

# ADEM

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## ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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**CERTIFIED MAIL NO.: 7004 1160 0006 6052 3539**  
**RETURN RECEIPT REQUESTED**

January 6, 2005

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Mr. Douglas Neeley  
Air Planning Branch  
Air, Pesticides & Toxics Management Division  
U.S. EPA, Region 4  
Atlanta Federal Center  
61 Forsyth Street, SW  
Atlanta, GA 30303-3104

**Subject:** Changes to Alabama's Particulate Monitoring Network Plan

Dear Mr. Neeley:

In July 2004, Alabama and Georgia jointly submitted a request to revise our respective Particulate Monitoring Plans to use spatial averaging in the Columbus, Georgia, Metropolitan Statistical Area (MSA). In your November 23, 2004 letter, you conveyed to us that EPA had determined that the case for spatial averaging was not made in our July 2004 submittal due to concerns with emission sources in the area not similarly impacting all three monitors. Enclosed is a revised plan to spatially average two monitors, one in Phenix City, Alabama, and one in Columbus, Georgia, at the health department. We believe your concerns with our previous monitoring plan revision regarding the impact from emission sources are resolved by spatially averaging these two monitors. The Air Quality System (AQS) site identification number for our monitor is 011130001. Georgia's PM2.5 monitor AQS site identification number is 132150001. The attached document includes the data that supports this proposal and detailed information which describes the new monitoring planning area.

Further, in accordance with the spatial averaging rules, ADEM is requesting that the designation of the Russell County monitor be changed from SLAMS to Core-SLAMS. This monitor is being operated in accordance with the requirements for Core-SLAMS sites.

We therefore request that EPA approve this revision to our Particulate Monitoring Network Plan. We would appreciate your expedited review and approval of this revised plan in light of the deadlines in the recent PM2.5 designation rule signed by the Administrator.



Mr. Douglas Neeley  
Page 2  
January 6, 2005

If you have any questions or if we can provide further information regarding these issues, please do not hesitate to contact Ken Barrett at (334) 271-7870 or me at (334) 260-2747.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael E. Malaier", with a long horizontal flourish extending to the right.

Michael E. Malaier, Chief  
Air Assessment Unit

#### Attachments

cc: Richard Guillot  
U. S. EPA

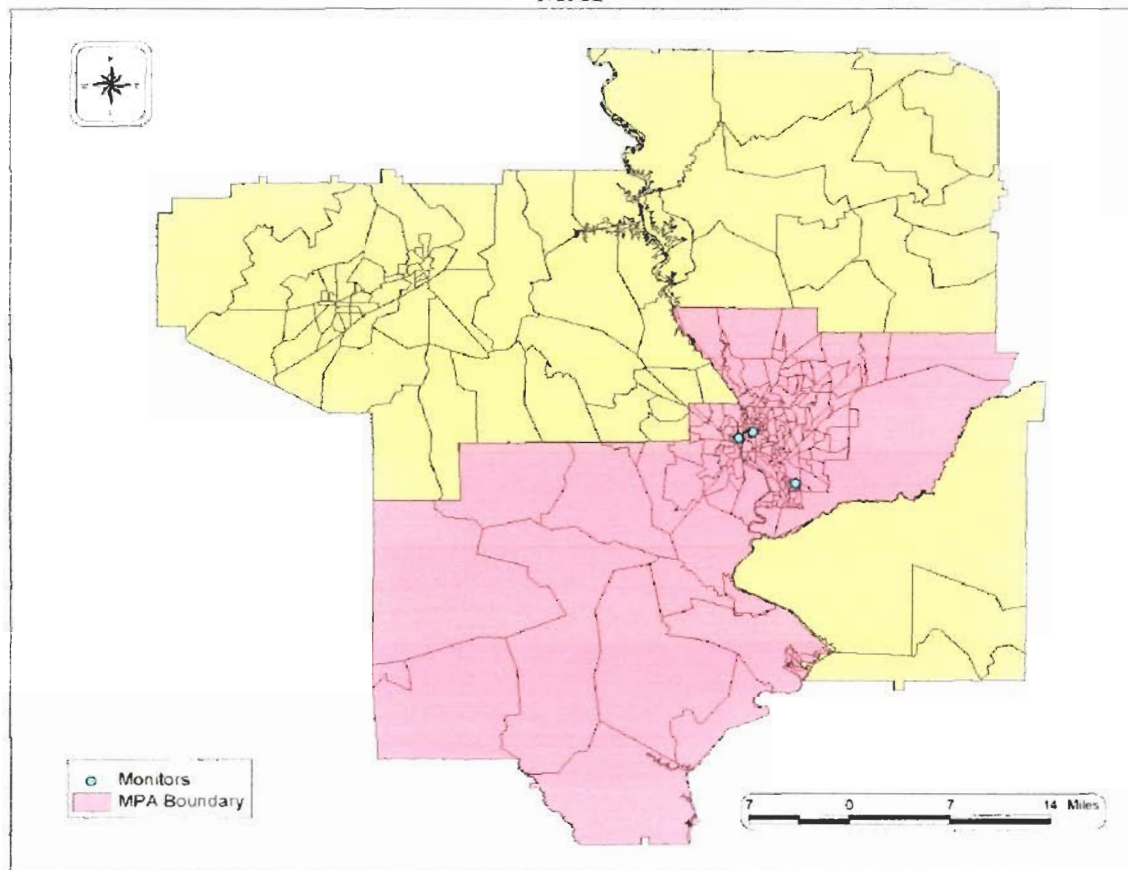
Dick Schutt  
U. S. EPA

Ron Methier  
Georgia DNR

**Supporting Data**  
**Revision to ADEM's Particulate Monitoring Plan for the Phenix City Area**  
**December 2004**

The proposed Columbus-Phenix City Monitoring Planning Area (MPA) is located on the Alabama and Georgia state line southeast of Birmingham, Alabama, and southwest of Atlanta, Georgia. Currently, the Russell County, Alabama, MPA includes Phenix City and the Muscogee County, Georgia, MPA includes Columbus. The boundary of the proposed Columbus-Phenix City MPA will consist of Russell County Alabama and Muscogee County Georgia. Columbus and Phenix City are adjacent cities, separated only by the Chattahoochee River which serves as the state boundary in the immediate area. These two cities make up the "core city" of the Metropolitan Statistical Area (MSA) being that they account for most of the population in the MSA. Interstate 185 runs through Columbus, Georgia, allowing traffic from Chattahoochee County, just south of the Columbus-Phenix City area to where it originates, to flow north through Harris County. The population of the two-county MPA is approximately 220,000, while the population of the entire Metropolitan Area is less than 300,000. The residential, commercial, and industrial distribution of the area is uniform and more abundant around these two large more urbanized cities.

