

**The State of New Jersey
Department of Environmental Protection**

**State Implementation Plan (SIP) Revision for the Attainment
and Maintenance of the Fine Particulate Matter (PM_{2.5})
National Ambient Air Quality Standards**

**PM_{2.5} Redesignation Request and Maintenance Plan
Proposal**

Appendix V, Attachment 5:

**2007 Area Source Calculation Methodology Sheets
PM_{2.5}, NO_x, SO₂**

TABLE OF CONTENTS

Fuel Combustion

Industrial Anthracite Coal Combustion..... 1
Industrial Subbituminous/Bituminous/Lignite Coal Combustion..... 3
Industrial Distillate Oil Combustion..... 6
Industrial Residual Oil Combustion 8
Industrial Natural Gas Combustion 10
Industrial Liquified Petroleum Gas Combustion 12
Industrial Kerosene Combustion 14
Commercial/Institutional Anthracite Coal Combustion..... 16
Commercial/Institutional Bituminous/Subbituminous/Lignite Coal Combustion..... 18
Commercial/Institutional Distillate Oil Combustion..... 21
Commercial/Institutional Residual Oil Combustion 23
Commercial/Institutional Natural Gas Combustion 25
Commercial/Institutional Liquified Petroleum Gas Combustion..... 27
Commercial/Institutional Kerosene Combustion 29
Residential Anthracite Coal Combustion 31
Residential Distillate Oil Combustion 33
Residential Natural Gas Combustion..... 35
Residential Liquified Petroleum Gas Combustion 37
Residential Wood Combustion 39
Residential Kerosene Oil Combustion 41

Waste Disposal, Treatment and Recovery

On-Site Incineration, Industrial..... 43
On-Site Incineration, Municipal Solid Waste Incinerator..... 45
On-Site Incineration, Pathological Incinerator..... 47
On-Site Incineration, Sewage Sludge 49
Open Burning 51

Miscellaneous Combustion

Agricultural Field Burning, Land Clearing 53
Agricultural Field Burning, Herbaceous 56
Agricultural Field Burning, Infested 59
Agricultural Field Burning, Orchard..... 62
Forest Wildfires 65
Managed Burning..... 67
Commercial Cooking: Conveyor Charbroiling 69
Commercial Cooking: Underfired Charbroiling 71
Commercial Cooking: Flat Griddle Frying..... 73
Commercial Cooking: Clamshell Griddle Frying..... 75
Structural Fires..... 76
Vehicle Fires..... 78
Cigarette Smoking..... 80

Fugitive Dust

Paved Roads..... 82
Unpaved Roads..... 85
Construction - Residential..... 87
Construction - Commercial..... 90
Construction -Institutional..... 92
Construction - Roadway..... 95
Mining and Quarrying - Sand and Gravel..... 97
Mining and Quarrying - Stone 99
Agricultural Tilling..... 102

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Anthracite Coal Combustion

SCC: 2102001000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and lead (Pb). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of anthracite coal in industrial boilers are calculated using statewide tons of coal burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial anthracite coal use, COAL ² (tons)
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP ³
3. Emission Factors, EF, (lbs/ton of coal burned)

Emission Factor		Reference
VOC =	0.07	4 SCC 10100102 stoker-fired boiler
NOx =	9.0	5 Table 1.2-1 stoker fired boiler
CO =	0.60	5 Table 1.2-2
PM ₁₀ =	4.75	5 Figure 1.2-1 total particulate
PM _{2.5} =	2.4	5 Figure 1.2-1 total particulate
SO ₂ =	39*(wt% sulfur, S)*0.95(weight fraction of SO ₂ in SO _x)	5 Table 1.2-1 and 1.1-3
Pb =	0.0089	4

4. Weekly activity factor, WAF=6 days/week ⁶

5. Seasonal adjustment factors, SAF ²

Summer Season Adjustment Factor	0.99
Fall Season Adjustment Factor	0.99
Winter Season Adjustment Factor	1.01
Spring Season Adjustment Factor	1.01

