 15.0 micrograms per cubic meter of air. It bears mention that the standard for PM2.5 was strengthened in 2006 to its current level. The 2006 standard applies retrospectively to monitoring data for prior years.

In the table for PM2.5, a color scheme is in effect. For the data showing the 1st through 4th maximums for PM2.5 and the 98th percentile data, cells shaded **red** are above the 35 micrograms per cubic centimeter standard, cells shaded **yellow** are under the standard by one microgram or less, and cells shaded **green** are more than one microgram under the standard.

Particulate Matter 24-Hour Sample Results (micrograms per cubic meter of air) from Rockford Location

(Particles < 2.5 micrometers in diameter)

Year	1st Max	2nd Max	3rd Max	4th Max	98th %	Annual Mean
1998	Monitor Not Active					
1999	41.1	30.6	27.4	27.4	**30.6**	***14.34***
2000	40.7	37.4	36.2	32.5	**36.2**	***14.99***
2001	58.5	42.6	31.4	31.0	**42.6**	***16.06***
2002	39.4	38.7	32.6	32.2	**32.6**	***14.74***
2003	35.8	26.6	24.3	22.2	**26.6**	***12.19***
2004	47.9	27.2	23.1	22.8	**27.2**	***11.68***
2005	49.3	46.5	41.9	36.7	**46.5**	***15.95***
2006	33.2	27.3	25.9	25.2	**27.3**	***12.25***
2007	42.4	31.7	30.4	29.1	**30.4**	***12.51***
2008	46.4	29.5	28.7	25.4	**28.7**	***10.58***
2009 Design Value (98th %) = 45.9						
2009 Design Value (Annual Mean) = 21.91						

For the Annual Mean data, cells shaded ***red*** are above the 15.0 micrograms per cubic meter of air standard, cells shaded ***yellow*** are under the standard by one microgram or less, and cells shaded ***green*** are more than one microgram under the standard. The 'Design Value' fields indicated what rating of a pollutant would cause the region to become Non-Attainment in a given year. As with the other pollutants, this data is averaged over the three most recent available years of data.

The data indicates that the levels of PM2.5 in the Rockford region are at acceptable levels, and show continued progress towards lower and lower annual means as well as 98th percentile data. While this data is encouraging, it is in the best interests of the Rockford Region to continue enacting and developing procedures for PM2.5 mitigation and tracking.

Implications

The monitors' data discussed herein indicates that the existing efforts of RMAP and its partners to mitigate air pollution from the selected sources have been effective. Carbon monoxide, which is well below the maximums allowed by the EPA in the RMAP area, is known to be one of the most common air polluting side-effects of transportation sources; its historically low values and trends toward ever lower levels show the effectiveness of programs thus far undertaken. However, especially regarding ground-level ozone pollution, more steps must be continually taken.

