APPENDIX C

$PM_{2.5}$ Continuous Monitor Comparability Assessment and Request for Waiver

Introduction

The South Coast AQMD monitoring program has historically operated $PM_{2.5}$ continuous monitors primarily to support forecasting and reporting of the Air Quality Index (AQI). These monitors supply hourly data to provide AQI information to the general public through the South Coast AQMD smartphone application and website AQI map. The data also supports national websites such as AirNow (www.airnow.gov). South Coast AQMD has been using $PM_{2.5}$ continuous monitors since the early 2000s. The first $PM_{2.5}$ continuous monitor was approved as a (Federal Equivalent Method) FEM in 2008. By utilizing an approved FEM, any subsequent data produced from the method may be eligible for comparison to U.S. EPA's health-based standard known as the NAAQS. The primary advantage of operating a $PM_{2.5}$ continuous FEM is that it can support the AQI, while also supplying data that is eligible for comparison to the NAAQS. Thus, a network utilizing $PM_{2.5}$ continuous FEMs can potentially lower the number of filters based Federal Reference Method (FRM) samplers operated in the network, which are primarily used for comparison to the NAAQS. These filter based FRMs are resource intensive in that they require field operations, pre-and post-sampling laboratory analysis, which results in data not being available for 2-4 weeks after sample collection.

South Coast AQMD has been evaluating $PM_{2.5}$ continuous monitors since they were designated equivalent methods. Although $PM_{2.5}$ continuous FEMs are automated methods, these methods still require careful attention in their set-up, operation, calibration, and validation of data. Once enough data was collected, South Coast AQMD began to evaluate the performance of these methods compared to collocated FRM data per 40 CFR §58.11(e). The evaluation is explained further below and includes our request regarding the use of the data from these methods.

Request for Exclusion of $PM_{2.5}$ Continuous FEM Data from Comparison to the NAAQS

Evaluation requirements for requesting exclusion of data from comparison to the NAAQS are identified in 40 CFR §58.11 (e). These requirements refer to the performance criteria described in Table C-4 to subpart C of part 53. To accommodate the differences in how routine monitoring agencies, operate their networks, additional provisions are described in §58.11 (e). When a topic is not addressed in §58.11 (e), then the test specifications from Table C-4 applies.

Evaluation of FRM/FEM data per §53 Table C-4 requires a slope of regression to be 1 ± 0.10 and an intercept of regression $\pm$ 2.0 to meet bias requirements. Table 1C shows, the regression slopes between collocated FRM and FEM measurements that do not meet the 1 ± 0.10 specification indicated in §53 Table C-4 (i.e. slope = 1 ± 0.1) or the intercept of the regression relationship between FRM and FEM data of ±2.0 (also indicated in §53 Table C-4). Compton failed to meet this comparison criteria for the second consecutive year, and the Route 710 Near Road FEM also failed to meet this comparison criteria.

Additionally, the correlation of reference value should be $\geq$ 0.95 for the R(y) vs FRM CCV (x) to meet the part 53 correlation criteria used in approving continuous PM2.5 FEMs, as per "Technical Note – $PM_{2.5}$ Continuous Monitor Comparability Assessment." According to §58.11 (e)(6), The key statistical metric to include in an assessment is the bias of the $PM_{2.5}$ continuous FEM(s) compared to a collocated FRM(s). Correlation is required to be reported in the assessment, but failure to meet the correlation criteria, by itself, is not cause to exclude data from a continuous FEM monitor. Data at or above the dashed line (r =0.9) meet the correlation criteria identified in guidance for reporting the AQI.

Therefore, in accordance with the PM NAAQS rule published on January 15, 2013 (78 FR 3086) and specific to the provisions detailed in §58.10 (b)(13) and §58.11 (e), South Coast AQMD is requesting that data from the Compton (POC 3), and Long Beach Route 710 (POC 3) monitors be excluded from comparison to the NAAQS.

The Met One BAM at Compton has been replaced with a new BAM 1020. Similarly, the Long Beach Route 710 Near Road monitor failed to meet the comparison criteria after the replacement of the Thermo Scientific 5014i with an older Met One BAM 1020. Subsequently, the older Met One BAM 1020 failed to meet the comparison criteria and has been replaced with a new Met One BAM 1020 monitor. South Coast AQMD will continue to monitor data closely from the Compton and Long Beach Route 710 Near Road monitors and re-conduct the comparison criteria once a sufficient number of data pairs are collected with the new monitors.

