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ENVIRONMENTAL PROTECTION DIVISION

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May 28, 2024

Mr. Brett Gantt
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Air Quality Assessment Division
Air Quality Analysis Group (Mail Code: C304-04)
Environmental Protection Agency
109 T.W. Alexander Drive
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Via email to gantt.brett@epa.gov

Subject: Georgia Environmental Protection Division responses to EPA's *Update of $PM_{2.5}$ Data from T640/T640X PM Mass Monitors* (Docket ID No. EPA-HQ-OAR-2023-0642)

Dear Mr. Gantt:

The Georgia Environmental Protection Division (Georgia EPD) appreciates the opportunity to provide the following responses to the Environmental Protection Agency's (EPA) *Update of $PM_{2.5}$ Data from T640/T640X PM Mass Monitors* (Docket ID No. EPA-HQ-OAR-2023-0642) published in the Federal Register on May 16, 2024 (89 FR 42874).

Executive Summary

The unadjusted Teledyne T640/T640X FEM data in Georgia is biased high by 23.37% as compared to our FRM data (individual sites range from 11.43% to 28.41%). The EPA alignment algorithm reduces the bias in Georgia to 9.59% (six individual sites were still above 10% bias and only two sites were less than ±5% bias). Georgia EPD proposes a simple update to the EPA alignment algorithm (i.e., multiply the T640/X raw PM value by 0.813233 regardless of concentration and temperature) which reduces the bias in Georgia to -0.24% (all Georgia sites have less than ±10% bias and 9 of 11 sites have less than ±5% bias). The 2021-2023 design values (DVs) calculated using the recently published EPA alignment algorithm were 0.5 $\mu g/m^3$ to 0.8 $\mu g/m^3$ higher at six monitors in Georgia compared to Georgia EPD's proposed update to EPA's alignment algorithm. This will result in approximately double the number of exceptional events (from 125 to 250) that would need to be submitted to have these areas designated attainment. EPA should not move forward with the current EPA alignment algorithm. Instead, EPA should reanalyze the FEM/FRM co-located data and develop a new FEM alignment algorithm that is unbiased in Georgia and throughout the U.S. If necessary, EPA should consider alignment algorithms that vary by Region or State. In addition, Georgia EPD replicated the EPA alignment algorithm to see if it was implemented correctly in AQS. Unfortunately, we found numerous instances where the algorithm was not implemented correctly. For these reasons, we recommend that EPA halt their current implementation of their alignment algorithm until all the issues identified by state and local air programs have been satisfactorily resolved.

Georgia's $PM_{2.5}$ Monitoring Network

Since 2017, Georgia EPD has incorporated continuous Federal Equivalent Methods (FEM) Teledyne T640 and T640x $PM_{2.5}$ samplers throughout our network. Starting in January 2021, Georgia EPD had 11 sites across the state that collected continuous $PM_{2.5}$ data with Teledyne T640/T640X samplers. By January 2022, there were 14 sites collecting continuous $PM_{2.5}$ data with Teledyne T640/T640X samplers. In 2023, Georgia EPD added four additional sites collecting continuous $PM_{2.5}$ data with Teledyne T640/T640X samplers for a total of 18 sites across the state.

As of January 2021, there were 15 sites across Georgia collecting $PM_{2.5}$ data with manual filter-based Federal Reference Method (FRM) samplers. In 2022, Georgia EPD added one additional site, for a total of 16 sites collecting $PM_{2.5}$ data with FRMs. By the end of 2023, Georgia EPD added two more FRM sites, for a total of 18. During 2024, one FRM was shut down, to leave the current number of FRMs at 17 across the state.

Georgia EPD had five sites that were co-located with both FEM and FRM samplers at the beginning of 2021. By 2022, there were nine sites across the state of Georgia that were co-located with both FEM (including NAAQS excluded) and FRM samplers. There were 15 sites co-located with both FEM (including NAAQS excluded) and FRM samplers by the end of 2023. Currently, Georgia EPD has 16 sites that are co-located with both FEM (including NAAQS excluded) and FRM samplers. Please refer to Figure 1 and Appendix A for more details.

At the beginning of 2021, Georgia EPD had three tapered element oscillating microbalance (TEOM) samplers collecting non-NAAQS comparable continuous $PM_{2.5}$ data. That number remained the same until 2023 when one TEOM was added to the network. However, that TEOM will be shut down in June 2024, leaving three TEOMs in the network.