**MAP**



## **Columbus-Phenix City Community Monitoring Zone (CMZ)**

The Alabama Department of Environmental Management (ADEM), along with the Georgia Department of Natural Resources, has determined that the best representation of the exposure of the public to fine particulate pollution for the Columbus-Phenix City area is through the application of spatial averaging for the annual PM<sub>2.5</sub> standard. Spatial averaging will be applied to the two monitors in the Columbus-Phenix City area with AQS site identification numbers 132150001 in Columbus (Health Dept. site), and 011130001 in Phenix City. The original monitoring plans were created prior to any PM<sub>2.5</sub> samples being collected in that area. Subsequent data from these monitors indicate a significant spatial homogeneity of the PM<sub>2.5</sub> concentrations. Based upon the background information in the final rule promulgating the PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS), the PM<sub>2.5</sub> health-based standard was based on a spatially-averaged monitoring approach. Therefore, we believe it is appropriate to define a larger MPA that is sub-divided into two CMZs that includes spatial averaging of the data as defined in 40 CFR Part 58. The revised MPA boundary would consist of Russell and Muscogee Counties.

All sites meet internal and external siting criteria as defined in 40 CFR Part 58, Appendix D, Item 2.8, as well as, the EPA document "Guidance for Network Design and Optimum Site Exposure for PM<sub>2.5</sub> and PM<sub>10</sub>". Both monitors were designated to be neighborhood scale at the time of installation and the Phenix City monitor was designated as a non-Core SLAM. We are also proposing changing the status of this monitor to a Core-SLAM. This monitor is being operated in accordance with the requirements for Core-SLAM sites. The samplers were sited to reasonably represent the predominant land uses, population densities, activities, and exposure to fine particulate within the MPA. Unusual impacts observed at the monitoring site or effecting the MPA or region are documented, and if appropriate, the affected data is flagged consistent with the exceptional event policy.

Russell County, Alabama, and Muscogee County, Georgia, are in the Columbus (Georgia) – Phenix City (Alabama) Interstate Air Quality Control Region (40 CFR 81.58). These air quality control regions are designated by the EPA Administrator pursuant to section 107 of the Clean Air Act for the purposes of developing and carrying out implementation plans under section 110 of the Clean Air Act.

The two FRM sites within the proposed CMZ follow the 1:3 sampling schedule and have been in operation since 1999.

The **Phenix City Monitor** (011130001) is located at what was once the Russell County Health Department, which was also the site for a PM<sub>10</sub> monitor. An additional FRM PM<sub>2.5</sub> monitor has been collocated at this site to ensure accuracy and data completeness.

The **Columbus H.D. Monitor** (132150001) is located at the Columbus Health Department approximately 1 mile east of the Phenix City Monitor. This site also has additional monitors.

## Comparison to the 24-Hour Standard

None of the sites in the Columbus-Phenix City MPA have measured 24-hour average concentrations near the level of the 24-hour PM<sub>2.5</sub> NAAQS (60ug/m<sup>3</sup>). Table 1 shows the 24-hour concentrations since 1999.

**Table 1**  
98<sup>th</sup> Percentile 24-Hour Averages (ug/m<sup>3</sup>)

Year	Phenix City	Health Dept
1999	46.5	36.9
2000	41.6	31.4
2001	33.8	34.3
2002	35.0	30.8
2003	32.3	32.4

## Adequacy for Spatial Averaging

For the purpose of spatial averaging, the Community Monitoring Zone (CMZ) is defined as the Columbus Phenix City urban core and is represented in figure 10. The MPA boundary encompasses the higher population and activity areas associated with the Columbus-Phenix City urbanized area.

Review of the sampling data collected at the two representative sites from calendar years 2001-2003 show that the three specific requirements for spatial averaging stated in Appendix D of 40 CFR Part 58 are met.

- 1) The sites represent neighborhood or larger spatial measurement scale.
- 2) The CMZ represents homogeneous air quality, defined as:
  - a. Sites' annual averages must be within 20% of the CMZ-wide average on an annual basis; and.
  - b. Reasonably correlated on a daily basis ( $r > 0.6$ ).
- 3) The entire CMZ should principally be affected by the same major emissions sources of PM<sub>2.5</sub>.

The guidance indicates that three years of PM<sub>2.5</sub> air quality data is needed before final evaluation of site eligibility can be made. Five years of data have been collected, and the most recent three years are being used to determine adequacy for the application of spatial averaging for this CMZ and comparison to the NAAQS, consistent with the method described in Appendix N of 40 CFR Part 50.

## Spatial Scale of the Samplers

At the time of initial network design, all of the samplers were intended to represent areas defined as neighborhood scale (0.5 to 4 km) or larger. The homogeneity of the data collected at and comparison of data between the sites support the conclusion that none of the sites are unduly impacted by local sources. Although most directly representative of the area immediately adjacent to each site, it is believed that each sampler is also representative of non-contiguous areas within the CMZ having similar population density, transportation, land, and heating fuel use, and impacts from the emissions from the regional point and mobile sources.

## Homogeneous Air Quality

The annual PM<sub>2.5</sub> averages at both sampling sites within the CMZ are similar and well within 20 percent of the spatial average for each year. The metrics for comparison to the CMZ spatial average are listed in Table 2, and the annual average at each site and the CMZ spatial average are in Table 3. The data reflects the deletion of data declared invalid by EPA as a result of a data audit.

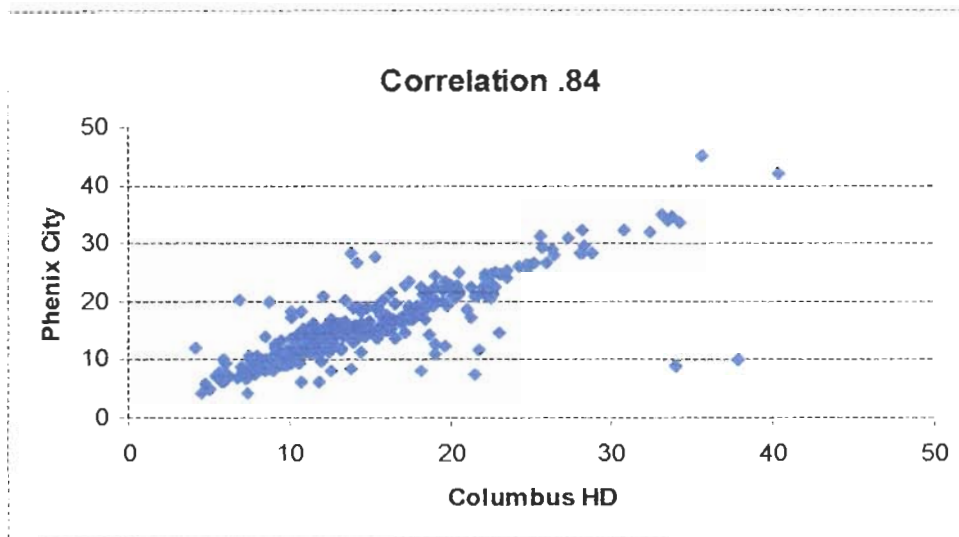
**Table 2**

Spatial Average Statistics (ug/m <sup>3</sup> )									
Year	Spatial Average	Spatial Std	Spatial COV	Max Average	Min Average	Average +20%	Average -20%	Average +10%	Average -10%
1999	18.93	2.2	0.1	21.08	16.78	22.72	15.14	20.19	17.04
2000	17.62	0.9	0.05	18.54	16.7	21.37	14.1	19.38	15.86
2001	15.48	0.08	0.005	15.56	15.39	18.58	12.38	17.03	13.93
2002	14.66	0.4	0.02	15.09	14.23	17.62	11.7	16.13	13.19
2003	14.95	0.4	0.02	15.36	14.49	17.94	11.96	16.45	13.45