Detailed one-page assessments from which the information was obtained are summarized in Table 1C and included at the end of this section.

Table 1C – Request for Exclusion of $PM_{2.5}$ Continuous FEM Data

Site Name	City	Site ID	Cont. POC	Cont. Method Description	$PM_{2.5}$ Cont. Begin Date	$PM_{2.5}$ Cont. End Date	Continuous/ FRM Sampler Pairs Per Season	Slope (m)	Intercept (y)	Meets Bias Requirement	Correlation (r)
Sites with $PM_{2.5}$ continuous FEMs that are collocated with FRMs											
Compton	Compton	06-037-1302	3	Met-One BAM 1020 w/VSCC **as 88502*	01/01/2021	12/31/2023	Winter = 242 Spring = 266 Summer = 271 Fall = 260 Total = 1039	0.90	2.56	No	0.98
Long Beach Route 710	Long Beach	06-037-4008	3	Met-One BAM 1020 w/VSCC **as 88101*	08/11/2022	12/31/2023	Winter = 96 Spring = 92 Summer = 118 Fall = 173 Total = 479	0.93	3.87	No	0.96

Period of Exclusion of Data from the $PM_{2.5}$ Continuous FEMs

The above Table 1C details the period of available data by monitor on which the request to exclude $PM_{2.5}$ continuous FEM data is based. Per U.S. EPA Regional Office approval, this data will be entered into U.S. EPA's AQS database in a manner where the data is only used for the appropriate monitoring objective(s) (i.e., use data for just the AQI). Additionally, South Coast AQMD will continue to load any new data generated for the next 18 months (intended to represent the period until December 31, 2023) in the same manner or until such time we request and receive approval from the U.S. EPA Regional Office to change the status of these monitors.

$PM_{2.5}$ Continuous FEM data for Reporting the AQI

Where the analysis supports the request for exclusion from comparison to the NAAQS, the data is of sufficient comparability to collocated FRMs that they be used for public AQI reporting. Therefore, with U.S. EPA Regional Office approval we will report this data on our website and to AirNow (www.airnow.gov). As such, data submitted to U.S. EPA's AQS database will be under "acceptable AQI" reporting (i.e., parameter code 88502) so that data users will know that this data is appropriate for use in AQI calculations, but not for NAAQS comparison.

Assessments

The following one-page assessments are of locations where South Coast AQMD has collocated $PM_{2.5}$ FRM and continuous FEM monitors. Each of these assessments is represented in the "Table 1C – Request for Exclusion of $PM_{2.5}$ Continuous FEM Data" and "Table 2C – Request for Inclusion of $PM_{2.5}$ Continuous FEM Data" above.

Compton

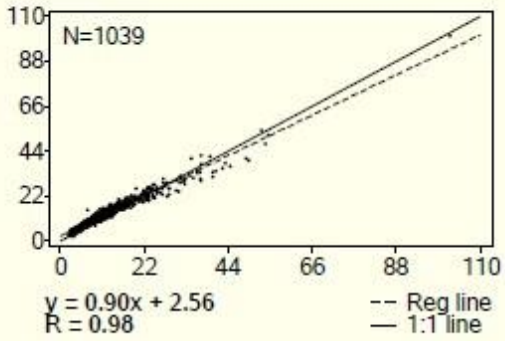
(FRM POC: 1 - FEM POC: 3) **as 88502*

$PM_{2.5}$ Continuous Monitor Comparability Assessment

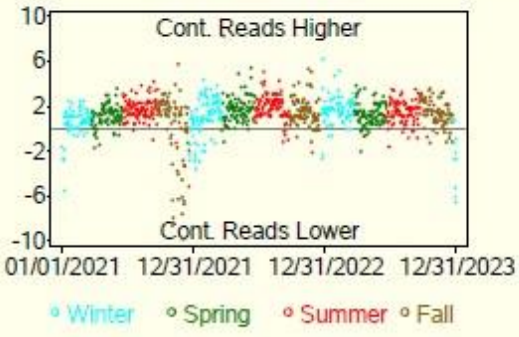
Site 06-037-1302: Compton, CA

FRM: R & P Model 2025 PM-2.5 Sequential Air Sampler w/VSCC - Gravimetric (120,145,155), PM2.5 - Local Conditions (88101), POC=1
Cont: Met-One BAM W/PM2.5 VSCC - Beta Attenuation (733), Acceptable PM2.5 AQI & Speciation Mass (88502), POC=3

