2007 Chugiak-Eagle River
Long-Range Transportation Plan
and
2006-2008 Transportation Improvement Program

PM-10 Air Quality Conformity Determination

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Introduction

This document provides the analysis and conclusions regarding the PM-10 air quality conformity determination for the 2007 Update of the Chugiak-Eagle River Long-Range Transportation Plan and 2006-2008 Transportation Improvement Program pursuant to 40 CFR Part 93.

AMATS Planning Program

Transportation planning efforts in the Municipality of Anchorage are conducted under the auspices of the Anchorage Metropolitan Area Transportation Solutions (AMATS). The AMATS planning process consists of two principal parts; the Long-Range Transportation Plan (LRTP) and the Transportation Improvement Program (TIP). The LRTP is the key planning document used by AMATS to plan the development and implementation of transportation system improvements 20 years into the future. There are currently two Long-Range transportation Plans covering the AMATS area: The Anchorage Bowl LRTP and the Chugiak-Eagle River LRTP. The Anchorage Bowl LRTP, with its associated Carbon Monoxide Air Quality Conformity Report, was most recently adopted in December 2005.

The 2007 Chugiak-Eagle River Long-Range Transportation Plan, which is the subject of this PM-10 Air Quality Conformity Report, is an update of the approved 2003 Plan. The objective of the Plan is to create a balanced transportation system that meets the future travel demands of the community through the support of roadway, transit, and complementary services while enhancing area safety, meeting environmental standards, and reducing the impacts on residential neighborhoods. The update process involved review and revision of the land use assumptions and projections used to forecast travel needs for this subarea of the Municipality of Anchorage as well as an extensive public review process.

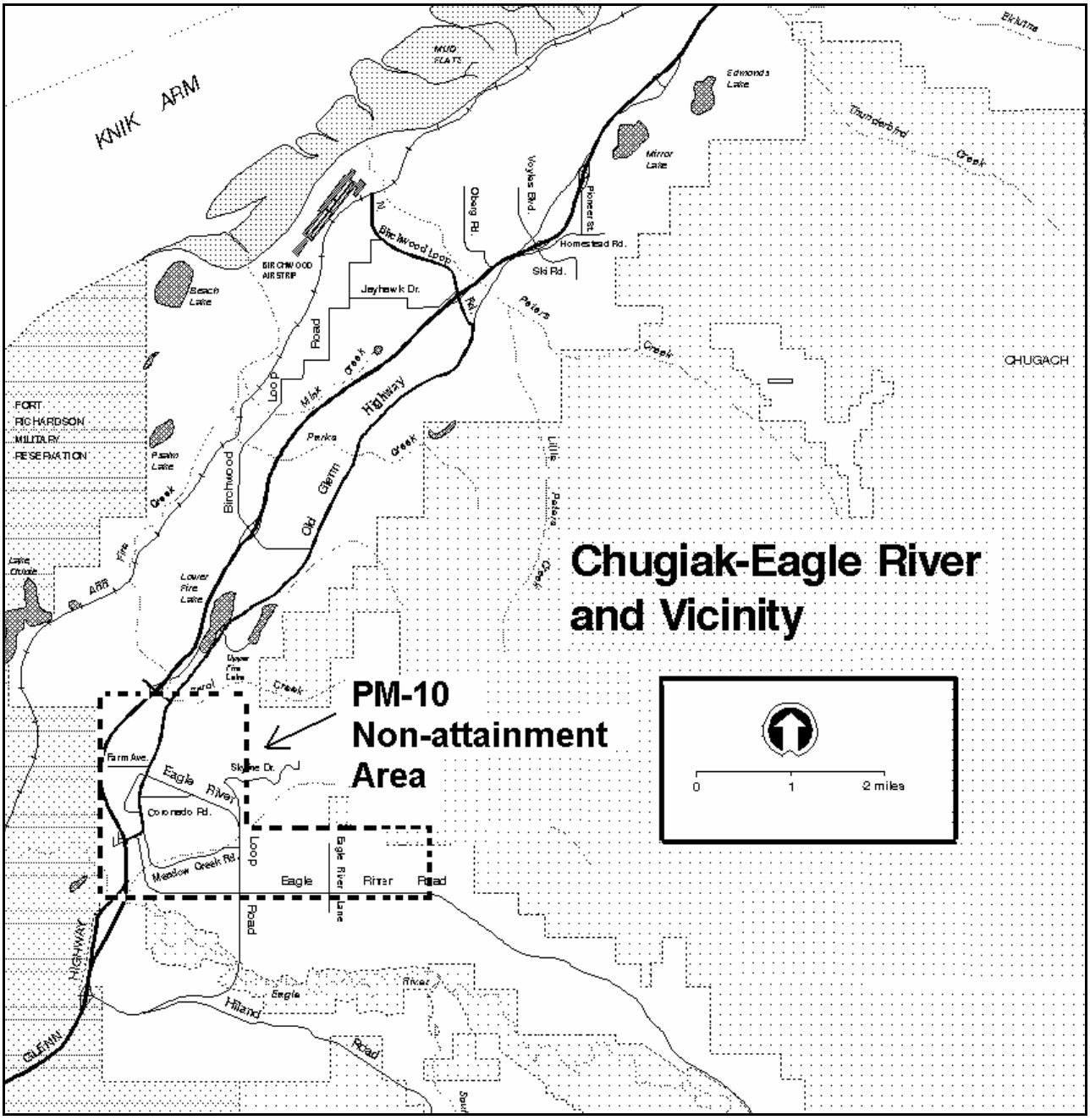
The Transportation Improvement Program (TIP) is short-range programming document. This federally mandated document must be updated at least once every two years in order for AMATS to qualify for FHWA and FTA funding. AMATS adopted a new TIP that spans the years 2006 to 2008 in March 2006. The new TIP allocates money to roadway, transit, trail, and Congestion Management and Air Quality projects within the AMATS planning area. Several of these projects are located within the Eagle River PM-10 non-attainment area. This PM-10 Air Quality Conformity Report also serves as an update of the previously approved PM-10 Air Quality Conformity Report completed at the time of the 2006-2008 TIP adoption.