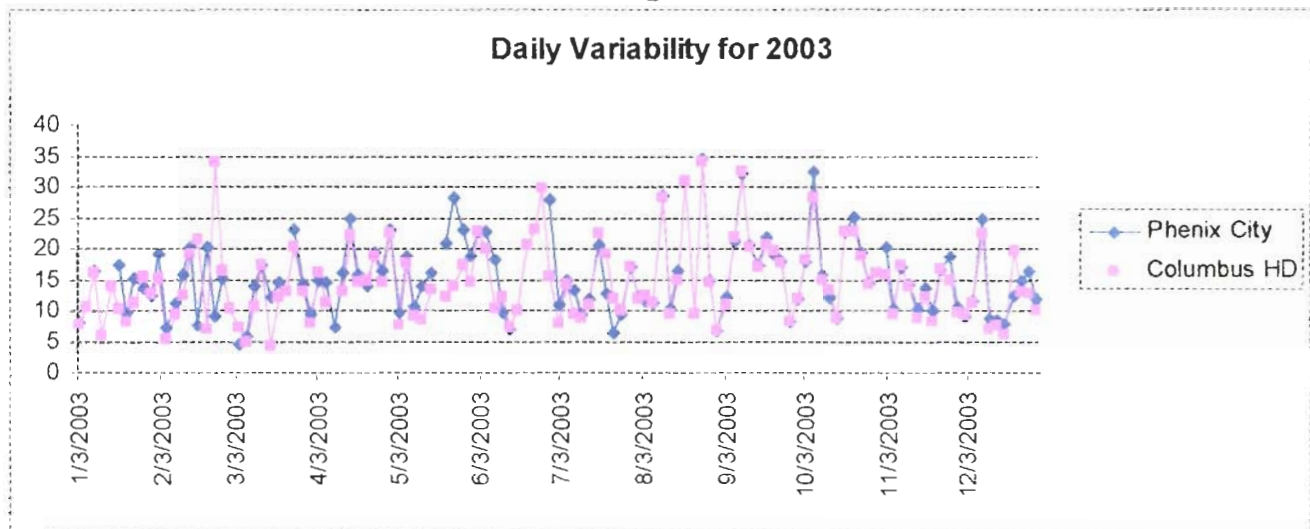
**Table 3**

Spatial Averaging of Phenix City and Columbus			
2001			
	Phenix City Average	Columbus H.D. Average	Both Monitors Spatially Averaged
1st Qtr	14.96	14.89	14.92
2nd Qtr	15.82	15.44	15.63
3rd Qtr	17.17	16.74	16.95
4th Qtr	18.58	14.49	16.53
<b>Annual</b>	<b>16.63</b>	<b>15.39</b>	<b>16.01</b>
2002			
	Phenix City Average	Columbus H.D. Average	Both Monitors Spatially Averaged
1st Qtr	15.31	13.44	14.38
2nd Qtr	15.56	14.57	15.06
3rd Qtr	16.93	15.84	16.39
4th Qtr	13.82	13.07	13.45
<b>Annual</b>	<b>15.41</b>	<b>14.23</b>	<b>14.82</b>
2003			
	Phenix City Average	Columbus H.D. Average	Both Monitors Spatially Averaged
1st Qtr	13.31	12.46	12.89
2nd Qtr	17.41	15.44	16.42
3rd Qtr	15.66	15.96	15.81
4th Qtr	15.06	14.11	14.59
<b>Annual</b>	<b>15.36</b>	<b>14.49</b>	<b>14.93</b>
<b>3-yr avg</b>	<b>15.8</b>	<b>14.7</b>	<b>15.25</b>

The day-to-day variability of the sampling and monitoring sites within the CMZ is very similar. Using methods suggested in EPA guidance documents, daily concentrations measured at the sites within the CMZ were compared over the period covering all available sample days. Similarities in concentrations throughout the period and area are evident (Figure 1). Several examples of the daily variability are provided below.



**Figure 1**



## Emissions Sources

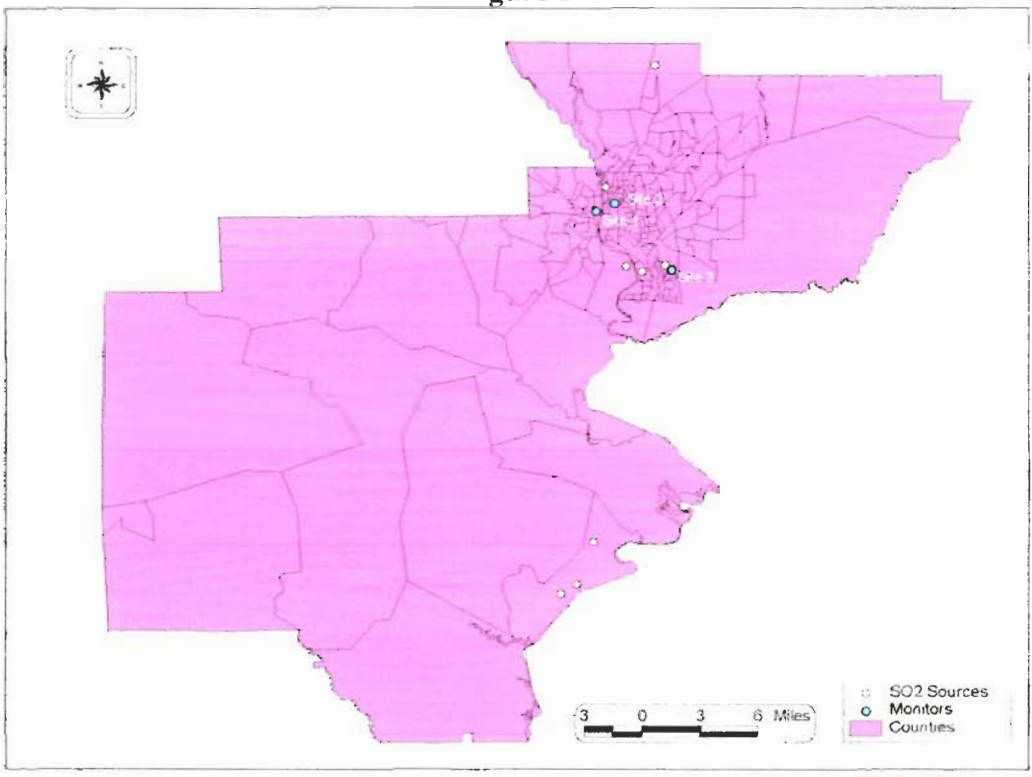
The CMZ is not impacted by any unusual sources of fine particulate. There is 1 regulated major source contained within the CMZ that is within 1.5 miles of both monitors in the CMZ. Expectedly, the distribution of facilities is consistent with the population distribution and access to Interstate I-85.