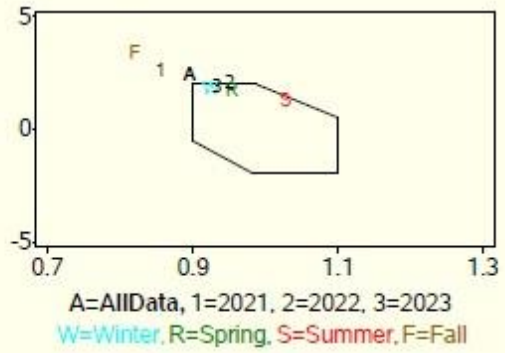
Cont. (y) vs. FRM (x) ($\mu g/m^3$)



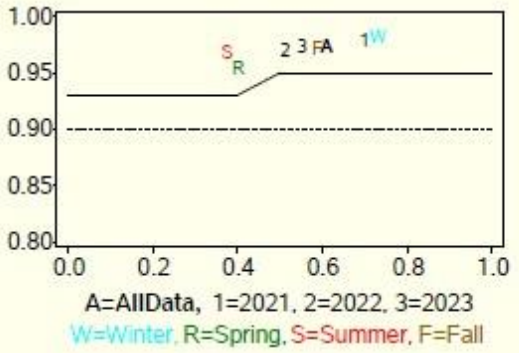
Cont. minus FRM ($\mu g/m^3$)



Additive (y) vs. Multiplicative (x) Bias



R (y) vs. FRM CCV (x)



Mean Concentration ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	**1039**	**12.2**	**13.5**	**1.11**
Winter	242	13.9	14.9	1.07
Spring	266	9.6	11.1	1.15
Summer	271	10.8	12.5	1.16
Fall	260	14.7	15.6	1.07
2021	340	13.4	14.2	1.06
2022	358	12.1	13.7	1.14
2023	341	11.1	12.4	1.12

Appendix A Statistics

Dataset	N (all observations)	Bias	N (only >= 3 ug/m^3)	Bias
AllData	**1039**	**15.3**	**1027**	**14.9**
Winter	242	13.4	238	12.5
Spring	266	18.5	259	17.6
Summer	271	17.3	270	17.5
Fall	260	11.9	260	11.9
2021	340	11.9	338	11.7
2022	358	17.3	356	17.3
2023	341	16.7	333	15.7

Data Source: EPA AQS Data Mart

Generated: April 24, 2024

Long Beach Route 710

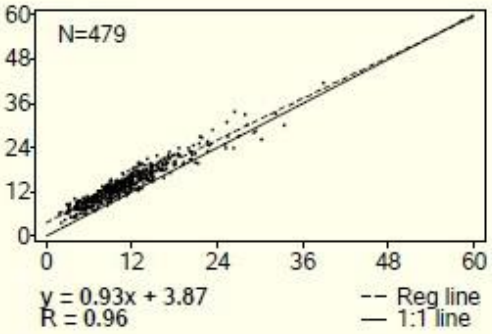
(FRM POC: 1 - FEM POC: 3) ***as 88501***

$PM_{2.5}$ Continuous Monitor Comparability Assessment

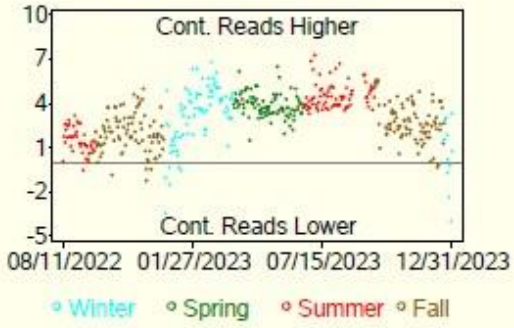
Site 06-037-4008: Long Beach, CA

FRM: R & P Model 2025 PM-2.5 Sequential Air Sampler w/VSCC - Gravimetric (145), PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

