# KANSAS IMPLEMENTATION PLAN REVISION – KCMA OZONE MAINTENANCE PLAN, 2007

# APPENDIX J

# A Clean Air Action Plan For the Kansas City Region

Prepared by

MARC

Mid-America Regional Council

May 2005

## GLOSSARY OF TERMS

| | |
|---|---|
| CAMx | Comprehensive Air quality Model with extensions |
| CO | carbon monoxide |
| CAAP | Clean Air Action Plan |
| EGU | electric generating unit |
| EPA | U.S. Environmental Protection Agency |
| I/M | vehicle inspection and maintenance program |
| KCPL | Kansas City Power & Light |
| KDHE | Kansas Department of Health & Environment |
| MARC | Mid-America Regional Council |
| MDNR | Missouri Department of Natural Resources |
| MW | megawatt |
| NAAQS | National Ambient Air Quality Standards |
| NEI | National Emission Inventory |
| $NO_x$ | nitrogen oxides |
| ppb | parts per billion |
| ppm | parts per million |
| RVP | Reid vapor pressure |
| SIP | state implementation plan |
| STI | Sonoma Technology, Inc. |
| tpd | tons per day |
| tpsd | tons per summer day |
| VOC | volatile organic compounds |
| VMT | vehicle miles traveled |

## ACKNOWLEDGEMENTS

The Mid-America Regional Council (MARC) wishes to recognize the following agencies and individuals whose efforts were instrumental to the creation of the Clean Air Action Plan, which was formally approved by the MARC Air Quality Forum and Board of Directors in March 2005.

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**MARC Air Quality Forum**

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## 1 – EXECUTIVE SUMMARY

This Clean Air Action Plan (CAAP) represents a comprehensive, community-based voluntary strategy for reducing ground-level ozone pollution in the Kansas City metropolitan area. The CAAP has multiple objectives. The first and most important of these is to reduce ozone-forming emissions in order to protect the health of area residents. Second, the plan aims to reduce ozone precursor emissions earlier than required under regulatory timelines in order to increase the likelihood that the region will stay in compliance with the health-based, eight-hour ozone standard that became effective in April 2004. Maintaining regulatory compliance, in turn, will protect the health of the regional economy and make the Kansas City metropolitan area more competitive nationally in attracting new growth and development, providing jobs and a better quality of life for area residents. Finally, the CAAP includes recommendations about regulatory strategies that could be further investigated and considered for implementation in the event the region violates the ozone standard in the future.

Metropolitan Kansas City has a long history of working to improve its air quality through both regulatory and voluntary measures, but the CAAP represents the first time that the region has worked to develop a systematic and comprehensive clean air strategy outside of a regulatory framework. The CAAP bears some resemblance to a state implementation plan (SIP), the regulatory air quality improvement plan that the Clean Air Act requires nonattainment and maintenance areas to develop and implement. Both contain strategies for reducing air pollution. Both use models and other technical tools to evaluate air quality problems and the potential effectiveness of proposed solutions. Both contain primary clean air strategies, as well as a list of contingency measures that could be implemented if a violation of an air quality standard occurs. Ideally, a SIP also resembles the CAAP in its inclusion of short-, intermediate- and long-term strategies for reducing emissions.

However, there are some key differences between the CAAP and a SIP. Kansas City area stakeholders developed the CAAP on a purely voluntary basis. Where the strategies in a SIP are legally enforceable, those in the CAAP are voluntary and will ultimately be backed up by formal, public commitments by participating stakeholders to take action to reduce emissions by quantifiable amounts within specified time frames. Commitments that have been secured to date are included in **Appendix A**. A number of partnerships that will be required to implement

elements of the CAAP already exist. Other plan elements will require that new partnerships be formed to oversee the implementation of new ozone reduction measures. MARC and its partners in the community are committed to working collaboratively and aggressively to ensure that the CAAP is implemented as completely and as expeditiously as possible to maximize its near- and long-term air quality benefits.

The criteria that were developed to assess proposed emission reduction strategies did not focus exclusively on their potential to reduce ozone concentrations. While reductions in volatile organic compound (VOC) and nitrogen oxide ($NO_x$) emissions and corresponding ozone concentrations were the primary objective, additional consideration was given to anticipated multi-pollutant benefits, the potential for improving water quality and general ecosystem health, and the potential for creating synergies with community initiatives aimed at improving the quality of life for area residents. This holistic approach to improving air quality is consistent with recommendations developed independently by the National Academy of Sciences, which are included in the 2004 report *Air Quality Management in the United States.*

Another notable difference between the CAAP and previous Kansas City ozone SIPs relates to new information that became available when preliminary runs of a regional photochemical model were completed in summer 2004. Historically, efforts to address ozone pollution in the Kansas City region focused on reducing VOC emissions. The conventional wisdom suggested that the region was VOC-limited, meaning that reducing VOC would be a more effective strategy for lowering ozone concentrations than reducing $NO_x$. Surprisingly, modeling runs showed not only that the region was not strictly VOC-limited, but also that monitors that tended to register the highest ozone concentrations were located in $NO_x$-limited areas under the modeled meteorological regime. Much progress has been made to reduce VOC emissions in the region, but much remains to be done to significantly reduce $NO_x$ emissions. It should be noted that, while the model represents the best technical tool area officials have ever had to assess the region's ozone problem, the modeling work assessed only one ozone episode that occurred six years prior to the model run. If future violations indicate a need for new regulatory measures, more modeling and technical analysis will be needed to better define how current emission levels may affect ozone formation under different weather conditions.

That said, area officials recognize that controlling $NO_x$ emissions is more critical than previously thought. In response to this new information, the CAAP contains four major groups of

strategies for reducing both $NO_x$ and VOC emissions. Principal among these is a plan to put new emissions controls on existing power plants in the region. Kansas City Power & Light (KCPL), the largest electric utility in the metropolitan area, has proposed an ambitious agenda for reducing the air quality impacts of its power plants. As part of a $300 million investment package, it would put new emissions controls on generating units near La Cygne, Kansas, and Weston, Missouri. The utility is also proposing to develop wind generation capacity in Kansas and would implement energy efficiency programs that could significantly reduce the demand for electricity on the hottest days of summer – days when ozone concentrations are likely to be at their highest. If approved by the two state regulatory commissions, KCPL's investment strategy would help reduce $NO_x$ emissions in the region by an estimated 71 tons per day (tpd), or 17.5% of the estimated regional $NO_x$ emissions inventory for 2010. The corresponding reduction in ozone concentrations would range from one to five parts per billion – a margin potentially significant enough to keep the region in attainment of the eight-hour ozone standard.

A second group of strategies addresses emissions from diesel engines, including on-road sources like buses and semi-trucks, and off-road sources such as construction equipment and locomotives. $NO_x$ is one of the primary constituents of diesel exhaust, and strategies to reduce idling, replace old equipment with newer, lower-emitting equipment, and retrofit older engines with emissions control equipment could yield an estimated 1.2 tpd of $NO_x$ reductions. Diesel engine emission reduction measures could also generate up to 0.1 tpd of VOC reductions. Air quality officials in the region have begun to assess the feasibility of implementing ultra-low sulfur diesel before EPA requires its use in all areas in 2010. Early adoption of this fuel would increase the air quality benefits generated by the use of newer, lower-emitting engines. Although relatively small in comparison to those generated by power plant controls, the air quality benefits associated with these strategies are important because they would also encompass reductions in fine particulate pollution. According to EPA, fine particulates can pose a serious health threat to those with cardiac and respiratory conditions, and particulate pollution has been linked to increased hospital admissions and emergency room visits.

Public education measures comprise a third principal strategy. When it violated the one-hour ozone standard in the mid-1990s, the Kansas City region incorporated public education as a primary control strategy in its SIP. An annual air quality awareness campaign has helped to inform area residents that fully fifty percent of ozone precursor emissions are generated by

individual activities, like driving and refueling one's car, mowing the lawn, and using paints, solvents, and even personal products like hairspray. In 2004, local governments such as Johnson County, Kansas, and the city of Kansas City, Missouri, implemented comprehensive ozone action programs to reduce emissions generated by government activities and to educate their employees about individual actions that reduce ozone pollution. In the absence of a nonattainment designation that would require the region to adopt new air quality regulations, public educations efforts such as the regional AirQ campaign and local government outreach programs will continue to be an important means of achieving voluntary emissions reductions. Under the CAAP, these efforts will also be expanded to targeted audiences such as unregulated commercial solvent users and vehicle fleet operators to educate them about best management practices and technologies that can be implemented voluntarily to reduce VOC and $NO_x$ emissions. Potential emission reductions associated with public education programs are estimated to be 1.5 tpd of VOC and 1.0 tpd of $NO_x$.

A fourth group of strategies addresses issues related to sustainability. Promoting sustainable growth and development will be essential if the region is to address its ozone problem in the long term. Land use policies that promote a decreased reliance on the automobile, planning practices that place greater emphasis on a truly multi-modal transportation network, natural resource conservation techniques that reduce the urban heat island effect, and green building practices that increase resource efficiency would make clean air easier to achieve. The time frame for implementing these strategies on a regional scale would generally be ten to twenty years or longer. If implemented on a regional scale, the emissions reductions associated with these long-term measures could far exceed those of almost all other voluntary strategies.

The CAAP also contains a set of recommendations about regulatory controls that should be further studied and considered for implementation if the region violates the standard. As of this writing, the complete rule concerning the implementation of the eight-hour ozone standard has not been issued, and it is not clear whether a violation of the eight-hour standard would necessarily lead EPA to designate the Kansas City region nonattainment. However, the photochemical modeling work completed in 2004 indicates that the region will be very close to the eight-hour standard in 2010. The regulatory measures to better control emissions from cars and trucks, from large industrial sources, and from smaller, currently unregulated sources are included in the CAAP as contingency measures that could be implemented if a violation occurs.

Two of these – the gas cap replacement program and the remote-sensing based vehicle emissions testing program – could be implemented on a small scale as voluntary programs. The modification of existing VOC reasonably available control technology (RACT) rules and establishment of new VOC and $NO_x$ RACT rules would be most likely to occur only after the region experienced a violation of the eight-hour ozone standard. Under existing guidelines, the last regulatory measure – reformulated gas (RFG) – would only be available to the region if it were redesignated nonattainment and could show that the use of RFG would be necessary to bring the region into attainment.

The CAAP can be viewed as a "roadmap" to cleaner air. The measures it contains have generated broad support among the diverse group of stakeholders who participated in its development. Funding for some elements of the plan already exists, but many elements will require new public and private investments. The costs of implementing new clean air initiatives, however, will be miniscule in comparison to the public health costs and potential economic impacts that could result if the region fails to address its ozone problem. Implementation of the strategies in the plan will also require the expansion of existing public-/private-sector partnerships, as well as the creation of new ones. Businesses, governments and residents in the Kansas City metropolitan area have a history of working together to improve air quality, and this action plan provides a tool the regional community can use to ensure that area residents have clean, healthy air for years to come.

# 2 - INTRODUCTION

How clean should Kansas City's air be? What pollution control strategies make the most sense for the region? Who should bear the cost of reducing ground-level ozone in the metropolitan area? How much would nonattainment cost?

These are just a few of the questions that local elected leaders, government officials, industry representatives and other stakeholders have asked in the process of developing this Clean Air Action Plan (CAAP). The issues these questions raise have numerous implications for public health and the health of the regional environment and its economy. Air quality issues relating to public health, environmental quality and the regional economy touch on the lives of all 1.8 million people who call the Kansas City metropolitan area home. And like most big questions, the aforementioned defy simple answers.

The elected officials, business leaders, and community group representatives who sat on the Air Quality Working Group (AQWG) that guided the development of this action plan gave considerable thought to the environmental, political, regulatory, and public health issues central to Kansas City's ground-level ozone problem. Through a series of meetings and a regional workshop attended by 175 stakeholders, and with assistance from the most sophisticated technical tools that have ever been brought to bear on Kansas City's air quality problem, working group members arrived at a set of strategies for reducing ozone in the region.

## 2.1 - HISTORICAL BACKGROUND

The Kansas City one-hour ozone maintenance area consists of Johnson and Wyandotte Counties in Kansas, and Clay, Jackson and Platte Counties in Missouri (**Figure 2-1** – Map of Kansas City Metropolitan Area). In 1978, the U.S. Environmental Protection Agency designated the five-county area nonattainment for ground-level ozone, one of six "criteria" pollutants as defined by the Clean Air Act. For the next decade, the region struggled to reduce emissions in order to meet the federal ozone standard. By 1992, it achieved success; the region was able to demonstrate that its air quality met federal standards, and EPA redesignated the area a maintenance area for the one-hour ozone standard. After violations of the one-hour ozone standard occurred in the mid 1990s, the region implemented contingency measures listed

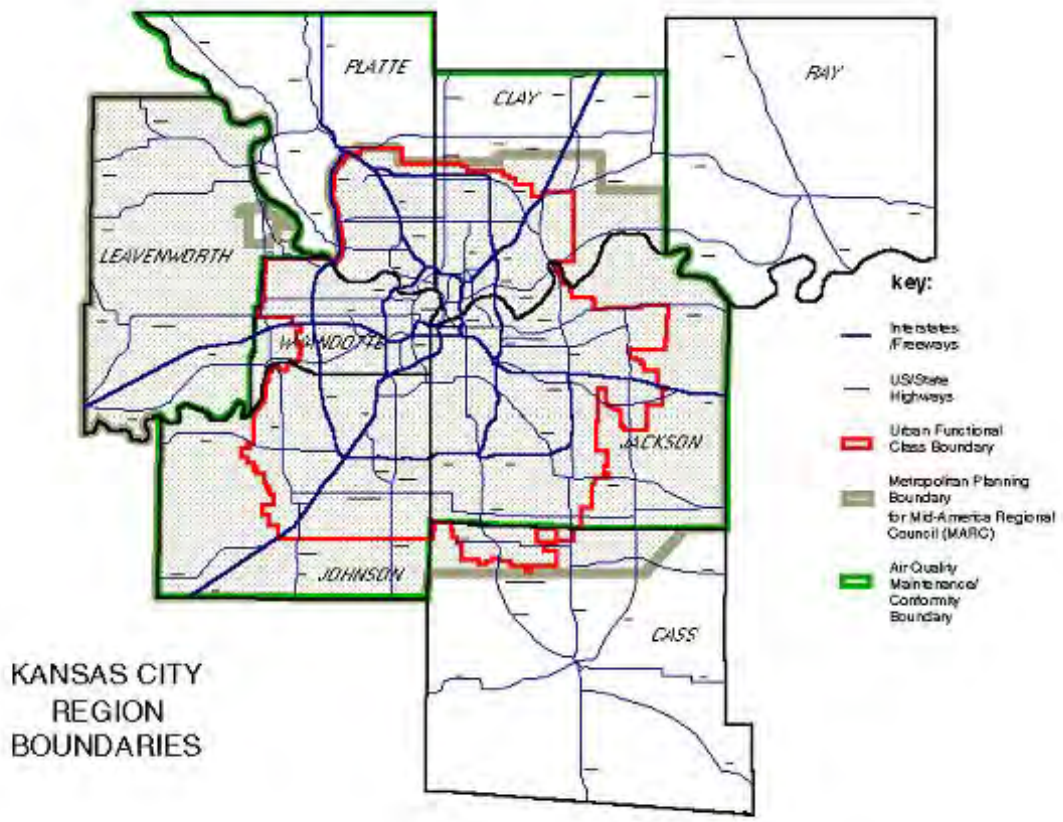


Figure 2-1 – Map of Kansas City Metropolitan Area

in the region's state implementation plans for ground-level ozone. These measures, which include the use of less volatile gas in the summertime, new regulations governing commercial solvent use and emissions from bakeries, and an expanded regional air quality public education program, appear to have been successful. Since 1999, there have been only two occasions on which ozone monitors in the regional network exceeded the one-hour standard; both occurred in 2000.

In 1997, the EPA promulgated a new, more stringent health-based standard for ground-level ozone. It did so in response to a growing body of research that showed the old one-hour ozone standard did not adequately protect human health. Where the old standard was set at 0.12 parts per million (ppm) in a one-hour period, the new standard established a limit of 0.08 ppm over an eight-hour period to better account for the health effects associated with chronic exposure to ozone (under EPA rounding conventions, a reading below 0.085 ppm is considered

to be under the federal limit). The eight-hour standard faced a number of legal challenges after EPA first issued it, but the U.S. Supreme Court ultimately upheld it in 2001. A consent decree with environmental groups the following year required EPA to issue attainment and nonattainment designations for the new standard by April 15, 2004.

Since the eight-hour standard was first issued, state and local air quality officials have tracked air quality in the Kansas City region to assess the region's ability to comply with the new federal limit for ground-level ozone. At the outset, it was clear the region would have difficulty meeting the standard. Under EPA guidelines, the three-year average of the fourth highest reading at any single monitor cannot exceed 0.085 ppm, or 85 parts per billion (ppb). In 1999 and 2000, three of the six ozone monitors in the Kansas City network – those at Liberty, Watkins Mill State Park, and Kansas City International Airport – would have been in violation of the standard. A mild summer in 2001 enabled all six area ozone monitors to meet the standard, but a hotter summer in 2002 caused the Liberty monitor to have a three-year average reading in excess of 85 ppb.

In 2003, the region experienced exceedances of the eight-hour ozone standard the weekend of April 12-13, and the high readings were linked to agricultural burning in the Flint Hills region of Kansas. The Missouri Department of Natural Resources petitioned EPA to "flag" the data, or to exclude the high readings in making a determination about the region's compliance status. EPA determined that the April high ozone readings were attributable to anomalous events that occurred outside the metropolitan area, which enabled all the monitors in the area to end the year under the 85 ppb standard. However, at the start of 2004, the thresholds for violations at three area monitors were at or below their 2002-2003 average readings. (See **Table 1** - Monitors at Risk of Violating the Eight-Hour Ozone Standard in 2004). It seemed almost a foregone conclusion that the Kansas City region would violate the eight-hour standard by the end of 2004.

Unexpectedly, Kansas City and most of the eastern United States experienced remarkably good air quality in the summer of 2004. According to the National Weather Service, the summer was the third coolest on record. Throughout the summer months, a series of fronts moved through the area, bringing clean, cool air from the northwest that prevented the establishment of ozone-conducive weather patterns. Not only did the region not experience any days when ozone concentrations exceeded the standard, but the three monitors at risk of violating the standard did

not reach the threshold values shown below. Consequently, the Kansas City region ended the year with all of its monitors in compliance with the eight-hour standard.

Table 1. Monitors at Risk of Violating the Eight-Hour Ozone Standard in 2004

| **Monitor** | **2002-03 Average of 4th-Highest Value (ppb)** | **Highest 2004 4th-High Value That Would Not Trigger Violation (ppb)** | **Actual 2004 4th-High Value (ppb)** |
|---|---|---|---|
| Rocky Creek | 89 | 75 | 69 |
| Liberty | 87 | 79 | 71 |
| Watkins Mill | 84 | 86 | 67 |

## 2.2 - THE CLEAN AIR ACTION PLAN

At the end of 2003, when violations of the eight-hour standard appeared imminent, the MARC Air Quality Forum created a 12-member Air Quality Working Group (AQWG) to oversee the development of a Clean Air Action Plan for the Kansas City metropolitan region. The group consisted of four elected officials, four representatives of business and regulated industry, and four community group representatives. The AQWG was supported by a technical advisory group consisting of state and local air agency staff.

The working group set an aggressive meeting schedule and, beginning in February 2004, embarked on a mission to better understand the dynamics of the region's ozone problem. Concurrently, MARC, in conjunction with Sonoma Technology, Inc., the Kansas Department of Health and Environment, the Missouri Department of Natural Resources, and EPA Region 7, worked to complete the development of a photochemical model to assess the dynamics of ozone pollution in the region and to evaluate measures that could be used to reduce emissions. Work on the model had first begun in the late 1990s, but resource constraints had slowed its development. MARC held a contractor selection process and in early 2004, selected Sonoma Technology, Inc., to work with the Kansas Department of Health & Environment and the Missouri Department of Natural Resources, and EPA Region 7 to complete work on the model.

In April 2004, EPA issued designations under the eight-hour ozone standard. The Kansas City region was one of only two metropolitan areas in the country to receive an "unclassifiable" designation. EPA indicated that it did not have sufficient data to determine Kansas City's status, and pledged to render a decision after the conclusion of the 2004 ozone season.

The AQWG focused its initial efforts on examining short-term voluntary strategies the region could employ to minimize the risk of ozone violations in 2004. Discussion about regulatory strategies was postponed until work on the photochemical model could be completed. In June, preliminary model runs were completed to assess whether the model could accurately replicate the dynamics of the August 1998 ozone episode that had been selected for the model's development. Initial runs showed that the model's performance was very good. Because it was expected that the Kansas City region's target attainment year would be 2010, modelers then began to develop a 2010 emissions inventory to determine how close the region would be to meeting the standard. The inventory reflected emissions reductions from stationary sources, gasoline vehicles, diesel trucks, and other sources that were expected to occur as the result of federal and state rules that have been finalized.

By the time the AQWG began to focus its attention on potential regulatory measures in late summer 2004, it had become apparent that the region was experiencing an unusual weather year for ozone formation. The group assembled a list of regulatory controls that could potentially be used to reduce ozone precursor emissions from large industrial sources; smaller, unregulated businesses; cars and trucks; and off-road mobile sources like locomotives. Because the regulatory measures were expected to be the most contentious element of the Action Plan, a regional air quality workshop was planned for September 10, 2004, to get stakeholder input on the most effective and equitable ways to define regional air quality protection strategies, including the establishment and implementation of new air quality regulations.

Over 170 people attended the regional air quality workshop on September 10. Although the region had not had any high ozone days and appeared poised to avoid a nonattainment designation, workshop participants learned that, according to the air quality model, the region would be perilously close to violating the eight-hour standard in 2010. Thus, while the need for new regulatory measures appeared to be less imminent than originally anticipated, the underlying sense was that new strategies to reduce emissions would have to be undertaken at some point before the end of the decade. Two hours of the half-day workshop were devoted to facilitated

small-group discussions in which participants provided feedback on a spectrum of regulatory options that were anticipated to be available to the region. Workshop attendees also provided input on a list of voluntary measures that had been developed by the AQWG.

Subsequently, the AQWG reviewed comments provided by workshop participants to determine which voluntary measures and regulatory controls had garnered the greatest support. From the comments emerged four general categories of emissions reduction strategies, three of which encompassed multiple measures. These involved power plant emissions reductions; diesel engine replacement, retrofitting and idling reduction; expanded public education and outreach to targeted audiences; and efforts to promote sustainability through land use and transportation planning practices that actively seek to protect and improve air quality. In terms of regulatory measures, workshop participants expressed support for gas cap replacement efforts, remote sensing to identify high emitting cars, the establishment of new regulations to limit VOC and $NO_x$ emissions from commercial and industrial sources, and the use of reformulated gasoline.

These measures were further evaluated to assess impact on emissions and were then bundled into groups for additional analysis through the photochemical model. The bundles included scenarios involving both conservative and aggressive implementation of voluntary measures. Regulatory measures were evaluated both with and without voluntary measures to define the nature of any synergies between the two. Completed in December 2004, the modeling runs showed that, under the chosen meteorological regime, retrofitting area power plants with control equipment would clearly have the greatest effect on reducing ozone concentrations in the region. Other strategies, including proposed regulatory measures, would have a comparatively smaller effect but would still help reduce the potential for ozone formation.

The completion of the modeling that was done in support of the CAAP represents a big leap forward for air quality planning in the Kansas City region. As resources become available, additional modeling should be done to determine the effect that current emissions levels have on regional ozone formation under multiple meteorological regimes. In fact, additional modeling and technical analysis will be necessary when the region develops a new maintenance SIP for the eight-hour standard. Nevertheless, the information in the CAAP provides a much clearer sense of the direction in which the Kansas City region should move to provide cleaner air for its residents and to avoid violating federal air quality standards. This action plan should be viewed as a living document subject to evolution over time. As new information and technologies become

available, they may bring new opportunities for more effectively addressing Kansas City's ozone problem. As elements of the plan are implemented, they should be evaluated to determine their actual effectiveness.

At this writing, uncertainty surrounds the nature of the federal requirements the region may be subject to after it is redesignated as attainment under the new ozone standard. However, as the modeling results in this plan indicate, the Kansas City metropolitan region must not wait before it begins to take serious steps toward cleaner air. This plan lays out a clear course not only for addressing the region's ground-level ozone problem, but for improving the overall health of its natural environment and the quality of life of its citizens.

# 3 - AIR QUALITY AND EMISSIONS

## 3.1 - HISTORICAL AND CURRENT AIR QUALITY

### Background

Ozone ($O_3$) is a naturally occurring constituent of the upper atmosphere, where it protects the earth from the sun's ultraviolet rays. However, ozone can also be formed at the earth's surface, where it causes health problems in humans and damage to many plant species. The EPA has established National Ambient Air Quality Standards (NAAQS) to protect public health and uses an Air Quality Index (AQI) to report daily air quality and associated health effects. For ozone, an AQI exceeding 100 is considered "unhealthy for sensitive groups" (such as people with respiratory disease), and this index corresponds to an 8-hour average ozone concentration of 85 parts per billion (ppb) or higher. Ozone is formed by reactions involving oxides of nitrogen ($NO_x$) in sunlight, which are enhanced by the presence of volatile organic compounds (VOC). The precursors to ozone (i.e., VOC and $NO_x$) are emitted into the atmosphere by both anthropogenic (man-made) and biogenic (naturally occurring) sources. The nitrogen oxide-ozone cycle is the basic chemical mechanism for the production (and destruction) of ground-level ozone as shown in Equations 2-1 through 2-3:

$$NO_2 + \text{sunlight} \rightarrow NO + O \qquad \textbf{(2-1)}$$

$$O + O_2 \rightarrow O_3 \qquad \textbf{(2-2)}$$

$$NO + O_3 \rightarrow NO_2 + O_2 \qquad \textbf{(2-3)}$$

The nitrogen oxide-ozone cycle begins with the photolysis of nitrogen dioxide ($NO_2$) by sunlight (Equation 2-1) and finishes with the titration of $O_3$ by nitrous oxide (NO) (Equation 2-3). The nitrogen oxide-ozone cycle reaches a steady-state condition that alone cannot explain the observed build-up of ground-level ozone above natural background levels. Reactions involving VOC as shown in Equations 2-4, 2-5 and 2-6 lead to the conversion of NO to $NO_2$ without consuming ozone, thus causing ground-level ozone concentrations to build up. The hydroxyl radical (OH), a naturally abundant chemical in the atmosphere, is the driving force behind daytime VOC reactions. The OH radicals react with VOCs to produce an oxygen-bearing free radical ($RO_2$), where R represents one of the many chemicals that comprise VOCs. $RO_2$

then reacts with NO to yield $NO_2$ without consuming ozone; thus, it recycles $NO_2$ making it available to form more ozone.

$$VOC + OH \rightarrow R + H_2O \quad \textbf{(2-4)}$$

$$R + O_2 \rightarrow RO_2 \quad \textbf{(2-5)}$$

$$RO_2 + NO \rightarrow NO_2 + RO \quad \textbf{(2-6)}$$

During the night, reaction Equation 2-1 stops because of lack of sunlight, but reaction Equation 2-3 continues to occur; thus, ground-level ozone concentrations decrease at night as long as NO is available from emission sources.

The equations above are a simplification of the photochemistry of ozone, which actually involves hundreds of reactions, all occurring at different rates, which can be a function of sunlight, temperature, and humidity. Ozone concentrations are dependent on this complex photochemistry in which the rate of ozone formation is a nonlinear function of the mixture of VOC and $NO_x$ in the atmosphere. Depending on the relative concentrations of VOC and $NO_x$ and the specific mix of VOC species present, the rate of ozone formation can be most sensitive to changes in VOC alone or to changes in $NO_x$ alone or to simultaneous changes in both VOC and $NO_x$.

In general, ozone concentrations fluctuate as a function of three factors: (1) pollution released by local emissions sources, (2) transported ozone and ozone precursor emissions from upwind areas, and (3) meteorological influences (such as warm days with a temperature-induced inversion layer that traps ground-level ozone). Modeling and data analyses conducted in support of the CAAP show that ozone in the Kansas City area is comprised of about 1/3 natural background, 1/3 transported ozone and ozone precursors and the remaining 1/3 is due to local emission sources. **Figure 3-1** shows the location of ozone monitors in the Kansas City area, as well as their proximity to areas of dense population.

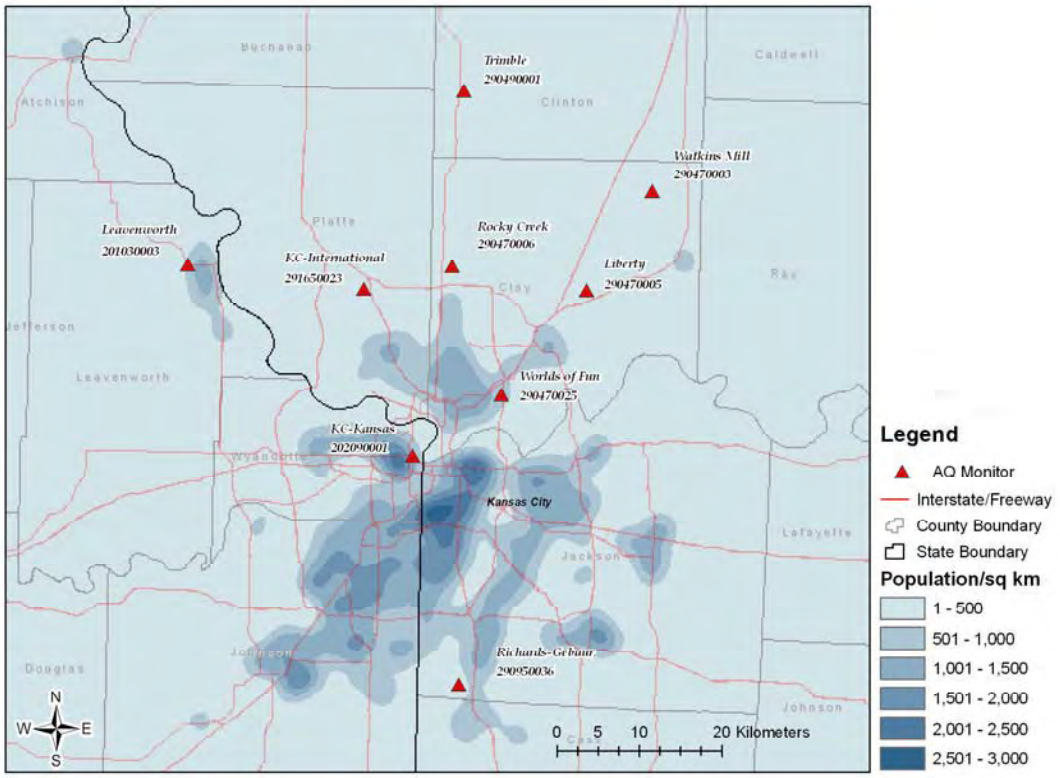


Figure 3-1. Map of Kansas City area population and ozone monitor locations.

Since ozone formation varies with meteorological conditions, it is important to look at how the number of high ozone days varies over time to take the effect of unusual weather into consideration. **Figure 3-2** shows the number of days the 8-hour ozone average exceeded 85 ppb for each of the past 11 years in the Kansas City area. As seen in the figure, the number of exceedances varies considerably from year-to-year.

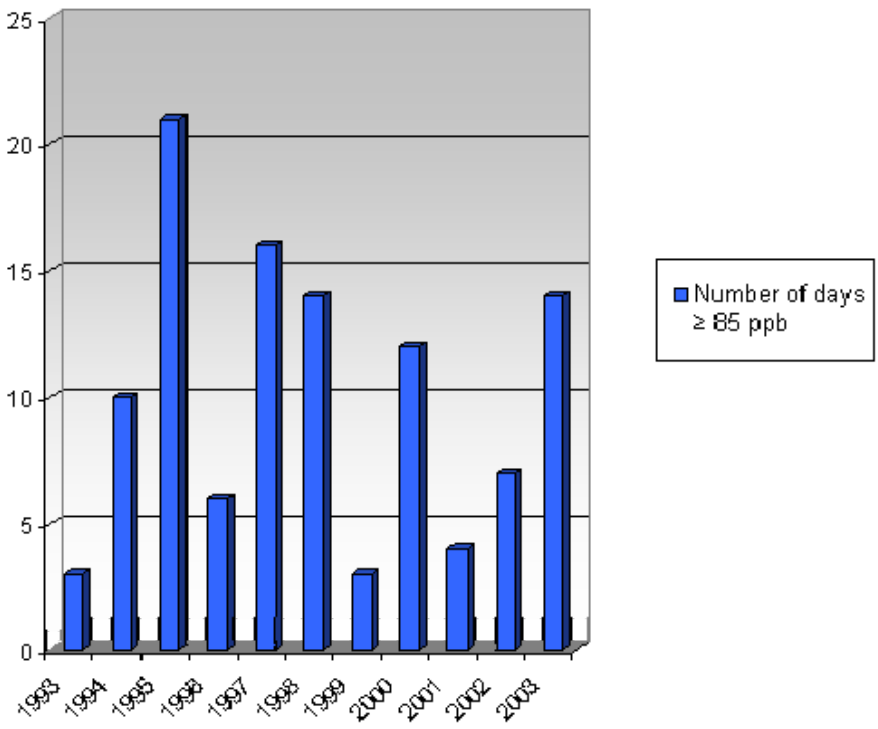


Figure 3-2. Annual number of days with 8-hour ozone levels designated "unhealthy for sensitive groups."

## 3.2 - OZONE DESIGN VALUES

A design value is a statistic that describes the air quality status of a given area relative to the level of the NAAQS. Design values are typically used to classify nonattainment areas, assess progress towards meeting the NAAQS, and develop control strategies. Design values are calculated as a 3-year average of the 4th-highest ozone value at each monitoring site. If this average meets or exceeds 85 ppb, an area may be designated as "nonattainment" by the U.S. EPA. As **Figure 3-3** shows, although ozone design values have been lower in recent years than in the 1990s, ozone design values are still close to air quality standards (particularly at the Liberty monitor). Since ozone levels depend strongly on weather, one hot summer could trigger violations for Kansas City.

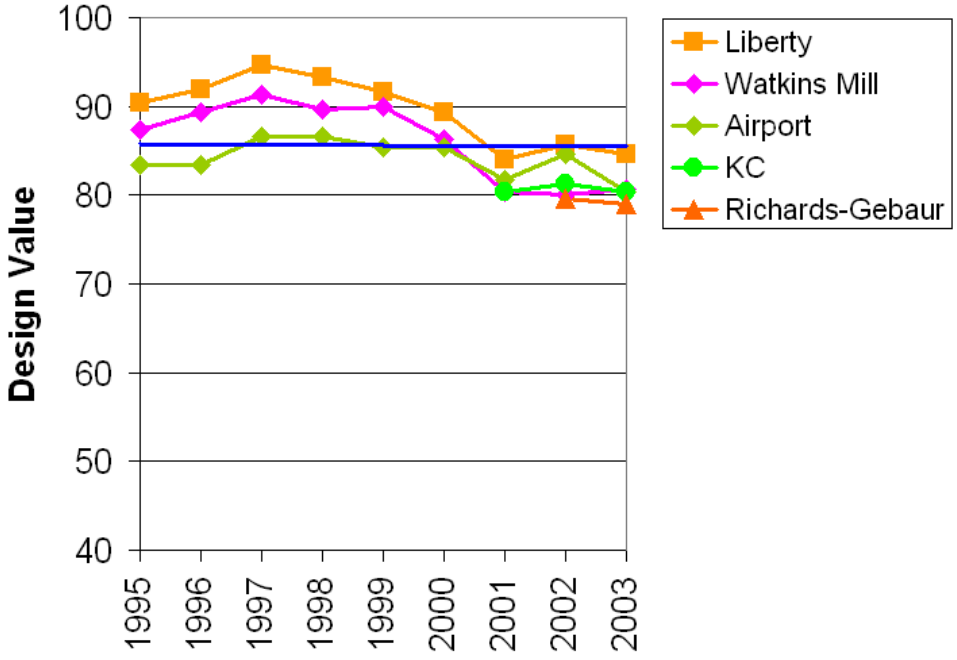


Figure 3-3. Ozone design values by year and monitoring site for the Kansas City area.

