SMAT-CE

Utah Division of Air Quality

Introduction

Utah DAQ used the Software for Model Attainment Test - Community Edition (SMAT-CE) v. 1.2 utility from EPA[1]. The SMAT-CE utility faithfully follows EPA guidance[2] on conducting a modeled attainment test for daily PM2.5.

Species fractions

The State of Utah has three Chemical Speciation Network (CSN) monitors: Hawthorne, Bountiful and Lindon. Hawthorne is located in Salt Lake County, while Bountiful is in Davis to the North, and Lindon is located in Utah County to the South (outside of the Salt Lake nonattainment area). Speciation data gets collected on 1-in-3 day sampling schedule at Hawthorne and 1-in-6 day sampling schedule at Bountiful and Lindon.

Because of the mismatch in sampling frequency, Utah DAQ found that the interpolated speciation profiles SMAT-CE initially created were not uniform for Salt Lake Valley as expected. To create more realistic PM2.5 speciation profiles for all Salt Lake Valley FRM sites, Utah DAQ used only the Hawthorne CSN monitoring data. In other words, all FRM monitors in the Salt Lake nonattainment area used the same (Hawthorne) species profile for assigning species fractions. Utah DAQ believes this is reasonable based on prior special studies.

SMAT-CE options used

Utah DAQ used 2011 CSN data to create species fractions profiles for FRM monitors at all locations except for Erda. 2011 CSN data presented a profile representative of typical wintertime peak daily PM2.5 speciation. 2011 CSN data was used for species fractions as well as for CSN filter mass. 2016 speciation data was used for Erda since 2011 filter mass data is not available for this site, which was established in 2016.

A grid of 3-by-3 (9) cells surrounding the monitors was used for relative response factor (RRF) calculations. Utah DAQ's grid resolution is relatively high at 1.33 km, implying a nine-cell window of 4 km x 4 km centered around monitor location. Since the grid-cell window was small in extent, Utah DAQ felt comfortable using the mean statistic for computing RRF values. A larger window could extend into upper elevation areas, where PM2.5 would naturally be less concentrated.

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[1] https://www.epa.gov/scram/photochemical-modeling-tools
[2] https://www3.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf

Utah DAQ used the most up-to-date AQS PM2.5 monitoring data for its baseline design value (BDV) calculations. EPA guidance[2] (page 22) says one possibility for deriving baseline design values is using : "The design value period that straddles the baseline inventory year". Therefore, a 3-year period (2016 - 2018) that straddles the 2017 baseline inventory year was selected to get a representative estimate of Utah air quality.

The table below (Table 1) shows a list of settings used in SMAT-CE by Utah DAQ to complete their modeled attainment demonstration. Options not listed should be assumed to be default.

Table 1: List of different SMAT-CE parameters used in Utah DAQ's modeled attainment demonstration.

SMAT-CE Option	Setting
Species Fraction Options	
Improve-CSN Monitor Data Years	2011 - 2011 (1-year) for all locations except Erda. 2016-2016 (1-year) for Erda
Use top X percent of daily monitor days	15%
PM2.5 Monitor Data Years	2011 - 2011 (1-year) for all locations except Erda. 2016-2016 (1-year) for Erda
Use top X percent of daily monitor days	15%
PM2.5 Monitor Data Years	
PM2.5 Monitor Data Years	2016 - 2018 (3-year)
Model Data Options	
Grid for Point Forecast	3x3
Grid for Spatial Forecast	3x3
Statistic	Mean
Use top X number of daily model days (RRF)	3

The results of the modeled attainment test are discussed in the next section.