Section 8. Defining Regional Applicability

The basic relationship between a continuous monitor and an FRM should be similar throughout a given "region" of application, especially with respect to bias. This reasoning is the foundation for the new regional equivalent method approach which assumes consistent monitor behavior can be achieved within a "region" despite inconsistencies nationally. Sections 3 and 4 provided example requirements (2 sites per MSA) for demonstrating consistency. The determination of regional applicability should be based first on technical considerations related to the homogeneity of aerosol composition and meteorology. This section addresses candidate approaches to determine regional applicability, and is intended to raise the understanding of this topic for further development of applications guidance.

Operationally, only one transformation model would be applied within the region of consideration. Determining the region in which the use of one transform is appropriate, meaning that all the sites within the region will meet the bias and precision requirements (REM) or goals (CAC), can be approached in two ways. One approach is to establish regions a priori where the regions explicitly cover specific land masses in the United States. For example, regions may be the interior southeast, the east coast, Florida, the industrial belt, the Midwest, the western coast, the arid southwest, Alaska, the Rocky Mountain states, and the humid northwest coastal area. The testing requirements for a candidate method would have to be met throughout one or more of these previously established regions. If one of the sites does not meet the testing requirements, then the method can not be used within that region. Such an approach implies knowledge about areas in which a particular type of continuous methodology and the FRMs have similar relationships. As shown in Section 2, knowledge based on the analysis of ambient measurements does not currently exist due to lack of data, especially data from emerging continuous monitoring methodologies. However, as more ambient measurements are collected for the various continuous monitoring methodologies, environmental conditions, and particulate composition and size distributions, such regions may become more clearly defined. ***This approach could be acted on by establishing a panel of experts charged with developing these regions.*** EPA and other organizations (monitoring agencies, Tribal nations, Regional Planning Organizations, RPO's) would address logistical and administrative complications associated with multiple monitoring organizations operating in a defined "region".

A second approach is to allow any size and shape of region. The State/local/tribe, RPO, or vendor interested in using a particular type of continuous instrument would specify the boundary of the region and then follow the testing requirements or goals to prove whether one transformation would be adequate for the entire region. That is, the domain of the region is flexible. However, once the testing has been completed for a specific domain, the domain remains fixed until on-going evaluations indicate the performance criteria are no longer being met throughout the region.

Both approaches will be pursued. It will be strongly encouraged that potential continuous monitoring methodologies be deployed at a core set of sites where the data from these sites will help to determine potential regions for the first approach. Until there are sufficient data to determine appropriate regions, the second approach will be used.

Definition of Regionality of Transformation

For a specific type of continuous monitoring methodology, given a sufficiently dense monitoring network of these monitors collocated with FRMs, it would be possible to develop a surface of the bias between the two types of instruments. In some places the bias might be small while in other places the bias might be large. In some places the bias might be negative and in others, it might be positive. Hopefully, the surface of biases would be smooth, that is, it would gradually change from one location to the next. Given such a smooth surface, it would be possible to produce FRM-like measurements at any location, even if there were no collocated FRM.

A difficulty with this construct of a surface of biases is that there is not a sufficiently dense network with which to build a surface for any large geographical area, especially for each type of continuous monitoring methodology. However, understanding this surface is the basis for being able to know sizes of regions. Collection of data with which to build such a surface is an important step to understanding regionality and is described below.

A surface of biases implies that the transformation to generate FRM-like measurements from continuous data would vary from site to site. Implementing site-specific transformations likely would prove to be intractable for a large number of sites, especially if the transformation is considered to be part of the method. One way around this problem is to use one transformation over an area where the biases are "similar." Specifically, the definition of the regionality of a transformation is that geographical area in which it is possible to use one statistical model to estimate FRM-like measurements and those FRM-like measurements meet the performance criteria specified in Section 6. Determining regions for which biases are "similar" also hinges on a dense data base of collocated FRMs and continuous instruments.

Data Collection to Support Definition of Regionality of Transformations

At least 100 sites of collocated continuous monitors and FRMs will be established as part of a National Core (NCore) network. These collocated sites will provide the data necessary to understand and monitor the temporal and spatial relationships between FRMs and continuous samplers. Characteristics of the sites include: (1) FRMs should operate at least every third day, (2) monitors should operate year-round and every year, (3) speciation trends sites are ideal given that the speciated data may help better understand the relationships, and (4) sites upwind of the speciation trends sites are also ideal, as the upwind sites likely have different compositions due to urban/rural gradients. The database generated by these sites will be regularly analyzed to determine if and how the FRM-continuous relationships vary spatially and temporally and how those relationships may change over time as compositions change due to implemented control strategies.

Until such time that a priori regions are defined, the regions may be any size and shape and the following guidance is applicable.

Regionality of Transformations for CAC

If the data from the non-FRMs are intended to be used for non-regulatory purposes, it is important that the data be comparable to the data produced by FRMs. However, since the data will not be used for direct comparison to the NAAQS, there is more flexibility in determining the regions within which one transformation is applicable.

Step 1. Develop transformations for each collocated site within the region of interest, based on the guidance provided in Section 7.

Step 2. Determine whether the transformations are statistically equivalent. For the sites that are equivalent, pool their data together to estimate one transformation. This one relationship should be used at each of the sites that was considered equivalent and may be used at other continuous sites for which there is no collocated FRM, provided that the sites operate the same type of non-FRM sampler using the same standard operating procedures, have similar chemical composition, and are exposed to similar meteorology. For examples, it would be inappropriate to apply a relationship established at a site running a TEOM to a site running a BAM, to apply a relationship established at a population-oriented site without any nearby sources to a site impacted by a large local source, or to apply a relationship established at an inland site to a coastal site. Sites that are not statistically equivalent to others should be considered unique, meaning that the transformation for the site should not be applied to any other site.

Step 3. On-going evaluation. It is recommended that at least 10% of the non-FRM sites be collocated with FRMs for at least 1 year of every 3 years and that the regionality be re-evaluated every 3 years. This recommended level of collocation on a permanent basis generally is met or exceeded in current networks.

Regionality of Transformations for REM

Following the approaches for CAC and REM discussed in Sections 3-7, the approval process for regional applicability for REMs would incorporate an as yet undetermined independent review procedure and more formalized demonstration of meeting performance and test requirements. The development of a review panel or board was raised above, and such an approach might be necessary given the probability of several unique cases and the desire to maintain equity in approval nationally.

Alternatively, due to the lack of understanding of the regionality of a relationship between data produced by FRMs and non-FRMs, the size of the region within which a continuous monitor can be considered for equivalency will be no larger than a site. As the data from the core sites becomes available and some understanding of the relationships grows, the size of potential regions will be reconsidered. Given that the continuous monitoring technology is changing and as a result few locations have at least a year of collocated measurements collected using the most-current SOPs, it is premature to propose an approach for using one

transformation over an area larger than an site. Too little is known about the potential gradients in the bias surface at this time.