6. Wt% sulfur, S = 0.8 ⁷

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = COAL*(EF/CF)*(CEMP/NJEMP)$$

$$Ep_s = Ep_a*SAF/AADF$$

$$Ep_w = Ep_a*SAF/AADF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

CF = Conversion factor for units = 2000 lbs/ton

AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report. ⁸

2. All industrial anthracite coal burners are uncontrolled overfeed stokers.
3. All industrial coal consumption included in the State Energy Data Report is bituminous coal.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory:

$$E_{p_{adj}} = (COAL-PT) * (EF/CF) * (CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Industrial point sources' anthracite coal use (tons)⁹

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
4. Factor Information Retrieval (FIRE) system, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
5. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection
8. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
9. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Subbituminous/Bituminous/Lignite Coal Combustion

SCC: 2102002000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of bituminous coal in industrial boilers are calculated using statewide tons of coal burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial bituminous/subbituminous/lignite coal use, COAL (tons)²
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF (lbs/ton of coal burned)^{4a}

$$\text{VOC} = (0.11 + 0.05 + 0.05 + 1.3 + 0.07 + 0.03 + 0.03) / 7 = 0.23$$

which is the average of uncontrolled emission factors for bituminous coal (AP-42 Table 1.1-19) and lignite (AP-42 Table 1.7-1) for the following furnaces: cyclone furnaces, spreader stoker, overfeed stokers, and underfeed stokers

$$\text{NO}_x = (33 + 17 + 11 + 8.8 + 7.5 + 9.5 + 15 + 5.8) / 8 = 13.45$$

$$\text{CO} = (0.5 + 0.5 + 5 + 5 + 6 + 11) / 6 = 4.67$$

which is the average of uncontrolled emission factors for bituminous coal (AP-42 Table 1.1-3) and lignite (AP-42 Table 1.7-1) for the following furnaces: cyclone furnaces, spreader stoker, overfeed stokers, and underfeed stokers

$$\text{SO}_2 = 35 * (\text{wt\% sulfur, S}) * 0.95 (\text{weight fraction of SO}_2 \text{ in SO}_x)$$

$$\text{PM}_{10} = (13.2 + 6.0 + 6.2) / 3 + (0.04 \text{ lb/MMBTU} * 23 \text{ MMBTU/ton}) = 9.39$$

$$\text{PM}_{2.5} = (4.6 + 2.2 + 3.8) / 3 + (0.04 \text{ lb/MMBTU} * 23 \text{ MMBTU/ton}) = 4.45$$

which is the average of uncontrolled emission factors for bituminous coal for the following furnaces: spreader stoker (AP-42 Table 1.1-9), overfeed stokers (AP-42 Table 1.1-10), and underfeed stokers (AP-42 Table 1.1-11) for filterable particulates plus the condensable particulates in Table 1.1-5.

$$\text{Pb} = 0.0133$$

$$\text{NH}_3 = 0.03^{4b}$$

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor 0.99

Fall Season Adjustment Factor 0.99

Winter Season Adjustment Factor 1.01

Spring Season Adjustment Factor 1.01

6. Wt% sulfur, S=⁶
1.0: Atlantic, Cape May, Cumberland, Ocean Counties,
Hunterdon, Sussex, and Warren Counties
0.2: Burlington, Camden, Gloucester, Mercer, Salem,

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= COAL*(EF/CF)*(CEMP/NJEMP) \\ Ep_s &= Ep_a*SAF/AADF \\ Ep_w &= Ep_a*SAF/AADF \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report. ⁷
2. All industrial coal consumption included in the State Energy Data Report is bituminous coal.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$Ep_{adj} = (COAL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

Ep_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting
 PT = Industrial point sources' subbituminous/bituminous/lignite coal use (tons) ⁸

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC

- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009.
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1,1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Distillate Oil Combustion

SCC: 2102004000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of distillate oil coal in industrial boilers are calculated using statewide gallons of fuel burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial distillate oil use, FUEL² (10³ gallons)
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10³ gallons burned)

