

TECHNICAL SUPPORT DOCUMENT
FOR ON-ROAD MOBILE SOURCES:
MOTOR VEHICLE EMISSIONS BUDGET DERIVATION
FOR THE SALT LAKE CITY, UT PM_{2.5} NONATTAINMENT AREA

September 2019
Utah Division of Air Quality
Planning Branch/Mobile Sources

Motor Vehicle Emissions Budget (MVEB) Derivation:

Emissions Inventory

Wasatch Front Regional Council (WFRC) MPO constructed the on-road mobile source emissions inventory. This inventory covered the analysis years of 2017, 2026, and 2035 for the following counties within the Salt Lake City, UT PM_{2.5} Nonattainment Area (NA): Box Elder, Davis, Salt Lake, Tooele, and Weber. The emissions results can be found in the **Technical Support Document for On-road Mobile Sources: PM_{2.5} Emissions Inventory for 2017, 2026, and 2035 for the Salt Lake City, UT PM_{2.5} Nonattainment Area and surrounding modeling domain within Utah**; Table 1. PM_{2.5} SIP On-road Mobile Source Inventory 2017-2035 (Tons per Winter Weekday). (p14) An example of the 2035 Countywide On-Road Mobile inventory is located below in Table 1.

Table 1. Salt Lake City, UT PM _{2.5} NA 2035 Countywide On-Road Mobile Emissions Inventory (Tons per Winter Weekday)						
Year	County	NOx	PM 2.5**	VOC***	Vehicle Population	VMT
2035*	Box Elder (NA & AA)	1.60	0.04	0.54	59,456	2,913,233
2035*	Davis (NA)	2.53	0.18	2.45	364,537	10,872,076
2035*	Salt Lake (NA)	8.70	0.65	8.42	1,278,737	38,311,188
2035*	Tooele (NA & AA)	2.98	0.07	1.04	95,230	3,471,453
2035*	Weber (NA)	1.75	0.12	1.96	275,639	6,554,101
	Total	17.56	1.06	14.41	2,073,599	62,122,050

NA = Nonattainment Area County Portion

AA = Attainment Area County Portion

* Gasoline 10 PPM Sulfur

** PM 2.5 = PM 2.5 Exhaust, Brakewear, and Tirewear

***VOC = VOC does not include Refueling Displacement and Spillage

MVEB Year Selection

The conformity regulation (40 CFR 93.118(b)(2)) requires that the last year of the maintenance plan be used as a MVEB. Intermediate MVEB years can be established within the maintenance plans but are not required. The 2026 analysis year will not be a MVEB year but the maintenance plan consists of a qualitative finding that there are no factors which would cause or contribute to a new violation or exacerbate an existing violation in the years before the last year of the maintenance plan (2035). The qualitative finding for 2026 is found in **Section IX.A.36.c.4(a)(i) of the Utah State Implementation Plan: PM_{2.5} Maintenance Provisions for the Salt Lake City, UT Nonattainment Area**.

MVEB Development

The MVEB for the Salt Lake City, UT PM_{2.5} NA is based on the actual Nonattainment Area inventory. The inventory used to demonstrate attainment in 2035 was based on a countywide inventory. This inventory included all of the on-road emissions within Davis, Salt Lake, and Weber counties that are located entirely within the Nonattainment Area. Box Elder and Tooele Counties are unique in that they are located within both the Attainment and Nonattainment Area boundary. In order to construct the Nonattainment Area MVEB adjustments will need to be made to Table 1 to indicate the portion of Box Elder and Tooele county emissions inventories that contribute to the Nonattainment Area.

Nonattainment Area Boundary Adjustments-

For the purposes of transportation conformity, DAQ determined that the MVEB needs to consist of on-road emissions that occur specifically within the Salt Lake PM_{2.5} Nonattainment Area. In order to create the MVEB, DAQ requested that WFRC prepare a revised inventory of emissions for 2035 excluding portions of Box Elder and Tooele Counties that extend beyond the Salt Lake PM_{2.5} Nonattainment Area boundary.