PM-10 Non-Attainment Status

The U.S. Environmental Protection Agency found the Municipality of Anchorage to be in violation of the 24-hour National Ambient Air Quality Standard (NAAQS) for PM-10 in 1987. A PM-10 attainment plan was prepared in 1992 and was later approved by EPA as an amendment to the Alaska State Implementation Plan. The PM-10 non-attainment area, shown in Figure 1, encompasses the Eagle River central business district and surrounding residential areas including the lower portion of the Eagle River Valley. The plan identified emissions from unpaved roads as the primary source of PM-10. In the late 1980's, PM-10 concentrations sometimes exceeded the NAAQS especially during dry, snow-less periods in the fall. An ambitious road paving and surfacing program was designed and implemented to reduce dust from the 22 miles of gravel roadway in the non-attainment area. By 1992, the majority of these

Figure 1

Eagle River PM-10 Non-attainment Area

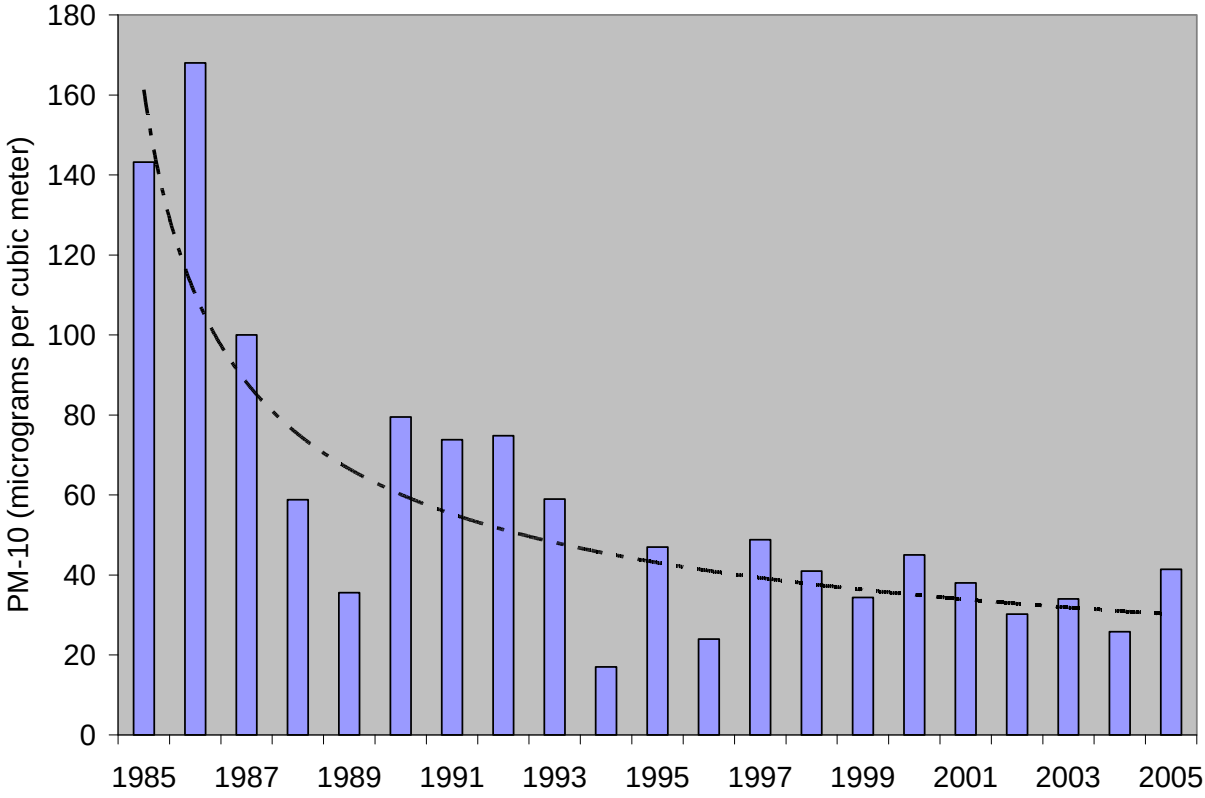


roads had been paved or surfaced with recycled asphalt. As of 2006, there were no remaining unpaved public roads in the nonattainment area.

Since 1989 there have been no official exceedances of the NAAQS standards in Eagle River. Figure 2 shows PM-10 air quality trends measured at the Park Gate site in downtown Eagle River during the peak PM-10 period in the fall (defined October 1 – November 15). PM-10 concentrations have dropped dramatically since the late 1980's. Nevertheless, the Eagle River

Figure 2

Fall Season PM-10 Trend in Eagle River
90th Percentile PM-10 Concentrations at the Park Gate Monitoring Station



area is still designated as a PM-10 non-attainment area. Therefore, transportation plans are required to undergo a PM-10 conformity determination as a part of the approval process for the Chugiak-Eagle River Long Range Plan as well as for any updates of the Transportation Improvement Plan.

Methodology

Federal regulation 40 CFR 93.118 requires that transportation plans be consistent with the motor vehicle emissions budget in the State Implementation Plan (SIP). Because a portion of Eagle River is a designated PM-10 non-attainment area, PM-10 emissions in this area must be less than or equal to the emission budget identified in the SIP through the last year of the transportation plan's forecast period. For the Chugiak-Eagle River Long Range Transportation Plan, this forecast period ends in 2027. This report presents PM-10 emission forecasts for analysis years 2007, 2017, and 2027. The methodology used to perform the required conformity analysis is described below.

Development of Applicable PM-10 Emission Budget

The Alaska SIP was amended with the addition of the Eagle River PM-10 Control Plan in 1992 before emission budgets were required as part of the conformity determination process. Thus, there is no emission budget explicitly identified in the SIP. In the absence of an explicit emission budget, 1993 Transportation Conformity Rule, (58 FR 62188,November 24, 1993) allows the emission inventory and attainment demonstration to be used as an emission budget. This approach was used in the conformity analysis performed for a previous Chugiak- Eagle River Long Range Transportation Plan update in 2003.