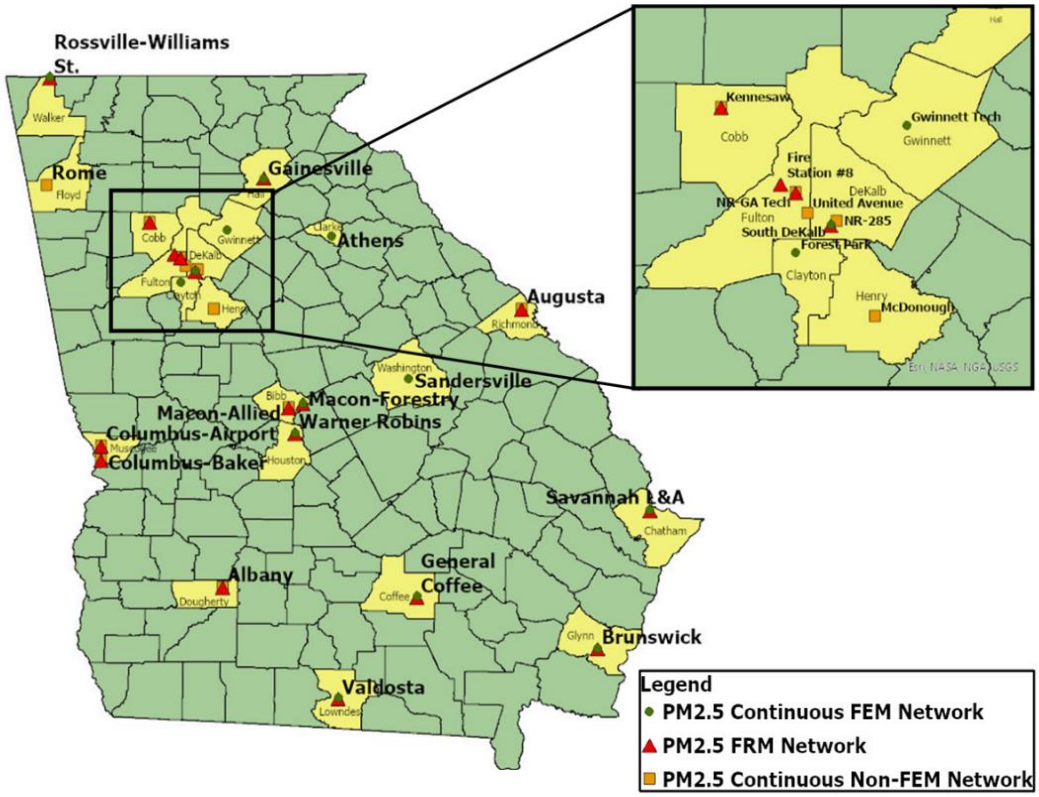

Figure 1. Location and Type of $PM_{2.5}$ Monitors in Georgia.

Comparability of Unadjusted and EPA Adjusted $PM_{2.5}$ FEM Data

While the FEM instruments have the benefit of near real-time air quality reporting to the public, the Teledyne T640/T640x samplers have a known positive bias in $PM_{2.5}$ concentrations as compared to the FRM $PM_{2.5}$ samplers. Figure 2 compares the unadjusted 24-hour FEM data with the 24-hour FRM data collected in Georgia from January 1, 2021 – July 31, 2023. The Teledyne firmware update was applied across Georgia's network on August 1, 2023. The high bias is clearly shown with most of the FEM concentrations reading significantly higher than the FRM concentrations.

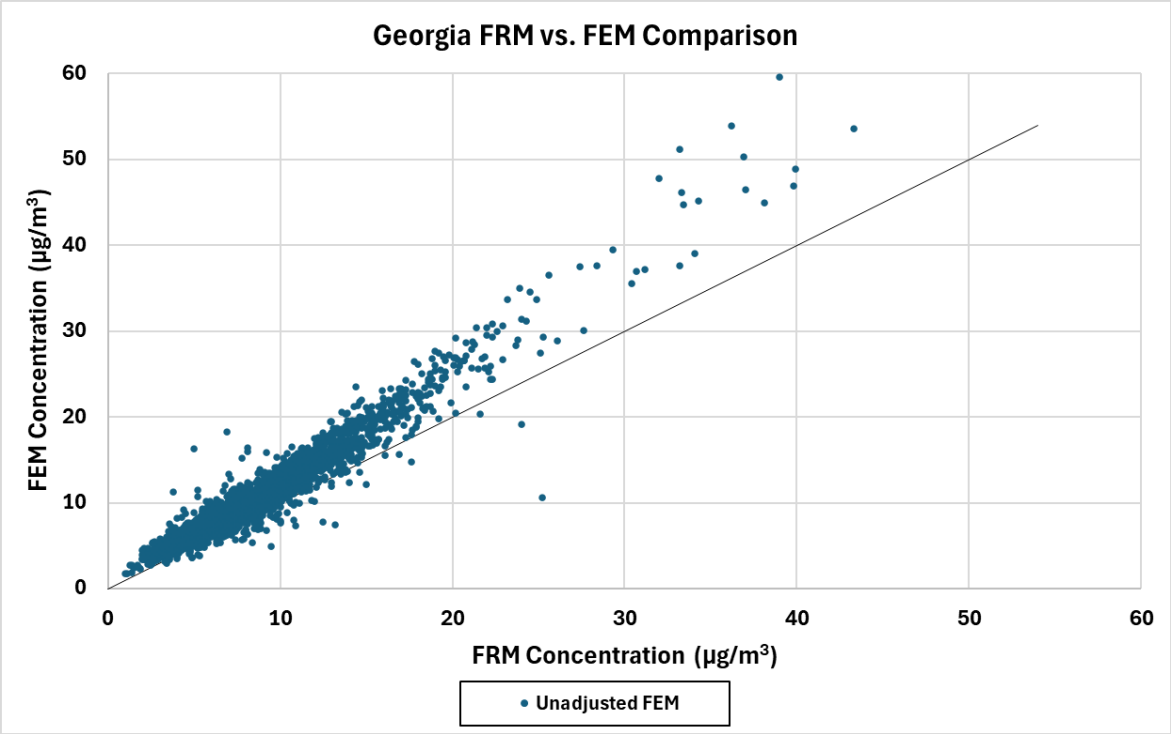

Figure 2. Georgia $PM_{2.5}$ FRM Data versus Unadjusted FEM Data for January 1, 2021-July 31, 2023.

Teledyne created an adjustment factor to be applied to the FEM data with the expectation to correct the known bias issue. The Teledyne T640/T640X alignment algorithm implemented by EPA in the federal air quality system (AQS) database is:

- If the ambient temperature is at or below 20°C
- - T640/x raw PM value is less than or equal to 10ug/m3, then multiply the T640/x raw PM value by 0.813233
- - T640/x raw PM value is greater than 10ug/m3, then use the equation (T640/x raw PM – 1.861)

- If the ambient temperature is above 20°C
- - T640/x raw PM value is less than or equal to 5ug/m3, then multiply the T640/x raw PM value by 0.813233
- - T640/x raw PM value is greater than 5ug/m3, then use the equation (T640/x raw PM – 0.925)

Table 1. Teledyne T640/T640X Alignment Algorithm Implemented by EPA.