## 3.3 - CURRENT AND PREDICTED FUTURE-YEAR VALUES

An emission inventory is a compilation of emissions from man-made and natural sources. Generally emissions are categorized by source type as:

- *Point sources* - stationary sources of emissions, such as an electric power plant, that can be identified by name and location. A "major" source emits a threshold amount (or more) of at least one criteria pollutant, and must be inventoried and reported. Many states also inventory and report stationary sources that emit amounts below the thresholds for each pollutant.
- *Area sources* - small point sources such as a home or office buildings, or a diffuse stationary source, such as wildfires or agricultural tilling. These sources do not individually produce sufficient emissions to qualify as point sources. Dry cleaners are one example, i.e., a single dry cleaner within an inventory area typically will not qualify as a point source, but collectively the emissions from all of the dry

cleaning facilities in the inventory area may be significant and therefore must be included in the inventory.

- *Mobile sources* – on-road and non-road sources - any kind of vehicle or equipment with a gasoline or diesel engine; airplane; or ship.

Most states prepare an emission inventory on a routine basis every few years. In support of the development of a CAAP for the Kansas City area, the Kansas Department of Health and Environment (KDHE), the Missouri Department of Natural Resources (MDNR), MARC and the AQWG determined there was a need to perform comprehensive photochemical modeling to better understand the causes of ozone formation and transport in the Kansas City area. As part of that modeling effort, August 17-22, 1998, an historical period with high ozone concentrations, was selected for analysis. The first step in the process was to prepare as representative an emission inventory as possible for that historical event.

**1998 Emission Inventory Development**

An initial 1998 base year emissions inventory was assembled and processed through the EPA's Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE) by KDHE as part of the modeling effort, and improvements were subsequently made to this inventory by KDHE including the use of:

- The Biogenic Emission Inventory System Version 3 (BEIS3) to estimate emissions from biogenic sources.
- EPA's MOBILE6 model to estimate emissions from on-road mobile sources.
- Continuous Emissions Monitoring (CEM) data for Kansas and Missouri electric generating units

Further improvements were made to the 1998 inventory by Sonoma Technology, Inc. (STI), including reprocessing mobile source emissions to better account for link-based vehicle miles traveled (VMT) in the Kansas City area and refueling emissions throughout the modeling domain. Table 3-1 lists the 1998 ozone precursor emissions (VOC and $NO_x$) by source category for the 8-county Kansas City area. Figure 3-4 depicts the emissions by source type as percentage of the 8-county total.

Table 3-1. Emissions (tons/day) by source type for 1998

| | 1998 Emissions (tons/day) | |
|---|---|---|
| Source Type | VOC | NOx |
| Area Sources | 130.8 | 24.6 |
| Nonroad Mobile Sources | 49.5 | 119.9 |
| Onroad Mobile Sources | 121.7 | 140.7 |
| Point Sources | 28.9 | 289.9 |
| Total | 330.9 | 575.1 |

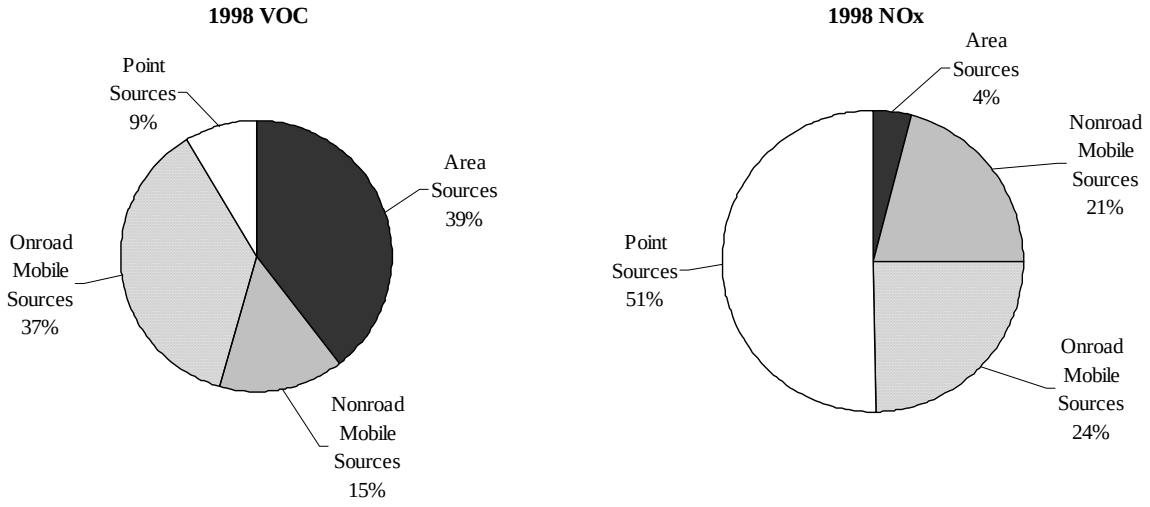


Figure 3-4. Percentage of emissions by pollutant and source type for 1998.

**2010 Emission Inventory Development**

To assess air quality in the future, KDHE and STI with assistance from the Missouri Department of Natural Resources (MDNR), the Mid-America Regional Council (MARC), and the U.S. EPA constructed a 2010 emissions inventory. The following section summarizes the steps used to develop this 2010 future-year inventory.

**Area Sources**

Area source emissions were derived by projecting the US EPA's 1999 National Emission Inventory (NEI) to 2010 using growth factors generated by the US EPA's Economic Growth Analysis System (EGAS). For some source categories, such as locomotives and commercial marine vessels, alternative growth factors were chosen in keeping with federal regulatory support

documents. Also, control factors were applied to some sources, such as locomotives and consumer/commercial solvent use, to represent existing federal control measures.

**Non-road Mobile Sources**

Emissions from non-road mobile sources other than locomotives, commercial marine vessels, and aircraft[1] were estimated using the EPA's NONROAD model. This model was run for 2010 with default activity data and temperature and fuel characteristics inputs specific to the Kansas City area. NONROAD outputs were reformatted and processed through SMOKE.

**On-road Mobile Sources**

Emissions from on-road mobile sources were estimated using vehicle miles traveled (VMT) data and emission factors produced by the EPA's MOBILE6 model. For all areas outside Kansas City, 1998 VMT were grown to 2010 levels using EGAS projection factors. For the Kansas City area, 2010 link-based VMT data were developed by MARC, and all VMT data were processed through SMOKE in order to apply MOBILE6 emission factors and estimate emissions. MOBILE6 input files for 2010 were developed using controls currently scheduled to be in place before 2010, such as gasoline Reid vapor pressure (RVP) standards, inspection-and-maintenance (IM) programs, and Stage II controls on vehicle refueling processes.[2] All MOBILE6 runs were performed within the SMOKE modeling system.

**Point Sources**

For all states except Kansas and Missouri, emissions for electric generating unit (EGU) point sources were derived from runs of the EPA's Integrated Planning Model (IPM)[3]. For Missouri, 2010 EGU emissions were estimated by MDNR from surveys of specific facilities, and 2010 EGU emissions for Kansas were similarly estimated by KDHE. For non-EGU point sources, 1999 NEI point source data was projected to 2010 using EGAS growth factors, and control factors were also applied to represent existing control measures.

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[1] These source categories are not covered by the NONROAD model and were included in the area source portion of the emission inventory.
[2] Stage 2 vapor recovery is used in various metropolitan areas in the modeling domain but is not currently used or planned to be implemented in the Kansas City region.
[3] These modeling runs were performed as part of the EPA's Clear Skies study, and outputs were converted to SMOKE-compatible format by the EPA.

**Emission Inventory Results**

**Table 3-2** and **Figures 3-5** show the projected 2010 emission levels by source type. Overall, both VOC and $NO_x$ emissions are projected to decline between 1998 and 2010. On-road mobile sources are predicted to decline by about half. Thus, the relative contributions of point source and area source emissions to the total inventory increase between 1998 and 2010.

Table 3-2. Projected emissions by source type in 2010.

| Source Type | 2010 Emissions (tons/day) VOC | $NO_x$ |
|---|---|---|
| Area Sources | 111.0 | 28.5 |
| Nonroad Mobile Sources | 32.4 | 77.8 |
| Onroad Mobile Sources | 52.1 | 71.9 |
| Point Sources | 31.5 | 226.0 |
| Total | 227.0 | 404.2 |

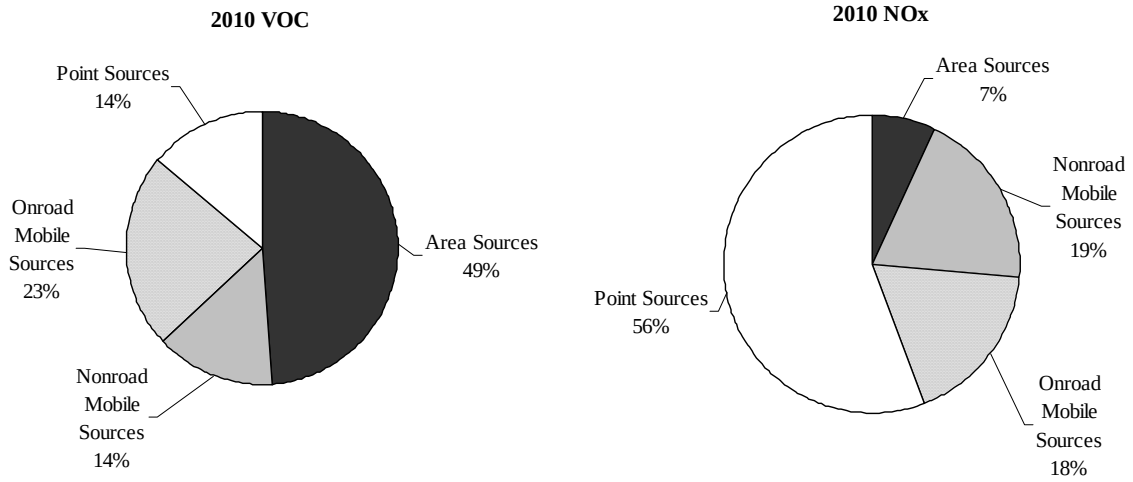


Figure 3-5. Percentage of emissions by pollutant and source type for 2010.

# 4 - SCIENTIFIC TOOLS USED TO PREDICT FUTURE AIR QUALITY

## 4.1 - OVERVIEW

Air quality models are tools to assess impacts from pollutant sources, develop an understanding of air pollution problems, design and evaluate pollution control strategies, and estimate the impact of emission growth and controls on future air quality. Meteorological models estimate transport and dispersion parameters that affect air quality. Emission models provide estimates of amounts and types of gases and particles emitted into the atmosphere by pollution sources. As shown in **Figure 4-1**, emission and meteorological estimates provide inputs to air quality models, which simulate physical and chemical processes in the atmosphere to estimate air quality.

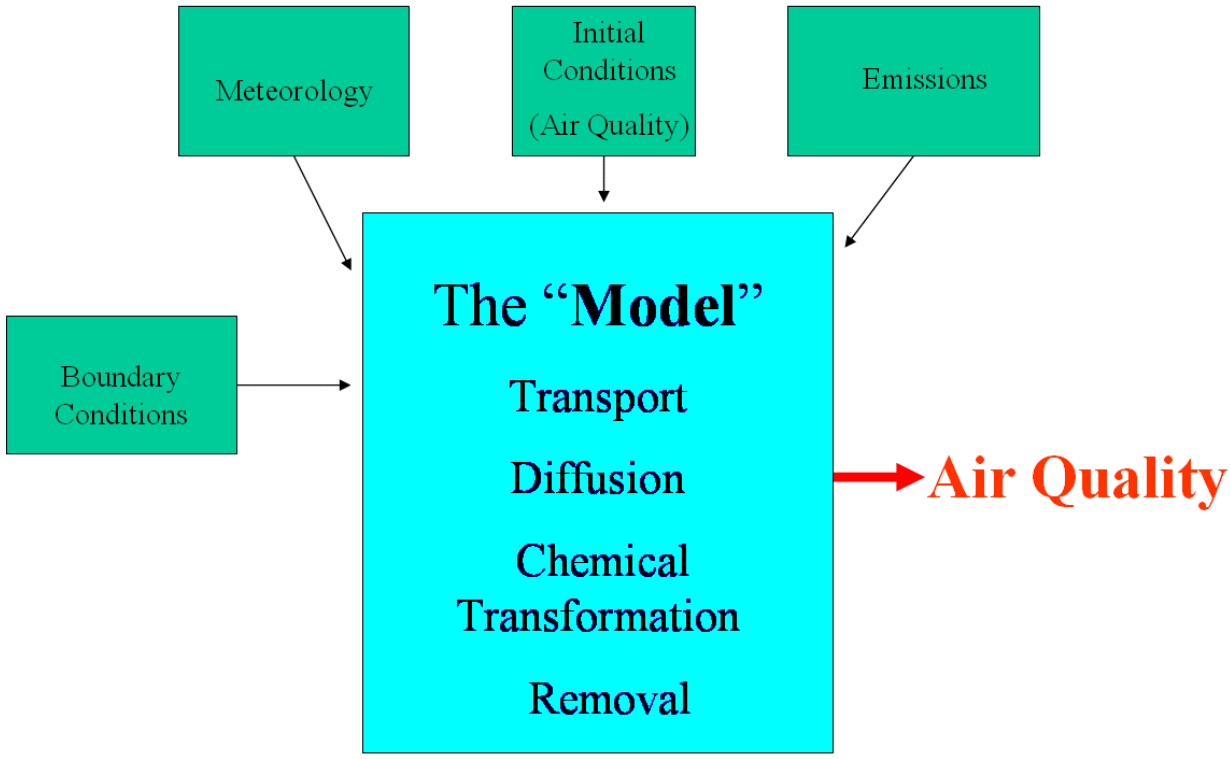


Figure 4-1. Air quality models are mathematical representations of important atmospheric chemistry and physics.

The computer modeling process involves several steps:

- The selection of an ozone episode to be modeled.

- Preparation of model inputs, including meteorology and emissions (these inputs must be "gridded" to match the horizontal and vertical grid definition used by the air quality model, as shown in **Figure 4-2**).
- Evaluate model performance through comparison with ambient air quality data.
- Estimate future-year emissions.
- Apply the model to the future year.
- Assess the need for additional emissions controls.

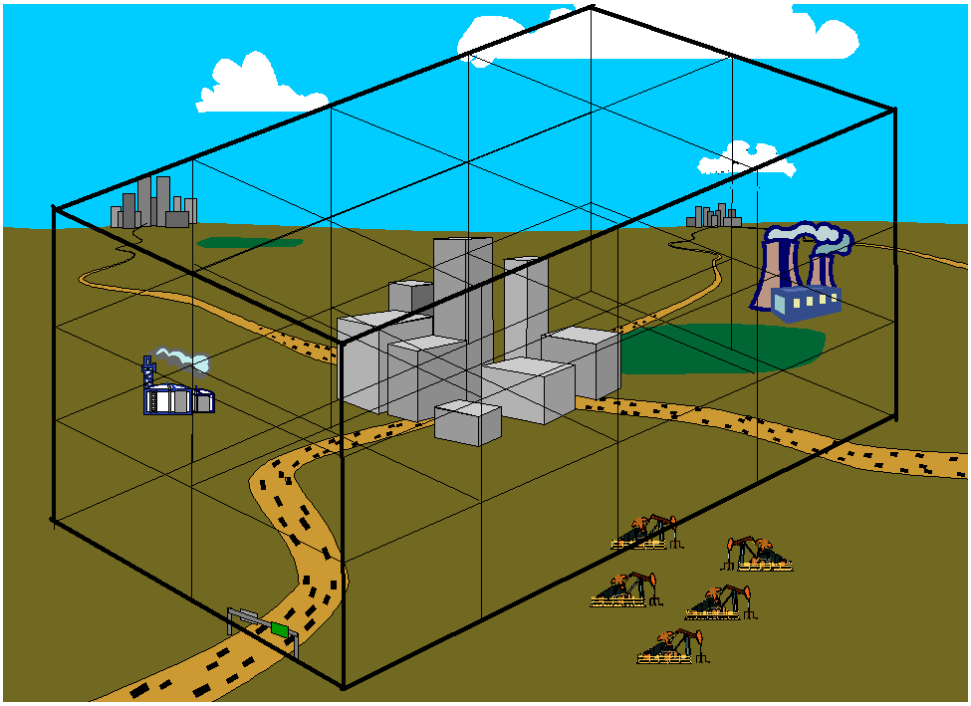

Figure 4-2. Photochemical grid model conceptualization.

The photochemical grid model chosen for use in this study is the Comprehensive Air Quality Model with extensions (CAMx). CAMx has been used in air quality assessments for SIP's and early action compacts by various regulatory agencies throughout the US. Because air quality models must account for the effects of long-range pollutant transport, multiple grid domains are utilized, with the grid resolution becoming finer and finer the closer one gets to the area of interest. For the Kansas City model runs, three nested domains were used: a large 36-km

domain, an intermediate 12-km domain, and a 4-km domain for the Kansas City and St. Louis area (see **Figure 4-3**).

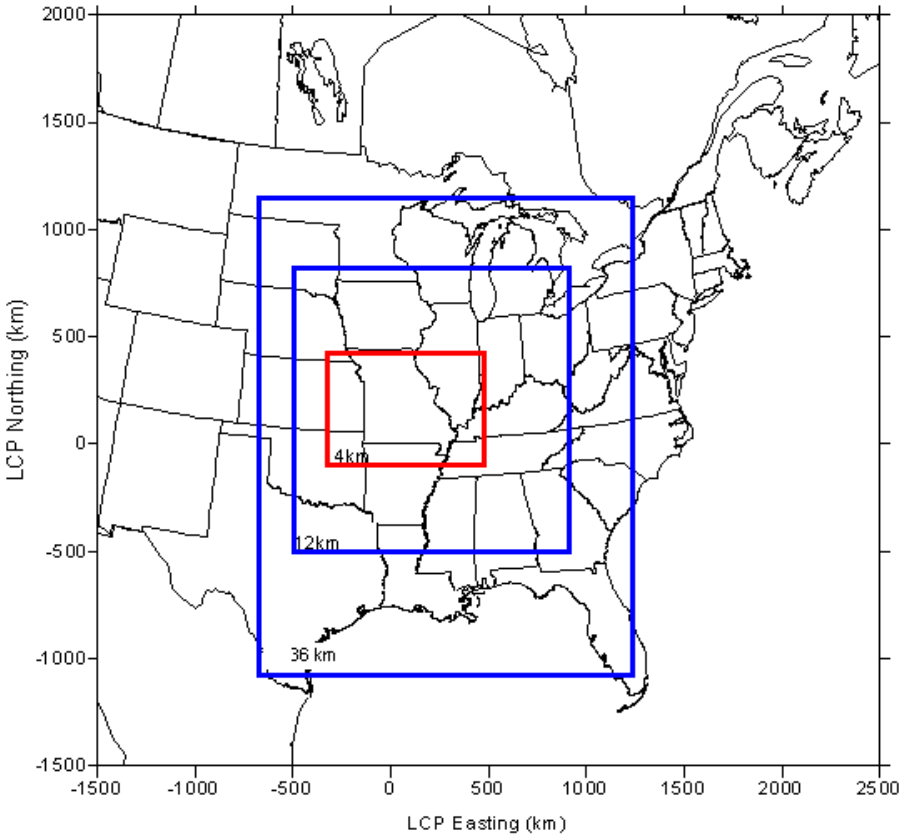


Figure 4-3. Grid definitions for the 36-km, 12-km, and 4-km modeling domains.

It should be noted that EPA has specific guidelines regarding the manner in which photochemical models can be used to assess regional ozone problems and to evaluate proposed controls. For SIP modeling purposes, EPA requires that multiple meteorological regimes be evaluated to determine the effect that different weather conditions may have on ozone formation and dispersion. EPA also requires that modelers use the most recent emissions inventory data available, as well as meteorological data from the most recent high ozone episodes, when modeling is used to demonstrate future year attainment of federal air quality standards.

Development of a CAMx model for the Kansas City region was begun in the late 1990s using three ozone episodes from 1995 and 1998. Resource constraints and model performance issues delayed the completion of the project. The CAAP provided an impetus to accelerate the completion of the model. Due to time and resource constraints, project staff were able to model

only one ozone episode, choosing the 1998 event that was believed to represent a worst-case scenario. The model's performance in replicating observed readings for the August 1998 ozone episode was very high, providing local officials with the most sophisticated tool the region has ever had to assess its ozone problems and to evaluate potential clean air strategies. However, it should be noted that the data below represent only one meteorological regime. High ozone may occur in the Kansas City region under varying meteorological conditions, the dynamics of which could be expected to produce different results than those described below. If a violation of the eight-hour ozone standard leads to future consideration of new regulatory controls, it may be necessary to update emissions inventories and rerun control scenarios using weather data from more recent ozone episodes to determine if the dynamics of the region's ozone problem have changed.

## 4.2 - MODEL PERFORMANCE EVALUATION

Before a photochemical model is used to evaluate emission controls, it should be evaluated as thoroughly as the available aerometric database will allow. This evaluation is intended to provide an estimate of the model's reliability as an ozone prediction tool. This section describes how the photochemical model was evaluated for the selected ozone episode. The evaluation plan follows the procedures recommended by the USEPA (U.S. Environmental Protection Agency, 1991, 1999) for ozone attainment demonstration modeling.

### Evaluation Principles

It is important to establish a framework for assessing whether the photochemical modeling system (i.e., the emissions, meteorological and dispersion models and their supporting data sets) performs with sufficient reliability to justify its use in developing ozone control strategies. The framework for assessing the model's reliability consists of the following principles:

- **The model should be viewed as a system.** When we refer to evaluating a "model", we mean model in the broad sense. Model includes not only the photochemical model, but its various components: companion preprocessor models (i.e., the emissions and meteorological models), the supporting aerometric and emissions database, and any other related analytical and numerical procedures used to produce modeling results. A

principal emphasis in the model testing process is to identify and correct flawed model components.

- **Model acceptance is a continuing process of non-rejection.** Over-reliance on explicit or implied model "acceptance" criteria should be avoided. This includes USEPA's so-called performance goals (U.S. Environmental Protection Agency, 1991). Models should be accepted gradually as a consequence of successive non-rejections. Over time, confidence in a model builds as it is exercised in a number of different applications without encountering major or fatal flaws that cause the model to be rejected.
- **Previous experience should be used as a guide.** Previous photochemical modeling experience serves as a primary guide for judging model acceptability. Interpretation of the modeling results for each episode, against the backdrop of previous modeling experience, will aid in identifying potential performance problems and suggest whether the model should be tested further or rejected.
- **Criteria for judging model performance should remain flexible.** The criteria for judging the acceptability of model performance should remain flexible.

Incorporating these principles into an operational philosophy for judging model performance, STI used the following approach for assessing the reliability of the photochemical model. The model should produce peak unpaired ozone estimation accuracy, overall bias, and gross error statistics in the approximate ranges of $\pm$ 15-20%, $\pm$ 5-15%, and 30-35%, respectively. For the selected ozone episode, if the model's performance is better than all of these ranges, the base case would not be rejected unless evidence from any supplemental diagnostic or sensitivity simulations suggest unusual or aberrant behavior.

If a simulation falls significantly outside any one of the above general ranges, it will become necessary to explain why the performance is poorer than that commonly achieved in similar applications and whether the causes of poorer performance will adversely compromise the model's ability to simulate the effects of emission controls correctly. Otherwise, the particular base case in question should be declared adequate.

**Base Case Episode Model Evaluation**

Once the model was run for 1998, an evaluation of the simulations was made in accordance with the EPA guidelines. Comparisons of model-predicted ozone levels were made

with ambient air quality data to determine how closely ozone concentrations predicted by the model correspond to observed concentrations.

Figure 4-4 depicts the time-series plots of predicted ozone and observed ozone for each hour of the day over the entire ozone episode. As shown in the figure, the model predicts ozone quite well at all sites and for most hours of the day with a few minor exceptions (the model tends to under-predict ozone levels at night in the urban core area). The deviations however, do not reach a level of concern and the overall model performance statistics meet EPA criteria for acceptance as shown in Figure 4-5.

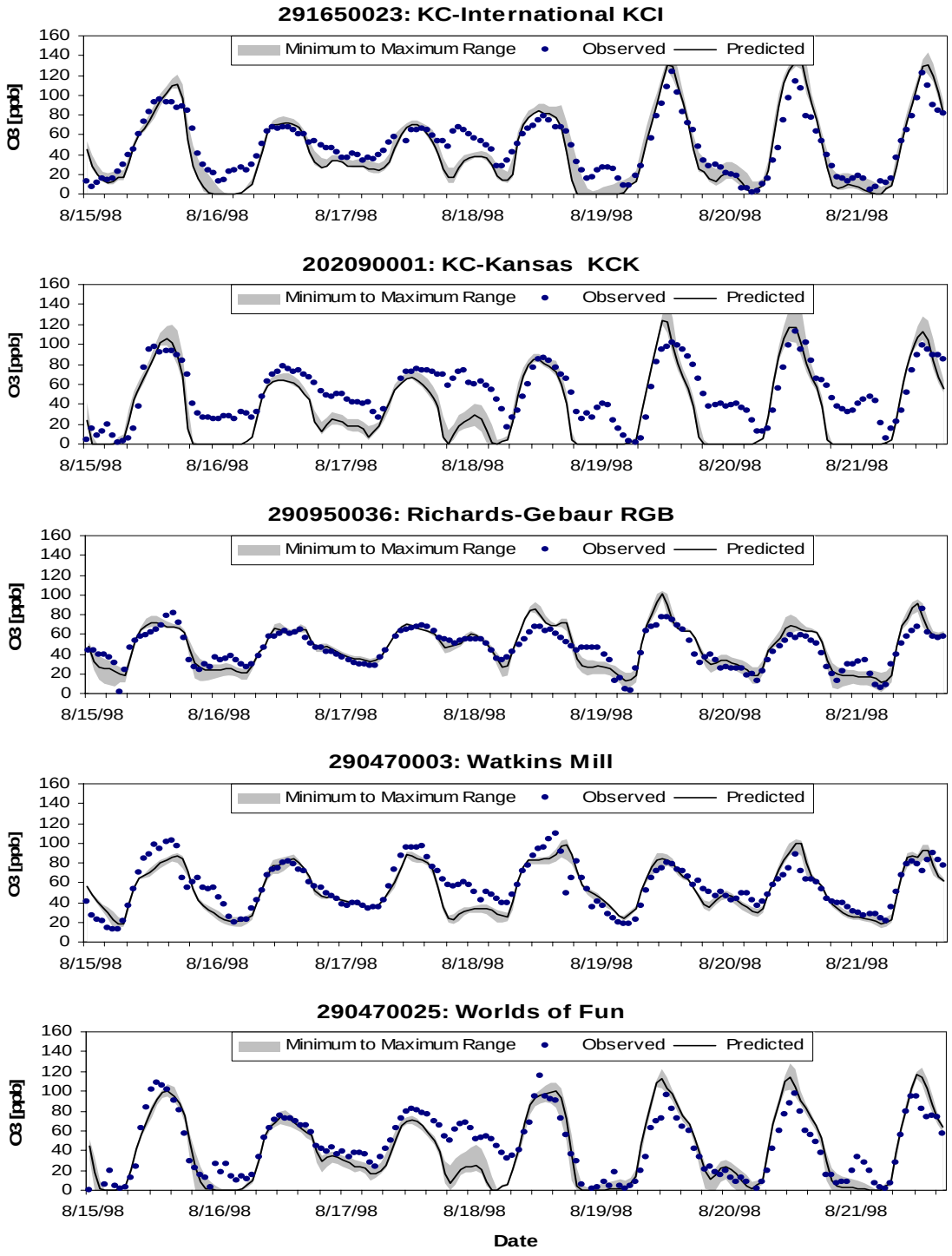


Figure 4-4. Observed vs. predicted one-hour ozone concentrations for monitoring sites in the Kansas City area.

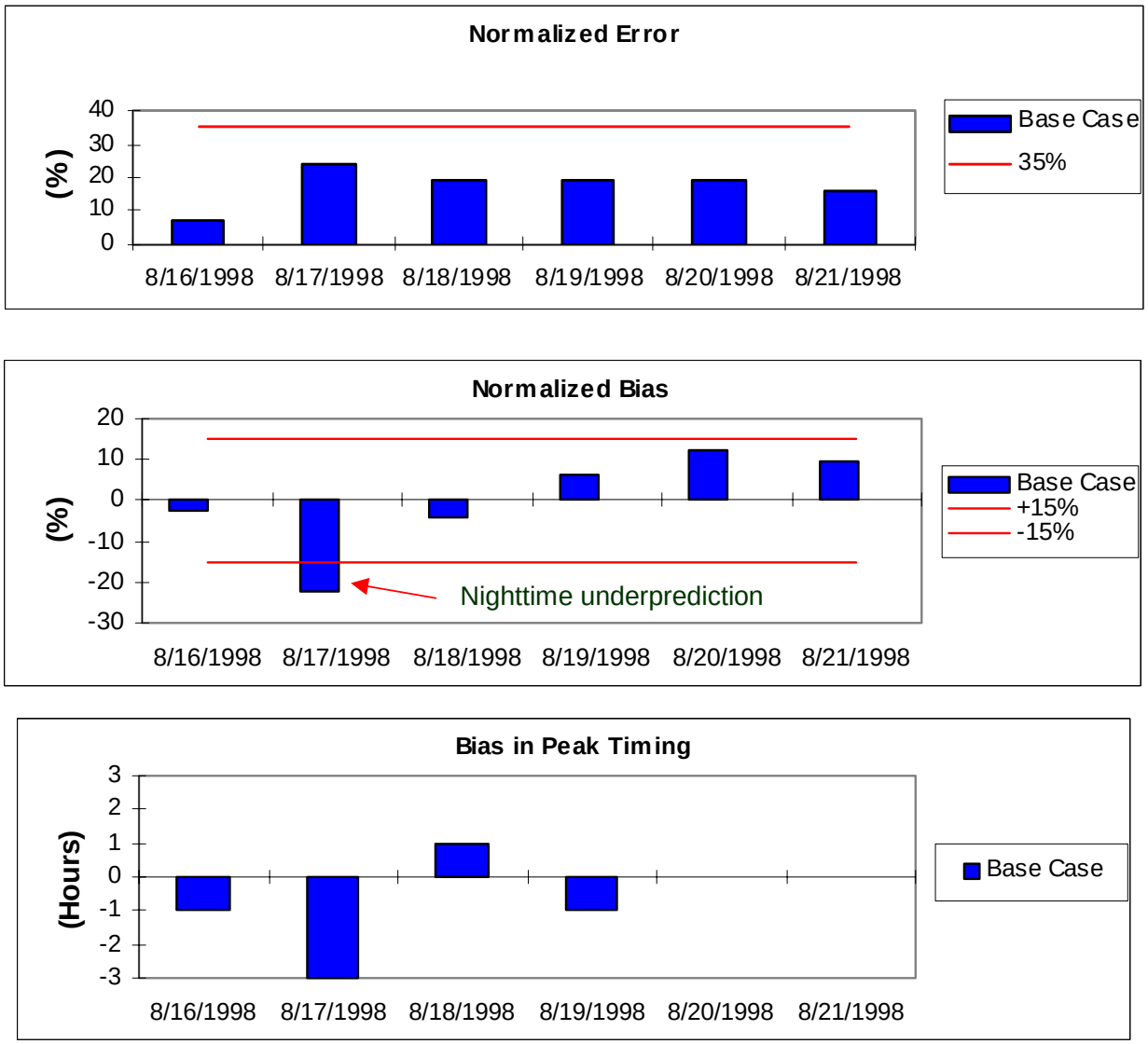


Figure 4-5. Model performance evaluation statistics.

## 4.3 – FUTURE-YEAR PREDICTED OZONE LEVELS

Once it was established that the air quality modeling system was adequately reproducing ozone levels for the historic (August 1998) episode, the model was re-run substituting emissions from 1998 with projected 2010 emissions (without any additional local controls) to predict future-year ozone concentrations. The model predicts a peak 8-hour ozone concentration of 93 ppb in 2010, which is categorized as unhealthy for sensitive groups (see **Figure 4-7).** For the chosen ozone episode, this peak value was predicted to occur in northern Platte County – an area that does not currently have an ozone monitor. Using the relationship between the peak ozone

and the ozone design value for the Kansas City area historically, the predicted ozone design value for 2010 would fall just below the 8-hour ozone NAAQS. Since, the predicted peak ozone level is above the standard and the ozone design value is close to the NAAQS, it was determined that assessing control strategies to reduce emissions leading to ozone formation in the Kansas City area would be a valuable tool for policy makers.

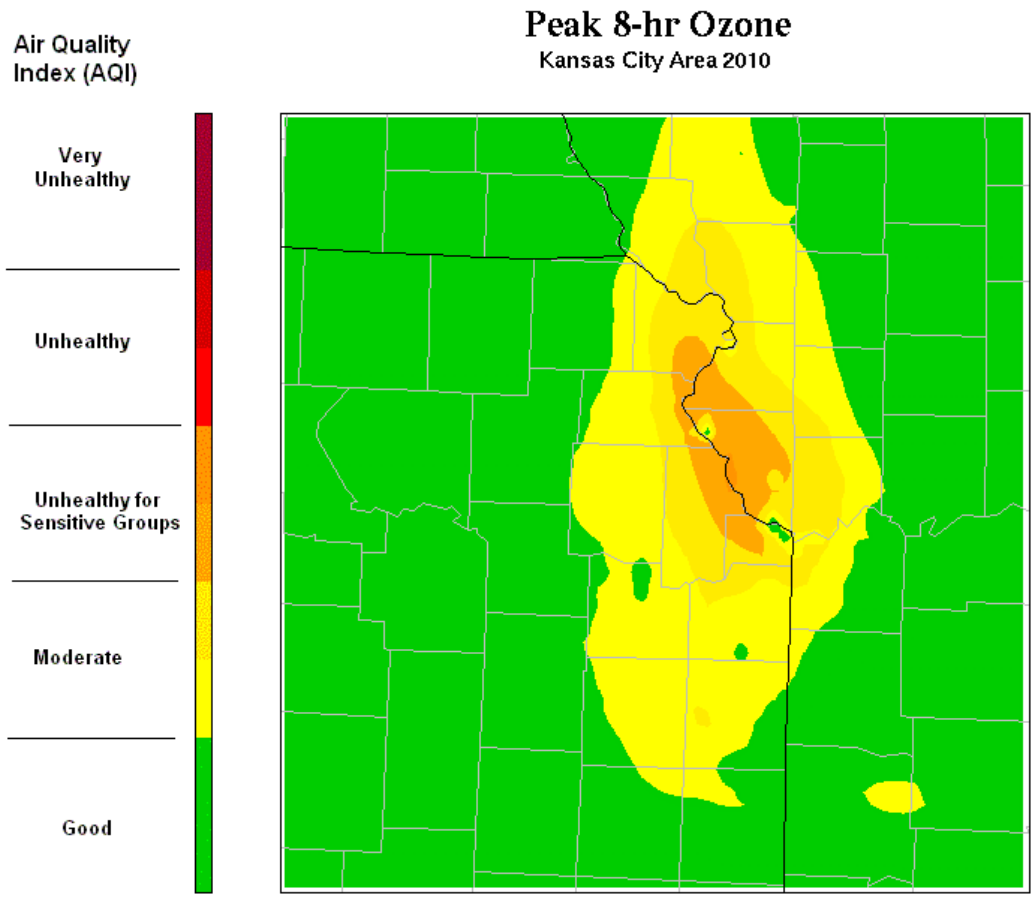


Figure 4-7. Peak 8-hour ozone concentrations in the Kansas City area for 2010.

