

Appendix F

**Methodology for Estimating PM₁₀ Emissions
from Point, Area, and Mobile Sources
in El Paso County**

Methodology for Estimating PM_{10} Emissions
from
Point, Area, and Mobile Sources
in El Paso County

Point Sources

The methodology for estimating PM_{10} emissions from point sources in El Paso are listed below by Standard Industrial Classification (SIC) Major Group.

SIC Group	Category	Method
29	Petroleum Refining	AP-42, Sec. 9.1
32	Concrete Products	AP-42, Sec. 8.10
33	Primary Metal Industries	AP-42, Sec. 7.3, 7.5
49	Electric Services	AP-42, Sec. 1.3, 1.4
50	Wholesale Trade	Stack Tests, Company estimate
97	National Security	AP-42, Sec. 11.2.1

Area Sources

The methodology for estimating PM_{10} emissions from area sources in El Paso is discussed by Category.

Dust Reentrainment from Roads

Unpaved Roads

AP-42, Sec. 11.2.1.2

$$E = k(5.9) \frac{(s)}{(12)} \frac{(S)}{(30)} \frac{(W)}{(3)}^{0.7} \frac{(w)}{(4)}^{0.5} \frac{(365-p)}{(365)}$$

Where:

k = particle size multiplier	= 0.36
s = % silt content of road surface material	= 5
S = mean vehicle speed	= 25 mph
W = mean vehicle weight	= 3 tons
w = mean number of wheels	= 6 wheels
p = no. days with 0.01 inches precip./yr	= 20 days

$$E = 0.36(5.9) \frac{(0.05)}{(12)} \frac{(25)}{(30)} \frac{(3)}{(3)}^{0.7} \frac{(6)}{(4)}^{0.5} \frac{(365-20)}{(365)} = 1.02 \text{ lbs./VMT}$$

$$\frac{1.02 \text{ lbs.} (3,000,000,000 \text{ VMT}) (0.001) (\text{Tons})}{\text{VMT} (2000 \text{ lbs.}) (\text{year})} = 15 \text{ tons/year}$$

Assumption: 0.1% of urban VMT is on unpaved roads in El Paso. Emissions from unpaved roads in El Paso are estimated to be 15 tons per year.

Paved Roads

AP-42, Section 11.2.5.3, Table 11.2.5.4 was used to determine PM_{10} emission factors and specific roadway categories in El Paso. PM_{10} emissions by each roadway category are listed below. The percent vehicles travelling each category was provided by the TSDHPT Region 10 office in El Paso.

Emission estimates:

1986 Total VMT in El Paso County: 3,339,552,238

EQUATIONS

Freeways/expressways:

$$\frac{3,339,552,238 \times 0.32 \times 0.00067}{2000} = 358 \text{ tons/year}$$

Major streets/highways:

$$\frac{3,339,552,238 \times 0.47 \times 0.0064}{2000} = 5,023 \text{ tons/year}$$

Collector streets:

$$\frac{3,339,552,238 \times 0.13 \times 0.013}{2000} = 2,822 \text{ tons/year}$$

Local streets:

$$\frac{3,339,552,238 \times 0.08 \times 0.018}{2000} = 2,405 \text{ tons/year}$$

$$\text{Total} = 10,608 \text{ tons/year}$$

Fuel Combustion

This category includes emissions resulting from residential, commercial, and institutional distillate fuel use. These emission estimates are proportional to the population of the county. Commercial and institutional fuel use includes consumption by establishments such as shops and public and private institutions such as schools and libraries. The emissions are dependent upon the amount of distillate used and are assumed to be proportional to the population.

Solid Waste Disposal

This category represents the emissions from disposal by incineration of solid waste produced by commercial establishments and institutions. The TACB area source model used 15 tons of solid waste per year per 1000 population and the AP-42 emissions factors to calculate emissions.

Residential Wood Burning

Emission estimates from wood burning are based on the assumption that 30% of the single family units have fireplaces and each burns 0.5 cord of wood per year. These emissions are proportional to the population of the county.

Structural Fires

Structural fire emissions are estimated and distributed by assuming four structural fires per 1000 population and 10% of the structure is estimated to be consumed in the fire.

Agricultural Tilling

Emissions from agricultural tilling are proportional to the number of acres of tilled land and the rain activity. In 1986 El Paso County had 46,646 acres in tillage.

Mobile Sources

Estimation of PM_{10} emissions from diesel combustion in internal combustion engines based on sales apportionment is shown below:

Total Diesel Sold: 96 million gallons/year

Amount consumed in El Paso County: 48 million gallons/year

Assume railroad switching yards consume 10% of total diesel consumed in El Paso.