CASE	$PM_{2.5}$ Conc.	Temp. ≤ 20°C
A	≤ 10 µg/m³	T640/x * 0.813233
B	> 10 µg/m³	T640/x - 1.861

CASE	$PM_{2.5}$ Conc.	Temp. > 20°C
C	≤ 5 µg/m³	T640/x * 0.813233
D	> 5 µg/m³	T640/x – 0.925

Figure 3 graphically displays the expected bias correction needed as a function of uncorrected FEM concentration and temperature based on the equations listed in Table 1. This alignment algorithm calculation depends on the ambient temperature at the time the data was collected, as well as the raw FEM concentrations that were collected. According to the alignment factor calculations that were implemented in the new T640/T640X software, the adjustment for the FEM data would fall along the blue line for $PM_{2.5}$ FEM data collected with the ambient temperature ≤ 20ºC (Cases A and B from Table 1), and along the red line for $PM_{2.5}$ FEM data collected with the temperature >20ºC (Cases C and D from Table 1).

EPA does not explain why the bias between the FRM and FEM is higher with colder temperatures. In warmer temperatures, condensable PM species may volatize off the FRM filters leading to larger differences between the FRM and FEM concentrations. However, the adjustment algorithm described in Table 1 does the opposite and applies a larger bias adjustment in the colder months when volatilization off the FRM filter is less problematic.

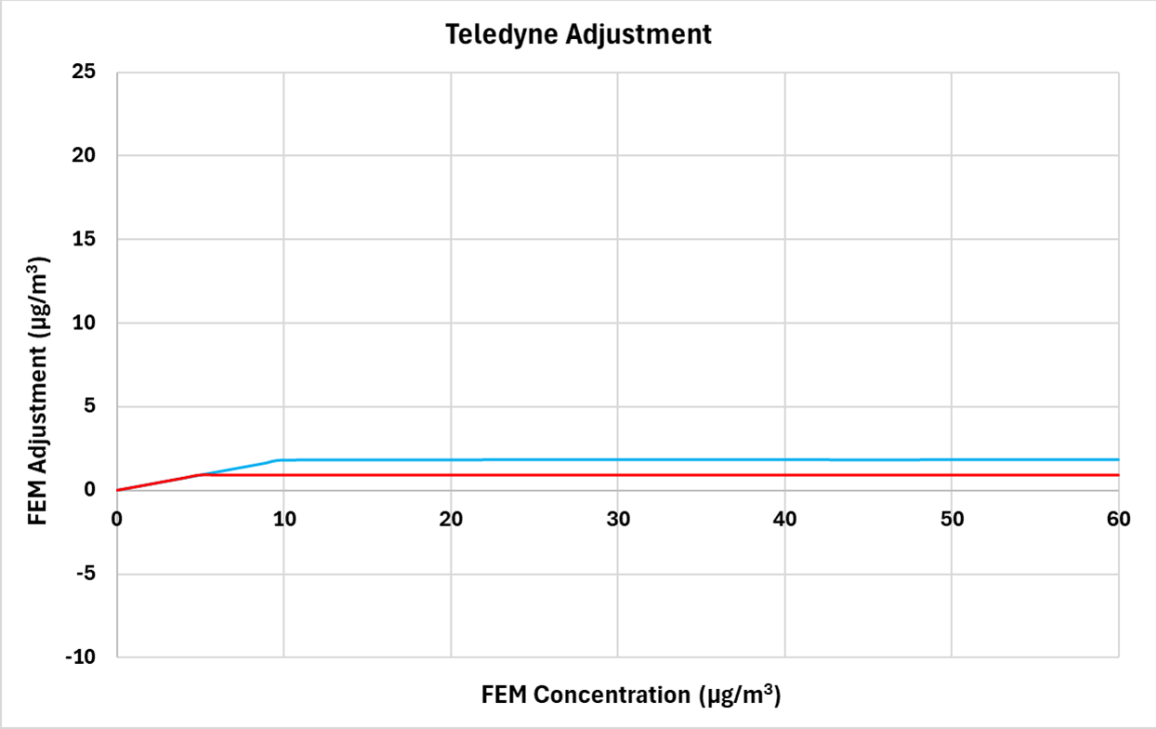

Figure 3. Teledyne Adjustment to FEM data.

Figure 4 shows the difference between the unadjusted FEM concentrations and the FRM concentrations (y-axis) in Georgia as a function of unadjusted FEM concentration (x-axis) from January 1, 2021 – July 31, 2023. The figure clearly shows that the bias increases as the uncorrected FEM concentration increases. However, the Teledyne adjustment algorithm applies a fixed adjustment of 0.925 µg/m^3 when the temperature is above 20ºC and the FEM concentration is above 5 µg/m^3, and 1.861 µg/m^3 when the temperature is at or below 20ºC and the FEM concentration is above 10 µg/m^3. The conceptual form of the Teledyne bias adjustment algorithm does not match the actual bias shown in the Georgia data. Therefore, EPA should not move forward with the current Teledyne alignment algorithm. Instead, EPA should reanalyze the FEM/FRM co-located data and develop a new algorithm that better reduces the bias in the FEM concentrations in Georgia.