The principal components of the fine particulate are measured in the Cussetta Road (located in Columbus but outside CMZ) speciation samples. The largest contributor to fine mass is sulfate, followed by carbon. This is characteristic of all fine particulate in the southeastern United States. There is sulfur dioxide (SO<sub>2</sub>) or a sulfate sources in the CMZ. The largest of the SO<sub>2</sub> sources is Continental Carbon which is located in Russell County and is within 3.5 miles of both monitors. Through an analysis of the meteorological patterns (Figure 7) and location of the facility in relation to the CMZ monitors, it was determined that none of the monitors are located downwind of the facility based on the predominant wind direction.

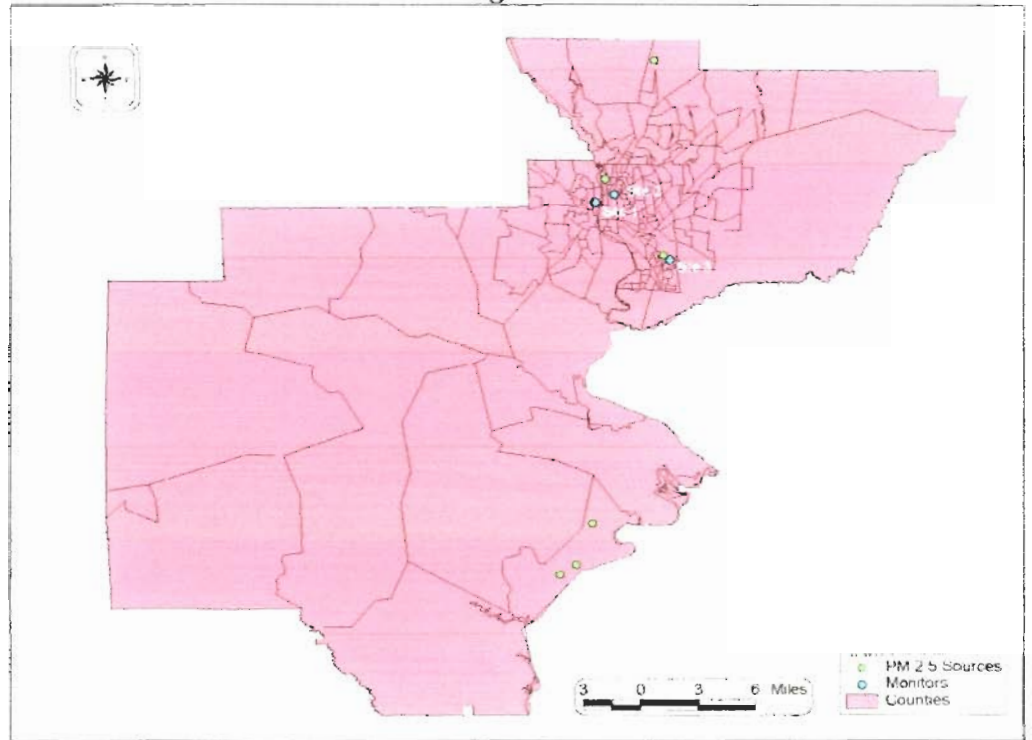
Figures 2 and 3 are illustrations of the even and relatively low rate of emissions from the regulated facilities in and around the CMZ. All facilities are indicated, with sources of the specific pollutant

designated by the yellow circles and all monitors in the area indicated in green. Note that sites 1 and 2 are the Phenix City and Columbus Health Department monitors, respectively.

**Figure 2**



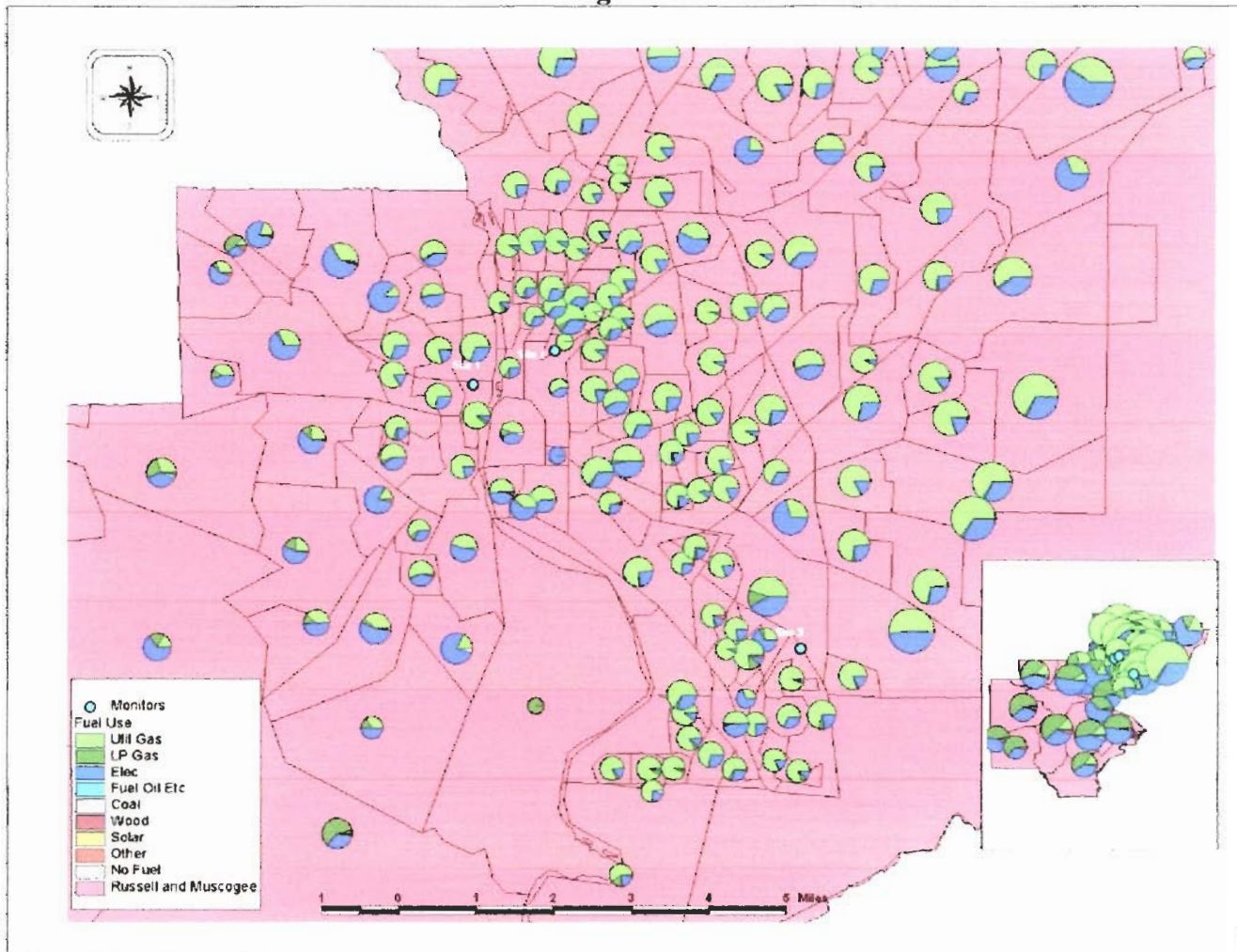
**Figure 3**





Other area-wide sources of emissions include transportation and, in the cooler months, residential heating. All monitoring sites in the CMZ meet the requirements for distance from roads and represent typical area impacts related to gas or diesel vehicle emissions. The possible contribution of the variety of residential fuel use across the CMZ is captured by the placement of the monitors in neighborhoods characteristic of the mix seen throughout the CMZ (Figure 4).