# 5 - PUBLIC PARTICIPATION PROCESS AND SELECTION OF CLEAN AIR STRATEGIES

## 5.1 - AIR QUALITY WORKING GROUP

Through input from both the AQWG and Air Quality Forum, a wide range of control strategies was formulated aimed at reducing ozone-forming emissions in the Kansas City region. These controls were chosen based on the following list of eight evaluation criteria established by the AQWG:

- Emission reduction potential;
- Quantifiable impact on ozone formation;
- Cost/economic impact;
- Implementation feasibility (political, economic, current level of control);
- Implementation timing (short-term, intermediate, long-term);
- Reduction of multiple pollutants (VOCs, NOx, particulates, carbon dioxide, hazardous air pollutants);
- Multiple community benefits (transit enhancement, quality growth and development, open space conservation, energy efficiency, etc.); and
- Multiple environmental benefits (air, water, solid waste, land, habitat).

From these evaluation criteria, which will be discussed in further detail in the following section, a set of eight separate groupings was created to encompass all possible emissions reduction strategies in the Kansas City region. Strategies were grouped by emission source and listed either as new actions that could be implemented in the short-term, or longer-term strategies that would have to be implemented gradually over time. These long-term strategies are included because there are 'first steps' that need to be taken in the near term in order to realize the ultimate benefits. The groups of pollution control strategies and their descriptions are as follows:

- **Fleet Operations** – targets emissions that are produced by publicly and privately operated fleets (ranging from light-duty passenger vehicles to heavy-duty trucks);
- **Fuels and Vehicle Emission Controls** – targets emissions from cars and trucks and from motor or vehicle fuel distribution and dispensing;

- **Heavy Construction** – targets emissions that are created by road construction and maintenance equipment, construction activities, and those created secondarily by on-road vehicle congestion that results during road construction;
- **Lawn and Garden** – targets emissions that are generated by lawn mowers and other gas-powered yard equipment as well as by related landscaping activities (like pesticide applications);
- **Office and Institutional** – focuses on emissions generated by public and private sector workplaces;
- **On-Road Vehicle Operations** – targets emissions from the operation of cars and trucks on area roadways;
- **Solvent Use** – relates to industrial and consumer solvent use;
- **Stationary Combustion** – targets stationary combustion sources, primarily large emitters such as power plants and industrial facilities, but also smaller sources like emergency generators and residential burning.

A more detailed description of these groupings and the specific measures within each grouping can be found in the Appendix.

## 5.2 - REGIONAL AIR QUALITY WORKSHOP

With a set of potential local emission reduction measures identified and described, the next step involved holding a public meeting aimed at gaining insight into the relative appeal of each measure or set of measures. To this end, the Air Quality Community Workshop was held on September 10, 2004 in Mission, Kansas, which provided a venue for participation by interested parties. The workshop was well attended with over 170 participants. Great effort was taken to include a broad spectrum of interests and perspectives from throughout the region. Accordingly, a wide range of stakeholders was represented at the event, including: environmental groups, community activists, elected officials, manufacturing company representatives, and business owners. Below is a highlight of the parties in attendance:

- More than thirty officials representing over ten local governmental entities;
- State agency representatives, including those from the Kansas Department of Health and Environment, Missouri Department of Natural Resources, and both Kansas and Missouri Departments of Transportation;
- U.S. EPA Region 7 representatives;
- Representatives from fuel refinery and retail industries and fuel regulators, including officials from the American Petroleum Institute, ConocoPhilips, and QuikTrip;
- Representatives from energy production industries, including Kansas City Power & Light and Westar Energy;
- Representatives from numerous other industries and businesses in the region, including Hallmark Cards, Inc., General Motors, and Cargill.
- Representatives from health and environmental groups, including Bridging the Gap, Inc., Concerned Citizens of Platte County, the Burroughs Audubon Society, the Healthy Homes Network, and Children's Mercy Hospital.

Following a presentation of materials from MARC and STI, these stakeholders were provided the opportunity to learn about and comment on the various strategies. Workshop participants were divided into groups, which discussed at a minimum two separate sets of control measures. A trained facilitator led each group through a discussion of voluntary and regulatory strategies for reducing ozone precursor emissions. In the process of these highly productive discussions, a handful of measures garnered widespread support, while others were met with staunch opposition.

Among strategies generally viewed as favorable by workshop participants were:

- Emission controls on power plants
- Gas cap replacement program
- "Laid-back" lawn care and use of native landscaping materials
- Cleaner lawn and garden equipment; aimed at both individuals and lawn care businesses

- Retrofits and low sulfur fuels for diesel on-road vehicles and heavy construction equipment
- Truck stop electrification
- Promotion of alternative fuel vehicles
- Partnership with region's vendors for environmentally friendly products
- Coordination of construction projects.

In addition to those above, participants showed support for a host of strategies containing elements of public education and promoting long-term sustainability. While participants lauded many of the measures, some were viewed less favorably. Some of the strategies considered less agreeable by a majority of workshop attendees included:

- Reducing speed limits on area highways;
- Stage II Vapor Recovery at gas pumps;
- Vehicle Inspection and Maintenance Program;
- Ban of gas-powered lawn care equipment on Ozone Alert days; and
- Vehicle repair/replacement program for low income groups.

In large part, participants opposed strategies that were mandatory in nature, preferring instead voluntary approaches such as incentive-based programs. Correspondingly, measures containing the word "ban" were frequently viewed unfavorably. A more detailed account of the discussions can be found in the Appendix, including a breakdown of the various comments made regarding each specific measure.

## 5.3 - MEASURES SELECTED FOR FURTHER TECHNICAL ANALYSES

Based on comments received during the workshop, a short list of clean air strategies was compiled to determine which specific measures should be selected for further technical evaluation by STI. Included on this short list were any and all measures that had received a measurable degree of support by workshop participants. The AQWG was then charged with prioritizing these strategies by designating a level of importance to each respective measure. The measures included in the short list were divided into four categories:

- **Regulatory Control Strategies**
  - Establish RACT rules for NOx emitters
  - Lower RACT applicability limits for VOC emitters
  - Remote-sensing-based “dirty screen” and/or gas cap program
  - Reformulated gas
- **Industry and Corporate Leadership**
  - Reduce power plant emissions
  - Retrofits for on-road diesel engines
  - Greater use of hybrid gas-electric vehicles
  - Alternative fuel vehicles
  - Early adoption of low sulfur diesel
  - Small business education and technical training
  - Idling reduction technologies for switching locomotives
  - Retrofits for diesel construction equipment
  - Diesel truck idling reduction technologies
  - By-product synergy, or application of industrial ecology concepts
  - Voluntary gas cap replacement
- **Near-Term Public Sector Voluntary Strategies**
  - Regional public education campaign
  - Government/institutional ozone programs
  - Environmentally friendly consumer products
  - Native landscaping, clean mowers, etc.
  - Green building and energy efficiency
  - Coordinated road construction schedules
- **Long-Term Public Sector Voluntary Strategies**
  - Policies for more efficient development
  - Urban forestry, open space conservation

Using feedback received from the AQWG, STI examined different sets of strategies containing those measures with the most support.

# 6 - PRIORITIZATION OF SELECTED CONTROL MEASURES

## 6.1 - EVALUATION CRITERIA ADOPTED BY THE AQWG

The AQWG identified a set of eight criteria to evaluate voluntary measures and potential regulatory controls to reduce VOC and $NO_x$ emissions. Below is a discussion of the significance and relevance of each criterion.

### Emission Reduction Potential

The potential to reduce VOC and $NO_x$ emissions was one of the most significant factors considered in evaluating prospective control strategies. Measures proven to be more effective at reducing ozone precursor emissions were given higher priority in the selection process. Clearly, some measures would reduce NOx and VOC emissions to a much greater extent than others. For instance, reductions in power plant emissions, such as through the installation of environmental upgrades at existing plants, would bring about more significant reductions than most other measures. However, this prioritization was not meant to minimize the value of a wide range of measures that would have smaller, yet still important, impacts.

### Quantifiable Impact on Ozone Formation

This criterion was used to identify ozone reduction strategies that would impact emission sources contributing most to ozone formation as a result of geographical location or time of year. Because of prevailing wind patterns, some sources, although not necessarily the highest emitters, affect the formation of ground-level ozone in the region to a greater extent than others. In Kansas City, winds typically travel from the south to the north or from the southwest to the northeast. As a result, sources located in the southern or southwestern portions of the region generally contribute more to the formation of ozone, even if there may be sources emitting much higher levels of NOx or VOCs located to the north. As such, strategies aimed at reducing emissions from sources in the south were given precedence.

Another factor taken into consideration using this criterion addressed the time of year. Strategies targeting emission reductions during the ozone season were clearly most important, since ozone is primarily a summertime problem. For example, wood-burning stoves generate VOC and $NO_x$ emissions but are typically only used during the winter months, consequently, their impact on ozone formation is not a serious concern. On the other hand, some activities, such as those related to lawn and garden, are more common during the summer months and measures speaking to such sources could have significant impacts. It is important to note that $NO_x$ emissions tend to have a greater adverse affect on air quality downwind, while the impacts of VOC emissions are generally more localized and have a greater effect on air quality in the urban core.

**Cost/Economic Impact**

Another important factor in the consideration of ozone reduction strategies was the monetary cost associated with each measure. Determining the economic impact of each measure is imperative as some are unquestionably more burdensome than others. Certain controls would necessitate large startup costs while others would not. Great care was needed to ensure that the regional economy would not suffer as a result of ozone reduction strategies. To this end, it was essential that more cost-effective measures were selected. A breakdown of the cost-effectiveness of a handful of control measures can be found in Appendix A.

**Implementation Feasibility**

A number of factors can influence the feasibility of implementing a given strategy. These include, but are not limited to:

1. Cost of implementation
2. Physical/administrative infrastructure required
3. Political and public support
4. Potential effect on businesses, regional economy
5. Anticipated air quality benefit
6. Degree of certainty about measure's effectiveness
7. Fairness/cost distribution

These factors can work to varying degrees to increase or decrease the feasibility of implementing a strategy. For example, for many years, Kansas City stakeholders discussed the

possibility of implementing a vehicle emissions testing program in the region. The strategy was widely considered to be among the most potentially effective in reducing ozone precursor emissions. However, the anticipated costs and infrastructure development issues were perceived to be onerous. Residents balked at the notion that they might be required to have their cars emissions tested, and elected officials were wary of supporting a program their constituents opposed. The issue failed to gain momentum, and the region gravitated toward the use of less volatile gas as a primary mobile source strategy.

The current level of ozone reduction controls also deserved consideration in the process of selecting new strategies. Until recently, VOC emissions were believed to be the larger factor in the formation of ground-level ozone in the Kansas City region. As a result, controls in the past were geared more towards the control of VOCs rather than NOx emissions. Under the one ozone episode that was modeled, $NO_x$ emissions had a greater impact on monitored ozone readings than was originally expected. This suggests a greater need to consider both $NO_x$ and VOC emission reduction strategies in metropolitan Kansas City.

**Implementation Timing**

In order to adequately address air quality issues, a wide range of control strategies was seen as beneficial. This range includes strategies that will be realized in the short-term, long-term, and intermediate time periods. To best deal with reducing emissions, strategies speaking to each of the time periods were desirable. Many efforts aimed at public education can be qualified as short-term as these are typically programs that can be promptly instituted and their effects seen within a few years. Other measures, such as native landscaping, cannot be realistically achieved within this time period and are seen as having an intermediate time frame. These types of control strategies typically require 4-10 years before full realization. Long-term strategies are also crucial in moving towards cleaner air in the Kansas City region. These types of measures are aimed at regional sustainability and will generally take more than ten years before the results are appreciated. Examples of long-term strategies include the promotion of fuel cell technologies or the Smart Highways program.

**Multiple Pollutants**

While reducing ozone precursor emissions was the primary goal in selecting a set of strategies, the reduction of additional air pollutants is also greatly beneficial to the region and was thus a concomitant goal. Many strategies aimed at reducing NOx and VOC emissions can also reduce other potentially harmful air pollutants such as particulates, carbon dioxide, and hazardous air pollutants. Below is a summary of reasoning behind efforts to reduce each of these pollutants.

- **Particulates** – Refers to particles suspended in the air, including dust, dirt, soot, smoke, and liquid droplets. These can be emitted either directly into the air or formed from the chemical change of gases. Breathing particulates has been linked to serious health problems and the presence of particulates in the air can cause reduced visibility.
- **Carbon dioxide** – A naturally occurring greenhouse gas that is also emitted in large quantities by the combustion of fossil fuels. Current thinking among atmospheric scientists leans fairly strongly in the direction of carbon dioxide and other greenhouse gases from anthropogenic sources being implicated in global warming. As such, the AQWG believed it prudent to include the potential reduction of carbon dioxide among its goals.
- **Hazardous air pollutants (HAPs)** – Includes any of the nearly 200 pollutants or pollutant classes identified in the Clean Air Act. HAPs are released by a number of sources, primarily mobile and industrial sources, and have the potential to cause serious health and environmental consequences. Notably, most HAPs are also VOCs, although typically most VOCs are not HAPs.

Clearly there is value in aiming to reduce multiple air pollutants. In many cases, specific sources are responsible for emitting multiple pollutants. Using this evaluation criterion, measures that affected emissions of multiple air pollutants, including NOx and VOCs, were more highly regarded.

**Multiple Community Benefits**

Another evaluation criterion considered significant by the AQWG was the selection of strategies that would yield multiple community benefits in tandem with air quality improvements. Such benefits range from traffic mitigation to an increase in open space and parks. A number of already-established programs and plans have displayed these qualities:

- **MetroGreen –** MetroGreen is a proposed 1,144-mile interconnected system of public and private open spaces, greenways and trails designed to link seven counties in the Kansas City metropolitan area. This plan would help protect and preserve the area's most valuable natural assets. In addition, a functioning system of trails would encourage people to use non-motorized means of transportation, which results in reduced traffic congestion, noise, and air pollution.
- **Creating Quality Places (CQP) –** CQP is a program that encourages alternative urban planning and design practices throughout the Kansas City area. Developed by MARC, CQP is intended to foster dialogue and action, resulting in positive changes in the Kansas City region's built environment. The program's 20 principles are a set of affirmative statements and represent a consensus on what is needed to design successful neighborhoods, vibrant mixed-use commercial areas, and efficient transportation systems – all within a healthy natural environment. By supporting wise development principles, more sustainable development patterns will result, meaning reduced traffic congestion, better air quality, and a decrease in land consumption, among other things.
- **Smart Moves –** Smart Moves is a regional plan aimed at expanding and enhancing public transit in the Kansas City metropolitan area. MARC, together with area public transit providers, has cooperatively developed this plan, which incorporates models and best practices from across the country for modern, effective and efficient public transportation services. Increased investment in an integrated transit plan and use of public transportation will provide direct air quality benefits by relieving roadway congestion and reducing the necessity for automobile use.

Each of these initiatives has the potential to reduce ozone precursor emissions as well as to provide many other community benefits. A host of other measures also incorporate a diverse range of regional benefits. This criterion indicates the importance of including strategies that would improve not only regional air quality, but also the overall quality of life in the Kansas City region.

**Multiple Environmental Benefits**

The final criterion used in selecting ozone reduction strategies dealt with a potential to procure multiple environmental benefits. Because elements of the ecosystem are profoundly interrelated and synergistic, strategies aimed at reducing ozone precursor emissions often have environmental benefits that go well beyond the primary focus. Strategies with the potential to affect a range of environment media were thus given priority in the selection process. Below is a summary of multiple benefits that can be achieved by such strategies.

- **Air** – For the purposes of the CAAP, a measure's potential impact on air quality was paramount. Most measures under consideration directly address air quality, whether focusing on precursor emissions or any of the other air pollutants mentioned above.
- **Water** – Emissions reductions strategies may benefit water quality directly by reducing the level of chemical deposition into water bodies and also by reducing or eliminating other pollutants that may harm watersheds. For example, increasing the availability of public transportation may enable more people to drive less or get rid of their cars altogether. This may, in turn, reduce vehicle emissions, as well as other pollutants, such as oil and other fluids, that are deposited in parking areas and roadways.
- **Solid Waste** – Certain clean air strategies may also address issues related to the generation and disposal of solid wastes. Reusing and recycling building materials, for example, may help eliminate emissions from trucks that would otherwise transport new materials into the region and haul old materials to a landfill, and would also help keep good, usable lumber, masonry and other products out of area landfills.
- **Land and Green Space Conservation** – Smart Growth approaches to land development better support transit, reduce the need for automobile ownership and

use, and conserve green space. Greenway development also provides greater opportunities for individuals to travel to nearby destinations on foot or by bicycle. Surveys show that proximity to trails and other green amenities adds value to adjacent properties. Protecting green space may also mitigate urban heat island effects.

- **Biodiversity and Habitat Conservation** – Clean air strategies that also protect water quality, conserve green space, and slow the encroachment of development into undisturbed areas have the residual benefit of protecting habitat, and may help increase the biodiversity found in suburban and exurban areas.

## 6.2 - COST-BENEFIT DETERMINATIONS

Control strategy options typically involve either technological or behavioral changes, with the effectiveness of the latter being the more difficult to assess. Technology-based controls include, for example, tighter emissions standards for new sources, maintenance or retrofits for existing sources, and improved fuel economy standards. Behavior-based controls, on the other hand, call for reduced usage of emission sources, such as decreased driving of on-road motor vehicles.

The cost of specific control strategies is often estimated in terms of dollars per ton of pollution reduced, although sometimes the customer cost per unit of product is used. Also, some control measures provide additional benefits through the reduction of pollutants other than VOC or $NO_x$ (such as particulate matter, carbon monoxide, and hazardous air pollutants).

Modeling results for 2010 indicated the need to reduce ozone precursor emissions in order to insure compliance with the 8-hour average ozone NAAQS. As noted earlier, ozone formation is a function of both $NO_x$ and VOC emissions. Thus controls for each were considered, and modeling was performed to assess the relative effectiveness of several different control strategies (groups of control measures). Below is a brief description of individual control measures and, in some cases, the versions (aggressive vs. conservative implementation) of each measure that were considered. Control measures considered in this CAAP fall into two broad types: Voluntary Actions and Regulatory Actions. **Table 6-1** shows how these measures were grouped into various control strategies, as well as the estimated emission reductions and costs

associated with each control measure. Appendix A includes more details of the assumptions and calculations used to determine the costs and benefits (emission reductions) for each measure.

***Voluntary Actions***

**Reduce Power Plant Emissions**: Kansas City Power and Light (KCPL) proposes to install selective catalytic reduction on existing units at its La Cygne and Iatan power plants. In addition, KCPL plans to construct another 800-900 MW coal-fired plant next to the existing Iatan plant.

**Retrofit or Replace On-road Diesel Engines**: The U.S. EPA and some private sources have limited grant funding to assist local governments and fleet operators with replacing or retrofitting heavy duty diesel engines to reduce NOx and fine particulate emissions. For example, a number of mid- to late-1990s model-year diesel buses could be brought up to current emissions standards. An "aggressive" approach would retrofit or replace 5% of the diesel bus fleet in 2010, while a "conservative" approach would retrofit or replace only 1% of the fleet.

**Retrofit or Replace Construction Equipment Diesel Engines:** Construction contracts could be designed to include incentives for contractors using either new engines (including those using alternative fuels), or pre-1997 engines retrofitted with controls. An "aggressive" approach would retrofit or replace 5% of pre-1997 construction diesel engines, while a "conservative" approach would retrofit or replace only 1% of such engines.

**Electrify Truck Stops:** There are at least 9 truck stops with 50+ parking spaces located in the Kansas City area. Installing HVAC, electrical and phone and data line infrastructure in truck stop parking lots would enable drivers to shut off their engines while parked, reducing NOx and particulate emissions associated with truck stops. An "aggressive" approach would electrify 250 truck stop spaces, while a "conservative" approach would electrify only 100 spaces.

**Install On-Board Idle Reduction Technologies on Heavy-Duty Trucks:** Installing on-board auxiliary power units (APUs) and automatic idle time-out/engine shutoff switches on heavy-duty trucks would prevent truck drivers from unnecessary idling while allowing them continue operating necessary cab functions, such as heating, air conditioning, etc. In order for this approach to be cost effective to MARC or its sponsors, candidate trucks would need to operate almost exclusively within the MARC area and commit significant unnecessary idling during the

summer. An "aggressive" approach would install APUs on 5% of in-state heavy-duty trucks, while a "conservative" approach would install APUs on only 1% of such trucks.

**Install On-Board Idle Reduction Technologies on Switching Locomotives:** Locomotive emissions can be drastically reduced through the use of an auxiliary power unit (APU), which automatically shuts down the main locomotive engine idle while maintaining all vital main engine systems at greatly reduced fuel consumption. An "aggressive" approach would install APUs on 5% of Kansas City area switching locomotives, while a "conservative" approach would install APUs on only 1% of such locomotives.

**Public Education and Government-Institutional Ozone Programs**: The regional AirQ public education program discourages vehicle use during days where high ozone is predicted through timely air quality forecasting, public outreach, and participation of critical area employers. Participating employers notify and offer incentives to their employees on episode days to encourage carpooling, use of public transit, and/or telecommuting. For the Kansas City area, an "aggressive" AirQ program was assumed to yield an emissions reduction of 2.3% for both VOC and NOx, and a "conservative" program was assumed to reduce emissions of these pollutants by 1% (see the appendix for further details on how these figures were derived).

**Replace or Replace the Use of Gasoline-Powered Lawnmowers**: Gasoline-powered lawnmowers can be replaced with electric-powered mowers through rebate or incentive programs or displaced entirely by encouraging the planting of native wildflowers and grasses. An "aggressive" approach would replace 5% of Kansas City area gas-powered lawnmowers, while a "conservative" approach would replace only 1% of such lawnmowers.

***Regulatory Controls***

**Remote-sensing "Dirty Screen" Program**: Remote sensing equipment can be used to measure the emissions of vehicles as they travel down the road. This technology employs an infrared beam to measure pollutant concentrations in a vehicle's exhaust plume. Some areas have used remote sensing to "clean screen", or exempt low-emitting vehicles from more extensive emissions testing. However, remote sensing can also be used to "dirty screen", or identify high-emitting vehicles for notification and repair. An "aggressive" program would require inspection-and-maintenance for high-polluting vehicles, whereas a "conservative" program would ask drivers of dirty vehicles to voluntarily take their vehicles in for repairs.

**Gas Cap Replacement Program**: Leaking gas caps allow evaporative emissions from a vehicle's gas tank to escape into the atmosphere. A program that would identify and replace leaking gas caps could be operated in conjunction with the vehicle safety inspection in Missouri. Since Kansas does not have a safety inspection, this strategy would require legislation to establish a decentralized gas cap testing program that would be implemented by private auto service shops. Gas cap replacement is inexpensive, but without an I/M program in place, some alternative infrastructure would need to be established to operate a gas cap replacement program. One possible approach would involve outreach to motorists and the vehicle repair industry.

**NOx and VOC RACT Rules**: Existing non-utility sources of NOx could install Reasonably Available Control Technology (RACT) for NOx. In addition, VOC RACT regulations that only apply to businesses that emit at least 100 tons per year (tpy) of VOC could be lowered. Other parts of the country apply RACT to businesses that emit 50 tpy, 25 tpy, or even as little as 10 tpy.

**Reformulated Gasoline**: A federally specified blend of fuel is required in some areas that do not meet federal air quality standards for ozone. The blend is designed to reduce emissions of VOC, NOx, and hazardous air pollutants (HAPs). If designated an ozone nonattainment area, the Kansas City region could be eligible to use reformulated gasoline if EPA finds that RFG is necessary to achieve air quality standards.

Table 6-1. Emission reductions and costs associated with proposed 2010 control scenarios.

| **MARC Control Strategy Descriptions** | | | **Emission Reductions (tons/day)** | | **Approximate Costs** |
|---|---|---|---|---|---|
| Scenario | Description | Controls Implemented | VOC | NOx | dollars/ton |
| C01 | All Voluntary Measures (Conservative) | Conservative Dirty Screen I&M | 0.08 | 0.08 | $70,000 |
| | | Conservative Onroad Diesel Retrofit | 0 | 0.01 | $2,000 |
| | | Conservative Construction Equipment Replacement | 0 | 0.02 | $5,000 |
| | | Conservative Truck Stop Electrification | 0.01 | 0.22 | $1,700 |
| | | Conservative Heavy-Duty Truck Idle Reduction | 0 | 0.016 | $45,000 |
| | | Conservative Switching Locomotive Idle Reduction | 0 | 0.07 | $1,000 |
| | | Conservative Public Education and Government/ Institutional Ozone Action Programs | 0.48 | 0.37 | $4,800 |
| | | Conservative Lawnmower Use Reduction | 0.03 | 0 | $10,000 |
| | | | | | |
| C02 | All Voluntary Measures (Aggressive) | Conservative Dirty Screen I&M | 0.08 | 0.08 | $70,000 |
| | | Aggressive Onroad Diesel Retrofit | 0 | 0.06 | $2,000 |
| | | Aggressive Construction Equipment Replacement | 0 | 0.12 | $5,000 |
| | | Aggressive Truck Stop Electrification | 0.03 | 0.56 | $1,700 |
| | | Aggressive Heavy-Duty Truck Idle Reduction | 0 | 0.08 | $45,000 |
| | | Aggressive Switching Locomotive Idle Reduction | 0.03 | 0.33 | $1,000 |
| | | Aggressive Public Education and Government/ Institutional Ozone Action Programs | 1.1 | 0.86 | $4,800 |
| | | Aggressive Lawnmower Use Reduction | 0.14 | 0 | $10,000 |
| | | Reduction in Power Plant Emissions | -2 | 71 | $2,150 |
| | | | | | |
| C03 | All Regulatory and Voluntary Measures; Aggressive Voluntary; Maximum Expected Reductions | Aggressive Dirty Screen I&M | 0.8 | 0.8 | $7,000 |
| | | Gas Cap Replacement Program | 0.8 | 0 | $700 |
| | | Reformulated Gasoline | 3.1 | -0.3 | $5,000 |
| | | NOx and VOC RACT Rules | 1 | 5 | $2,000 |
| | | Reduction in Power Plant Emissions | -2 | 71 | $2,150 |
| | | Aggressive Onroad Diesel Retrofit | 0 | 0.06 | $2,000 |
| | | Aggressive Construction Equipment Replacement | 0 | 0.12 | $5,000 |
| | | Aggressive Truck Stop Electrification | 0.03 | 0.56 | $1,700 |

| | | | | | |
|---|---|---|---|---|---|
| | | Aggressive Heavy-Duty Truck Idle Reduction | 0 | 0.08 | $45,000 |
| | | Aggressive Switching Locomotive Idle Reduction | 0.03 | 0.33 | $1,000 |
| | | Aggressive Public Education and Government/ Institutional Ozone Action Programs | 1.1 | 0.86 | $4,800 |
| | | Aggressive Lawnmower Use Reduction | 0.14 | 0 | $10,000 |
| | | | | | |
| C04 | All Regulatory Measures | Aggressive Dirty Screen I&M | 0.8 | 0.8 | $7,000 |
| | | Gas Cap Replacement Program | 0.8 | 0 | $700 |
| | | Reformulated Gasoline | 3.1 | -0.3 | $5,000 |
| | | NOx and VOC RACT Rules | 1 | 5 | $2,000 |
| | | | | | |
| C-- | Some Voluntary (Conservative) | Not Run; Effectively the same as C01 | | | |
| | | | | | |
| C05 | Voluntary Measures (Aggressive) without Power Plant Reductions | Conservative Dirty Screen I&M | 0.08 | 0.08 | $70,000 |
| | | Aggressive Onroad Diesel Retrofit | 0 | 0.06 | $2,000 |
| | | Aggressive Construction Equipment Replacement | 0 | 0.12 | $5,000 |
| | | Aggressive Truck Stop Electrification | 0.03 | 0.56 | $1,700 |
| | | Aggressive Heavy-Duty Truck Idle Reduction | 0 | 0.08 | $45,000 |
| | | Aggressive Switching Locomotive Idle Reduction | 0.03 | 0.33 | $1,000 |
| | | Aggressive Public Education and Government/ Institutional Ozone Action Programs | 1.1 | 0.86 | $4,800 |
| | | Aggressive Lawnmower Use Reduction | 0.14 | 0 | $10,000 |

## 6.3 - VOC AND $NO_X$ SENSITIVITY

Because ozone formation is a function of both VOC and $NO_x$ emissions, determining the likely effect of emission reductions on ozone levels requires the use of a comprehensive photochemical model. Using the modeling system set up for the Kansas City area discussed above, shows that both VOC and $NO_x$ reductions will help to reduce ozone peaks in 2010. A visual display of the results for a selected day in the modeled ozone episode is depicted in **Figure 6-1a (note: Figure 6-1b** shows the results for a day when substantial amounts of ozone are being transported into the Kansas City area). The information in the figure is referred to as an ozone isopleth diagram. The curved lines should be considered like the contours of a topographic map with the peak of the hill in the upper-right hand corner of the figure. Thus, to move down slope (reduce ozone levels) reductions in either VOC or $NO_x$ are effective. However, since emissions are not uniform throughout the Kansas City area and ozone formation takes several hours, ozone levels in some locations are more effected by VOC emissions than $NO_x$ emissions or vice versa (also note that ozone in the Kansas City area is much less responsive to local controls when significant ozone transport is taking place, as shown in **Figure 6-1b**). **Figure 6-2** illustrates the effectiveness of VOC and $NO_x$ controls at different monitoring locations.

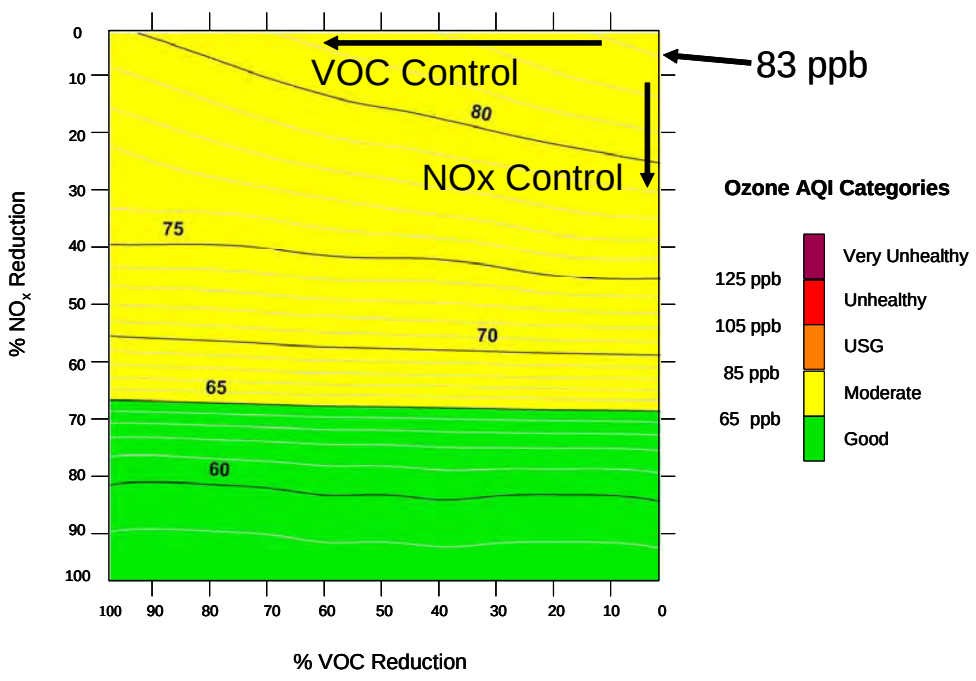


Figure 6-1a. August 21, 2010 Ozone Isopleth Diagram for the Kansas City Area.