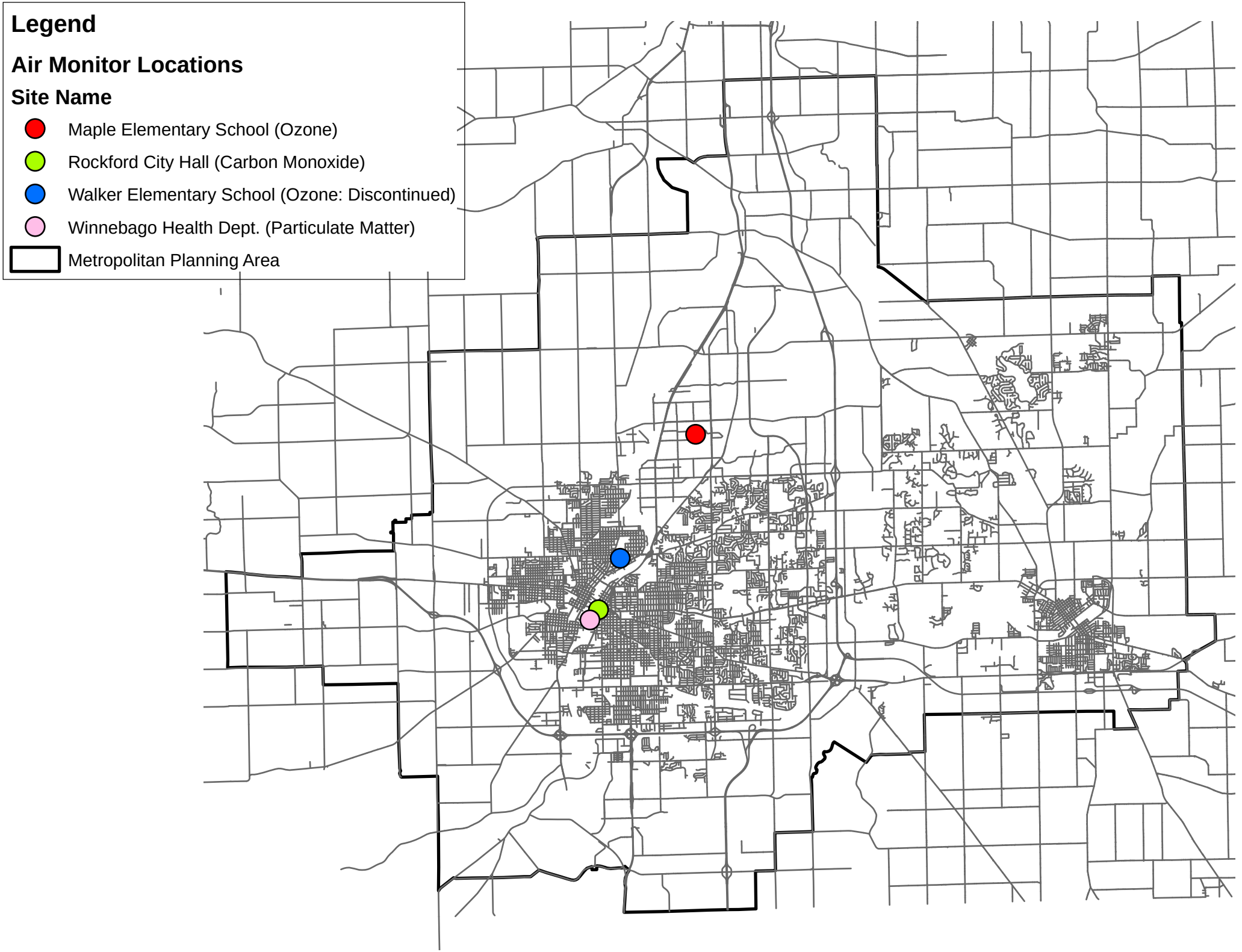
Continuing to support and strengthen requirements for automobiles and factories to cut NOx and VOC emissions from vehicles, industrial facilities and electric utilities, as well as reformulation of fuels, commercial products and consumer products such as paints and chemical solvents can help drive the amount of ground-level ozone even further down. Close enforcement of restrictions on emissions from power plants and industries can aid in the reduction of fine particulate matter. Work on not only reformulation of existing fuels but on new cleaner burning fuels or alternative energy sources can bring down ozone, carbon monoxide, and particulate matter numbers. The same can be said for policies encouraging reduction in use of single-occupant vehicles, such as carpools, use of mass transit and alternative modes. The region has made great progress in reducing congestion and spurring shifts in mode of transportation used, but more should still be sought.

Even the habits of single-occupant vehicle owners can be improved through education in energy and fuel-conserving techniques. These range from removing unnecessary weight from vehicles to slowing down, to bundling errands such that vehicles' engines sit for less than an hour between trips. All of these tips and a number of others can save fuel, which reduces the amount of emissions produced by vehicles, thus further cutting the pollutants in the region.

In addition, land use planning can have an effect on pollution levels. Some highly aggressive strategies could include classifying uses based on amounts of these and other pollutants released by the uses, requiring special use permits for uses emitting over a certain amount of pollutants or charging impact fees on a scale dependent on amount of pollutants emitted. Such uses as truck stops, while potentially lucrative, are dangerously high in pollutants because of idling diesel burning engines.

Furthermore, by taking measures in land use plans to cluster uses and reduce sprawl, steps can be made towards cleaner air. The more dense an area's uses, the less travel time is required, taking vehicles off the road for longer periods of time, exponentially reducing the amount of emissions produced by such sources. Even less aggressive strategies, such as limiting the total number of certain types of highly polluting uses or rewarding the use of environmentally-friendly technologies and practices, such as link-ups at truck stop s to prevent idling, can start a community on a road towards healthier air qualities, and overall quality of life.

Other considerations that should factor into this discussion include pollutants that are not monitored in the region or those without national ambient air quality standards (NAAQS) that are of growing concern to the health of people in the region. These include lead, nitrogen dioxide, sulfur dioxide, carbon monoxide and a number of others. While the region is not yet in a position of concern with regard to these pollutants, a proactive approach should be maintained in order to ensure that there is never a reason to have concern over those or any other hazards to residents' health.


Legend
Air Monitor Locations
Site Name
Maple Elementary School (Ozone)
Rockford City Hall (Carbon Monoxide)
Walker Elementary School (Ozone: Discontinued)
Winnebago Health Dept. (Particulate Matter)
Metropolitan Planning Area