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September 17, 2014

Ms. Heather McTeer Toney
Regional Administrator
U.S. EPA, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-8960

Re: SIP Revision for Kentucky's Regional Haze Periodic Report

Dear Ms. Toney:

Enclosed for your consideration is a formal revision to Kentucky's State Implementation Plan (SIP) that includes Kentucky's Regional Haze Periodic Report for Kentucky's Class I Federal area Mammoth Cave National Park. This SIP revision addresses the requirements of the Regional Haze Rule at 40 C.F.R. 51.308(g), requiring periodic reports that evaluate progress towards the State's Reasonable Progress Goals for visibility improvement in Class I areas.

Kentucky's initial SIP for Regional Haze, submitted to EPA in 2008, established 2018 reasonable progress goals for visibility in Kentucky's Class I area. The enclosed periodic report addresses the progress made toward the 2018 reasonable progress goals during the first five-year period after the 2000–2004 baseline period for visibility assessment.

Documentation in the enclosed Kentucky Regional Haze Periodic Report demonstrates that based on more current monitored visibility improvements and SO_2 emission reductions, the Commonwealth is expected to continue meeting and exceeding its 2018 reasonable progress goals for visibility for Mammoth Cave National Park and will not impede a Class I area outside of Kentucky from meeting their goals. Responses to comments received during the public comment period are included in Appendix C.

Based on the evidence presented herein, the Kentucky Division for Air Quality submits a negative declaration to the EPA Administrator specifying that further revision of the existing implementation plan is not needed at this time.

Your prompt consideration of this request is appreciated. If you have any questions or comments, please contact Ms. Andrea Smith, Assistant Director of the Division for Air Quality, at (502) 564-3999.

Sincerely yours,

LK Peters

Leonard K. Peters
Secretary

LKP/mrl
Enclosures

Kentucky
State Implementation Plan (SIP) Revision:
Regional Haze 5-Year Periodic Report
2008-2013
For
Kentucky's Class I Federal Area

Prepared by

Kentucky Energy and Environment Cabinet

Kentucky Division for Air Quality

September 17, 2014

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Executive Summary

The Clean Air Act (CAA) mandates requirements to protect visibility, especially in Class I Federal Areas. In 1999, the U.S. Environmental Protection Agency (EPA) finalized the Regional Haze Rule (RHR) [64 FR 35714]. The rule calls for state, tribal and federal agencies to work together to improve visibility in 156 national parks and wilderness areas.

States are required to develop and implement air quality protection plans (State Implementation Plans, or SIPs) to reduce pollution that causes visibility impairment. These plans establish goals and emission reduction strategies based on trends from various sources, including area source emissions, mobile source emissions (both on-road and non-road emissions), biogenic emissions, and wildfire and agricultural emissions.

In developing the Kentucky Regional Haze SIP (*submitted to EPA on June 25, 2008, and amended on May 28, 2010*), Kentucky prepared a long-term strategy and examined the possible application of Best Available Retrofit Technology (BART) in order to establish reasonable progress goals for its Class I area Mammoth Cave National Park. The predicted reductions in visibility impairment were expected to result from implementation of existing and planned emission control programs. This document is intended to address the requirements of 40 C.F.R. 51.308(g) requiring periodic reports evaluating progress goals toward reasonable progress goals (RPGs).

Ammonium sulfate is the largest contributor to visibility impairment at Mammoth Cave National Park and reduction of sulfur dioxide (SO_2) emissions is the most effective means of reducing ammonium sulfate. As such, the majority of the focus with regard to existing and planned emission controls pertains to the largest sources of SO_2 emissions. These sources consist of electric generating units (EGUs) and large industrial boilers.

Many of the EGUs within Kentucky have committed to and have installed controls through a number of mechanisms, including the Clean Air Interstate Rule (CAIR), state programs and state and federal consent agreements. Reductions associated with many of these mechanisms were used to estimate the 2018 visibility improvements at Class I areas. However, since the development of the Base G2 emissions inventory utilized for the June 2008 Kentucky Regional Haze SIP submittal and the Base G4 "Best and Final" emissions inventory, additional regulations and actions have been imposed on this source sector. These additional mandates will help ensure that the reasonable progress goals are attained on or before 2018. Moreover several large EGUs have announced plans to retire sources, install additional controls, and/or curtail emissions by converting to natural gas, leading to even more significant reductions in SO_2 emissions than predicted in the RH SIP (See Tables 11 and 14 for more specific information). Additionally, more current IMPROVE monitoring data (2009-2013) indicates significant visibility improvement for Mammoth Cave such that Mammoth Cave is meeting and exceeding its 2018 RPGs for the 20% worst days and the 20% best days (See Tables 16 - 18 and Figures 14 - 15 for more specific information).

Based on the evidence presented herein, the Kentucky Division for Air Quality (KYDAQ) submits a negative declaration to the EPA Administrator specifying that further revision of the existing implementation plan is not needed at this time.

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A. INTRODUCTION

1. REQUEST

The Commonwealth of Kentucky is requesting that the U.S. Environmental Protection Agency (EPA) approve this submittal as meeting the requirements for a periodic report describing the progress toward meeting the reasonable progress set forth in the Kentucky Regional Haze State Implementation Plan (SIP) as required by 40 C.F.R. 51.308(g).

Based on the evidence presented herein, the KYDAQ submits a negative declaration to the EPA Administrator specifying that further revision of the existing implementation plan is not needed at this time.

2. BACKGROUND

Regional haze is defined as visibility impairment that is produced by a multitude of sources and activities which emit fine particles and their precursors, and which are located across a broad geographic area. These emissions are transported over large regions, including national parks and wilderness areas ("Class I" Federal areas). The CAA mandates protection of visibility, especially in Class I Federal areas.

Fine particles may either be emitted directly or formed from emissions of precursors, the most important of which are sulfur dioxide (SO_2) and nitrogen oxides (NO_x). Particles affect visibility through the scattering and absorption of light, and fine particles - particles similar in size to the wavelength of light - are most efficient, per unit of mass, at reducing visibility. Therefore, reducing fine particles (particles with a diameter less than 2.5 µm, $PM_{2.5}$), in the atmosphere is generally considered to be an effective method of reducing regional haze, and thus improving visibility. The most important sources of $PM_{2.5}$ and its precursors are coal-fired power plants, industrial boilers and other combustion sources. Other significant contributors to $PM_{2.5}$ and visibility impairment include mobile source emissions, area sources, fires, and wind blown dust.

In 1999, EPA finalized the Regional Haze Rule (RHR) [64 FR 35714]. The rule calls for state, tribal, and federal agencies to work together to improve visibility in 156 national parks and wilderness areas. The rule addresses the combined visibility effects of various pollution sources over a wide geographic region. This wide-reaching pollution net meant that all states – even those without Class I areas – would be required to participate in haze reduction efforts. EPA designated five Regional Planning Organizations (RPOs) to assist with the coordination and cooperation needed to address the visibility issue (see Figure 1). Kentucky is among those states that make up the southeastern portion of the contiguous United States and therefore formed the RPO known as VISTAS (Visibility Improvement – State and Tribal Association of the Southeast), and includes the eastern band of Cherokee Indians, in addition to the following states: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia. The Southeastern Modeling, Analysis and Planning (SEMAP) group, funded by the same ten states originally involved in VISTAS, was formed to address the next phase of ozone, fine particle and regional haze assessment obligations of the member states. The organizational change was implemented primarily as an administrative convenience.

Figure 1. Geographical Areas of Regional Planning Organizations

States are required to develop and implement air quality protection plans (SIPs) to reduce the pollution that causes visibility impairment. These plans establish goals and emission reduction strategies based on trends from various sources, including point source emissions, area source emissions, mobile source emissions (both on-road and non-road emissions), biogenic emissions, and wildfire and agricultural emissions. Under the RHR, states are required to develop, and periodically update, SIPs to reduce visibility impairment with the express intent that by 2064, the visibility in the Class I areas will be returned to natural conditions. The rule requires States to establish reasonable progress goals (RPGs), expressed in deciviews, for visibility improvement at each Class I area covering each (approximately) 10-year period until 2064, with the first SIP, covering the first ten-year period from 2008 through 2018, which was due December 17, 2007.

States were required to establish baseline visibility conditions for 2000-2004; natural background visibility in 2064; and the rate of uniform progress between baseline and background conditions. The first set of reasonable progress goals must be met through measures contained in the state's long-term strategy covering the first ten year period from 2008 through 2018.

The five RPOs worked together to develop the technical basis for these SIPs. The products of the regional planning organizations were used to establish monitoring strategies for evaluating visibility conditions, baselines, and trends, and to develop long-term (10-15 year) strategies for making "reasonable progress" toward eliminating all manmade visibility impairment from mandatory Class I areas. With the help of VISTAS, Kentucky developed a SIP to address visibility impairment in its one Class I area Mammoth Cave National Park, which is located in south central Kentucky (see Figure 2).

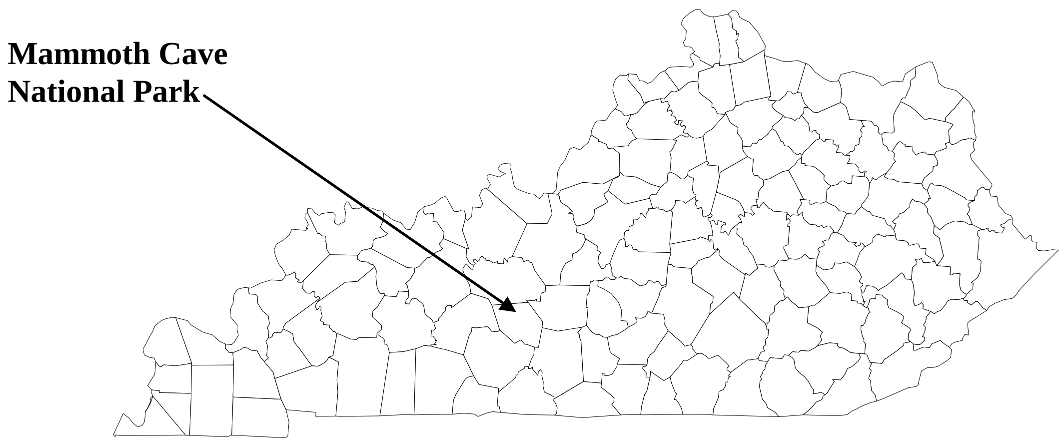


Figure 2. Kentucky's Class I area

In developing the Kentucky Regional Haze SIP (submitted to EPA on June 25, 2008 and amended on May 28, 2010, herein referred to as the Kentucky Regional Haze SIP), Kentucky prepared a long-term strategy and examined the possible application of Best Available Retrofit Technology (BART) in order to establish reasonable progress goals for Mammoth Cave. As provided in the SIP, for the 20% worst days, Kentucky adopted a reasonable progress goal (RPG) of a 5.81 deciview (dv) reduction in visibility impairment by 2018, which is consistent with the uniform rate of progress needed to achieve a natural background condition of 11.08 dv by 2064. Likewise, Kentucky has also adopted a reasonable progress goal for the 20% best days that would result in a 0.94 dv reduction in visibility impairment. The aforementioned predicted reductions in visibility impairment were expected to result from implementation of existing and planned emission controls that will be discussed in further detail.

This document is intended to address the requirements of 40 C.F.R. 51.308(g) requiring periodic reports evaluating progress towards the RPGs established for each mandatory Class I area and 40 C.F.R. 51.308(h) requirements for determining the adequacy of the current Kentucky Regional Haze SIP. To be sure, "*EPA believes that a requirement for regular SIP revisions will result in a more effective program over time and provide a focus for demonstrating ongoing progress and making mid-course corrections in emissions strategies*" [62 FR 41151]. In accordance with the requirements listed in 40 C.F.R. 51.308(g) of the RHR, Kentucky in its original SIP committed to submitting a report on reasonable progress to EPA every five (5) years following the initial submittal of the SIP. This document fulfills this requirement and is in the form of a SIP revision. This reasonable progress report evaluates the progress made towards the RPG for Mammoth Cave, as well as for each mandatory Class I Federal area located outside Kentucky that may be significantly affected by emissions from Kentucky sources.

3. REQUIREMENTS FOR PERIODIC PROGRESS REPORTS

The RHR, published as final July 1, 1999 [64 FR 35714], established the following requirements for periodic reports describing the progress toward meeting the reasonable progress goals set forth in the Kentucky Regional Haze SIP:

> 40 C.F.R. 51.308(g) *Requirements for periodic reports describing progress towards the reasonable progress goals.* Each state identified in 40 C.F.R. 51.300(b)(3) must submit a report to the Administrator every 5 years evaluating progress towards the reasonable progress goal for each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the State. The first progress report is due 5 years from submittal of the initial implementation plan addressing paragraphs (d) and (e) of this section. The progress reports must be in the form of implementation plan revisions that comply with the procedural requirements of 40 C.F.R. 51.102 and 40 C.F.R. 51.103. Periodic progress reports must contain at a minimum the following elements:
>
> (1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the state.
>
> (2) A summary of the emission reductions achieved throughout the State through implementation of the measures described in paragraph (g)(1) of this section.
>
> (3) For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5-year averages of these annual values.
>
> (i) The current visibility conditions for the most and least impaired days;
> (ii) The difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions;

(iii) The change in visibility impairment for the most impaired and least impaired days over the past 5 years.

(4) An analysis tracking the changes over the past 5 years in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.

(5) An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

(6) An assessment of whether the current implementation plan elements and strategies are sufficient to enable the State, or other States with mandatory Federal Class I areas affected by emissions from the State, to meet all established reasonable progress goals.

(7) A review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

4. ADEQUACY OF EXISTING SIP

The RHR also establishes the following requirements for determining the adequacy of the current Kentucky Regional Haze SIP.

40 C.F.R. 51.308(h) *Determination of the adequacy of existing implementation plan.* At the same time the State is required to submit any 5-year progress report to EPA in accordance with paragraph (g) of this section, the State must also take one of the following actions based upon the information presented in the progress report:

(1) If the State determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the State must provide to the Administrator a negative declaration that further revision of the existing implementation plan is not needed at this time.

(2) If the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another State(s) which participated in a regional planning process, the State must provide notification to the Administrator and to the other State(s) which participated in the regional planning process with the States. The State must also collaborate

with the other State(s) through the regional planning process for the purpose of developing additional strategies to address the plan’s deficiencies.

(3) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the State shall provide notification, along with available information, to the Administrator.

(4) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources within the State, the State shall revise its implementation plan to address the plan’s deficiencies within one year.

B. SUMMARY OF THE EXISTING KENTUCKY REGIONAL HAZE SIP

The regional haze rule required States to establish reasonable progress goals, expressed in deciviews, for visibility improvement at each affected Class I area, covering each (approximately) ten-year period until 2064. The first set of reasonable progress goals was required to be met through measures contained in the state's long-term strategy covering the period from the baseline until 2018. This section discusses development of Kentucky's long-term strategy, which was laid out in the Regional Haze SIP submitted to EPA on June 25, 2008 and amended May 28, 2010.

1. RELATIVE CONTRIBUTIONS TO VISIBILITY IMPAIRMENT: POLLUTANTS, SOURCE CATEGORIES AND GEOGRAPHIC AREAS

An important step toward identifying future reasonable progress measures for inclusion in the Regional Haze SIP was to identify the key pollutants contributing to visibility impairment at each Class I area. To understand the relative benefit of further reducing emissions from different pollutants, source sectors and geographic areas, VISTAS engaged the Georgia Institute of Technology to perform emission sensitivity model runs using CMAQ. Emissions sensitivities were initially performed for three episodes representing winter and summer conditions: Jan 2002, July 2001 and July 2002. These runs used the initial 2018 projection inventory and considered 30% reductions from specific pollutants, source categories and geographic areas. Emissions sensitivities were repeated using the 2009 Base D projection inventory and two month-long episodes from 2002; Jun 1 - Jul 10 and Nov 19 - Dec 19. Emissions in 2009 were reduced by 30% for each pollutant sensitivity run. The pollutant contributions that were evaluated were:

- SO_2 from EGU sources in each VISTAS state, other RPOs in the VISTAS 12-km grid, and Boundary Conditions from outside the 12-km domain
- SO_2 from non-EGU point sources in each VISTAS state, other RPOs and Boundary Conditions
- NO_x from ground level (on-road plus non-road area) sources in each VISTAS state and other RPOs
- NO_x from point (EGU plus non-EGU) sources in each VISTAS state and other RPOs
- NH_3 from all sources in VISTAS and other RPOs
- Volatile Organic Compounds from anthropogenic sources in the 12-km modeling domain
- Primary Carbon from all ground level sources in each VISTAS state and other RPOs
- Primary Carbon from all point sources in each VISTAS State and other RPOs
- Primary Carbon from all fires in each VISTAS state and other RPOs

Results are shown in Figure 3 below for the average of the 20% worst visibility days for Mammoth Cave. Responses for the 20% worst days were calculated by averaging the responses for the 20% worst days that were modeled in the two episodes. For Mammoth Cave, responses on 6 of the 20% worst visibility days were included in the graphic.

As Figure 3 illustrates, the greatest visibility benefits on the 20% worst days for Mammoth Cave are projected to result from further reducing SO_2 emissions from EGUs. At Mammoth Cave, benefits are projected from SO_2 reductions from EGUs in several VISTAS states, including Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia and West Virginia. Contributions from other RPOs and SO_2 coming from outside the boundary are also significant. The greatest benefit would be from further EGU reductions in Kentucky, the MRPO, and from outside the boundary. Additional, smaller benefits are projected from additional SO_2 emission reductions from non-utility, industrial point sources. Within the VISTAS states, the relative importance of SO_2 reductions from non-EGUs is similar to that for EGUs.

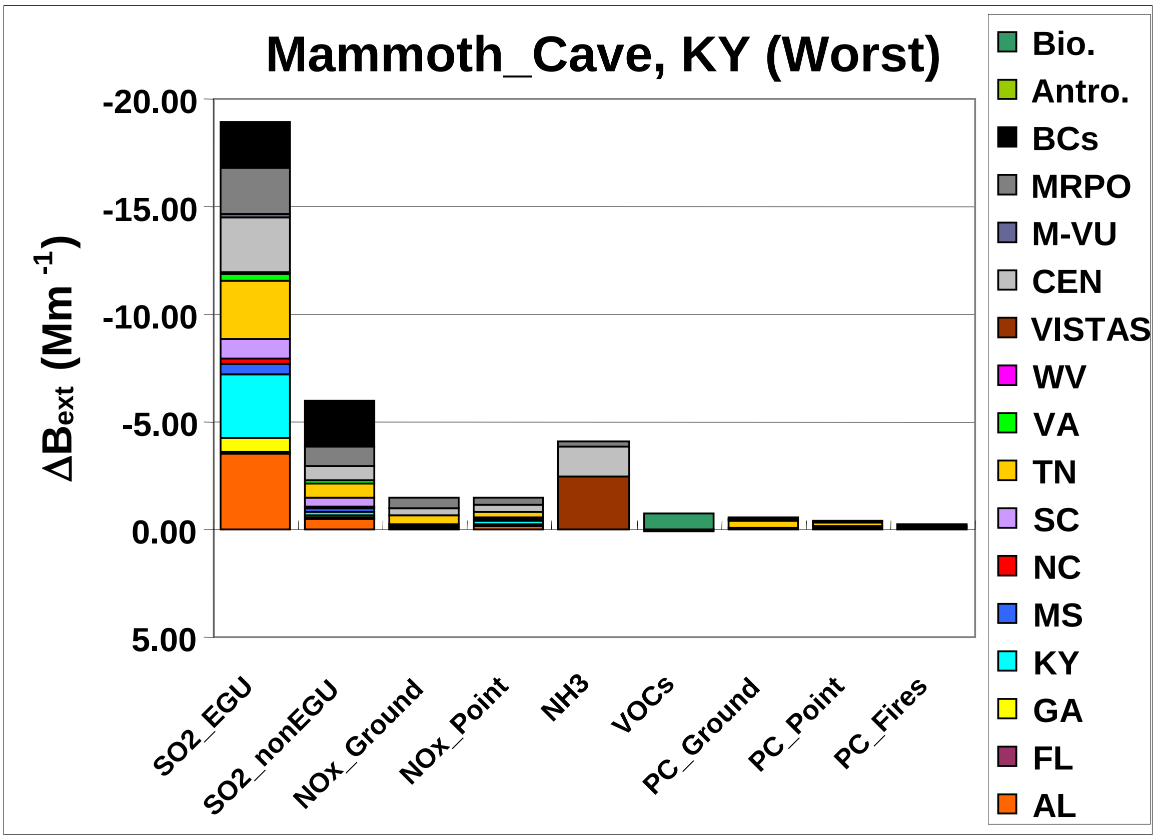


Figure 3. CMAQ projections of visibility responses on 20% worst days at Mammoth Cave, KY to 30% reductions from 2009 Base D inventory for visibility-reducing pollutants in different source categories and geographic areas.

Ammonium nitrate (NH_4NO_3) is a small contributor to $PM_{2.5}$ mass and visibility impairment on the 20% worst days at Mammoth Cave. Therefore the benefits of reducing NO_x and ammonia (NH_3) are small. Volatile Organic Compounds (VOC) in Kentucky originate primarily from biogenic sources, as vegetative emissions, and also contribute to visibility impairment. Controlling anthropogenic sources of VOC has little, if any, visibility benefit at Mammoth Cave. Reducing primary carbon from point sources, ground level sources or fires is projected to have minimal visibility benefit. This is consistent with the monitoring data which shows that most measured organic carbon is secondary in origin and primary carbon is only a small fraction of the total measured carbon (Appendix B of the June 25, 2008, Kentucky Regional Haze SIP). Reducing carbon from fires was not found to be effective because there was little fire activity at these sites on the days modeled in the sensitivity analyses.

The results indicate that sulfate is the dominant contributor to visibility impairment on the 20% worst days at all VISTAS sites and that NH_4NO_3 can be important for sites where 20% worst days occur in the winter. KYDAQ concluded that reducing SO_2 emissions from EGU and non-EGU point sources in Kentucky and the Midwest RPO would have the greatest visibility benefit for Mammoth Cave. Contributions from other VISTAS states were also significant for this area.

2. RELATIVE CONTRIBUTIONS TO VISIBILITY IMPAIRMENT: GEOGRAPHIC LOCATIONS OF THE LARGEST EMISSIONS SOURCES CONTRIBUTING TO VISIBILITY IMPAIRMENT AT MAMMOTH CAVE NATIONAL PARK

Once it was determined that SO_2 emission reductions from EGU and non-EGU point sources in the VISTAS states would be the most effective sources to control to improve visibility at the Class I areas, the next step was to identify the specific geographic areas that most likely influence visibility in each Class I area, and then to identify the major SO_2 point sources located in those geographic areas. An SO_2 Area of Influence (AoI) was defined for each Class I area to represent the geographic area containing sources that would likely have the greatest impact on visibility at that Class I area. All SO_2 point sources within these AoI were identified and ranked by their 2018 Base G emissions. The following sections contain a broad overview of the steps in the AoI analyses. See Appendix H of the Kentucky Regional Haze SIP for a more detailed discussion of these analyses and plots for additional Class I areas.

The AoI analysis was not a source apportionment modeling exercise, but rather a relative metric based on the magnitude of emissions from a source, its distance to the Class I area(s) of concern, and the sulfate extinction weighted residence time plots, developed using back trajectories. In other words, it is not an exact quantification of source-by-source contribution to visibility impairment on the 20% worst days at a specific Class I area, but a relative metric used to infer this information.

2.1. Back Trajectory Analyses

The first step was to generate meteorological back trajectories for IMPROVE monitoring sites in Kentucky and neighboring Class I areas for the 2000-2004 baseline period. Back trajectory analyses use interpolated, measured or modeled meteorological fields to estimate the most likely central path of air masses that arrive at a receptor at a given time. The method essentially follows a parcel of air backward in hourly steps for a specified length of time. Figure 4 is an example of a back trajectory analysis for Mammoth Cave for the 20% worst days in 2002.

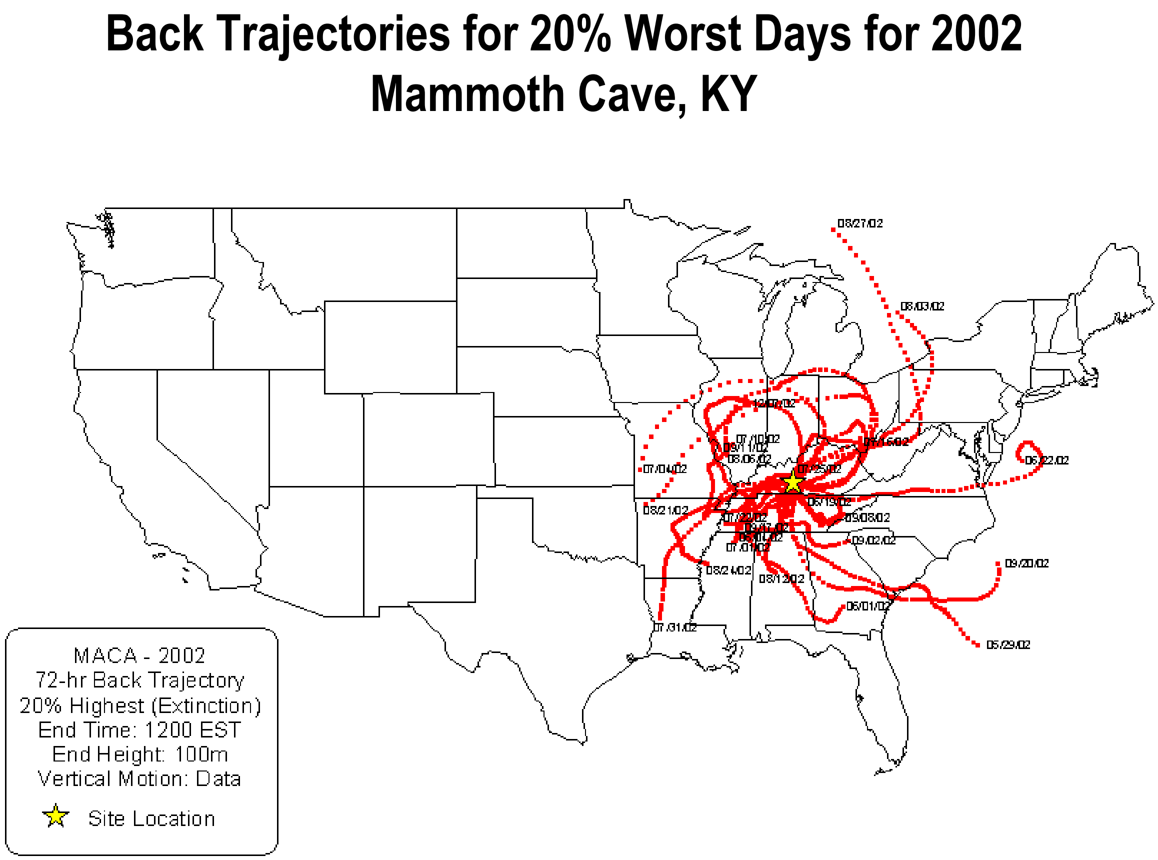


Figure 4. Example back trajectories for 20% worst visibility days in 2002 for Mammoth Cave National Park

Trajectories were started at 100 meters and 500 meters above the surface and run backward from the site for 72 hours. These individual back trajectories for the 20% worst days in 2002 were also useful in evaluating model performance for individual days at the Class I areas.

2.2. Residence Time Plots

The next step was to plot residence time for each Class I area using five years of back trajectories for the 20% worst visibility days in 2000-2004. Residence time is the frequency that winds pass over a specific geographic area on the way to a Class I area. Separate residence time plots were generated using trajectories with 100m and 500m start heights. As illustrated in Figure 5, winds influencing Mammoth Cave on the 20% worst days come from all directions and there is no single predominant wind direction influencing the 20% worst visibility days.

