

Baseline PM₁₀ SIP Point Source Inventory

The PM₁₀ SIP requires a point source inventory for baseline evaluation. Baseline inventories are used to establish an inventory for the base-year that can be compared to future-year inventories for the purpose of attainment. The baseline inventory selected for this evaluation was the 2011 tri-annual inventory.

As with all inventories collected for this analysis, the pollutants of concern included PM₁₀, PM_{2.5}, SO_x, NO_x, VOC, CO, and NH₃ and the unit of measurement was tons per year (tpy). For these PM₁₀ maintenance plans the pollutants of concern are PM₁₀, SO_x and NO_x. While VOC and NH₃ are considered precursors to PM_{2.5} they are not however, defined as PM₁₀ precursors.

Source Selection:

Industrial point sources are one of the fundamental pieces to this inventory. As of the outset of this project the 2011 tri-annual inventory was the latest and most current inventory available for point sources. This 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 51.20) to define the thresholds for the reporting of actual emissions. These thresholds are the potential to emit annual emissions of 100 tons for all relevant criteria air pollutants except CO, for which it is 1000 tons. The 2011 periodic, three-year inventory was used to make this assessment. Emissions from sources under the above thresholds were included in the area source base-year inventory.

It was determined that according to the above definition that as of 2011, 23 major sources were contained within the prescribed modeling domain. This list included major point sources located in Utah County (the Utah County nonattainment area), Salt Lake County (the Salt Lake County nonattainment area), and several sources in Davis County that were included in the PM₁₀ SIP for Salt Lake County (Big West Oil Co. – Flying J Refinery, Chevron Products Co. – Salt Lake Refinery, Holly Refining & Marketing – Phillips Refinery, and Bountiful City Light & Power – Power Plant). The third PM₁₀ nonattainment area is Ogden City, which lies within Weber County. There were no major point sources located within Ogden City.

All remaining major point sources within the core area (Utah County, Salt Lake County, Davis County, and Weber County) were treated like other major point sources outside the core area but within the greater modeling. Collectively, the emissions from these sources represent less than 3% of the emissions within Davis or Weber Counties.

Outside of the core area, the NEI inventory for 2011 was downloaded from EPA and used to fill in the surrounding modeling domain. As discussed above, this inventory is still of high quality, but was not seasonally adjusted for the period of analysis. Still, given the stagnant air conditions that accompany episodes of elevated PM₁₀ concentrations and the relative lack of emissions in this surrounding area, it was a good approximation that had minimal influence on the concentrations predicted by the model within the nonattainment areas.

In addition, it was also determined that 2011 NEI point source data would be used for 31 Idaho sources and 35 Wyoming sources in the modeling domain.

Table 1 lists the 23 major sources in Utah along with their 2011 annual emissions for PM₁₀, PM_{2.5}, SO_x, NO_x, VOC, CO and NH₃.

Data Collection and QA/QC

The 2011 point source inventory data was collected in electronic and hard copy form in the spring of 2012. 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 all 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 UDAQ 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 database. UDAQ utilized inventory workbooks for 21 of the 23 major point sources contained in the prescribed modeling domain to collect the 2011 annual emissions inventory. The only exceptions were Geneva Rock Products (Point of the Mountain Facility), and Geneva Rock Products (Mount Jordan Operations). Workbooks have not been completed for Geneva Rock Products (Point of the Mountain Facility) and Geneva Rock Products (Mount Jordan Operations). It was estimated that these 21 inventory workbooks encompass approximately 98% of the total calculations for Utah's 2011 major point source SIP emissions inventory 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 21 major point source emissions inventory workbooks along with hard copy submittals from Geneva Rock Products (Point of the Mountain Facility), and Geneva Rock Products (Mount Jordan Operations) are maintained at UDAQ and are available for inspection upon request.

It was determined that 2011 NEI point source data would be used for the additional 31 Idaho sources and 35 Wyoming sources in the modeling domain.

Condensable Particulate Emissions:

Condensable particulate matter (PM) is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM after discharge from the stack. Note that all condensable PM, if present is typically in the PM_{2.5} size fraction, and therefore all of it is a component of both primary PM_{2.5} and primary PM₁₀.

Condensable emissions were included in the workbook inventories submitted by the sources in 2011. Geneva Rock Products (Point of the Mountain Facility), and Geneva Rock Products (Mount Jordan Operations) emissions were adjusted by UDAQ staff to account for condensable emissions. Electronic versions of the emissions inventory workbooks for the major point sources in the non-attainment areas along with hard copy submittals and condensable emissions calculations for Geneva Rock Products (Point of the Mountain Facility), and Geneva Rock Products (Mount Jordan Operations) are maintained at UDAQ and are available for inspection upon request.

The SMOKE Emissions Model and Processor

The emissions processing model 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 PM₁₀ 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 created for area sources and mobile sources too.

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 PM₁₀ and VOC emissions.

In the case of spatial processing, the emissions from large industrial sources are placed in the location of the source itself. As with area and mobile sources, the emissions from the smaller point sources are spatially distributed using various surrogates like population density.