Emission Factor	Reference
VOC = 0.2	4a Table 1.3-3 industrial boilers distillate oil fired
NOx = 20	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
PM ₁₀ = (1.0+1.3)=2.3	4a Table 1.3-6 and 1.3-2 filterable plus condensible
PM _{2.5} = (0.25+1.3)=1.55	4a Table 1.3-6 and 1.3-2 filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired

$$Pb = (8.9 \text{ lb}/10^{12} \text{ BTU}) * (1.42 * 10^8 \text{ BTU}/10^3 \text{ gals}) = 0.001264$$

$$NH_3 = 0.8 \quad 4b \text{ ERTAC 2009}$$

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.96
Fall Season Adjustment Factor	0.99
Winter Season Adjustment Factor	1.05
Spring Season Adjustment Factor	1.00

6. Wt% sulfur content, S = ⁶

0.3:	Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties
0.2:	Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = OIL * (EF/CF) * (CEMP/NJEMP)$$

$$Ep_s = Ep_a / AADF * SAF$$

$$Ep_w = Ep_a / AADF * SAF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

CF = Conversion factor for units = 2000 lbs/ton

SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Industrial point sources' distillate oil use⁸ (10³ gallons)

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Residual Oil Combustion

SCC: 2102005000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residual oil in industrial boilers are calculated using statewide gallons of fuel burned, allocated to the county level by industrial employees.

Required Input Parameters:

1. Total statewide industrial residual oil use, OIL² (10³ gallons)
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10³ gallons burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 0.28	4a Table 1.3-3 industrial no 6 oil fired
NOx = 55	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
PM ₁₀ =(7.17*(1.12*Wt%sulfur, S)+0.37))+1.5	4a Table 1.3-2 and 5 filterable plus condensible
PM _{2.5} =(4.67*(1.12*Wt%sulfur, S)+0.37))+1.5	4a Table 1.3-2 and 5 filterable plus condensible
SO ₂ = 157*(Wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
Pb=((28+194)/2 lb/10 ¹² BTU)*(1.51/10 ⁸ BTU/10 ³ gals)= 111*1.51*10 ⁻⁴ lb/10 ³ gals = 0.01676 lb/10 ³ gals ⁵	
NH ₃ = 0.8	4b ERTAC 2009

4. Weekly activity factor, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.96
Fall Season Adjustment Factor	0.99
Winter Season Adjustment Factor	1.05
Spring Season Adjustment Factor	1.00

6. Wt% sulfur content, S=⁶

2.0:	Atlantic, Cape May, Cumberland, and Ocean Counties
1.0:	Hunterdon, Sussex, Warren, and Salem Counties
0.5:	Burlington County, Camden, Gloucester, and Mercer Counties except those municipalities included below in Zone 6
0.3:	The municipalities of Bass River, Shamong, Southampton, Tabernacle, Washington, Woodland Townships in Burlington County, and Waterford Township in Camden County, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset and Union Counties.

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= OIL*(EF/CF)*(CEMP/NJEMP) \\E_{p_s} &= E_{p_a}*SAF/AADF \\E_{p_w} &= E_{p_a}*SAF/AADF\end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$Ep_{adj} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

Ep_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting
 PT = Industrial point sources' residual oil use⁸ (10³ gallons)

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Natural Gas Combustion

SCC: 2102006000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) lead (Pb), and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of industrial natural gas are calculated using statewide amount of fuel burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial natural gas use, GAS² (10⁶ cubic feet)
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10⁶ cubic feet burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 5.5	4a Table 1.4-2
NOx = 100	4a Table 1.4-1 boilers<100 million btu/hr
CO = 84	4a Table 1.4-1 boilers<100 million btu/hr
PM ₁₀ = 0.45	4b ERTAC 2009
PM _{2.5} = 0.43	4b ERTAC 2009
SO ₂ = 0.6	4a Table 1.4-2
Pb = 0.0005	
NH ₃ = 3.2	4b ERTAC 2009

4. Weekly activity, WAF=6 days/week⁴

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.88
Fall Season Adjustment Factor	0.92
Winter Season Adjustment Factor	1.16
Spring Season Adjustment Factor	1.03

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{GAS} * (\text{EF} / \text{CF}) * (\text{CEMP} / \text{NJEMP}) \\E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁵

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{\text{adj}} = (\text{GAS-PT}) * (\text{EF/CF}) * (\text{CEMP/NJEMP})$$

Where:

E_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Industrial point sources' natural gas use (10^6 cubic feet)⁶

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
6. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Liquified Petroleum Gas Combustion