Locomotive Emissions

AP-42, 4th Edition, Table 3.4-1. Emission factor for large bore diesel engines: 50 lb/1000 gallons diesel consumed.

$$\frac{(4,800,000 \text{ gal.}) (50 \text{ lbs.}) (\text{Ton})}{(1,000 \text{ gal.}) (2,000 \text{ lbs.})} = 120 \text{ Tons per year}$$

All Others

AP-42, 4th Edition, Table 3.3-1. Emission factor for small bore diesel engines: 33.5 lb/1000 gallons diesel consumed.

$$\frac{(43,200,000 \text{ gal.}) (33.5 \text{ lbs.}) \text{ Ton}}{(1,000 \text{ gal.}) (2,000 \text{ lbs.})} = 724 \text{ Tons per year}$$

Estimation of mobile emissions using A Program to Calculate Size Specific Particulate Emissions for Mobile Sources--A User's Guide (EPA 460/3-85-007 August 1985) and an accompanying computer program is shown in the following pages.

El Paso

URBAN

Mobile PM₁₀ Emissions

CALCULATIONS FOR YEAR 1986
 SPEED 32.0 MPH
 PARTICLE CUTOFF = 10.00 MICRONS
 DRIVING CONDITIONS = TRANSIENT

FLAG SETTINGS

TAMPERING RATES = NORM MISFUELING RATES = NORM
 VMT MIXTURE = SCEN MILEAGE & REGIST. = NORM
 Inspection/Maintenance SPECIAL CONDITIONS = NORM
 (I/M) PROGRAM = YES

PARTICULATE EMISSIONS (GRAMS/MILE) BY VEHICLE CLASS

VEH. CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL	VMT FRAC.	VMT WT. TOTAL
LDV	0.0086	0.0209	0.0103	0.0142	0.0541	0.7290	0.0394
LDT1	0.0152	0.0248	0.0091	0.0241	0.0733	0.1500	0.0110
LDT2	0.0308	0.0240	0.0087	0.0241	0.0876	0.0850	0.0074
HDGV	0.0971	0.1398	0.0023	0.0000	0.2392	0.0140	0.0033
HDDT	0.0000	0.0000	0.0000	1.8739	1.8739	0.0140	0.0262
MC	0.0305	0.0000	0.0000	0.0000	0.0305	0.0080	0.0002

Total URBAN PM₁₀ Emissions (grams/mile)

TOTAL BRAKE PARTICULATES = 0.0125
 TOTAL TIRE PARTICULATES = 0.0020
 TOTAL VMT WEIGHTED PARTICULATE EMISSIONS = 0.1022

PARTICULATE FRACTION BY VEHICLE CLASS

VEH. CLASS	LEAD	ORGANIC	SULFATE	DIESEL
LDV	0.1585	0.3873	0.1912	0.2629
LDT1	0.2077	0.3388	0.1247	0.3288
LDT2	0.3518	0.2743	0.0989	0.2751
HDGV	0.4059	0.5846	0.0095	0.0000
HDDT	0.0000	0.0000	0.0000	1.0000
MC	1.0000	0.0000	0.0000	0.0000

El Paso

RURAL

Mobile PM₁₀ Emissions

CALCULATIONS FOR YEAR 1986
 SPEED 53.0 MPH
 PARTICLE CUTOFF = 10.00 MICRONS
 DRIVING CONDITIONS = CRUISE

FLAG SETTINGS

TAMPERING RATES = NORM MISFUELING RATES = NORM
 VMT MIXTURE = SCEN MILEAGE & REGIST. = NORM
 I/M PROGRAM = YES SPECIAL CONDITIONS = NORM

PARTICULATE EMISSIONS (GRAMS/MILE) BY VEHICLE CLASS

VEH.CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL	VMT FRAC.	VMT WT. TOTAL
LDV	0.0072	0.0209	0.0121	0.0142	0.0545	0.7290	0.0397
LDT1	0.0128	0.0248	0.0110	0.0241	0.0727	0.1500	0.0109
LDT2	0.0259	0.0240	0.0108	0.0241	0.0847	0.0850	0.0072
HDGV	0.0971	0.1398	0.0023	0.0000	0.2392	0.0140	0.0033
HDDT	0.0000	0.0000	0.0000	1.8739	1.8739	0.0140	0.0262
MC	0.0305	0.0000	0.0000	0.0000	0.0305	0.0080	0.0002

Total RURAL PM₁₀ Emissions (grams/mile)