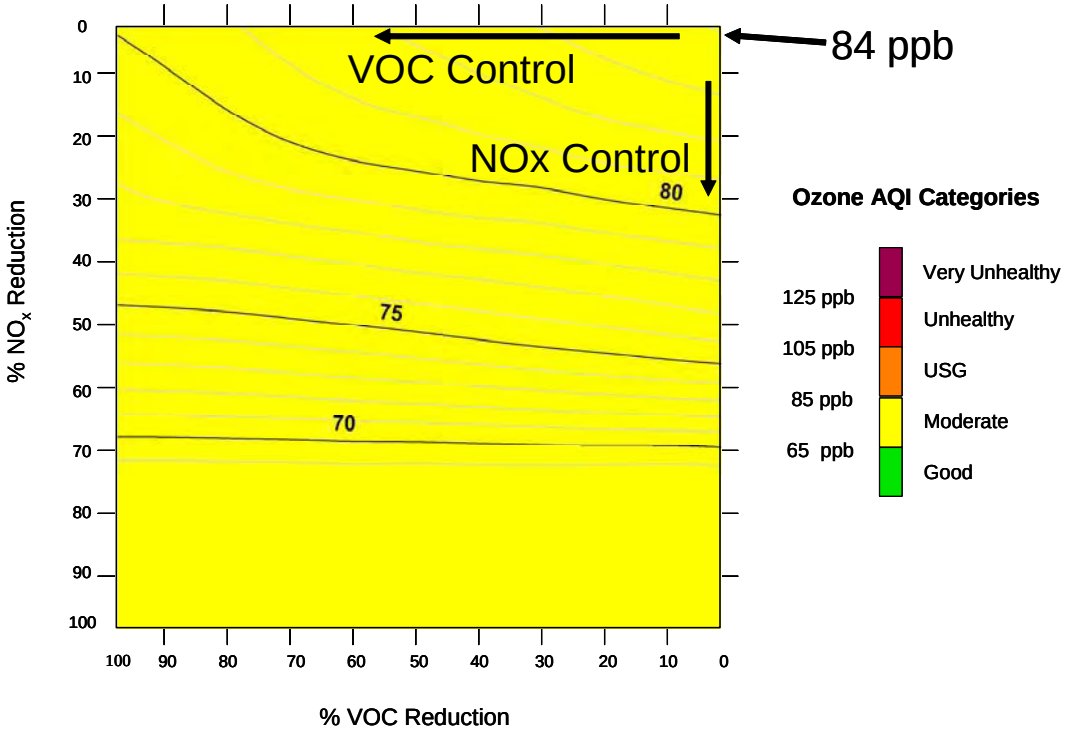


Figure 6-1b. August 19, 2010 Ozone Isopleth Diagram for the Kansas City Area

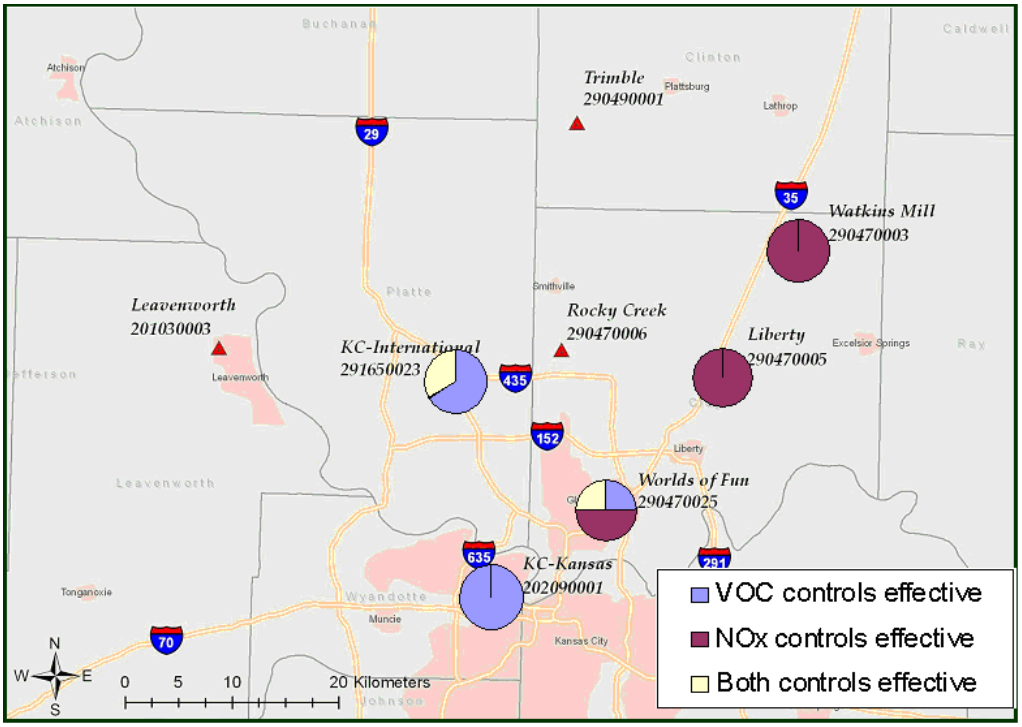


Figure 6-2. Assessment of VOC and $NO_x$ controls at various monitoring locations.

## 6.4 - ASSESSMENT OF THE EFFECTIVENESS OF CONTROL SCENARIOS

Each of the control scenarios in **Table 6-1** were modeled to assess the impact of emission reductions on ozone concentrations in the Kansas City area. **Figure 6-3** shows the total emission reductions associated with each control scenario.

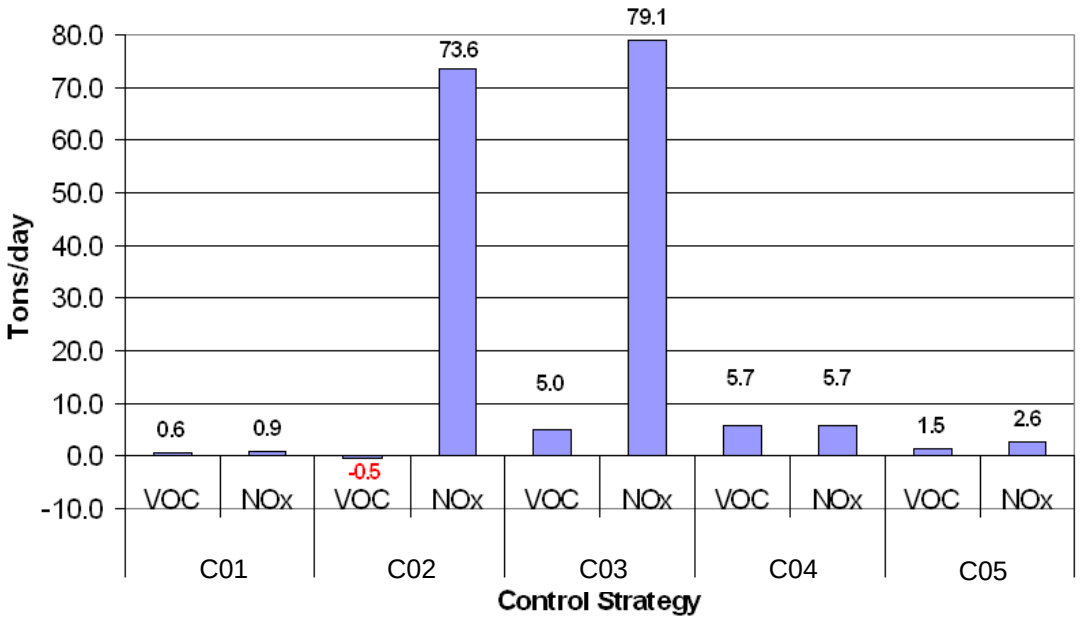


Figure 6-3. Net emission reductions by control strategy.

As shown in Figure 6-3, the largest emission reductions are associated with the aggressive implementation of voluntary controls including at power plants (e.g., control measure packages C02 and C03) and the regulatory control measures (C04). **Figures 6-4 and 6-5** show the corresponding changes in peak ozone concentrations resulting from the implementation of each control measure package. As seen in figures 6-4 and 6-5, the largest effect at the location of the maximum 8-hr ozone concentration predicted in the Kansas City area is about 2 ppb and is associated with the aggressive implementation of voluntary control measures including power plant emission reductions. The implementation of voluntary measures without power plant emission reductions (e.g. C04) yields about the same benefits as the regulatory control measure package (e.g. C05), about 0.5 ppb. It is important to note that impacts of emission reductions on predicted ozone levels may vary by location in the metropolitan area. As seen in Figure 6-5, the greatest reductions in ozone concentrations may occur in areas that do not typically register the

highest peak ozone values. The figure shows that 8-hr ozone levels can be reduced by as much as almost 5 ppb for CO2 and C03, but that most sites are predicted to have between 0.5 and 2 ppb of ozone reduction.

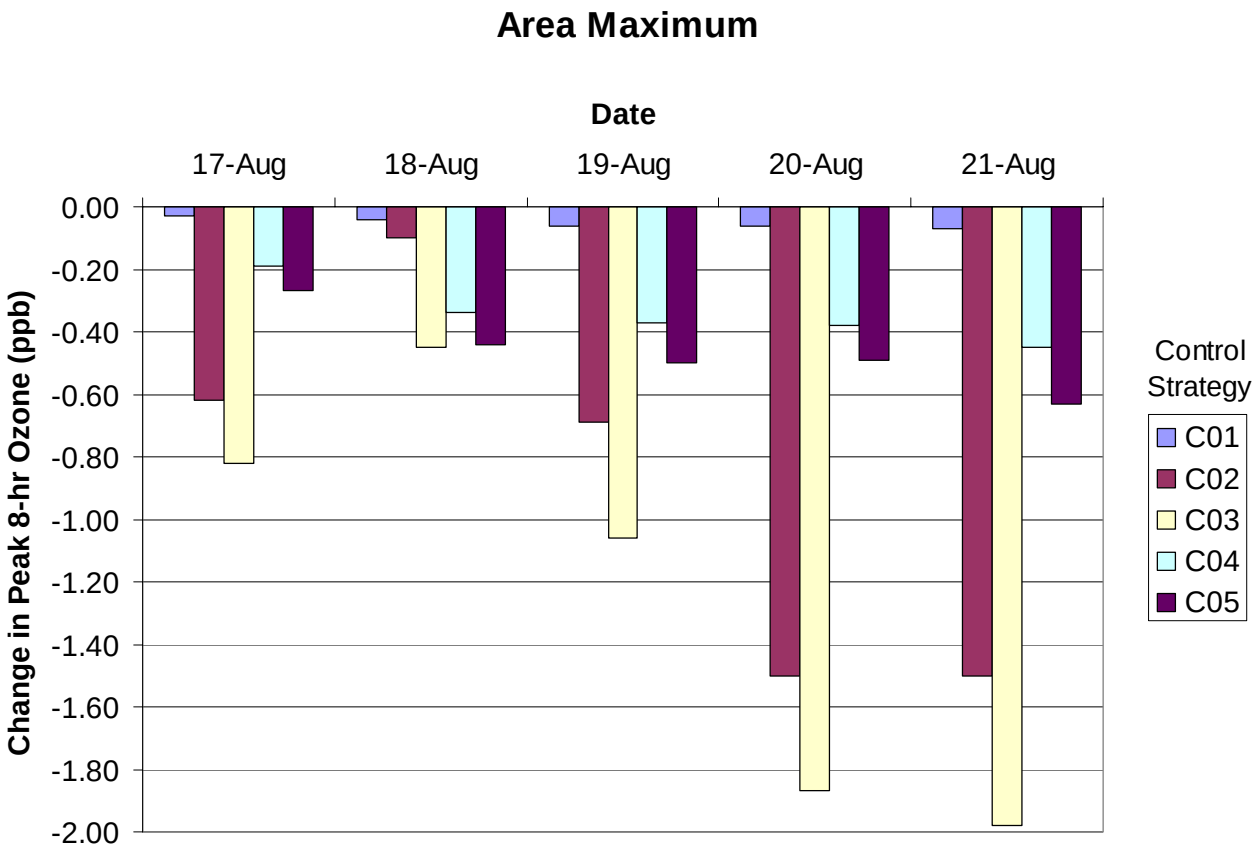


Figure 6-4. Reduction in peak area 8-hr ozone concentration.

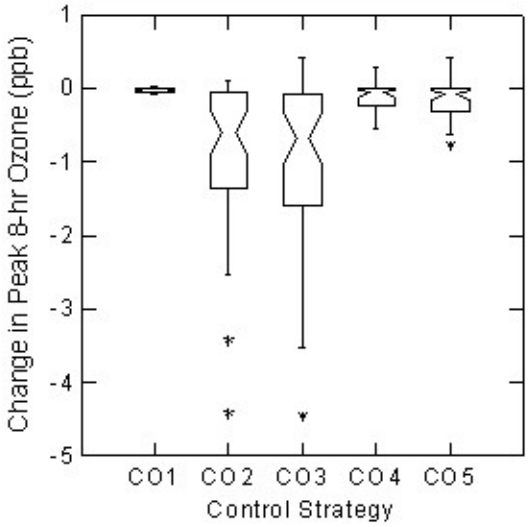


Figure 6-5. Changes in peak area ozone concentration (frequency box plot).

# 7 - RECOMMENDED CLEAN AIR STRATEGIES

The voluntary measures and regulatory control strategies listed in Table 5.1 are those that generated the greatest support among participants in the September 10, 2004, regional air quality workshop. However, the table does not contain specific voluntary measures, such as an expansion of the regional Rideshare program or targeted outreach to unregulated small emitters, that have been advocated by the AQWG. Nor does it include measures that were not well suited to photochemical modeling analysis, such as those related to sustainability.

Section 6.1 lists all voluntary measures recommended for implementation in the Kansas City region. Section 6.2 is a list of contingency measures that should be considered for further study and possible implementation if the region violates the ozone standard at some point in the future. Implementation time frames for measures listed below are defined as follows: short-term – up to three years; intermediate term – four to eight years; long term – nine years or longer.

## 7.1 - VOLUNTARY STRATEGIES

**Power Plant Emission Reductions**
**VOC Reduction:** 2 tpd *increase*
**$NO_x$ Reduction:** 80 tpd
**Time frame for implementation:** Intermediate term; controls potentially online in 2008-2010
**Implementation Cost:** ~$300 million
**Lead Entity:** Kansas City Power & Light

Reducing emissions from existing power plants in the region is the cornerstone of this action plan. New controls on the La Cygne and Iatan generating units would reduce NOx emissions in the region by an estimated 80 tpd (a proposed new 850 Mw generating unit at Iatan would add nine tpd $NO_x$ emissions, resulting in a net decrease of 71 tpd $NO_x$). As indicated in Figure 5-4 on page 53, this strategy would be principally responsible for decreasing monitored ozone concentrations by 0.4 to 2.0 ppb in the part of the local domain where the highest ozone concentrations are likely to occur. However, the modeling also shows that even without $NO_x$ emissions from new power plant controls, voluntary measures contained in the CAAP would still reduce ozone concentrations by up to 0.6 ppb under some conditions.

At this writing, KCPL has requested rate approvals from the Kansas Corporation Commission and the Missouri Public Service Commission that would enable it to proceed with

the environmental investments it has proposed. If approval is not granted, controls might nonetheless be required for La Cygne and Iatan under new proposed federal legislation or draft EPA rules, but it is not clear at this time when such controls would be installed.

Other privately and publicly owned utilities also operate in the region and generate $NO_x$ emissions. While new controls on other electric generating units are not reflected in the analysis above, local and state air quality planning agencies should identify resources that could be used to assess the impact that other electric generators have on the region's air quality. Consideration should be given to implementing new controls on existing power plants wherever they may be feasible.

KCPL has also proposed investments in wind power and energy efficiency programs. The MARC Air Quality Forum has endorsed these environmental investments because they not only reduce the potential for ozone formation but also increase the region's reliance on cleaner power and help to offset the need for new generation capacity. KCPL and other utilities in the region should work to aggressively implement programs that promote the more efficient use of electricity and manage demand to reduce peak loads.

**On-road and Off-road Diesel Emission Reductions**

Diesel engines are significant sources of $NO_x$ and also contribute to fine particulate pollution. Diesel engine emissions reductions may be achieved easily in the near term and at little cost simply by establishing policies to limit idling when trucks are parked for extended periods. Other strategies, such as retrofitting engines, installing automatic shutoff devices, or replacing equipment, are more costly and may be more difficult to implement in the short term. Costs associated with technological controls may be recouped as the result of decreased fuel consumption, improved public health resulting from cleaner worksites and school environments, and lowered maintenance costs. Below are five recommended strategies for reducing diesel engine emissions.

The efficacy of diesel retrofits and the use of newer engines would be enhanced by the early adoption of ultra low sulfur diesel (ULSD) in the Kansas City region. Under current federal rules, ULSD will be phased in starting in 2006, with full implementation in 2010. Area officials have begun discussions with fuel suppliers to determine if ULSD could be made available to area

fleets before EPA mandates its use. Using ULSD prolongs the life of diesel emissions control equipment, providing greater air quality benefits over longer periods.

**Retrofits for On-Road Diesel Engines**
**VOC Reduction:** none
**$NO_x$ Reduction:** ~0.01 – 0.06 tpd
**Time frame for implementation:** short to intermediate term, depending on funding availability
**Implementation Cost:** $1,500 - $5,000 per vehicle, depending on engine size
**Lead Entity:** school districts, school bus contractors, truck fleet operators, local governments

Growing awareness about the potentially serious health effects of fine particulate pollution has led to expanded efforts nationally to reduce emissions from diesel engines. Retrofitting older, pre-1996 diesel engines with controls can reduce emissions of both fine particulates and NOx. Retrofitting engines would have air quality benefits regionally, but more importantly, could significantly improve air quality in localized areas such as school bus loading zones, freight loading areas, and residential areas along highways and major thoroughfares.

No funding has been identified to begin retrofitting buses and diesel trucks in the Kansas City region; however, limited funding may be available through EPA's Clean School Bus USA program to retrofit school buses in the region. School districts that contract school bus services should consider establishing contractual provisions requiring bus operators to meet certain fleet emissions criteria. Local governments and businesses that contract with businesses operating diesel fleets should consider similar contractual language to encourage contractors to reduce emissions from their diesel vehicles.

**Diesel Construction Equipment Replacement**
**VOC Reduction:** none
**$NO_x$ Reduction:** ~0.02 – 0.12 tpd
**Time frame for implementation:** short to intermediate term
**Implementation Cost:** variable, depending on scope of implementation
**Lead Entity:** Construction firms, local governments

According to the latest data available, there are currently 25 major construction projects underway in the Kansas City metropolitan area, with individual project costs ranging from $32 million to over $274 million. This construction boom means that a number of locations around

the metro are experiencing increased NOx and fine particulate concentrations which, as mentioned above, can have both localized and regional effects.

Accelerating the replacement of old construction equipment can substantially reduce the air quality impacts associated with heavy construction. Replacing a pre-1997 engine with Tier 3 equipment that will become available in 2006 could reduce emissions by 70 percent. Implementation of this strategy will fall primarily to construction companies that operate in the Kansas City region. Companies that own and operate fleets of diesel construction equipment should actively look for opportunities to accelerate equipment replacement schedules to improve air quality in the region and to improve the quality of worksite environments for their employees.

**Truck Stop Electrification**
**VOC Reduction:** ~ 0.01 – 0.03 tpd
**$NO_x$ Reduction:** ~ 0.22 – 0.56 tpd
**Time frame for implementation:** intermediate term
**Implementation Cost:** ~$12,500 per parking space
**Lead Entity:** Truck stop operators, utilities, local governments

There are nine truck stops in the Kansas City maintenance area that have 50 or more parking spaces. Installing HVAC, electrical and phone and data line infrastructure in truck stop parking lots would enable drivers to shut off their engines while parked, reducing NOx and particulate emissions associated with truck stops. The cost of installing such equipment is estimated to be around $12,500 per parking space.

In parts of the country where truck stop electrification projects have been or are being implemented, public-private partnerships have been established. Some areas have used Congestion Mitigation/Air Quality (CMAQ) funding to support such projects. Because Kansas City will no longer be eligible to receive CMAQ funding that was previously designated specifically for the region, implementation of this strategy locally will need to depend on greater private sector investment. Utilities and truck stop operators, supported by state and local air agency personnel, would be the most appropriate parties to take the lead on truckstop electrification projects.

**Idling Reduction Programs for Public and Private Diesel Fleets**
**VOC Reduction:** none
**$NO_x$ Reduction:** ~0.016 – 0.08 tpd
**Time frame for implementation:** short to intermediate term
**Implementation Cost:** $0 - $7,000/unit
**Lead Entity:** public and private fleet operators

Idling reduction programs can be technology based, policy based, or both. Technologies such as auxiliary power units (APU) may enable drivers to shut off their engines without losing the ability to operate heating, cooling and other onboard systems. According to the U.S. Department of Energy, the cost of APUs ranges from around $1,500 for a heat-only system to $7,000 for a system that provides heating, cooling, and engine/fuel warming, as well as electric current. Weighing up to 300 pounds, such units may lead to nominal decreases in fuel economy as well. Automatic engine shutdown systems may also be installed on diesel trucks and buses. The cost for such a system is approximately $1,325.

A less expensive method of reducing idling is to establish no-idling policies for vehicles that are parked for prolonged periods and to educate drivers about the reasons for adopting the policy. Reducing idling in school bus loading zones, for example, benefits air quality generally but may have an even greater benefit for school children who would otherwise be breathing emissions produced by buses. Similarly, reducing idling in freight delivery areas may provide health benefits to those who work in and around trucks and product distribution centers. Companies who adopt no idling policies may also realize substantial costs savings resulting from reduced fuel consumption.

**Switching Locomotive Emissions Control Technologies**
**VOC Reduction:** ~ 0 – 0.03 tpd
**$NO_x$ Reduction:** ~0.07 – 0.33 tpd
**Time frame for implementation:** short to intermediate term
**Implementation Cost:** $7,500 - $40,000 per locomotive
**Lead Entity:** Railroad companies

New U.S. Environmental Protection Agency (EPA) regulations are requiring locomotive manufacturers and railroads to reduce pollutant emissions from locomotive operations. All new locomotives, and those overhauled after January 1, 2002, are required to meet strict standards for oxides of nitrogen (NOx) emissions. These emissions can be reduced either by adjusting combustion parameters, which incurs a fuel penalty, or by turning the diesel engine off when the train is not moving and would otherwise be idling. Locomotive emissions can be drastically reduced through the use of an auxiliary power unit (APU), which automatically shuts down the main locomotive engine idle while maintaining all vital main engine systems at greatly reduced fuel consumption.

Because the Kansas City region has several major switching yards, reducing emissions from switching locomotives could provide significant localized and regional benefits. Some railroad companies that operate in the Kansas City region have already begun to invest in newer locomotives and technologies to reduce emissions from older equipment. However, because the need for switching locomotives varies by location and time of year, there is no dedicated fleet of switching locomotives in the Kansas City area. Two railroads have indicated that they will continue to invest in equipment to minimize the air quality impact of their operations in the Kansas City region.

**Public Education and Government/Institutional Ozone Programs**
**VOC Reduction:** ~0.48 – 1.1 tpd
**$NO_x$ Reduction:** ~0.37 – 0.86 tpd
**Time frame for implementation:** short term
**Implementation Cost:** $150,000 - $1,000,000 annually
**Lead Entity:** Mid-America Regional Council, state and local air agencies, transit providers

For eight years, MARC has coordinated an annual air quality public awareness campaign to teach the public about the health effects of ground-level ozone and to urge individuals to take steps to reduce emissions on high ozone days. Surveys show that this effort has paid off. On an average Ozone Alert! day, thousands of area residents help improve air quality by driving less, refueling in the evening, and postponing the use of gas-powered yard equipment.

In early 2004 when the region was expected to violate the eight-hour ozone standard by the end of summer, several local governments designed and implemented their own ozone action plans. Johnson County, Kansas, the City of Kansas City, Missouri, and other local jurisdictions promoted the use of new policies and practices to reduce emissions from government activities such as fleet vehicle operation and refueling, mowing, and painting and solvent use. Local governments also used newsletters, emails and incentives to raise awareness among employees about simple steps individuals can take to reduce ozone pollution. These programs were effective: in Johnson County, 29 people won $100 gift certificates for carpooling, riding the bus, or walking and cycling to work at least 80% of the time between June 1 and September 30. On September 2, during Kansas City's only Ozone Alert of the season, employees of Kansas City, Missouri, took over 1360 separate actions to reduce emissions. The strong support of these local

governments, as well as other entities whose efforts are detailed in Appendix C, will continue to be critical to the region's efforts to reduce emissions

While progress has been made, work remains to be done. Despite the fact that approximately one-half of regional ozone precursor emissions come from individual activities, 72 percent of respondents in the 2004 regional air quality awareness survey expressed the belief that the primary responsibility for reducing air pollution lies with large industry. Over one-quarter of respondents still believe Ozone Alerts have something to do with the hole in the ozone layer. These misconceptions speak to a need for ongoing education efforts both to inform area residents about basic air quality issues and to motivate them to take action personally to reduce driving, mowing, and other polluting behaviors on high ozone days.

Since the late 1990s, the regional air quality public education program has been the beneficiary of CMAQ funding. With the expected loss of the region's CMAQ eligibility in 2005, it is unclear how the program will be funded in the future. The decreasing availability of public funding for the program may require greater investment by area businesses and corporations to keep the program viable.

**Rideshare**
**VOC Reduction:** variable, depending on scope of implementation
**$NO_x$ Reduction:** variable, depending on scope of implementation
**Time frame for implementation:** ongoing
**Implementation Cost: currently** $250,000/yr
**Lead Entity:** Mid-America Regional Council

RideShare is a free, publicly funded commuter service designed to inform people about less expensive and environmentally friendly commuting alternatives. These include carpooling, vanpooling, transit programs, and employer services such as flextime and telecommuting. Rideshare staff also coordinates the Midwest Commuter Choice program, which provides additional incentives to employers that actively promote ridesharing to their employees.

In spring 2004, the MARC Air Quality Working group strongly advocated for the expansion of the regional Midwest Commuter Choice program, contingent on the availability of funding. MARC estimated that increasing the program budget to $400,000 annually would provide adequate resources to conduct direct outreach to the 100 largest businesses in the region

over a two year period and to recruit a majority of those businesses into the Midwest Commuter Choice program.

Unfortunately, Rideshare is another program that will suffer greatly as the result of the loss of CMAQ funding in the region. Currently, the program's entire annual budget comes from CMAQ, and in the absence of other public funding or investment by the private sector, the program may be forced to cut back or eliminate its services altogether.

**Targeted outreach to unregulated emitters and fleets**
**VOC Reduction:** variable, depending on scope of implementation
**$NO_x$ Reduction:** variable, depending on scope of implementation
**Time frame for implementation:** short term
**Implementation Cost:** variable, depending on scope of implementation
**Lead Entity:** state technical assistance programs, MARC

At the direction of the AQWG, MARC began working with the Kansas State University Pollution Prevention Institute, the Missouri Department of Natural Resources, and the Iowa Waste Reduction Center in late 2004 to co-sponsor three workshops in the Kansas City region. One training targeted printers in Kansas, while another was offered to printers on the Missouri side. The third training topic concerned parts washers and solvent use. All three workshops occurred in November 2004 and were fully paid for by existing MARC air quality public education funding.

Contingent on the availability of new funding, MARC plans to coordinate four additional workshops in 2005. These would target printers, auto body painters, commercial lawn services and heavy construction equipment operators. MARC will bring technical expertise to the region, coordinate workshop logistics, recruit businesses to attend the events, and evaluate the workshops' impact.

**Sustainability**

**Adopt land use policies to protect air quality**
**VOC Reduction:** high, if implemented regionally
**$NO_x$ Reduction:** high, if implemented regionally
**Time frame for implementation:** long-term
**Implementation Cost:** potentially revenue neutral or cost saving
**Lead Entity:** local governments

In communities across the nation, there is a growing concern that current urban and suburban development patterns are no longer in the long-term interest of our cities, existing suburbs, small towns, rural communities, or natural areas. Though supportive of growth, communities are questioning the economic costs of abandoning infrastructure in the city, only to rebuild it further out. Spurring the smart growth movement are demographic shifts, a strong environmental ethic, increased fiscal concerns, and more nuanced views of growth.

Reconsidering conventional development practices and adopting policies that seek to minimize the air quality impacts of development can produce communities that have a higher quality of life and provide residents with amenities not available in traditional suburban neighborhoods. These amenities could include increased proximity to greenways, retail establishments and transit. By increasing opportunities for residents to reach destinations by foot or bicycle, local governments can reduce the need for people to travel by car. On a regional scale, the impacts could be significant, since short trips are among the most polluting driving that most people do mile-for-mile. Smart Growth development patterns also reduce the need for new infrastructure like sewer lines, schools and fire stations, and help to minimize the environmental impacts of regional growth. Implementing new development policies could have the added benefit of reducing capital and long-term operations and maintenance expenditures for local governments.

**Increase tree planting, green space preservation**
**VOC Reduction:** variable; may reduce evaporative emissions from parked cars
**$NO_x$ Reduction:** n/a
**Time frame for implementation:** short term, but benefits accrue over the long term
**Implementation Cost:** variable, depending on scope
**Lead Entity:** businesses, governments, and individuals

Trees and green space provide environmental benefits and add value to nearby properties. Trees and other plants may serve to mitigate the urban heat island effect that is caused by the absorption and retention of heat energy by buildings and parking lots. Using trees to shade parking lots can help reduce evaporative emissions from cars and trucks. Also, certain species of trees take in ozone, which, on a large scale, could help to reduce monitored readings.

**Smart Moves Regional Transit Plan**
**VOC Reduction:** variable, depending on scope of implementation
**$NO_x$ Reduction:** variable, depending on scope of implementation
**Time frame for implementation:** intermediate term
**Implementation Cost:**
**Lead Entity:** Local transit agencies, MARC

Smart Moves is metropolitan Kansas City's vision for expanded and enhanced public transportation services. It is a regional plan, providing service in seven of the metro area counties and is the first detailed regional transit service plan cooperatively developed by Mid-America Regional Council (MARC), Kansas City Area Transportation Authority (KCATA), Johnson County Transit and Unified Government Transit. Smart Moves builds on extensive prior transit plans and studies, reflects what residents and businesses indicate they want in a public transit system, and incorporates models and best practices from across the country for modern, effective and efficient public transportation services.

MARC's voluntary commitment is to continue to work with the three area public transit providers to refine the Smart Moves plan, to identify short-term investments to begin plan implementation, to build community support for the plan, and to secure legislative support and financial support to implement the full vision. Increased investment in an integrated transit plan and use of public transportation will provide direct air quality benefits for the Kansas City region by relieving roadway congestion and reducing the necessity for automobile use and the ensuing air pollution produced. Enhanced transit service will continue to make transit more attractive and reduce automobile use.

## 7.2 - REGULATORY MEASURES

At the time of this writing, the Kansas City region is expected to be designated an attainment area under the eight-hour ozone standard. However, the region's ability to avoid future violations of the eight-hour standard is very much in question. If a violation occurs, the metropolitan area could face the prospect of implementing new regulatory controls to further reduce VOC and $NO_x$ emissions. These regulatory controls could potentially be included in a maintenance SIP as contingency measures.

Recognizing the tenuousness of the region's position in regard to the eight-hour ozone standard, the AQWG developed a list representing a broad spectrum of regulatory controls that could be implemented in the metropolitan area if violations occur. Participants at the September 10, 2004, workshop were asked to consider which of these controls would be most appropriate for implementation in the region. Based on the feedback received, the initial list was narrowed down considerably, and remaining measures were assessed using the CAMx photochemical model. These strategies, listed below, target emissions from on-road mobile, area and point sources.

If the region violates the eight-hour ozone standard at some point in the future, additional modeling and evaluation will have to be done before any of the following measures could be implemented. New emissions inventories for a more recent base year and potentially for a new future attainment year would have to be developed. More recent ozone episodes would need to be modeled to determine whether air quality impacts would vary under different meteorological regimes. Not least importantly, a new, more extensive public involvement process would need to be undertaken to provide ample opportunity for citizens to discuss and provide feedback on any measures that were ultimately implemented.

In the event of a violation, discussion of possible new regulatory controls would not necessarily be confined to those listed below. The inclusion of potential new regulatory measures in this action plan is intended to provide a starting point for a discussion about new air quality regulations, should such a discussion become necessary in the future.

**Remote-sensing based dirty screen program**
**VOC Reduction:** 0.8 tpd
**$NO_x$ Reduction:** 0.8 tpd
**Time frame for implementation:** intermediate
**Implementation Cost:** ~$7,000 per ton of VOC/NOx reduced
**Lead Entity:** State air agencies (regulatory); local agencies (voluntary)

A regulatory remote-sensing-based dirty screen program could be used to identify high-emitting cars on the road and to require owners of those cars to have their engines repaired after registering emissions in excess of the allowed limit. The scope of the program could vary considerably in the number of remote sensing test sites and the number of stationary versus mobile units.

Implementation of a remote-sensing-based emissions testing program would present a number of challenges. First, drivers of cars likely to be high emitters could avoid testing sites and escape detection. Also, drivers of high-emitting cars may be more likely to use local streets, rather than highways and the on-ramps that provide preferred conditions for remote-sensing testing. Third, invalid test results can occur inadvertently or as the result of deliberate attempts by the driver to produce an invalid reading (e.g., by releasing the accelerator or turning off the engine when passing through the infrared beam). Finally, a program targeting cars that are generally among the oldest on the road and whose owners may be unable to pay for needed repairs may raise serious questions concerning the basic equitability of the regulation.

Measures could be undertaken to address social and environmental justice concerns. In some areas where high emitter identification and repair programs have been implemented, car repairs have been subsidized for drivers who meet income and other eligibility guidelines. Other areas have adopted “clunker buyback” programs in which drivers of older cars may receive cash in exchange for their high emitting cars, which are then scrapped. However, the reimbursement would be unlikely to be substantial enough to allow the recipient to buy a significantly newer and lower emitting car.

While a number of issues would need to be addressed before a regulatory remote-sensing-based emissions testing program could be implemented, this strategy could potentially have greater value if implemented as a voluntary, public-education-oriented program. The Denver, Colorado, metropolitan area has for a number of years used remote-sensing emissions testing coupled with a message board to let drivers know whether their emissions are within or above

recommended limits. Those who fail the test are not penalized but receive a message from a roadside message board that a tune-up may be in order. It is reported that some drivers pass through the test lane deliberately to determine whether their vehicles are running properly. Such a program could be administered by state or local agencies.

**Gas cap replacement program**
**VOC Reduction**: ~0.8 tpd
**$NO_x$ Reduction:** none
**Time frame for implementation:** short to intermediate term
**Implementation Cost**: ~$700 per ton of VOC/NOx reduced
**Lead Entity:** State air agencies (regulatory); state and local agencies, auto repair shops (voluntary)

A gas cap that does not seal properly allows vapors to escape from a car's gas tank. Defective gas caps in most cases cannot be identified visually but must be checked using a device that measures the cap's ability to maintain constant pressure. Most service centers in greater Kansas City currently lack the equipment to perform a gas cap pressure test. Even newer vehicles have been identified as having failing gas caps.

A mandatory gas cap program could be implemented to reduce evaporative emissions from cars and light trucks. On the Missouri side of the state line, vehicles are already required to undergo a state inspection every two years. If a gas cap check were mandated, service centers that already perform inspections could, without a great deal of difficulty, incorporate a gas cap test into the inspection protocol. Gas cap pressure testers cost $500 - $700. On the Kansas side of the region, implementation of a gas cap program would be more problematic, since the state does not currently require that vehicles be inspected prior to registration renewal.

A voluntary gas cap program was implemented in the Kansas City region in 2002 – 2003 and resulted in the replacement of over 3,000 defective gas caps. The program was administered by MARC in partnership with O'Reilly Auto Parts. A similar public-private partnership might provide the most effective framework for implementing similar programs in the future. The MARC program was funded by through the Congestion Mitigation/Air Quality program. The anticipated loss of these funds would require new public funds to be identified for this purpose or would require greater private sector support.

**VOC/$NO_x$ RACT Rules**
**VOC Reduction:** ~ 1 tpd
**$NO_x$ Reduction:** ~ 5 tpd
**Time frame for implementation:** short to intermediate term
**Implementation Cost:** ~$2000 per ton of VOC/NOx reduced
**Lead Entity:** State air agencies

The States of Kansas and Missouri have each established regulations that apply specifically to emissions sources in the Kansas City region that have the potential to generate 100 tons per year or more of VOC. Known as Reasonably Available Control Technology (RACT) rules, these regulations apply to specific industries or processes that use VOC-containing products. See Appendix B for a summary of RACT rules specific to Kansas City. These rules were established to help the region comply with the old, one-hour ozone standard. Because the region's ozone problem was previously thought to be VOC-limited, RACT rules currently on the books only address VOC emissions. There are no NOx RACT rules currently in effect.

Lowering VOC RACT applicability limits from 100 tpy to 75 tpy or less would subject smaller sources to regulatory requirements that would lower their emissions. Before such a measure were implemented, considerable research would be needed to more accurately determine how many businesses would be affected by the rule change, and what the resulting air quality benefit would be. Because businesses that are under the current limit are not regulated, it is not clear how many would be affected by a reduction in the applicability limit.

Now that the role of NOx in regional ozone formation is better understood, NOx RACT rules could be established to help the region maintain compliance with the eight-hour standard. Applicability limits might be set at 100 tpy or some lower threshold. Again, implementation of such rules could not occur without substantial additional investigation regarding the economic costs of implementation, as well as the potential air quality benefits. Any changes to existing RACT rules or promulgation of new rules would be initiated by the state regulatory agencies.