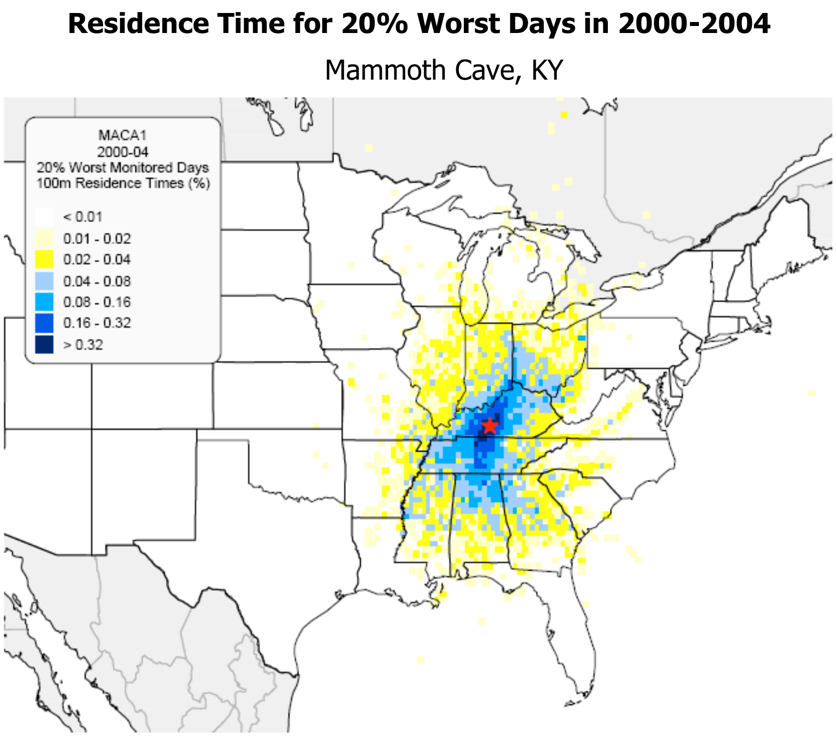
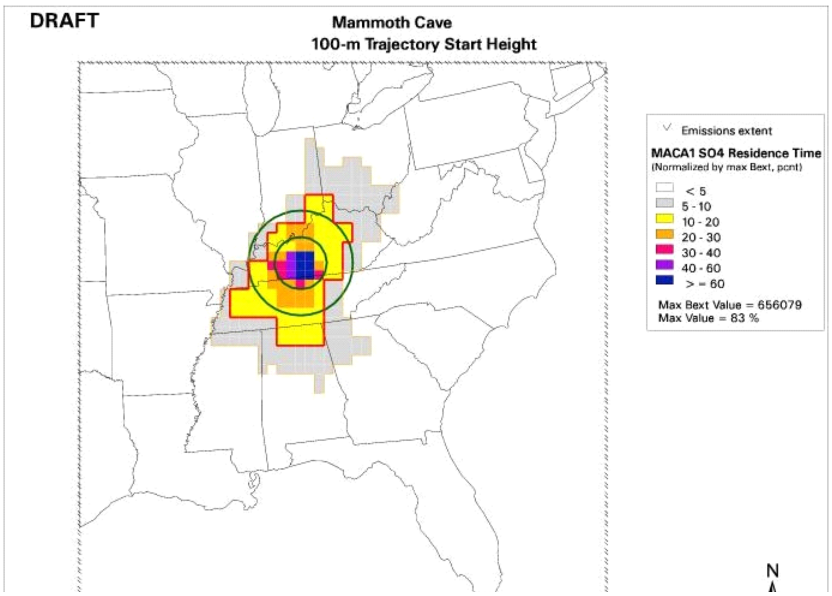


Figure 5. Residence time plot for 20% worst visibility days in 2000-2004 for Mammoth Cave National Park. Based on trajectories with 100m start height.

2.3. SO_2 Areas of Influence

The next step was to develop sulfate extinction-weighted residence time plots to define the geographic area with the highest probability of influencing the receptor on the 20% worst days in 2000-2004 that were dominated by sulfate. Each back trajectory was weighted by sulfate extinction for that day. This allowed us to focus on the 20% worst days that are influenced by sulfate and place less importance on days influenced by organic carbon from fires. Sulfate weighted back trajectories for 20% worst days were combined for 5 years of data. The resulting sulfate extinction-weighted residence time plots were used to define the geographic AoI for sources of SO_2 emissions. In Figure 6 the area representing 10% or greater residence time is outlined in red and the area representing 5% or greater residence time is outlined in gray. The VISTAS states focused their analyses on the AoI defined by 5% or greater sulfate extinction-weighted residence time.

SO2 Area of Influence for Mammoth Cave, KY



Green circles indicate 100-km and 200-km radii from Class I area.
Red line perimeter indicate Area of Influence with Residence Time > 10%
Orange line perimeter indicate Area of Influence with Residence Time > 5%.

Figure 6. SO_2 Area of Influence plot for sulfate extinction weighted residence time for 20% worst visibility days in 2000-2004 for Mammoth Cave National Park - Based on trajectories with 100m start height.

2.4. Emission Sources within SO_2 Areas of Influence for Mammoth Cave

Residence time plots were then combined with geographically-gridded emission data based on the 2002 baseline and 2018 Base G emissions inventories. Plots were generated for the AoI defined by trajectories with 100m and 500m start heights. As a way of incorporating the effects of transport, deposition and chemical transformation of point source emissions along the path of the trajectories, these data were weighted by 1/d, where d was calculated at the distance between grid cell centers, in kilometers. The distance-weighted point source SO_2 emissions were then combined with the gridded, extinction-weighted back-trajectory residence times at a spatial resolution of 36-km.

The final step was to combine the residence times and gridded emissions data in plots and data sets. The distance weighted (1/d), gridded point source SO_2 emissions were multiplied by the total extinction-weighted back-trajectory residence times on a grid cell by grid cell basis. These results were then normalized by the domain-wide total and displayed as a percentage. The analysis was done using both the 2002 and 2018 base year inventories.

Figure 7 illustrates 2002 and 2018 distance weighted, gridded emissions multiplied by sulfate-weighted residence time plots for Mammoth Cave. These maps help visualize where emissions reductions will be occurring between 2002 and 2018. The change in SO_2 emissions between 2002 and 2018 can be seen by comparing emission source strengths in the two plots. Note the emissions from each source are normalized by the total emissions in the domain. Sources that reduce SO_2 emissions by 2018 will show a lower contribution to emissions in the domain. On the 2018 map, the grid cells with these sources will show a lighter color gradient than on the 2002 map. For example, SO_2 reductions from EGUs from west to east for Kentucky resulting from CAIR can be seen by comparing the 2002 and 2018 maps. Because the total emissions in the domain are smaller in 2018, a source that does not change emissions between 2002 and 2018 may actually appear to increase in importance in 2018 compared to 2002.

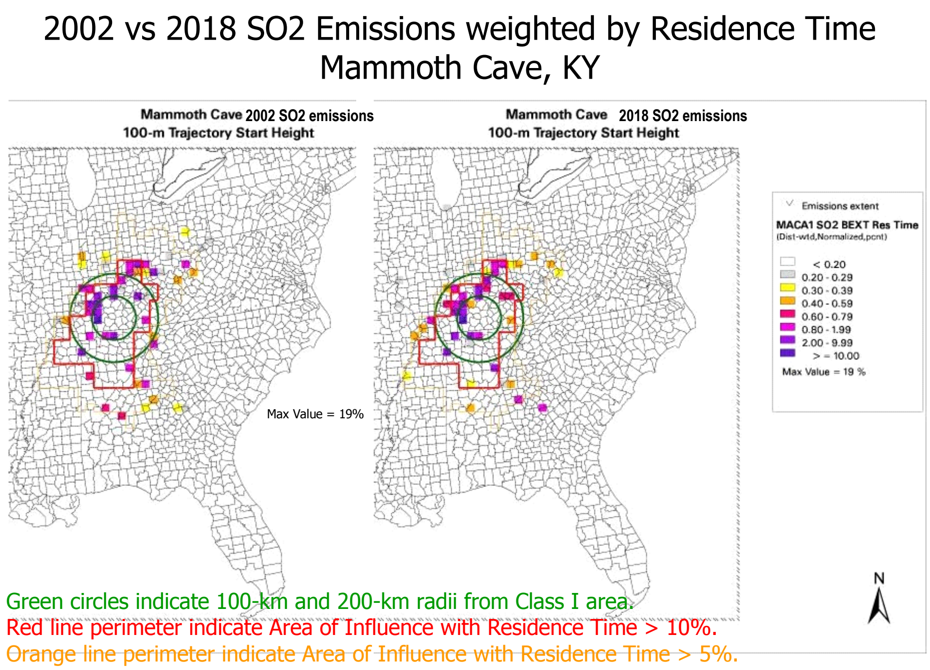
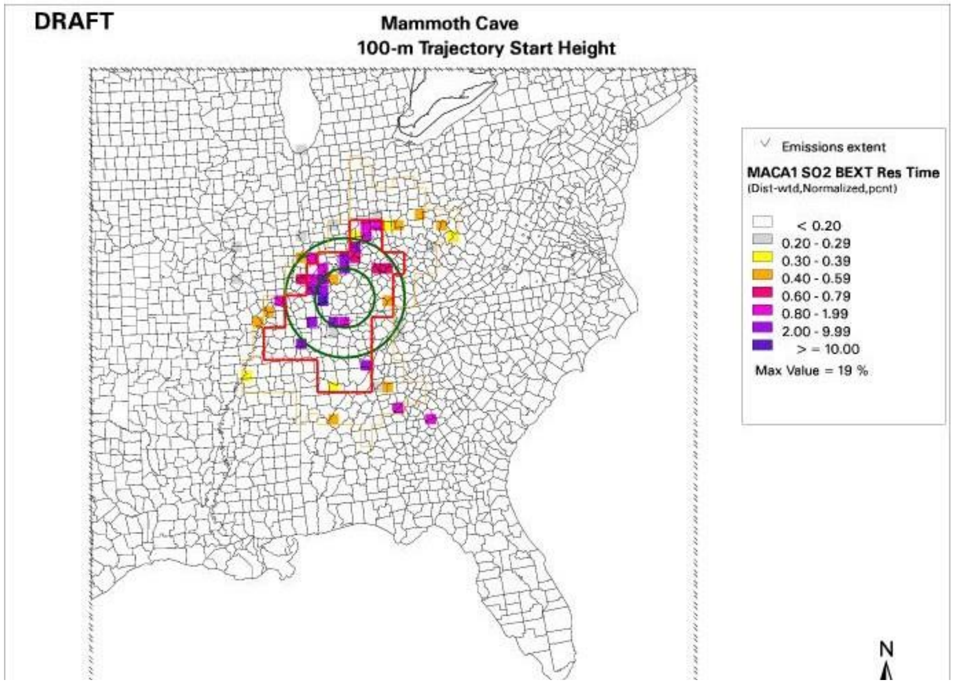


Figure 7. Mammoth Cave National Park 2002 (left) and 2018 (right) SO_2 distance weighted emissions x SO_4 extinction-weighted residence time plots.

Figure 8 illustrates the SO_2 distance weighted emissions x sulfate weighted residence time plots for 2018 emissions for Mammoth Cave. This plot illustrates the relative importance of Kentucky sources compared to sources in neighboring states. Additional analyses, including 2002 and 2018 distance weighted emissions x residence time plots for Mammoth Cave and the Class I areas in neighboring states were contained in Appendix H of the Kentucky Regional Haze SIP.

2018 SO2 Emissions weighted by Residence Time
Mammoth Cave, KY



Green circles indicate 100-km and 200-km radii from Class I area.
Red line perimeter indicate Area of Influence with Residence Time $\geq$ 10%.
Orange line perimeter indicate Area of Influence with Residence Time $\geq$ 5%.

Figure 8. 2018 SO_2 distance weighted emissions x SO4 extinction weighted residence time plot for Mammoth Cave National Park.

Table 1 shows, in tabular form, the relative contributions of point source SO_2 emissions from nearby states to Mammoth Cave. Again it should be noted, as stated in the introduction to section B.2, that the AoI analysis is not a source apportionment modeling exercise, but rather a relative metric based on the magnitude of emissions from a source, its distance to the Class I area(s) of concern, and the sulfate extinction weighted residence time plots, developed using back trajectories. In other words, it is not an exact quantification of source-by-source contribution to visibility impairment on the 20% worst days at a specific Class I area, but a relative metric used to infer this information.

Table 1. 2018 SO_2 Point Source Contribution to Mammoth Cave, KY by State			
State	**Relative Contribution**	**State**	**Relative Contribution**
Alabama	4.33%	Missouri	0.53%
Georgia	1.79%	Ohio	3.95%
Illinois	0.53%	Tennessee	13.46%
Indiana	21.22%	West Virginia	0.54%
Kentucky	53.60%		

As indicated by Table 2, there were 261 units identified within the AoI which were projected to contribute to sulfate at Mammoth Cave, including seventy-three (73) units in Kentucky. Forty-one (41) units were projected to have a relative contribution greater than 0.5% and contribute 66.60% to sulfate, including twenty (20) units in Kentucky, nineteen (19) of which are EGUs. In addition, nineteen (19) units have a projected relative contribution greater than 1.0% and contribute 52.63% to sulfate, including eleven (11) units in Kentucky, ten (10) of which are EGUs.

Table 2. Point Source Units Contributing at least 1% to Sulfate at Mammoth Cave

Source Identification						2002 Base Year	2018 Base Case		AoI and Associated Metrics			Q/d*RTMax State/Source Contribution		
State	FIPS CNTY	Plant ID	Plant Name	Point ID	SIC	SO_2 Emissions (tpy)	Q SO_2 Emissions (tpy)	CE (%)	Distance (km)	Q/d	RT Max	Q/d * RTMax	Unit % Contribution to Total Q/d* RTMax	State % Contribution to Total Q/d* RTMax
Indiana	147	00020	INDIANA MICHIGAN POWER-ROCKPORT	002	4911	25,602	32,660	0	117.79	277.29	12.31	3,413.4	3.53%	21.22%
Indiana	147	00020	INDIANA MICHIGAN POWER-ROCKPORT	001	4911	25,943	32,350	0	117.79	274.65	12.31	3,380.9	3.50%	21.22%
Indiana	043	00004	PSI ENERGY - GALLAGHER	004	4911	11,161	5,383	0	128.51	41.89	25.48	1,067.4	1.10%	21.22%
Indiana	043	00004	PSI ENERGY - GALLAGHER	001	4911	11,743	5,383	0	129.50	41.57	25.48	1,059.2	1.10%	21.22%
Indiana	043	00004	PSI ENERGY - GALLAGHER	003	4911	23,773	5,309	0	128.51	41.31	25.48	1,052.6	1.09%	21.22%
Indiana	043	00004	PSI ENERGY - GALLAGHER	002	4911	12,252	5,285	0	129.50	40.81	25.48	1,039.8	1.08%	21.22%
Kentucky	177	2117700006	TVA PARADISE STEAM PLANT	003	4911	46,029	22,539	90	75.45	298.73	35.87	10,715.4	11.08%	53.60%
Kentucky	183	2118300069	WESTERN KY ENERGY CORP WILSON STATION	001	4911	9,262	11,115	90.9	89.81	123.76	48.07	5,949.1	6.15%	53.60%
Kentucky	177	2117700006	TVA PARADISE STEAM PLANT	002	4911	17,256	7,941	90	75.45	105.25	35.87	3,775.3	3.90%	53.60%
Kentucky	177	2117700006	TVA PARADISE STEAM PLANT	001	4911	15,930	7,823	90	75.45	103.69	35.87	3,719.4	3.85%	53.60%
Kentucky	111	0127	LOU GAS & ELEC, MILL CREEK	04	4911	7,245	12,823	91.7	104.63	122.56	25.68	3,147.3	3.25%	53.60%
Kentucky	111	0127	LOU GAS & ELEC, MILL CREEK	03	4911	6,494	10,316	91.7	104.63	98.60	25.68	2,532.0	2.62%	53.60%
Kentucky	177	2117700001	KENTUCKY UTILITIES CO GREEN RIVER STATION	004	4911	9,224	4,234	0	90.11	46.98	35.87	1,685.2	1.74%	53.60%
Kentucky	111	0127	LOU GAS & ELEC, MILL CREEK	02	4911	4,941	6,014	91.8	106.63	56.40	25.68	1,448.4	1.50%	53.60%
Kentucky	091	2109100004	CENTURY ALUMINUM OF KY LLC	024	3334	4,985	6,366	0	106.54	59.75	21.08	1,259.5	1.30%	53.60%
Kentucky	177	2117700001	KENTUCKY UTILITIES CO GREEN RIVER STATION	003	4911	6,189	2,944	0	90.11	32.67	35.87	1,171.9	1.21%	53.60%
Kentucky	091	ORIS90012	GENERIC UNIT	GSC21	4911	0	5,927	0	108.62	54.57	21.08	1,150.3	1.19%	53.60%
Tennessee	161	0011	TVA CUMBERLAND FOSSIL PLANT	001	4911	7,354	12,073	95	157.50	76.65	21.87	1,676.3	1.73%	13.46%

Table 2. Point Source Units Contributing at least 1% to Sulfate at Mammoth Cave

Source Identification						2002 Base Year	2018 Base Case		AoI and Associated Metrics			Q/d*RTMax State/Source Contribution		
State	FIPS CNTY	Plant ID	Plant Name	Point ID	SIC	SO_2 Emissions (tpy)	Q SO_2 Emissions (tpy)	CE (%)	Distance (km)	Q/d	RT Max	Q/d * RTMax	Unit % Contribution to Total Q/d* RTMax	State % Contribution to Total Q/d* RTMax
Tennessee	**161**	**0011**	**TVA CUMBERLAND FOSSIL PLANT**	**002**	**4911**	**9,165**	**11,936**	**95**	**157.56**	**75.76**	**21.87**	**1,656.9**	**1.71%**	13.46%
									TOTAL All Sources			**96,715.9**	**100.00%**	**261 units**
									Contribution from 0.5% sources			**64,415.7**	**66.60%**	**41 units**
									Contribution from 1.0% Sources			**50,900.5**	**52.63%**	**19 units**

Note: Units identified in black text are EGUs, units identified in blue text are non-EGUs.
Units identified with bold text have greater than 1.0% contribution to sulfate.

2.5. Specific Source Types in the Area of Influence for Mammoth Cave

The next step in the analysis was to review the emissions inventories to determine the source categories, as well as specific sources, found to have the greatest impact on visibility at Mammoth Cave. Lists of SO_2 point sources found within the AoI for each Class I area were developed using the most current (Base G) VISTAS 2002 base year and 2018 future year emissions. For this purpose the AoI was defined as the counties with maximum sulfate extinction weighted residence time greater than five (5). For SO_2 sources within each AoI, the following attributes were defined for each individual unit:

- State, county, source (plant) and industry identification codes
- SO_2 emissions for 2002 and 2018
- 2018 control efficiency
- Distance to Class I areas (defined by centroid of the Class I area)
- Emissions divided by distance (Q/d), a metric that accounts for dispersion of emissions over distance
- Maximum sulfate extinction weighted residence time (RTmax)

The review was conducted in a top down fashion starting with an analysis of the major source categories in each SO_2 AoI to determine which major categories had the highest residual contribution to the area in 2018. It was also important to identify reductions that occurred or are projected to occur between 2002 and 2018 within each category or at specific units. This allowed VISTAS states to determine if certain source categories or units that had yet to be controlled under the future year base case had the potential for reduction. Once the highest source types were identified, subcategories within those sources types were reviewed. The contributions from major source categories to the 2018 Base G2 inventory for the SO_2 AoI for Mammoth Cave are listed in Table 3.

Table 3. 2018 Emissions Contributions from Major Source Categories in the Area of Influence for Mammoth Cave, KY

Tier	VOC	NOX	CO	SO2	PM-10	PM-2.5	NH3
Fuel Comb. Elec. Util.	1%	25%	1%	66%	8%	18%	1%
Fuel Comb. Industrial	1%	16%	2%	19%	3%	6%	0%
Fuel Comb. Other	4%	7%	3%	5%	3%	8%	0%
Chemical & Allied Product Mfg	2%	1%	1%	1%	1%	1%	1%
Metals Processing	1%	1%	5%	3%	3%	7%	0%
Petroleum & Related Industries	1%	0%	0%	1%	0%	0%	0%
Other Industrial Processes	7%	5%	1%	3%	8%	10%	1%
Solvent Utilization	45%	0%	0%	0%	0%	0%	0%
Storage & Transport	6%	0%	0%	0%	1%	1%	0%
Waste Disposal & Recycling	3%	1%	2%	0%	3%	7%	0%
Highway Vehicles	17%	20%	48%	0%	1%	2%	9%
Off-highway	12%	24%	36%	1%	2%	4%	0%
Miscellaneous	1%	0%	3%	0%	69%	35%	87%
VISTAS Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 3 indicates that for Mammoth Cave, Electric Utilities and Industrial Boilers are the two major source categories contributing to 2018 SO_2 emissions in the AoI, even after implementation of CAIR. Together these two source categories contribute 85% of the 2018 SO_2 emissions to the AoI for Mammoth Cave. Other Fuel Combustion and Other Industrial Processes comprise another 8% of the 2018 SO_2 emissions.

This table can also be used to evaluate the major source categories contributing to emissions of NO_x, NH_3 and PM emissions in 2018. For instance, highway vehicles and off-road vehicles are major sources of NO_x emissions, in addition to electric utilities and industrial boilers. The source category "miscellaneous" (which includes agricultural sources and fires) is the major contributor to NH_3 and primary PM.

The contributions to SO_2 emissions in 2018 from the three highest source categories, Electric Utilities, Industrial Boilers and Other Fuel Combustion have been further broken out into subcategories. Table 4 indicates subcategories for the AoI for Mammoth Cave. Within Electric Utilities, all the SO_2 emissions are attributable to coal-fired power plants. Within Industrial Boilers, most emissions are attributable to coal-fired boilers with lesser contributions from oil and gas boilers. Commercial and institutional coal and oil-fired boilers have smaller contributions.

Table 4. 2018 SO_2 Emissions contributions from Major Source Subcategories in the Area of Influence for Mammoth Cave, KY

Tier	MACA
Fuel Comb. Elec. Util.-Coal	66%
Fuel Comb. Elec. Util.-Oil	0%
Fuel Comb. Elec. Util.-Gas	0%
Fuel Comb. Elec. Util.-Other	0%
Fuel Comb. Elec. Util.-Internal Combustion	0%
Fuel Comb. Industrial-Coal	14%
Fuel Comb. Industrial-Oil	3%
Fuel Comb. Industrial-Gas	2%
Fuel Comb. Industrial-Other	1%
Fuel Comb. Industrial-Internal Combustion	0%
Fuel Comb. Other-Commercial/Institutional Coal	2%
Fuel Comb. Other-Commercial/Institutional Oil	2%
Fuel Comb. Other-Commercial/Institutional Gas	0%
Fuel Comb. Other-Misc. Fuel Comb. (Except Residential)	0%
Fuel Comb. Other-Residential Wood	0%
Fuel Comb. Other-Residential Other	1%

These analyses indicated Kentucky should consider what additional control measures for electric utilities and industrial boilers were reasonable. The lists of individual sources was also used to determine if individual sources in other sources categories were major contributors to SO_2 emissions in the AoI.

The KYDAQ elected to focus on those units that contributed at least 1% to sulfate visibility impairment at a given Class I area. First, the units with the larger contribution toward visibility impairment would likely show an environmental benefit under a control evaluation, and KYDAQ would be able to use that environmental benefit to require controls on a given unit. Second, there are several regulatory programs that use a higher threshold than 1% for evaluation thresholds.

1. The BART rule specifies that a maximum impact of 0.5 dv is an acceptable threshold for establishing significance. This threshold equates to roughly a 5% change in visible perception. This same significance level is used in the Prevention of Significant Deterioration/ New Source Review program for the visibility air quality related value.
2. The NOx SIP Call laid out a significance level for Section 126 petitions of 4 parts per million (ppm), that being the level to which a State's contribution to another state's ozone problem

was considered significant. Four ppm represents approximately 3.75% of the 1-hour ozone standard, which was in place at the time EPA promulgated the NOx SIP Call.

3. For the CAIR rule, a PM contribution of 0.2 ug/m3 was used to demonstrate a significant impact, which is 1.3% of the annual PM2.5 standard of 15 ug/m3.

4. Lastly, when National Ambient Air Quality Standards (NAAQS) for human health standards are proposed, significant impact levels (SILs) are assigned which allow sources to determine their significance on air quality in the area around their facilities. Sources that demonstrate that their "contribution" from the new or modified sources is less than these significance levels do not have to complete any further modeling. The SILs represent a percentage of the NAAQS.

After reviewing all averaging periods for the criteria pollutants, KYDAQ determined that the 1% threshold utilized for reasonable further progress was as protective or more protective than the significant impact levels. The most restrictive threshold identified was for NOx, which has a NAAQS of 100 ug/m3 and a significance level of 1 ug/m3, which represents 1% of the total.

Finally, KYDAQ established a threshold to determine which sources to evaluate in the Class I area's sulfate AoI. Table 5 shows that a 1% contribution threshold captures greater than 53% of the total point source SO_2 contribution to Mammoth Cave, while requiring an evaluation of only 19 units. The next 40% of cumulative contribution may be attributed to units with individual contribution between 0.1% - 1% and would require analysis of 130 additional units. The KYDAQ determined that the 1% threshold was appropriate, given the contribution to the total visibility impairment at each Class I area.

Table 5. Numbers and Percentages of 2018 SO_2 Emission Units that Contribute to Sulfate Visibility Impairment at Mammoth Cave, KY

	Mammoth Cave
# Units Contributing > 1%	**19**
Percentage of total Contribution	**52.63%**
# Units Contributing > 0.1%, but < 1%	**130**
Percentage of total Contribution	**40.29%**
# Units Contributing < 0.1%	**112**
Percentage of total Contribution	**7.08%**

3. CURRENT REASONABLE PROGRESS GOALS

The regional haze rule at 40 C.F.R. 51.308(d)(1) required States to establish RPGs for each Class I area within the state (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility. In addition, EPA released guidance on June 7, 2007, to use in setting reasonable progress goals. The goals were required to provide for improvement in visibility for the most impaired days, and ensure no degradation in visibility for the least impaired days over the SIP period.

In accordance with the requirements of 40 C.F.R. 51.308(d)(1), the Regional Haze Implementation Plan established reasonable progress goals for Mammoth Cave. To calculate the rate of progress represented by each reasonable progress goal, KYDAQ compared baseline visibility conditions to natural visibility conditions in each Class I area and determined the uniform rate of visibility improvement (in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064. The RPGs, as indicated in Table 6, were based on the available Base G2 modeling results, and represented the best data available at the time of the original Kentucky Regional Haze SIP submittal on June 25, 2008.

Table 6. Kentucky Reasonable Progress Goals

Class I Area	2000-2004 Baseline Visibility (Deciviews) Worst Days (dv)	Reasonable Progress Goal (Deciview Improvement Expected by 2018, 20% Worst Days) (dv)	2000-2004 Baseline Visibility (Deciviews) Best Days (dv)	Reasonable Progress Goal (Deciview Improvement Expected by 2018, 20% Best Days) (dv)
Mammoth Cave National Park	31.37	25.56 (5.81)	16.51	15.57 (0.94)

C. PERIODIC PROGRESS REPORT

40 C.F.R. 51.308(g) of the RHR requires the state to submit:

> [A] report to the Administrator every 5 years evaluating progress towards the reasonable progress goals for each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the state.