WFRC created a GIS definition for the Salt Lake City, UT PM_{2.5} NA boundary and used this to filter VMT data from the travel demand model. VMT data is used as a surrogate for vehicle population. Tooele County data reveals that 73% of the 2040 VMT (freeways, arterials, and local roads combined) is accumulated within the boundary, and 92% of the Box Elder 2040 VMT is accumulated within the boundary. Note that 2040 VMT data was used as the closest available match to 2035 conditions, and that the VMT percentage varies for different years and by different road types. Using the factors above, the VMT and vehicle population input files for Tooele County and Box Elder County for the year 2035 were modified. The MOVES model was then applied using the modified inputs and the resulting emissions were reported to DAQ. Table 2 below indicates how the vehicle population and VMT adjustments were applied to Box Elder and Tooele Counties.

Table 2. 2035 Box Elder and Tooele Countywide NA and AA On-Road Mobile Emissions Inventory (Tons per Winter Weekday)						
Year	County	NOx	PM 2.5**	VOC***	Vehicle Population	VMT
2035*	Box Elder (NA)	1.46	0.04	0.51	56,809	2,679,025
2035*	Box Elder (AA)	0.14	0.00	0.03		
2035*	Box Elder (NA + AA)	1.60	0.04	0.54		
2035*	Tooele (NA)	1.89	0.05	0.73	69,204	2,522,757
2035*	Tooele (AA)	1.09	0.02	0.31		
2035*	Tooele (NA + AA)	2.98	0.07	1.04		

NA = Nonattainment Area County Portion

AA = Attainment Area County Portion

* Gasoline 10 PPM Sulfur

** PM 2.5 = PM 2.5 Exhaust, Brakewear, and Tirewear

Safety Margin

The transportation conformity regulations found in 40 CFR 93.102 requires that the PM_{2.5} SIP include motor vehicle emissions budgets for PM_{2.5} precursor emissions of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC), and direct PM_{2.5} (primary exhaust PM_{2.5} + brake and tire wear) emissions. Budgets for VOC emissions are required because UDAQ has identified VOCs as a PM_{2.5} precursor that significantly impact PM_{2.5} concentrations.

EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify explicitly the amount by which motor vehicle emissions could be higher while still demonstrating compliance with the maintenance requirement. These additional emissions that can be allocated to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101, safety margin represents the amount of emissions by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for demonstrating maintenance. The implementation plan can then allocate some or all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

WFRC requested UDAQ to determine whether there is a safety margin present in the 2035 inventory that was constructed for the Salt Lake City, UT PM_{2.5} Nonattainment Area. The safety margin determination identifies additional on-road mobile source emissions of PM_{2.5} precursors of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC), and direct PM_{2.5} (primary exhaust PM_{2.5} + brake and tire wear) combined with the 2035 inventory of emissions that satisfy air quality attainment. The requested safety margin emissions are identified below in Table 3.

Table 3. Salt Lake City, UT PM_{2.5} NA Inventory and NA Safety Margin with final MVEB				
Year	County	NOx	PM 2.5**	VOC***
2035*	Box Elder ****	1.46	0.04	0.51
2035*	Davis	2.53	0.18	2.45
2035*	Salt Lake	8.70	0.65	8.42
2035*	Tooele ****	1.89	0.05	0.73
2035*	Weber	1.75	0.12	1.96
	Total	16.33	1.04	14.07
	Safety Margin Request	5.303	0.34	6.50
	Salt Lake City, UT PM _{2.5} NAA MVEB	21.63	1.38	20.57