Figure 4



### Network Adequacy for Spatial Averaging

In addition to the CFR requirements, the guidance also recommends a review of Temporal Behavior, Consistent Trends, Spatial Placement of the Monitors, Chemical Composition and the Population Density and Air Quality Patterns.

### Temporal Behavior

The guidance states: 'One site should not be consistently and substantially higher (e.g. 30%) than all other sites'. Tables 4 and 5 show the differences in annual means from individual sites and the spatial average.

**Table 4**

<b>Spatial Uniformity Between Columbus/Phenix City PM2.5 Sites</b>				
Site	Pearson Correlation	% Differences		
		2001	2002	2003
Phenix City/Columbus Health Dept.	0.84	-1.1%	-6.0%	-6.0%

**Table 5**

<b>Comparison of Annual Average to Spatial Average</b>						
	2001	% of average	2002	% of average	2003	% of average
<b>Phenix City</b>	16.63	7.4%	15.41	5.1%	15.36	2.9%
<b>Columbus H.D.</b>	15.39	0.6%	14.23	2.9%	14.49	2.9%
<b>Spatial Average</b>	<b>16.01</b>		<b>14.82</b>		<b>14.93</b>	

\* Percentages are displayed in absolute value.

Review of the annual averages available for the sites being included in the spatial average show year-to-year differences between concentrations at the sites (Figure 5) that are consistent with the temporal behavior criteria referenced in section 5.5.1 of the Monitoring Siting Guidance. The figure shows the relative ranking among the sites and the variation among the means which reflects sampling and meteorological variations. This does not show any consistent differences in air quality within the proposed CMZ and indicates that homogeneity exists.

**Figure 5**

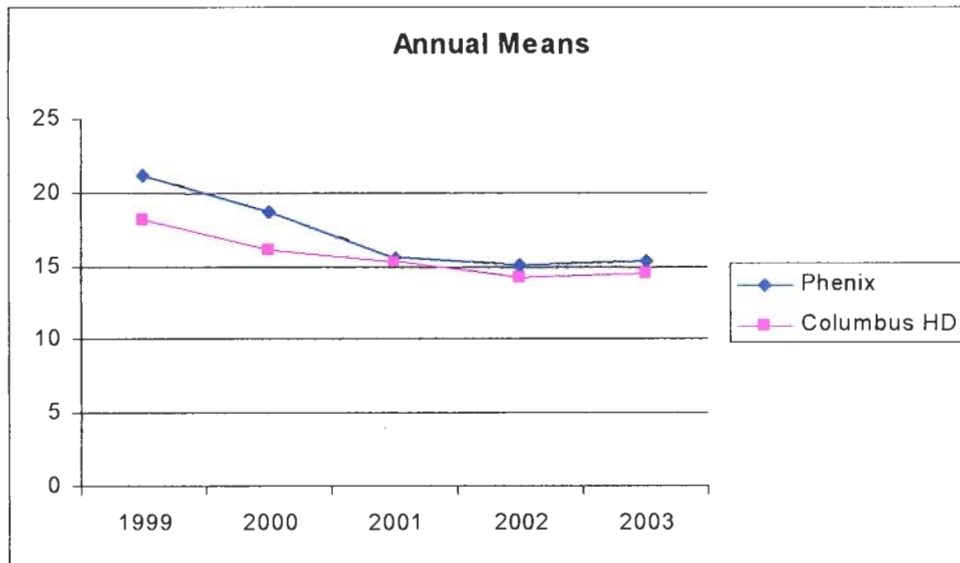
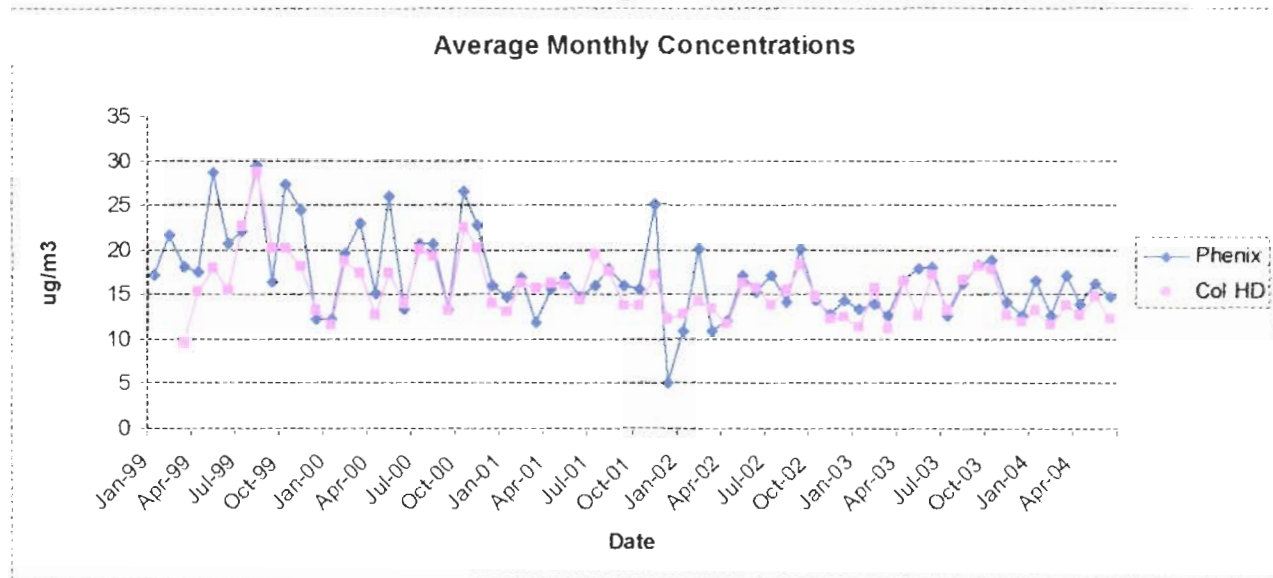


Figure 6



### Consistent Trends

Both sites in the CMZ show similar trends throughout their sampling period. Figures 5 and 6 depict a consistent downward trend at all monitors in the CMZ while tables 4 and 5 show that the three monitors meet the suggested 10-15% variability in the initial values to allow for potential changes over time.

### Spatial Placement of the Monitors

Consistent with the intent to monitor the highest expected concentrations in the MPA, the samplers were placed in the heaviest populated area, which marks the approximate centerline of the urbanized area and is the anchor for most of the population vehicle use and industrial activity (Figure 8).