Figure 9 illustrates the Class I Federal areas located within VISTAS/SEMAP, as well as the neighboring Class I Federal areas which may be affected by emissions from within Kentucky.

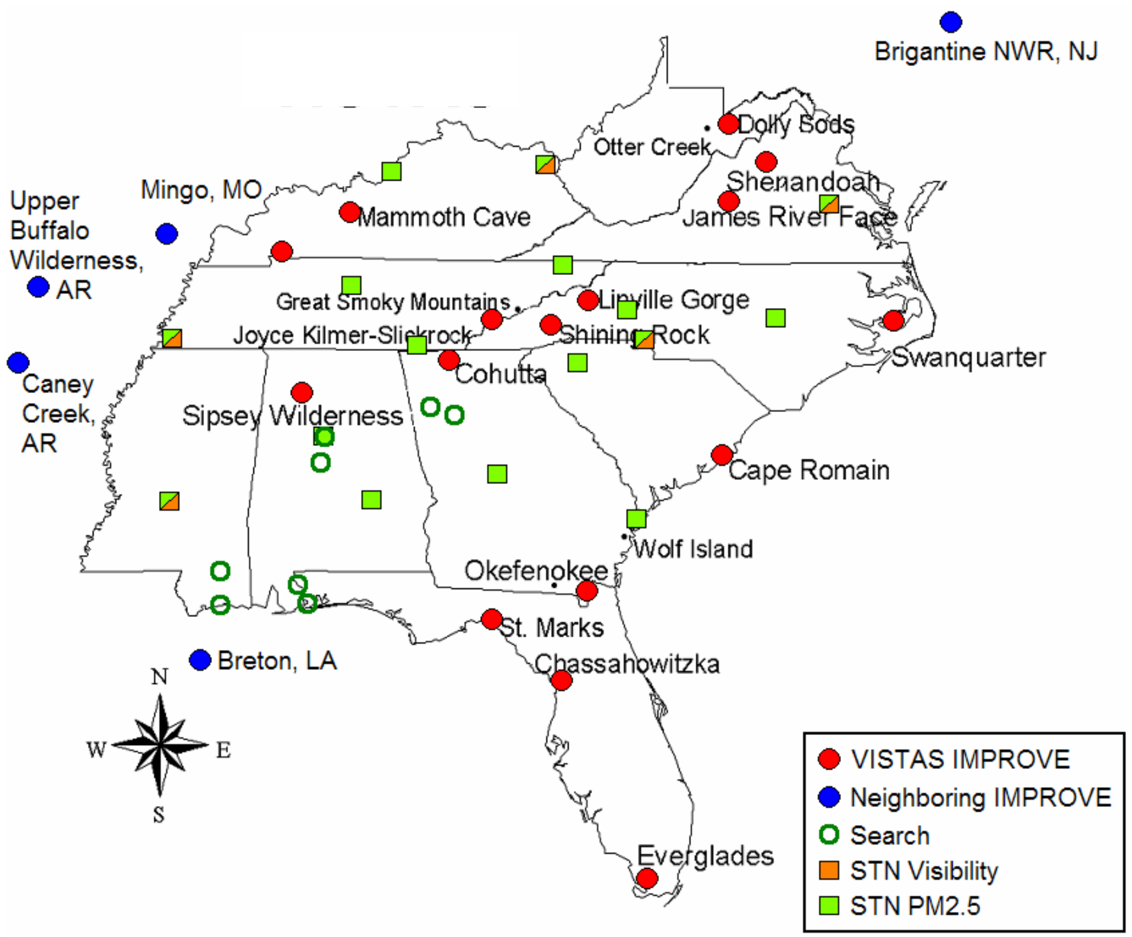


Figure 9. VISTAS and neighboring Class I areas, and monitoring locations

1. STATUS OF IMPLEMENTATION OF MEASURES IN THE SIP

40 C.F.R. 51.308(g)(1) requires "A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for Class I areas both within and outside the state."

This summary provides a status of the federal and state emission reduction measures that were included in the June 25, 2008, Kentucky Regional Haze SIP based on the VISTAS Regional Haze Base G2 emissions inventory**,** and reasonable progress goal modeling effort. This report covers the time period from 2008 through 2013. This summary includes discussions of benefits associated with each measure. Such benefits are quantified wherever possible. In instances where implementation of a measure did not occur in a timely manner, information is provided on the source category and its relative impact on the overall future year emissions inventories.

The paragraphs in Section 2 also contain information on emissions strategies that were not included in the original Kentucky Regional Haze SIP Base G2 emissions inventory and modeling effort. At the time of the Base G2 emissions inventory development process, certain of these measures were not fully documented or had not yet been published in final form, and therefore the benefits of these measures were not included in future year inventories. Emissions reductions from these measures will further help ensure that each Class I area meets or exceeds the visibility progress goals set in the Kentucky Regional Haze SIP (See Section 2).

1.1. Federal and State Programs

The emission reductions associated with the federal programs described below were included in the VISTAS future year emissions estimates. Descriptions contain qualitative assessments of emissions reductions associated with each program, and where possible, quantitative assessments. In cases where delays or modifications altered emissions reduction estimates such that the original estimates are no longer accurate, information is also provided in the effects of these alterations.

- **Clean Air Interstate Rule (CAIR) and the Cross State Air Pollution Rule (CSAPR)**

On May 12, 2005, EPA promulgated CAIR, which required reductions in emissions of NO_x and SO_2 from large fossil fuel-fired EGUs. The U.S. Court of Appeals for the D.C. Circuit ruled on petitions for review of CAIR and CAIR Federal Implementation Plans, including their provisions establishing the CAIR NO_x annual and ozone season and SO_2 trading programs. On July 11, 2008, the Court issued an opinion vacating and remanding these rules. However, parties to the litigation requested rehearing of aspects of the Court's decision, including the vacatur of the rules. On December 23, 2008, the Court remanded the rules to EPA without vacating them. The December 23, 2008 ruling leaves CAIR in place until EPA issues a new rule to replace CAIR in accordance with the July 11, 2008 decision.

On July 6, 2011, EPA finalized the Transport Rule, commonly referred to as the Cross-State Air Pollution Rule or CSAPR. EPA intended for this rule to replace CAIR beginning in 2012, requiring 27 states in the eastern half of the United States to reduce power plant emissions. EPA also issued a supplemental proposal for six (6) states to make ozone season (summer time) NO_x reductions. This proposal, when finalized, would bring the total number of states participating in the program to 28. CSAPR was estimated to reduce 2005 emissions from EGUs by 6,500,000 tons of SO_2 annually and 1,400,000 tons of NO_x annually in the covered states. These estimates represent a 71% reduction in SO_2 and a 52% reduction in NO_x from 2005 levels.

On December 30, 2011, the U.S. Court of Appeals for the DC Circuit issued a ruling staying the CSAPR pending judicial review. Oral arguments in the case were held on April 13, 2012, and on August 21, 2012 the D.C. Circuit vacated the CSAPR, although on June 24, 2013, the U.S. Supreme Court issued an order granting petitions for review of this judgment. In the vacature, the court ordered EPA to "continue administering CAIR pending the promulgation of a valid replacement." *[EME Homer City Generation, L.P. v. EPA, No. 11-1302*] Therefore, CAIR remains in place and enforceable until substituted by a "valid" replacement rule. Kentucky's Regional Haze SIP identifies CAIR as a control measure that is expected to achieve significant visibility improvements by 2018. Kentucky submitted a CAIR SIP to EPA in July 2007, which was subsequently updated to incorporate additional EPA rule-makings. Kentucky's CAIR SIP was approved by EPA on December 3, 2007. To the extent that Kentucky is relying on CAIR in its Regional Haze SIP, the same logic applies as it relates to reliance on CAIR in the Huntington-Ashland maintenance plan, as EPA explained in the proposed *Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Kentucky; Redesignation of the Kentucky Portion of the Huntington-Ashland 1997 Annual Fine Particulate Matter ($PM_{2.5}$) Nonattainment Area to Attainment* [77 FR 69409, 19Nov2012]:

> [T]he recent directive from the D.C. Circuit in EME Homer ensures that the reductions associated with CAIR will be permanent and enforceable for the necessary time period. EPA has been ordered by the Court to develop a new rule, and the opinion makes clear that after promulgating that new rule EPA must provide states an opportunity to draft and submit SIPs to implement that rule. CAIR thus cannot be replaced until EPA has promulgated a final rule through a notice-and-comment rulemaking process, states have had an opportunity to draft and submit SIPs, EPA has reviewed the SIPs to determine whether they can be approved, and EPA has taken action on the SIPs, including promulgation of a federal implementation plan, if appropriate. These steps alone will take many years, even with EPA and the states acting expeditiously. The Court's clear instruction to EPA that it must continue to administer CAIR until a ''valid replacement'' exists provides an additional backstop; by definition, any rule that replaces CAIR and meets the Court's direction would require upwind states to eliminate significant downwind contributions to downwind nonattainment and prevent interference with maintenance in downwind areas.

> Further, in vacating the Transport Rule and requiring EPA to continue administering CAIR, the D.C. Circuit emphasized that the consequences of vacating CAIR ''might be more severe now in light of the reliance interests accumulated over the intervening four years.'' EME Homer, slip op. at 60. The accumulated reliance interests include the interests of states who reasonably assumed they could rely on reductions associated with CAIR, which brought certain nonattainment areas into attainment with the NAAQS. If EPA were prevented from relying on reductions associated with CAIR in redesignation action, states would be forced to impose additional, redundant reductions on top of those achieved by CAIR. EPA believes this is precisely the type of irrational result the Court sought to avoid by ordering EPA to continue administering CAIR. For these reasons also, EPA believes it is appropriate to allow states to rely on CAIR, and the existing emission reductions achieved by CAIR, as sufficiently permanent and enforceable for purposes such as redesignation. Following promulgation of the replacement rule, EPA will review SIPs as appropriate to identify whether there are any issues that need to be addressed.

On April 29, 2014, the U.S. Supreme Court reversed the D.C. Circuit opinion vacating CSAPR. Additionally, on June 26, 2014, the U.S. government filed a motion with the U.S. Court of Appeals for the D.C. Circuit to lift the stay of the Cross State Air Pollution Rule. While the Court considers the motion, CAIR remains in place and no immediate action from States or affected sources is expected.

- **Maximum Achievable Control Technology (MACT) Programs (40 C.F.R. Part 63)**

VISTAS applied controls to future year emissions estimates from various MACT regulations for VOCs, SO_2, NO_x, and PM on source categories where controls were installed on or after 2002. Control estimates are documented in the report entitled "Control Packet Development and Data Sources," Alpine Geophysics, July 14, 2004. Table 7 below describes the MACTs used as control strategies for the non-EGU point source emissions. The table notes the pollutants for which controls were applied as well as the promulgation dates and the compliance dates for existing sources.

Table 7. MACT Source Categories with Compliance Dates On or After 2002

MACT Source Category	40C.F.R. 63 Subpart	Date Promulgated	Existing Source Compliance Date	Pollutants Affected
Hazardous Waste Combustion (Phase I)	Parts 63 (EEE), 261 and 270	9/30/99	9/30/03	PM
Oil & Natural Gas Production	HH	6/17/99	6/17/02	VOC

Table 7. MACT Source Categories with Compliance Dates On or After 2002				
MACT Source Category	**40C.F.R. 63 Subpart**	**Date Promulgated**	**Existing Source Compliance Date**	**Pollutants Affected**
Polymers and Resins III	OOO	1/20/00	1/20/03	VOC
Portland Cement Manufacturing	LLL	6/14/99	6/10/02	PM
Publicly Owned Treatment Works (POTW)	VVV	10/26/99	10/26/02	VOC
Secondary Aluminum Production	RRR	3/23/00	3/24/03	PM
Combustion Sources at Kraft, Soda, and Sulfite Pulp & Paper Mills (Pulp and Paper MACT II)	MM	1/12/01	1/12/04	VOC
Municipal Solid Waste Landfills	AAAA	1/16/03	1/16/04	VOC
Coke Ovens	L	10/27/03	Phased from 1995-2010	VOC
Coke Ovens: Pushing, Quenching, and Battery Stacks	CCCCC	4/14/03	4/14/06	VOC
Asphalt Roofing Manufacturing and Asphalt Processing (two source categories)	LLLLL	4/29/03	5/1/06	VOC
Metal Furniture (Surface Coating)	RRRR	5/23/03	5/23/06	VOC
Printing, Coating, and Dyeing of Fabrics	OOOO	5/29/03	5/29/06	VOC
Wood Building Products (Surface Coating)	QQQQ	5/28/03	5/28/06	VOC
Lime Manufacturing	AAAAA	1/5/04	1/5/07	PM, SO_2
Site Remediation	GGGGG	10/8/03	10/8/06	VOC
Iron & Steel Foundries	EEEEE	4/22/04	04/23/07 04/22/05 work practice std.	VOC
Taconite Iron Ore Processing	RRRRR	10/30/03	10/30/06	PM, SO_2
Miscellaneous Coating Manufacturing	HHHHH	12/11/03	12/11/06	VOC
Metal Can (Surface Coating)	KKKK	11/13/03	11/13/06	VOC
Plastic Parts and Products (Surface Coating)	PPPP	4/19/04	4/19/07	VOC
Miscellaneous Metal Parts and Products (Surface Coating) (includes Asphalt/Coal Tar Application to Metal Pipes)	MMMM	1/2/04	1/2/07	VOC
Industrial Boilers, Institutional/ Commercial Boilers and Process Heaters	DDDDD	9/13/04	9/13/07	PM, SO_2
Plywood and Composite Wood Products	DDDD	7/30/04	10/1/07	VOC
Reciprocating Internal Combustion Engines	ZZZZ	6/15/04	6/15/07	NO_x, VOC
Auto and Light-Duty Truck (Surface Coating)	IIII	4/26/04	4/26/07	VOC

Table 7. MACT Source Categories with Compliance Dates On or After 2002				
MACT Source Category	**40C.F.R. 63 Subpart**	**Date Promulgated**	**Existing Source Compliance Date**	**Pollutants Affected**
Wet Formed Fiberglass Mat Production	HHHH	4/11/04	4/11/05	VOC
Metal Coil (Surface Coating)	SSSS	6/10/02	6/10/05	VOC
Paper and Other Web Coating (Surface Coating)	JJJJ	12/4/02	12/4/05	VOC
Miscellaneous Organic Chemical Production (MON)	FFFF	11/10/03	5/10/08	VOC

Use of the Industrial/Commercial/Institutional (ICI) boiler MACT standard was problematic in that the U.S. Court of Appeals for the District of Columbia Circuit vacated and remanded that regulation to EPA on June 8, 2007. However, VISTAS chose to leave the emissions reductions associated with this regulation in place since the CAA required use of alternative control methodologies under Section 112(j) for uncontrolled source categories. The applied MACT control efficiencies were 4% for SO_2 and 40% for PM_{10} and $PM_{2.5}$ to account for the co-benefit from installation of acid gas scrubbers and other control equipment to reduce HAPS.

To determine how the vacatur of this regulation may have affected the VISTAS future year inventories, VISTAS created an analysis of inventory data to determine the level of SO_2, PM_{10}, and $PM_{2.5}$ reductions associated with the vacated regulation. Table 8 compares the level of emission reductions for VISTAS in 2009 and 2018 estimated to be derived from the vacated regulation to the total non-EGU point source inventory for those years and to the total annual inventory for those years.

Table 8: ICI Boiler MACT Reductions compared to the 2009 and 2018 VISTAS Inventory						
Pollutant	**ICI Boiler MACT Estimated Reductions in VISTAS States[1]**		**Non-EGU Inventories for VISTAS States[2]**		**Total Inventories for VISTAS States[2]**	
	2009	**2018**	**2009**	**2018**	**2009**	**2018**
Primary PM_{10} (tpy)	13,325	14,556	211,267	248,367	4,151,695	4,549,680
Primary $PM_{2.5}$ (tpy)	10,892	11,919	157,615	185,490	1,124,150	1,195,487
SO_2 (tpy)	7,773	8,188	548,196	575,716	3,468,899	2,169,773

[1]ICI Boiler MACT reduction estimates taken from *VISTAS Boiler_MACT_20080611.xls*
[2]Data from *Documentation of the Base G2 and Best & Final 2002 Base Year, 2009 and 2018 Emission Inventories for VISTAS - Revision 1*, April 9, 2008 Table 2.1-15, Table 2.1-19, Table 2.1-20 and Appendix A.

The emission reductions associated with the vacated ICI Boiler MACT were a very small percentage of overall non-EGU and total inventory emissions for each of the affected pollutants. Additionally, EPA finalized the revised ICI Boiler MACT on February 21, 2011. EPA estimated that implementation of the revised rulemaking would reduce emissions nationwide from major source boilers and process heaters by 47,000 tpy of PM, 440,000 tpy of SO_2 and 7,000 tpy of VOCs.

However, in March of 2011, the EPA published a notice [76 FR 15266, 21Mar2011] stating their intention to reconsider certain aspects of the national emissions standards for hazardous air pollutants (NESHAP) for new and existing sources for Major Source industrial, Commercial and Institutional Boilers and Process Heaters; the NESHAP for new and existing sources for Area Source Industrial, Commercial and Institutional Boilers; and standards of performance for new Commercial and Industrial Solid Waste Incineration Units and emission guidelines for existing Commercial and Industrial Solid Waste Incineration Units. On December 23, 2011 [76 FR 80532] EPA published the reconsideration proposal for 40 C.F.R. 63, Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources; Industrial, Commercial and Institutional Boilers and Process Heaters; and published proposed amendments to 40 C.F.R. 63, Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial and Institutional Boilers. In the meantime, on February 7, 2012, EPA issued a "No Action Assurance Letter" stating that they would exercise enforcement discretion to not pursue enforcement action for violations of certain notification deadlines in the final Major Source Boiler Rule (40 C.F.R. 63, subpart DDDDD); and on March 13, 2012, EPA issued a "No Action Assurance Letter" stating that they would exercise enforcement discretion to not pursue enforcement action for violations of the initial tune-up deadlines in the final Area Source Boiler Rule (40 C.F.R. 63, Subpart JJJJJJ). On December 20, 2012, the EPA: finalized changes to the National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers (subpart JJJJJJ); finalized changes to National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (subpart DDDDD); and finalized adjustments for certain solid waste incineration units. EPA estimated that the revised rulemakings would reduce emissions nationwide from the source categories by 18,000 tpy of PM and 580,000 tpy of SO_2. The finalized ICI Boiler MACT is expected to result in even greater emission reductions of visibility-impairing pollutants, which may provide further assurance that Kentucky will achieve its RPGs.

- **2007 Heavy-Duty Highway Rule (40 C.F.R. 86, Subpart P)**

In this regulation, EPA set a PM emission standard for new heavy-duty engines of 0.01 g/bhp-hr, which took effect for diesel engines in the 2007 model year. This rule also included standards for NO_x and non-methane hydrocarbons (NMHC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. These diesel engine NO_x and NMHC standards were successfully phased in together between 2007 and 2010. The rule also required that sulfur in diesel fuel be reduced to facilitate the use of modern pollution control technology on these trucks and buses. The EPA required a 97% reduction in the sulfur content of highway diesel fuel – from levels of 500 ppm (low sulfur diesel) to 15 ppm (ultralow sulfur diesel). These requirements were successfully implemented on the timeline in the regulation.

- **Tier 2 Vehicle and Gasoline Sulfur Program (40 C.F.R. 80, Subpart H; 40 C.F.R. 85, 40 C.F.R. 86)**

The EPA's Tier 2 fleet averaging program for on-road vehicles, modeled after the California LEV II standards became effective in the 2005 model year. The Tier 2 program allows manufacturers to produce vehicles with emissions ranging from relatively dirty to very clean, but the mix of vehicles a manufacturer sells each year must have average NO_x emissions below a specified value. Mobile emissions continue to benefit from this program as motorists replace older, more polluting vehicles with cleaner vehicles.

- **Nonroad Diesel Emissions Program (40 C.F.R. 89)**

The EPA adopted standards for emissions of NO_x, hydrocarbons, and carbon monoxide (CO) from several groups of nonroad engines, including industrial spark-ignition engines and recreational non-road vehicles. Industrial spark-ignition engines power commercial and industrial applications and include forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Nonroad recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain vehicles. These rules were initially effective in 2004 and were fully phased in by 2012.

The nonroad diesel rule set standards that reduced emissions by more than 90% from nonroad diesel equipment and, beginning in 2007, the rule reduced fuel sulfur levels by 99% from previous levels. The reduction in fuel sulfur levels applied to most nonroad diesel fuel in 2010 and applied to fuel used in locomotive and marine vessels in 2012.

- **NOx SIP Call or state equivalent**

Phase I of the NO_x SIP call applies to certain EGUs and large non-EGUs, including large industrial boilers and turbines, and cement kilns. Those states affected by the NOx SIP call in the VISTAS region have developed rules for the control of NOx emissions that have been approved by the USEPA. The NOx SIP Call has resulted in a 66% reduction in summertime NOx emissions from large stationary combustion sources in Kentucky.

- **One-hour ozone SIPs (Atlanta / Birmingham / Northern Kentucky)**

New SIPs have been submitted to the USEPA to demonstrate attainment of the one-hour ozone NAAQS. These SIPs require NOx reductions from specific coal fired power plants and address transportation plans in these cities.

- **Large Spark Ignition and Recreational Vehicle Rule**

The USEPA has adopted new standards for emissions of NOx, hydrocarbons, and CO from several groups of previously unregulated nonroad engines. Included in these are large industrial spark-ignition engines and recreational vehicles. Nonroad spark-ignition engines are those powered by gasoline, liquid propane gas, or compressed natural gas rated over 19 kilowatts (kW) (25 horsepower). These engines are used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Nonroad recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain-vehicles. These rules were initially effective in 2004 and will be fully phased-in by 2012.

- **Combustion Turbine MACT**

The projection inventories do not include the NOx co-benefit effects of the MACT regulations for Gas Turbines or stationary Reciprocating Internal Combustion Engines, which the USEPA estimates to be small compared to the overall inventory.

- **VOC 2-, 4-, 7-, and 10-year MACT Standards**

Various point source MACTs and associated emission reductions were implemented. Reductions occurring before 2002 were assumed to be accounted for in the 2002 base year inventory.

1.2 EGU Federal Consent Decrees

Federal consent decrees with major utilities contained remedies that imposed control requirements or other reductions in future year emissions. Many of these requirements were taken into account in the June 25, 2008 Kentucky Regional Haze SIP Base G2 inventory. Consent Decrees that have been executed since 2008, and therefore were not included in the initial RH SIP, are discussed under Reasonable Progress in Section C.2.6.

- <u>TECO [US District Court, Middle District of Florida]:</u> Under a settlement agreement, by 2008, Tampa Electric will install permanent emissions-control equipment to meet stringent pollution limits; implement a series of interim pollution-reduction measures to reduce emissions while the permanent controls are designed and installed; and retire pollution emission allowances that Tampa Electric or others could use, or sell to others, to emit additional NO_x, SO_2 and PM.

- <u>VEPCO [US District Court, Eastern District of Virginia]:</u> Virginia Electric and Power Co. agreed to spend $1.2 billion between by 2013 to eliminate 237,000 tons of SO_2 and NO_x emissions each year from eight coal-fired electricity generating plants in Virginia and West Virginia.

- <u>Gulf Power 7 [State of Florida "Agreement for the Purpose of Ensuring Compliance with the Ozone Ambient Air Quality Standards", dated August 28, 2002]:</u> A 2002 agreement calls for Gulf Power to upgrade its operation to cut NO_x emission rates by 61% at its Crist 7 generating plant by 2007 with major reductions beginning in early 2005. The Crist plant is a significant source of nitrogen oxide emissions in the Pensacola area.

- EKPC [US District Court, Eastern District of Kentucky, Central Division, Lexington]: A July 2, 2007 consent agreement between the EPA and East Kentucky Power Cooperative requires the utility to reduce its emissions of SO_2 by 54,000 tpy and its emissions of NO_x by 8,000 tpy, by installing and operating selective catalytic reduction (SCR) technology; low-NOx burners, and PM and mercury Continuous Emissions Monitors at the utility's Spurlock, Dale and Cooper plants all in Kentucky. According to the EPA, total emissions from the plants will decrease between 50% and 75% from 2005 levels. As with all federal consent decrees, EKPC is precluded from using reductions required under other programs, such as CAIR, to meet the reduction requirements of the consent decree. EKPC is expected to spend approximately $650 million to install pollution controls. This consent decree and BART facilitated SO_2 scrubbers installed for EKPC's Spurlock Units 1 (in 2009) and 2 (in 2008) and Cooper Units 1(in 2012) and 2 (by 2015).

- AEP [US District Court for the Southern District of Ohio, Eastern Division]: American Electric Power (AEP) has agreed to cut 813,000 tons of air pollutants annually (654,000 tons of SO_2 and 159,000 tons of NO_x) at an estimated cost of more than $4.6 billion, pay a $15 million penalty, and spend $60 million on projects to mitigate the adverse effects of its past excess emissions. The agreement imposes caps on emissions of pollutants from 16 plants located in five states. The facilities are located in Moundsville (2 facilities), St. Albans, Glasgow, and New Haven (2 facilities), West Virginia; Louisa, Kentucky; Glen Lyn and Carbo, Virginia; Brilliant, Conesville, Cheshire, Lockburne, and Beverly, Ohio; and Rockport and Lawrenceburg, Indiana. AEP will install pollution control equipment to reduce and cap SO_2 and NO_x emissions by more than 813,000 tpy when fully implemented. By installing these pollution control measures, the plants will emit 79% less SO_2 and 69% less NO_x, as compared to 2006 emissions. This consent decree facilitated a SO_2 scrubber requirement for BART for Kentucky's AEP Big Sandy Unit 2. However, AEP has announced it plans to retire coal-fired operations at both Units 1 and 2 by 2015.

1.3. Review of BART Determinations

The VISTAS 2018 Base G2 emissions inventories contained SO_2 emissions reductions expected to be achieved from BART determinations made by the member States. A summary of Kentucky BART determinations for facilities located in Kentucky is provided in Table 9. More information of Kentucky BART analyses and determinations may be found in the June 25, 2008, Kentucky Regional Haze SIP and as amended on May 28, 2010. BART determinations for other states may be found in their respective Regional Haze SIP and periodic report.