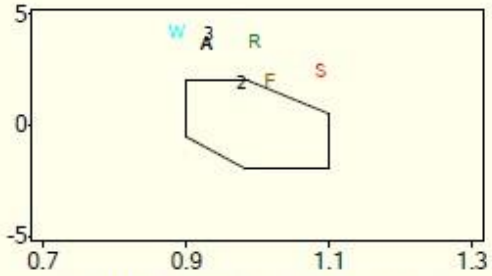
Cont. (y) vs. FRM (x) (µg/m³)



Cont. minus FRM (µg/m³)

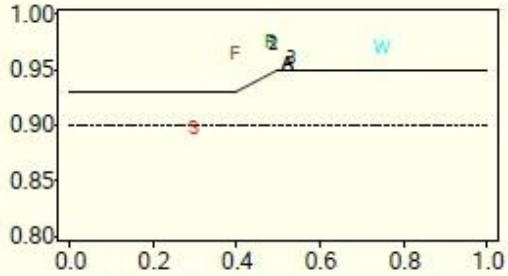


Additive (y) vs. Multiplicative (x) Bias



A=AllData, 1=2021, 2=2022, 3=2023
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)



A=AllData, 1=2021, 2=2022, 3=2023
W=Winter, R=Spring, S=Summer, F=Fall

Mean Concentration (µg/m³)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	**479**	**11.2**	**14.3**	**1.28**
Winter	96	12.1	15.1	1.25
Spring	92	8.0	11.9	1.49
Summer	118	10.6	14.1	1.33
Fall	173	12.7	15.1	1.19
2021	0	.	.	.
2022	138	12.5	14.3	1.14
2023	341	10.7	14.2	1.34

Appendix A Statistics

Dataset	N (all observations)	Bias	N (only >= 3 ug/m^3)	Bias
AllData	**479**	**37.1**	**474**	**36.0**
Winter	96	45.8	93	43.5
Spring	92	59.7	90	57.0
Summer	118	35.2	118	35.2
Fall	173	21.6	173	21.6
2021	0	.	.	.
2022	138	17.8	137	17.4
2023	341	45.0	337	43.6

Data Source: EPA AQS Data Mart

Generated: April 24, 2024

$PM_{2.5}$ Continuous Monitor Comparability Assessment and Request for Waiver

Indio Jackson Street Monitoring Site
AQS Site Codes 06-065-2002

The monitoring site at Indio Jackson Street (Indio) has been in operation since January 1983 and monitoring was discontinued on April 20, 2022, at the request of the City of Indio. The site was located at the Indio Police and Fire Department premises, at 46990 Jackson Street, Indio, CA 92201. Initially established to monitor ozone (O3) and coarse particulate matter (PM_{10}) levels to characterize the Indio and Coachella Valley region, measurements at this site were expanded in February 1999 when South Coast Air Quality Management District (South Coast AQMD) began measuring integrated 24-hour fine particulate matter ($PM_{2.5}$) concentrations on a 1-in-3-day schedule.

In January 2020, South Coast AQMD began measuring hourly concentrations of $PM_{2.5}$ at Indio using a Thermo Fisher Scientific 5014i continuous monitor to assess instrument performance. Following the conclusion of testing, the Thermo Fisher Scientific 5014i was decommissioned on April 20, 2022, coinciding with the closure of this monitoring site. Throughout the acceptance testing phase, staff identified performance issues with the instrument. Notably, hourly data was noisy, exhibiting positive and negative excursions with values that exceeded established data qualifiers.

Data qualifiers were based on the Met One 1020 instrument specifications and a Technical Bulletin dated May 31, 2013, which specified that hourly concentration < -5 µg/m³ are statistically unlikely. This data qualifier was maintained to ensure consistency between the Thermo Scientific 5014i and Met One 1020 instruments within the South Coast AQMD continuous $PM_{2.5}$ monitoring network. Continuous $PM_{2.5}$ hourly values < - 5.0 µg/m³ were flagged and excluded during the validation process. As a result of negative values being excluded, the 24-hour average was skewed toward higher concentrations. The number of negative hourly averages < - 5 µg/m³ and the average concentration are illustrated in Table 1.