The emission budget can be readily derived from the 1987 emission inventory and associated attainment demonstration in the SIP. Because monitoring data indicated that the environmental conditions and sources contributing to PM-10 violations in the late-1980's were distinctly different in the two seasons, the Eagle River PM-10 SIP contains two separate emission inventories for the fall and spring periods. Fall PM-10 violations occurred under calm and dry conditions while spring violations typically occurred under high winds. In the fall emission inventory, the most significant source of PM-10 emissions in 1987 was road dust generated by vehicle travel on unpaved roads. In contrast, the spring season inventory identifies vehicle–generated and wind-generated dust from paved streets heavily laden with winter traction sand as the predominant sources of emissions. The spring and fall emission inventories for the Eagle River PM-10 problem zone are shown below:

Table 1

1987 PM-10 Emission Inventory
Estimated for Peak PM-10 Periods in Spring and Fall

Source	**Fall Emissions (tons per day)**	**Spring Emissions (tons per day)**
Vehicle travel on unpaved Roads	5.01	5.01
Vehicle Travel on paved roads	0.52	9.18
Track-out emissions	1.34	0.00
Vehicle exhaust, brake and tire wear	0.01	0.01
Windblown dust from paved roads	0.00	15.76
Wind blown dust from unvegetated open areas	0.00	4.68
Other (wood burning, space heating, point sources)	0.45	0.45
TOTAL	**7.34**	**35.07**

The Eagle River PM-10 SIP employed the linear rollback method to determine the reduction required to achieve attainment of the national ambient air quality standard. For the SIP, PM-10 monitoring data collected in Eagle River between 1985 and 1988 were examined to determine a "design value" for the spring and fall. This design value was then used in the rollback calculation to determine the amount of emission reduction required to meet the standard in the fall and the spring. An 11% reduction from 1987 emission levels was required to demonstrate attainment during the spring and a 40% reduction was required in the fall. The motor emission budget can be derived from the emission inventory and required emission reductions as follows:

Spring season motor vehicle emission budget:

1987 PM-10 Emissions =	35.07 tons per day
Reduction required to achieve attainment =	11%
Total emission budget = 35.07 – (35.07 x 0.11) =	31.21 tons per day
Emissions from non-motor vehicle related sources[1] =	5.13 tons per day
Net Motor vehicle emission budget =	**26.08 tons per day**

Fall season motor vehicle emission budget:

1987 PM-10 Emissions =	7.34 tons per day
Reduction required to achieve attainment =	40%
Total emission budget = 7.34 – (7.34 x 0.40) =	4.40 tons per day
Emissions from non-motor vehicle related sources =	0.45 tons per day
Net Motor vehicle emission budget =	**3.95 tons per day**

Estimating Spring and Fall PM-10 Emissions in Analysis Years 2007, 2017 and 2027

The methodology used to estimate PM-10 emissions in the analysis years was identical to the methodology employed to develop the 1987 inventory in the PM-10 SIP. Road dust emissions from vehicle travel were estimated using AP-42 emission factors. Most of the road dust-related emission factors in AP-42 have not changed significantly in the 15 years since the SIP was developed.

The latest planning assumptions were used to estimate activity levels (e.g. amount of roadway travel, distribution of travel on paved vs. unpaved roads) for the emission inventory calculations. The Municipality of Anchorage Street Maintenance Department provided an inventory of local roads in Eagle River that tabulated the amount of road miles by surface (i.e. paved, unpaved or chip-sealed). The Anchorage transportation model was used to estimate vehicle miles traveled on paved arterials and freeways within the nonattaiment area. Off-network travel (e.g.VMT on local paved and unpaved local roads) was computed in a manner analogous to that used in the 1987 inventory in the SIP. This method is summarized below:

Off-Network VMT Estimates:

Step A:	Assume the average distance traveled on off-network roads is one kilometer (i.e. the average trip to and from a home in the Eagle River PM-10 problem zone includes one-kilometer (0.62 miles) of travel on local roads before the arterial or freeway network is reached).
Step B:	Assume the average number of trips per household on local roads is 7 per day. This is the same assumption used as the basis to calculate the SIP. (Source: 2002 Anchorage Household Travel Survey)
Step C:	Calculate the number of households projected for the Eagle River PM-10 non-attainment area for the 2027 LRTP planning horizon.
Step D:	Off-network VMT = (# of Households in PM-10 Problem Zone) x (7 trips per day) x (0.62 miles/trip)
Step E:	Allocate off-network VMT in proportion to number of miles of paved and unpaved road within problem zone.

[1] Non-motor vehicle sources excluded from the spring season motor vehicle budget include wind blown dust from unvegetated open area and “other” sources like fireplaces and point sources.