1.3.a. Kentucky BART Sources

Table 9. Summary of Kentucky BART Determination Requirements				
Kentucky BART Subject Source	**BART Controls To Be Installed**	**BART Emission Limits**	**Inclusion in Title V Permit**	**Timeframe for Compliance with BART Emission Limits\Controls**
East Kentucky Power Cooperative (EKPC) Spurlock Units 1 and 2 and Cooper Units 1 and 2	Install wet FGD and wet ESP on Spurlock Units 1 and 2 and a dry FGD and fabric filtration on Cooper Units 1 and 2.	A 07/02/07 EKPC consent decree provides a filterable PM emission rate of 0.030 lb/MMBTU, which was utilized to demonstrate modeled visibility improvement.	Emission limits and controls will be included in the source's Title V Permit as appropriate or on renewal.	Expeditiously as practicable, but no later than 5 years after EPA approves Kentucky's Regional Haze SIP. Installed a wet FGD and wet ESP on Spurlock Units 1 and 2 in 2009 and 2008 respectively. A dry FGD and fabric filtration control was installed for Cooper Unit 1 in 2012 and for Unit 2 control in 2015.
AEP Big Sandy Unit 1 Unit 2	Install ammonia injection controls on Unit 1 and FGD on Unit 2	Inorganic Condensible Particulate Limits (modeled as sulfates): 101.0 lb/hr (H_2SO_4) 127.0 lb/hr (H_2SO_4)	Emission limits and controls will be included in the source's Title V Permit as appropriate or on renewal.	Expeditiously as practicable, but no later than 5 years after EPA approves Kentucky's Regional Haze SIP. Plans for Unit 2 to retire in 2015, and Unit 1 to be retired for coal

Table 9. Summary of Kentucky BART Determination Requirements				
Kentucky BART Subject Source	**BART Controls To Be Installed**	**BART Emission Limits**	**Inclusion in Title V Permit**	**Timeframe for Compliance with BART Emission Limits\Controls**
				usage when it is converted to natural gas in mid-2016.
TVA Paradise Unit 1 Unit 2 Unit 3	Although not for BART, TVA previously indicated to KYDAQ its plans to install hydrated lime injection controls on TVA Paradise Units 1-3 to mitigate opacity due to SO3 emissions. Specifically, TVA has related to KYDAQ its proposed plan to have hydrated lime injection controls operating on all three TVA Paradise units by the fall of 2010.	NA	Although not for BART, TVA has indicated that its planned SO3 controls for Paradise Units 1-3 will be included in its Title V Permit as appropriate or on renewal.	Although not for BART, TVA in its BART Determination has indicated the SO_3 controls will be in place on Paradise Units 1-3 well before BART controls are required. TVA installed hydrated lime injection controls on all three TVA Paradise Units 1-3 in 2010. Plans to retire Units 1 and 2 and replace them with new combined cycle natural gas-fired plant in 2017.
E.ON U.S. Mill Creek	Install sorbent injection controls on	Inorganic Condensible	Emission limits and	Expeditiously as practicable, but

Table 9. Summary of Kentucky BART Determination Requirements				
Kentucky BART Subject Source	**BART Controls To Be Installed**	**BART Emission Limits**	**Inclusion in Title V Permit**	**Timeframe for Compliance with BART Emission Limits\Controls**
Unit 3 Unit 4	larger Units 3 and 4 to control SO3 emissions and continue to utilize existing ESPs to control PM emissions for Units 1 through 4.	Particulate Limits (modeled as sulfates): 64.3 lb/hr (H2SO4) 76.5 lb/hr (H2SO4)	controls will be included in the source's Title V Permit as appropriate or on renewal.	no later than 5 years after EPA approves Kentucky's Regional Haze SIP. These controls are on track to be installed starting in 2014 for Unit 4 and Unit 3 to follow. In addition, new scrubbers are being installed before or by April 16, 2016, for Units 1-4 to comply with other EPA rules.

1.6. Reasonable Progress Determinations

Regional air quality modeling projected that reductions in SO_2 from EGU and non-EGU point sources would result in the greatest improvements in visibility at VISTAS Class I areas. Therefore, for this first round of regional haze planning, VISTAS chose to focus reasonable progress evaluations on potential SO_2 emission controls from these source sectors. To select the specific point sources that would be considered for each Class I area, states first identified the geographic areas that most likely influenced visibility in each Class I area and then identified the major SO_2 point sources in that geographic area, this area was defined as the SO_2 Area of Influence (AoI). VISTAS created detailed spreadsheets identifying SO_2 emission by stack, distance from Class I areas, and estimated sulfate extinction-weighted residence times.

To further aid in the reasonable progress analyses, AirControlNET results were used. AirControlNET, a control technology analysis tool developed to support the USEPA in its analyses of air pollution policies and regulations, provided data on emission sources, potential pollution control measures, emission reductions, and the costs of implementing those controls. Every available SO_2 control strategy in AirControlNET was run against the EGU and non-EGU point source inventories to develop a master list of available, increment control strategies for VISTAS states to use in reasonable progress controls development. States reviewed stacks with an estimated calculated sulfate visibility contribution of at least 1% to any Class I area to determine if further SO_2 controls were feasible. Kentucky used a benchmark of approximately $2,000/ton of pollutant removed to determine economic feasibility (See EPA's CAIR cost analysis in 70 FR 25201-25208 12May2005). More detail on the methodology of the VISTAS reasonable progress analysis may be found in Appendix H of the June 25, 2008, Kentucky Regional Haze SIP.

During the initial Kentucky Regional Haze SIP reasonable progress assessment, no Non-EGUs in Kentucky were identified for additional control because no measures were found to be cost-effective. For Non-EGUs, KYDAQ found that emissions from the following facility contributed 1% or more to visibility impairment in a Class I area, and therefore focused the reasonable progress assessments on specific units at this facility:

- Century Aluminum of Kentucky in Hancock County (21091) for impacts at Mammoth Cave.

The SO_2 control suggested by the VISTAS control cost spreadsheet for Century Aluminum is a sulfuric acid plant at a cost of $14,207; $23,020; and $43,281 per ton of SO_2 removed for potlines 1-4, potline 5, and the anode baking furnace respectively (See the VISTAS control cost spreadsheet for Century Aluminum in Appendix H of the June 25, 2008, Kentucky Regional Haze SIP). Therefore, since the cost of compliance for the control option ranged from 7 to 22 times greater than the cost-effectiveness threshold, the KYDAQ concluded that there were no cost-effective controls available for these Century Aluminum units at the time within the cost threshold established for this reasonable progress assessment.

However, an August 29, 2013, Federal Land Manager (FLM), National Park Service (NPS) consultation comment on this SIP revision provided: (1) updated EPA SO_2 emission control cost information for an aluminum smelter in Washington state; (2) a Century Aluminum Sebree SO_2 emissions increase pursuant to a 2010 KYDAQ permit revision; and a recommendation that KYDAQ consider additional control options for Century Aluminum in the 2018 Regional Haze Plan. Based on this NPS comment, KYDAQ commits to consider additional emission control options for Century Aluminum in the Kentucky 2018 Regional Haze SIP.

The KYDAQ also looked at what sources in Kentucky may be impacting Class I areas located outside of the Kentucky, as well as what sources located outside of Kentucky may be impacting Kentucky's Class I area. KYDAQ, based on its Q/d times RTMax analysis identified eight EGUs, six from Indiana and two from Tennessee, with a 1% or more contribution for the Mammoth Cave area of influence. KYDAQ sent letters to Indiana and Tennessee indicating that no additional controls are requested at this time since Mammoth Cave is currently exceeding the uniform rate of progress and the EGUs are being addressed by CAIR (See copies of the letters in Appendix J of the June 25, 2008, Kentucky Regional Haze SIP).

In addition, based on the KYDAQ Q/d times RTMax analysis, no Kentucky sources were identified with a contribution of 1% or more to the visibility impairment at Class I areas in other states. The list of sources identified by the KYDAQ's Q/d times RTMax analysis for given Class I areas are available in Appendix H of the Kentucky Regional Haze SIP.

2. EMISSION CONTROL MEASURES NOT INCLUDED IN THE SIP

Since development of the Kentucky Regional Haze SIP, a number of regulations and requirements have been developed that were not included in 2018 estimates. The sections below provide information on these requirements, and where possible, estimates of additional reductions are provided. These reductions provide extra assurances that the Mammoth Cave National Park will meet reasonable progress goals in a timely manner.

2.1. Mercury and Air Toxics Rule

On December 16, 2011, the EPA finalized national CAA standards to reduce mercury and other toxic air pollution from coal and oil-fired power plants. National Emission Standards for Hazardous Air Pollutants From Coal-Fired and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units [77 FR 9304] was published in the Federal Register on February 16, 2012, with an effective date of April 16, 2012. The final rule, also known as the Mercury and Air Toxics Standards (MATS), established power plant emission standards for mercury, acid-gases, and non-mercury metallic toxic pollutants that will prevent 90% of the mercury in coal burned in power plants from being emitted into the air; reduce by 88% the acid gas emissions from power plants; and cut power plant SO_2 emissions by 41% beyond the reductions expected from CSAPR. These reductions are expected in the 2016 timeframe.

On August 2, 2012, [77 FR 45967] the EPA issued a partial stay of the effectiveness of NESHAP air pollutants from coal and oil-fired utility steam generating units issued pursuant to Section 112 of the CAA that were published in the Federal Register on February 16, 2012 [77 FR 9304].

On November 30, 2012, [77 FR 71323] the EPA proposed to update emission limits for new power plants under MATS. On April 24, 2013, [78 FR 24073] the EPA finalized updated emission limits for new power plants under MATS. The updates would only apply to future power plants; would not change the types of state-of-the-art pollution controls that they are expected to install and would not significantly change costs or public health benefits of the rule.

2.2. 2010 SO_2 NAAQS

On June 2, 2010, the EPA strengthened the primary NAAQS for SO_2 by revising the primary SO_2 standard to 75 ppb averaged over one hour. This short term standard is significantly more stringent than the revoked standards of 140 ppb averaged over 24 hours and 30 ppb averaged over a year. Under the new standard, facilities with significant emissions of SO_2, many of which are EGUs, will be required to demonstrate compliance with the standard no later than 2017. Pursuant to the CAA, states are required to submit such demonstrations 18 months from the date of designation of a nonattainment area. On August 5, 2013 (78 FR 47191), EPA finalized the initial round of SO_2 nonattainment designations that included a part of Jefferson County, Kentucky, and a part of Campbell County, Kentucky, which is part of the Campbell-Clermont County, KY-OH SO_2 nonattainment area. For the Campbell County SO_2 area, EGU SO_2 emissions from a Clermont County, Ohio EGU were determined to be impacting the SO_2 monitor in the nonattainment part of Campbell County, Kentucky. For the Jefferson County SO_2 area, EGU SO_2 emissions from a Jefferson County, Kentucky EGU were determined to be impacting the SO_2 monitor in the nonattainment part of Jefferson County. SO_2 emission reductions for compliance with the EPA MATS rule are expected to bring these areas into compliance with the 2010 one-hour SO_2 NAAQS. In addition, it is possible that other SO_2 emission controls in Kentucky may be needed in the future for this standard. Resulting emission reductions of visibility-impairing pollutants for compliance with the one-hour SO_2 standard may provide further assurance that Kentucky will achieve its RPGs.

EPA plans to use a combination of monitoring and modeling to assess compliance with the 1-hour SO_2 standard. EPA has proposed implementation and modeling guidance and held stakeholder meetings to gather additional information to develop additional guidance and/or a final rule. These additional stakeholder discussions signaled the need to further develop the guidance to include potential alternatives to modeling for designations and compliance.

KYDAQ will follow EPA guidance to determine compliance with the NAAQS for SO_2. KYDAQ will initially focus on the nonattainment areas to determine whether sources of SO_2 emissions will need additional emissions controls or other emissions reduction measures to attain the NAAQS. EPA modeling results detailed in a May 28, 2010 memo placed in the SO_2 NAAQS Review Docket indicates the potential that some facilities will likely need additional control measures. Any additional reductions in SO_2 emissions will enhance protection of visibility, especially in Federal Class I areas.

In addition, recent EPA actions regarding the 2010 SO_2 NAAQS include the April 17, 2014, signing of EPA's proposed *Data Requirements Rule for the 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)*(79 FR 27446 - May 13, 2014) and the issuance of the April 23, 2014, EPA Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions.

2.3. North American Emission Control Area

On March 26, 2010, the International Maritime Organization officially designated waters off North American coasts as an area in which stringent international emission standards will apply to ships. These standards will reduce air pollution from ships and deliver air quality benefits that extend hundreds of miles inland. In 2020, EPA expects emissions from ships operating in the designated area to be reduced by 320,000 tons for NO_x; 90,000 tons for $PM_{2.5}$; and 920,000 tons for $SO_{2,}$ which is 23%, 74%, and 86%, respectively, below predicted levels in 2020 absent the Emissions Control Area designation.

Implementation of the Emission Control Area means that ships entering the designated area would need to use compliant fuel for the duration of their voyage that is within that area, including time in port as well as voyages whose routes pass through the area without calling on a port. The requirements for quality of fuel change over time. From the effective date in 2012 until 2015, the sulfur content of fuel used by all vessels operating in designated areas cannot exceed 10,000 ppm. Beginning in 2015, the sulfur content of fuel used by vessels operating in these areas cannot exceed 1,000 ppm. With regard to NO_x emissions, marine diesel engines installed on a ship constructed on or after January 1, 2011 must comply with the "Tier II" standard. Marine diesel engines installed on a ship constructed on or after January 1, 2015 will be required to comply with the more stringent "Tier III" NO_x standard.

2.4. Residual Risk Requirements

The CAA requires the EPA to assess the risk remaining after application of final technology-based air toxics standards to any source category within 8 years of setting the technology based MACT standards. In the residual risk process, the EPA must assess the remaining health risks from each source category to determine whether the MACT standards provide an ample margin of safety to protect public health and protect against adverse environmental effects. Final rules for this CAA requirement are expected for 28 source categories between 2011 and 2013. Additional requirements to reduce toxic air emissions under the residual risk assessment may also have co-benefits for the reduction of VOC and other criteria pollutant emissions between now and 2018.

2.5. Control Technique Guidelines

Section 172(c)(1) of the CAA provides that SIPs for nonattainment areas must include reasonably available control techniques (RACT) for control of emissions that contribute to the formation of ozone air pollution. Section 182(b)(2) of the CAA provides that for certain nonattainment areas, states must revise their SIPs to include RACT for sources of VOC emissions covered by a control techniques guidelines document (CTG). Section 183(e) of the CAA then directs the EPA to list for regulation those categories of products that account for at least 80% of the VOC emissions from commercial products in ozone nonattainment areas.

RACT controls for source categories controlled by a CTG are known as CTG RACTs. CTG RACTs have been issued for various printing, coating, and cleaning operations. In 2006, 2007, and 2008, EPA published CTGS as listed in Table 10. These regulations, which had to be implemented in ozone nonattainment areas and the Ozone Transport Region within 1 year of becoming final, will reduce emissions of VOCs from areas in which they are required.

Table 10. CTGs Promulgated in 2006, 2007 and 2008

Category	EPA Document Number
Industrial Cleaning Solvents	EPA-453/R-06-001
Offset Lithographic Printing and Letterpress Printing	EPA-453/R-06-002
Flexible Package Printing	EPA-453/R-06-003
Flat Wood Paneling Coatings	EPA-453/R-06-004
Paper, Film, and Foil Coatings	EPA-453/R-07-003
Large Appliance Coatings	EPA-453/R-07-004
Metal Furniture Coating	EPA-453/R-07-005
Miscellaneous Metal and Plastic Parts Coatings	EPA-453/R-08-003
Fiberglass Boat Manufacturing Materials	EPA-453/R-08-004
Miscellaneous Industrial Adhesives	EPA-453/R-08-005
Automobile and Light-Duty Truck Assembly Coatings	EPA-453/R-08-006

2.6. Federal Consent Decrees

- INVISTA S.à.r.l. (INVISTA) [US District Court for the District of Delaware]: On April 13, 2009, INVISTA agreed to limit its emissions at the Camden, South Carolina facility such that two of its boilers will comply with a combined NO_x emissions limit of 202 tons on a 12-month rolling average basis by converting one boiler to natural gas controlled with selective catalytic reduction (SCR) technology, and installing a Mobotec with Rotamix designed to reduce NO_x emissions by 65% on an additional boiler. SO_2 emissions from the natural gas boiler will be limited to 1 ton on a 12-month rolling average basis. INVISTA has also committed to limit sulfur content in all vaporized fuel to 1%. (INVISTA is subject to BART but refined modeling analysis conducted as part of the SC Regional Haze SIP effort indicated that emissions were below the contribution threshold established.) The changes at the Camden facility were required to be completed by December 31, 2011.

- Dupont/Lucite [US District Court for the Southern District of West Virginia]: On April 20, 2009 DuPont and Lucite International Inc. agreed to pay a $2 million civil penalty to settle CAA violations at a sulfuric acid plant in Belle, WV. The companies chose, on their own, to shut down the sulfuric-acid manufacturing unit and the settlement confirms that agreement. Under the settlement the sulfuric acid unit was required to shutdown by April 1, 2010. In 2002 emissions from the sulfuric acid unit included 960 tons of SO_2, and 52 tons of NO_x. The sulfuric acid unit was shutdown in 2010, as required.

- Tennessee Valley Authority [Federal Facilities Compliance Agreement]: On April 14, 2011, the EPA announced a settlement with the Tennessee Valley Authority (TVA) to resolve alleged CAA violations at 11 of its coal-fired plants in Alabama, Kentucky and Tennessee. The settlement requires TVA to invest $3 billion to $5 billion on new and upgraded state-of-the-art pollution controls. Once fully implemented, the pollution controls and other required actions will address 92% of TVA's coal-fired power plant capacity, reducing NO_x by 69% (115,977 tpy) and SO_2 by 67% (225,757 tpy) from TVA's 2008 emissions levels. This agreement's resulting emission reductions of visibility-impairing pollutants may provide further assurance that Kentucky will achieve its RPGs.

2.7. Additional Kentucky EGU SO_2 Emission Reductions Not Included in the Kentucky Regional Haze SIP

Table 11 provides information on unit planned EGU retirements that did not have the associated 2018 emissions reductions included in the Kentucky Regional Haze SIP. These facilities accounted for 118,862; 124,636; and 69,213 tons of SO_2 emissions in 2002, 2007, and 2012 respectively and are projected to emit 42,519 fewer tons of SO_2 in the VISTAS 2018 emissions inventory due to planned retirements and fuel switching to natural gas.

Table 11. Kentucky EGU SO_2 Emission Reductions Not Included in the Kentucky Regional Haze SIP*								
Facility Data					SO_2 Emissions			
Facility	**ID**	**Unit**	**Comment**	**Current Status**	**2002 VISTAS Actual Emissions (tpy)**	**2007 SEMAP Emissions (tpy)**	**2012 CAMD Emissions (tpy)**	**2018 VISTAS Projected Emissions (tpy)**
Kentucky Power Big Sandy Plant	21-127-00003	All - Units 1 and 2	Plans for Unit 2 to retire in 2015, and Unit 1 to be retired for coal usage when it is converted to natural gas in mid-2016.		11,840 30,244	10,637 36,114	5,779 13,920	676 4,203
Kentucky Utilities Tyrone Station	21-239-00001	All - Unit 5	Retired February 1, 2013	Retired	2,254	3,483	0	3,105
Louisville Gas and Electric Cane Run Station	21-111-0126	All – Units 04, 05, and 06	Plans to retire all three units in 2015 and to replace them with new 731 MW combined cycle natural gas-fired facility by Nov. 1, 2015.		5,063 5,748 4,165	5,521 4,024 5,334	1,434 1,462 3,232	2,173 2,385 3,166
Kentucky Utilities Green	21-177-00001	All - Units 003 and	Plans to retire by 4\15\15 or		4,325 8,968	10,616 11,444	6,814 12,176	2,944 4,234

Table 11. Kentucky EGU SO_2 Emission Reductions Not Included in the Kentucky Regional Haze SIP*								
Facility Data					**SO_2 Emissions**			
Facility	**ID**	**Unit**	**Comment**	**Current Status**	**2002 VISTAS Actual Emissions (tpy)**	**2007 SEMAP Emissions (tpy)**	**2012 CAMD Emissions (tpy)**	**2018 VISTAS Projected Emissions (tpy)**
River St		004	possibly operate until 4\15\16 for grid reliability.					
Big Rivers Robert Reid	21-233-00001	R1	Switching Unit R1 from coal to natural gas in 2014.		9,765	6,736	805	3,869
TVA Paradise	21-177-00006	Units 1 and 2	Plans to retire Units 1 and 2 and replace them with new combined cycle natural gas-fired plant in 2017.		15,601 20,889	12,198 18,529	12,445 11,146	7,823 7,941
Totals					**118,862**	**124,636**	**69,213**	**42,519**

*In addition to the above SO_2 reductions, planned new scrubbers at LG&E Mill Creek Units 1-4; and other EGU controls for MATS were not included in the current Kentucky Regional Haze SIP, but will be reflected in the next regional haze SIP in 2018.

3. SUMMARY OF EMISSIONS REDUCTIONS ACHIEVED

40 C.F.R. 51.308(g)(2) of the RHR requires "A summary of the emissions reductions achieved throughout the State through implementation of the measures in paragraph (g)(1)."

As in the original SIP submittal, this periodic update is focused on sulfates, the largest contributor to visibility impairment. Overall SO_2 emissions have decreased in Kentucky.

3.1. EGU Reductions

Table 14 (in Section C.3.3) lists all EGU units in Kentucky and shows the controls assigned to the units in 2018 as part of the June 25, 2008 Kentucky Regional Haze SIP, the current status of those control assignments, estimated tons of SO_2 emission reductions from those units, and utilizing current 2011 and 2012 SO_2 emissions data from EPA's Clean Air Markets Division. Table 12 lists any EGU outside of Kentucky having a calculated visibility impact on Mammoth Cave of 1% or greater based on the analysis in Section 7.6 and Appendix H.2 of the June 28, 2008, Kentucky Regional Haze SIP; the current SO_2 controls; and the 2002, 2007, 2011, and 2012 emissions for those units.

This source sector has been shown to be a major contributor to visibility impairment in the VISTAS Class I areas, including Mammoth Cave. Very good progress has been made towards reducing SO_2 emissions from this sector. Additional reductions beyond those assumed in the Base G2 modeling are expected to be realized by 2018, further improving visibility at Class I areas.

The large reductions in SO_2 emissions from electric generating units during 2008-2012 resulted from many factors, including control installations, units switching to cleaner fuels, load shifting from dirtier units to cleaner units, and/or an overall decrease in demand for generation. CAMD data for Acid Rain Program units from 2002 through 2012 indicate that reductions in SO_2 emissions appear to be maintained, and further reductions achieved, even with fluctuations in heat input. This is generally true for EGUs in Kentucky and across the VISTAS states.

Figure 10 depicts the trends for Kentucky's Acid Rain Program units that reported emissions to CAMD (See Table 13 for data utilized). From 2002 to 2012, heat input for these units decreased from 962,510 TBtu to 918,760 TBtu, a decrease of 4.5%. SO_2 emissions from these units decreased from 482,653 tons to 186,176 tons, a decrease of 61.4%, and the average SO_2 emission rate decreased from 1.003 lb/MMBtu to 0.405 lb/MMBtu, a decrease of 59.6%.

Table 12. Status and Emissions of EGUs outside of Kentucky with a Calculated Visibility Impact of 1% or greater on Mammoth Cave								
Facility (State)	**ORIS ID**	**Unit**	**Current SO_2 Controls**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**2007 SO_2 Emissions (tons)**	**2011 CAMD SO_2 Emissions (tons)**	**2012 CAMD SO_2 Emissions (tons)**	**Future SO_2 Emission Controls**
Indiana Michigan Power-Rockport (IN) 147-00020	6166	002		25,602	25,740	34,913	26,541	Company plans to install dry sorbent injection control technology in 2015 per consent decree
Indiana Michigan Power-Rockport (IN) 147-00020	6166	001		25,943	23,093	21,820	27,849	Company plans to install dry sorbent injection control technology in 2015 per consent decree
PSI Energy - Gallagher (IN) 043-00004	1008	004	Dry sorbent injection (2010),and burns low-sulfur coal	11,161	17,135	586	324	
PSI Energy – Gallagher (IN) 043-00004	1008	001	Retired in early 2012	11,743	12,903	850	2.1	
PSI Energy – Gallagher (IN) 043-00004	1008	003	Retired in early 2012	23,773	16,237	846	1.2	
PSI Energy – Gallagher (IN) 043-00004	1008	002	Dry sorbent injection (2010),and burns low-sulfur coal	12,252	13,717	728	598	
TVA Cumberland and Fossil	3399	001	Wet Scrubber (1995)	7,354	7,760	3,837	5047	Meet a 0.5 lb/MMBtu SO2 emissions limit

Table 12. Status and Emissions of EGUs outside of Kentucky with a Calculated Visibility Impact of 1% or greater on Mammoth Cave								
Facility (State)	**ORIS ID**	**Unit**	**Current SO_2 Controls**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**2007 SO_2 Emissions (tons)**	**2011 CAMD SO_2 Emissions (tons)**	**2012 CAMD SO_2 Emissions (tons)**	**Future SO_2 Emission Controls**
Plant (TN) 161-0011								by 2017
TVA Cumberland and Fossil Plant (TN) 161-0011	3399	002	Wet Scrubber (1995)	9,165	9,336	3,856	5054	Meet a 0.5 lb/MMBtu SO2 emissions limit by 2017
Totals				**126,993**	**125,921**	**67,436**	**65,416**	**Total EGU SO_2 emissions from 2002 to 2012 has decreased by 48.5% for these units.**

The overall SO_2 emissions in Kentucky are expected to continue to drop due to the planned retirements, fuel switching to natural gas, and load shifting to cleaner units. Figure 11 also shows the trend in SO_2 reductions in Kentucky for 2002-2012 for coal-fired EGUs.