Table 1 Negative Hourly Exclusions

Thermo Fisher Scientific Negative Hourly Values Excluded from 24 Hour Average Calculations		
Year	Average of Excluded Concentrations	Number of Negative Hourly Averages Excluded
2020	-11.19 µg/m³	41
2021	-12.57 µg/m³	59
2022	-7.02 µg/m³	43

Due to ongoing performance issues with the Thermo Fisher Scientific 5014i, it became imperative to remove the instrument from the site and return it to the manufacturer for warranty servicing. Over the course of two years, the Thermo Fisher Scientific 5014i $PM_{2.5}$ monitor required two separate instances of comprehensive servicing at the manufacturer facility, as illustrated in Table 2.

Table 2 Thermo Fisher Scientific 5014i Service Log

Thermo Fisher Scientific 5014				
Model	Serial Number	Install Date	Removal Date	Disposition
5014i	14101001	1/1/2020	8/26/2020	Returned to factory
5014i	15221018	8/27/2020	6/23/2021	On 4/13/21, staff documented that $PM_{2.5}$ measured higher concentrations than PM_{10} and the instrument was subsequently removed from service and returned to the factory.
5014i	14101001	6/30/21	3/31/2022	Site shutdown

After the site shutdown, all Thermo Fisher Scientific 5014i instruments were taken out of service for $PM_{2.5}$ measurement purposes.

A comparison analysis of data from the nearby Palm Springs site indicates potential performance issues with the Thermo Fisher Scientific 5014i $PM_{2.5}$ monitor. During the period between 2017 and 2020, both Indio and Palm Springs $PM_{2.5}$ Federal Reference Method (FRM) samplers exhibited consistent Annual Design Values (DV) as the primary monitors. However, with the introduction of the 5014i $PM_{2.5}$ as the primary monitor, there was a notable rise in the Annual DV that occurred in 2021 and 2022 at Indio. This is in contrast with the stable trend observed in Palm Springs. This discrepancy implies that the introduction of the new $PM_{2.5}$ monitor might have been a contributing factor to the observed changes in Indio's DV as shown in Figure 1.

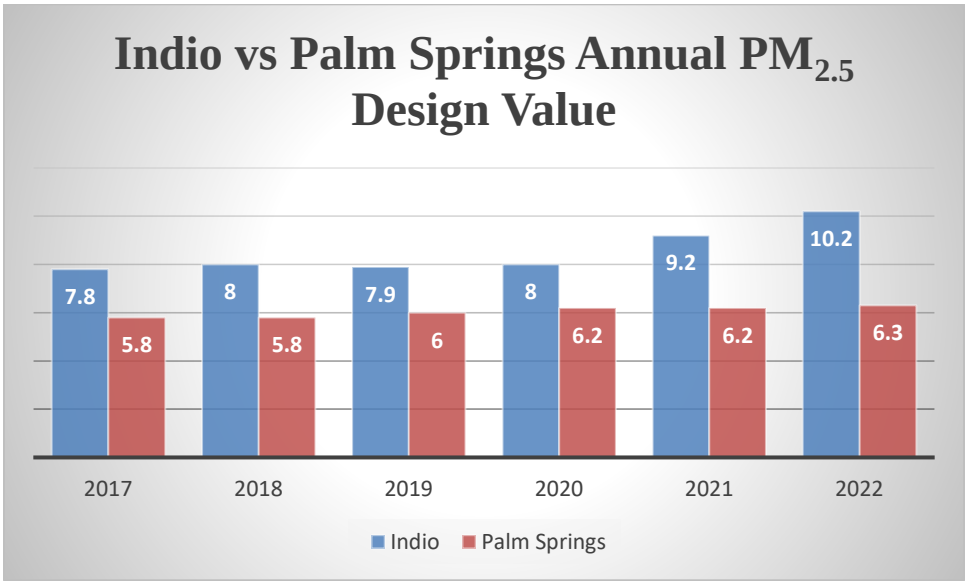


Figure 1 Indio vs Palm Springs Annual $PM_{2.5}$ Design Value.

Consequently, due to concerns regarding the performance of the Thermo Fisher Scientific 5014i $PM_{2.5}$ monitor, South Coast AQMD initiated an assessment of the Thermo Fisher Scientific 5014i functionality by comparing it to collocated FRM data, as mandated by 40 CFR §58.11(e).

