UTAH DIVISION OF AIR QUALITY

Baseline and Projected Emissions Inventories

For the Serious PM2.5 Salt Lake Nonattainment Area

June 26, 2018

Executive Summary

The following collection of documents present baseline and projected emissions inventories (EI) for the Serious PM2.5 Salt Lake City Nonattainment Area for the 2006 24-hour national ambient air quality standard (NAAQS). These EIs were prepared to support the State Implementation Plan (SIP), and interface with an air quality model and allow for assessments of various control strategies in future years with respect to the NAAQS. Such an analysis is called an attainment demonstration.

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SIP Inventory Overview

Much of the technical work supporting the modeled attainment demonstration of a State Implementation Plan (SIP) for PM2.5 is the collection of accurate emissions inventories.

There are various time horizons that are significant to the development of this SIP. It is first necessary to look at actual emissions incurred during past episodes of elevated PM2.5 concentrations in order to develop the air quality model. The episodes studied as part of the SIP occurred in 2011, 2013, and 2016. A baseline year, 2016 in this case, is then determined and becomes the basis for comparisons with all projections into the future.

It is then necessary to look several years into the future when developing emission control strategies. The significant time horizon for this plan relates to the statutory attainment date, December 31, 2019. A projected inventory represents the bulk of assumptions concerning population growth and economic development as well as potential SIP control strategies. The projection inventory prepared for 2019 was then compared with a baseline inventory that is contemporaneous with the monitored design values. In addition, it is necessary to evaluate progress towards attainment by looking at specific milestone years. In this case there are two significant milestone years; 2017 and 2020. Inventories must be prepared to evaluate all of these time horizons.

Each inventory includes estimates for the following pollutants: PM2.5, SOx, NOx, VOC, and NH3 and includes contribution from a number of sectors. The Utah Division of Air Quality (UDAQ) routinely considers emissions from the following generalized source groupings:

- Large industrial point sources;
- Area sources, which include smaller, and more numerous, industrial sources as well as activities like space heating that may be well approximated by surrogate indicators such as population;
- On-road mobile sources; and
- Non-road mobile sources.

Supporting documentation for the emission inventories would also contain an Inventory Preparation Plan (see TSD 1.a General), which is developed to guide the overall development of the EI within the context of the PM2.5 attainment SIP. While not actually required, it is a useful tool for those who prepare these inventories. It is also informative enough to readers unfamiliar with this work that it has been included in 1.a General.

An overall summary is provided for baseline and projected years. All of the supporting documents are organized in the directories below.

2016 Baseline Year Inventory Overview

The baseline inventory should correspond to the period with a recently observed design value. The baseline year inventory selected for this evaluation is the 2016 inventory. The baseline inventory is used to compare to the projected attainment inventory year of 2019, in addition to the milestone years of 2017 and 2020.

The 2014 tri-annual inventory was the most recent comprehensive inventory compiled by UDAQ. The 2016 baseline inventory was developed using the 2014 tri-annual inventory. In addition to the large major point sources that are required to report emissions every year, the tri-annual inventories consider emissions from many more, smaller point sources. These inventories are collected in accordance with state and federal rules that ensure proper methods and comprehensive quality assurance.

Thus, to develop the baseline and projected years, the comprehensive 2014 inventory was either back-cast and adjusted for certain episodic conditions, or forecast to represent more typical conditions, including for the baseline year of 2016 chosen for this SIP.

To assist the reader, the baseline and projected year inventories portion of the TSD are organized using these categorizations, corresponding to the contribution from the following generalized source groupings:

- Large industrial point sources;
- Area sources, which include smaller, and more numerous, industrial sources as well as activities like space heating that may be well approximated by surrogate indicators such as population;
- On-road mobile sources; and
- Non-road mobile sources.

2017, 2019, and 2020 Projected Inventories Overview

As discussed above, the baseline inventory is used to compare to the projected attainment inventory year of 2019, in addition to the milestone years of 2017 and 2020. The 2014 tri-annual inventory was also used as the basis to develop the necessary baseline and projected inventories.

A summary table of baseline and projected emissions inventories is presented below and organized in this TSD as follows:

3.b Point Sources

3.c Area Sources

3.d Non-Road Mobile Sources

3.e On-Road Mobile Sources

Inventory Preparation Plan: 1.a General

Inventory Pre-processor (SMOKE): 1.a General

Baseline and Projected Inventories Summary Table

Emissions [tons/day]	Sector	PM2.5	NOx	VOC	NH3	SO2
2016 Base Year	Area Sources	6.13	13.63	45.96	14.22	0.17
	Mobile Sources	4.98	55.38	31.84	1.29	0.41
	NonRoad Sources	1.01	16.41	8.70	0.02	0.32
	Point Sources	3.26	18.18	5.25	0.44	4.70
	Total	**15.38**	**103.61**	**91.74**	**15.97**	**5.60**
2017 Milestone Year	Area Sources	6.19	13.57	46.02	14.21	0.22
	Mobile Sources	5.02	52.53	30.87	1.30	0.43
	NonRoad Sources	0.96	15.77	8.47	0.02	0.33
	Point Sources	3.58	18.32	6.13	0.44	4.61
	Total	**15.75**	**100.18**	**91.48**	**15.97**	**5.59**
2019 Attainment Year	Area Sources	6.23	11.84	44.34	14.21	0.22
	Mobile Sources	4.78	44.02	27.26	1.25	0.43
	NonRoad Sources	0.88	15.18	9.01	0.02	0.35
	Point Sources	4.25	23.86	6.21	0.48	3.90
	Total	**16.13**	**94.90**	**86.82**	**15.96**	**4.89**
2020 Milestone Year	Area Sources	6.24	9.54	43.73	14.20	0.20
	Mobile Sources	4.68	40.38	25.42	1.23	0.42
	NonRoad Sources	0.82	14.08	8.10	0.02	0.36
	Point Sources	4.26	23.86	6.22	0.49	3.90
	Total	**16.00**	**87.86**	**83.47**	**15.94**	**4.88**

Figure 1 Emissions Summary for the Salt Lake City PM2.5 Nonattainment Area; Baseline, Milestone, and Attainment Years

Emissions are presented in tons per average-episode-day. All projections incorporate assumptions concerning growth in population and vehicle miles traveled. They also include the effects of emissions control strategies that are either already promulgated or will be required as part of the SIP.

It is important to realize that the summary table reports these emissions in units of tons per average episode day. This is a construct discussed in the PM Implementation Rule, and is most consistent with the nature of the 24-hour averaging period of the PM2.5 NAAQS for which the area has been designated nonattainment.

Nevertheless, as one reviews the various components of the inventory it becomes apparent that different units are utilized in calculating each of the various source categories. This would seem to make an overall aggregation of the EI a comparison of apples and oranges, but again each of these components was prepared for use in the air quality model, and it is within this model, in an emissions pre-processor called SMOKE, that each of the respective pieces is apportioned in space and time allowing for its overall compilation in consistent units.

There are also geographical differences between what is reported in the summary table vs. what is presented in some of the raw inventory work that follows. Area source emissions, for instance, are calculated for each specific county. Nonattainment area boundaries sometimes bisect county lines, and so the emissions pre-processor is able to more accurately describe the emissions distributed within each nonattainment area.

A discussion of what SMOKE actually does and how an average episode day has been defined is also included here as 1.a General.