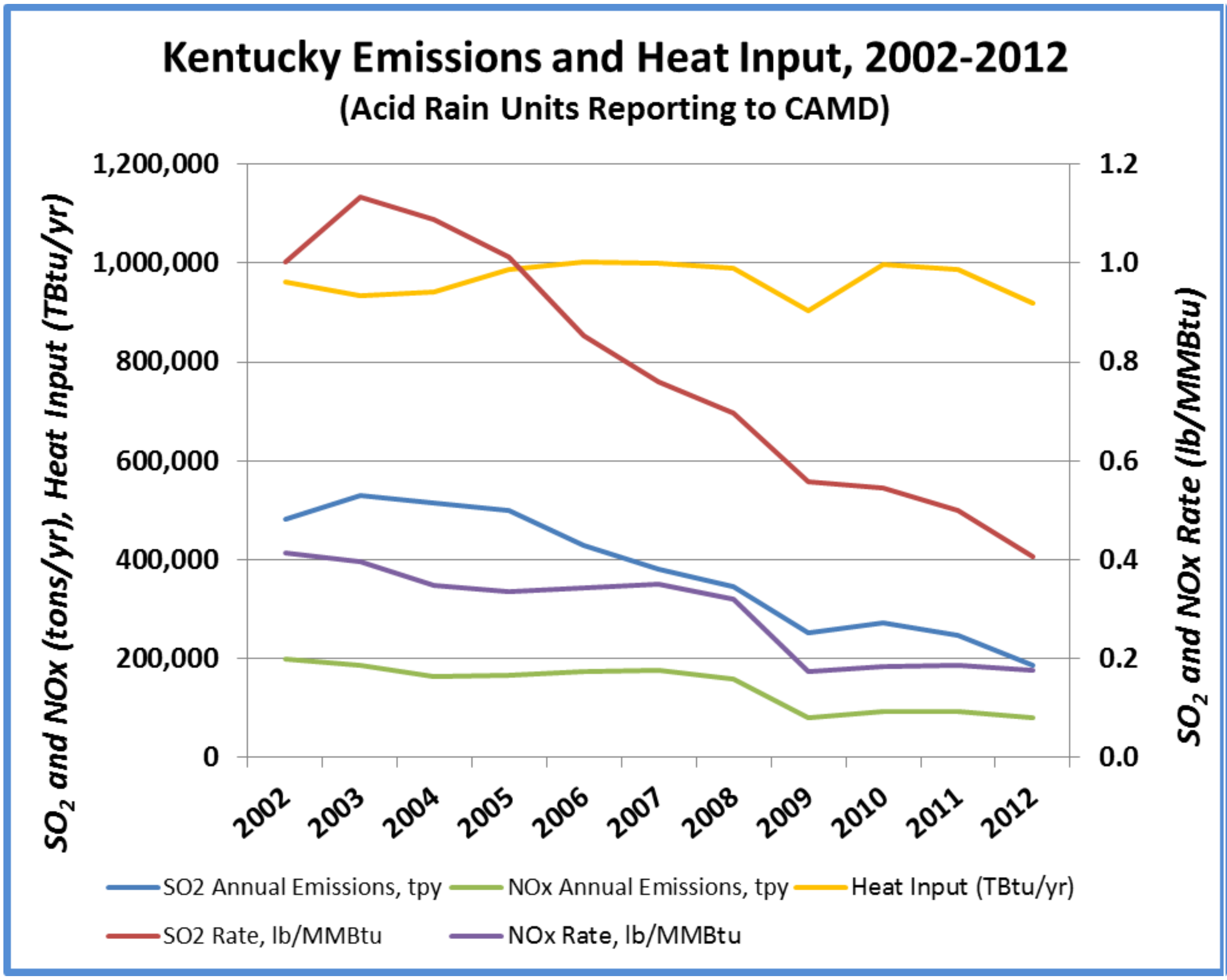


Figure 10. Kentucky EGU Emissions and Heat Input, 2002-2012.
(Source: CAMD database http://ampd.epa.gov/ampd/QueryToolie.html)

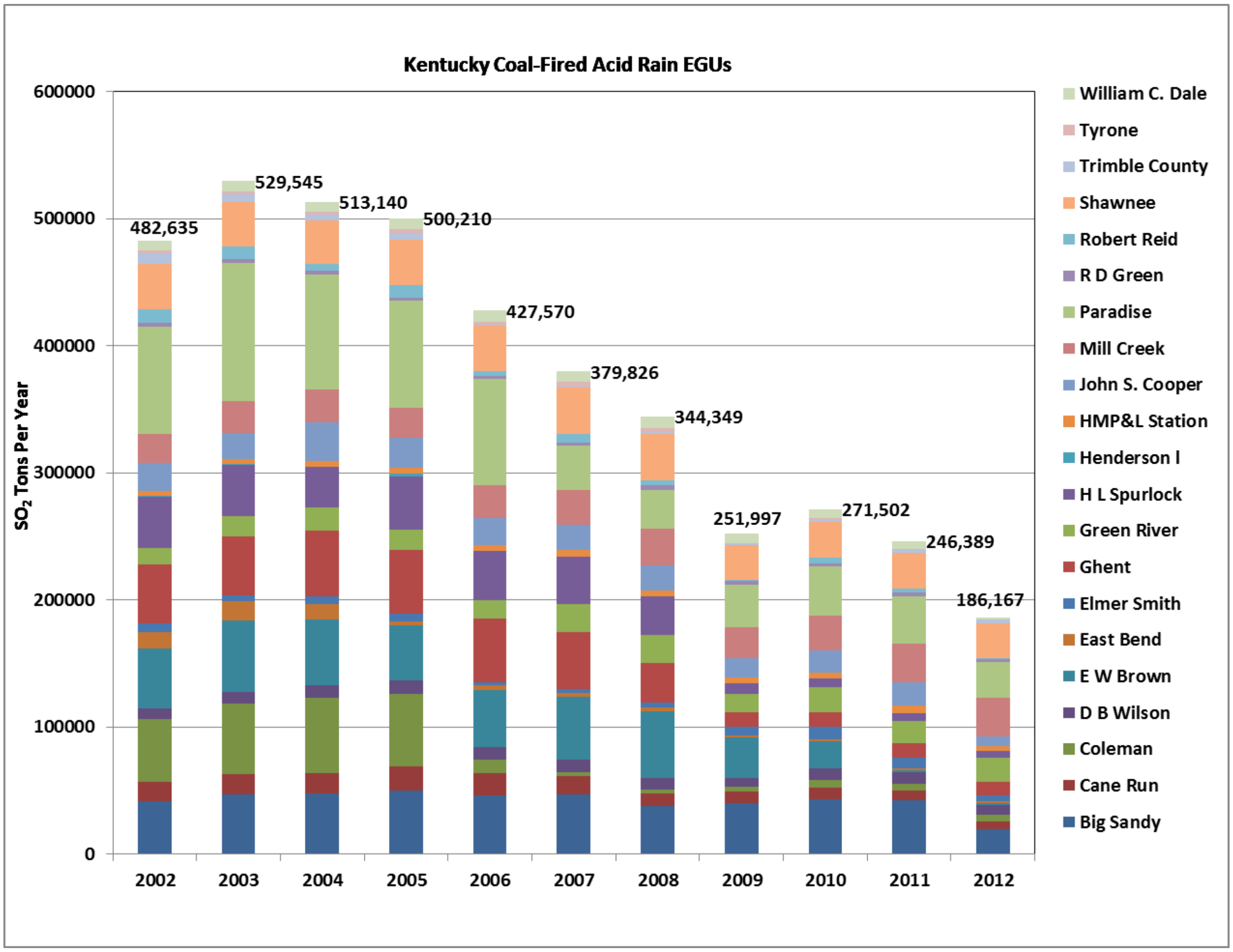


Figure 11. Kentucky CAMD Acid Rain EGU SO_2 Plant Emissions 2002-2012

Figure 12 shows the trends for the Acid Rain Program units across all VISTAS states (See Table 13 for data utilized). From 2002 to 2012, heat input from these units decreased from 7,645,295 TBtu to 7,035,392 TBtu, a decrease of 8.0%. SO_2 emissions from these units decreased from 3,713,262 tons to 811,063 tons, a decrease of 78.2%, and the average SO_2 emission rate decreased from 0.971 lb/MMBtu to 0.231 lb/MMBtu, a decrease of 76.2%. As additional controls are installed to meet the more stringent requirements of CAIR and MATS, this emission rate is expected to continue to decline.

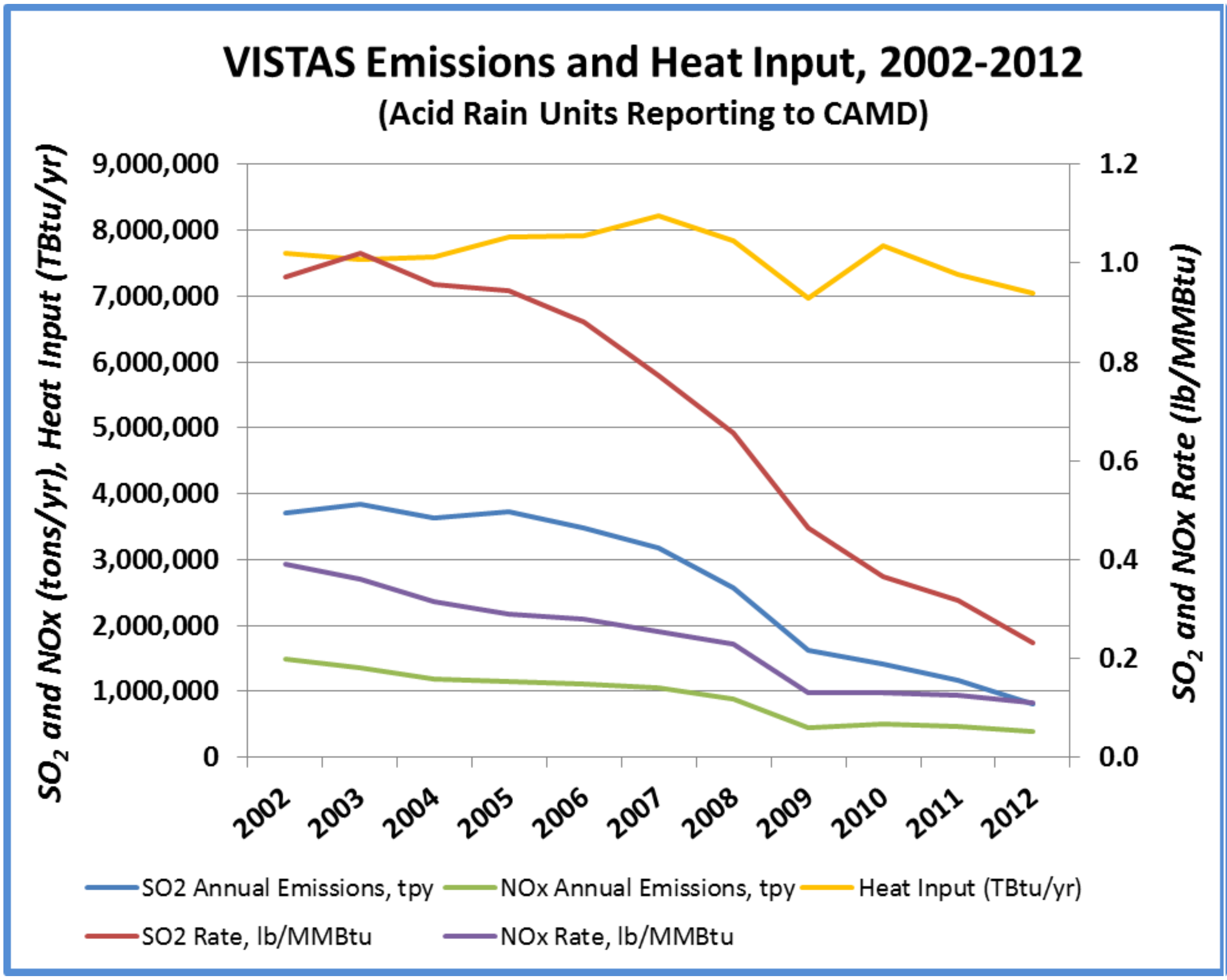


Figure 12. VISTAS EGU Emissions and Heat Input, 2002-2012.
(Source: CAMD database http://ampd.epa.gov/ampd/QueryToolie.html)
(SO_2 Rate calculated by taking state Acid Rain Program (ARP) SO_2 emissions divided by state ARP heat input.)

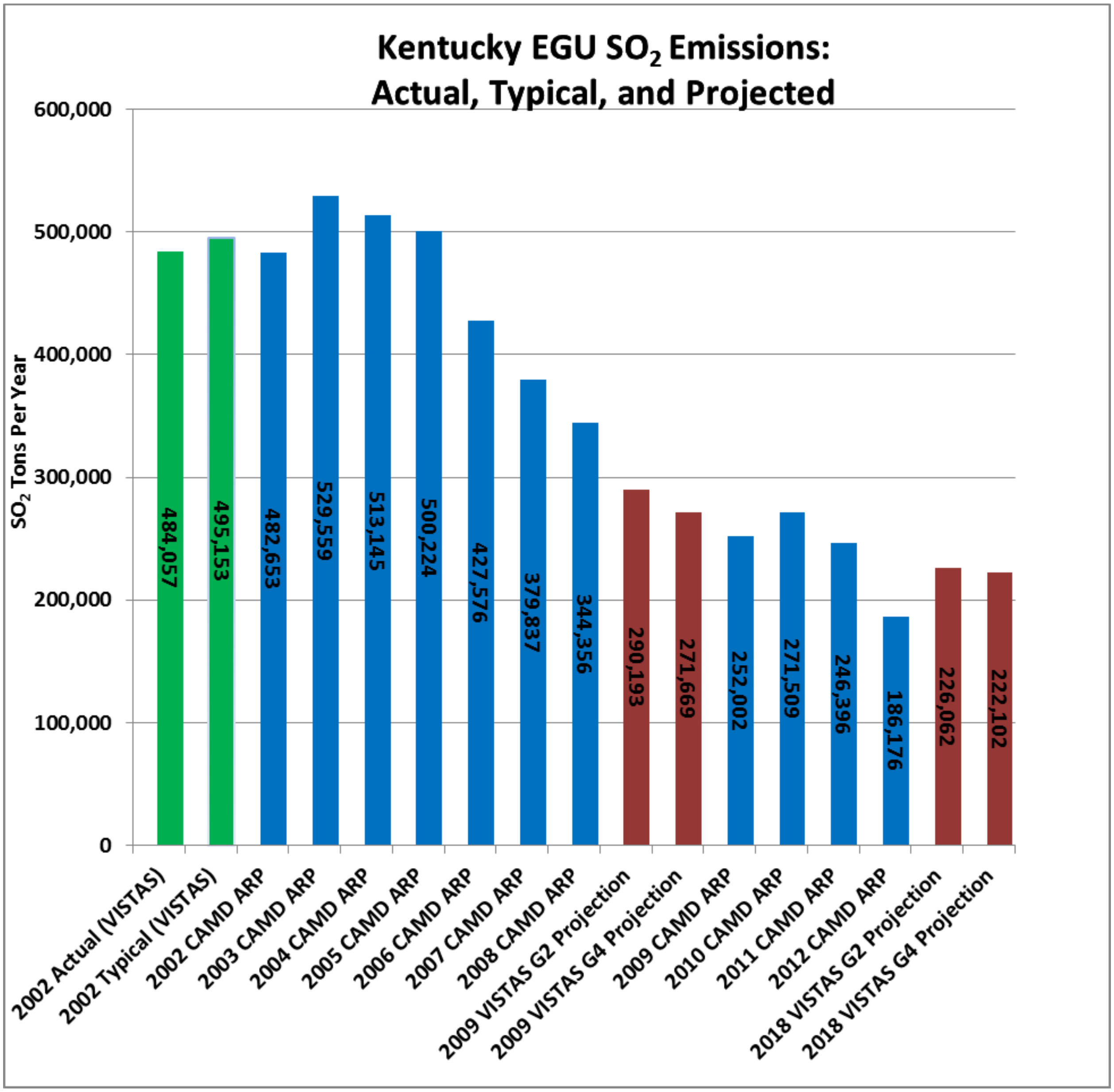
Since sulfates have been shown to be the predominant species of concern to visibility impairment at Mammoth Cave for the first round of regional haze planning, visibility improvements from reduced sulfate contribution should continue into the future with new SO2 controls, planned EGU retirements and fuel switching to natural gas. Table 13 summarizes this data for Kentucky and the VISTAS states.

Table 13. Summary of Acid Rain Program SO_2 Emission and Heat Input Data for 2002-2012 for VISTAS States and Kentucky						
Year	VISTAS States			Kentucky		
	Heat Input (TBtu)	SO_2 Emissions (tons)	SO_2 Rate (lb/MMBtu)	Heat Input (TBtu)	SO_2 Emissions (tons)	SO_2 Rate (lb/MMBtu)
2002	7,645,295	3,713,262	0.971	962,510	482,653	1.003
2003	7,549,812	3,846,147	1.019	935,091	529,559	1.133
2004	7,601,246	3,635,738	0.957	942,421	513,145	1.089
2005	7,893,946	3,725,196	0.944	988,267	500,224	1.012
2006	7,921,127	3,489,194	0.881	1,002,080	427,576	0.853
2007	8,217,954	3,175,353	0.773	1,000,266	379,837	0.759
2008	7,833,760	2,565,907	0.655	990,691	344,356	0.695
2009	6,966,766	1,619,348	0.465	904,136	252,002	0.557
2010	7,760,906	1,415,331	0.365	997,330	271,509	0.544
2011	7,336,214	1,166,586	0.318	986,999	246,396	0.499
2012	7,035,392	811,063	0.231	918,760	186,176	0.405

Source: USEPA CAMD data for Acid Rain Program units. http://ampd.epa.gov/ampd/QueryToolie.html
(SO_2 Rate calculated by taking state Acid Rain Program (ARP) SO_2 emissions divided by state ARP heat input.)

3.2. Additional EGU SO_2 Emission Reductions

As depicted in Figure 13, Kentucky's 2009 EGU SO_2 emissions, as reported to CAMD, are below the 2009 modeled values. In fact, actual EGU SO_2 emissions as reported to CAMD are below the VISTAS 2009 projections for 2009, 2010, 2011 and 2012. In addition, actual EGU SO_2 emissions as reported to CAMD for 2012 are below the VISTAS 2018 projections.



Note: The VISTAS 2002 Actual and 2002 Typical emissions, and the VISTAS 2009 and 2018 projections include the SO_2 emissions for the entire facility, while the CAMD emissions include just the boiler SO_2 emissions as reported to CAMD. The actual 2002 VISTAS inventory reflects the base year emissions that correspond to the meteorological data used in the modeling effort, in this case, 2002. These emissions were used for evaluating air quality model performance. The 2002 typical VISTAS inventory is similar to the actual base year. However, for sources that may have significant emissions changes from year to year, a more typical emission value was used. Typical emissions were developed for the electric generating units (EGUs) and the wildfire emissions.

Figure 13. Kentucky EGU SO_2 Emissions, Actual, Typical and Projected

3.3. EGU Unit Specific Reductions

Table 14 indicates the current status of SO_2 controls for coal-fired EGUs in Kentucky, and the SO_2 controls and emission reductions that were included in the Kentucky Regional Haze SIP. As can be seen in Table 14, the current SO_2 emission reductions from VISTAS 2002 to CAMD 2012 emissions are 39,101 tons more than the estimated SO_2 ton reduction predicted in the original Kentucky Regional Haze SIP from VISTAS 2002 to VISTAS 2018 emissions. This information provides a clear indication that the existing Kentucky Regional Haze SIP, as submitted on June 25, 2008 and amended on May 28, 2010, is sufficient and on track for Mammoth Cave and other applicable Class I areas outside of Kentucky to meet or exceed their 2018 RPGs.

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs

Facility	ID		SO_2 Controls	Year SO_2 Controls Installed	Additional Controls Identified in Regional Haze SIP	Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)	Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)	Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)	Comments: (Not in future year modeling)
East Bend Station 2101500029	2		Wet Scrubber	1981		10,698	11,195	10,698	10,920	11,423	
Ghent Generating Station 2104100010	1		Wet Scrubber	1994		-4,724	3,081	-4,724	2,782	2,751	
Ghent Generating Station 2104100010	2		Wet Scrubber	2009	In future year modeling	14,632	11,105	5,517	11,508	11,984	
Ghent Generating Station 2104100010	3		Wet Scrubber	2007	In future year modeling	13,154	11,862	9,946	11,722	11,192	
Ghent Generating Station 2104100010	4		Wet Scrubber	2008	In future year modeling	8,794	9,422	5,665	9,349	9,640	
William C Dale Plant 2104900003	1					-1,585	195	-1,701	710	1,102	
William C Dale Plant 2104900003	2					-1,968	186	-2,099	724	1,104	
William C Dale Plant 2104900003	3					1,623	651	1,623	925	2,693	
William C Dale Plant 2104900003	4					1,582	1,054	1,582	779	2,711	
Elmer Smith Station 2105900027	1		Wet Scrubber	1980s		1,346	48	1,346	-425	611	

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs

Facility	ID		SO_2 Controls	Year SO_2 Controls Installed	Additional Controls Identified in Regional Haze SIP	Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)	Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)	Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)	Comments: (Not in future year modeling)
Elmer Smith Station 2105900027	2		Wet Scrubber	1980s		2,148	342	2,148	-953	1,544	
Coleman Station 2109100003	C1		Wet Scrubber	2006	In future year modeling	16,064	15,120	15,914	15,063	14,795	
Coleman Station 2109100003	C2		Wet Scrubber	2006	In future year modeling	17,354	16,090	17,204	16,303	16,242	
Coleman Station 2109100003	C3		Wet Scrubber	2006	In future year modeling	14,773	14,648	14,618	13,416	13,656	
Generic Unit	GSC21					-5,927	-6,747	-5,927	-9,721	0	
Henderson Mun Pow & Light 2110100012	6				Retired in 2008, in future year modeling	-1269	446	-825	446	446	
Henderson Mun Pow & Light 2110100012	5				Retired in 2008, in future year modeling	-2,112	0	-2112	0	0	
Cane Run 21-111-0126	4		Wet Scrubber	1976		2,300	2,905	2,890	3,498	3,629	(Company plans to retire Units 4, 5, and 6 in 2015 and to replace them

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs											
Facility	**ID**		**SO_2 Controls**	**Year SO_2 Controls Installed**	**Additional Controls Identified in Regional Haze SIP**	**Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)**	**Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)**	**Comments: (Not in future year modeling)**
											with new 731 MW combined cycle natural gas-fired facility by Nov. 1, 2015)
Cane Run 21-111-0126	5		Wet Scrubber	1977		2,716	3,648	3,363	4,127	4,286	(*See above comment for Cane Run Unit 4*)
Cane Run 21-111-0126	6		Wet Scrubber	1978		140	-369	999	-473	933	(*See above comment for Cane Run Unit 4*)
Mill Creek 21-111-0127	1		Wet Scrubber	1981		1,670	1,091	1,670	-389	-1,578	
Mill Creek 21-111-0127	2		Wet Scrubber	1982		-1,275	616	-1,275	-2,063	-621	
Mill Creek 21-111-0127	3		Wet Scrubber	1978		-4,541	-2,440	-4,541	-1,400	-5,179	
Mill Creek	4		Wet	1982		-5,611	-952	-5,611	-3,544	-572	

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs											
Facility	**ID**		**SO_2 Controls**	**Year SO_2 Controls Installed**	**Additional Controls Identified in Regional Haze SIP**	**Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)**	**Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)**	**Comments: (Not in future year modeling)**
21-111-0127			Scrubber								
Big Sandy Plant 2112700003	BSU1				Wet Scrubber in future year modeling	66	3,131	11,164	-139	6,061	(Company plans for Unit 1 to be retired for coal usage when it is converted to natural gas in mid-2016.)
Big Sandy Plant 2112700003	BSU2				Wet Scrubber in future year modeling	-5,717	-1,272	26,041	83	16,324	(Company plans to retire Unit 2 in 2015)
Shawnee Plant 2114500006	1		Burns low sulfur coal			321	1,066	321	668	1,436	
Shawnee Plant 2114500006	2		Burns low sulfur coal			223	899	223	577	534	
Shawnee Plant 2114500006	3		Burns low sulfur coal			581	835	581	1,071	1,218	
Shawnee Plant 2114500006	4		Burns low sulfur coal			325	1,013	325	777	963	

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs

Facility	ID		SO_2 Controls	Year SO_2 Controls Installed	Additional Controls Identified in Regional Haze SIP	Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)	Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)	Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)	Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)	Comments: (Not in future year modeling)
Shawnee Plant 2114500006	5		Burns low sulfur coal			363	498	363	725	503	
Shawnee Plant 2114500006	6		Burns low sulfur coal			452	832	452	728	813	
Shawnee Plant 2114500006	7		Burns low sulfur coal			174	1,042	174	396	276	
Shawnee Plant 2114500006	8		Burns low sulfur coal			363	808	363	617	699	
Shawnee Plant 2114500006	9		Burns low sulfur coal			231	695	231	772	545	
Shawnee Plant 2114500006	10		Limestone fluidized bed			-1,688	492	-1,935	1,500	1,500	
Spurlock St. Maysville 2116100009	1		Wet Scrubber	2009	In future year modeling	17,979	14,287	18,497	17,810	18,214	
Spurlock St. Maysville 2116100009	2		Wet Scrubber	2008	In future year modeling	20,091	20,735	17,168	19,644	20,212	
Brown Facility 2116700001	1		Wet Scrubber	2010	In future year modeling	7,136	4,003	7,062	7,384	7,314	
Brown Facility 2116700001	2		Wet Scrubber	2010	In future year modeling	10,082	3,935	9,913	10,049	9,772	
Brown Facility	3		Wet	2010	In future year	25,777	5,073	25,377	26,804	26,543	

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs											
Facility	**ID**		**SO_2 Controls**	**Year SO_2 Controls Installed**	**Additional Controls Identified in Regional Haze SIP**	**Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)**	**Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)**	**Comments: (Not in future year modeling)**
2116700001			Scrubber		modeling						
Green River Station 2117700001	4					1,942	-1,123	1,381	-3,865	-2,489	(Company plans to retire Units 4 and 5 by 4\15\15 or possibly operate until 4\15\16 for grid reliability.
Green River Station 2117700001	5					5,540	-308	4,734	-93	-3,208	(*See above comment for Green River Unit 4*)
Paradise Steam Plant 2117700006	1		Wet Scrubber	1982		373	2,626	7,778	1,596	3,156	Company plans to retire Units 1 and 2 and replace them with new combined cycle natural gas-fired

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs											
Facility	**ID**		**SO_2 Controls**	**Year SO_2 Controls Installed**	**Additional Controls Identified in Regional Haze SIP**	**Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)**	**Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)**	**Comments: (Not in future year modeling)**
											plant in 2017.
Paradise Steam Plant 2117700006	2		Wet Scrubber	1982		10,437	3,657	12,958	1,138	9,753	(*See above comment for Paradise Unit 1*)
Paradise Steam Plant 2117700006	3		Wet Scrubber	2006	In future year modeling	25,061	44,011	25,061	43,646	43,165	
Wilson Station 118300069	W1		Wet Scrubber	1985		-2,239	8,876	-2239	8,876	1,489	
John Sherman Cooper 2119900005	1		Dry Scrubber	2015		2,299	3,071	7,085	776	3,586	
John Sherman Cooper 2119900005	2		Dry Scrubber	2012	In future year modeling	3,533	3,827	13,934	2,964	11,042	
Trimble Co Gen 2122300002	1		Wet Scrubber	1990		5,756	7,152	5,756	6,258	6,392	
Henderson Station 2 123300001	H1		Wet Scrubber	1990s		-2033	57	-2033	-887	269	
Henderson Station 2 123300001	H2		Wet Scrubber	1990s		101	-1,381	101	-2,177	-497	

Table 14. Summary of Regional Haze SIP SO_2 Controls and Emission Reductions for Kentucky Coal-Fired EGUs											
Facility	**ID**		**SO_2 Controls**	**Year SO_2 Controls Installed**	**Additional Controls Identified in Regional Haze SIP**	**Estimated VISTAS SO_2 Emission Reductions in VISTAS 2009 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Emission Reductions in CAMD 2009 from VISTAS Actual 2002 (tons)**	**Estimated VISTAS SO_2 Reductions in VISTAS 2018 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2011 from VISTAS Actual 2002 (tons)**	**Actual SO_2 Reductions in CAMD 2012 from VISTAS Actual 2002 (tons)**	**Comments: (Not in future year modeling)**
Reid 2123300001	R1					5,896	9,220	5,896	6,544	8,960	(Company plans switching Unit R1 to natural gas in 2014)
Green Station 123300052	G1		Wet Scrubber	1980s		-424	43	-424	377	238	
Green Station 123300052	G2		Wet Scrubber	1980s		-591	288	-591	167	506	
Tyrone Facility 2123900001	5					-725	2,050	-851	2,052	2,254	(Retired Feb. 1, 2013 per company letter)
Totals						**211,667**	***233,335**	**261,234**	**240,142**	****300,335**	

3.4. MANE-VU "Ask"

During the initial Kentucky Regional Haze SIP development, the MANE-VU states of New Jersey, New Hampshire and Vermont sent letters to Kentucky stating that based on 2002 emissions, Kentucky contributed to visibility impairment at Class I areas located in those states. The MANE-VU states identified 167 EGU stacks as contributing significantly to visibility impairment at MANE-VU Class I areas in 2002. MANE-VU asked states to control the SO_2 emissions from these units by 90% from 2002 levels ("EGU Ask"). MANE-VU also requested a control strategy to provide a 28% reduction in SO_2 emissions from sources, other than EGUs, that would be equivalent to their proposed low sulfur residential fuel oil strategy ("Non-EGU Ask").

3.4.a. MANE-VU "EGU and Non-EGU Ask"

The MANE-VU states identified 167 EGU stacks, ten (10) of which were located in Kentucky. These 10 stacks identified by MANE-VU vent the emissions from fourteen (14) EGUs in Kentucky. These 14 Kentucky EGUs are identified in Table 15, along with the current status of controls, planned retirements, SO_2 control efficiency and 2002 and 2012 emissions. MANE-VU asked states to control the SO_2 emissions from these units with 90% efficiency from 2002 emission levels (232,174 tons). MANE-VU also requested a control strategy to provide a 28% reduction in SO_2 emissions from sources, other than EGUs, that would be equivalent to their proposed low sulfur residential fuel oil strategy. Kentucky's Non-EGUs were estimated to emit 40,682 tons of SO_2 in 2018. MANE-VU requested a 28% reduction in these emissions, or approximately 11,391 tpy of reductions. Thus the total MANE-VU SO_2 emission reduction request for Kentucky is an estimated 243,565 tons.

