Appendix A

Consumer and Commercial Products Emission Analysis

The following describes the process used to estimate the VOC emissions increase from the repeal of Georgia Rule 391-3-1-.02(2)(aaa), *Consumer and Commercial Products* (Rule (aaa)). This rule regulated the content of windshield washer fluid in the 13-county former 1-hour ozone nonattainment area. Windshield washer fluid is the only product regulated by this rule.

EPA has developed a per capita windshield washer VOC emission factor of 0.611 lb of VOC per year found in *"EPA Consumer and Commercial Solvent Use Final Report: August 1996" (EPA's Final Report)*. This emission factor was modified to account for lower-volatility windshield washer fluid generally sold in the southeast. Based on information included in the 1996 EPA report indicated above and the March 20, 2012, report "Summary of state and Federal VOC Limitations for Institutional and Consumer Products", EPD estimated a national typical VOC content of 35 weight percent. A telephone survey of windshield washer distributors conducted by EPD indicated that windshield washer fluid is typically 8 to 10 weight percent in the summer and 30 weight percent for winter time formulas in the Southeastern United States. The difference between the national typical content and the Southeastern typical content is a result of the climate difference in the Southeast and other parts of the nation. Because of the mild climate in the Southeastern United States, windshield washer fluid is not likely to freeze, and therefore a higher VOC content in the washer fluid is not necessary. EPA's 1996 Final Report estimates Rule effectiveness (RE) and Rule penetration (RP) at 100 percent.

VOC Emissions Based on Typical Southeast VOC Content

The ratios for adjusting the national average VOC emission factor to account for the lower VOC content typically found in the Southeast are developed by dividing the typical Southeast VOC content by the national VOC content of 35%. Since the estimated southeastern content is different in the summer and winter, separate ratios are determined for the summer and winter.

EPA's Final Report assumes that 100% of the VOC content is emitted and that per capita emissions are 0.611 lbs per person-year.

0.611 lbs per person/365 days

In order to convert this into lbs/day per person we must divide by the number of days. Appropriately, this allows for both a Summertime (ozone season) and a wintertime emission ratio (or factor), where; ozone season is 244 days assuming that as summer and rest 121 days as winter:

Summer Emission Factor: 0.408 lbs/person

Winter Emission Factor: = 0.202 lbs/person

Since rule effectiveness and rule penetration are both estimated at 100% as previously stated in the 1996 EPA document, no adjustment is necessary for rule effectiveness or rule penetration.

The VOC fraction attributed to the Southeast, along with EPA's emission factor of 0.611 per capita per year, and the 2010 census data population of each county in the 13-county Atlanta nonattainment area, can then be used to calculate the VOC emissions. An example calculation follows. Additional calculations and final results can be found in the spreadsheet in this Appendix A1.
Summer VOC emissions based on Southeastern VOC fraction for the Cherokee County =

(Population for Cherokee County in 2010)*(EPA Emission Factor per capita per day)*(Summer Southeast Ratio) =

(214,346 people) * (0.408lbs/person) or 87,453.17 lbs

At this point in the calculation, pounds (lbs) need to be converted to tons and then converted to days based on the number of days in the ozone season.

(87,453.17 lbs) * (1 ton/2000 lbs) =

43.73 tons during the summer

A similar calculation is used for calculating winter emissions with the Winter Ratio of 0.857. These calculations are also found in Appendix A1.

VOC Emissions with Georgia Rule (aaa) in Place

Rule (aaa) limits the VOC content of windshield washer fluid sold in the southeast to 8.0% VOC by weight. To account for this limit, a ratio is developed by dividing the regulatory limit of 8.0% by the national VOC content of 35%.

Rule (aaa) ration = 8%/35% = 0.229

This ratio is then applied to the national emission factor of 0.611 pounds of VOC per capita. Emissions for the 13-county former Atlanta 1-hour ozone nonattainment area with Rule (aaa) in place is calculated by multiplying by the 2010 census population for each of the 13 counties. An example calculation follows. Additional calculations and final results can be found in the spreadsheet in this Appendix A1.

Rule (aaa) VOC emissions based on Southeastern VOC fraction for Cherokee County =

(Population for Cherokee County in 2010)*(EPA Emission Factor per capita per day)*(Rule (aaa) Ratio) =

(214,346 people) * (0.229) or 29,934.95 lbs/year

In order to compare emissions under Rule (aaa) to the uncontrolled emissions calculated in the previous section, the annual emissions for Rule (aaa) are calculated based on the number of days in ozone season or Summer Months and are divided accordingly.

Summer Months = 42.54 tons

Winter Months = 77.92 tons

These calculations are replicated for each county with the rule in place and can be found in the spreadsheet in Appendix A1.