The road paving and surfacing program has eliminated 22 miles of unpaved road since 1987. The effect of this paving program has had a very dramatic effect, particularly on fall season PM-10 emissions. Spring season emissions have been reduced as a consequence of changes to traction sand application methods. The silt content of the winter traction sand has been cut from approximately 8% to less than 1% as a result of tighter Municipal and State and specifications. In addition, traction sand is now treated with magnesium chloride brine before application. This serves to lower the amount of sand that needs to be applied and, because of the hygroscopic properties of the magnesium chloride, reduces the "dustiness potential" of the sanding material. Local studies conducted by the Midwest Research Institute suggest that the use of magnesium chloride may reduce PM-10 emissions from applied traction sand by as much as 80%. For this conformity analysis, the combined impact of sanding practice changes (lower silt content, reduced application rates, and pre-wetting with magnesium chloride) were estimated to result in an 80% reduction in the spring season paved road emission factor. In addition, a 50% reduction in PM-10 emissions from wind blown dust from paved roads was assumed.

Source apportionment analysis, conducted in support of the Eagle River PM-10 SIP, suggests that road dust emissions are the predominant source of emissions in Eagle River. PM-10 emissions from vehicle exhaust, tire and brake wear were assumed to be negligible in the 1987 inventory. This was affirmed in this analysis. MOBILE6.2 was used to estimate the magnitude of these emissions in the PM-10 problem zone. Using worst case assumptions (e.g. diesel fuel sulfur content = 3000 ppm) the vehicle exhaust, tire and brake wear emissions amount to less than 0.02 tons per day or 0.3% of the total PM-10 inventory.

Emission factor computations and assumptions used in this analysis are summarized in the appendix.

Conclusion

The analysis shows that PM-10 emissions in the PM-10 problem zone are expected to be below the spring and fall PM-10 emission budgets derived from the Eagle River PM-10 SIP. Forecast emissions are consistent with the emission budget and meets criteria established in 40 CFR 93.118. The projects included in the 2006-2008 Transportation Improvement Program and 2007 Chugiak-Eagle River Transportation Plan will not contribute to new violations of the national ambient air quality standard (NAAQS) for PM-10, increase the frequency or severity of any existing violations in the problem zone, or delay timely attainment of the NAAQS. Projected spring and fall PM-10 emissions are compared with respective emission budgets in the table below:

Table 2
Comparison of Projected Fall and Spring Season Mobile Source PM-10 Emissions with Emission Budgets

Fall Season				Spring Season		
Year	Mobile Source PM-10 Emissions (tons per day)	Emission Budget (tons per day)	Under Budget?	Mobile Source PM-10 Emissions (tons per day)	Emission Budget (tons per day)	Under Budget?
1987	6.88	3.95	no	29.96	26.10	no
2007	1.10	3.95	yes	18.99	26.10	yes
2017	1.39	3.95	yes	19.54	26.10	yes
2027	1.68	3.95	yes	22.15	26.10	yes

Based on the above discussion, the 2007 Chugiak-Eagle River Long Range Transportation Plan as well as the 2006-2008 Transportation Improvement Program is found to be in conformity with the Federal Clean Air Act as amended in 1990. Furthermore, it has been determined that the proposed transportation improvements will not undermine the ability of the Municipality of Anchorage to achieve compliance with the EPA carbon monoxide standards.

Appendix – AP-42 Emission Factor Assumptions and Computations

Fall Season Emissions Inventory

		VMT by Roadway Type (miles per day)				Fall Emissions (tons per day)											
	Housing Stock	Local Unpaved	Local Paved	Arterials	Glenn Hwy	Unpaved	Local Paved	Arterial	Trackout Arterial	Trackout Local	Tailpipe Exhaust	Brake & Tire Wear	Other Sources	Roadway Windblown Dust	Open Area Windblown Dust	**TOTAL**	**MOBILE SOURCE ONLY**
1987	2,935	7,334	5,403	44,575	31,040	5.01	0.05	0.47	1.18	0.16	0.009	0.002	0.45	0.00	0.00	**7.33**	**6.88**
2007	4,548	0	19,738	68,664	77,532	0.00	0.18	0.92	0.00	0.00	0.002	0.002	0.70	0.00	0.00	**1.79**	**1.10**
2017	4,908	0	21,299	83,370	107,640	0.00	0.19	1.20	0.00	0.00	0.001	0.002	0.75	0.00	0.00	**2.14**	**1.39**
2027	5,267	0	22,859	98,076	137,748	0.00	0.20	1.48	0.00	0.00	0.001	0.002	0.81	0.00	0.00	**2.49**	**1.68**