All Kentucky EGUs identified by MANE-VU and provided in Table 15 have or will have scrubbers with a minimum SO_2 control efficiency of 90% or are scheduled for retirement (100% control) by 2018. In addition, as indicated in Table 15, from 2002 to 2012 there was a decrease of 196,753 tons (76.3%) in SO_2 emissions from 2002 EGU levels (257,971 tons). This reduction combined with planned retirements referenced in Table 15 will result in SO_2 decreases of an additional 30,845 tons (11.9%) resulting in an overall decrease from 2002 SO_2 levels of 227,598 tons (88.2%) by 2018 for Kentucky MANE-VU "EGU Ask" sources. Additional, Kentucky EGU SO_2 emission reductions already achieved or planned for at other coal-fired EGU units at the same facility or different facilities, as indicated in Table 14, are expected to provide SO_2 reductions, (estimated at 300,335 SO_2 tons from 2002 to 2012), that will continue to exceed the MANE-VU "EGU Ask". Furthermore and in concert with Table 14, Figure 11 reflects a 296,468 ton SO_2 emission reduction from all Kentucky coal-fired EGU CAMD emissions from 2002 (482,635 tons) to 2012 (186,167 tons) levels, which exceeds the <u>total</u> MANE-VU "Ask" request. Therefore, KYDAQ and CAMD data indicates that the Kentucky EGU SO_2 emission decreases now, and in the future, due to retirements and fuel switching more than satisfies both the MANE-VU "EGU and Non-EGU Ask".

Table 15. 14 Kentucky Electric Generating Units Identified in MANE-VU "EGU ASK"										
Plant		**ID**	**Unit**	**MW**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**Current Status/ SO_2 Controls**	**Year of SO_2 Control Installation or Projected Shutdown**	**SO_2 Control Efficiency (%)[3]**	**2002 CAMD SO_2 Emissions (tons)[1]**	**2012 CAMD SO_2 Emissions (tons)[1]**
Duke Energy	East Bend	21-015-00029	2	600	12,920	Wet Scrubber	1981	98.35	12,918	1,497
East Kentucky Power Cooperative	Cooper	21-199-00005	1	116	7,525	Dry Scrubber	2015	95.00	7,754	3,939
			2	225	14,531	Dry Scrubber	2012	95.00	14,959	3,489
	H.L. Spurlock	21-161-00009	1	300	19,265	Wet Scrubber	2009	96.94	19,032	1,051
			2	510	22,040	Wet Scrubber	2008	97.52	21,478	1,828

Table 15. 14 Kentucky Electric Generating Units Identified in MANE-VU "EGU ASK"										
Plant		**ID**	**Unit**	**MW**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**Current Status/ SO_2 Controls**	**Year of SO_2 Control Installation or Projected Shutdown**	**SO_2 Control Efficiency (%)[3]**	**2002 CAMD SO_2 Emissions (tons)[1]**	**2012 CAMD SO_2 Emissions (tons)[1]**
AEP	Big Sandy	21-127-00003	BSU1	260	11,840		Plans for Unit 1 to be retired for coal usage when it is converted to natural gas in mid-2016	100	11,758	5,779
			BSU2	800	30,244		Plans to retire Unit 2 in 2015	100	30,141	13,920
E.ON U.S.	E.W. Brown	21-167-00001	2	166	10,661	Wet Scrubber	2010	95.05	10,980	889
			3	412	27,144	Wet Scrubber	2010	98.31	27,510	601
E.ON U.S.	Ghent	21-	3	489	15,050	Scrubber	2007	95.89	15,001	3,858

Table 15. 14 Kentucky Electric Generating Units Identified in MANE-VU "EGU ASK"										
Plant		**ID**	**Unit**	**MW**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**Current Status/ SO_2 Controls**	**Year of SO_2 Control Installation or Projected Shutdown**	**SO_2 Control Efficiency (%)[3]**	**2002 CAMD SO_2 Emissions (tons)[1]**	**2012 CAMD SO_2 Emissions (tons)[1]**
	Ghent	041-00010	4	469	10,642	Scrubber	2008	98.70	10,781	1,002
	Mill Creek	21-111-0127	4	477	7,212	Scrubber	1982 [2](New scrubber before or by 2015)	90.00	7,212	7,784
TVA	Paradise	21-177-00006	2	602	20,899	Scrubber	1982 Plans to retire Units 1 and 2 and replace them with new combined cycle natural gas-fired plant in 2017	90.60	20,889	11,146
			3	971	47,600	Scrubber	2006	90.60	47,558	4,435

Table 15. 14 Kentucky Electric Generating Units Identified in MANE-VU "EGU ASK"										
Plant		**ID**	**Unit**	**MW**	**2002 VISTAS Actual SO_2 Emissions (tons)**	**Current Status/ SO_2 Controls**	**Year of SO_2 Control Installation or Projected Shutdown**	**SO_2 Control Efficiency (%)[3]**	**2002 CAMD SO_2 Emissions (tons)[1]**	**2012 CAMD SO_2 Emissions (tons)[1]**
Totals					**257,573**				**257,971**	**61,218**

[1]2002 and [1]2012 emissions data from EPA's Clean Air Markets Division website, Air Markets Program Data (AMPD): http://ampd.epa.gov/ampd/QueryToolie.html.
[2]New scrubbers at LG&E Mill Creek for Units 1, 2, and 3 will achieve additional SO_2 emission reductions before or by April 16, 2016. [3]In addition, changes in emissions between 2002 and 2012 may not be consistent with the reported control efficiency percentage due to various factors including the timing of when the controls were installed and/or increases in the amount of fuel consumed. The SO_2 control efficiency indicated is applicable to a more recent year of operation. However, the overall SO_2 percentage/emission reduction for the EGUs as indicated by Table 14 and Figure 11 2002 and 2012 emissions more than satisfies both the MANE-VU "EGU and Non-EGU Ask".

4. ASSESSMENT OF VISIBILITY CONDITIONS

40 C.F.R. 51.308(g)(3) of the RHR requires:

> For each Class I area in the state, an assessment of the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5 year averages of these annual values:
>
> (i) Current visibility conditions for the most and least impaired days;
> (ii) Difference between current visibility conditions for the most and least impaired days and baseline visibility conditions;
> (iii) Change in visibility impairment for the most impaired and least impaired days over the past five years.

The RHR at 40 C.F.R. 51.308(d)(1) requires States to establish RPGs (in dv) for each Class I Federal area within the state and provide for reasonable progress towards achieving natural visibility. In the Kentucky Regional Haze SIP, based on VISTAS Base G2 emission inventory modeling, the KYDAQ established a reasonable progress goal of a 5.81 dv reduction in visibility impairment by 2018, which is significantly greater than the 4.73 dv reduction required to meet the uniform rate of progress necessary to achieve a natural background condition of 11.08 by 2064. Likewise, Kentucky has also adopted a reasonable progress goal for the 20% best days that would result in a 0.94 dv reduction in visibility impairment (See Table 16). In addition, the VISTAS Base G4 "Best and Final inventory modeling results are provided for comparison purposes only.

Table 16. Kentucky Reasonable Progress Goals

Class I Area Mammoth Cave NP, KY	2000-2004 Baseline Visibility, 20% Worst Days (Deciviews-dv)	Uniform Rate of Progress for 20% Worst Days (dv)	Reasonable Progress Goal (Deciview (dv) Improvement Expected by 2018, 20% Worst Days)	2000-2004 Baseline Visibility, 20% Best Days (Deciviews - dv)	Uniform Rate of Progress for 20% Best Days (dv)	Reasonable Progress Goal (Deciview (dv) Improvement Expected by 2018, 20% Best Days)
Base G2 EI	31.37	26.64 (4.73)	25.56 (5.81)	16.51	16.51 (0.00)	15.57 (0.94)
Base G4 EI	31.37	26.64 (4.73)	25.40 (5.97)	16.51	16.51 (0.00)	15.42 (1.09)

Table 17 addresses the current visibility conditions expressed in terms of 5-year averages. As provided in Table 17, the baseline conditions are for 2000 through 2004, the current conditions are for 2006 through 2010, and more current conditions are from 2009 through 2013.

Table 17. Current Visibility and Differences from the Baseline (deciviews)

Class I Area	Baseline (2000-2004)	Current (2006-2010)	Difference from Baseline	More Current (2009-2013)	Difference from Baseline
20% Worst Days					
Mammoth Cave National Park	31.37	29.09	-2.28	25.09	-6.28
Base G2 Expected Improvement by 2018			(-5.81)		(-5.81)
20% Best Days					
Mammoth Cave National Park	16.51	15.41	-1.10	13.69	-2.82
Base G2 Expected Improvement by 2018			(-0.94)		(-0.94)

Based on the more current IMPROVE data (2009-2013) in Table 17, Mammoth Cave saw a significant improvement in visibility on the 20% worst days and in visibility on the 20% best days. In fact, Mammoth Cave, based on the 2009-2013 data, is exceeding the 2018 Base G2 expected visibility improvement for the 20% worst days and 20% best days. This data provides a clear indication that the existing Kentucky Regional Haze SIP, as submitted on June 25, 2008 and amended on May 28, 2010, is more than sufficient for Mammoth Cave to meet or exceed its 2018 visibility reasonable progress goals.

Table 18 displays the change in visibility impairment for the worst (most) and best (least) impaired days over the past 5 years in terms of 5-year averages of IMPROVE data. For Mammoth Cave, the overall trend for the 20% worst days and 20% best days shows significant visibility improvement by 2009-2013.

Table 18. Visibility Change over the Past 5 years in terms of 5-year averages (deciviews)								
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
20% Worst Days								
Mammoth Cave National Park	31.75	32.00	31.38	30.68	29.09	27.92	26.14	25.09
20% Best Days								
Mammoth Cave National Park	16.84	16.50	16.19	15.76	15.41	14.73	14.28	13.69

An analysis of SO_2 emission reductions in Kentucky indicates that the Commonwealth is on track to continue achieving its visibility RPGs for Mammoth Cave in 2018 (See Tables 11 and 14). Figures 14 and 15 address the three (3) requirements at 40 C.F.R. 51.308 and depict the current visibility conditions; the difference between current and baseline visibility; and a five-year rolling average for the most (20% worst) and least (20% best) days at Mammoth Cave. As indicated by these figures, visibility at Mammoth Cave has significantly improved since 2000-2004.

Figure 14 indicates that recent observations demonstrate that visibility on the 20% worst days is below the glide path. Even when examining the changes in visibility impairment for the most impaired days, taken over a five-year rolling average, Mammoth Cave is exceeding its 2018 RPG. Moreover, expected future reductions in SO_2 emissions based on additional controls, unit retirements, and fuel switching to natural gas should serve to continue this improving trend in the coming years.

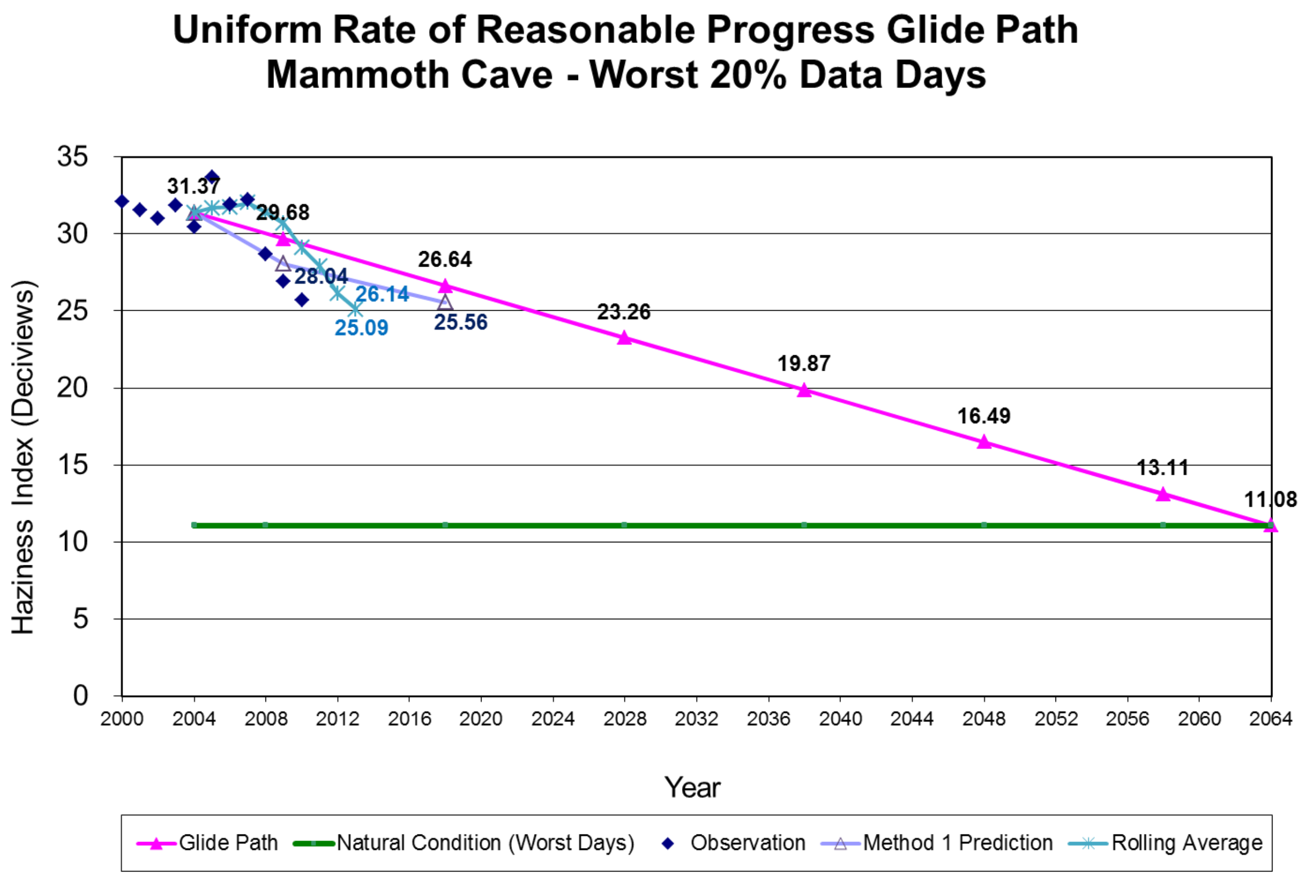


Figure 14. Uniform Rate of Reasonable Progress Glide Path for Mammoth Cave on 20% Worst Days

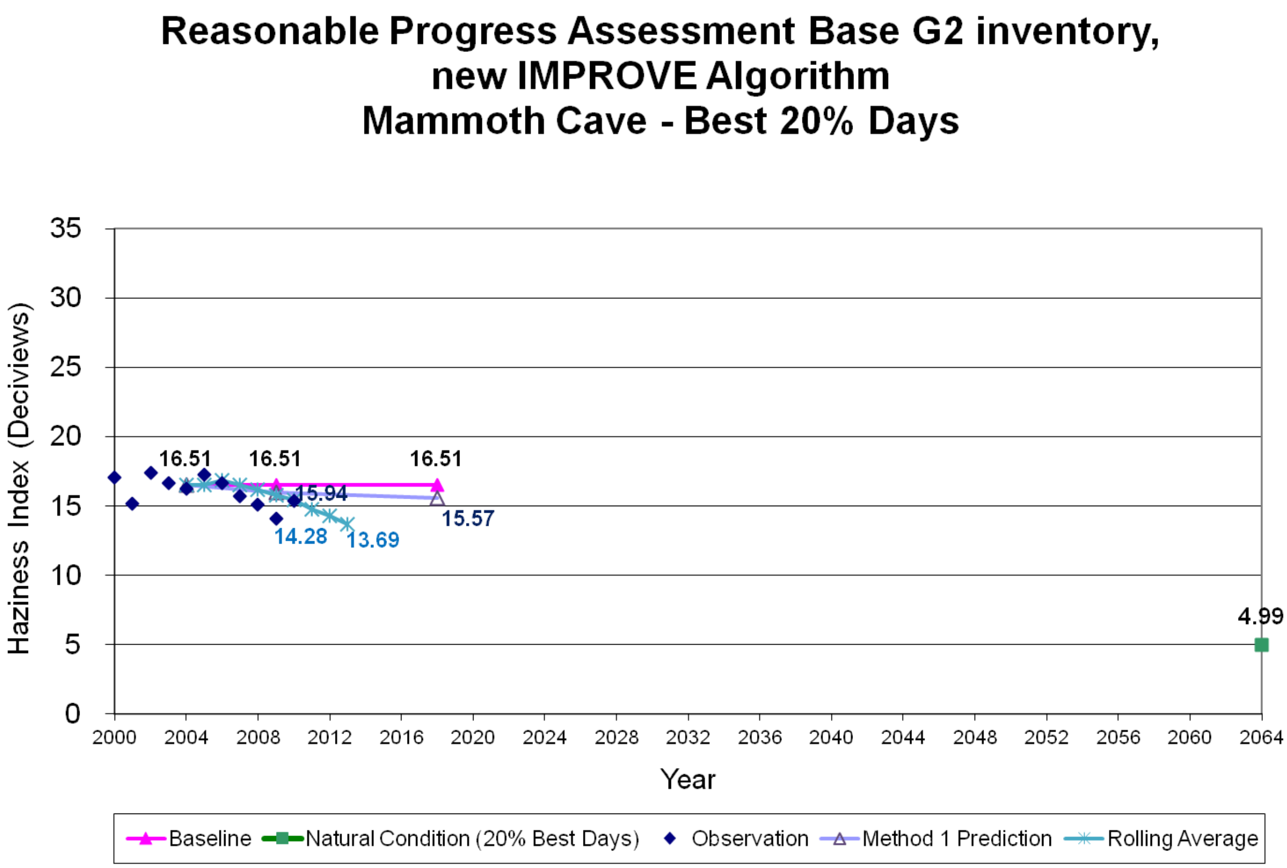


Figure 15. Reasonable Progress Assessment for Mammoth Cave on 20% Best Days

In addition to improvement in visibility on the 20% worst visibility days, Figure 15 demonstrates that visibility on the 20% best days is also improving at Mammoth Cave. The changes in visibility impairment for the least impaired days, taken over a five-year rolling average, are also improving and are actually exceeding the RPG as originally anticipated in the Kentucky Regional Haze SIP, and Mammoth Cave is expected to continue to exceed its RPG in 2018.

As discussed in the Kentucky Regional Haze SIP, the greatest benefits on the 20% worst visibility days for Mammoth Cave were projected to result from reducing SO_2 from EGUs. As outlined in this report, the reductions in SO_2 emissions from EGUs in Kentucky have been significant and are expected to continue over the next five years.

The KYDAQ committed in its Kentucky Regional Haze SIP to re-examine the need for additional non-EGU controls during this, the state's five-year periodic progress report. As evidenced by the current and future SO_2 emission reductions from EGUs, further reductions from non-utility, industrial point sources continues to be unnecessary at this time.

5. ANALYSIS OF EMISSIONS CHANGES BY SOURCE CATEGORY

40 C.F.R. 51.308(g)(4) requires:

> An analysis tracking the change over the past 5 years in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the past 5-year period."

Moreover, the RHR (64 FR 35747) goes on to require that *"Each 5 year progress report must contain . . . An emissions tracking report that analyzes the changes over the past 5 years in emissions of pollutants contributing to visibility impairment, disaggregated by source category and emissions activity, for significant categories of sources or activities."*

40 C.F.R. 51.308(d)(4)(v) of the RHR requires a statewide inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment. As such, the VISTAS states developed an inventory for the base year of 2002, along with estimated inventories for future years of 2009 and 2018. The pollutants inventoried include VOC, NO_x, $PM_{2.5}$, PM_{10}, and NH_3, and SO_2. Five emission inventory source classifications were developed and include: Stationary point and area sources, off-road and on-road mobile sources, and biogenic sources. Throughout the course of its work to develop the Regional Haze SIPS, VISTAS made several improvements to the emissions inventory to improve model performance. Appendix D of the Kentucky Regional Haze SIP describes in depth the state's efforts with regard to the initial emission inventory development and subsequent emission tracking.

The Kentucky Regional Haze SIP was developed using the Base G2 Emission Inventory as indicated in Tables 19, 20, 21, and 23. A final iteration of the emissions inventory known as Base G4, or "Best and Final", was made available in 2008. Tables 22 and 24 show the projected 2009 Base G4, and 2018 Base G4 inventory, respectively, for comparison purposes only.

The SEMAP project is funded by the EPA and the same ten states originally involved in the VISTAS project. The organizational change was primarily an administrative convenience (e.g., to address grant funding constraints). The SEMAP project addresses the next phase of ozone, fine particle and regional haze assessment obligations of the member states. The SEMAP project was designed to produce technical analyses to aid the participating agencies in developing SIPs required by the CAA, including the development of a 2007 inventory for the Southeastern states. Table 25 shows a summary of the 2007 SEMAP inventory. The 2007 SEMAP inventory is the most recent, fully vetted inventory available.

Although emissions inventories for 2002, 2007, 2009 and 2018 are presented, it is difficult to make comparisons between the inventories. The 2002 inventories represent actual and typical historical emissions, while the 2009 and 2018 inventories are projection inventories, based on predictions of future events. All inventories are estimates of emissions based on the best assumptions available at the time of development. Estimates for the 2002, 2009 and 2018 inventories were developed starting in 2004 and finalized in 2007 using different assumptions than those used for the 2007 estimates. Estimates of current emissions require the use of emission factors based on surrogate data, since direct measurements are not often available. Projections of future emissions also involve assumptions. For example, assumptions about economic growth, population growth, growth in fuel consumption, the balance among different fuels, such as coal, oil and natural gas. There have been significant changes in the economy, the balance among fuels, the growth in fuel consumption, the regulatory requirements affecting different industries that were not foreseen when the 2009 and 2018 projections were made. Natural gas prices have declined, coal prices have risen, and coal-fired power plants have been shut down. EPA has also updated emission factors. Further adding to the comparison are changes in emissions models used to estimate emissions, for example Mobile 6.2 and MOVES, while both used to estimate onroad mobile source emissions, give significantly different results for similar inputs. Due to the required switch to the onroad MOVES model, the SEMAP 2007 $PM_{2.5}$ onroad emissions appear higher than the VISTAS 2002-2009-2018 emissions. In addition, the SEMAP 2007 NOx onroad emissions appear higher than the VISTAS 2009 and 2018 onroad NOx emissions, but lower than the VISTAS 2002 onroad NOx emissions. Overall these emission differences appear consistent with national trends with the switch to the MOVES onroad model.

The 2002, 2009 and 2018 inventories were developed by VISTAS and finalized in 2007. Future year projections were prepared based on the base year 2002 inventory for 2009 and 2018. The projections reflected a scenario accounting for all in-place controls that were fully adopted into federal or individual state regulations or SIPs. Controls to comply with the CAIR were included in what was referred to as the “On the Books/On the Way” scenario. Several versions of the inventories were developed, with improvements made in each subsequent version. The final VISTAS inventory was Base G4. The 2007 inventory was prepared by SEMAP and finalized in 2012.

Documentation for the 2002, 2009, and 2018 VISTAS inventories is contained in Appendix D of the Kentucky Regional Haze SIP, submitted to EPA June 25, 2008. Documentation for the 2007 SEMAP inventory is contained in Appendix A to this Progress Report.

Table 19. Kentucky 2002 Actual Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	1,000	237,209	21,326	14,173	518,086	46,321
	Area	51,135	39,507	233,559	45,453	41,805	95,375
	Onroad	5,055	156,417	3,723	2,697	6,308	103,503
	Nonroad	31	104,571	6,425	6,046	14,043	44,805
	Fires	44	1,142	5,226	5,074	49	2,640
	Total	**57,265**	**538,846**	**270,259**	**73,443**	**580,291**	**292,644**

Table 20. Kentucky 2002 Typical Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	995	240,362	21,421	14,219	529,182	46,315
	Area	51,135	39,507	233,559	45,453	41,805	95,375
	Onroad	5,055	156,417	3,723	2,697	6,308	103,503
	Nonroad	31	104,571	6,425	6,046	14,043	44,805
	Fires	110	1,460	6,667	6,310	136	3,338
	Total	**57,326**	**542,317**	**271,795**	**74,725**	**591,474**	**293,336**

Table 21. Kentucky 2009 Base G2 Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	1,160	129,778	23,637	15,966	326,611	49,154
	Area	53,005	42,088	242,177	46,243	43,087	94,042
	Onroad	5,796	101,182	2,976	1,920	759	73,942
	Nonroad	34	94,752	5,544	5,203	9,180	38,558
	Fires	110	1,460	6,667	6,310	136	3,338
	Total	**60,105**	**369,260**	**281,001**	**75,642**	**379,773**	**259,034**

Table 22. Kentucky 2009 Base G4 Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	1,160	135,020	23,637	15,966	308,087	49,154
	Area	53,005	42,088	242,177	46,243	43,087	94,042
	Onroad	5,796	101,182	2,976	1,920	759	73,942
	Nonroad	34	94,752	5,544	5,203	9,180	38,558
	Fires	110	1,460	6,667	6,310	136	3,338
	Total	**60,105**	**374,502**	**281,001**	**75,642**	**361,249**	**259,034**

Table 23. Kentucky 2018 Base G2 Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	1,377	105,411	26,848	18,172	266,744	57,287
	Area	55,211	44,346	256,052	47,645	44,186	103,490
	Onroad	7,811	52,263	2,580	1,272	763	47,066
	Nonroad	40	79,392	4,556	4,256	8,592	30,920
	Fires	110	1,460	6,667	6,310	136	3,338
	Total	**64,549**	**282,872**	**296,703**	**77,655**	**320,421**	**242,101**

Table 24. Kentucky 2018 Base G4 Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	1,377	105,411	26,848	18,172	262,784	57,287
	Area	55,211	44,346	256,052	47,645	44,186	103,490
	Onroad	7,811	52,263	2,580	1,272	763	47,066
	Nonroad	40	79,392	4,556	4,256	8,592	30,920
	Fires	110	1,460	6,667	6,310	136	3,338
	Total	**64,549**	**282,872**	**296,703**	**77,655**	**316,461**	**242,101**

Table 25. Kentucky 2007 SEMAP Emissions Inventory by Source Sector							
State	**Sector**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
KY	Point	113	210,213	30,678	21,110	410,413	47,679
	Area	52,332	12,693	226,829	40,341	15,590	75,100
	Onroad	2,172	133,425	5,524	4,363	1,022	55,883
	Nonroad	46	63,454	4,207	3,969	3,037	38,785
	Fires	138	1,377	5,016	4,678	180	2,939
	Total	**54,801**	**421,163**	**272,254**	**74,461**	**430,242**	**220,386**

As noted earlier, VISTAS identified sulfate as the major contributor to regional haze, and focused efforts on the control of SO_2 from point sources, primarily EGUs and industrial boilers. As can be seen in the Figure 16, SO_2 emissions in 2007 were in line with the projected reductions. Further, as shown earlier in Table 14, and Figure 13, EGU SO_2 emissions have decreased significantly from 2002 to 2012. Given the planned EGU retirements and fuel switching as indicated in Table 11, Kentucky EGU SO_2 emissions should continue to decline.

