

Episodic PM_{2.5} Serious SIP Point Source Inventory

The PM_{2.5} Serious SIP requires a point source inventory for episodes and projections. Episodic inventories are used to verify that the air quality model is working properly by replicating concentrations that were measured during the corresponding episode. The modeling analysis that supports this SIP evaluated three such episodes. The days selected included January 1, 2011 through January 10, 2011, December 7, 2013 through December 19, 2013, and February 1, 2016 through February 16, 2016. For further information on how the specific days were determined, refer to the Episode Selection portion of this Technical Support Document.

As with all inventories collected for this analysis, the pollutants of concern included PM₁₀, PM_{2.5}, SO₂, NO_X, VOC, CO, and NH₃ and the unit of measurement was tons per year (tpy).

Source Selection:

Industrial point sources are one of the fundamental pieces to this inventory. At the outset of this project the 2011 tri-annual and 2014 tri-annual inventories along with the 2013 “Large Major” inventory were the latest and most current inventories available for point sources. The 2013 Large Major inventory includes sources that meet the definition of a Type A Source (as specified in 40 CFR 51.20). The tri-annual inventories included all major sources, Title V sources, and any sources included in the PM₁₀ or ozone maintenance plans.

For the SIP base year inventory, UDAQ used the definition of a major source under Title V of the Clean Air Act (as specified in 40 CFR 51.1000) to define the thresholds for the reporting of actual emissions for point sources in the nonattainment areas. These thresholds are 70 tons per year or more of direct PM_{2.5} or any PM_{2.5} precursor in a serious nonattainment area for the PM_{2.5} NAAQS. For point sources located in the surrounding area however, a threshold for potential to emit annual emissions of 100 tons for any of the relevant criteria air pollutants was used. The inventories listed above were used to develop the selected episodic inventories. Emissions from sources under the above thresholds were included in the area source inventory.

Major sources contained within the prescribed modeling domain were determined according to the above definition. Emissions data for any additional sources contained in the prescribed modeling domain but located outside of Utah was obtained from the EPA National Emission Inventory (NEI) database (2014 NEI v2).

Representative Time Periods:

As indicated above, three distinct episodes of elevated PM_{2.5} concentrations from 2011, 2013, and 2016 were used in the episodic modeling analysis. A description of how a representative inventory for each episode was developed is given below.

2011 Episodic Inventory

A representative inventory for the 2011 period was developed using actual emissions from the 2011 tri-annual inventory.

2013 Episodic Inventory

A representative inventory for the 2013 period was developed by using actual emissions for the 2013 Large Major sources along with projecting actual emissions from the 2014 tri-annual inventory back to the 2013 episode for all other sources with one exception. For one source a 2014 inventory was unavailable. Therefore, the 2011 inventory for this source was used to project to 2013.

2016 Episodic Inventory

A representative inventory was developed for the 2016 period by projecting actual emissions from the 2014 tri-annual inventory forward to the 2016 episode for all sources with one exception. For one source a 2014 inventory was unavailable. Therefore, the 2011 inventory for this source was used to project to 2016.

It was determined that data from the Regional Economic Models, Inc. (REMI) would be used to project 2014 actual point source emissions to both 2013 and 2016. Since REMI data did not exist for military installations it was determined that data from the Bureau of Economic Analysis (BEA) along with data from the Governor's Office of Management and Budget (GOMB) would be used for projecting emissions at military bases. The data from the REMI model and BEA & GOMB along with a description of how the projection data for military installations was developed may be found in Appendix 1.

The 2011, 2013, and 2016 inventories was reported and compiled in terms of tons per year (tpy). Since the PM_{2.5} Serious SIP is designed to protect the 24-hour standard, the model (CAMx) evaluates emissions on an hourly basis. It uses a pre-processor called SMOKE in order to convert the annual inventory to a 24-hour basis (explained in further detail below.)

Because the model is evaluating the buildup of PM_{2.5} concentrations over the span of multi-day episodes, an (annual) inventory worksheet was used to develop each episode day. This stands in contrast to the mobile source portion of the inventory wherein differences between weekdays and weekends (among other factors) will result in daily variations.

Data Collection and QA/QC

The 2011, 2013, and 2014 point source emissions inventory data was collected in electronic and hard copy form in the 2012, 2013 and 2015 respectively. Data collected electronically was uploaded via an electronic upload- program into the UDAQ TEMPO database. Summary data for hard-copy inventories were entered by hand into the database by UDAQ inventory staff.

UDAQ has constructed Microsoft Excel inventory workbooks for most of the larger point sources. These workbooks provide a better interface with sources, a more thorough quality assurance/quality control (QA/QC), and allow for seamless upload to the TEMPO database. Construction of these workbooks required a very careful evaluation of the emissions calculations and their representativeness of each particular facility. After receiving completed workbooks from the sources they were individually inspected and updated to reflect any necessary changes requested by the sources before being uploaded into the TEMPO database. UDAQ utilized inventory workbooks for the majority of the defined major point sources contained in the prescribed modeling domain to collect the 2011, 2013, and 2014 annual emissions inventories. Hard copy inventories were collected for the remaining sources with the following exception. For any sources where an emissions inventory was not available UDAQ used 90% of PTE to develop an emissions inventory. The electronic inventory workbooks encompass over 75% of the total calculations for Utah's major point source episodic emissions inventories thereby greatly surpassing EPA guidance requiring 10% QA/QC as the minimum criteria necessary for a SIP inventory QA/QC check. Electronic versions of the point source emissions inventory workbooks for the majority of major sources along with hard copy submittals for the remaining sources are maintained at UDAQ and are available on a CD titled "Episodic Point Source Emissions Data."

Emissions data for any additional sources contained in the prescribed modeling domain but located outside of Utah was obtained from the EPA National Emission Inventory (NEI) database (2014 NEI v2).

The SMOKE Emissions Model and Processor

The emissions processing model, SMOKE, takes the annual, county wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory that, in the end, produces a refined version of the inventory. These include temporal processing, spatial processing, and speciation. Temporal processing converts emissions from annual to daily and hourly values. Spatial processing locates emissions from the county to specific grid cells within the modeling domain. Speciation breaks PM and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles based on various Source Classification Codes (SCCs) and associated cross reference files developed using source provided temporal data. This feature essentially establishes the

level of detail required of the point source inventories, wherein each “source component” has with it an associated SCC. These SCCs and the cross reference files are also created for area sources and mobile sources.

Once developed, these activity profiles serve to establish the temporal allocation of emissions within the model (e.g. 8-hour workdays), and also determine the speciation of PM and VOC emissions.