

Massachusetts

2011 Periodic Emissions Inventory of VOC, NO_x, CO, SO₂, PM₁₀, PM_{2.5} and NH₃

February 2018

SECTION 3

STATIONARY AREA SOURCES

(continued)

3.6 FUGITIVE DUST

MassDEP adopted EPA's 2011 emissions for the fugitive dust categories that were reported in EPA's National Emissions Inventory (NEI). The data and documentation for the seven fugitive dust categories are summarized here in this section and the full description and supporting files can be accessed at EPA's FTP website: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>.

Fugitive or wind-blown dust includes particulate matter (PM) emissions from the following categories.

1. Construction activities – Residential
2. Construction activities – Non-residential
3. Construction activities – Roads
4. Mining & Quarrying
5. Paved Roads
6. Unpaved Roads
7. Agricultural Tilling

Construction activities contribute to PM emissions due to soil disturbance. MassDEP adopted the EPA PM emissions for the residential, nonresidential, and road construction subcategories as presented in Tables 3.6-1 to 3.6-3. EPA's methodologies were based on Section 4.8.1.7.2 of the EPA's *Procedures Document for National Emissions Inventory, Criteria Air Pollutants (1985-1999)*.

The parameters used to calculate the emissions are the acres of land disturbed and the construction activity duration. These parameters are not generally available directly; they are estimated from other activity data.

The emission factors used are representative of uncontrolled emissions. The base emissions are adjusted according to the following formula to account for the effect of moisture, specific silt content of the soil in each county, and control efficiency:

$$\text{Adjusted Emission} = \text{Base Emissions} * (s/0.09) * (24/PE) * CE$$

s = silt content (by county)

PE = precipitation evaporation value for county

CE = control efficiency for PM10, PM2.5 (assumed to be 0.50, EPA default value)

Silt values were obtained from USGS data (please refer to the information and references provided in Section 3.6-7 of this document - Agricultural Tilling). A control efficiency of 50% was assumed (EPA default value). The precipitation evaporation value was assumed to be 126 calculated from annual average temperature and moisture values for the entire state.

3.6-1 CONSTRUCTION ACTIVITIES: RESIDENTIAL

The following is a summary of EPA's 2011 NEI documentation for residential construction, which can be found at: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>

Emissions from residential construction activity are a function of the acreage disturbed and volume of soil excavated for residential construction. Residential construction activity is developed from data obtained from the U.S. Department of Commerce (DOC) Bureau of the Census.

For this source category, the following SCC was assigned.

Source Classification Code	SCC Level One	SCC Level Two	SCC Level Three	SCC Level Four
2311010000	Industrial Processes	Construction: SIC 15 - 17	General Building Construction	Total

There are two activity factors for this SCC: acres of surface soil disturbed and volume of soil removed for basements.

Table 3.6-2 of EPA's documentation for this section provides emission factors according to building size (which determines the duration of construction). Emission factors are presented in tons of PM per acre/month. Regional variances in construction emissions are corrected using soil moisture level and silt content using 30-year precipitation-evaporation.

Residential construction PM emissions are summarized by county in Table 3.6-1.

3.6-2 CONSTRUCTION ACTIVITIES: NON-RESIDENTIAL

The following is a summary of EPA's 2011 NEI documentation for non-residential construction which can be found at: <http://ftp.epa.gov/EmisInventory/2011nei/doc/>

Emissions from non-residential construction activity are a function of the acreage disturbed for non-residential construction.

For this source category the following SCC was assigned.

Source Classification Code	SCC Level One	SCC Level Two	SCC Level Three	SCC Level Four
2311020000	Industrial Processes	Construction: SIC 15 - 17	Heavy Construction	Total

According to the EPA documentation for this category, the 2011 National Value of Non-residential construction was obtained from the *Annual Value of Construction Put in Place in the US*. The national value of non-residential construction put in place (in millions of dollars) was allocated to counties using county-level non-residential construction (NAICS Code 2362) employment data that was obtained from *County Business Patterns (CBP)*. Because some counties employment data was withheld due to privacy concerns, the following procedure was adopted:

1. State totals for the known county level employees were subtracted from the number of employees reported in the state level version of CBP. This results in the total number of withheld employees in the state.
2. A starting guess of the midpoint of the range code was used (so for instance in the 1-19 employees range, a guess of 10 employees would be used) and a state total of the withheld counties was computed.
3. A ratio of guessed employees (Step 2) to withheld employees (Step 1) was then used to adjust the county level guesses up or down so the state total of adjusted guesses should match state total of withheld employees (Step 1)

Initial PM₁₀ emissions from construction of non-residential buildings were calculated using an emission factor of 0.19 tons/acre-month. The duration of construction activity for non-residential construction is assumed to be 11 months. Once PM₁₀ emissions are developed, PM₂₅ emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions.

Regional variances in construction emissions are corrected using soil moisture level and silt content using 30-year precipitation-evaporation.

Nonresidential construction PM emissions are summarized by county in Table 3.6-2.