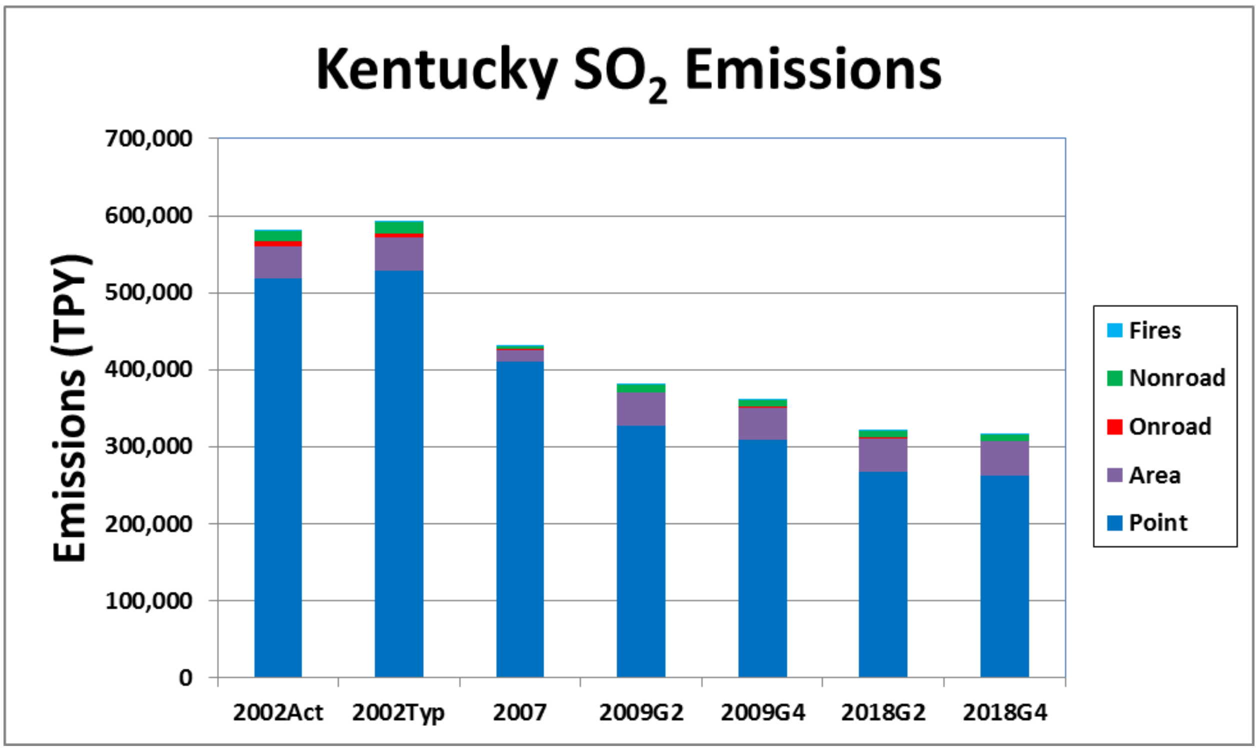


Figure 16. Kentucky SO_2 Emissions by Sector for 2002 Actual, 2002 Typical, 2007, 2009 and 2018

6. ASSESSMENT OF SIGNIFICANT CHANGES IN ANTHROPOGENIC EMISSIONS

40 C.F.R. 51.308(g)(5) of the RHR requires:

> An assessment of any significant changes in anthropogenic emissions within or outside the state that have occurred over the past 5 years that have limited or impeded progress in reducing pollutant emissions and improving visibility.

Figures 17 and 18 both indicate that sulfates continue to be the largest single contributor to regional haze at Mammoth Cave. As explained in the Kentucky Regional Haze SIP and earlier, the KYDAQ focused its analysis for the Kentucky Regional Haze SIP on addressing large SO_2 emissions from point sources. To this end, as evidenced by the data in previous Figures 10, 11, and 12, there have been significant reductions in the anthropogenic emission of concern. However, there does not appear to be any significant changes in anthropogenic emissions within Kentucky or outside of Kentucky that would have limited or impeded progress in reducing pollutant emissions or improving visibility.

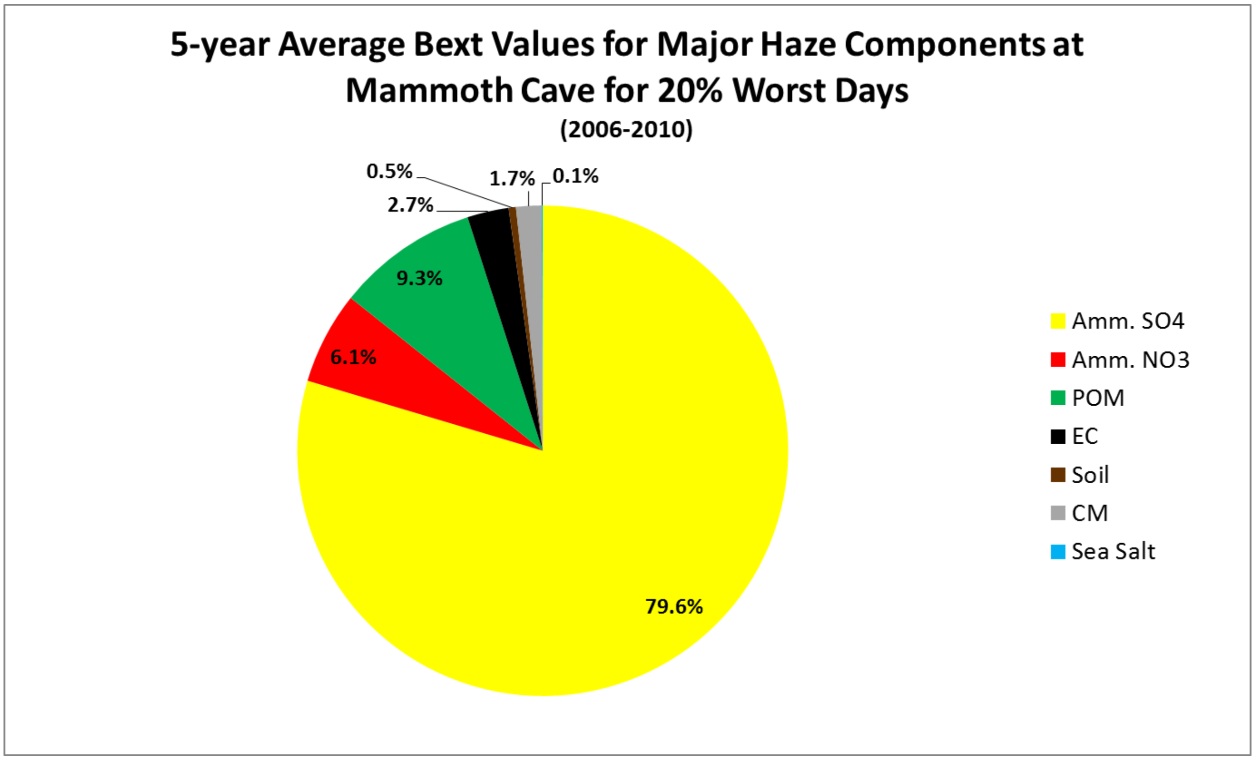


Figure 17. 5-year Average Light Extinction Values for Major Haze Components at Mammoth Cave, KY for 20% Worst Days for 2006-2010

For the 20% worst days for 2006-2010, Figure 17 indicates that after ammonium sulfate (79.6%), the next largest fraction of regional haze at Mammoth Cave is primary organic matter (9.3%). In addition, while sulfates continue to be the largest contributor to visibility impairment, as indicated in Figure 17, the contributions of primary organic matter (9.3%), ammonium nitrate (6.1%), and elemental carbon (2.7%) are also pollutants of concern.

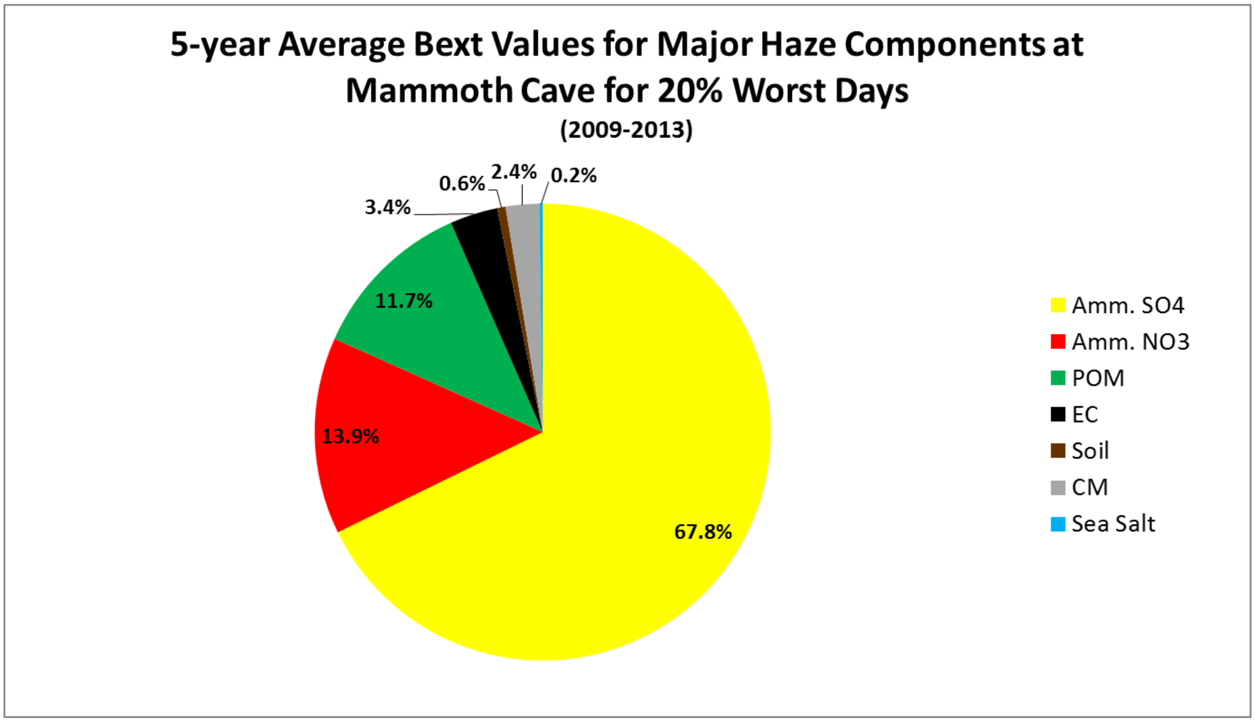


Figure 18. 5-year Average Light Extinction Values for Major Haze Components at Mammoth Cave, KY for 20% Worst Days for 2009-2013

For the 20% worst days for 2009-2013, Figure 18 indicates that after ammonium sulfate (67.8%), the next largest fraction of regional haze at Mammoth Cave is ammonium nitrate (13.9%). In addition, while sulfates continue to be the largest contributor to visibility impairment, as indicated in Figure 18, the contributions of ammonium nitrate (13.9%), primary organic matter (11.7%), and elemental carbon (3.4%) are also pollutants of concern. Component information as provided in Figures 17 and 18 is also shown in Figures 19-20.

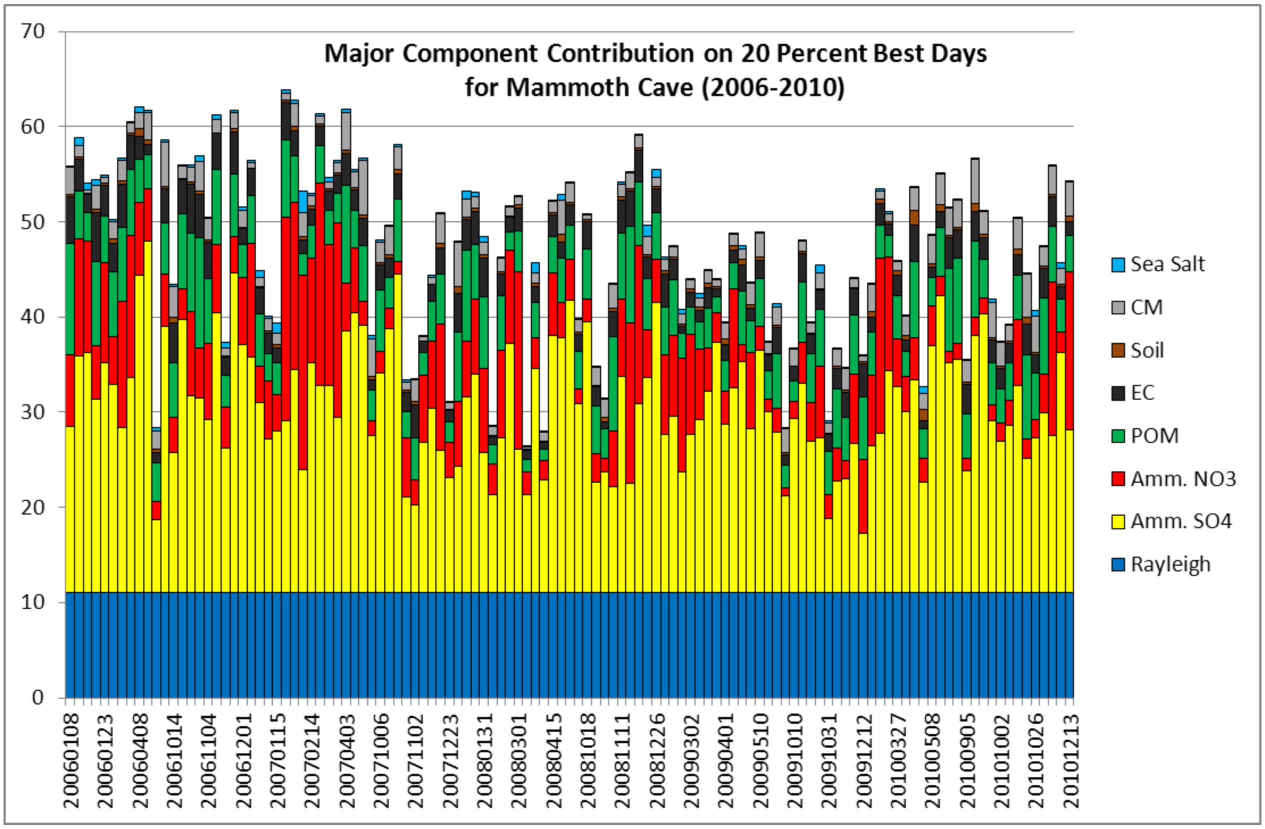


Figure 19. Major Component Contribution on 20% Best Days (2006-2010) (Note: y-axis is Extinction (Mm^{-1})

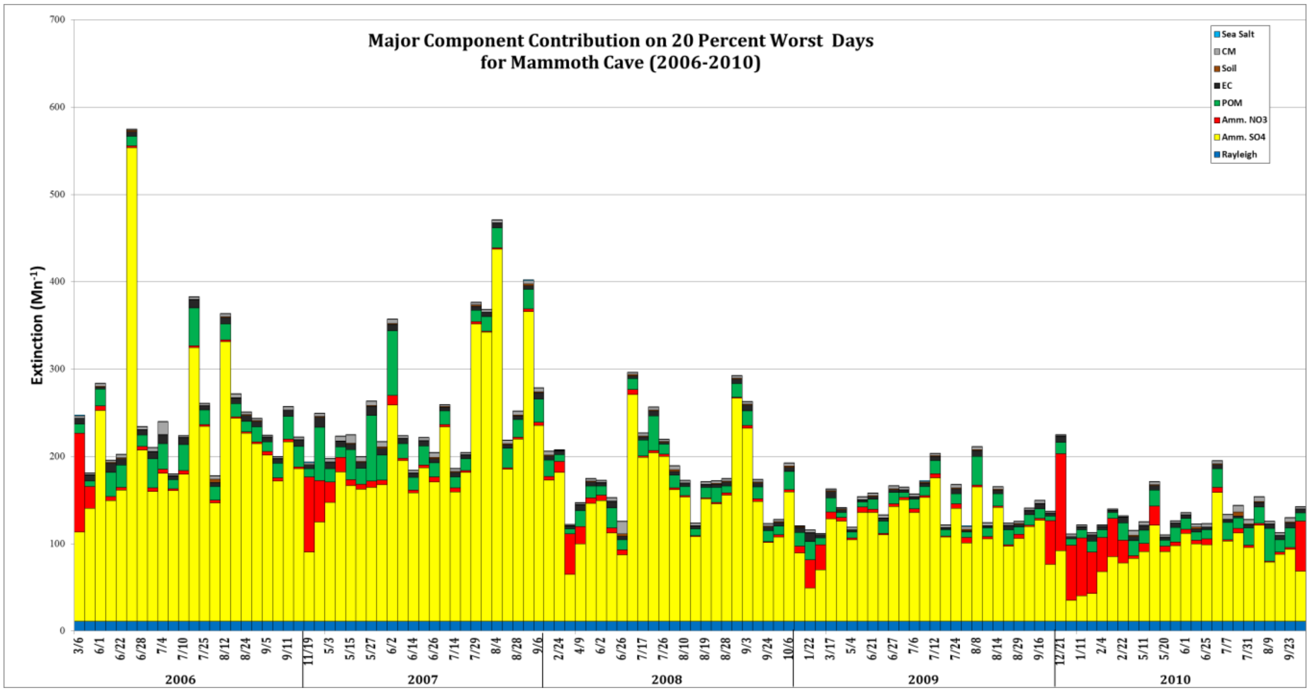


Figure 20. Major Component Contribution on 20% Worst Days (2006-2010)
(Note: y-axis is Extinction (Mm-1))

Analysis of the annual averages by species for 2000 through 2013, for the 20% best and 20% worst days at Mammoth Cave, show a significant improvement in visibility and a significant decrease in the sulfate contribution to visibility impairment, as can be seen in Figures 23 and 24 respectively.

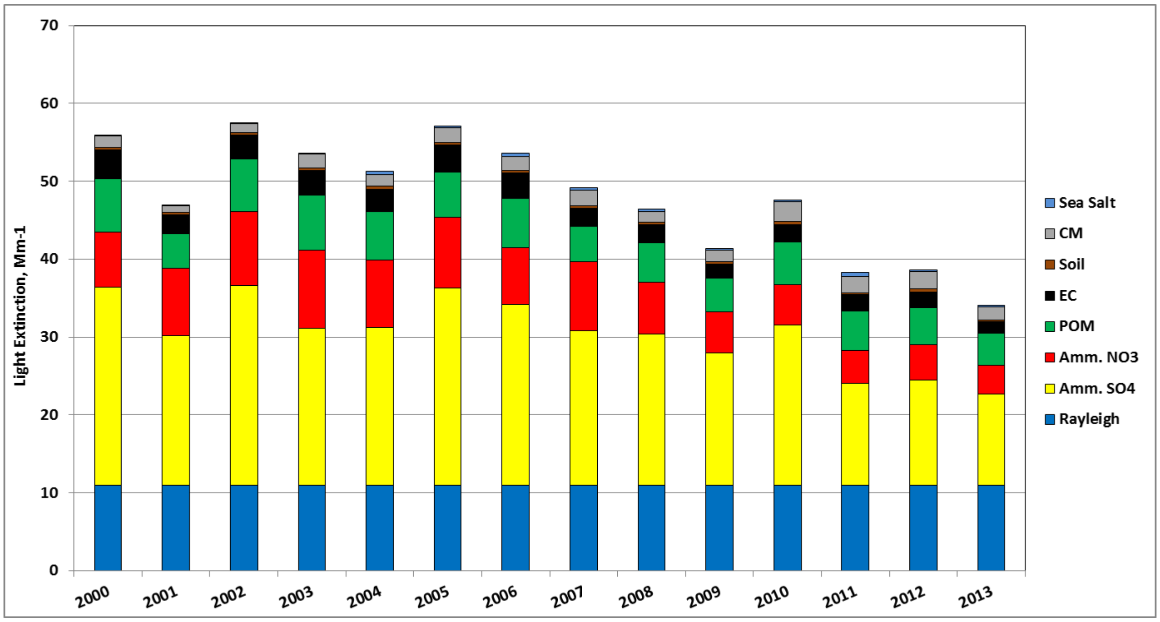


Figure 21. Annual Average Species Contribution on 20% Best Days at Mammoth Cave for 2000-2013

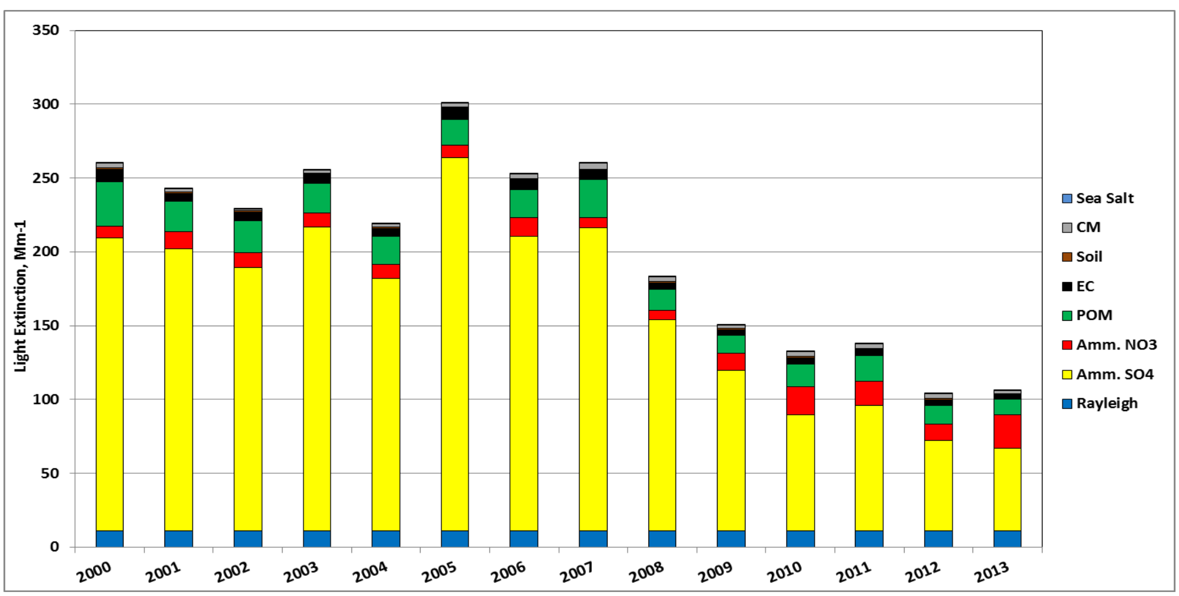


Figure 22. Annual Average Species Contribution on 20% Worst Days at Mammoth Cave for 2000-2013

7. ASSESSMENT OF ELEMENTS AND STRATEGIES FOR MEETING RPG

40 C.F.R. 51.308(g)(6) of the RHR rule requires:

> An assessment of whether the current implementation plan elements and strategies are sufficient to enable the state, or other states with Class I area affected by emissions from the State, to meet all established reasonable progress goals.

Given that the current SO_2 emission reductions from VISTAS 2002 to CAMD 2012 emissions are 39,101 tons more than the estimated SO_2 ton reduction predicted in the original Kentucky Regional Haze SIP from VISTAS 2002 to VISTAS 2018 emissions (Table 14) and that more current IMPROVE data for 2009-2013 (Tables 16 - 18 and Figures 14 - 15) indicates significant visibility improvement for Mammoth Cave, Mammoth Cave is exceeding its 2018 RPGs for the 20% worst days and 20% best days. Based upon the relevant data; projected emissions; and modeling results presented in this periodic report, KYDAQ has demonstrated that the current implementation plan elements and strategies outlined in the Kentucky Regional Haze SIP are sufficient to enable Kentucky and neighboring states to meet all established RPGs. Further revision of the existing implementation plan is not needed at this time.

7.1. Class I Areas in Other States

As indicated in Section 7.6 of the Kentucky Regional Haze SIP, based on the KYDAQ Q/d times RTMax analysis, no Kentucky sources were identified with a contribution of 1% or more to the visibility impairment at Class I areas in other states. In fact, only two Kentucky sources at 0.55% and 0.53% were identified with a contribution above 0.5% to visibility impairment at another state's Class I area. One of these sources is scheduled to be retired by 2015 and the other has made a significant reduction to its SO_2 emissions. Based on a review of other neighboring state Class I areas that follows, each area appears on track to achieve or is already achieving its 2018 RPG for the 20% worst days and 20% best days.

7.1.a. Great Smoky Mountains, NC and TN

Kentucky was projected to have a 1.02% relative contribution to sulfate in the Great Smoky Mountains. No units in Kentucky were projected to have a relative contribution greater than 0.41%. As shown below in Figures 21 and 22 respectively, for Visibility conditions for 20% Worst Days and 20% Best Days, the Great Smoky Mountains are on track to achieve RPG by 2018.

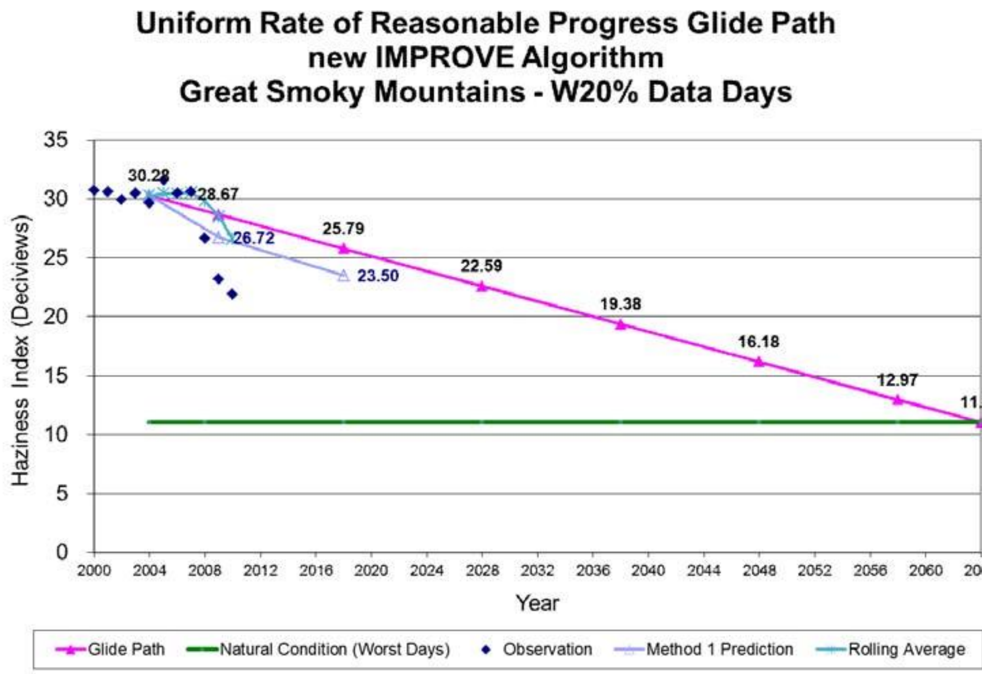


Figure 23: Visibility Conditions for Great Smoky Mountains on 20% Worst Days

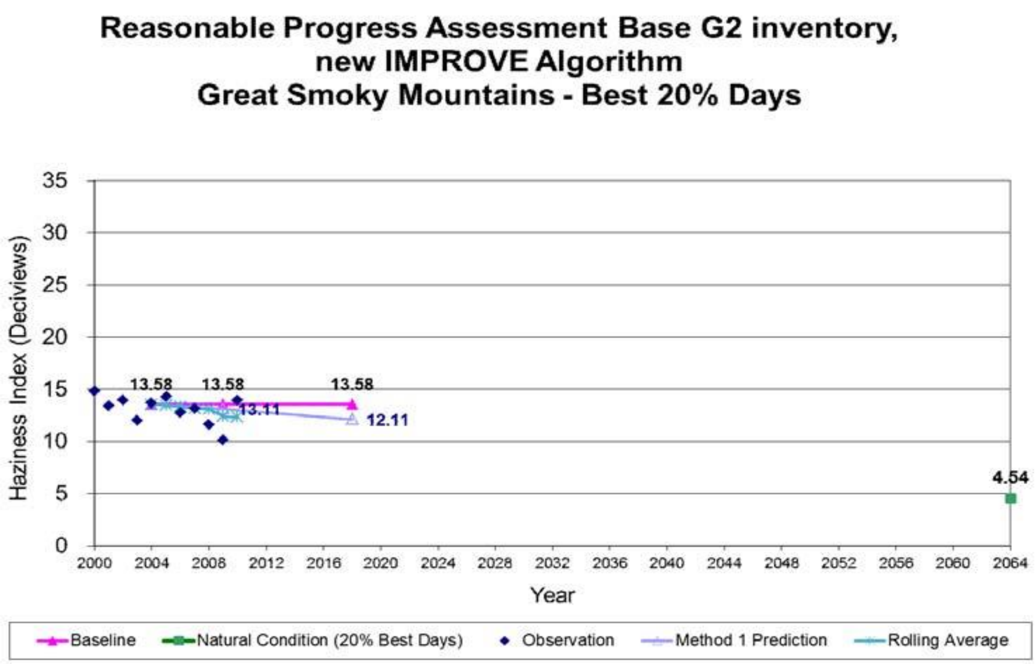


Figure 24: Visibility Conditions for the Great Smoky Mountains on 20% Best Days

7.1.b. James River Face, VA

Kentucky was projected to have a 2.02% relative contribution to sulfate in the James River Face. Only two units in Kentucky, at 0.55% and 0.53%, were projected to have a relative contribution greater than 0.5%. As shown below in Figures 23 and 24 respectively, for Visibility conditions for 20% Worst Days and 20% Best Days, the James River Face is on track to achieve RPG by 2018.