**Reformulated Gas**
**VOC Reduction:** ~ 3.1 tpd
**$NO_x$ Reduction:** ~ 0.3 tpd *increase*
**Time frame for implementation:** short to intermediate term
**Implementation Cost:** ~ $5000 per ton of VOC/NOx reduced
**Lead Entity:** Federal and state regulatory agencies

Reformulated gasoline (RFG) is a cleaner burning federal blend of gasoline. The fuel contains oxygenates that allow for more thorough combustion, leading to reduced emissions.

In 1999, the States of Kansas and Missouri attempted to opt in to the federal reformulated gas (RFG) program to help the Kansas City region maintain compliance with the one-hour ozone standard. Litigation ensued, and a federal court ultimately determined that the Clean Air Act only provides for the use of RFG in areas that are nonattainment and that can prove the use of RFG is necessary to bring them into attainment with NAAQS. As a result, the region established its own fuel requirement that lowered gas volatility from 7.2 to 7.0 RVP.

Clearly the RFG option would not be available to the Kansas City region unless it were designated nonattainment, or unless the Clean Air Act were amended to change RFG eligibility requirements. Too, there are environmental concerns about the oxygenate used in RFG. For many years, methyl tertiary butyl ether (MTBE) was used as an oxygenate, but MTBE is both water-soluble and possibly carcinogenic, and has contaminated ground water supplies in some areas where it has been used. Some additives that could be used to replace MTBE, such as ethanol, might pose less of a threat to water supplies, but care would have to be taken to ensure that evaporative emissions would not increase as a result of the substitution (there is currently a waiver in place that allows Kansas City gas retailers who sell blends containing ten percent ethanol to exceed the current volatility limit by 1.0 PSI, or 14 percent).

As with other potential regulatory measures that could be implemented given the occurrence of violations, additional research and modeling would have to be carried out to more thoroughly to assess the costs and air quality impacts of RFG before such a measure could be considered for implementation.

## 8 - RECOMMENDED FUTURE ACTIONS

As noted above, EPA has indicated that areas like Kansas City that were classified as maintenance areas under the one-hour ozone standard but have been designated attainment areas under the eight-hour standard will be required to develop maintenance plans under Section 110 of the Clean Air Act. Section 110 provides the EPA Administrator with the discretion to set requirements for the development of maintenance plans. At this writing, EPA has not released the second part of the eight-hour ozone implementation final rule. Consequently, it is unclear exactly what federal requirements will apply to the Kansas City region, and how the requirements for the maintenance plan will differ from the criteria that were used to develop the CAAP.

Regardless of what the regulatory requirements may be, the region has put considerable effort and resources into the development of the Clean Air Action Plan. The plan provides a clear list of steps the region can take to improve its air quality and retain its status as one of the largest metropolitan areas in the country to meet the federal eight-hour ozone standard. When the time comes to develop a maintenance plan for the eight-hour standard, additional modeling and technical evaluation will need to be performed using more recent emissions inventories and more recent ozone episodes that represent multiple meteorological regimes. While a great deal of effort went into getting input from a broad spectrum of stakeholders to develop the CAAP, additional public involvement will need to occur when the region develops a regulatory plan for maintaining its air quality.

In the meantime, local government officials, business leaders, and community group representatives have committed themselves to a serious effort to reduce emissions voluntarily in order to improve air quality in the Kansas City region. This CAAP represents a solid and carefully considered strategy for moving forward on the implementation of a range of programs and initiatives that will provide area residents with not only cleaner air to breathe, but also a better quality of life overall. This is a living document that will be updated as regional efforts to improve air quality move forward.

## APPENDIX A – REGIONAL VOLUNTARY COMMITMENTS

The following pages reflect voluntary commitments that local governments and other organizations have made to improve air quality in the Kansas City region. The correspondence and other documentation contained in this appendix should not be viewed as an exhaustive list of entities that are undertaking efforts to reduce emissions, and the scope of pollution prevention activities that occur in the future may exceed that described below. Over time, MARC and its partners will continue to solicit broader community involvement in efforts to achieve cleaner air, and the number of commitments is expected to increase. This document will be updated on a quarterly basis to include any new commitments that are secured.

Johnson County
Kansas

KANSAS DON'T SPOIL IT!

January 31, 2005

Mr. David Warm
Executive Director
Mid-America Regional Council
600 Broadway, Suite 300
Kansas City, MO 64105

Dear Mr. Warm:

For purposes of MARC's Clean Air Action Plan, it is my pleasure to document the actions taken by Johnson County government to reduce ozone pollution in 2004 and to share our ozone reduction plans for 2005. We are proud to be part of regional efforts to improve air quality, and we applaud MARC's leadership role in developing the Clean Air Action Plan.

In April, 2004, the Environmental Department initiated Johnson County government's first Ozone Reduction Campaign with the support of the County Manager's Office and the Board of County Commissioners. Our campaign focused on educating employees about ozone pollution and promoting emission reduction strategies in each of our 38 departments and agencies, tailored to their unique operational needs. Strategies included changes in refueling habits, expedited maintenance and repairs on county vehicles, testing of gas caps with replacement of faulty caps on county vehicles (employees' personal cars were also voluntarily tested), tire pressure checks, promoting ridesharing and transit as alternatives to commuting alone, and changes in lawn maintenance schedules. Most departments implemented at least 20 separate strategies.

We also hired an Ozone Reduction Coordinator who worked with each of our departments to educate employees about ozone and to assist departments in determining the best ozone reduction strategies for their operations. Our Coordinator tracked and periodically reported progress back to the departments and the Board, and as time allowed, she worked with cities and other counties to implement their own campaigns. Copies of our campaign brochure and periodic newsletters to employees are attached. Most notably, we provided incentives to participate in the campaign and rewarded action with prizes such as spill-proof gas cans and charcoal chimneys.

We also encouraged employees to take actions to reduce ozone pollution in their personal lives. Anyone who carpooled, rode the bus or bicycled at least 80 percent of the ozone season also received a $100 gift certificate funded by the County Manager's Office with support from the Board. About 30 employees earned the gift certificates.

Environmental Department | Southlake Tech Center Bldg. #4 | 11180 Thompson Ave. Lenexa, KS 66219 | (913) 492-0402 Fax (913) 492-0142

Johnson County government is committed to continuing our efforts to reduce air pollution. We are gradually replacing many of our gasoline-powered county vehicles with alternative-fueled or hybrid vehicles. The Environmental Department already has eight (8) such vehicles with plans to acquire more.

We will be kicking off our 2005 Ozone Reduction Campaign in April with funding support from both the county and the Kansas Department of Health and Environment. This year, we hope to expand our efforts to include more cities in Johnson County. It is our intent to continue the Campaign in future years as resources allow.

Thank you for the opportunity to share our efforts to improve air quality. We sincerely appreciate MARC's work on behalf of improved health and a better economy for the entire region.

Sincerely,

Cindy Kemper
Director

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Enclosures

C: Annabeth Surbaugh, Chairman of the Board
Ed Peterson, Commissioner, First District
Mike Press, County Manager
Bernice Duletski, Assistant County Manager
Betsy Betros, Director, Pollution Control
Mike Boothe, Air Quality Program Manager
James Joerke, Air Quality Coordinator, MARC

# Kansas City Power & Light®

**WILLIAM H. DOWNEY**
President and
Chief Executive Officer

September 21, 2004

Mr. David Warm
Executive Director
Mid-America Regional Council (MARC)
300 Rivergate Ctr.
600 Broadway
Kansas City, MO 64105

Dear David:

As a community leader, you are no doubt aware of the comprehensive framework Kansas City Power & Light (KCP&L) has proposed to help meet the growing energy needs of the Northland and surrounding areas. I wanted to take this opportunity to remind you about the framework and why we, as a community, need to act now.

Demand for electricity is growing, both nationally and in our region. According to the Missouri Energy Development Association, Missouri will need an additional 4000 megawatts of generation capacity in the next 10 years in order to meet demand. In addition, recent studies by the county Economic Development Councils have shown almost a quarter of the businesses surveyed in Platte County and almost half in Clay County anticipate increased need for electricity in the future. The rise in demand is due to a number of factors, including population growth, regional economic development, and greater energy use per household (bigger TVs, computers, etc.). While we are not facing an immediate energy crisis, we need to act soon as it takes years to bring new sources of energy on line.

Our comprehensive approach includes several key initiatives designed to ensure affordable, reliable electricity, while dramatically *reducing* emissions that can affect air quality.

- A $300 to $350 million accelerated investment in environmental control technologies that would dramatically reduce emissions of all kinds, including mercury, at our existing power plants and help them meet or exceed proposed new air-quality standards before being required to do so. In addition, we are continuing to work closely with local, state, and federal officials to develop our environmental plan.

- Developing wind generation that could produce up to 200 megawatts of electricity without affecting air quality. In addition, wind is a renewable resource that helps keep electricity prices stable.

- Building one new coal-powered plant near the existing Iatan plant in Platte County. This plant would generate up to 900 megawatts of electricity and would be built with modern emissions-control technology. In fact, by retrofitting the existing Iatan plant and building a second Iatan plant with modern emissions-control technology, the two facilities would actually produce fewer emissions than the existing Iatan facility does by itself today.

1201 Walnut Street | Post Office Box 418679 | Kansas City, Mo. 64141-9679 | tel. 816.556.2200 | www.kcpl.com

- Investing in programs and technologies to help customers use energy more efficiently. This includes low-income assistance and forming "energy partnerships" with our customers by using technologies and programs that allow us to better understand our customers and better manage the flow of information and energy between us.

We are currently in discussions with regulatory officials in both Kansas and Missouri and hope to reach an agreement on the framework soon. We are convinced this proposal strikes the right balance of affordability, reliability, and environmental responsibility, and we hope you agree. If you have any questions about what we have proposed, or would like more information, please visit our Web site at *www.kcpl.com*, or feel free to contact me directly.

Sincerely,

Bill Downey

Bill Downey
President & CEO

# City of Kansas City, Missouri

**DATE:** April 21, 2004

**TO:** Department Directors

**FROM:** Wayne Cauthen, City Manager

**SUBJECT:** Ozone Action Policy

**Background –** The Kansas City Metropolitan Area experiences unhealthy air quality due to elevated ozone levels on certain days when weather conditions are favorable for ozone formation (Ozone Alert days). The Metropolitan Area is in jeopardy of losing its attainment status under the Clean Air Act due to elevated ozone levels, which would impede economic development and inconvenience Kansas City residents and businesses. To promote the health of residents and maintain its attainment status, the City of Kansas City is committed to joining with area governments, businesses, and individuals in taking action to reduce ozone generating activities on Ozone Alert days, and throughout the ozone season.

The City's Environmental Coordinating Managers met on March 25th and began the process of planning Kansas City's ozone reduction efforts. Draft documents are currently being circulated and comments on the drafts are being received and processed by Environmental Management. The next meeting of the ECMs, scheduled for April 22nd, will continue that process. With ozone season just a few weeks away, it is necessary to move quickly from planning to implementation. **Therefore, please give your attention to this effort and include as many efforts as possible in your action plans.**

**Policy –**

- Each Department shall develop and implement an Ozone Action Plan (OAP) by May 15, 2004 which identifies steps that will be taken to reduce ozone generating activities throughout the ozone season, and additional steps that will be taken on days that MARC issues an Ozone Alert.
- Each Department shall appoint an Ozone Alert Coordinator, responsible for developing and implementing the Department's OAP, and reporting plans and accomplishments.
- The Environmental Management Department shall be charged with coordinating the City's ozone reduction efforts and compiling and reporting citywide accomplishments. Each Department shall provide information to EM on their OAP and actions taken to implement the OAP.
- The specific actions listed in Attachment 1 (Suggested Clean Air Actions For Area Businesses and Governments by Mid America Regional Council) and Attachment 2 (City of Kansas City, Ozone Reduction Measures) are authorized and encouraged. Each of these measures should be included in each Department's OAP unless the Department Director determines that one or more of the measures would be unduly expensive or disruptive of

Departmental efforts, or are not relevant because the Department has no activities that would be impacted by the measure.

- Departments are encouraged to include actions in their OAP which are not found in Attachment 1 or 2 if such actions will reduce ozone generation and not be unduly expensive or disruptive of Departmental efforts.

Attachment 1

# Suggested Clean Air Actions For Area Businesses and Governments

Ground-level ozone is caused by emissions from industry, small businesses, cars and trucks, yard equipment and household paints and solvents. Because a variety of emissions sources contribute to the ozone problem, area governments, businesses and residents can all play a role in improving the region's air quality. The following is a menu of strategies public and private organizations could implement to provide healthier air and a higher quality of life for area residents.

**Employee Education, Notification, and Participation**

- Assign Ozone Alert! Coordinator(s)
  - Responsible for developing and implementing an Ozone Alert! Response procedure
- Promote employee education/awareness of ozone issues and helpful individual actions
  - E-mail
  - Lobby Displays
  - Internal Newsletters
  - Seminars/Training Sessions
  - Flyers
  - Posters
- Notify employees of Ozone Alert! days
  - E-mail
  - Network Boot Up Message
  - Intercom
  - Bulletin Board
  - Flag
- Provide incentives for participating employees
  - Raffle Prizes
  - Reserved Parking
  - Subsidized Parking Fees
  - Meals/Drinks
  - Flextime

**Operations and Maintenance Activities**

- Delay/reschedule the use of gasoline-powered lawn mowers, leaf blowers, and other small gasoline engines on Ozone Alert! days
- Postpone painting and spraying pesticides on Ozone Alert! days
- Postpone vehicle refueling until the evening during Ozone Season
- Do not 'top off' the tank when refueling
- Replace vehicle gas caps that have broken seals or stripped threads
- Establish a fuel tank inspection program to identify leaks and maintain fuel tanks to specifications

- Dissuade employees from driving to lunch and meetings
  - Subsidize or provide lunches on Ozone Alert! days
  - Encourage brown bag or take out lunches
  - Provide shuttle services to common dining areas and meetings
  - Walk, bicycle or carpool to lunch and meetings
- Offer direct deposit of paychecks
- Employ building energy conservation measures
  - Turn off lights and computers daily
  - Purchase ENERGY STAR compliant equipment (www.energystar.gov)
  - Consider an energy audit for existing buildings
  - Use Green Power where available (www.epa.gov/greenpower/)
- Buy water-based paints, stains and sealers
  - When oil-based paints, stains and sealers must be purchased, make sure they have a low VOC content that is clearly identified on the label

**Commuter Actions**

- Encourage commute alternatives for employees
  - Vanpooling
  - Carpooling
  - Mass Transit
    - i) Support development of park and ride facilities at the urban fringe and along major corridors
    - ii) Offer free bus passes on Ozone Alert! days and subsidized bus passes throughout the year
  - Walking/Biking
    - i) Provide secure bike racks and shower facilities
- Encourage telecommuting and videoconferencing
- Encourage compressed work weeks
- Implement a flextime program, which would encourage people to commute to and from work during non-peak travel hours.
  - The United States Office of Personnel Management has developed a handbook on Alternative Work Schedules (AWS). For more information, go to: http://www.opm.gov/oca/aws/.

**Fleet Vehicles**

- Consider purchase of alternative-fuel vehicles and equipment
  - Electric
  - Methanol and Ethanol
  - Compressed Natural Gas
  - Propane
  - Biodiesel
  - Hydrogen

- Consider retrofit of heavy-duty diesel fleets
  - Exhaust control technologies
  - Conversion of diesel engines to natural gas
  - Implement fleet emissions reduction measures
  - Fuel-efficient driving techniques
  - Anti-idling policy
  - Regular vehicle maintenance
- Encourage selection of trip-appropriate vehicles
  - Select the most efficient vehicle possible for each staff trip based on the number of passengers, weight of cargo, and likelihood of off-road use.
- Use tax incentives to promote expanded use of low emissions technology
- Implement a smoking vehicle program; i.e. require smoking vehicle reports and repairs

**Contractor Requirements**

- Provide incentives in contract bids to encourage the use of electric or manually powered equipment
- Encourage procurement and operation of low-emission vehicles
- Encourage low-emission fleet status for off-road equipment
- Consider establishing a low-emissions vehicle program pertaining to the purchase and retrofit of vehicles

**Impact of New Growth**

- Utilize and promote green building designs and maintenance techniques that reduce energy and water consumption
  - Install highly reflective surfacing and roofing materials
  - Consider tree planting/landscaping standards
  - Tree ordinances
    - i) Establish minimum tree planting standards for new development
    - ii) Promote strategic tree planting, street trees and parking lot trees
- Native landscaping practices
- Promote land use planning practices that lead to a reduced dependence on automobiles
  - Implement Creating Quality Places principles

The program's 20 principles are a set of affirmative statements and represent a powerful consensus on what is needed to design successful neighborhoods, vibrant mixed-use commercial areas, efficient transportation systems – all within a healthy natural environment (http://www.qualityplaces.marc.org/).

- i) Urban infill
- ii) Linkages to surrounding areas that would encourage walking and bicycling
- iii) Mixed-use development
- iv) Transit supportive development
- v) Small playgrounds or neighborhood parks
- vi) Utilize various means to achieve land use planning that is cognizant of transportation issues

- Policies
- Programs
- Actions
  i) Zoning regulations
  ii) Design controls
  iii) Green development
  iv) Incentive programs that encourage smart growth

**Governmental E-Services**

- Website development
- On-line applications and permitting
- On-line bill paying
- On-line recreation reservations
- On-line library book renewals and reservations

**Support Regional Transportation and Environmental Initiatives**

- **Smart Moves**

Smart Moves is a comprehensive transit improvement strategy that integrates services throughout the seven-county Kansas City metropolitan area. It features transit centers and services tailored to the needs of communities in the region. (http://www.marc.org/kcsmartmoves/)

- **RideShare**

RideShare is a free, publicly funded commuter service designed to inform people about less expensive and environmentally friendly commuting alternatives. These include carpooling, vanpooling, transit programs, and employer services such as flextime and telecommuting. (http://www.marc.org/rideshare/index.htm)

- **Operation Green Light**

Operation Green Light works with federal, state and local agencies to develop and implement a system that will coordinate traffic signal timing plans and communication between traffic signal equipment across jurisdictional boundaries. (http://www.marc.org/transportation/ogl/index.htm)

- **Metro Green**

MetroGreen is a proposed 1,144-mile interconnected system of public and private open spaces, greenways and trails designed to link seven counties in the Kansas City metropolitan area. (http://www.marc.org/metrogreen/)

Attachment 2

City of Kansas City, Ozone Reduction Measures

1) Employees, with the consent of their supervisors, may opt to work 4 10-hour days per week instead of 5 8-hour days during the peak ozone season. Supervisor consent requires a determination that the modified schedule will not adversely affect performance of the employee's duties. [Working a 4 day week will reduce vehicle use for commuting by that employee by 20%, and also reduces traffic congestion during rush hour, which means less idling time and less ozone generation by the vehicles remaining on the road.]

2) Employees, with the consent of their supervisors, may opt to modify their daily work shift so that commuting is not done during rush hour. For example, instead of working 8-5 with a 1 hour lunch, an employee might work 6:30-3:30, or 9:30-6:30. Supervisor consent requires a determination that the modified schedule will not adversely affect performance of the employee's duties. [Commuting at non-rush-hour times will reduce the time spent driving, and thereby reduce the total vehicle emissions for the trip. It also reduces traffic congestion during rush hour, which means less idling time and less ozone generation by the vehicles remaining on the road.]

3) Residents and employees should be prohibited from having fires (including cooking fires) on City property on ozone alert days. [Fires, especially those using lighter fluid, generate ozone precursors.]

4) Field crews that perform a mixture of ozone generating activities and non-ozone generating activities should, where feasible, be scheduled to perform non-ozone generating activities during the peak ozone season, and ozone generating activities during non-peak times of year. [Ozone is formed from precursors by a chemical reaction that is accelerated by high temperatures and sun light. Less ozone will be produced if activities which generate precursors are done at times when temperatures are likely to be cooler, and less sunlight is likely to be present.]

5) Field crews that perform a mixture of ozone generating activities and non-ozone generating activities should, where feasible, be assigned non-ozone generating activities on ozone alert days.

6) Field crews that must perform ozone generating activities on ozone alert days should, where feasible, be assigned to work sites as far north as possible on ozone alert days. [Prevailing winds in the Kansas City area during ozone season are from the south. Ozone precursors generated in the northern part of the metropolitan area are likely to exit the metropolitan area before they are converted to ozone.]

7) Where feasible, activities requiring lane closures on heavily traveled streets should not be scheduled during peak ozone season, and should not be conducted on ozone alert days. [Lane closures can contribute to traffic congestion, resulting in long lines of vehicles generating ozone precursors but not going anywhere.]

8) City fueling facilities should dispense biodiesel and ethanol/gasoline blends during the peak ozone season (and the rest of the year). [Biodiesel and ethanol burn significantly cleaner than conventional motor fuels, thereby producing less ozone precursors.]

9) Where feasible, City contractors should be required or encouraged to make ozone reduction efforts similar to those being made by the City.

2004 Kansas City, Missouri, departmental action plans

| **Department** | Plan Developed | Coordinator Named | Informational Meeting | Employee Education | Provide notice on Alert Days | Maximize alt fuel vehicle use | 4-10s schedule | flex time | Postpone fueling | Restrict vehicle idling | Limit non-essential driving | Restrictions on contractors | Raise thermostat settings | Subsidize bus passes | Increase alt. fuel fleet | Ensure vehicle maintenance | Limit use of lights/electric | Buy energy efficient equipment | Encourage vanpools/carpools | Allow telecommuting | Promote e-business w/ City | Reduce Solvent use | Postpone small engine use | Limit outdoor fires/cooking | Ban space heaters | Close blinds/drapes | Contest with Prizes | Postpone incinerator use | Use alt. fuels (biodiesel) | Minimize lane closures |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aviation | x | x | | | x | | x | | | | | | | | x | | | | x | | | x | x | | | | | | | |
| City Auditor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| City Planning | x | x | | x | x | x | x | x | x | | x | x | | | x | x | x | x | x | x | x | | | | | | | | | |
| Codes Admin. | x | x | | | x | | | | x | | | | | | | | | | | | | | | | | | | | | |
| Conventions | x | x | x | | x | | x | x | x | x | x | x | x | | | | | | | | | | | | | | | | | |
| EM | x | x | x | | | | x | x | x | x | x | x | x | x | | | | | | | | | | | | | | | | |
| Finance | x | x | | | | | | | | | x | | | | | | x | | | | | x | | | | | | | | |
| Fire | x | x | | x | x | | | x | x | x | x | | | | | x | | | | | | | x | x | | | | | | |
| Health | x | x | x | | | | x | x | x | | x | x | x | x | | | | | x | | | | x | | | | | | | |
| Housing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Human Relations | x | x | | x | x | | | | x | | x | | | | | | x | | | | | | | | x | | | | | |
| Human Resources | x | x | | x | x | | | | | | | | | | | | x | | | | | | | | x | x | x | | | |
| IT | x | x | | x | | | | x | x | x | x | x | | x | | | | | x | | | | | | | | | | | |
| Law | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NCS | x | x | | | | | x | x | x | | | x | | | | | | | x | | | | x | x | | | | x | x | |
| Parks | x | x | x | | | | | x | x | x | x | x | x | | | | | | | | | | x | x | | | | | | |
| Police | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Public Works | x | | | x | x | | | | x | x | x | | | | | x | | | x | | | x | | | | | | | x | |
| Water Services | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | | x | | x | | | x | x | x | | | | | x | x |

# Ozone Accomplishments Report for the Ozone Alert Day – September 2, 2004

For more information: Larry Falkin (816) 513-3456 Larry_Falkin@kcmo.org

**Background** – On April 21, 2004, City Manager Wayne Cauthen issued an Ozone Action Policy which required each City Department to develop and implement an Ozone Action Plan to reduce ozone generating activities on Ozone Alert Days. The Environmental Management Department was charged with coordinating the City's ozone reduction efforts and with compiling and reporting citywide accomplishments.

**Overview** – September 2, 2004 was the first Ozone Alert Day of the 2004 ozone season. In response to that Alert, 12 city departments have reported a total of 1369 actions taken to reduce ozone generating activities on that day. Due to actions taken by organizations and individuals throughout the Kansas City area, and to slightly cooler and breezier weather than had been forecasted, air quality in the Kansas City area remained in the acceptable range on September 2nd.

At the beginning of this ozone season, it was considered highly unlikely that Kansas City would be able to retain its "attainment status" under the federal Clean Air Act. Due largely to cool, wet and breezy weather this summer, it now appears likely that Kansas City will retain its attainment status.

**Accomplishments** – The following accomplishments were reported by City Departments for September 2, 2004. A breakout by Department appears on the attached spreadsheet.

| | | |
|---|---|---|
| City Vehicle Usage – | | |
| - vehicle trips avoided or postponed | | 118 |
| - vehicle refueling avoided or postponed | 362 | |
| - hours of vehicle idling avoided | 354 | |
| - alternative fuel vehicles used | 157 | |
| City Equipment (Mowers, chainsaws, etc.) – | | |
| - hours of use avoided or postponed | | 185 |
| City Buildings – | | |
| - buildings set warmer to reduce HVAC demand | 18 | |
| Commuting - | | |
| - Commutes not by car (bus, bicycle, carpool passenger, etc.) | 85 | |
| - Commutes moved to off-peak hours | 90 | |

Other – Street work that would have required lane closures was postponed at 5 sites.
- Outdoor cooking fires were banned in all City parks.
- Most City diesel equipment uses B20 biodiesel containing 20% soybean oil. B20 significantly reduces air emissions.
- Numerous unquantifiable actions occurred (posting notices, etc.)

Heavy Constructors
...making it better
for 50 years

# The Heavy Constructors Association
**of The Greater Kansas City Area**

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JIM KISSICK
*Utility Division*

February 4, 2005

Mr. James Joerke
Air Quality Program Manager
Mid-America Regional Council
600 Broadway, Suite 300
Kansas City, MO 64105

Dear Mr. Joerke:

The Heavy Constructors Association of the Greater Kansas City Area represents more than 150 contractors, specialty contractors, suppliers and other companies engaged in heavy, highway, and utility construction in both Kansas and Missouri. The Association recognizes the importance of maintaining air quality in the Kansas City Metropolitan Area and understands the serious economic consequences of becoming a non-attainment area.

The Association has been actively involved in the efforts of both the Mid-America Regional Council (MARC) and the Greater Kansas City Chamber of Commerce to establish a Clean Air Action Plan. This involvement has included taking part in discussions of possible strategies and offering our industry's perspective and insight on those strategies. We plan to remain involved in the months ahead as the Clean Air Action Plan is shaped.

Sincerely,

Edward R. DeSoignie
Executive Director

BROADWAY SUMMIT BLDG., STE. 780 • 3101 BROADWAY, KANSAS CITY, MO 64111-9227
(816) 753-6443 • FAX (816) 753-1239 • E-MAIL: hcakc@swbell.net • www.heavyconstructors.org

# KANSAS

DEPARTMENT OF TRANSPORTATION
DEB MILLER, SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

TERRY HEIDNER, DIRECTOR

June 9, 2004

Mr. David Warm
Executive Director
Mid-America Regional Council
600 Broadway, 300 Rivergate Center
Kansas City, MO 64105

Dear Mr. ~~Warm~~: David

I want to thank you for the work that MARC has done to date on the Clean Air Action Plan to proactively address the air quality concerns in the Kansas City metropolitan region. Based on discussions from the meeting between MARC and KDOT staff on March 12, 2004 KDOT would like to offer the following voluntary measures to be included in the Clean Air Action Plan:

- KDOT through its partnership in Kansas City Scout will provide motorist information through use of its Dynamic Messages Signs (DMS) when the Mid-America Regional Council (MARC) issues an ozone forecast by recommending action to reduce ozone emissions.

- When MARC forecasts conditions favorable for the formation of ground level ozone (MARC's Red or Orange Ozone Alert days), KDOT will schedule its maintenance operations to avoid closing lanes during daylight hours on highways in Johnson and Wyandotte Counties with Average Daily Traffic greater than 30,000. However, during emergencies and when long term traffic control measures have already been implemented, curtailment of maintenance activities may not be possible.

- When MARC forecasts a Red or Orange Ozone Alert day, KDOT will abstain from mowing operations in Johnson, Wyandotte & Leavenworth Counties.

- During the period from April 1st to September 30th, KDOT will refuel all gasoline-powered equipment and vehicles in Johnson, Wyandotte and Leavenworth Counties as late in the day as possible. On Red or Orange Ozone Alert days, gasoline powered equipment and vehicles will only be refueled when absolutely necessary.

DIVISION OF PLANNING AND DEVELOPMENT
700 S.W. HARRISON STREET, TOPEKA, KS 66603-3754
~~PUBLIC ACCESS AT NORTH ENTRANCE OF BUILDING~~
VOICE 785-296-2252 TTY 785-296-3585 FAX 785-296-7173 http://www.ksdot.org

- The Kansas Department of Transportation will encourage its Metro area employees to share rides and carpool to work.

- KDOT has recently up-dated its standard seed mixtures used on all re-construction projects. The shoulder mix includes a variety of cool and warm season grasses next to the roadside; beyond the shoulder area, the seed mix is comprised of all native plants and forbs. Additionally, a slurry tack has been added to the mulch after seeding, to further help the establishment of vegetation which will improve both air and water quality.

- In addition, KDOT will continue its practice of using biodiesel fuel when the cost differential is 10 cents or less.

We are committed to working with MARC and all the stakeholders in the metro area to develop and implement strategies to improve the long term air quality of the region. If you need further assistance please contact Rene Hart at (785) 368-7341.

Sincerely,

Terry W. Heidner

Terry W. Heidner
Director of Planning & Development

cc: Rene Hart
Mick Halter
Rex Fleming
Mike Fletcher
Jim Kowach
Dean Testa
Rick Kreider
Jim Tobaben

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James

Missouri
Department
of Transportation

MoDOT

Pete K. Rahn, Director

105 West Capitol Avenue
P.O. Box 270
Jefferson City, MO 65102
(573) 751-2551
Fax (573) 751-6555
www.modot.org

January 28, 2005

David Warm
Executive Director
Mid-America Regional Council
600 Broadway, Suite
Kansas City, MO 64105-1554

Dear Mr. Warm:

The Missouri Department of Transportation (MoDOT) is pleased to inform the Mid-America Regional Council (MARC) of our proposed clean air plan. We are also pleased that some of our plan is being implemented statewide. MoDOT will continue to enhance our clean air plan to maximize benefits for Missouri and the Kansas City community.

MoDOT's commitment to improve the region's air quality involves the following eight components: (a) modification of daily operations, (b) employee action and education, (c) public information, (d) community leadership, (e) Kansas City Scout program and congestion management, (f) commuter choice, (g) alternative fuels and environmentally sensitive vehicles, and (h) asphalt mixture standards.

These eight components include a variety of activities including the reduction of maintenance activities on red ozone alert days, encouragement of car-pooling and the use of alternative modes of transportation, flexible hours and telecommuting for some employees, the use of hybrid vehicles and bio-diesel, and paving with an asphalt mixture that has virtually no volatile organic compounds (VOC). VOC is a main contributor to ground-level ozone formation.

In addition to the activities targeted at MoDOT's operations, the department also actively works to inform people outside of their organization. MoDOT provides information to the government agencies and organizations with which they interact about activities that improve air quality. MoDOT participates in the multi-agency Kansas City Scout Program, which uses high-tech communications equipment to provide traveler information and congestion management. Kansas City Scout will also be used to post red ozone forecasts so individuals can positively impact the region's air quality.

Many of MoDOT's activities are targeted at reducing the number and length of vehicle trips in the Kansas City area. Approximately 33 percent of the gases that form ground-level ozone in the Kansas City area can be attributed to on-road vehicles. Reduction in the number of vehicles on the road and the amount of time they are on the road directly improves the region's air quality.

I look forward to working together to improve the region's air quality and increase the overall health of the Kansas City community.

Sincerely,

Beth Wright

Beth Wright, P.E.
District Engineer

R. M. (Bob) Grimaila
Sr. Assistant Vice President
Safety & Environmental Practices

Mailing Address:
1400 Douglas Street
Stop 1030
Omaha, Nebraska 68179

L. A. (Lanny) Schmid
Director Environmental Field Operations
J. R. (Joel) Strafelda
Program Manager

Directors Environmental Field Operations
R. L. (Rick) Eades – Northern Region
B. A. (Brock) Nelson – Western Region
G. (Glenn) Thomas – Southern Region

December 2, 2004
File: Air Quality – Kansas City Metro

Mr. Jesse Gotz
Air Quality Planning Intern
Mid-America Regional Council
600 Broadway, Suite 300
Kansas City, MO 64105

Dear Mr. Gotz,

In response to your letter, this letter serves to describe the Union Pacific Railroad locomotive usage and general estimates of the number of locomotives utilizing auto-start/stop equipment in the Kansas City area.

Union Pacific Railroad (UPRR) operates locomotives in the Kansas City area in two general classes of service, line-haul and switcher/local. Line-haul locomotives haul freight into and out of UPRR's Kansas City or through the Kansas City area in its route from origination to destination. Switcher/local locomotives are used to sort freight cars from incoming trains and for local pick up and delivery service. Although some locomotives are best suited for line-haul service, switcher/local locomotives can also be used in line-haul service if additional horsepower is required to move a train when the specific need arises.

In addition, UPRR has somewhat limited maintenance/repair capabilities for locomotives in the Kansas City area. Because of this, locomotives are moved to other locations when necessary for maintenance/repairs and will likely be replaced by another unit before maintenance/repairs are complete.

Because UPRR strives to maximize utilization of assets (locomotives), and because of limitations on locomotive maintenance/repair capabilities, UPRR does not have a dedicated fleet of locomotives that are used for switcher/local service in the Kansas City area. Rather UPRR operating personnel utilize locomotives from a fleet assigned to the operating service unit that includes the Kansas City area.

Currently, the transportation plan calls for a daily need of 59 locomotives in the Kansas City area for switcher/local service. Locomotives to fill the daily switcher/local needs in Kansas City are filled from a pool with 128 locomotives currently assigned. Of the 128 locomotives in the pool, 68 locomotives (or 53%) have an auto start/stop technology applied.

Because specific locomotive assignments from this pool may change from day to day, it is difficult to estimate the percentage of auto-start/stop units being utilized in the Kansas City metro area on a given day. For example, in a snap shot view on 11/4/04 of the locomotives operating in Kansas City in switcher/local service, 74% were auto-start/stop equipped. Because 60 locomotives in the pool are not auto-start/stop equipped, it is theoretically possible that none of the 59 locomotives operating in the Kansas City metro area on a given day are auto start/stop equipped. However, the latter case is very unlikely. A reasonable and conservative estimate of the percentage of UPRR auto-start/stop equipped local/switcher locomotives operating in the Kansas City area at any given time would be 40%.

As for future voluntary emission reducing measures, UPRR's strategy is to acquire newer, cleaner locomotives while retiring older less fuel-efficient locomotives. Union Pacific Railroad currently operates the youngest fleets of locomotives in the United States. In addition, all new locomotive acquisitions will be

equipped with auto-start/stop technology. UPRR also plans to continue to retrofit existing locomotives with auto-start/stop equipment.

The entire UPRR locomotive fleet currently has over 7,000 locomotives of which nearly 25% are equipped with auto-start/stop equipment. The UPRR new locomotive acquisitions and auto-start/stop retrofit program are estimated to increase this percentage by 5% per year.

I trust this information will meet your needs. If you have any questions, don't hesitate to call me at 816-245-2881.