3.6-3 CONSTRUCTION ACTIVITIES: ROAD CONSTRUCTION

The following is a summary of EPA's 2011 NEI documentation for road construction which can be found at: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>

Emission estimates from road construction activity are based on an emission factor for heavy construction and an estimate of the acres of road disturbed by construction. Estimates of the acres of road disturbed were based on the capital outlay expenditure by road type, estimates of the average dollar-per-mile spent on various road construction projects by road type, and a miles-to-acres conversion factor by road type. State-level estimates of acres disturbed are distributed to counties based on the 2010 Housing Starts in each county.

State expenditure data for capital outlay are available from Federal Highway Administration (FHWA) for six road classifications. EPA has used data from the North Carolina Department of Transportation for the dollar per mile (\$/mile) spent on road construction. Because Massachusetts does not compile such data, EPA values have been used.

An emission factor of 0.42 tons PM₁₀/acre/month (EPA default value) has been assumed to account for the high level of soil disturbance from the cut and fill activity at the road construction sites. It is also assumed that the road construction projects last for a period of 12 months.

Road construction PM emissions are presented in Table 3.6-3.

3.6-4. MINING AND QUARRYING

The following is a summary of EPA's 2011 NEI documentation for Mining and Quarrying which can be found at: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>

Mining and quarrying activities produce particulate emissions due to the variety of processes used to extract the ore and associated overburden, including drilling and blasting, loading and unloading, and overburden replacement. Mining and quarrying includes dimensional and crushed stone operations as well as sand and gravel extraction.

Fugitive dust emissions from mining and quarrying operations are the sum of emissions from the mining of metallic and nonmetallic ores and coal. Each of these mining operations has specific emission factors accounting for the different means by which the resources are extracted.

For this source category the following SCC was assigned:

Source Classification Code	SCC Level One	SCC Level Two	SCC Level Three	SCC Level Four
2325000000	Industrial Processes	Mining and Quarrying: SIC 14	All Processes	Total

Metallic Ore Mining: The emissions factor for metallic ore mining includes overburden removal, drilling and blasting, and loading and unloading activities. The total suspended particulates (TSP) emission

factors developed for copper ore mining are applied to all three activities with PM10/TSP ratios of 0.35 for overburden removal, 0.81 for drilling and blasting, and 0.43 for loading/unloading operations.

Non-Metallic Ore Mining: The emissions factor for non-metallic ore mining includes overburden removal, drilling and blasting, and loading and unloading activities. The emissions factor is based on western surface coal mining operations.

PM emissions from Mining and Quarrying are presented in Table 3.6-4.

3.6-5/6 PAVED AND UNPAVED ROADS

The following is a summary of EPA's documentation for paved and unpaved roads which can be found at: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>. Note that EPA revised the 2014 estimates for Unpaved and Paved Roads emissions July 25, 2016 due to a gross overestimate for Urban Local Unpaved Roads. Although EPA may not have revised their 2011 estimates MassDEP made the adjustment this 2011 report.

Paved and unpaved road dust is entrained when vehicles travel on a road. The extent of this entrainment depends on various factors such as the nature of the road (e.g., paved or unpaved, dirt or sand-and-gravel, industrial or public), the level of moisture in the air, average vehicle weight, etc.

Re-entrained road dust emissions from paved and unpaved roads were estimated by EPA using road VMT. The emission factors were obtained from AP-42 Table 13.2.1-3. VMT data was obtained from Table HM-51 the Federal Highway Administration (FHWA) Highway Statistics report by state and road type. VMT was then allocated to county and road classification by month. Paved road silt loadings were assigned to each of the 12 functional roadway classifications based on average annual daily traffic volumes (AADTV). The silt loading values were assigned to the AADTV category.

The emission factors were corrected for days per month of measurable precipitation. The average weight of vehicles by county was estimated and the VMT fraction by vehicle was applied to the road class. The emission factors were also determined by average speeds by roadway type. The speeds were based on the same national average speeds that were used for on-road mobile emission calculations.

Paved and Unpaved Roads PM emissions and are summarized by county in Table 3.6-5 and 3.6-6.

3.6-7 AGRICULTURAL TILLING

MassDEP adopted EPA's estimates for Agricultural Tilling which can be found at: <ftp://ftp.epa.gov/EmisInventory/2011nei/doc/>

Fugitive dust from agricultural tilling includes airborne soil particulate emissions produced during the preparation of agricultural lands for planting. PM emissions from agricultural tilling were computed by

EPA by multiplying a crop specific tillage emissions factor in lb/acre by the activity factor of crop acreage.

The emissions factor is based the silt content of the surface soil and the number of passes or tillings in a given year for a given crop. The silt content was determined by the US Department of Agriculture (USDA) Surface Soil Survey map from which each county was assigned a soil type. EPA obtained the crop acreage from the USDA Census of Agriculture for 2007 and other crop survey reports as stated in the documentation for this category.

Agricultural Tilling emissions are presented in Table 3.7.