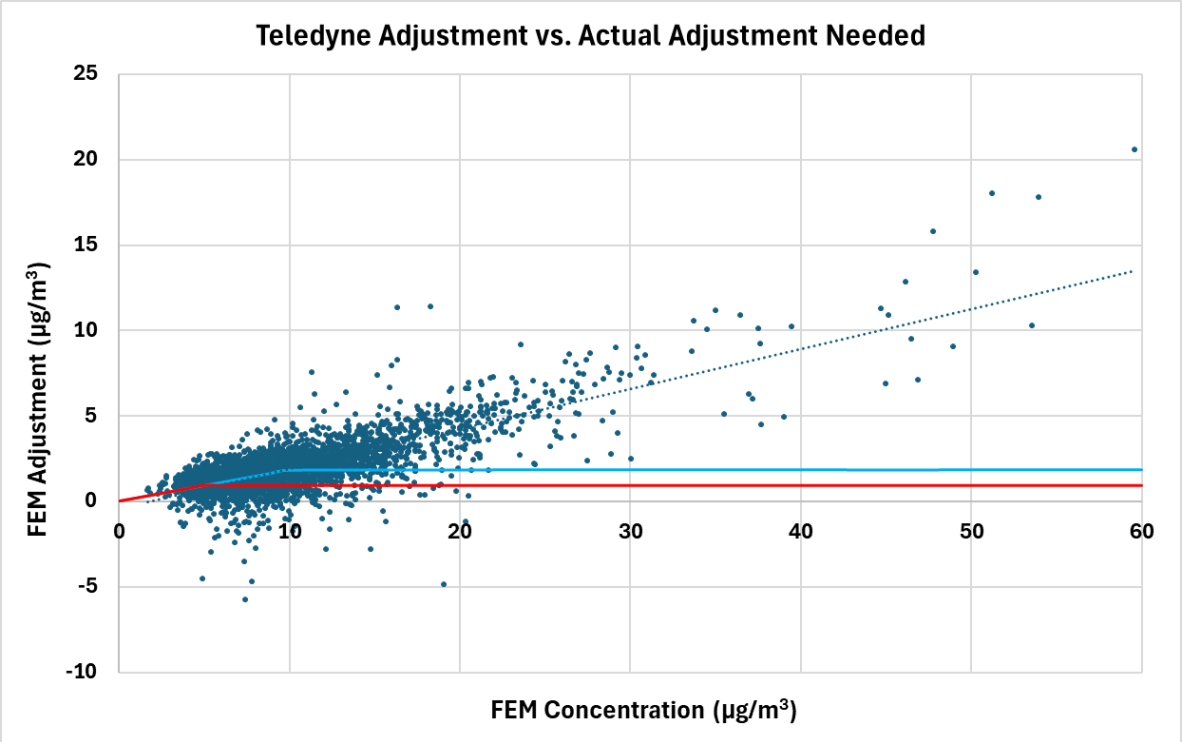

Figure 4.Teledyne Adjustment versus Actual Adjustment Needed.

Figure 5 displays the Georgia FEM concentrations that have been corrected by EPA with the Teledyne alignment algorithm (y-axis) compared to the FRM concentrations (x-axis) from January 1, 2021 – July 31, 2023. Ideally, the best fit regression line and the 1:1 line should overlap each other. In this analysis, the best fit regression line is well above the 1:1 line indicating the "corrected" FEM measurements are still significantly higher than the FRM measurements after the FEM data has been adjusted with the Teledyne alignment algorithm.

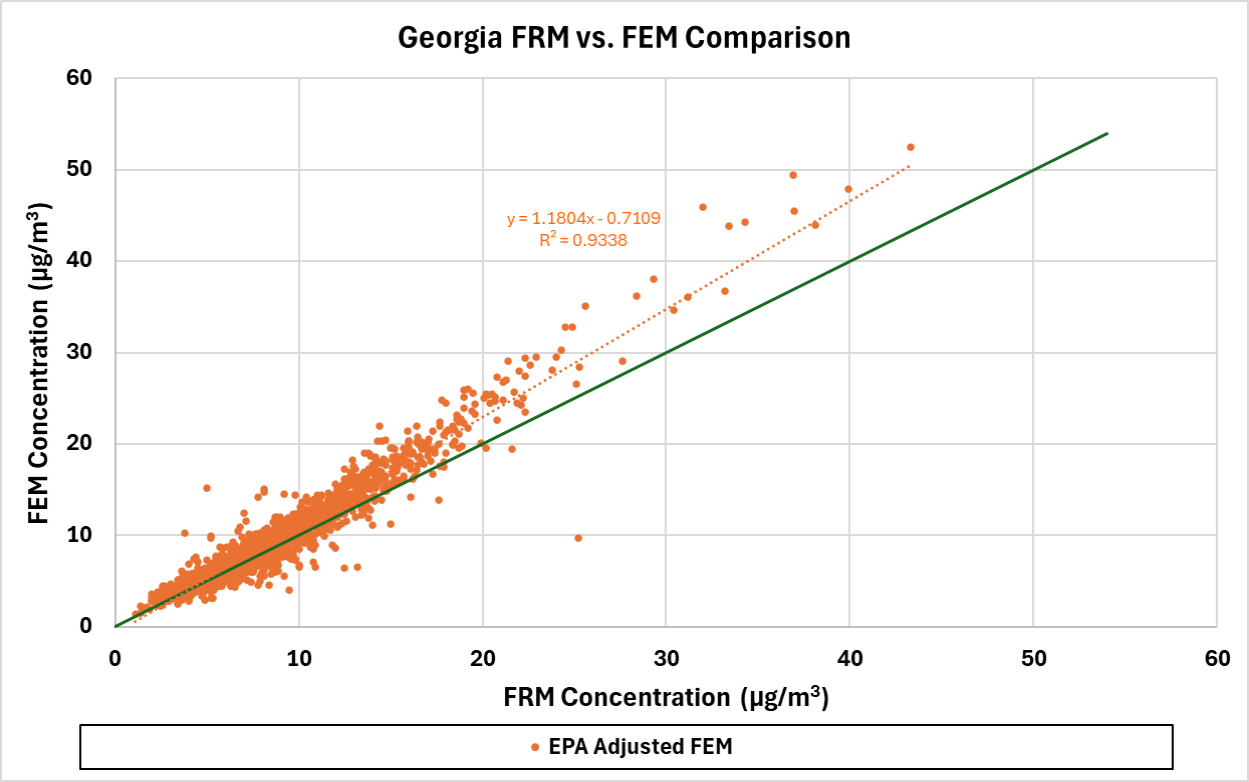

Figure 5. FRM versus EPA Adjusted FEM Data.