Sincerely,
UNION PACIFIC RAILROAD

Christi Hornick

Christi Hornick
Manager Environmental Field Operations.

CC: Lanny Schmid – UPRR – Omaha, Stop 1030
Jon Germer – UPRR – Omaha, Stop 1030
Rick Eades – UPRR – Omaha, Stop 1080
Pat Meriwether – Kansas City, MO
Joe Bussard – Kansas City, MO

# Public Health Department

Joseph M. Connor, Director

619 Ann Avenue
Kansas City, KS 66101-3099

Phone: (913) 321-4803
Fax: (913) 321-7932


April 27, 2004

Mr. James Joerke
Air Quality Manager
MARC
600 Broadway
Suite 300
Kansas City, Missouri 64105-1554

Dear Mr. Joreke,

The Wyandotte County Health Department of the Unified Government has been evaluating voluntary ozone reductions strategies for implementation by Health Department employees during the Ozone season this summer. The following are actions that we propose to implement in the near term:

Ozone Reduction Strategies for the Health Department Fleet/Employee Vehicles

Encourage tune up of vehicles prior to the hot summer months
Check for proper tire pressure in fleet vehicles prior to the ozone season and throughout
Supply tire pressure gauges to fleet drivers
Encourage refueling in the late afternoon, especially on ozone alert days
Discourage topping off of the gas tank during the ozone season
Inspect vehicles for fuel leakage periodically during the ozone season
Coordinate trips to minimize travel time
Discourage unnecessary idling
Reduce travel on alert days
Initiate program to check fleet and employee gas caps
Explore incentives for participating employees

Community/Employee Notification

Notify elementary schools, day care facilities, and elderly care facilities of ozone alert days by fax transmittal and provide information
Notify Unified Government Employees of ozone alert days by email and provide tips
Post notification outside of Air Quality Office on ozone alert days
Post notification in front lobby of Health Department on ozone alert days and provide information and tips to incoming public

Public Outreach and Education Activities

Assign ozone alert/public education coordinator
Annual summer billboard campaign to educate and offer tips
Charcoal chimney exchange program
Annual 4th grade poster contest to educate kids in the community
Develop and distribute 2005 air quality calendars
Educational outreach at community fairs

Other Strategies

Develop and distribute a list of ozone reductions tips and information on air pollution for Unified Government employees and the public
Encourage commute alternatives
Continue to work with the Unified Government on strategies
Implement building energy conservation measures

In addition to these measures, we will continue to explore actions we can take to reduce ozone and other pollutants in the Kansas City Metropolitan area and look forward to working with MARC in the future.

Sincerely,

Joe Connor, Director of Public Health

cc: Bruce Andersen, Director of Air Quality

## APPENDIX B - DOCUMENTATION[4] FOR CONTROL STRATEGY INFORMATION

***Voluntary Actions***

**Reductions in power plant emissions**

*Description*: This strategy refers to reductions in emissions from the La Cygne and Iatan coal-fired generating stations owned by Kansas City Power & Light (KCP&L), which the baseline modeling scenario assumed would remain uncontrolled in 2010. KCP&L is considering installing Selective Catalytic Reduction (SCR) $NO_x$ control equipment on one unit at La Cygne and one unit at Iatan in 2007-2008. Additionally, a new 800-900 MW coal-fired unit may be added near Iatan in 2009.

*Effectiveness*: During the ozone season (May 1 through September 30), reductions in $NO_x$ due to the installation of SCR at La Cygne and Iatan are estimated to be 9,142 tons and 3,056 tons, respectively (Eaton, 2004). This corresponds to **$NO_x$ reductions of 60 tpsd at LaCygne and 20 tpsd at Iatan**. The increases in emissions at Iatan due to the installation of a new 850 MW unit are estimated to be roughly **9 tpsd $NO_x$ and 2 tpsd VOC**.[5]

*Costs/Cost-Effectiveness:* Wang (2004) has estimated that costs of SCR on coal-fired utility boilers are **$1,100-$3,200/ton $NO_x$**. This is comparable but somewhat lower than information identified in a local newspaper (Fickett, 2004).[6]

---

[4] The control strategy information presented here is based on a review of readily available information, for purposes of identifying relative cost effectiveness on a preliminary basis. It does not include a formal review of all sources of information, includes several assumptions (which have been identified), and did not include an investigation into the differences in cost methodologies used by various information sources.

[5] Calculated based on an assumed heat input of (850 MW)(10 MMBtu/MW-hr) = 8500 MMBtu/hr for 24 hrs per summer day and emission factors entered into EPA's RACT/BACT/LAER Clearinghouse for an August 2003 permit of an 800 MW coal-fired boiler in Arkansas (Plum Point Energy), with a $NO_x$ emissions rate of 0.09 lb/MMBtu and a VOC emissions rate of 0.02 lb/MMBtu.

[6] The newspaper identified a capital cost of $300 million for the controls at Iatan, which are being estimated to result in approximately 20 * 365 = 7,300 tons per year of $NO_x$ reductions. If a capital cost recovery factor of 0.10 is assumed, the annualized capital cost is $30 million/year, or approximately $4,000/ton $NO_x$ removed; however, this figure does not include operation and maintenance (O&M) costs.

**Retrofits or replacements of buses**

*Description*: This control strategy would consist of encouraging the use of replacing 1-5% of the bus fleet (i.e., the older buses in the fleet), and/or retrofitting them with controls to reduce emissions.

*Effectiveness*: Diesel bus emissions will be decreased dramatically with the 2007 model year, which requires average $NO_x$ emissions to be approximately 0.6 g/mile.[7] By comparison, MOBILE6.2 assumes that most buses, 1997 and older have emissions of approximately 14 g/mile; therefore, emissions from the bus fleet in 2010 (which are 1.1 tpsd $NO_x$) will be dominated by the older buses. Because the bus fleet in 2010 will still consist predominantly of older-technology buses, replacement of 1-5% of the older fleet can be assumed to have the approximate effect of reducing the total bus emissions by 1-5%. This corresponds to emission reductions of **0.01-0.06 tpsd.**

*Costs/Cost-Effectiveness:* MOBILE6 assumes that on average, diesel school buses only accumulate approximately 10,000 miles per year, whereas transit buses accumulate approximately 45,000 miles per year at the beginning of their lifetime and less than 20,000 miles per year at the end of their lifetime (Jackson, 2001). The cost to retrofit a bus is substantially less than the cost of a new bus. However, retrofit technologies that can meet 2007 $NO_x$ emission standards are not widely available, and the full benefits of replacing old buses with new buses are not captured within environmental costing techniques. EPA has estimated that the cost-effectiveness of its 2007 $NO_x$ standards for new heavy-duty vehicles (including buses) are approximately **$2,000/ton $NO_x$ removed** (U.S. Environmental Protection Agency, 2000).

*Retrofits encouraged through voluntary partnership with ground freight industry*
$12,000 - $15,000/ton VOC + $NO_x$
The strategies include lean $NO_x$ catalyst, and selective catalytic reduction.
Source: Eastern Panhandle Region, WV Early Action Plan, Page 3-11

**Retrofits/replacement for construction equipment**

*Description*: This control strategy would consist of encouraging the use of replacing older off-road diesel engines (pre-1997) and/or retrofitting them with controls to reduce emissions. EPA phased in Tier 1 emission standards (requiring that $NO_x$ emissions be below 6.9 g/bhp-hr) in 1996-2000.

*Effectiveness*: Using EPA's NONROAD2004 model, 2010 emissions from construction equipment were 21 tpsd $NO_x$ and 2 tpsd VOC; of these emissions, 3.3 tpsd $NO_x$ and 0.6 tpsd VOC are from 1997 and older equipment. (It is estimated that of this older equipment, approximately 600 pieces will be relatively large; i.e., larger than 175 hp.) Replacing 1997 and older equipment with equipment meeting EPA's Tier 3 standards (which will start being effective as of 2006-2007) is expected to result in an emissions reduction of approximately 70%.[8] Thus, replacement of 1-5% of the older equipment with the new equipment will result in emissions reductions of approximately **0.02-0.12 tpsd**.

*Costs/Cost-Effectiveness:* Recent bids for funding for construction engine repowering were submitted to the South Coast Air Quality Management District (SCAQMD); accepted bids for construction-related equipment ranged from approximately **$4,000-$6,000/ton $NO_x$ removed** (based on five years of operation) (South Coast Air Quality Management District, 2004).

**Diesel truck idling reduction**

*Description*: This control strategy would diminish long duration diesel truck engine idling through truck stop electrification and/or the installation of onboard auxiliary power units (APUs).

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[7] This is based on a regulatory average NOx emissions requirement of 0.2 g NOx/bhp-hr and a conversion factor of approximately 3 bhp-hr/mi for diesel intercity and school buses (Browning, 1998); however, MOBILE6 shows this emission factor only applying for the 2010 model year, not 2007-2009.

*Effectiveness*: EPA has stated that long duration idling reduction measures should assume an emission factor of 135 g $NO_x$/hour per truck (U.S. Environmental Protection Agency, 2004a). Use of electrified truck stops essentially completely eliminates these emissions; California has assumed that APUs will have emissions of 29 g $NO_x$/hr per truck (California Air Resources Board, 2004). (VOC emissions are not significant.) Based on survey data and other information, the California Air Resources Board (CARB) assumed that truck stop space utilization was on average 20 hours/day and that while occupied, trucks idled for 70-90% of the time (California Air Resources Board, 2004). A quick internet survey (Pacific Customs Brokers Ltd., 2002) showed that there are at least 6 truck stops in the 8-county KCMA, and that the number of spots is likely to be at least 900 (see **Table A-1**). Total idling emissions from these spots are therefore estimated to be approximately 2 tpd.[9]

Table A-1. Truck stops in the 8-county area (not necessarily a complete list).

| County | Truck Stop | Company | # spaces |
|---|---|---|---|
| Jackson | Apple Trail | Independent | 100 |
| Jackson | Oak Grove | TA | 130 |
| Jackson | Kansas City | Flying J | 121 |
| Cass | Peculiar | Flying J | 165 |
| Jackson | Oak Grove | Petro Bros. | 305 |
| Clay | Kearney Truck Plaza | Ambest | (unknown) |

Two different levels of implementation were assessed: one corresponding to electrification of 100 spaces (which would correspond to **0.22 tpsd $NO_x$**) and one corresponding to electrification of 250 spaces (which would correspond to **0.56 tpsd $NO_x$**).

California assumed that no credit would be taken for APUs installed on in-state trucks for sleeping emissions, since these trucks are likely to travel interstate and sleep overnight outside the state (California Air Resources Board, 2004). Assuming 1% APU penetration and 5% APU penetration to trucks at truck stops in the KCMA area, the corresponding emissions reductions (based on the above information, estimating that APUs are 79% cleaner than the idling truck

[8] Based on emissions from older equipment of approximately 10 g/bhp-hr $NO_x$ and Tier 3 standards of 3.0 g/bhp-hr $NO_x$+VOC (for engines between 100 and 750 hp).
[9] (900 spots)(20 hrs/summer day/spot)(0.80)(135 g/hr)(1 lb/453.6 g)(1 ton/2000 lb) = 2 tpsd.

engines) would be **0.016 tpsd and 0.08 tpsd**, respectively. However, it should be noted that the majority of the trucks at these truck stops are not likely to be registered in the KCMA area.

In SIPs, EPA limits creditable emission reductions from idling controls to 3.4% of the Class 8 truck SIP emissions inventory (U.S. Environmental Protection Agency, 2004a). In the 8-county KCMA, this limit corresponds to 228 TPY[10] or 0.62 tpsd; therefore, all of the abovementioned reductions would be creditable.

*Costs/cost-effectiveness:* Installation costs vary; some electrification companies incorporate installation costs into an hourly usage fee (at least one company, IdleAire Technologies Corporation, has mentioned hourly fees of between $1.25 and $1.50/hour) (U.S. Environmental Protection Agency, 2004b). For purposes of an Early Action Compact (EAC) being developed in West Virginia, Chan et al. (Eastern Panhandle Air Quality Task Force, 2004) cited estimated costs of **$1,700/ton $NO_x$ removed for truck stop electrification**. That EAC also concluded that the **cost-effectiveness of APU usage for idling reduction would be $45,000/ton ($NO_x$ + VOC) removed**.

**Idling reduction technologies for switch yard locomotives (SYLs)**

*Description*: SYLs are designed or used solely for the purpose of propelling railroad cars a short distance within a confined area. They usually idle their engines when not in use, and they idle for a variety of reasons, such as maintaining engine operating temperature during cold weather, being immediately available, preventing start-up engine damage, and maintaining air brake pressure. Overall, idling represents approximately 60% of the SYL duty cycle.[11] SYL idling emissions can be reduced through the use of an auxiliary power unit (APU), which automatically shuts down the main locomotive engine idle while maintaining all vital main engine systems at greatly reduced fuel consumption. For this measure, assumptions of 1-5% total SYL emissions reduction is being assumed (which corresponds to a somewhat greater

[10] Calculated by STI, based on MOBILE6 emission factors for Class 8A and Class 8B trucks and calculating VMT based on factors in the MOBILE6.2 user's guide, Appendix D.
[11] 69 FR 39282, June 29, 2004.

percentage of SYLs equipped with APUs, given that 40% of the SYL duty cycle is not idling and at a higher emissions rate).

*Effectiveness*: EPA guidance identifies SYL long-duration idling $NO_x$ emission factors of 620 g/hr for 4-stroke engines and 800 g/hr for 2-stroke engines, and provides an example of APU emissions being 71 g/hr (since these are approximately only 10% of the locomotive emissions, they are being neglected for purposes of these calculations) (U.S. Environmental Protection Agency, 2004c). Both this guidance and estimates by an APU vendor (EcoTrans Technologies, 2001) use examples of 8 hrs/day of reductions.

Locomotive counts are not available for Kansas City, but total annual SYL emissions were calculated by STI to be 6.5 tpsd. A 1-5% emissions reduction is therefore **0.07-0.33 tpsd $NO_x$**.

*Costs/Cost-Effectiveness:* The Metropolitan Washington Council of Governments (Metropolitan Washington Council of Governments, 2004) has estimated that the cost-effectiveness of APUs at switchyards is **$750-1,250/ton $NO_x$**, although this was based on $NO_x$ reductions during the winter.

**Public Education and Government/Institutional Ozone Programs.**

*Description*: MARC sponsors an ongoing regional ozone action program to discourage vehicle use during days when high ozone is predicted. The program involves timely air quality forecasting, public outreach, and participation of critical area employers. Local governments and businesses play a significant role in urging their employees to reduce driving and other polluting activities on Ozone Alert days. Many employers offer incentives to their employees on episode days to encourage carpooling, use of public transit, and/or telecommuting.

*Effectiveness:* One regional ozone alert program, Sacramento's Spare the Air, has estimated that in 2003, emission reductions from their Spare-the-Air program were 1% of total VOC and $NO_x$ emissions from light-duty and medium-duty vehicles, and that an expanded program would

reduce emissions by 2.3% in 2010 (Sacramento Metropolitan Air Quality Management District, 2003). STI has used EPA's MOBILE6.2 model to estimate that in 2010, light-duty vehicle emissions in the KCMA will be 48.3 tpd of VOC and 37.4 tpd of $NO_x$. Therefore, a program that obtains 1% reductions will yield **0.48 tpd of VOC reductions and 0.37 tpd of $NO_x$ emissions**; a program that obtains 2.3% reductions will yield **1.1 tpd of VOC reductions and 0.86 tpd of $NO_x$ emissions**.

*Costs/Cost-Effectiveness:* Sacramento (Sacramento Metropolitan Air Quality Management District, 2003) has estimated a cost effectiveness of **$4,800 per ton of ($NO_x$ + VOC)** for their current Spare-the-Air program. The estimate was arrived at by multiplying the current paid advertising cost per Spare-the-Air day by the number of Spare-the-Air days per year, combined with the cost of public transit incentives ($3.50 per transit ticket).

**Lawnmower usage reduction**

*Description*: This measure would reduce gasoline-fueled lawnmower usage by encouraging native landscaping (i.e., landscaping that doesn't require mowing) and/or trade-ins of old lawnmowers for electric lawnmowers or new lawnmowers. An evaluation of the replacement or discontinued use of 500-5,000 mowers was assumed in this analysis.

*Effectiveness*: EPA's NONROAD2004 model estimates that there will be approximately 297,000 lawnmowers in the KCMA area by 2010 and that on an average summer day,[12] emissions are 2.7 tpsd VOC and 0.2 tpsd $NO_x$. The emissions associated with replacing the need for 1-5% of these mowers (through either native landscaping or replacement with electric mowers) is therefore **0.03-0.14 tpsd VOC** (with $NO_x$ reductions being negligible).

*Costs/Cost-Effectiveness:* Lawn mower buyback program - **$10,000/ton VOC.** EPA's NONROAD model indicates that individual residential lawnmowers have a useful life of approximately six years and emit 7 lbs/year-mower on average. Assuming a capital recovery factor of 0.2 (corresponding to six years at a 6% rate of return) and a cost of $180 per electric

[12] Weighted average of weekday and weekend emissions.

mower yields an annual cost of $36 per year-mower. Therefore, it would cost about $10,000 to reduce annual VOC emissions from lawnmowers by one ton.

***Regulatory Actions***

**Remote-sensing-based "dirty screen" program**

*Description*: This program would be a regulatory requirement that utilizes stationary vans with remote sensing devices (RSDs) to detect high-polluting vehicles. The aggressive assumption is that these vehicles would then be subjected to a vehicle inspection & maintenance (I&M) program. The conservative assumption is that drivers would voluntarily have their vehicles repaired.

*Effectiveness*: Effectiveness depends on how "high-polluting" is defined and how many monitors are used to determine this status. Virginia DEQ recently sponsored an extensive remote sensing study (Klausmeier and McClintock, 2003) and estimated that in calendar year 2010, a "dirty screen" RSD program requiring I&M for dirty vehicles would result in approximately 50% as many emission reductions (VOC+$NO_x$ combined) as an enhanced (dynamometer-based) I&M program (Virginia Department of Environmental Quality, 2003).[13] However, Virginia already has a testing infrastructure in place, including dynamometers at test centers, whereas Kansas City does not. Previous studies have indicated that the program effectiveness would be reduced by approximately half[14]. Therefore, for purposes of the aggressive assumption, STI assumed that the program effectiveness for VOC and $NO_x$ (individually) would be 25% of that estimated for an enhanced I&M program.[15] This resulted in emission reductions of **<u>0.8 tons per summer day (tpsd) VOC and 0.8 tpsd $NO_x$</u>** relative to the 2010 base case.

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[13] The value of 50% corresponds to only using RSDs to screen all vehicles. (Virginia estimated that if, in 2010, all 1996 and newer vehicles with on-board diagnostics (OBD) were required to be subjected to I&M and the "dirty screen" was only used for older vehicles, the effectiveness of that program would be 90% of that for the standard I&M program.)

[14] 40 CFR Part 51, November 1992.

[15] Detailed I&M data were not readily available for Virginia's I&M program; STI used EPA's MOBILE6 model to estimate the effectiveness of a similar I&M program in Harris County, Texas and found that reductions associated with that program in the Kansas City area would be 3.1 tpd VOC and 3.2 tpd $NO_x$.

Given that voluntary reductions in travel during high-ozone days only result in 1-2.3% emission reductions, it seems likely that no more than 1% of people would voluntarily take their car in for repairs if it was sensed as "dirty." This corresponds to emission reductions of **0.08 tons per summer day (tpsd) VOC and 0.08 tpsd $NO_x$.**

*Costs/Cost-Effectiveness:* Virginia DEQ (Virginia Department of Environmental Quality, 2003) estimated that the cost-effectiveness for a 50% effective "dirty screen" program would be approximately $4,000/ton (VOC+$NO_x$) reduced in 2005, dropping to $3,000/ton in 2010. As mentioned above, the program effectiveness is being discounted by another 50% to account for the fact that Kansas City does not have a testing infrastructure in place. If it is assumed that costs are approximately the same for a Kansas City program as for a Virginia program, the cost-effectiveness of a program involving mandatory repair in Kansas City could be estimated as being **$6,000-$8,000/ton (VOC+$NO_x$) removed**. (These values would likely be two orders of magnitude higher for a voluntary program, since the costs of monitoring would still be present, but the number of reductions would be much lower.)

**Gas cap program**

*Description*: This program would be a regulatory requirement that requires gas caps to be pressure tested annually and replaced if faulty.

*Effectiveness*: EPA's MOBILE6 model includes a subroutine for estimating the effectiveness of this program. For the Kansas City area during the 2010 ozone season, an emission reduction of **0.8 tpsd VOC** was calculated, relative to the 2010 base case.

*Costs/Cost-Effectiveness:* Costs would be much less in Missouri (where the gas cap inspection could be incorporated into existing safety inspections) than in Kansas (where there is no such inspection program). A $100,000 gas cap program was instituted in Denver (which already has an I&M program) that was assumed to have an emissions benefit of approximately 750 lb/day (0.4 tons/day) VOC (Regional Air Quality Council, 2001). Dividing the cited cost by the

emission reductions results in a cost-effectiveness of approximately **$700/ton**; however, there are several assumptions built into this. First, because the program involved a rebate for gas caps (rather than the full price), costs to the consumer may not have been included in this figure. Second, it is being assumed that the 0.4 tons/day is appropriate for all days of interest. Third, this methodology assumes that the improvement due to the gas cap replacement only lasts for one year. More detailed information for gas cap replacement program costs and effectiveness were not readily available.

**Establish RACT rules for non-utility sources of $NO_x$**

*Description*: EPA's $NO_x$ SIP call requires substantial reductions in NOx emissions from existing utility boilers and large reciprocating (diesel) engines. However, in Kansas City, there are currently no control requirements for existing industrial stationary sources of $NO_x$—e.g., boilers, reciprocating engines, and/or other industrial sources. Regulations for such sources to apply "Reasonably Available Control Technology" (RACT) were passed in many other states in the early to mid 1990s (EC/R Incorporated, 1995); at that time, "reasonable" was interpreted as corresponding to a cost-effectiveness of approximately $2,000/ton $NO_x$ or less (Berry, 1994). RACT measures can include annual emissions testing/tuning, installation of flue gas recirculation (FGR) systems, injection of water and/or ammonia, or the installation of catalysts.

*Effectiveness*: The effectiveness of this program would depend on the definition and applicability of the regulations, as well as the emission inventory. The current 2010 inventory includes approximately 193 tpsd $NO_x$ from utility boilers and 52 tpsd $NO_x$ from smaller stationary sources (23 tpsd from "point" sources—i.e., those which are tracked individually by the regulatory agencies—and an estimated 29 tpsd from area sources that are not individually tracked, including 4 tpsd from residential heating units).[16] Emissions from the smaller stationary sources are attributed primarily to boilers (25 tpsd) and miscellaneous industrial sources (19

[16] STI attempted to estimate the population of smaller $NO_x$ sources based on data from the Pittsburgh, Pennsylvania area (which tracks smaller sources); however, relatively few $NO_x$ sources were included in the Pittsburgh database—i.e., not enough to draw broad conclusions other than to confirm a hypothesis that facility-scale emissions tend to follow a lognormal distribution (very few facilities at the high-emitting tail of the distribution and the bulk of the population of the facilities at the low-emitting centroid of the distribution).

tpsd), with smaller contributions from reciprocating internal combustion engines (8 tpsd) and a negligible contribution from turbines (0.1 tpsd).

EPA's control techniques document for industrial, commercial, and institutional (ICI) boilers (U.S. Environmental Protection Agency, 1994a) has estimated that noncatalytic $NO_x$ RACT controls could be reasonably cost-effective for small boilers, although control efficiencies vary widely. It is known the largest of the industrial $NO_x$ point sources (a cement kiln, with projected 2010 emissions of 2.8 tpsd) was dedicated in 2002 and applies the latest, most efficient technology (preheater, precalciner, long dry kiln); therefore $NO_x$ RACT would likely not affect this source (Prokopy, 2002). Another large industrial source in the area (projected 2010 emissions of 6.2 tpsd) is a flat glass melting furnace, and EPA's control technology document for this source type has estimated that reasonably available $NO_x$ controls (costing approximately $1,000-$2,000 per ton $NO_x$ removed) could control up to 75-85% of the uncontrolled $NO_x$ emissions from this source (U.S. Environmental Protection Agency, 1994b). However, STI did not have specific information with respect to local sources that may already have applied controls.

Given the lack of specific information available for non-utility $NO_x$ sources in the Kansas City region, as well as identification of a specific RACT program, a precise estimate of the effectiveness $NO_x$ RACT regulations cannot be determined. However, $NO_x$ RACT regulations promulgated in Houston, Texas for industrial boilers and rich-burn reciprocating engines have been estimated as reducing the point source inventory of industrial boilers and IC engines by approximately 20% (Texas Natural Resource Conservation Commission, 1998). Applying this percentage to the non-utility point source inventory in Kansas City results in a reduction of approximately **5 tpsd**.

*Costs/Cost-Effectiveness:* Overall, as noted above, the cost-effectiveness is expected to be on the order of **$2,000/ton $NO_x$ or less**, although costs for individual installations will vary.

**Extend VOC RACT rules**

*Description*: Both Kansas and Missouri already require some existing VOC sources in the 5-county area (Clay, Jackson, Johnson, Platte, Wyandotte) to apply Reasonably Available Control Technology (RACT); due to the very large number of VOC source types, this information is shown in more detail in a separate document.[17] However, these regulations could be applied to other counties nearby, and there are additional VOC sources for which RACT rules do not currently exist; RACT requirements could be made more stringent.

*Effectiveness*: As with $NO_x$ RACT, the effectiveness of this program would depend on the definition and applicability of the regulations, as well as the emission inventory. The 2010 emission inventory estimates that 140 tpsd of VOC will be emitted by stationary sources in the 8-county area, but only 28 tpsd will be from point sources that are tracked individually by the regulatory agencies; based on information in the existing point source inventory (which includes facilities with emissions of 40 TPY and above), STI estimated that the emissions reductions associated with lowering RACT applicability thresholds for point sources from 100 TPY to 50 TPY would probably be small (e.g., 0.1-0.3 tpsd). The two largest VOC sources, owned by GM and Ford, are likely to be subject to more stringent Maximum Achievable Control Technology (MACT) standards for surface coating of automobiles and light-duty trucks, which will apply to existing sources beginning in 2007.

Of the area source emissions, approximately 35 tpsd are due to surface coating. The VOC content of miscellaneous metal parts coaters is regulated in Kansas City for any facility with a potential to emit more than 3 TPY VOC. However, the South Coast Air Quality Management District (SCAQMD) has regulated the VOC content of some of these coatings (e.g., those for coating paper, and metal coils) to levels that are approximately 20-40% more stringent than the Kansas City limits. Based on this information, it should be feasible for Kansas City to obtain at least **1 tpsd** of reductions from making VOC RACT rules more stringent. Although it is recognized that Kansas City may not want to have regulations that are as stringent as California's, VOC RACT reductions may be possible in sources other than surface coating.

[17] See the accompanying spreadsheet RACT_Applicability.xls.

Examples of more stringent VOC RACT requirements in nine states have been summarized by Pacific Environmental Services (Tedijanto and LaFlam, 1995).

*Costs/Cost-Effectiveness:* Given that the majority of stationary source VOC emissions are estimated to be emitted from sources that are not tracked, and have not been tested, cost-effectiveness is difficult to estimate. EPA guidance for VOC RACT has typically identified a cost-effectiveness threshold of approximately **$2,000/ton VOC removed**; however, more stringent controls are likely to have higher costs per ton of VOC removed.

**Reformulated Gasoline (RFG)**

*Description*: This program would be a regulatory requirement that gasoline sold in Kansas City be reformulated in accordance with Federal standards (40 CFR 80, Subpart D). [Note, however, that Section 211(k)(6)(A) of the Clean Air Act prevents attainment areas from opting into the Federal RFG program, and Section 211(c)(4) limits the ability of States or localities to prescribe any type of gasoline controls unless they are justified to EPA as being necessary to achieve air quality standards. As a result, previous attempts by the governors of Kansas and Missouri to opt Kansas City into the RFG program have been unsuccessful (Missouri Air Conservation Commission, 2002).]

*Effectiveness*: EPA's MOBILE6 model includes a subroutine for estimating the effectiveness of RFG. For the Kansas City area during the 2010 ozone season, an emission reduction of **3.1 tpsd VOC** was calculated, relative to the 2010 base case. A slight **increase in emissions of $NO_x$ (0.3 tpsd**) was also calculated by the model.

*Costs/Cost-Effectiveness:* Wang (2004) notes that RFG cost-effectiveness estimated by three studies has ranged from $7,000 per ton of pollutants (VOC+$NO_x$) removed to $64,600 per ton of pollutants (VOC+$NO_x$) removed. Several evaluations of RFG cost-effectiveness have been based on comparisons of RFG to conventional gasoline, rather than comparisons of RFG to the low-volatility gasoline sold in Kansas City. In the past, EPA has estimated RFG costs as being

approximately 4-8 cents per gallon (Perciasepe, 2000), although API has noted that costs could be significantly impacted by various potential future regulatory factors (i.e., whether RFG will continue to be required to contain oxygenates, and whether certain oxygenates will be banned) (Wiese, 2003).

As a benchmark, however, the EPA estimates a cost-effectiveness of approximately **$5,000 per ton of VOC removed** (Indiana Department of Environmental Management, 1998).

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# APPENDIX C – KANSAS CITY AREA RACT RULES

**RACT Applicability**

| Regulation | | Applicability | | | | | |
|---|---|---|---|---|---|---|---|
| **Number** | **Name** | **Facilities** | **Quantity** | **Basis** | **Exemptions** | **Area** | **Cross-reference** |
| 10 CSR 10-2.205 | Control of Emissions From Aerospace Manufacture and Rework Facilities | aerospace manufacture and rework facilities | VOC > 25 TPY | potential | (3)(K) | Platte, Clay, Jackson | |
| 10 CSR 10-2.210 | Control of Emissions From Solvent Metal Cleaning | all installations which emit VOC from solvent metal cleaning or degreasing operations; all processes which use cold cleaners, open-top vapor degreasers or conveyed degreasers, using nonaqueous solvents to clean and remove soils from metal surfaces | > 5 gallons sold (for cold cleaners) | - | (3)(B)1.C. | Platte, Clay, Jackson | KAR 28-19-714 |
| 10 CSR 10-2.215 | Control of Emissions from Solvent Cleanup Operations | any person who performs or allows the performance of any cleaning operation involving the use of a VOC solvent or solvent solution | VOC >= 500 lbs/day | actual | Operations regulated by 10-2.210; | Platte, Clay, Jackson | KAR 28-19-714 |
| 10 CSR 10-2.220 | Liquefied Cutback Asphalt Paving Restricted | cutback asphalt paving operations | all | - | filling potholes and emergency repair; asphalt | Platte, Clay, Jackson | KAR 28-19-69 |
| 10 CSR 10-2.230 | Control of Emissions From Industrial Surface Coating Operations | industrial surface coating | VOC > 2.7 TPY or 6.8 kg/day | uncontrolled potential | exterior refinishing of airplanes; | Platte, Clay, Jackson | KAR 28-19-63 |
| 10 CSR 10-2.260 | Control of Petroleum Liquid Storage, Loading and Transfer | petroleum storage tanks | > 40,000 gal tank | - | (3)(D) | Platte, Clay, Jackson | KAR 28-19-65; KAR 28-19-66 |
| | | loading of gasoline onto delivery vessels | > 120,000 gal | average monthly throughput | - | Platte, Clay, Jackson | KAR 28-19-64 |
| | | transfer of gasoline from delivery vessels into stationary storage containers | transfer to tank > 250 gal | - | storage tanks having a capacity <= | Platte, Clay, Jackson | KAR 28-19-72 |
| 10 CSR 10-2.290 | Control of Emissions From Rotogravure and Flexographic Printing Facilities | rotogravure and flexographic printing presses | VOC > 100 TPY or 250 kg/day | uncontrolled potential | none | Platte, Clay, Jackson | KAR 28-19-71 |
| 10 CSR 10-2.300 | Control of Emissions From the Manufacturing of Paints, Varnishes, Laquers, Enamels and Other Allied | Manufacturing of Paints, Varnishes, Laquers, Enamels and Other Allied Surface Coating Products | VOC > 100 TPY or 250 kg/day | uncontrolled potential | none | Platte, Clay, Jackson | |
| 10 CSR 10-2.310 | Control of Emissions From the Application of Automotive Underbody Deadeners | application of underbody deadeners | VOC > 100 TPY or 250 kg/day | uncontrolled potential | none | Platte, Clay, Jackson | |
| 10 CSR 10-2.320 | Control of Emissions From Production of Pesticides and Herbicides | pesticide or herbicide manufacturing installations | VOC > 100 TPY or 250 kg/day | uncontrolled potential | none | Platte, Clay, Jackson | |
| 10 CSR 10-2.340 | Control of Emissions From Lithographic Printing Installations | lithographic printing facilities | see (1)(B) | see (1)(B) | printing on fabric, metal, or plastic; sheet- | Platte, Clay, Jackson | KAR 28-19-76 |
| 10 CSR 10-2.360 | Control of Emissions From Bakery Ovens | large commercial bakeries | VOC > 100 TPY | potential | none | Platte, Clay, Jackson | KAR 28-19-717 |
| KAR 28-19-63 | Automobile and light duty truck surface coating | auto surface coating | VOC > 3 TPY | potential | none | areas which have been identified as | 10 CSR 10-2.230 |
| KAR 28-19-64 | Bulk gasoline terminals | bulk gasoline terminals | >= 20,000 gal daily throughput | - | none | areas which have been identified as | 10 CSR 10-2.260 |
| KAR 28-19-65 | Volatile organic compounds (VOC) liquid storage in permanent fixed roof type tanks | fixed roof liquid storage tanks | > 40,000 gal tank | - | none | areas which have been identified as | 10 CSR 10-2.260 |
| KAR 28-19-66 | Volatile organic compounds (VOC) liquid storage in external floating roof tanks | floating roof liquid storage | > 40,000 gal tank | - | (d) | areas which have been identified as | 10 CSR 10-2.260 |
| KAR 28-19-67 | Petroleum refineries | vacuum producing systems, wastewater separators, and turn-around operations at petroleum refineries | all | - | none | areas which have been identified as | |
| KAR 28-19-68 | Leaks from petroleum refinery equipment | leaks from seals, valves, connections, etc. | VOC > 10,000 ppm; 15 days | - | none | areas which have been identified as | |
| KAR 28-19-69 | Cutback asphalt | use or application of cutback asphalt | all | - | filling potholes and emergency repair; asphalt | areas which have been identified as | 10 CSR 10-2.220 |
| KAR 28-19-71 | Printing Operations | packaging and publication rotogravure and flexographic printing | VOC > 100 TPY | potential | none | areas which have been identified as | 10 CSR 10-2.290 |
| KAR 28-19-72 | Gasoline dispensing facilities | really applies to stationary storage containers | (a) > 2000 gal; (b) > 250 gal | - | none | areas which have been identified as | 10 CSR 10-2.260 |
| KAR 28-19-73 | Surface coating of miscellaneous metal parts and products and metal furniture | each metal parts and products and metal furniture coating application system | VOC > 3 TPY | facility-wide potential | autos and light trucks; metal cans; custom | areas which have been identified as | 10 CSR 10-2.230 |
| KAR 28-19-74 | Wool fiberglass manufacturing | wool fiberglass manufacturing | VOC > 100 TPY | facility-wide potential | none | areas which have been identified as | |
| KAR 28-19-76 | Lithography printing operations | Lithography printing operations | VOC > 100 TPY | potential; see (h) | printing on fabric, metal, or plastic; sheet- | areas which have been identified as | 10 CSR 10-2.340 |
| KAR 28-19-77 | Chemical processing facilities that operate alcohol plants or liquid detergent plants | facities that use, produce, or store ethanol or methanol | VOC > 100 TPY | sum of all ptotential from point | none | areas which have been identified as | |
| KAR 28-19-714 | Solvent metal cleaning | cold cleaning, open-top vapor degreasing, and conveyerized degreasing operations | > 5 gallons sold (for cold cleaners) | - | (c)(13) | Johnson, Wyandotte | 10 CSR 10-2.210 |
| KAR 28-19-717 | Control of volatile organic compound (VOC) emissions from commercial bakery ovens in Johnson and Wyandotte | commercial bakery oven facilities | VOC > 100 TPY | potential | none | Johnson, Wyandotte | 10 CSR 10-2.360 |

# APPENDIX D – COMMENTS FROM SEPTEMBER 2004 REGIONAL AIR QUALITY WORKSHOP

On September 10, 2004, over 175 area stakeholders met at the Sylvester Powell, Jr. Community Center in Mission, Kansas, to discuss strategies for protecting air quality in the Kansas City region. Participants were divided into 16 groups, and facilitators led each group through a discussion of voluntary and regulatory strategies for reducing ozone precursor emissions from cars and trucks, commercial and household solvent use, and large industrial sources. The following is a summary of comments the Mid-America Regional Council received in these discussions.

