

**UTAH DIVISION OF AIR QUALITY**

**Baseline and Projected Emissions Inventories**

**PM<sub>2.5</sub> Maintenance Plans: SLC, Provo, and Logan, UT-ID**

**September, 2019**

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## **Executive Summary**

The following collection of documents present baseline and projected emissions inventories (EI) for the Salt Lake City, Provo, and Logan, UT-ID Nonattainment Areas for the 2006 PM<sub>2.5</sub> 24-hour national ambient air quality standard (NAAQS). These EIs were prepared to support the State Implementation Plan (SIP) maintenance plan subsections, 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 PM<sub>2.5</sub> is the collection of accurate emissions inventories.

There are various time horizons that are significant to the development of the SIP maintenance subsections. It is first necessary to look at actual emissions incurred during past episodes of elevated PM<sub>2.5</sub> concentrations in order to develop the air quality model. The episodes studied as part of the maintenance plans occurred in 2011, 2013, and 2016. The 2011 episode was ultimately chosen as the best episode for model calibration. A baseline year, 2017 in this case, is then determined and becomes the basis for comparisons with all projections into the future.

For maintenance plans, it is necessary to model attainment for at least ten years beyond the year that EPA redesignates the area to attainment status. The projection years for the maintenance plans are 2035 for a final year and 2026 for an intermediate year check. Projection inventories represent the bulk of assumptions concerning population growth and economic development as well as control strategies that have been implemented and are still being phased-in over time. The projection inventories prepared for 2026 and 2035 are compared with the baseline inventory that is contemporaneous with the monitored design values.

Each inventory includes estimates for the following pollutants: PM<sub>2.5</sub>, SO<sub>x</sub>, NO<sub>x</sub>, VOC, and NH<sub>3</sub> 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 includes 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 PM<sub>2.5</sub> maintenance plans. 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.

## 2017 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 2017 inventory. The baseline inventory is used to compare to the projected attainment inventory years of 2026 and 2035.

For the chosen episodic inventory, the 2014 NEI was back-cast and adjusted for certain episodic conditions. During maintenance plan development, UDAQ was still in the process of completing certain emission source categories for the 2017 NEI.

For the 2017 baseline inventory, area sources emissions were forecasted from the 2014 NEI to 2017 in tons per year. For large point sources, the 2017 NEI actual emissions produced were used and reported in tons per year. On-road and non-road mobile source emissions were modeled and compiled for 2017 in tons produced per typical winter weekday. The data is then normalized spatially and temporally using an emissions pre-processor model.

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 categories:

- 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.

## 2026, and 2035 Projected Inventories Overview

As discussed above, the baseline inventory is used to compare to the projected attainment inventory year of 2026 and 2035.

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: 5.b SMOKE

## Baseline and Projected Inventories Summary Table

Emissions (tons/day)	Sector	PM <sub>2.5</sub> Filterable	PM <sub>2.5</sub> Condensable	PM <sub>2.5</sub> Total	NOx	VOC	NH3	SO2
2017	Area Sources	0.56	0.04	0.6	0.92	3.8	13.48	0.03
	Mobile Sources	–	–	0.23	3.76	2.46	0.1	0.02
	NonRoad Sources	–	–	0.1	0.79	2.19	0	0
	Point Sources	0	0	0	0	0	0	0
	<b>Total</b>			<b>0.93</b>	<b>5.47</b>	<b>8.45</b>	<b>13.58</b>	<b>0.05</b>
2026	Area Sources	0.60	0.04	0.64	0.7	3.88	13.27	0.03
	Mobile Sources	–	–	0.13	1.52	1.39	0.09	0.01
	NonRoad Sources	–	–	0.06	0.59	1.27	0	0
	Point Sources	0	0	0	0	0	0	0
	<b>Total</b>			<b>0.83</b>	<b>2.81</b>	<b>6.54</b>	<b>13.36</b>	<b>0.04</b>
2035	Area Sources	0.63	0.04	0.67	0.71	4.29	13.11	0.03
	Mobile Sources	–	–	0.19	1.76	1.91	0.1	0.01
	NonRoad Sources	–	–	0.05	0.57	1.04	0	0
	Point Sources	0	0	0	0	0	0	0
	<b>Total</b>			<b>0.91</b>	<b>3.04</b>	<b>7.24</b>	<b>13.21</b>	<b>0.04</b>

Figure 1 Emissions Summary for the Logan PM<sub>2.5</sub> Nonattainment Area; Baseline, and Projection 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 were implemented through previous SIP revisions.

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 PM<sub>2.5</sub> NAAQS for which the area has been designated nonattainment. As discussed previously, the emission inventory reporting units are inconsistent between source categories. This inconsistency is removed by using an emissions pre-processor model called SMOKE. SMOKE apportions the different units in space and time allowing for 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 in 1.a General.