Alternatively, Georgia EPD examined a simpler version of the Teledyne alignment algorithm that used a single equation regardless of temperature and concentration. The alternative alignment algorithm shown in Figure 6 simply multiplies the uncorrected FEM concentration by a single value of 0.813233.

The alignment factor calculation implemented in the new T640/x software is:

- ~~*If the ambient temperature is at or below 20°C*~~
  - ~~*T640/x raw PM value is less than or equal to 10ug/m3, then*~~ *multiply the T640/x raw PM value by 0.813233*
  - ~~*T640/x raw PM value is greater than 10ug/m3, then use the equation (T640/x raw PM – 1.861)*~~

- ~~*If the ambient temperature is above 20°C*~~
  - ~~*T640/x raw PM value is less than or equal to 5ug/m3, then*~~ *multiply the T640/x raw PM value by 0.813233*
  - ~~*T640/x raw PM value is greater than 5ug/m3, then use the equation (T640/x raw PM – 0.925)*~~

-- Multiply the T640/x raw PM value by 0.813233

Figure 6. Alternative Alignment Algorithm

Figure 7 displays the Georgia FEM concentrations that have been corrected by Georgia EPD with the EPA Adjusted FEM_v2 alternative Teledyne alignment algorithm (y-axis) compared to the FRM concentrations (x-axis) from January 1, 2021 – July 31, 2023. In this analysis, the best fit regression line falls on top of the 1:1 line indicating the bias in the FEM measurements has been removed after the FEM data was adjusted with the alternative Teledyne alignment algorithm (FEM_v2).

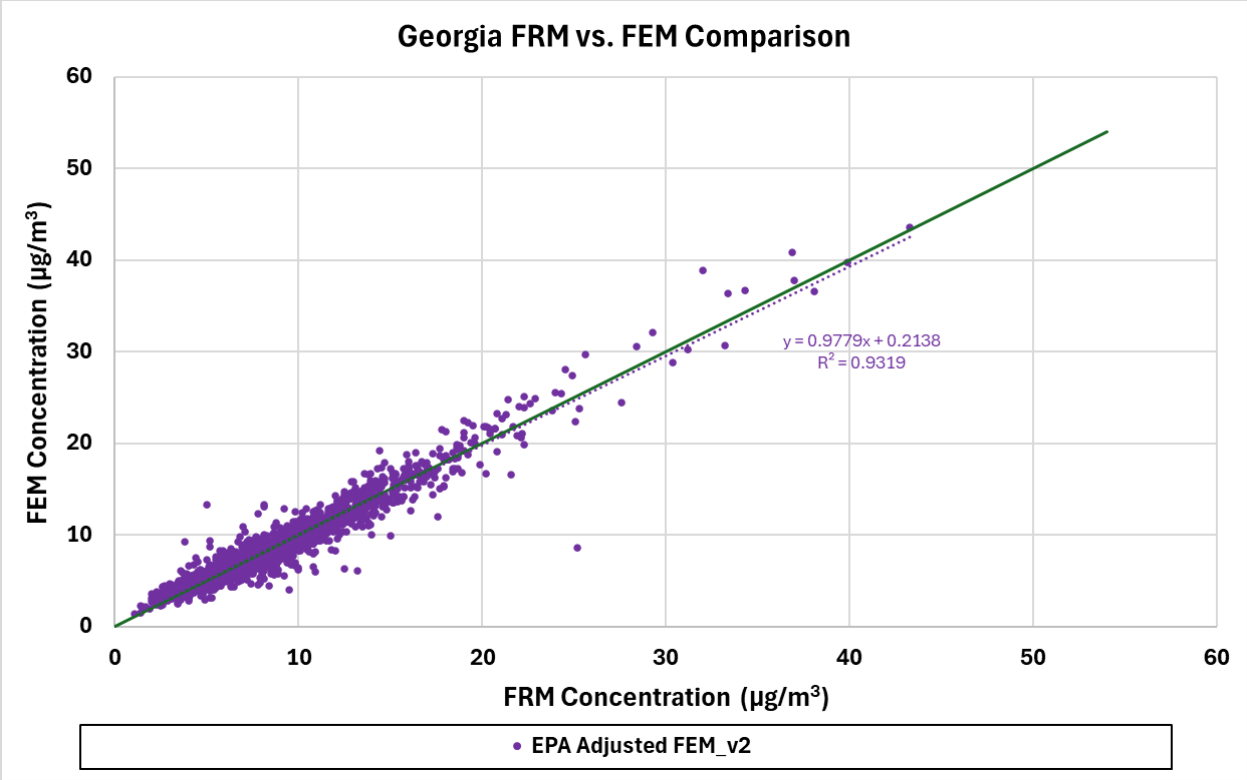

Figure 7. FRM versus EPA Adjusted FEM_v2 Data.

Figure 8 compares the Georgia FEM data adjusted using the Teledyne alignment algorithm (shown in orange) and the alternative Teledyne alignment algorithm using a 0.813233 adjustment factor (shown in purple) compared to the FRM data. Clearly, the adjustments made with the 0.813233 adjustment factor (EPA Adjusted FEM_v2) more accurately represent FRM data than the adjustments made with the EPA Adjustment FEM approach.