## FUELS AND VEHICLE EMISSION CONTROLS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Full emissions testing program (I/M 240) | Significant emissions reduction<br>Cost effective<br>Becomes routine behavior<br>Broad-based population<br>Targets vehicles with emissions problems<br>Spreads responsibility<br>Remote sensing possible to clean screen or identify dirty vehicles<br>State of MO already used to safety inspections<br>Modified program will likely be more successful (e.g. combine with gas cap testing)<br>Increased vehicle quality – better gas mileage<br>Ongoing and self-sustaining<br>Establishes a new industry<br>Measurable reductions | Politically unpopular<br>Politically unlikely<br>Implementation difficulties and delays<br>Potential for repair delays<br>Lower-income groups are hardest hit<br>Fairness issue with exemptions<br>Requires bi-state legislation<br>High up-front costs<br>Inconvenience for public<br>KS has no inspection program<br>Possible to avoid testing<br>Fraud – disreputable inspection stations<br>New vehicles don't need testing |
| Stage II Vapor Recovery at the gas pump | Large initial emissions reduction (VOC and HAPs)<br>Convenient for consumers<br>Equitable<br>No need for a consumer behavior change<br>Helps older cars without onboard Stage II<br>Technology available<br>Reduces human exposure to vapors and carcinogens<br>Can be used with a Vaporsaver<br>An increase in fuel costs could cause a decrease in VMT | Increased costs (administrative and enforcement)<br>High cost/ton reduction<br>Cost-prohibitive for smaller businesses<br>Declining return on investment<br>Not as effective as onboard vapor recovery systems<br>Unpopular with gas suppliers<br>Need to change pumps – labor and money costs<br>Positive pressure in tank can lead to fuel spills<br>Greater chance of fuel spills at vehicle<br>Onboard systems make it almost obsolete<br>People dislike awkward hoses |

## FUELS AND VEHICLE EMISSION CONTROLS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Stage II Vapor Recovery w/time-of-day pricing | • Strong signal to consumers for best fueling times<br>• Time-of-day can stand on its own<br>• Could fund conservation efforts<br>• Doable if mandated<br>• No infrastructure costs | • Need to constantly change prices<br>• Unfairness to consumers regarding when to refuel<br>• Potential class-action lawsuit |
| Reformulated gasoline (RFG) ***would replace lower RVP*** | • Invisible to consumers<br>• Significant emissions reduction potential<br>• Equitable<br>• Could include ethanol to help agricultural industry<br>• HAP benefits for consumers/workers<br>• Could work if formula is simplified | • Availability – refineries are already at capacity and heavily regulated<br>• Fuel islands created – could jeopardize supplies<br>• More expensive<br>• Not available legally<br>• MTBE content |
| More aggressive promotion of alt fuel vehicles (including hybrid-electric) | • Low cost to promote<br>• Tax credits – pro for states<br>• Improves AQ<br>• Supports local economies<br>• Agricultural promotion<br>• Lower fuel costs and needs – H/E vehicles<br>• East of operation<br>• Encourages hydrogen research<br>• Creation of new jobs and technologies<br>• Both public and private sectors could adopt policies<br>• Popular with consumers<br>• Politically popular<br>• More sustainable<br>• Decreased maintenance needs<br>• Johnson Co. has many of these vehicles | • Tax credits – locals<br>• Refueling availability<br>• Initially higher vehicle costs<br>• Voluntary nature won't necessarily lead to AQ gains<br>• Limited availability of maintenance for these vehicles<br>• Slow implementation<br>• Difficulty measuring progress<br>• Battery disposal issues<br>• True manufacturing costs hidden by tax credits<br>• Production and technology in infancy<br>• Unknown/unproven life-cycle costs<br>• Very long-term solution |

## FUELS AND VEHICLE EMISSION CONTROLS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Gas cap replacement | • Link with safety inspections<br>• Immediate savings and AQ benefits<br>• Low cost to consumers<br>• Significant emissions reduction potential<br>• Could include off-road and lawn/garden vehicles<br>• Low cost/ton – cost effective<br>• Simple | • Finding sponsors to underwrite cost and distribute<br>• Voluntary nature may reduce benefits<br>• Difficult to measure benefits<br>• Time-consuming for operator |
| Require emissions testing for vehicle title transfer | • Addresses problem and puts responsibility where it belongs | • Discriminates against lower-income groups<br>• Raises cost of non-private vehicle sales |
| Vehicle repair/replacement for low income owners in conj. W/ | • Targets high emitters<br>• Significant emissions reduction potential<br>• Sponsors available for advertising value<br>• High benefit/cost ratio<br>• Helps small repair businesses<br>• Already implemented<br>• Benefits lower-income groups<br>• Could combine with emissions testing | • Requires subsidy for lower-income groups<br>• Repair caps diminish AQ benefits<br>• Must ensure vehicle is crushed – SW problems, fraud<br>• Unpredictable benefits<br>• Difficult to administer<br>• Legal implications<br>• Keeps older on road longer<br>• Very expensive |
| **LONG TERM ACTIONS** | | |
| Promote production and use of regional alternative fuels | • Value added to agriculture<br>• Creates consumer choices<br>• Allows competitive market<br>• Economic development<br>• Renewable fuels<br>• Waste – product synergy potential<br>• Less reliance on foreign fuel<br>• Already being promoted as an oxygenator | • Cost – subsidies needed<br>• Increased volatility – ethanol may increase VOCs while biodiesel may increase NOx<br>• Production process not perfected<br>• Lack of regulatory controls<br>• Impacts highway money for roads |
| Advanced electric and hybrid technologies | • Less fossil fuel dependence<br>• Creates new economies<br>• Significant emissions reduction potential<br>• Transparent/seamless | • May require lifestyle changes<br>• Unknown byproducts<br>• Needs to be market-driven<br>• Cost |

## FUELS AND VEHICLE EMISSION CONTROLS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Fuel cell technologies | • See H/E list<br>• Longer term planning and development<br>• Potential for local auto manufacturer partnership | • Long implementation, fleet turnover<br>• Consumer perception of performance limits |
| Zero emission vehicles | • See above | • See above |
| Increase the tree canopy along roadways & parking lots | • Aesthetically pleasing<br>• Comfort of consumers<br>• Habitat<br>• Increased property values<br>• Noise benefits<br>• Wind barriers<br>• Erosion, stormwater management benefits<br>• Could use native landscaping<br>• Could keep urban core temperatures down | • Unknown AQ benefits<br>• Maintenance and upkeep needed<br>• Safety with storms<br>• Trees don't grow everywhere<br>• Increased habitat could lead to number and severity of auto accidents<br>• Cost effective? |

## ON-ROAD VEHICLE OPERATIONS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Double speeding fines on ozone alert days | • Revenue generating?<br>• Good idea if reflective of strategy (7am-7pm) | • Enforcement times<br>• Money to staff process (police – courts)<br>• Difficulty of adequately informing public of an Ozone Alert<br>• What if driver is in construction zone on an Ozone Alert day? |
| Enhanced enforcement of speed limits | • Safety | • Not realistic<br>• Cost |
| Reduce regional highway speeds to 55 mph | • Possible increase in use of arterial roads<br>• Need HOV lanes | • Need for all states to adopt speed reduction<br>• Hard to quantify reductions<br>• Cars most efficient at 60 mph<br>• Take too much enforcement<br>• Questionable on safety |
| Reduce regional highway speeds by 5 mph | | |
| Institute surcharges on parking to encourage transit/carpooling | • Need incentives<br>• Makes people aware there's a problem | • Could cause parking problems<br>• PR issue causing adverse effects<br>• Penalizes single user that must drive during day<br>• Minimal transit options<br>• People more likely to pay additional fee than use transit<br>• Needs pilot tests |
| Promulgate and enforce anti-idling rules | • Resources available to make happen<br>• Able to specify accountability<br>• Less noise and odor<br>• Health benefits<br>• Idling fee could used at drive-thrus<br>• Needs to extend to school buses and fleet vehicles<br>• Could also do adopt-a-bus program to convert to natural gas<br>• Could be enforced only on Ozone Days | • Difficult to enforce<br>• Truckers may refuse the state |

## ON-ROAD VEHICLE OPERATIONS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Truck stop electrification | • Less noise<br>• Health benefits<br>• Measurable AQ benefits<br>• CMAQ eligible funding? | • Difficult to enforce<br>• Availability<br>• Cost per unit – who pays?<br>• Electrification needs to be at truck stops, not rest stops |
| **LONG TERM ACTIONS** | | |
| Operation Green Light, Phase II | • Cost-effective<br>• Reducing idling<br>• Reduce road-rage<br>• Reduce speeding<br>• Significant AQ benefits<br>• Federal funding available<br>• Standardization among municipalities<br>• Efficiency outweighs negative | • Costs – setup and maintenance<br>• Long time to implement<br>• Makes other transportation less enticing<br>• Needs more outreach to affect driver behavior |
| Expansion of transit services throughout the region | • Personal cost<br>• Fewer vehicles = less pollution<br>• Good personal time<br>• Greater mobility<br>• Less congestion<br>• Transit subsidies (employers)<br>• Encourage regional communication<br>• Dependable (more convenient in bad weather) | • Cost<br>• Time to implement<br>• Public perception<br>• Hard sell in KC<br>• Availability<br>• Less personal time |
| Implementation of regional trails and greenway plans | • Reduced traffic will lead to better AQ and better health<br>• Encourages multi-modal transportation<br>• Transportation integrated with planning | • Not always built around commerce (just recreational)<br>• Infrastructure (lockers, racks) not always available<br>• Trails not all connected<br>• Education—how to support lifestyles |
| Smart highways | • Better traffic flow<br>• Cost efficient<br>• Car companies already using similar technology<br>• Encourages collaboration among governments<br>• Money available | • Cost (capital and maintenance)<br>• Education and buy-in by public<br>• Dependability |

## FLEET OPERATIONS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Benchmarks for emissions reductions | • Proven/feasible tool<br>• Expansion of the use of hybrid/alternative fuel vehicles<br>• Flexible – pick best strategy for fleet<br>• Most cost effective<br>• If fleets do it, then individuals more likely to participate<br>• Provide tax incentive for large fleets<br>• Need for standard measure<br>• Work with manufacturers to ensure engines are as efficient as possible | • Difficult to quantify in terms of AQ benefits<br>• Difficult to track – who keeps track of fleet?<br>• Should include emissions testing<br>• Need to lobby at federal level<br>• Fairly widespread already, so benchmarking may not provide large benefits<br>• Not enough information available<br>• Need for public educations<br>• Reluctance of complete buy-in<br>• Costs<br>• Short-term ok, long-term more fuel used |
| Convert light duty fleets to alternative fuels/hybrid technology | • Less dependent on foreign oil<br>• Emissions reductions<br>• Paves path for conversion of larger vehicles<br>• Fuel savings<br>• Captures fleet movement in smaller areas<br>• Could also be tax incentive<br>• Fleet conversion could lead to individual conversion to such vehicles<br>• Easier to quantify | • Costs (capital, maintenance, etc.)<br>• Need to create public awareness and provide public education<br>• Resistance to change to new fuels and vehicles<br>• Need more diversity<br>• Safety<br>• Vehicle availability<br>• Lack of long-term impact studies<br>• Performance data not available<br>• Hydrogen – high o-to-q energy cost<br>• New infrastructure needed for many alternative fuel vehicles |

## FLEET OPERATIONS

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Heavy duty engine retrofit incentive program | • Emissions reductions<br>• New technologies will continue to improve emission levels<br>• Better correlation between need power (in terms of engine use)<br>• PR benefit<br>• Creation of jobs (installation and new technologies)<br>• More effective for locally operated vehicles | • Education<br>• Costs – retrofit vs. new<br>• More incentives to public than private sector<br>• Tougher on small companies<br>• Performance disassociated with rebuilt power vs. public health<br>• Limited funding<br>• Can interfere with transportation utilization |
| Use of auxiliary controls to lower idling emissions from trains | • Cleaner air – KC has many trains<br>• If overhaul is somewhat frequent, AQ will improve more quickly<br>• Feasible by 2010<br>• High cost/benefit ratio<br>• Smart engine shutdown saves fuel<br>• Technology to switch is present<br>• Noise reductions | • Doesn't affect old trains<br>• Difficulty enforcing<br>• Disincentive to make major repairs<br>• Benefits may not be large because already in place in many areas<br>• May spend money to retrofit only to have other areas see the benefits<br>• Requires management commitment |
| **LONG TERM ACTIONS** | | |
| Maximize efficiency in mode choice for freight movements | • Better collaboration among participants<br>• Identify opportunities for infrastructure optimization<br>• Identify opportunities to piggyback different modes of transportation<br>• Rail movement far more efficient with regards to both NOx and particulate matter<br>• Reduces on-road congestion | • Implementation<br>• Idling emissions of locomotives<br>• Difficult to quantify<br>• Really a function of private sector |

## HEAVY CONSTRUCTION

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Contract incentives for early engine retrofits | • Emissions reductions –NOx, HAPs, and particulate matter<br>• Immediate and continued emissions reductions on existing fleet<br>• Could accelerate use of low-sulfur diesel<br>• Fuel industry has been a productive partner in the past<br>• Encourages contractors to be proactive<br>• Local region is most likely to capture emissions benefits<br>• Market-driven vs. regulatory<br>• Incentive keeps local jobs and money here<br>• Economic benefit to company<br>• Year-round benefits<br>• Greatest benefit during ozone season<br>• Health benefits | • Increased costs<br>• May reduce number of bidders (small contractors cannot afford to compete)<br>• Lowest bid will likely win regardless of emissions<br>• May not receive benefits from out-of-state contractors<br>• Out-of-state contractors could take money and jobs from area<br>• Two year delay before benefits will be achieved |
| Require coordination with road work and utility work | • Emissions reductions<br>• Systems management is possible<br>• Reduces traffic congestion<br>• Saves time, cost and fuel<br>• Health benefits<br>• Easy public buy-in<br>• More economically efficient<br>• Implementation | • Implementation and coordination difficulties<br>• Scheduling conflicts<br>• Could lead to increase project costs<br>• Night construction more expensive and more dangerous<br>• Seasonal construction issues |
| Geographic coordination of construction in the region | • Reduces traffic congestion<br>• Emissions reductions<br>• Saves time and fuel<br>• May decrease urban sprawl<br>• Shared resources<br>• Restrict construction on Ozone Alert days<br>• Allow controlled activity within a geographic location<br>• Systems management possible | • Disruption of staff activities, etc.<br>• Resistance to change<br>• Construction delays<br>• Cost<br>• Too far behind on construction already to implement such a system<br>• Should not affect vertical construction<br>• Night construction more dangerous<br>• Behavioral change regarding work hours |

## HEAVY CONSTRUCTION

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Require low VOC paving and striping materials | • Long-term benefits after initial implementation<br>• Fewer environmental impacts from disposal materials<br>• Could be addressed by regulations – contractual basis<br>• Easy to implement<br>• Benefits from city, counties, and private industry<br>• Low cost for local governments<br>• Most striping materials are now latex | • Reluctance to switch to requirements more stringent than those set by federal government<br>• Durability issues<br>• Potential for poor-quality product<br>• Not much potential benefit from state projects (DOTs already have in place)<br>• Learning curve<br>• Slight increase in cost |
| **LONG TERM ACTIONS** | | |
| Life-cycle costing of roadways reduced maintenance needs | • Common sense approach<br>• Emissions reductions<br>• Reduces traffic congestion<br>• Can alther maintenance times (night vs. day)<br>• Bring AQ impact studies in life-cycle analysis<br>• Use example of Johnson Co. CARS program as solution to cost problem | • Cost<br>• Financially limited (can't build for 30 year projections)<br>• Difficult to shift culture<br>• Data availability<br>• Need education<br>• 'Sticker shock' (especially for smaller jurisdictions) |
| More efficient land use patterns, less pavement | • Emissions reductions<br>• Reduce vehicle miles traveled<br>• Decreased runoff<br>• More aesthetically pleasing<br>• Not using construction money to compete with transit<br>• Promote better regionalization of transit (e.g. regional bus pass)<br>• Lower city temperatures<br>• Could offer tax incentives for better land use<br>• Lower future costs<br>• Conservation of both land and fuel<br>• Downtown renewal<br>• Coordination between AQ and planning<br>• Health benefits<br>• Economic benefits to local retailers | • May be more expensive<br>• Developer resistance<br>• Competing development interests<br>• Political challenges<br>• Not consistent with existing regulations |

## LAWN AND GARDEN

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Ban use of gas-powered equipment on alert days | • Reduces both VOC and NOx emissions<br>• Easy for homeowners/community to comply with voluntary actions<br>• Increases public awareness of individual impacts and health impacts of ozone (education)<br>• Warmest days aren't comfortable to work in anyway<br>• Grass often dormant on high ozone days so wiser to refrain from mowing | • Funding needed to replace equipment<br>• Technology may not be advanced enough to sustain electric motors – hybrid needs to be further developed<br>• Enforcement resources needed<br>• Commercial lawn-care industry could suffer on Ozone Alert days<br>• Economic impact on workers<br>• Episodic impacts<br>• Resistance by individuals<br>• Not practical for large buildings<br>• "Ban" is a loaded PR word<br>• Hard to measure benefits<br>• Can disrupt big workload schedules – public parks, private businesses |
| Laid back lawn care – less water, chemicals, mowing | • After education, greatest potential for individual impacts<br>• Low maintenance, less work, less cost, less energy consumption<br>• Increased awareness of beauty and functionality of native landscapes<br>• Great success potential from industry/business parks and public road access areas<br>• Great success potential from schools and school-age children for behavioral change<br>• Promote less harmful/reactive chemicals<br>• Introduce new markets for lawn care "helps" – non-chemical<br>• Huge benefits to water quality<br>• Increased native wildlife<br>• Easy public info campaign<br>• Could easily communicate info using KC Scout | • Native grasses perceived as unkempt<br>• Native landscaping goes against many current city codes or home association edicts<br>• Could lead to neighborhood restrictions and compliance issues<br>• Perceived pests in natural landscapes<br>• Less acceptance by homeowners and individuals<br>• Resistance from commercial (impact on profits)<br>• Less maintenance could impact small businesses<br>• Changing habit is difficult<br>• AQ benefits not much unless mowing is reduced significantly<br>• Measuring benefit is difficult |

## LAWN AND GARDEN

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Small engine buyback incentive program | • AQ benefits – less pollution<br>• "Good will" and tax write-off potential for industry supporters<br>• Less fuel costs<br>• Opportunity for hybrid development<br>• Less noise<br>• Measurable benefits<br>• Manufacturers could participate through sponsorships or link with other programs (e.g. hybrid giveaways) | • Funding concerns<br>• Need to ensure industry support and cooperation<br>• Future need to dispose of a large number of electric batteries<br>• Disposal of old engines<br>• Electric motors more expensive<br>• Not practical on large operations |
| Distribute or subsidize low emission gas cans | • Less fumes escape<br>• Low cost<br>• Easy to implement and gain widespread use<br>• Measurable<br>• Great for sponsorship and PR corporations (logos, etc.)<br>• Potential for co-op buying through local organizations to reduce cost | • Disposal of old gas cans<br>• Requires user to learn how to operate<br>• Impact on overall emissions is questionable<br>• Funding concerns<br>• New cans more expensive than older cans |
| Green purchasing co-op for commercial lawn services | • Some companies already implementing programs<br>• Could work well if free media attention is received<br>• Could lower some operating costs (e.g. use idling reduction)<br>• Reduced NOx by using 'greener' fertilizers | • Potential difficulty in getting competitors to work together<br>• Questionable AQ benefits<br>• Old fleets still used<br>• Large expenditure for small businesses<br>• Small gain compared to more efficient lawnmowers |
| Time-of-day ban on use of gasoline equipment tied to accelerated replacement | • Incentive to buy new equipment shows positive reason<br>• ATA's rideshare discount for ozone days (federal money) | • Enforcement resources needed<br>• Bad PR to use the word "ban"<br>• Difficult to change from 7pm message |
| **LONG TERM ACTIONS** | | |
| Increase natural and garden areas relative to lawns | • Good for both air and water pollutions<br>• Small changes = big benefit over time<br>• Increase wildlife diversity<br>• See related lawn-care items | • Too small of change in the short-term |

## STATIONARY COMBUSTION

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Regulate emergency generator use for non-emergency power | • Emissions reductions<br>• Easy to avoid<br>• Needs to be voluntary<br>• Industry can try to reschedule tests due to Ozone Alerts<br>• Possible vapor recovery system?<br>• Emissions low to ground and don't disperse<br>• Non-emergency testing and running time so not at warmest part of day | • Limited impact – large emitters already regulated<br>• Produces other pollutants<br>• Too expensive<br>• How much does it happen?<br>• Must allow testing during emergency<br>• Industry resistance<br>• Industry may not want to regularly post implementation and energy costs for all to see<br>• KCPL/Westar concerned at peak load days/ interruptibles and demand decrease – will regulation work in practice?<br>• Questionable effectiveness<br>• Need model to show this is worth it<br>• New technology is fairly efficient |
| Restrict use of lighter fluids and switch to charcoal chimneys | • Reduces emissions<br>• Cheaper/more effective way to light charcoal<br>• Safer<br>• Increases public awareness<br>• Provides incentives<br>• Easy to implement<br>• Chiefs – demo<br>• Potential for sponsorship of charcoal chimneys<br>• Vehicle to get message across | • Need for behavioral change<br>• Potential for public resistance to restrictions<br>• Limited emissions reduction may not be worth it (not much bang for the buck)<br>• Enforcement<br>• Measurement |
| Prohibit residential open burning and construction debris burns | • Reduces emissions<br>• Public safety issues addressed<br>• Health benefits<br>• Eliminate toxic fumes<br>• Individual involvement<br>• Easy to implement<br>• KCMO P & R uses signage at grills asking not to burn during Ozone Alert<br>• Local may have more opportunities to make difference | • Difficult to regulate<br>• Public resistance<br>• Emissions from landfill use<br>• Jurisdiction by jurisdiction |

## STATIONARY COMBUSTION

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Lower RACT applicability limits | • Increased regulation on emitters leads to reduced VOC/NOx emission<br>• Health benefits<br>• Measurable<br>• System of rules already in place<br>• Cost effective in terms of reduction in NOx per dollar spent<br>• Companies could formulate "good citizen" campaign<br>• Precedent already set | • Technology dependent<br>• Measurements keep changing<br>• What was established 20 years ago still hasn't changed<br>• Cost of implementation<br>• Industry resistance<br>• High cost for small businesses<br>• Not a regulatory approach<br>• MO can't do it because of statutes and current fed standards (must reach non-attainment status)<br>• Politically unacceptable<br>• Current RACT standards in MO don't address NOx |
| Establish RACT for new source categories | • Good first step<br>• Voluntarily easy<br>• Health benefits<br>• See above measure | • Can't do until non-attainment (legal/political)<br>• Regulatory diff. |
| Control major NOx sources in strategic locations | • Quick impact<br>• Significant reductions impact<br>• Control/offsets<br>• Could create tax incentives<br>• Technology – are doing low NOx burners – have individual control over plant levels<br>• Most cost efficient at small- to midsize-locations<br>• Determine feasibility by running model at various times | • Technology is not yet where it needs to be<br>• Economic impact on industry<br>• Really needs thoughtful study<br>• Regulations on other sources continue to change, which changes picture for major stationary sources<br>• At utility level, low NOx burners will require expensive modifications to achieve significant reductions (more practical to achieve lower reductions) |

| LONG TERM ACTIONS | | |
|---|---|---|
| Pollution prevention, environmental mgmt system | • Industry programs in place<br>• Include new industry<br>• Long-term benefits from upfront investments<br>• Emissions reductions in multiple areas | • Funding?<br>• Time investment and dollar outlay (personnel and other resources)<br>• No methodology for county numbers<br>• Need MARC to follow up and quantify<br>• Coordination of actions/results<br>• Need system to track<br>• Institutional capacity |
| Byproduct synergy – new industrial use of waste | • The ultimate in recycling<br>• Saves money<br>• Saves landfill space/regional waste capacity<br>• Grants available or could be a cooperative venture<br>• KC area has a group (BTG) that tries to do this | • Institutional capacity<br>• Coordination is difficult; can be specific needs |

## SOLVENT USE

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Partner with retailers to sell low emission products | • Potential to make more money – retail<br>• VOC reductions<br>• Local retail headquarter<br>• Education on proper use<br>• Safer products<br>• Many products already available<br>• Good partnership potential<br>• Quantifiable (but need larger database)<br>• Identify corporate social responsibility – get them onboard to create leverage (PR value)<br>• May reduce costs | • People not aware of rules<br>• Difficult to change retailers and customers<br>• A lot of manpower required<br>• Time and money<br>• Hard to measure<br>• Not a lot of return<br>• Question of whether or not products perform as well<br>• Difficult to regulate manufacturers outside of region<br>• May require subsidies for R & D |

## SOLVENT USE

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Best Practices training tied to business licensing | • Chamber already working towards this goal (connections with businesses both large and small)<br>• Major impact potential – many auto-paint businesses in area not regulated currently<br>• Impacts businesses of all sizes<br>• National model already established<br>• Link best practices to money savings<br>• Trade associations and unions<br>• Insurance<br>• Personal responsibility<br>• Target groups<br>• Implemented at ground level<br>• "Green" education will provide long-term benefits<br>• Small business education<br>• Marketability of "green methods"<br>• Area sources responsible for 51% of VOCs<br>• General public driver regulations<br>• Incentives rather than regulations<br>• Hand training packet when applying for license | • Hard to coordinate work schedules to have meeting<br>• Requires regulatory change<br>• Oversight responsibility<br>• Cost<br>• Early resistance<br>• Getting trained and timing connected to licensing could be difficult<br>• Certain business activities (e.g. house painting) hard to go on hold at certain times – could encourage use of different<br>• May not bring in small businesses that are required to train for license<br>• Perhaps should not be tied to licensing – just required |
| Lower RACT applicability limits | • Less pollution<br>• Brings more small businesses into regulatory fold<br>• Technology is catching up | • Voluntary efforts can't count reductions<br>• MO – no stricter than State<br>• Money for businesses<br>• Hard sell – could be a difficult education effort<br>• Cost effectiveness of regulating small shops goes down significantly<br>• Lots of manpower needed |
| Early MACT/HAP implementation | • Some companies will implement<br>• Rules already established<br>• Lower costs to build it up front<br>• Cheaper to plan ahead | • Businesses risk to get out early<br>• Most expensive<br>• Reduction not worth the cost |

## SOLVENT USE

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Economic incentives for using low-VOC alternatives | • Bank and sell<br>• Tax reductions<br>• Increased return on investment<br>• New clients<br>• Inherent reduction of cost in handling if they dispose of them correctly<br>• Home use can decrease VOC as well<br>• Partner with local hardware/home improvement stores | • Large number of small shops outside regulation<br>• Low VOC products not as effective<br>• Cost of economic incentive – who pays?<br>• No state legislation<br>• MO just removed tax credit |
| Control emissions from solvent metal cleaning | • Worked in St. Louis (at GM)<br>• Measurable emissions reduction<br>• Other cleaning methods exist | • Change in thinking required<br>• New methods must be as effective as old – hard to find for specific uses |
| **LONG TERM ACTIONS** | | |
| Support promulgation of Federal product standards | • Federal regulations reduce disparity between regions<br>• Make store/retail labeling as recognizable as recycling symbol | |
| Pollution prevention, environmental mgmt system | • Some more informal versions already in place<br>• Dovetails w/ By-product Syn.<br>• Can be a savings<br>• Conversion – one company's waste is another product<br>• There are currently exchange programs | • Lots of manpower to produce and maintain<br>• Expensive |
| Byproduct synergy – new industrial use of waste | • 5-10 KC companies working on project now<br>• Incentives and training | • Tricky to coordinate time, effort, and money<br>• Use of waste is not always good |

## OFFICE AND INSTITUTIONAL

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| **POTENTIAL NEW ACTIONS** | | |
| Benchmarks for emissions reduction – **property management** | • Decrease in PM and VOCs<br>• Stormwater benefits – reduced impervious cover (pavement and roof surface alternatives)<br>• Cost savings – less fuel<br>• Reduced parking fees and tolls<br>• Decreased urban heat island effect<br>• Less cost for businesses<br>• Spreads burden to all agencies<br>• Incentives possible<br>• Easily done through education – Green Council in KC<br>• Increases wildlife habitat<br>• Native landscaping decreases maintenance needs<br>• More trees<br>• Employee health from green cleaning | • Change in lawn care-independent approach<br>• Retrofitting<br>• Buy-in from managers/unions<br>• Requires large-scale participation to be effective<br>• Fuel is cheap right now<br>• Low return on investment<br>• Negative aesthetic perception of native landscaping<br>• Wildlife sometimes pesky and hazard-causing<br>• Potential increase in particulates<br>• Upfront costs<br>• Livelihood of commercial mowers |
| Benchmarks for emissions reduction – **fleet management** | • Hybrids<br>• Long-term benefits from decreased maintenance and fuel consumption<br>• Use of domestic fuel sources<br>• Biodiesel better than diesel<br>• Emissions reductions<br>• Reward fleets with alternative fleets<br>• Target market<br>• Postpone non-essential tasks on Ozone Alert days<br>• Periodic gas cap check<br>• Better maintenance<br>• Voluntary installation of vapor recovery systems (II)<br>• UPS could make decision – have their own fueling hybrids<br>• Federal money for vehicles (CNS vehicles) | • Not all fleets owned by users<br>• Buy-in from senior management<br>• Difficulty in reaching nontraditional fleets<br>• Large upfront costs<br>• Availability of hybrids<br>• Increased PM<br>• Increased cost of domestic fuel sources |

## OFFICE AND INSTITUTIONAL

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Benchmarks for emissions reduction – **set thermostat higher to reduce AC load** | • Saves money on utility costs<br>• Reduces peak production<br>• Windows that open (green building) | • Unpopular<br>• Cannot change due to production requirements<br>• Cost to reprogram<br>• Indoor air quality<br>• High humidity makes this harder to control<br>• Too narrow of a focus – need to focus on total energy efficiency<br>• Won't work in larger office buildings<br>• Requires efficient envelope (structure) |
| Benchmarks for emissions reduction – **cooperative purchasing for low emission products** | • Lowers disposal costs<br>• Provide incentives such as tax credits or rebates<br>• Educate to do more "green" purchasing<br>• Employee health<br>• Drives recycling market | • Price competition<br>• Limited selection<br>• Difficult because everyone has their own standards<br>• Difficult to manage in private sector<br>• Could be more effective if scope were broadened<br>• Higher initial costs<br>• Structure needs to be established<br>• Priority products |
| **LONG TERM ACTIONS** | | |
| Green building | • Better indoor/outdoor atmosphere<br>• Long-term decrease in costs for maintenance and energy<br>• Better community sustainability<br>• Increased employee productivity | • Owner must support<br>• Requires strategic location |
| Increasing proximity between housing, jobs and transit service | • Infill residential growth<br>• Increased daily hours worked means shorter work week<br>• Decreased VMT, traffic congestion, and commute time<br>• Fixed urban boundary<br>• Decreased road and infrastructure costs | • Telecommuting requires much creativity to be feasible<br>• People will drive even if work week is shortened<br>• Requires a cultural attitude change<br>• Family needs<br>• Social consequences<br>• Developer opposition |

## OFFICE AND INSTITUTIONAL

| CLEAN AIR STRATEGY | PROS | CONS |
|---|---|---|
| Pollution prevention, environmental mgmt system | • Reduces regulatory compliance requirements<br>• Reduces costs for business<br>• More competitive, esp. in internat'l. markets (e.g. ISO program) | • Institutional issues in setting up system<br>• Takes time to establish |
| Byproduct synergy – new industrial use of waste | • Reduces costs of disposal and may generate income<br>• Implement quickly<br>• Emissions reduction<br>• Decreased landfill usage<br>• Barriers can be overcome<br>• Improves water quality | • Difficult to quantify AQ impacts<br>• Costs to start (time/money)<br>• Liability<br>• Sharing company info (competitive information)<br>• Need system to monitor; carry thru agreements made<br>• Building trust |

## APPENDIX E – ONGOING REGIONAL CLEAN AIR INITIATIVES

# Kansas City Clean Cities

**Organization/Sponsor**
KC Regional Clean Cities Coalition
3808 Paseo
Kansas City, Missouri 64109

**Contact Information**
Benjamin Watson, Director
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816-531-7624

**URL**
http://www.kc-cleancities.org

**Project Description**
Clean Cities is a program sponsored by the U.S. Department of Energy that is designed to encourage the use of alternative fuel vehicles (AFVs) and their supporting infrastructure throughout the nation. The Clean Cities program works with coalitions of local stakeholders to help develop the AFV industry and integrate this development into larger planning processes.

The Clean Cities program thrives on strong local initiatives and a flexible approach to the challenge of building alternative fuels markets, providing participants with options to address problems unique to their cities, and fostering partnerships as the mechanism to overcome these problems. Clean Cities works directly with local businesses and governments, guiding them through each step in the process of building the foundation for a vibrant local organization, including goal-setting, coalition-building, and securing commitments. Current and potential members of the Clean Cities network also help each other by sharing local innovations, by addressing and relaying obstacles they encounter in pursuing alternative fuels programs, and by exchanging "do's" and "don'ts," based on experiences in these programs.

The Kansas City Regional Clean Cities Coalition celebrated five years of designation on June 16, 2004. The Kansas City area was the 67$^{th}$ designation obtained from the U.S. Department of Energy. Since that time, the coalition has been very active in placing alternative fuel vehicles and refueling infrastructure throughout the metropolitan area. During the past five years, the coalition has been recognized as one of the ten best of the more than 80 coalitions and received various awards for excellence.