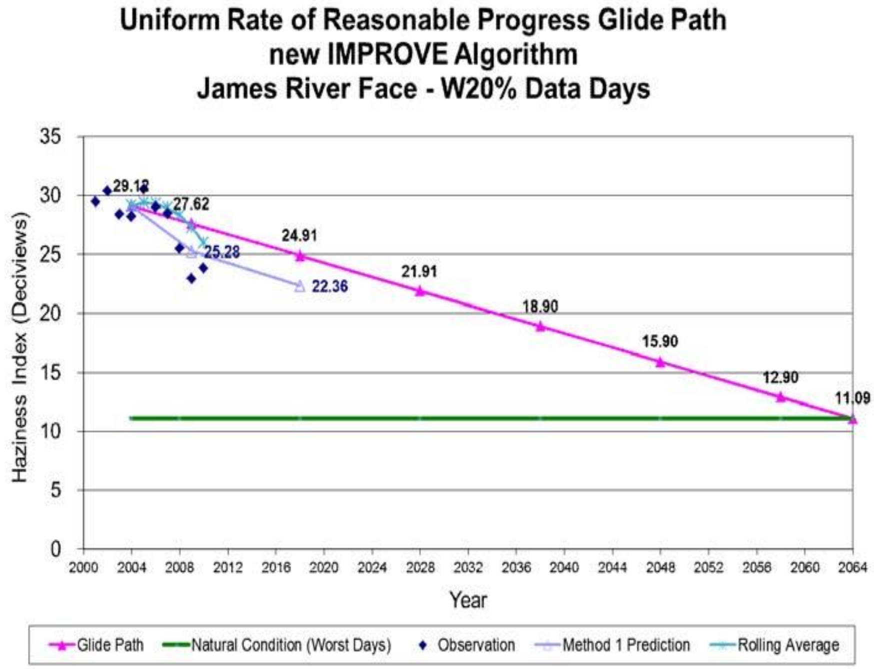


Figure 25: Visibility Conditions for James River Face on 20% Worst Days

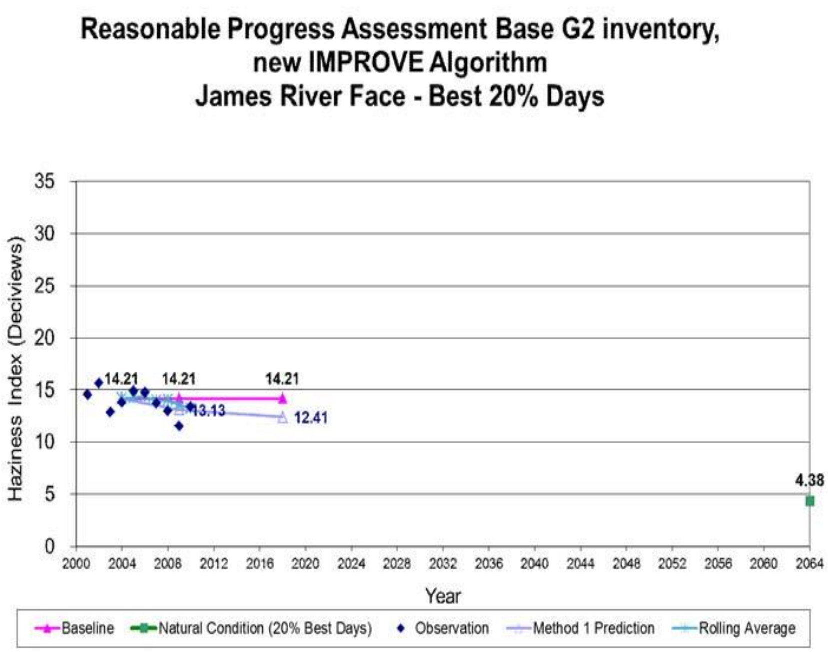


Figure 26: Visibility Conditions for the James River Face on 20% Best Days

7.1.c. Linville Gorge, NC

Kentucky was projected to have a 0.90% relative contribution to sulfate in the Linville Gorge Wilderness Area. No units in Kentucky were projected to have a relative contribution greater than 0.27%. As shown below in Figures 25 and 26 respectively, for Visibility conditions for 20% Worst Days and 20% Best Days, the Linville Gorge Wilderness Area is on track to achieve RPG by 2018.

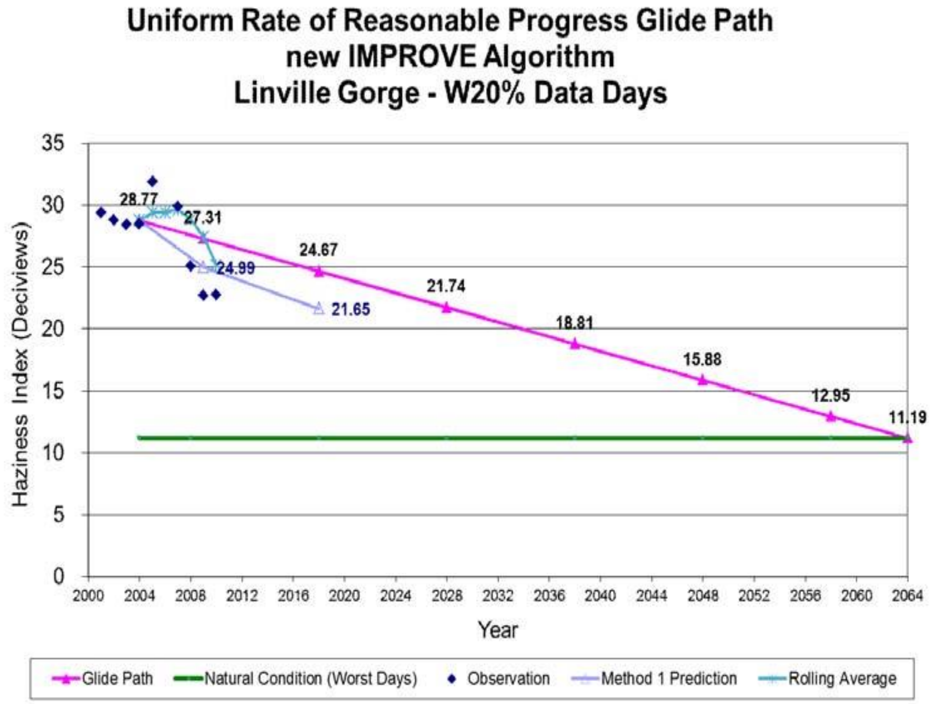


Figure 27: Visibility Conditions for Linville Gorge on 20% Worst Days

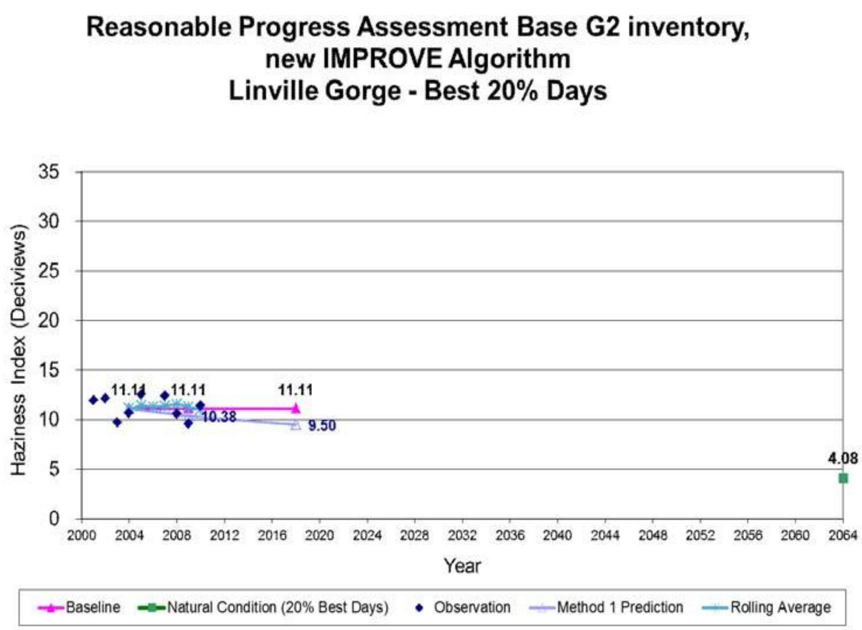


Figure 28: Visibility Conditions for Linville Gorge on 20% Best Days

7.1.d. Shenandoah, VA

Kentucky was projected to have a 1.10% relative contribution to sulfate in Shenandoah. No units in Kentucky were projected to have a relative contribution greater than 0.32%. As shown below in Figures 27 and 28 respectively, for Visibility conditions for 20% Worst Days and 20% Best Days, Shenandoah is on track to achieve RPG by 2018.

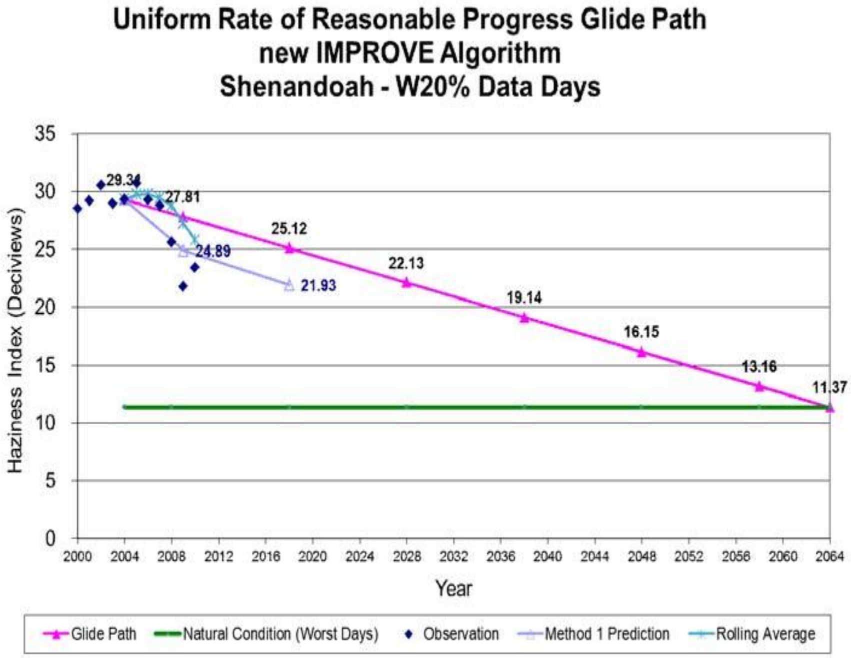


Figure 29: Visibility Conditions for Shenandoah on 20% Worst Days

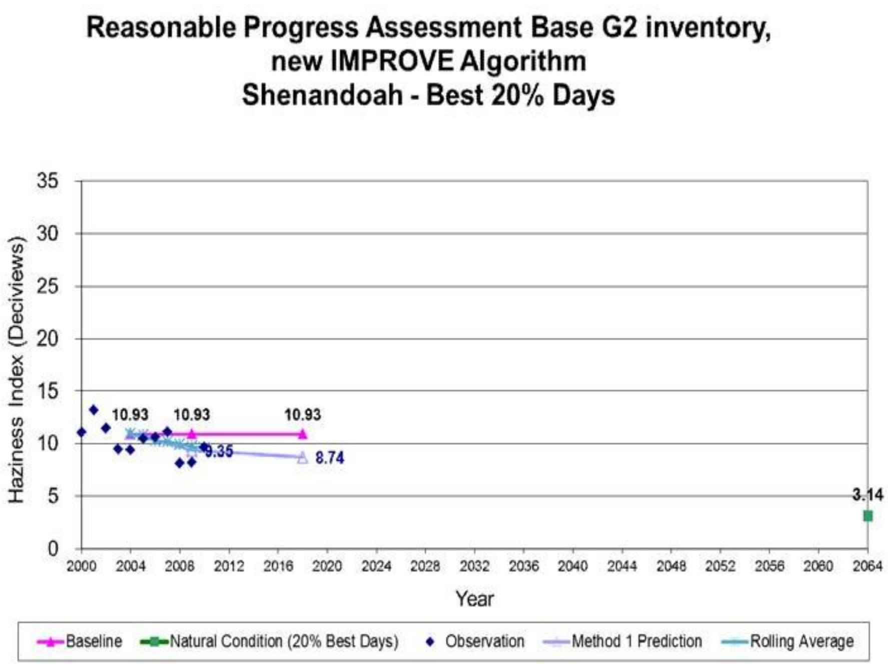


Figure 30: Visibility Conditions for Shenandoah on 20% Best Days

7.1.e. Dolly Sods, WV

Kentucky was projected to have a 1.34% relative contribution to sulfate in the Dolly Sods Wilderness Area. No units in Kentucky were projected to have a relative contribution greater than 0.37%. As shown below in Figures 29 and 30 respectively, for Visibility conditions for 20% Worst Days and 20% Best Days, the Dolly Sods Wilderness Area is on track to achieve RPG by 2018.

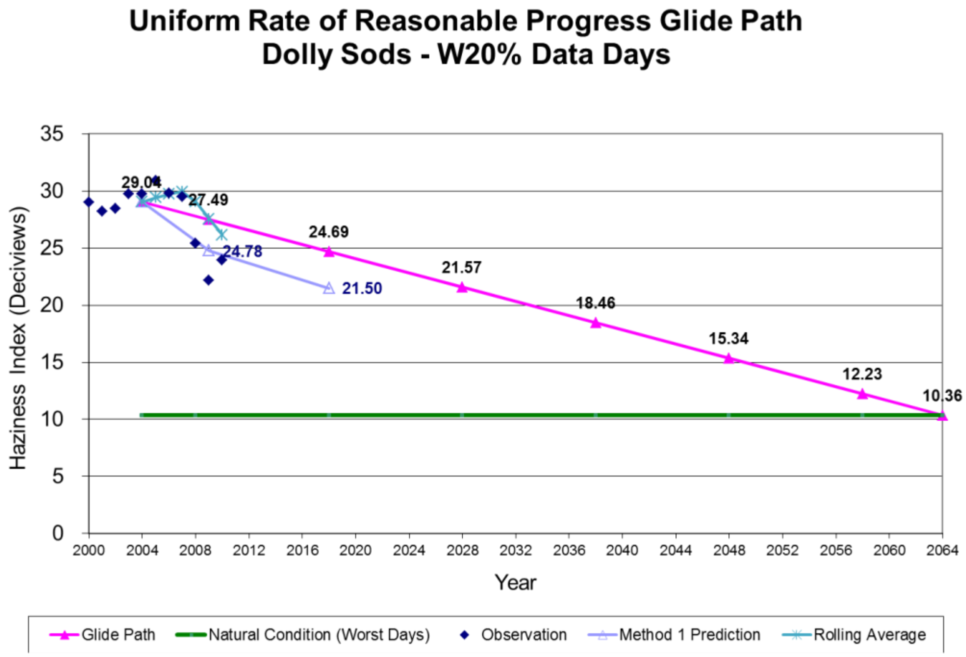


Figure 31: Visibility Conditions for Dolly Sods on 20% Worst Days

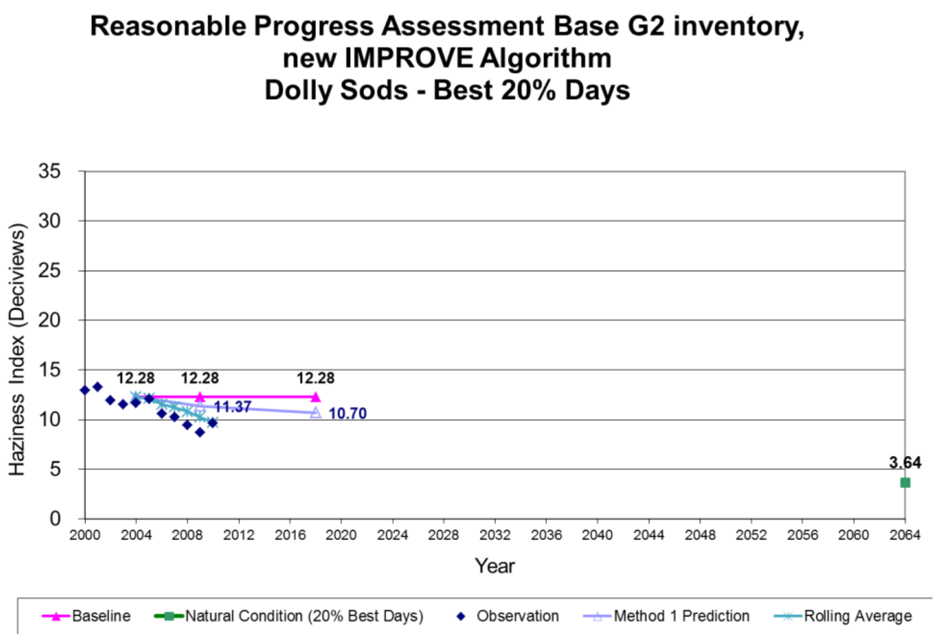


Figure 32: Visibility Conditions for Dolly Sods on 20% Best Days

In addition, Table 26 provides a side-by-side comparison of the 2018 RPGs, as plotted in previous figures in this section, and the more current 5-year average 2009-2013 IMPROVE data for the aforementioned neighboring Class I areas including Mammoth Cave for comparison purposes. This below information indicates significant improvement in visibility for these Class I areas. In fact, these Class I areas are either meeting or on track to meet their 2018 RPGs given that their more current 2009-2013 IMPROVE average values are less than or very close to their 2018 RPG values.

Table 26. Comparison of 2018 Reasonable Progress Goals (RPG) and More Current 2009-2013 5-Year Average IMPROVE Data Values

Class I Area	20% Days	Baseline (2000-2004) (dv)	2018 RPG (dv)	More Current (2009-2013) IMPROVE Average Data Values (dv)
Great Smoky Mountains, NC, TN	Worst Days	30.28	23.50	22.50
	Best Days	13.58	12.11	10.63
James River Face, VA	Worst Days	29.12	22.36	22.55
	Best Days	14.21	12.41	11.79
Linville Gorge, NC	Worst Days	28.77	21.65	21.60
	Best Days	11.11	9.50	9.70
Shenandoah, VA	Worst Days	29.31	21.93	21.82
	Best Days	10.93	8.74	8.60
Dolly Sods, WV	Worst Days	29.04	21.50	22.40
	Best Days	12.28	10.70	9.03
Mammoth Cave, KY	Worst Days	31.37	25.56	25.09
	Best Days	16.51	15.57	13.69

8. ASSESSMENT OF MONITORING STRATEGIES

40 C.F.R. 51.308(g)(7) of the RHR requires:

> A review of the state's visibility monitoring strategy and any modifications to the strategy as necessary.

The primary monitoring network for regional haze, both nationwide and in Kentucky, is the IMPROVE network. Given that IMPROVE monitoring data from 2002-2004 served as the baseline for the regional haze program, the future regional haze monitoring strategy must necessarily be based on, or directly comparable to, IMPROVE. The IMPROVE measurements provide the only long-term record available for tracking visibility improvement or degradation, therefore Kentucky intends to rely on the IMPROVE network for complying with the regional haze monitoring requirement in the Regional Haze Rule.

There is currently an IMPROVE monitor located at Mammoth Cave National Park. The IMPROVE measurements are central to Kentucky's regional haze monitoring strategy, and it is difficult to imagine how the objectives listed above could be met without the monitoring provided through IMPROVE. Any reduction in the scope of the IMPROVE network in Kentucky would jeopardize the KYDAQ's ability to demonstrate reasonable progress toward visibility improvement at Mammoth Cave. In particular, Kentucky's regional haze strategy relies on emission reductions that will result from the CAIR or the CAIR replacement rule and emissions reductions in neighboring States, which will occur at different times and will most likely not be spatially uniform. Continued IMPROVE monitoring at Mammoth Cave and other Class I areas is very important to document the air quality impacts of the emissions reductions. Therefore, the KYDAQ urges EPA to maintain support for the IMPROVE network at least equal to current levels.

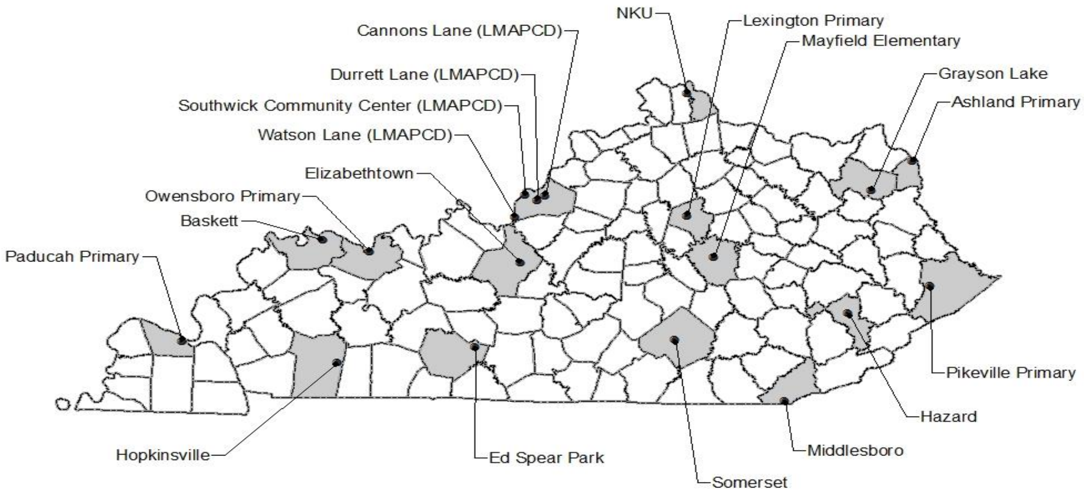
The IMPROVE network is periodically assessed to optimize the data acquisition versus the required resources. Because the current IMPROVE monitor at Mammoth Cave has an extensive data record that represents a unique airshed, reducing the IMPROVE network by shutting down the monitoring site would significantly impede tracking progress at Mammoth Cave. It is critical to the monitoring strategy that IMPROVE will continue to operate this site. In the event that the Mammoth Cave IMPROVE monitoring site is proposed for elimination, Kentucky, in consultation with EPA and relevant FLM, will seek to develop an alternative approach for meeting the tracking obligation, perhaps by seeking contingency funding to carry out limited monitoring or by relying on data from urban monitoring sites to demonstrate trends in the reduction of concentrations of the contributors to visibility impairment. However, such alternative monitoring approaches are unlikely to be sufficient to meet the RHR data requirements.

Data produced by the IMPROVE monitoring network will be used as the basis for preparation of the five-year progress reports and the ten-year SIP revisions, each of which relies on analysis of the preceding five years of data. Consequently, the monitoring data from the IMPROVE sites needs to be readily accessible and as up to date as possible. Presumably, IMPROVE will continue to process information from its own measurements at about the same pace and with the same attention to quality as it has shown in the recent past. The VIEWS website has been supported by VISTAS and the other Regional Planning Organizations to provide ready access to the IMPROVE data and data analysis tools. Therefore, Kentucky is encouraging VISTAS and other RPOs to maintain support of VIEWS or an equivalent data management system to facilitate analysis of the IMPROVE and visibility related data. Based on these assumptions and analysis no modifications to the State's existing visibility monitoring strategy are necessary at this time.

In addition to the IMPROVE measurements, some ongoing long-term limited monitoring supported by FLMs provides additional insight into progress toward regional haze goals. Kentucky benefits from the data from these measurements, but is not responsible for the funding decisions to maintain these measurements into the future.

Moreover, the KYDAQ operates a $PM_{2.5}$ network of the filter-based Federal reference method monitors and filter-based speciation monitors. A map of the various locations around the State is included in Figure 31. These $PM_{2.5}$ measurements help the KYDAQ characterize air pollution levels in areas across Kentucky, and therefore aid in the analysis of visibility improvement in and near the Class I areas.

Figure 33. Kentucky 2013 $PM_{2.5}$ Ambient Air Monitoring Network



D. ADEQUACY OF THE EXISTING SIP

1. REQUIREMENT TO DETERMINE THE ADEQUACY OF THE EXISTING SIP

40 C.F.R. 51.308(h) of the RHR states:

> (h) *Determination of the adequacy of existing implementation plan.* At the same time the State is required to submit any 5-year progress report to EPA in accordance with paragraph (g) of this section, the State must also take one of the following actions based upon the information presented in the progress report:
>
> > (1) If the State determines that the existing implementation plan requires no further substantive revision at this time in order to achieve established goals for visibility improvement and emissions reductions, the State must provide to the Administrator a negative declaration that further revision of the existing implementation plan is not needed at this time.
> >
> > (2) If the State determines that the implementation plan may be inadequate to ensure reasonable progress due to emissions from sources in another State(s) which participated in a regional haze planning process, the State must provide notification

to the Administrator and to the other State(s) which participated in the regional planning process with the States. The State must also collaborate with the other State(s) through the regional haze planning process for the purpose of developing additional strategies to address the plan's deficiencies.

(3) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, the State shall provide notification, along with available information, to the Administrator.

(4) Where the State determines that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources within the State, the State shall revise its implementation plan to address the plan's deficiencies within one year.

2. DETERMINATION OF IMPLEMENTATION PLAN ADEQUACY

Based on the options above and the evidence presented herein, the KYDAQ submits a negative declaration to the EPA Administrator specifying that further revision of the existing implementation plan is not needed at this time.

In keeping with the EPA's recommendations related to consultation, the KYDAQ is enlisted the support of appropriate state, local and tribal air pollution agencies, as well as the corresponding FLMs to formulate this report. As part of this commitment, the KYDAQ made an advanced, draft copy of this report available to the FLMs and sought their input. Comments received, along with the KYDAQ's responses are found in Appendix B – Interagency Consultation.

In addition, the KYDAQ placed the Notice of Public Hearing and Comment Period on its website (http://air.ky.gov/Pages/PublicNoticesandHearings.aspx), which provided a 30-day public comment period. A public hearing that was scheduled for May 30, 2014, was not conducted since no request for a hearing was received. The hearing notice, comments received, along with the KYDAQ's responses are found in Appendix C – Public Participation.

The KYDAQ commits to continued consultation among the states and FLMs as it relates to any SIP revisions and/or the implementation of other programs having the potential to contribute to visibility impairment. The Commonwealth anticipates that this will occur in much the same fashion as did the pre-hearing meetings, comments, and responses, as required by 40 C.F.R. 51.308(i)(3) and included in Appendix B.