Spring Season Emissions Inventory

		VMT by Roadway Type (miles per day)				Spring Emissions (tons per day)											
	Housing Stock	Local Unpaved	Local Paved	Arterials	Glenn Hwy	Unpaved	Local Paved	Arterial	Trackout Arterial	Trackout Local	Tailpipe Exhaust	Brake & Tire Wear	Other Sources	Roadway Windblown Dust	Open Area Windblown Dust	**TOTAL**	**MOBILE SOURCE ONLY**
1987	2,935	7,334	5,403	44,575	31,040	5.01	0.89	8.29	0.00	0.00	0.01	0.00	0.45	15.76	4.68	**35.09**	**29.96**
2007	4,548	0	19,738	68,664	77,532	0.00	0.66	2.30	0.00	0.00	0.00	0.00	0.70	16.01	4.68	**24.36**	**18.99**
2017	4,908	0	21,299	83,370	107,640	0.00	0.71	2.80	0.00	0.00	0.00	0.00	0.75	16.01	4.68	**24.97**	**19.54**
2027	5,267	0	22,859	98,076	137,748	0.00	0.77	5.36	0.00	0.00	0.01	0.01	0.81	16.01	4.68	**27.64**	**22.15**

AP-42 Emission Factors used in Computations

Fall Emission Inventory					
Source	**Units**	**1987**	**2007**	**2017**	**2027**
Unpaved (gravel) road	lbs/VMT	1.367	1.367	1.367	1.367
Chip sealed local street	lbs/VMT	0.018	0.018	0.018	0.018
RAP-treated gravel road	lbs/VMT	0.273	0.273	0.273	0.273
Dirty paved arterial adjacent to gravel road	lbs/VMT	0.330	0.330	0.330	0.330
Dirty paved arterial adjacent to gravel road	lbs/VMT	0.330	0.330	0.330	0.330
Paved local road	lbs/VMT	0.018	0.018	0.018	0.018
Paved arterial (include Glenn Hwy)	lbs/VMT	0.013	0.013	0.013	0.013
Fleet-wide average tailpipe exhaust emissions	g/mi	0.092	0.022	0.013	0.011
Fleet-wide average tire and brake wear emissions	g/mi	0.021	0.021	0.021	0.021
Windblown Dust from unpaved roads	tons/acre exposed	0.000	0.000	0.000	0.000
Windblown Dust from open, unvegetated areas	tons/acre exposed	0.000	0.000	0.000	0.000
Windblown Dust from paved roads	tons/acre exposed	0.000	0.000	0.000	0.000

Spring Emission Inventory					
Source	**Units**	**1987**	**2007**	**2017**	**2027**
Unpaved (gravel) road	lbs/VMT	1.367	1.367	1.367	1.367
Chip sealed local street	lbs/VMT	0.330	0.067	0.067	0.067
RAP-treated gravel road	lbs/VMT	0.330	0.330	0.330	0.330
Dirty paved arterial adjacent to gravel road	lbs/VMT	0.330	0.330	0.330	0.330
Dirty paved arterial adjacent to gravel road	lbs/VMT	0.330	0.330	0.330	0.330
Paved local road	lbs/VMT	0.330	0.067	0.067	0.067
Paved arterial (exclude Glenn Hwy)	lbs/VMT	0.330	0.067	0.067	0.067
Glenn Highway	lbs/VMT	0.060	0.030	0.030	0.030
Fleet-wide average tailpipe exhaust emissions	g/mi	0.092	0.022	0.013	0.011
Fleet-wide average tire and brake wear emissions	g/mi	0.021	0.021	0.021	0.021
Windblown Dust from unpaved roads	tons/acre exposed	0.056	0.056	0.056	0.056
Windblown Dust from paved roads	tons/acre exposed	0.125	0.063	0.063	0.063
Windblown Dust from open, unvegetated areas	tons/acre exposed	0.075	0.075	0.075	0.075