Request for Exclusion of $PM_{2.5}$ Continuous FEM Data from Comparison to the NAAQS

Evaluation requirements for requesting exclusion of data from comparison to the NAAQS are identified in 40 CFR §58.11 (e). These requirements refer to the performance criteria described in Table C-4 to subpart C of part 53. To accommodate the differences in how routine monitoring agencies, operate their networks, additional provisions are described in §58.11 (e). When a topic is not addressed in §58.11 (e), then the test specifications from Table C-4 applies.
Evaluation of FRM/FEM data per §53 Table C-4 requires a slope of regression to be 1 ± 0.10 and an intercept of regression ± 2.0 to meet bias requirements. Table 1C shows the slope of the regression between collocated FRM and FEM measurements which do not meet the 1 ± 0.10 specification indicated in §53 Table C-4 (i.e. slope = 1 ± 0.1) or the intercept of the regression relationship between FRM and FEM data of ±2.0 (also indicated in §53 Table C-4). The Indio PM2.5 FEM air monitor failed to meet the slope criteria.

Additionally, the correlation of reference value should be ≥ 0.95 for the R(y) vs FRM CCV (x) to meet the part 53 correlation criteria used in approving continuous $PM_{2.5}$ FEMs, as per "Technical Note – $PM_{2.5}$ Continuous Monitor Comparability Assessment." According to §58.11 (e)(6), the key statistical metric to include in an assessment is the bias of the $PM_{2.5}$ continuous FEM(s) compared to a collocated FRM(s). Correlation is required to be reported in the assessment, but failure to meet the correlation criteria, by

itself, is not cause to exclude data from a continuous FEM monitor. Data at or above the dashed line (r =0.9) meet the correlation criteria identified in the guidance for reporting the AQI.

Indio $PM_{2.5}$ POC 3 Request Summary

South Coast AQMD is formally requesting a waiver to exclude $PM_{2.5}$ POC 3 data from January 1, 2020, through April 20, 2022. This is based on the supporting performance documentation of the Thermo Scientific 5014i instrument, as delineated in the PM NAAQS rule published on January 15, 2013 (78 FR 3086), specific to the provisions detailed in §58.10 (b)(13) and §58.11 (e). The Indio $PM_{2.5}$ FEM air monitor failed to meet the slope criteria. Therefore, South Coast AQMD requests that data from the Indio (POC 3), $PM_{2.5}$ monitor be set aside for comparison to the NAAQS. South Coast AQMD is working to optimize continuous $PM_{2.5}$ monitoring instrumentation and has replaced all Thermo Fisher Scientific 5014i $PM_{2.5}$ monitors with Met One 1020 FEM instruments that pass the Continuous Monitor Comparability Assessment.

A detailed one-page assessment from which the information was obtained is summarized in Table 3.

Period of Exclusion of Data from the $PM_{2.5}$ Continuous FEMs

Details in Table 3 include the period of available data by monitor on which the request to exclude $PM_{2.5}$ continuous FEM data is based. Per U.S. EPA Regional Office approval, this data will be entered into U.S. EPA's AQS database in a manner where the data is only used for the appropriate monitoring objective(s) (i.e., use data for just the AQI).

$PM_{2.5}$ Continuous FEM data for Reporting the AQI

Where the analysis supports the request for exclusion from comparison to the NAAQS, the data is of sufficient comparability to collocated FRMs that they be used for public AQI reporting. Therefore, with U.S. EPA Regional Office approval we will report this data on our website and to AirNow (www.airnow.gov). As such, data submitted to U.S. EPA's AQS database will be under "acceptable AQI" reporting (i.e., parameter code 88502) so that data users will know that this data is appropriate for use in AQI calculations, but not for NAAQS comparison.

Assessments

The following one-page assessment shows the collocated $PM_{2.5}$ FRM and continuous FEM monitors at the Indio site. The assessment is represented in the "Table 3 – Request for Exclusion of $PM_{2.5}$ Continuous FEM Data".