* Gasoline 10 PPM Sulfur

** PM 2.5 = PM 2.5 Exhaust, Brakewear, and Tirewear

***VOC = VOC does not include Refueling Displacement and Spillage

**** Nonattainment Portion of Box Elder and Tooele Counties

Modeling Demonstration

In order to model the MVEB and safety margin request UDAQ needed to create a more specific inventory than what was initially constructed. The initial modeling was done using countywide level emissions. The MVEB and safety margin request was done specifically for the Salt Lake City, UT PM_{2.5} NA. In order to run the inventory in CAMx DAQ had to construct a nonattainment and attainment countywide emissions inventories for Box Elder, Davis, Salt Lake, Weber, and Tooele counties. Table 4 below shows how the nonattainment on-road emissions were adjusted to include the requested safety margin within the Nonattainment and Attainment Areas. Table 3 and 4 indicate how the final MVEB was derived. The safety margin request and the final MVEB is located in **Section IX.A.36.c.4(a)(i) of the Utah State Implementation Plan: PM_{2.5} Maintenance Provisions for the Salt Lake City, UT Nonattainment Area.**

Table 4. 2035 CAMX Emissions Worksheet

NOx Emissions Worksheet													
Year	County	Countywide Inventories	BE and TO reduced to NAA	donut %	Safety Margin	% of NAA emissions	NAA adjust additional emissions	NAA only with safety margin (NOx MVEB)	% of countywide emissions	Safety margin request scaled to County wide emissions	Amt of Safety Margin to add County wide	Total Final County Wide	
2035*	Box Elder	1.60	1.46	91.25%		8.94%	0.47	1.93	9.11%		0.52	2.12	32.47%
2035*	Davis	2.53	2.53			15.49%	0.82	3.35	14.41%		0.82	3.35	32.47%
2035*	Salt Lake	8.70	8.70			53.28%	2.83	11.53	49.54%		2.83	11.53	32.47%
2035*	Tooele	2.98	1.89	63.42%		11.57%	0.61	2.50	16.97%		0.97	3.95	32.47%
2035*	Weber	1.75	1.75			10.72%	0.57	2.32	9.97%		0.57	2.32	32.47%
	Total	17.56	16.33		5.303		5.30	21.63		5.70		23.26	

PM 2.5 Emissions Worksheet													
Year	County	PM2.5	BE and TO reduced to NAA	donut %	Safety Margin	% of NAA emissions	NAA adjust additional emissions	NAA only with safety margin (PM2.5 MVEB)	% of countywide emissions	Safety margin request scaled to County wide emissions	Amt of Safety Margin to add County wide	Total Final County Wide	
2035*	Box Elder	0.04	0.04	100.00%		3.85%	0.01	0.05	3.75%		0.01	0.05	32.62%
2035*	Davis	0.18	0.18			17.31%	0.06	0.24	16.85%		0.06	0.24	32.62%
2035*	Salt Lake	0.65	0.65			62.50%	0.21	0.86	60.86%		0.21	0.86	32.62%
2035*	Tooele	0.07	0.05	71.43%		4.81%	0.02	0.07	6.55%		0.02	0.09	32.62%
2035*	Weber	0.12	0.12			11.54%	0.04	0.16	11.24%		0.04	0.16	32.62%
	Total	1.06	1.04		0.34		0.33	1.38		0.35		1.41	

VOC Emissions Worksheet													
Year	County	VOC	BE and TO reduced to NAA	donut %	Safety Margin	% of NAA emissions	NAA adjust additional emissions	NAA only with safety margin (VOC MVEB)	% of countywide emissions	Safety margin request scaled to County wide emissions	Amt of Safety Margin to add County wide	Total Final County Wide	
2035*	Box Elder	0.54	0.51	94.44%		3.62%	0.24	0.75	3.75%		0.25	0.79	46.20%
2035*	Davis	2.45	2.45			17.41%	1.13	3.58	17.00%		1.13	3.58	46.20%
2035*	Salt Lake	8.42	8.42			59.84%	3.89	12.31	58.43%		3.89	12.31	46.20%
2035*	Tooele	1.04	0.73	70.19%		5.19%	0.34	1.07	7.22%		0.48	1.52	46.20%
2035*	Weber	1.96	1.96			13.93%	0.91	2.87	13.60%		0.91	2.87	46.20%
	Total	14.41	14.07		6.50		6.50	20.57		6.66		21.07	