Review of data collected at all monitors indicates relatively consistent day-to-day (Figure 1), month-to-month (Figure 6), and year-to-year (Figure 5) concentrations. Interpolation of the fine particulate data collected within and near the MPA does not indicate any defined concentration gradients within or across the MPA. Local PM2.5 modeling is not available for comparison with monitored PM2.5 concentrations in the MPA or southeast United States.

### Chemical Composition

Collection and analysis of fine particulate for chemical composition analysis has only been performed at a second Georgia monitoring site, the Cussetta Rd. site, which is outside of the CMZ. These samples are collected and analyzed on a 1:6 sampling schedule using the PM2.5 Chemical Speciation Trends Network (STN) protocols. Based on the similarity demonstrated in the mass concentration with the other MPA sites, the Cussetta Rd samples should be representative of MPA fine particulate composition.

### Population Density and Air Quality Patterns

During network design, placement of the samplers was biased toward areas with the higher and relatively similar population densities to represent maximum population exposure to fine particulate.

The FRM samplers represent residential populations near the urban center. These monitors represent not only the areas immediately surrounding the sampler, but also similar areas throughout the MPA.

A wind analysis using wind data from the Columbus, Georgia Airport was completed to evaluate the predominant wind direction(s) in the area over the 3-year period on all days. As seen in the wind rose in Figure 7, there is a large easterly component to the winds during the 3-year time period.

A topographical map has been included to show that the topography located within the Community Monitoring Zone is similar. The Phenix City monitor and the Columbus Health Department monitor are close in proximity and similar in elevation. The Phenix City monitor is separated from the Columbus monitor by the Chattahoochee River.

Figure 7

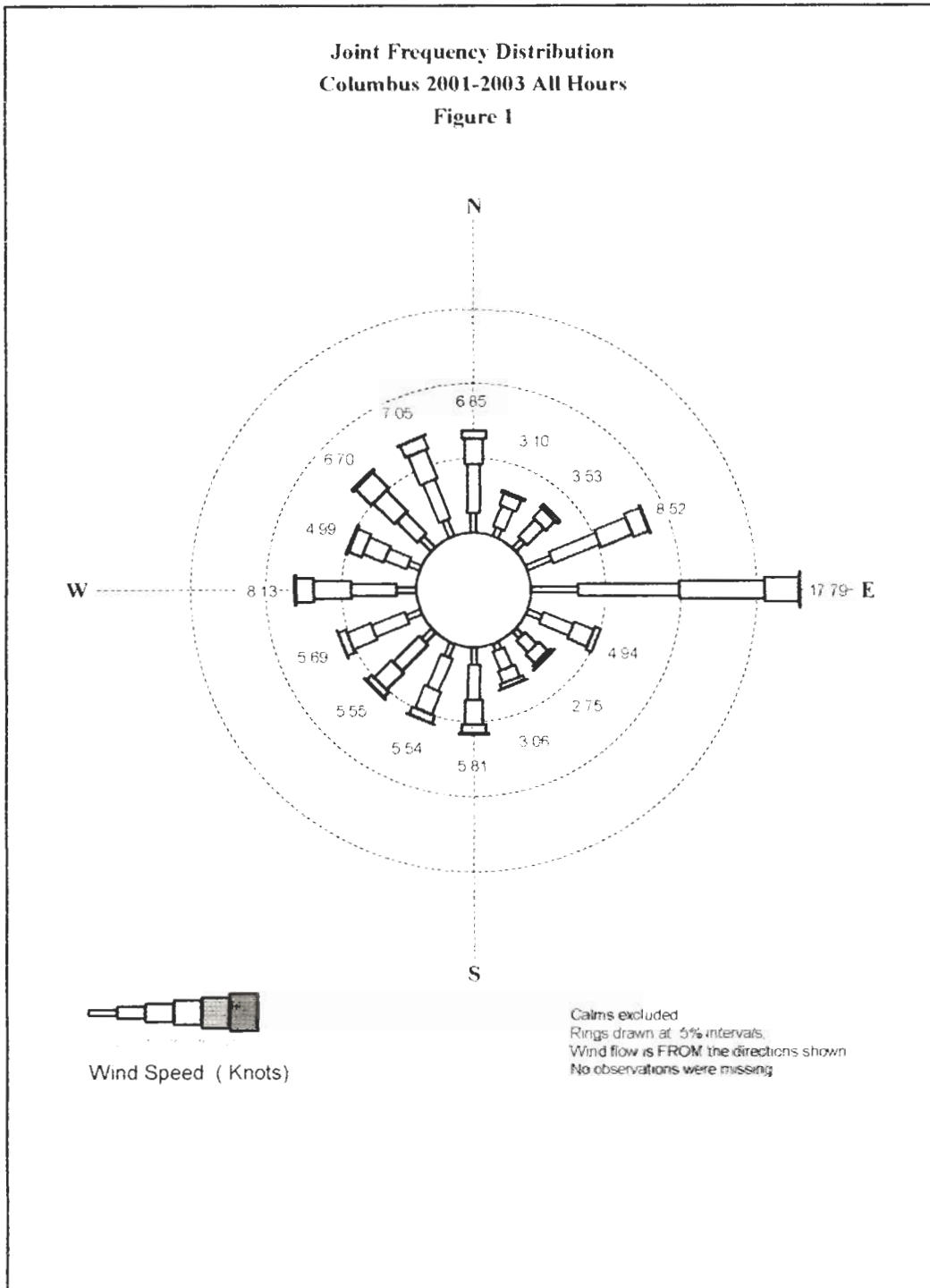
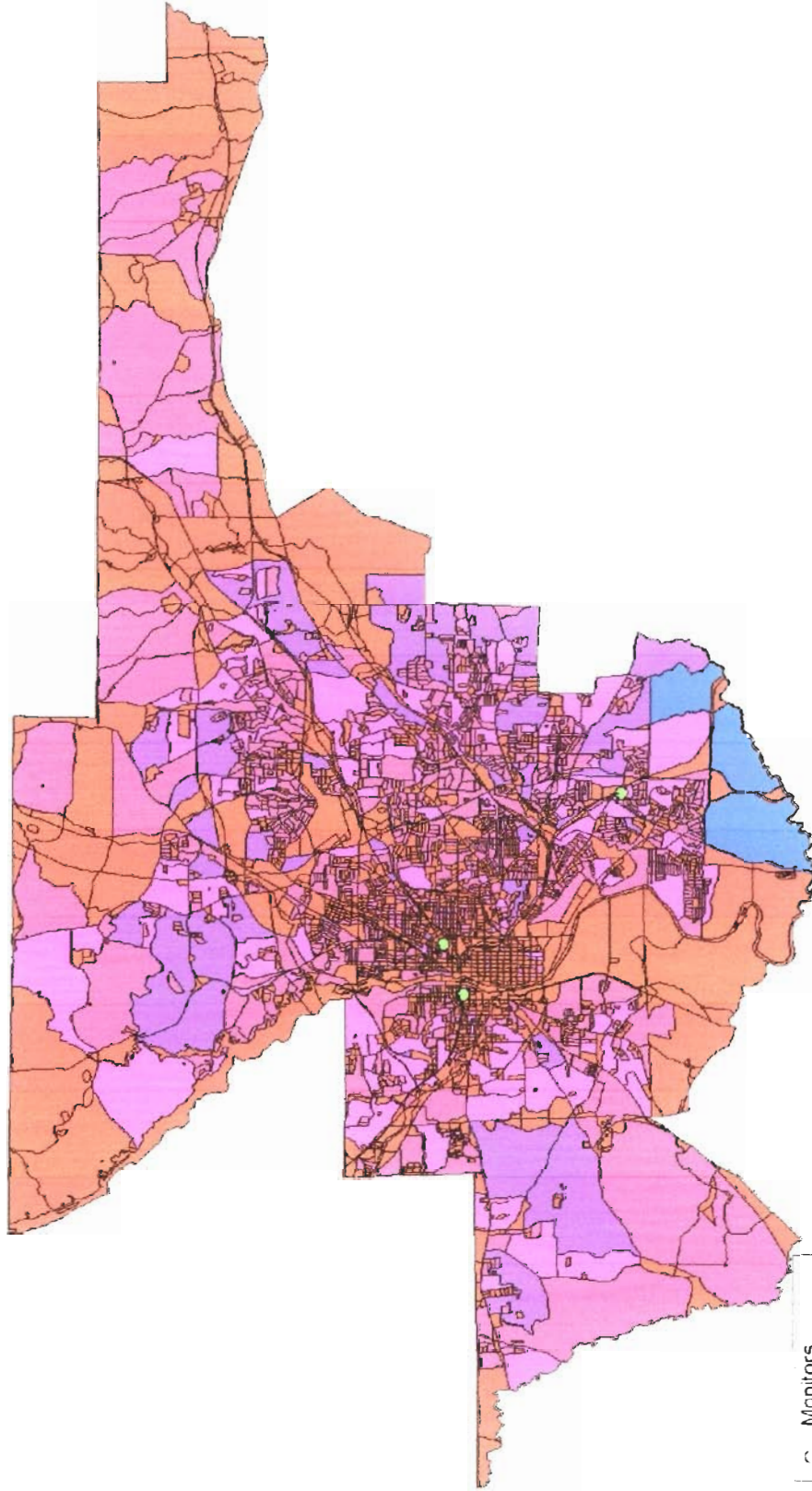
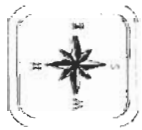