TOTAL BRAKE PARTICULATES = 0.0125
 TOTAL TIRE PARTICULATES = 0.0020
 TOTAL VMT WEIGHTED PARTICULATE EMISSIONS = 0.1022

PARTICULATE FRACTION BY VEHICLE CLASS

VEH.CLASS	LEAD	ORGANIC	SULFATE	DIESEL
LDV	0.1321	0.3843	0.2227	0.2609
LDT1	0.1758	0.3416	0.1510	0.3315
LDT2	0.3053	0.2834	0.1270	0.2843
HDGV	0.4059	0.5846	0.0095	0.0000
HDDT	0.0000	0.0000	0.0000	1.0000
MC	1.0000	0.0000	0.0000	0.0000

In 1986, vehicles in El Paso travelled a total of 3,289,000,000 miles--3,000,000,000 miles were urban travel and 289,000,000 miles were rural travel. EPA's document A Program to Calculate Size Specific Particulate Emissions for Mobile Sources--A User's Guide estimates PM₁₀ emissions in both rural and urban areas as follows:

Total Rural PM₁₀ Emissions:

$$\frac{(0.1022 \text{ gm}) (289,000,000 \text{ miles}) (\text{pound}) (\text{ton})}{(\text{mile}) (\text{year}) (453.6 \text{ gm}) (2000 \text{ pounds})} = 33 \text{ TPY}$$

Total Urban PM₁₀ Emissions:

$$\frac{(0.1022 \text{ gm}) (3,000,000,000 \text{ miles}) (\text{pound}) (\text{ton})}{(\text{mile}) (\text{year}) (453.6 \text{ gm}) (2000 \text{ pounds})} = 339 \text{ TPY}$$

Estimation of diesel emissions from this program was determined as follows:

RURAL PARTICULATE EMISSIONS (GRAMS/MILE) BY VEHICLE CLASS

VEH.CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL	VMT FRAC.
LDV	0.0072	0.0209	0.0121	0.0142	0.0545	0.7290
LDT1	0.0128	0.0248	0.0110	0.0241	0.0727	0.1500
LDT2	0.0259	0.0240	0.0108	0.0241	0.0847	0.0850
HDGV	0.0971	0.1398	0.0023	0.0000	0.2392	0.0140
HDDT	0.0000	0.0000	0.0000	1.8739	1.8739	0.0140
MC	0.0305	0.0000	0.0000	0.0000	0.0305	0.0080

For each vehicle class:

$$\frac{(\text{emission factor: gm}) (\text{VMT FRAC}) (289,000,000 \text{ Miles}) (\text{tons})}{(\text{mile}) (\text{year}) (453.6 \text{ gm}) (2000 \text{ pounds})} = \text{TPY}$$

RURAL PM₁₀ EMISSIONS (TPY)

VEH.CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL
LDV	2	5	3	3	13
LDT1	1	1	1	1	4
LDT2	1	1	0	1	3
HDGV	0	1	0	0	1
HDDT	0	0	0	8	8
MC	0	0	0	0	0
Total:	4	8	4	13	29

Subtotal RURAL PM₁₀ emissions: 29 TPY
Tire and Brake emissions: 4 TPY
Total RURAL PM₁₀ emissions: 33 TPY

URBAN PARTICULATE EMISSIONS (GRAMS/MILE) BY VEHICLE CLASS

VEH.CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL	VMT FRAC.
LDV	0.0086	0.0209	0.0103	0.0142	0.0541	0.7290
LDT1	0.0152	0.0248	0.0091	0.0241	0.0733	0.1500
LDT2	0.0308	0.0240	0.0087	0.0241	0.0876	0.0850
HDGV	0.0971	0.1398	0.0023	0.0000	0.2392	0.0140
HDDT	0.0000	0.0000	0.0000	1.8739	1.8739	0.0140
MC	0.0305	0.0000	0.0000	0.0000	0.0305	0.0080

For each vehicle class:

$$\frac{(\text{emission factor: gm}) (\text{VMT FRAC}) (3,000,000,000 \text{ Miles}) (\text{tons})}{(\text{mile}) (\text{year}) (453.6 \text{ gm}) (2000 \text{ pounds})} = \text{TPY}$$

URBAN PM₁₀ EMISSIONS (TPY)

VEH.CLS	LEAD	ORGANIC	SULFATE	DIESEL	TOTAL
LDV	21	50	25	34	130
LDT1	8	12	5	12	37
LDT2	9	7	2	7	25
HDGV	4	6	0	0	10
HDDT	0	0	0	87	87
MC	1	0	0	0	1
Total:	43	75	32	140	290

Subtotal URBAN PM₁₀ emissions: 290 TPY
 Tire and Brake emissions: 49 TPY
 Total URBAN PM₁₀ emissions: 339 TPY

Subtotal all PM₁₀ emissions:
 Rural: 29 TPY
 Urban: 290 TPY
 Tire and Brake wear: 53 TPY

Grand Total All PM₁₀ emissions: 372 TPY