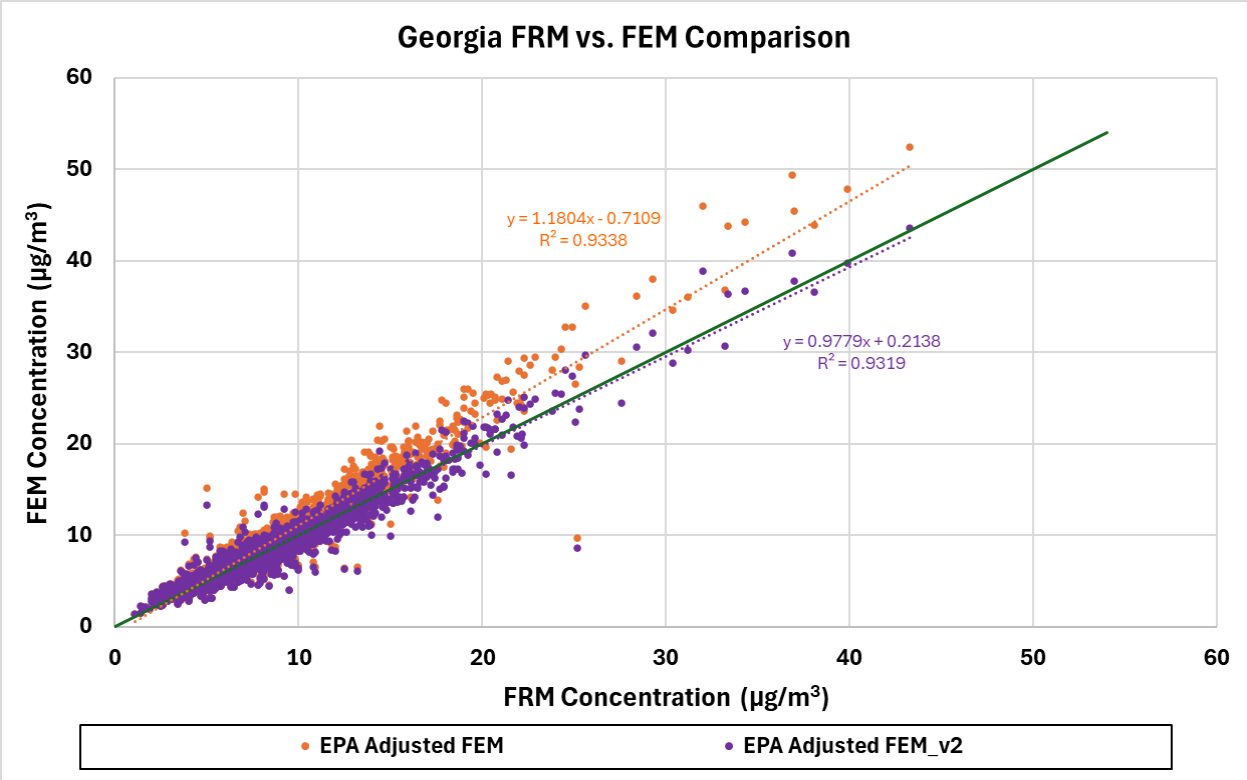

Figure 8. FRM versus EPA Adjusted FEM and EPA Adjusted FEM_v2.

Appendix B compares the Unadjusted FEM concentrations (green), EPA Adjusted FEM concentrations (orange), and EPA Adjusted FEM_v2 concentrations (blue) on the y-axis to the FRM concentrations on the x-axis at 11 individual sites in Georgia. In general, the EPA Adjusted FEM_v2 concentrations using the 0.813233 factor more closely matched the FRM concentrations compared to the adjustments made with the Teledyne alignment algorithm.

Table 2 and Table 3 show the normalized mean bias between the FEM and FRM concentrations using the following formula:

- Normalized Mean Bias (%) = (average FEM – average FRM)/(average FRM).

Table 2 shows the unadjusted FEM bias in the second column, the EPA Adjusted FEM bias with the Teledyne alignment algorithm in the third column, and the EPA Adjusted FEM_v2 bias using the 0.813233 factor in the fourth column. The unadjusted T640/T640X FEM data in Georgia is biased high by 23.37% as compared to the Georgia FRM data (individual sites ranged from 11.43% to 28.41%). The EPA alignment algorithm reduces the bias in Georgia to 9.59%, but six individual sites were still above 10% bias and only two sites were less than ±5% bias. The EPA Adjusted FEM_v2 approach reduced the bias in Georgia to -0.24%, and all sites were less than ±10% bias and 9 of 11 sites were less than ±5% bias.

Table 2. Normalized Mean Bias at Co-Located FRM/FEM Monitors in Georgia.

Monitor Name (AQS Number)	Unadjusted FEM	EPA Adjusted FEM (POC 23)	EPA Adusted FEM_v2
Albany (13-095-0007)	28.41%	14.03%	4.43%
Augusta (13-245-0091)	X	X	X
Brunswick (13-127-0006)	18.18%	4.06%	-3.89%
Columubus-Airport (13-215-0008)	X	X	X
Columbus-Baker (13-215-0012)	12.47%	5.61%	-8.54%
Gainesville (13-139-0003)	26.50%	15.68%	2.88%
Macon-Allied (13-021-0007)	25.24%	17.41%	1.85%
Macon-Forestry (13-021-0012)	25.57%	10.26%	2.11%
Rossville-Williams St (13-295-0004)	27.21%	14.18%	3.45%
Savannah-L&A (13-051-1002)	11.43%	-0.14%	-9.38%
South DeKalb (13-089-0002)	22.11%	7.63%	-0.70%
Valdosta (13-185-0003)	25.27%	10.60%	1.87%
Warner Robins (13-153-0001)	23.78%	9.47%	0.66%
Statewide	**23.37%**	**9.59%**	**-0.24%**

Table 3 displays the EPA Adjusted FEM bias before and after the Teledyne firmware update. In Georgia, the Teledyne T640/T640X firmware update was implemented on August 1, 2023. At many of the sites, the normalized mean bias increased after the Teledyne firmware update, with three sites over 25% bias. In general, this comparison shows that sites that were not performing well with the Teledyne alignment algorithm back calculation are still not performing well after the Teledyne firmware update.