Figure 8  
Population Density

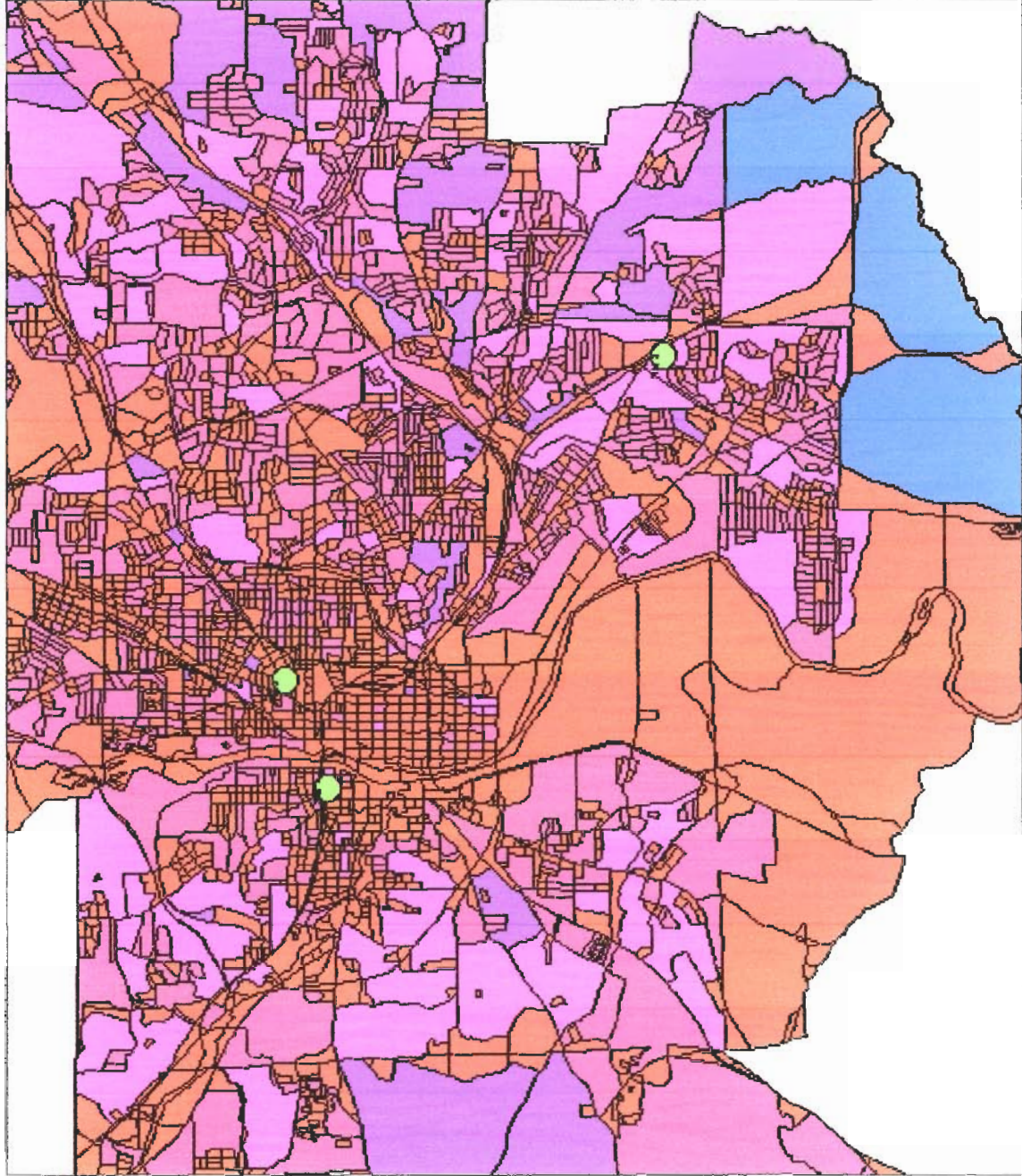


C Monitors  
Census Blocks 2000

0 - 45
46 - 174
175 - 535
536 - 1788
1789 - 3578



Figure 9



PHENIX CITY, COLUMBUS MONITORS AND TOPOGRAPHY