**Air Quality Impact/Benefits**
The coalition is very active in eight of the metropolitan counties (Jackson, Clay, Platte and Cass in Missouri, and Wyandotte, Johnson, Leavenworth and Shawnee in Kansas). The coalition has over 100 stakeholders that support the efforts to develop the AFV industry. Development of the AFV industry can help to reduce emissions from vehicles that rely on fossil fuels.

## Midwest Commuter Choice

**Organization/Sponsor**
Mid-America Regional Council
600 Broadway, Suite 300
Kansas City, Missouri 64105

**Contact Information**
Darrin Dressler, Employer Outreach Coordinator
ddressler@marc.org
816.474.4240

**URL**
http://www.midwestcommuterchoice.com/

**Description**:
MARC and Citizens for Modern Transit have teamed up with the U.S. Environmental Protection Agency Region 7 to offer Midwest Commuter Choice, a program that encourages employers to take an active role in encouraging and supporting alternative modes of transportation for their employees — helping to reduce traffic congestion and air pollution in the region.

Midwest Commuter Choice recognizes those employers who have voluntarily taken significant steps to promote alternatives to driving alone for the work commute in the Midwest.

To participate in the program employers are asked to take some simple steps, including:

- Offering a Guaranteed Ride Home program, a subsidized ride home in case of emergency for commuters who use alternatives to driving alone to work.
- Sharing the cost of the ride by adopting transit-friendly programs, including transit subsidies, pre-payroll tax deductions or selling bus passes onsite.
- Promoting teamwork by instituting perks like preferential parking for employees who share a ride in carpools or vanpools.
- Offering flexible work schedules such as compressed workweeks, flextime, or telecommuting.
- Promoting healthy alternatives to driving alone, like bike-to-work programs.
- Designating one person on the staff as a central point of contact for alternative transportation information.

In 2004 and 2005, MARC plans to target the metropolitan's 100 largest companies, with a goal of 35 companies participating in the program.

**Air Quality Impacts/Benefits:**
Participating companies help reduce air pollution and smog, help reduce traffic congestion, and reduce greenhouse gases from automobiles. Fewer cars on the road also means more energy saved and more fossil fuels conserved.

## Missouri Department of Natural Resources

**Organization/Sponsor**
Missouri Department of Natural Resources
Outreach and Assistance Center
Environmental Assistance Office
P.O. Box 176, 1659 E. Elm Street
Jefferson City, Missouri 65102-0176

**Contact Information**
Gus Ralston
gus.ralston@dnr.mo.gov
816-759-7333 or toll free: 1-800-361-4827

**URL**
http://www.dnr.mo.gov/oac

**Project Description**
The Environmental Assistance Office (EAO) and the Kansas City Urban Outreach Office (KCUOO), both part of the Outreach and Assistance Center (OAC), are non-regulatory services of the Department of Natural Resources. Part of their mission is to provide information, assistance and training to business owners, farmers, local governments and the general public on how to control or reduce pollution. This mission is met by providing technical and managerial assistance, financial planning assistance and other kinds of help, training and information.

Specific activities include the provision of technical assistance on air, land and water compliance issues to more than 400 facilities or individuals every month. They produce and distribute guidance documents and publish the *TAP into DNR* newsletter. Multimedia on-site assistance and workshops are provided for permit applications, other regulatory requirements and pollution prevention opportunities. They are in the process of revising their pollution prevention and compliance guides for printers and other industries to reflect the latest regulatory requirements and pollution prevention opportunities. The OAC also encourages organizations to develop environmental management systems through the Missouri Environmental Management Partnership (MEMP).

**Air Quality Impact/Benefits**
The OAC has helped dry cleaners, wood furniture manufacturers, printers, metal finishers, vehicle maintenance facilities, auto body shops, and various other businesses understand and comply with environmental regulations. They have helped numerous manufacturing facilities understand and complete Emission Inventory Questionnaires and construction and operating permits. They have also performed multimedia on-site compliance assistance, including environmental assessments and pollution prevention assessments for wood processing facilities, rock quarries, printers, metal finishers, vehicle maintenance facilities, auto body shops, and others.

## City of Gardner

**Organization/Sponsor**
City of Gardner
120 E. Main Street
Gardner, Kansas 66030

**Contact Information**
Melissa Mundt, Assistant City Administrator
mmundt@gardnerkansas.com
913-856-0942

**URL**
http://www.gardnerkansas.org

**Project Description**
On December 15, 2003, the City adopted the 2003 update of the ICC's International Residential Code. This update improved the energy efficiency requirements for construction and remodeling in Gardner. Under the new code, homes built and remodeled in Gardner have a much higher level of efficiency than homes built just one year prior.

In addition to adopting these standards, the City of Gardner provides residents with information on creating a more energy efficient home in a monthly publication -- the Utility News. A recurring section of the Utility News is dedicated to informing residents about ways to improve the energy efficiency of their home and the outdoor air quality during the warm summer months. The information helps residents to become wiser about what they can do to have a positive impact on the air they breathe and on their pocket books.

Over the next couple of years, the City will also be looking into voluntary ways to save power at peak demand times and working with residents and businesses in Gardner to provide incentives to become a more friendly user of the City's electric power.

In addition to the home energy efficiency, the City of Gardner is working to add bike paths along major arterials as part of newly constructed roadways or when a roadway is expanded. The goal is to make a walkable and rideable community.

**Air Quality Impact/Benefits**
Buildings are a significant producer of air pollutants and the processes used to create the energy, such as in coal-burning power plants, also contribute to air pollution. A home that uses less energy benefits the environment through reduced use of fossil fuels and fewer emissions into the air when heating or cooling the home. The bike paths being developed in Gardner offer alternative means of transportation that can help to reduce the number of vehicle trips made on the roadways. This in turn reduces the amount of air pollution generated by gas-powered vehicles.

## Regional Household Hazardous Waste Collection Program

**Organization/Sponsor**
Mid-America Regional Council Solid Waste Management District
600 Broadway, Suite 300
Kansas City, Missouri 64105

**Contact Information**
Nadja Karpilow, Environmental Planner
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816.474.4240

**URL**
http://www.marc.org/environment/reduce,reuse,recycle.htm

**Project Description**
The Regional Household Hazardous Waste (HHW) Collection Program offers Kansas City metropolitan area residents that live in Missouri the ability to safely dispose of household hazardous waste. Member communities pay a per capita rate per year for their residents to dispose their waste at the permanent facility in Kansas City or Lee's Summit, or at mobile events, free of charge. Johnson County, Kansas, and the Unified Government of Wyandotte County/Kansas City, Kansas also operate their own permanent collection facilities. Household Hazardous Waste (HHW) consists of caustic, corrosive, flammable, reactive and toxic products that people no longer want or use.

The Mid-America Regional Council Solid Waste Management District administers the HHW collection program and coordinates mobile collection events, promotes the program, and encourages continued local government participation.

**Air Quality Impact/Benefits**
The HHW collection program reduces the amount of HHW placed in landfills or emitted to the environment. Source reduction reduces the amount of toxicity, prevents emissions of many greenhouse gases, reduces pollutants, saves energy and conserves resources, all of which impact the region's air quality.

In 2003, over 300,000 pounds of Volatile Organic Compounds (VOCs) were collected in Kansas City, Missouri and Johnson County, Kansas.

## Jackson County, Missouri

**Organization/Sponsor**
Jackson County
415 E 12th Street
Kansas City, MO 64106

**Contact Information**
Chris Bussen, Resource Conservation Coordinator
Cbussen@jacksongov.org 816-795-1246

**URL**
www.jacksongov.org

**Project Description**

Jackson County Government has taken several steps to improve air quality in the region, particularly in the Parks and Recreation and Public Works Departments. The Parks and Recreation Department has been involved with the Kansas City Regional Clean Cities project since 1996. The program works to create a sustainable market for alternative fuel vehicles.

The Parks and Recreation and Public Works Departments are using biodiesel that is a blend of soy and diesel. The Parks and Recreation Department also adds a product called "performance gold" to increase fuel economy. The department currently has 120 pieces of equipment using biodiesel and is also considering the purchase of bi-fuel products that allow for the use of alternative fuels or conventional gas or diesel, depending on the availability of alternative fuel refilling sites. They have already purchased a bi-fuel compressed natural gas vehicle.

To reduce the need for natural gas furnaces, the Park and Recreation Department has purchased two used-oil-burning furnaces. The furnaces operate on waste oil products generated by the department, reducing the need to use natural gas and recycling their used oil. The Public Works and Parks and Recreation Departments are also using an auto-parts cleaning system that utilizes hot water and detergents instead of hazardous chemicals.

In addition to these steps, the Parks and Recreation Department has implemented procedures for Ozone Alert Days that include the postponement of mowing in non-essential areas, vehicle refueling as late as possible, keeping engines and emissions control systems maintained, providing information to employees and encouraging staff not to drive to lunch. The Public Works Department is constructing an aquatic rain garden, researching fuel additives that can reduce NOx emissions, and utilizing more crew cabs so that fewer vehicles are needed to move people to and from job sites.

**Air Quality Impact/Benefits**
The biodiesel and bi-fuel products reduce the emissions that come from county vehicles and equipment. The new auto-parts cleaning systems have resulted in a change in cleaners that reduces harmful vapor emissions. Aquatic rain gardens have been shown to reduce biochemical oxygen demand up to 82 percent.

## Johnson County, Kansas

**Organization/Sponsor**
Johnson County Environmental Department
11180 Thompson Avenue
Lenexa, Kansas

**Contact Information**
Mike Boothe
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913-492-0402

**URL**
http://www.jced.jocogov.org

**Project Description**
Johnson County Government has been active in air quality issues in the Kansas City region since the late 1980s. At the initiative of the Johnson County Environmental Department (JCED), the county committed to the creation and implementation of an Ozone Reduction Campaign in 2004 for county departments and agencies. The JCED hired an Ozone Coordinator for the summer of 2004 to advise county departments and agencies about the ozone issues facing the region and to help in the creation of ozone reduction programs tailored to meet the needs of each department. The JCED has also worked with several cities in the county to advise them on ozone issues and how to reduce emissions.

As an incentive for persuading county employees to modify their behavior, the County offers $100 gift certificates to employees that sign-up to carpool, bus, bike, or walk to work 80% of the work-days from June 1-September 30th. Monthly prizes are offered for people that sign-up to modify their behavior on Ozone Alert days. County employees are kept up-to-date with the ozone issues through an internal Intranet newsletter.

JCED is working with several departments regarding vehicle purchases to include the consideration of buying alternative fueled or gasoline-electric hybrid vehicles. The JCED has driven two propane/gasoline fueled SUV's since 1992, the first government agency in the metro to do so. In addition, the JCED has purchased five hybrids with another scheduled for purchase in 2005.

JCED worked with the county's Information Technology Systems Department to issue Ozone Alerts through their new JoCo Link software. JoCo Link is designed to issue emergency warnings and alerts to individual computers within county offices as well as for the public. This software is free to the public and can be found on the county's main website: http://www.jocogov.org/.

JCED staff has been testing the seals of gas caps on both county vehicles and privately owned vehicles. Approximately 400 tests have been conducted, with an average failure rate of 15%.

**Air Quality Impact/Benefits**

The actions taken by Johnson County have numerous air quality benefits by reducing emissions from County operations. Response to the educational and incentive program for employees has been excellent. The gas cap program helps to eliminate bad gas caps, which can lose from 30-50 gallons of gasoline annually through evaporation.

## Kansas City Southern Railway Co.

**Organization/Sponsor**
Kansas City Southern Railway Co.
427 West 12th Street
Kansas City, Missouri 64105

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**Project Description**
Kansas City Southern Railway has taken several steps to improve air quality in the Kansas City region. They are in the process of obtaining two battery-operated locomotives. The purchase of the locomotives is being funded through a grant from the Texas Commission on Environmental QualityTCEQ.

The railway is also significantly in front of the regulatory requirements for converting over to low sulfur fuel. Their conversion is currently 75 percent accomplished. An additional step that the company is taking to reduce air pollution is a review of auxiliary power units to reduce locomotive idling.

**Air Quality Impact/Benefits**
Locomotives are considered an "off-road mobile source" of emissions. Off-road sources account for 17 percent of all volatile organic compounds (VOC) and 25.7 percent of all oxides of nitrogen (NOx) emissions in the Kansas City area. These two gases are the primary contributors to ground level ozone. Kansas City Southern Railway's efforts to reduce emissions from locomotives will help to reduce the VOCs and NOx released into the air by off-road sources.

## City of Kansas City, Missouri

**Organization/Sponsor**
City of Kansas City
414 East 12th Street
Kansas City, Missouri 64106

**Contact Information**
Larry Falkin, Assistant Director for Environmental Compliance
Larry_Falkin@kcmo.org
816-513-3456

**URL**
http://www.kcmo.org

**Project Description**
On April 21, 2004, City Manager Wayne Cauthen signed an Ozone Action Policy requiring each City Department to develop and implement an Ozone Action Plan. The Plans identify specific actions that will be taken to reduce Ozone-generating activities on Ozone Alert days and throughout the ozone season. In addition to requiring that actions be taken internal to the Kansas City organization, nine City Departments either require or encourage their contractors to participate in Ozone reduction efforts.

Examples of actions included in the Ozone Action Plans are the postponement of City vehicle refueling, non-essential driving and small engine use (e.g. lawn mowers and weed eaters); restrictions on vehicle idling; encouragement of the use of carpools and vanpools for commuting; and prohibitions on outdoor fires on City property on Ozone Alert days. Five City Departments are also increasing their use of alternative fuels. This has resulted in 200 alternative fuel vehicles in the City fleet and the use of biodiesel in all diesel equipment.

**Air Quality Impact/Benefits**
Vehicles driving on the roadway account for 36 percent of the emissions that form ground-level ozone in the Kansas City region. The City of Kansas City's emphasis on the use of alternative fuels has significantly reduced the number of traditional-fueled vehicles on the road. The City uses over 50,000 gallons of biodiesel per month, further limiting the pollutants entering the air from on-road vehicles. The City also operates a van-pool program for employees commuting to work at Kansas City International Airport, eliminating over 200,000 vehicle miles traveled each year.

## Kansas City Power & Light (KCP&L)

**Organization/Sponsor**
Kansas City Power & Light (KCP&L)

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**Description:**

Kansas City Power & Light estimates that demand for electricity will grow two to three percent for the foreseeable future. The region is a snapshot of a national trend. The United States Department of Energy (DOE) projects a 45 percent increase in the demand for electricity over the next 20 years. Since 1987, residential energy use among Kansas City Power & Light (KCP&L) customers has increased 35 percent.

When combined with rising air quality concerns in the region, KCP&L faces the challenge of providing power in the future for a growing metro area, while proactively seeking ways to improve regional air quality. KCP&L recently proposed a framework of initiatives that could help it do both. It includes:

- A new coal-fired generating facility near the Iatan site in Platte County, Missouri
- Investing in wind as a means of generating renewable electric energy
- Technologies and programs to help customers optimize the use of energy
- Significant investments in environmental upgrades at selected, existing plants

**Air Quality Impacts/Benefits:**
The proposal calls for investing $300 to $350 million in the latest emissions control technology. For example, at the Iatan power plant, upgraded environmental control equipment could result in a 54 to 62 percent reduction in $NO_X$ and a 76 percent reduction in $SO_2$ emissions. New mercury emissions control equipment could result in a 46 percent reduction in mercury emissions at that facility.

With its proposed environmental investments, overall mercury emissions could be reduced by approximately 30 percent by 2010 and approximately 58 percent by 2014, when compared to 2003 levels. Furthermore, KCP&L is planning to meet a sizeable portion of future growth using wind resources and aggressive efficiency programs.

KCP&L's proposed framework could also invest up to $50 million in technologies and programs to help both residential and commercial customers manage their energy use more wisely. These technologies will give customers more options for managing both their energy use and their bills. These options will help preserve precious natural resources, which protects the environment and helps improve air quality. KCP&L is among the first utilities nationwide to explore creating

such a broad, integrated strategy that includes cutting-edge distribution and aggressive efficiency programs.

In addition to these local initiatives, KCP&L is one of eight companies selected nationally by the U.S. Department of Energy (DOE) to evaluate experimental technologies for further reducing mercury emissions. The goal is to identify proven technologies that will help utilities reduce mercury emissions by more than 70 percent, and as much as 90 percent.

## Kansas Department of Transportation

**Organization/Sponsor**
Kansas Department of Transportation
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**Project Description**
The Kansas Department of Transportation (KDOT) proposes to implement a variety a measures to improve the air quality in the Kansas City region. Through it's partnership in the Kansas City Scout program, KDOT will provide motorist information through the use of Dynamic Message Signs about high ozone forecasts and recommend actions that can be taken by the public to reduce ozone emissions.

KDOT will work to alleviate the emissions from private vehicles on the highways by scheduling maintenance operations to avoid closing lanes when possible during daylight hours on Red or Orange Ozone Alert days on major highways in Johnson and Wyandotte Counties. KDOT will further encourage its Kansas City area employees to share rides and carpool to work.

On Red or Orange Ozone Alert Days, KDOT will take steps to reduce the emissions from its own vehicles and equipment. KDOT will abstain from mowing operations in Johnson, Wyandotte and Leavenworth Counties and will refuel all gasoline-powered equipment and vehicles in those same counties only when absolutely necessary. Throughout the summer, the gasoline-power vehicles will be refueled as late in the day as possible. KDOT will continue to use biodiesel fuel when the cost differential is 10 cents or less.

KDOT has already updated its standard seed mixtures that are used on all re-construction projects to include a variety of cool and warm season grasses next to the roadside. Beyond the shoulder area, the seed mix is comprised of all native plants and some forbs (wildflowers). Additionally, a slurry tack has been added to the mulch after seeding to further help the establishment of vegetation.

**Air Quality Impact/Benefits**
Vehicles on the road account for 36 percent of the gases that create ozone. Off-road vehicles such as mowers create 17 percent of volatile organic compounds and 25.7 percent of oxides of nitrogen, the two gases that form ozone. Fewer lane closures and trips and reduced mowing on ozone alert days help to improve the region's air quality by limiting two significant source of pollution.

## Missouri Department of Transportation (MoDOT)

**Organization/Sponsor**
Missouri Department of Transportation
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**Project Description**
MoDOT's commitment to improve the region's air quality involves the following eight components: (a) modification of daily operations, (b) employee action and education, (c) public information, (d) community leadership, (e) Kansas City Scout program and congestion management, (f) commuter choice, (g) alternative fuels and environmentally sensitive vehicles, and (h) asphalt mixture standards.

These eight components include a variety of activities including the reduction of maintenance activities on red ozone alert days, encouragement of car-pooling and the use of alternative modes of transportation, flexible hours and telecommuting for some employees, the use of hybrid vehicles and biodiesel, and paving with an asphalt mixture that has virtually no volatile organic compounds (VOC). VOC is a main contributor to ground level ozone formation.

In addition to the activities targeted at MoDOT's operations, the department also actively works to inform people outside of their organization. Portable message boards display the daily ozone forecast. They provide information about activities that improve air quality to the government agencies and organizations with which they interact. MoDOT participates in the multi-agency Kansas City Scout Program, which uses high-tech communications equipment to provide traveler information and congestion management. Kansas City Scout will also be used to post red ozone forecasts so people can positively impact the region's air quality.

**Air Quality Impacts/Benefits**
Many of MoDOT's activities are targeted toward reducing the number and length of vehicles trips on the Kansas City area. On-road vehicles account for 36 percent of the gases that form ground-level ozone in the Kansas City area. Reduction in the number of vehicles on the road and the amount of time that they are on the road directly improves the region's air quality.

## City of Overland Park

**Organization/Sponsor**
City of Overland Park
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**Project Description**
The City of Overland Park has taken a variety of steps to increase energy efficiency and improve air quality. The City has purchased high-efficiency hybrid vehicles to replace conventional city vehicles and converted several vehicles to operate on compressed natural gas. They have also conducted a pilot test of a fully electric vehicle.

In order to improve energy efficiency and reduce electricity usage, the City has changed all red traffic lights from 90-watt incandescent bulbs to 14-watt light emitting diode fixtures. The City is currently in the process of changing out the green lights as well. They have installed photovoltaic school zone lighting fixtures, replaced all T-12 fluorescent lighting fixtures in city facilities with T-8 fixtures, replaced all magnetic ballasts with electronic ballasts and replaced incandescent lighting with compact fluorescents in city facilities wherever feasible.

Recognizing that vehicle congestion increases emissions from vehicles, the City performs video monitoring of critical intersections to reduce congestion and delays. They are also performing two major road projects to reduce congestion during peak periods.

The City of Overland Park also invests in a significant number of trees each year. They plant between 300 and 1,000 trees per year and have qualified for designation as a Tree City for more than 23 years.

Other steps that Overland Park has taken to improve air quality include the use of GIS (Geographical Information Systems) mapping to improve the routing of building inspectors, the encouragement of employees to refuel as infrequently and as late in the day as possible, and the inclusion of articles about energy efficiency in the city newsletter.

**Air Quality Impact/Benefits**
Electricity-generating facilities are a source of air pollutants and the City of Overland Park's efforts to become more energy efficient reduce the demand placed on such facilities. The City has also taken steps to reduce on-road vehicle emissions and invested in trees, which help to filter pollutants in the air and sequester carbon.

## QuikTrip Corporation

**Organization/Sponsor**
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**Project Description**
QuikTrip Corporation has voluntarily implemented a program dealing with ozone alerts in the Kansas City region. All 70 metro QuikTrip stores post a sign at every gasoline pump during ozone alert days. Specifically, the information informs customers that an ozone alert has been issued and customers should avoid topping off their gasoline tanks. The signage also suggests that customers make certain their gas cap is tightly sealed and avoid spilling gasoline.

**Air Quality Impact/Benefits**
Gasoline vapors escape into the air during vehicle refueling. Individuals can take steps to limit the vapors that enter the air by avoiding topping off their gasoline tanks, preventing gasoline spills, and ensuring that their gas cap is tightly sealed and not leaking. QuikTrip has taken the extra step of informing and reminding customers of these steps at the time that they are refueling, thus encouraging compliance.

## Specialty Graphic Imaging Association

**Organization/Sponsor**
SGIA/DPI (what is DPI?)
10015 Main Street
Fairfax, Virginia 22031

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**Project Description**
SGIA is the international association representing the screen printing, digital imaging and its associated supplier base. There are over 40,000 screen and digital facilities operating in the United States, and all have obligations to protect the environment. While many may fall under specific air permitting or control thresholds, the Association continues to educate the industry as to their regulatory responsibilities as well as providing information on available alternative technologies

Efforts include development of education resources clearly explaining both the impact and obligations of environmental regulations; workshops on specific topics of pollution prevention activities, new screen reclamation technologies, adoption of Environmental Management Systems, as well as specific regulatory requirements. SGIA maintains a robust web site that includes information on a variety of environmental, and other issues, directly impacting the industry sector.

Since 1996, SGIA has been a partner with the USEPA in their Design for the Environment Program (DfE). In partnership, alternative screen reclamation technologies were evaluated with the end result of providing information to the industry on environmental impact, performance and cost data. This information is used by the industry when making decisions regarding introduction of new technologies.

**Air Quality Impact/Benefits**
Ground-level ozone is formed by the reaction of volatile organic compounds (VOCs) and oxides of nitrogen (NOx). According to a 1999 study of the Kansas City region, point sources (specific points of origin where pollutants are emitted into the atmosphere) accounted for 11.1 percent of all regional VOC emissions.Certain inks and solvents used to clean printing presses emit volatile organic compounds (VOCs), a precursor of ground level ozone. The use of citrus-based cleaners and other alternative products may enable printers to reduce their emissions. Of that 11.1 percent, 11.5 percent was found to come from printing and publishing. SGIA's efforts to educate printers about their impacts on the environment make the local printing industry more aware of the steps that they can take to improve the air quality in the region.

## Smart Moves

**Organization/Sponsor**
Mid-America Regional Council
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**Project Description**
Smart Moves is metropolitan Kansas City's vision for expanded and enhanced public transportation services. It is a regional plan, providing service in seven of the metro area counties and is the first detailed regional transit service plan cooperatively developed by Mid-America Regional Council (MARC), Kansas City Area Transportation Authority (KCATA), Johnson County Transit and Unified Government Transit.

Smart Moves builds on extensive prior transit plans and studies, reflects what residents and businesses indicate they want in a public transit system, and incorporates models and best practices from across the country for modern, effective and efficient public transportation services.

MARC's voluntary commitment is to continue to work with the three area public transit providers to refine the Smart Moves plan, to identify short-term investments to begin plan implementation, to build community support for the plan, and to secure legislative support and financial support to implement the full vision.

**Air Quality Impact/Benefits**
Increased investment in an integrated transit plan and use of public transportation will provide direct air quality benefits for the Kansas City region by relieving roadway congestion and reducing the necessity for automobile use and the ensuing air pollution produced. Enhanced transit service will continue to make transit more attractive and reduce automobile use.

## University of Missouri, Kansas City

**Organization/Sponsor**
UMKC
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**Project Description**
As a large organization and an essential community partner, UMKC has undertaken several efforts related cleaner air in the greater Kansas City area. In late April of this year, a Clean Air Task Force of faculty, students and staff was constituted and charged with exploring ways to voluntarily contribute to reducing emissions of ozone pre-cursors, such as volatile organic compounds (VOC's) and nitrogen oxides (NOx), on campus, at home and in commuting to and from campus.

The task force has met regularly to identify strategies and has heard from several experts about the nature of the local ozone problem, as well as voluntary measures proposed by other organizations and groups. Mid-America Regional Council staff met with the task force to provide a region-wide overview of the issues involved in improving air quality. A representative of the Missouri Department of Natural Resources provided an air quality "audit" of the campus, inspecting the various boilers and locations on campus from which emissions of either VOC's or NOx can be minimized. The campus was found to be in excellent compliance with state guidelines for controlling these types of emissions.

More recently, the Clean Air Task Force leadership has been meeting with the co-chairs of the campus' Energy Management Team and Waste Management and Recycling Team to establish a "Green Alliance" among these three environmentally-related groups. A campaign by the Energy Management Team, called "Turn It Off," has encouraged turning off lights in rooms, hallways and other locations when those lights are not needed. The Waste Management and Recycling Team has been investigating ways in which the campus can institute a more vigorous recycling effort. The Campus Facilities Management office—through cardboard recycling and other efforts—and the Procurement Office—through "green purchasing" and performance contracting measures—have begun to save money for the campus, have contributed to reductions in gaseous emissions, and reduced both solid waste and wastewater streams.

**Air Quality Impact/Benefits**

UMKC estimates that its efforts to conserve electricity have produced reductions in emissions from local electrical generating units of 18,800 tons per year of the greenhouse gas, carbon dioxide; 147 tons per year of the acid rain component sulfur dioxide; and 63 tons per year of the ozone pre-cursor, NOx. These emission reductions are equivalent to removing the pollution from more than 3,500 automobiles on the area streets and highways.

## Unified Government of Wyandotte County/Kansas City, Kansas

**Organization/Sponsor**
Unified Government of Wyandotte County/Kansas City, Kansas
Department of Air Quality
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**Project Description**
The Unified Government of Wyandotte County and Kansas City, Kansas, is taking a variety of steps to improve air quality in the region. Their efforts focus on maintenance of vehicles, travel reduction on ozone alert days, and public education.

The Unified Government encourages maintenance of vehicles to reduce their impact on air quality. The maintenance includes the tune up of vehicles prior to the summer months, checking for proper tire pressure and checking gas caps. These steps are encouraged not only for fleet vehicles, but also for employees' vehicles.

To further reduce the impact of vehicles on air quality, the Unified Government coordinates trips on ozone alert days to minimize travel time and reduce travel. When trips are taken, unnecessary idling is discouraged.

The Unified Government is also implementing an extensive public and employee education and notification program. The program includes notifications of ozone alert days by fax, email and the posting of the information in the front lobby of the Health Department. An annual billboard campaign educates the public on air quality issues and offers tips to improve the situation. The public is also educated through an annual fourth grade poster contest, air quality calendars, and educational outreach at community fairs. A charcoal chimney exchange program encourages people to use charcoal chimneys rather than lighter fluid for charcoal grills and a No Spill Gas Can exchange program encourages people to use no spill cans.

**Air Quality Impact/Benefits**
Vehicles driven on the roadway contribute 36 percent of the gases that react to form ozone, the leading summer-time air pollutant. Reducing the number of vehicle trips made and the amount of emissions that come from those vehicles has a direct impact on our air quality. The Unified Government's efforts to reduce the impact of their own vehicles and also educate the public on steps they can take to reduce the impact of vehicles and other sources of pollution help to improve our region's air quality.

## MARC Air Quality Workplace Initiative

**Organization/Sponsor**
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**URL**
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**Project Description**
Kansas City's workplaces present a perfect distribution channel for spreading air quality messages and reaching both business and civic leaders and the public through a single outlet. By casting the net broadly, through area chambers of commerce, MARC will also carry emissions-reduction messages to three targeted industry audiences.

For the 2004 season, MARC will be implementing a "pilot program" of the workplace initiative for select area businesses. In addition, MARC will begin laying the groundwork with area chambers of commerce and securing business and volunteer participation in preparation for a full-scale launch of the workplace initiative for the 2005 season. The plan includes the implementation of a grassroots communications effort targeted at Kansas City's workplaces. This communications effort will be structured to engage and educate business and civic leaders, while reaching, educating and mobilizing the regional workforce. MARC also has enlisted Trozzolo Communications Group to design and implement the workplace initiative, which will include:

- Securing 500 commitments from area business executives to help launch a workplace education initiative.

- Raising awareness among business owners in three key industry groups – fleets, solvent users and lawn service providers – of the air quality attainment situation facing the Kansas City area, especially the economic risks of falling out of attainment. Objective to be measured by number of presentations scheduled.

- Securing commitments from industry business leaders to help carry the clean air message to the public (specific objectives to be created with each business).

**Air Quality Impacts/Benefits**
Education of the public and businesses helps to encourage activities that improve air quality and discourage activities that contribute to the region's ground-level ozone problem.

## Green Building

**Organization/Sponsor**
Metropolitan Energy Center
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**Project Description**
Since 1999, the Metropolitan Energy Center has been promoting the field of green building in the Kansas City region. The Center has provided green building education and consulting services for residential, commercial, public, local government, and nonprofit sectors. In 2002, the Energy Center worked with the Greater Kansas City Home Builders Association to develop a green building program that became KC Build Green and still exists.

Through early 2003, the Energy Center worked on commercial sector green building through a group it formed called the Heartland Green Building Forum. The Forum was made up of a broad range of stakeholders including major development companies, architects, engineers, construction firms, governments and other stakeholders. In 2003, the Heartland Green Building Forum combined with several others interested in starting a chapter of the U.S. Green Building Coalition. USGBC and the Kansas City Chapter work locally to promote green building in the region through education, technical assistance and LEED, a protocol for green building developed by USGBC. LEED is a voluntary incentive program designed to set performance standards for new and existing development in the areas of energy efficiency, indoor air quality, resource and water conservation, construction waste minimization and site design.

The mission of the Energy Center's green building program, called Sustainable Solutions, is to increase the quality of the built environment while enhancing the natural environment. The Center has developed a toolkit targeted at local governments that assists the government organizations in developing green building initiatives. The toolkit includes a presentation on green building, case studies, startup strategies and a discussion of challenges and benefits.

**Air Quality Impact/Benefits**
Buildings are a major source of the pollution that causes urban air quality problems and the pollutants that contribute to climate changes. Buildings account for 49 percent of all sulfur dioxide emissions, 25 percent of nitrous oxide emissions and 10 percent of particulate emissions, all of which damage urban air quality. Kansas City currently gets 72 percent of its power from coal, which produces a significant amount of air pollution. A reasonable goal for a High

Performance Green building is to reduce total energy usage by 30 percent for a typical commercial building.

**EPA Lab in KCK.**
**LEED Gold accredited**

**ECO Works, Lenexa, Ks. A Zimmer Company development - LEED accredited**

**Proposed plan for a LEED accredited Ronald McDonald House**

**Interior shot of the Discovery Center, one of the first green buildings in KC**

Johnson County, Kansas, has also made a commitment to building greener. When completed in 2006, the new $30,050,000 Sunset Drive office facility is expected to be only the second building in the Kansas City region to achieve a LEED Gold certification. Highlights of the 127,000-square-foot, two-story facility include:

- Water features that emphasize water conservation and treatment. Rainwater is captured from the roof and flows to an outdoor reflecting pool near a central lobby. Some of the water will pass through to the interior lobby space to the indoor bio-garden.
- Bio-swales will be located in parking areas rather than curbs and gutters to move run-off to dedicated green spaces in the surface lot that has specified plants to clean the water. The water works its way to the building's bio-swale where it naturally is absorbed as ground water or discharged from the site in a very clean state.
- Education, through the use of signage and tours, will inform the general public about the environmental aspects of the building along with providing information about water efficiency, water treatment, and conservation. Signage will also speak to the salvaged wood and other environmental features of the property.

**Johnson County, Kansas, LEED Gold office building**

# MARC Air Quality Public Education Campaign

**Organization/Sponsor**
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**Project Description**
MARC has spearheaded public education initiatives for the past six years. These campaigns have affected residents' awareness of and willingness to take ozone-reducing actions, as measured by telephone surveys.

MARC is now asking the public to find out about their AirQ. Based on the familiar IQ, AirQ is MARC's way of determining how much the public knows about Air Quality. This summer, the public is being asked through billboards, transit and radio ads, and a website to take simple steps to reduce their contributions to the region's air quality problem.

This integrated strategic communications plan will build awareness of the effect the mobile public has on air quality and the effect the EPA guidelines will have on the metro area. In addition, the AirQ campaign will seek to translate awareness into measurable action.

The AirQ campaign involves a wide-range of information about air quality and its impact on our lives. The program provides the basics about air pollution such as defining ozone and the impacts of high ozone on our community. It further teaches the steps that individuals and businesses can take to improve air quality.

**Air Quality Impact/Benefits**
The simple steps communicated through the public education campaign can reduce activities that lead to ground-level ozone. Ozone reaches dangerous levels during Ozone Alert! days and poses serious health and economic risks for the region. As more and more people begin to integrate these steps into their daily activities, our region's air quality improves.

## MetroGreen

**Organization/Sponsor**
Mid-America Regional Council
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Kansas City, Missouri 64105

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**Project Description**
MetroGreen is a proposed 1,144-mile interconnected system of public and private open spaces, greenways and trails designed to link seven counties in the Kansas City metropolitan area. The plan covers Leavenworth, Johnson and Wyandotte counties in Kansas and Cass, Clay, Jackson and Platte counties in Missouri.

MetroGreen continues a tradition of valuing green space in the Kansas City area by extending the "parkways and boulevards" concept of the 1894 Kessler Plan for Kansas City, Missouri. MetroGreen extends and enhances this commitment by identifying more than 75 separate corridors to form a regional network of greenways that connects many of the areas most valuable natural assets.

MARC's voluntary commitment includes technical support to local sponsors in advancing the development of priority segments of the MetroGreen system; and in particular, assisting in critical connections between trails and between communities.

**Air Quality Impact/Benefits**
MetroGreen will provide the Kansas City region alternative transportation routes that can reduce automobile use and provide alternatives to solo driving, resulting in improved air quality. By providing safe, pleasant places to walk and bicycle, trails encourage people to use non-motorized means of getting to work, school, play, and shopping which result in reduced traffic congestion, noise, and air pollution.