Based on the poor performance of the Teledyne alignment algorithm (before and after the Teledyne firmware update), EPA should not move forward with the current Teledyne alignment algorithm. Instead, EPA should reanalyze the FEM/FRM co-located data and develop a new algorithm that better reduces the bias in the FEM concentrations compared to the co-located FRM concentrations.

Table 3. Georgia Monitors Adjusted Before and After the Teledyne Firmware Update.

Monitor Name (AQS Number)	EPA Adjusted FEM (01/01/21-07/31/23)	EPA Adjusted FEM (08/01/23-12/31/23)
Albany (13-095-0007)	14.03%	10.95%
Augusta (13-245-0091)	X	-2.05%
Brunswick (13-127-0006)	4.06%	4.80%
Columubus-Airport (13-215-0008)	X	8.96%
Columbus-Baker (13-215-0012)	5.61%	6.77%
Gainesville (13-139-0003)	15.68%	27.33%
Macon-Allied (13-021-0007)	17.41%	13.52%
Macon-Forestry (13-021-0012)	10.26%	12.72%
Rossville-Williams St (13-295-0004)	14.18%	18.73%
Savannah-L&A (13-051-1002)	-0.14%	-1.74%
South DeKalb (13-089-0002)	7.63%	6.90%
Valdosta (13-185-0003)	10.60%	12.42%
Warner Robins (13-153-0001)	9.47%	2.07%
General Coffee (13-069-0002)	X	25.32%
Kennesaw (13-067-0003)	X	32.97%

Table 4 compares the Georgia $PM_{2.5}$ design values (DVs) before the EPA correction, after the EPA correction, and after the EPA Adjusted FEM_v2 correction. The last column shows the difference in design values between the EPA correction and the EPA Adjusted FEM_v2 correction. With the EPA Adjusted FEM_v2 correction, design values decreased at all sites where there is an FEM sampler. Only one site (Albany) goes from above 9.0 $\mu g/m^3$ to below 9.0 $\mu g/m^3$. However, the 2021-2023 design values using the EPA alignment algorithm were 0.5 $\mu g/m^3$ to 0.8 $\mu g/m^3$ higher at six monitors in Georgia compared to the EPA Adjusted FEM_v2 correction approach. Based on 2021-2023 design values calculated with the EPA Adjusted FEM_v2 correction approach, Georgia EPD estimates we will need to produce 125 exceptional event demonstrations to have these areas designated attainment. However, using the current EPA alignment algorithm will result in approximately double the number of exceptional events (from 125 to 250) that would need to be submitted to have these areas designated attainment**.**

Table 4. Georgia $PM_{2.5}$ Design Values Before EPA Correction, After EPA Correction, After EPA Correction v2, and Change in Design Value between EPA Correction and v2.

MSA	Site Name	Site ID	2021-23 PM2.5 Annual DV (Before EPA Correction)	2021-23 PM2.5 Annual DV (After EPA Correction)	2021-23 PM2.5 Annual DV (After EPA_v2 Adjusted)	Δ DV v1-v2
Macon-Bibb County MSA	Macon-Allied	13-021-0007	9.4	9.4	9.4	0.0
	Macon-Forestry	13-021-0012	9.4	8.4	7.9	0.5
Savannah MSA	Savannah-L&A	13-051-1002	9.8	8.8	8.4	0.4
Athens-Clarke County MSA	Athens	13-059-0002	9.7	8.8	8.1	0.7
Atlanta-Sandy Springs-Alpharetta MSA	Forest Park	13-063-0091	8.9	8.9	8.9	0.0
	Kennesaw	13-067-0003	8.9	8.9	8.9	0.0
	South DeKalb	13-089-0002	9.3	8.7	8.5	0.2
	Fire Station #8	13-121-0039	9.1	9.1	9.1	0.0
	NR-GA Tech	13-121-0056	9.7	9.7	9.7	0.0
	Gwinnett Tech	13-135-0002	9.6	8.6	8.1	0.5
Coffee County	General Coffee	13-069-0002	7.3	7.3	7.3	0.0
Albany MSA	Albany	13-095-0007	9.3	9.1	8.8	0.3
Brunswick MSA	Brunswick	13-127-0006	8.3	7.9	7.6	0.3
Gainesville MSA	Gainesville	13-139-0003	9.0	8.2	7.8	0.4
Warner Robins MSA	Warner Robins	13-153-0001	9.3	8.7	8.3	0.4
Valdosta MSA	Valdosta	13-185-0003	9.2	8.6	8.1	0.5
Columbus, GA-AL MSA	Columbus-Airport	13-215-0008	8.6	8.5	8.5	0.0
	Columbus-Baker	13-215-0012	10.0	10.0	10.0	0.0
Augusta-Richmond County, GA-SC MSA	Augusta	13-245-0091	10.1	9.7	9.4	0.3
Chattanooga, TN-GA MSA	Rossville-Williams St.	13-295-0004	10.7	10.0	9.5	0.5
Washington County	Sandersville	13-303-0001	11.0	10.0	9.2	0.8

QA/QC on Adjustment Application

Georgia EPD replicated the EPA adjusted values to verify that the alignment algorithm was applied correctly to the FEM data. Georgia EPD found many inconsistencies between the EPA adjusted values and the replication values. These inconsistencies caused the FEM data to have up to ±1 $\mu g/m^3$ difference between the EPA Adjusted FEM concentration and the Replication Adjusted FEM concentration. The following list includes inconsistencies that were identified by Georgia EPD:

- Less than or equal (≤) versus less than (<) used improperly,
- Rounding was used for several concentrations instead of using the truncation rule found in 40 CFR Part 50 (Appendix N), and
- Incorrect calculation cases was used.