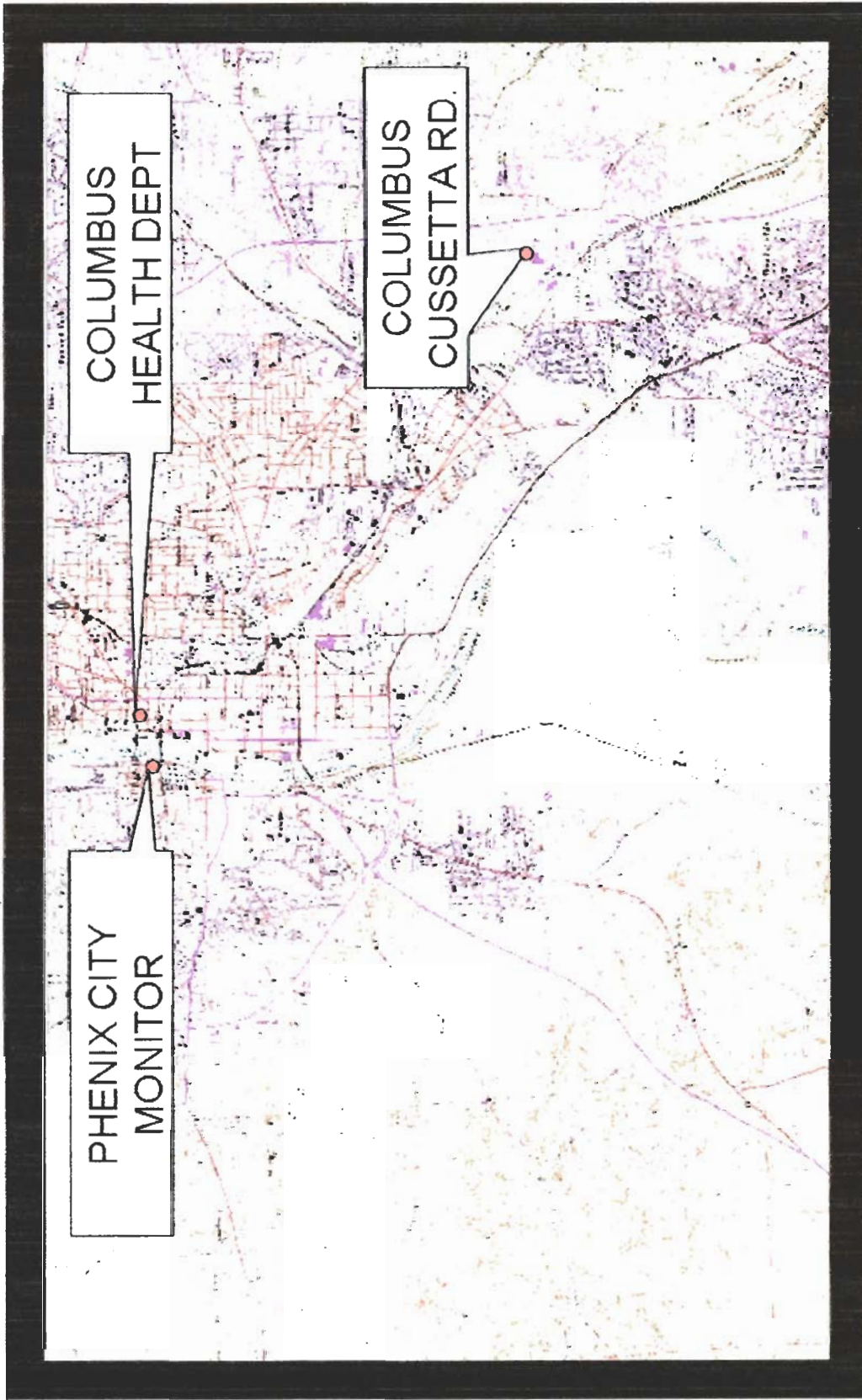
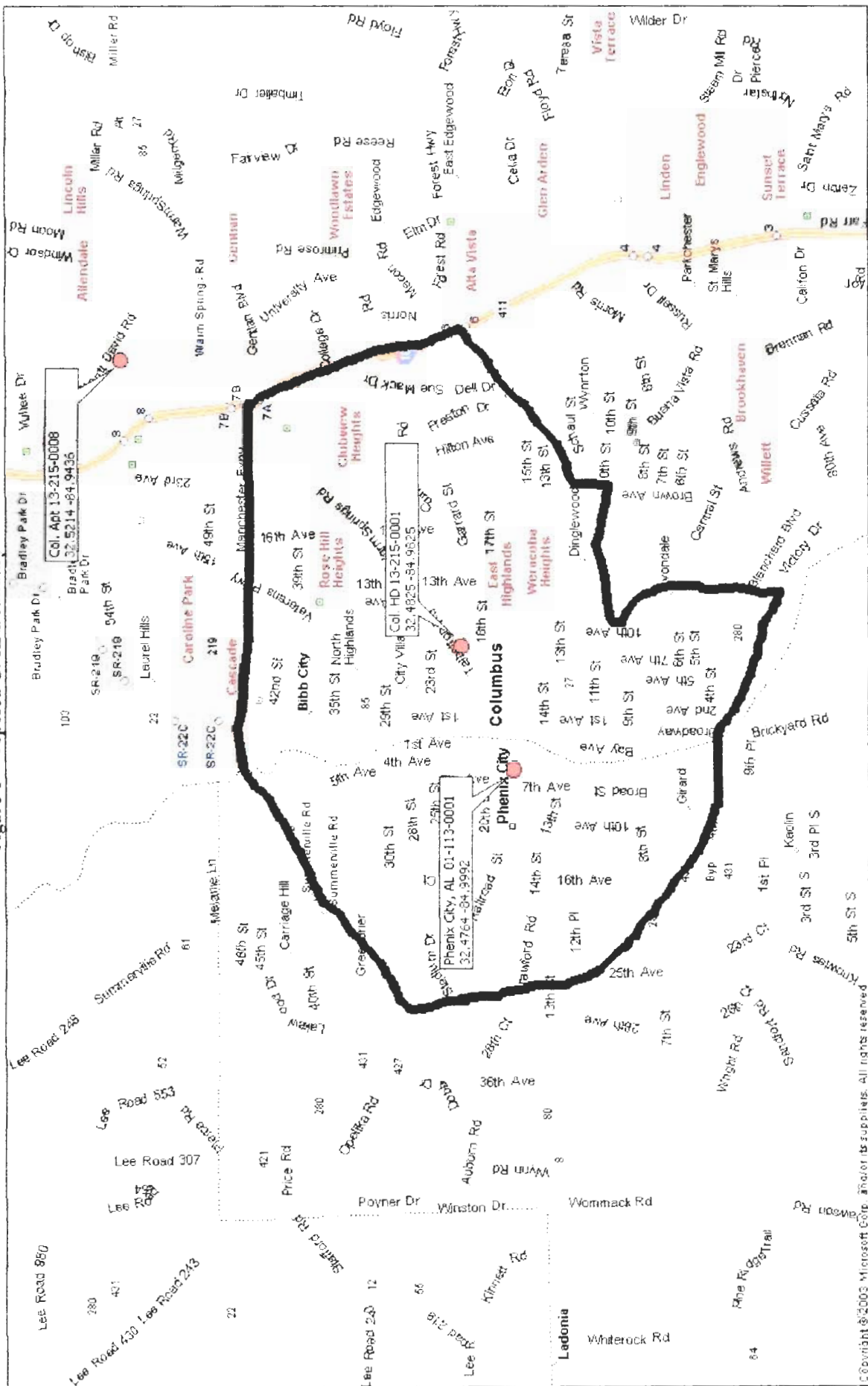




Figure 10 Proposed CMZ Boundary



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