Table 3 – Request for Exclusion of $PM_{2.5}$ Continuous FEM Data

Site Name	City	Site ID	Cont. POC	Cont. Method Description	PM2.5 Cont. Begin Date	$PM_{2.5}$ Cont. End Date	Continuous / FRM Sampler Pairs Per Season	Slope (m)	Intercept (y)	Meets Bias Requirement	Correlation (r)
Sites with $PM_{2.5}$ continuous FEMs that are collocated with FRMs											
Indio	Indio	06-065-2002	3	Thermo Fisher Scientific 5014i w/VSCC	01/01/2020	4/20/2022	Winter = 69 Spring = 56 Summer = 55 Fall = 60 Total = 240	1.20	1.22	No	0.90

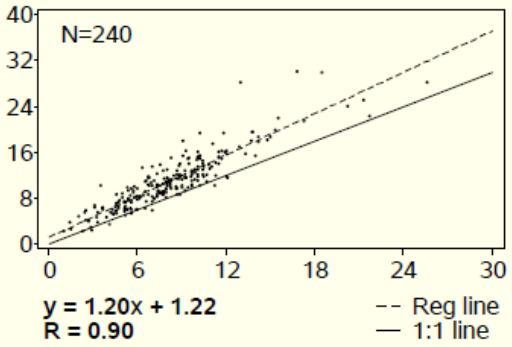
Indio
(FRM POC: 1, 2 - FEM POC: 3)

$PM_{2.5}$ Continuous Monitor Comparability Assessment

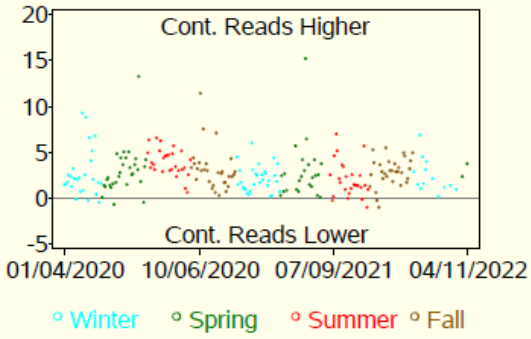
Site 06-065-2002: Indio, CA

FRM: R & P Model 2000 PM-2.5 Air Sampler w/VSCC - Gravimetric (120,143,145,155), PM2.5 - Local Conditions (88101), POC=1,2
Cont: Thermo Scientific 5014i or FH62C14-DHS w/VSCC - Beta Attenuation (183), PM2.5 - Local Conditions (88101), POC=3

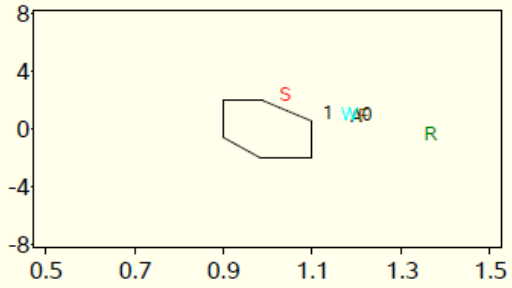
Cont. (y) vs. FRM (x) ($\mu g/m^3$)



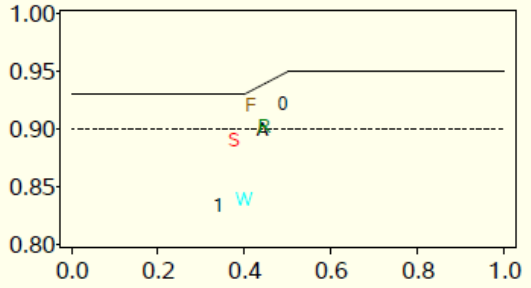
Cont. minus FRM ($\mu g/m^3$)



Additive (y) vs. Multiplicative (x) Bias



R (y) vs. FRM CCV (x)



Mean Concentration ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	240	8.1	11.0	1.35
Winter	69	6.4	8.8	1.38
Spring	56	8.2	11.1	1.36
Summer	55	10.0	13.0	1.30
Fall	60	8.4	11.5	1.36
2020	117	8.4	11.6	1.38
2021	110	8.0	10.4	1.31
2022	13	7.7	10.3	1.34

Appendix A Statistics

Dataset	N (all observations)	Bias	N (only >= 3 ug/m^3)	Bias
AllData	240	39.2	228	36.8
Winter	69	43.7	62	39.1
Spring	56	38.3	52	36.0
Summer	55	33.2	55	33.2
Fall	60	40.2	59	38.6
2020	117	42.4	109	40.5
2021	110	36.1	107	32.9
2022	13	36.0	12	38.4

Data Source: EPA AQS Data Mart

Generated: March 20, 2024