Table 5 shows some examples of the differences in the EPA Adjusted FEM concentration and Replication Adjusted FEM concentration. The calculation used for each case is circled in blue, highligting the different calculation cases used for the EPA Adjusted FEM concentration and Replication Adjusted FEM concentration, and the difference between the two concentrations.

Table 5. Georgia EPD Back Calculated FEM Data

CASE	Date & Time	Site Name	Site ID	T (°C)	Unadjusted FEM	EPA Adjusted FEM	Replication Adjusted w/o Trunc.	Replication Adjusted FEM*	Adjusted FEM Diff (EPA – Repl.)
A	3/3/2021 23:00	Savannah-L&A	13-051-1002	10.7	10 (B)	9.1	8.13233 (A)	8.1	1
B	10/1/2022 19:00	Valdosta	13-185-0003	20	122.7 (D)	121.8	120.839 (B)	120.8	1
C	6/15/2023 13:00	Macon-Allied	13-021-0007	23.3	5 (D)	4.1	4.066165 (C)	4.0	0.1
D	5/6/2022 0:00	Athens	13-059-0002	22.2	230.6 (D)	229.7	229.675 (D)	229.6	0.1
D	9/30/2021 6:00	Savannah-L&A	13-051-1002	20.7	28.6 (B)	26.7	27.675 (D)	27.6	-0.9
D	10/15/2021 0:00	Savannah-L&A	13-051-1002	21	19 (B)	17.1	18.075 (D)	18.0	-0.9
D	9/26/2021	Savannah-L&A	13-051-1002	21.1	9.2 (A)	7.5	8.275 (D)	8.2	-0.7
A	1/30/2022 0:00	Athens	13-059-0002	-2.8	8.8 (D)	7.9	7.15645 (A)	7.1	0.8

CASE	$PM_{2.5}$ Conc.	Temp. ≤ 20°C
A	≤ 10 µg/m³	T640/x * 0.813233
B	> 10 µg/m³	T640/x - 1.861

CASE	$PM_{2.5}$ Conc.	Temp. > 20°C
C	≤ 5 µg/m³	T640/x * 0.813233
D	> 5 µg/m³	T640/x – 0.925

**Following the truncation rule for 1-hour values described in Appendix N of 40 CFR Part 50.*

Table 6 summarizes the number of cases where the EPA Adjusted FEM concentration and Replication Adjusted FEM concentration do not match. According to this analysis, the majority of the concentrations did not match (more than 170,000 different cases). All non-zero differences for Cases A, B, and C are positive (i.e., EPA Adjusted FEM concentrations are higher than the Replication Adjusted FEM concentration). Also, there are about 2,000 cases across 13 monitors where EPA Adjusted FEM values exist when no temperature data is available.

Table 6. Differences in EPA Adjusted FEM Data

Case	# of All Cases	# of Non-zero Diff Cases	% of Non-zero Diff Cases	Max Diff	Min Diff	Avg of Diff	Std of Diff
A	84,960	43,871	51.64%	1	0	0.0543	0.0754
B	53,768	3,624	6.74%	1	0	0.0169	0.1207
C	15,478	8,442	54.54%	0.1	0	0.0531	0.0493
D	114,504	114,494	99.99%	0.1	-0.9	0.0975	0.0376

Options Going Forward

The algorithm developed by Teledyne and implemented by EPA in AQS does not fix the FEM bias issue in Georgia. Georgia EPD requests that we be able to develop our own correction factors (state-wide or site-specific) based on Georgia data. In response to EPA's *Reconsideration of the National Ambient Air Quality Standards for Particulate Matter* (Docket ID No. EPA-HQ-OAQ-2015-0072), Georgia EPD submitted comments to EPA on March 24, 2023, that proposed options for bias adjustment correction factors in Georgia. Georgia EPD analyzed five years (2018-2022) of FEM data compared to FRM data. The statewide annual bias adjustment factor for Georgia was determined to be 0.82, which is very close to the 0.813233 factor that was examined in this comment letter.

Alternatively, we request that EPA reanalyze the data and develop a new alignment algorithm. A simple option to consider would be to simply multiply the T640/T640X raw PM value by 0.813233, regardless of concentration and temperature. If this approach does not work across the entire U.S., EPA should develop an alignment algorithm that varies spatially (by Region or State). Regardless of the final alignment algorithm, EPA needs to perform a full performance evaluation of the algorithm by looking at mean bias and normalized mean bias at every co-located FRM/FEM site across the country to document that the alignment algorithm works across Regions and States.

If EPA does not fix the Teledyne alignment algorithm, Georgia EPD may be forced to shut down all FEMs and run a $PM_{2.5}$ network of only FRMs. This would result in the loss of hourly, real-time $PM_{2.5}$ concentrations for the daily air quality index (AQI), exceedance reports, and exceptional event demonstrations. Also, this would be a very expensive solution after accounting for the increased cost of filters, lab analysis, and personnel. To fulfill the AQI requirements, we could run non-regulatory FEMs, but our Air Partnership Agreement with EPA Region 4 does not allow the purchase of non-regulatory FEMs with EPA grant money. Another option would be to recommend "unclassifiable" for all areas that use FEM data until there is three years of FRM data available to make an accurate designation recommendation.

Thank you for the opportunity to provide input on this important issue. Please contact James Boylan at 470-524-0697 or James.Boylan@dnr.ga.gov if you have any questions or wish to discuss any of the recommendations described in these comments.

Sincerely,

James W. Boylan

James W. Boylan, Ph.D.
Chief, Air Protection Branch

cc: Richard A. Wayland, US EPA
Tim Hanley, US EPA
Kathleen Lusky, US EPA, Region IV
Sarah Taft, US EPA, Region IV
Darren Palmer, US EPA, Region IV
EPA Correspondence file