SCC: 2102007000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of industrial liquid petroleum gas are calculated using statewide amount of fuel burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial liquid petroleum gas use, LPG (10³ gallons)²
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF, (lbs/10³ gallons burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC=(1.1-0.2)+(1.0-0.2)/2=0.05	4 Table 1.5-1, industrial boilers
NOx=(15+13)/2=14	4 Table 1.5-1, industrial boilers
CO =(8.4+7.5)/2=7.95	4 Table 1.5-1, industrial boilers
PM10=0.05	5 ERTAC 2009
PM2.5=0.04	5 ERTAC 2009
SO2=(0.09S+0.10S)/2=0.23	4 Table 1.5-1, industrial boilers
NH3=0.05	5 ERTAC 2009

4. Weekly activity, WAF=6 days/week⁶

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.96
Fall Season Adjustment Factor	0.99
Winter Season Adjustment Factor	1.05
Spring Season Adjustment Factor	1.00

6. Wt% sulfur content, S=2.456 gr/100cf⁷

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{LPG} * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP}) \\E_{p_s} &= E_{p_a} * \text{SAF}/\text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF}/\text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the

preparation of the State Energy Data Report.⁸

2. Assumed 50/50 mixture of butane and propane in the development of the emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (LPG-PT) * (EF/CF) * (CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Industrial point sources' liquified petroleum gas use (10^3 gallons)⁹

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
4. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
5. Eastern Regional Technical Advisory Committee (ERTAC) 2009
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. Nonroad Source Inventory Development for Nonroad Engines presentation, <http://www.epa.gov/ttn/chief/eidocs/partisec4.pdf>
8. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
9. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Industrial Kerosene Combustion

SCC: 2102011000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb), and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of industrial kerosene are calculated using statewide amount of fuel burned, allocated to the county level by industrial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide industrial kerosene oil use, OIL² (10³ gallons)
2. County and statewide employment totals for SIC 10-3999, 461, 4939 or NAICS 21- 339999, 4861, 4869, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10³ gallons burned)

Emission Factor	Reference
VOC = 0.2	4a Table 1.3-3 industrial boilers distillate oil fired
NOx = 20	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
PM ₁₀ = (1.0+1.3)=2.3	4a Table 1.3-6 and 1.3-2 filterable plus condensible
PM _{2.5} = (0.25+1.3)=1.55	4a Table 1.3-6 and 1.3-2 filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired

$$\text{Pb} = ((28+194)/2 \text{ lb}/10^{12} \text{ BTU}) * (1.51/10^8 \text{ BTU}/10^3 \text{ gals}) = 111 * 1.51 * 10^{-4} \text{ lb}/10^3 \text{ gals} = 0.01676 \text{ lb}/10^3 \text{ gals}^5$$
$$\text{NH}_3 = 0.77 \quad 4b \text{ ERTAC } 2009$$

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.96
Fall Season Adjustment Factor	0.99
Winter Season Adjustment Factor	1.05
Spring Season Adjustment Factor	1.00

6. Wt% sulfur content, S=⁶

0.3:	Atlantic, Cape May, Cumberland, Ocean, Hunterdon, Sussex, and Warren Counties
0.2:	Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} \text{Ep}_a &= \text{OIL} * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP}) \\ \text{Ep}_s &= \text{Ep}_a * \text{SAF}/\text{AADF} \\ \text{Ep}_w &= \text{Ep}_a * \text{SAF}/\text{AADF} \end{aligned}$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant

CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the industrial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷
2. Assume emission factors for kerosene are equivalent to distillate oil emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$Ep_{adj} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

Ep_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting
 PT = Industrial point sources' kerosene oil use⁸ (10³ gallons)

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Anthracite Coal Combustion

SCC: 2103001000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial anthracite coal are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional bituminous/subbituminous coal use, COAL² (tons)
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³

3. Emission Factors, EF, (lbs/ton of coal burned)

Emission Factor	Reference
VOC = 0.07	4a SCC 10300102 commercial stoker-fired boiler
NOx = 9.0	5 Table 1.2-1 stoker fired boiler
CO = 0.60	5 Table 1.2-2
PM ₁₀ = 4.75	5 Figure 1.2-1 total particulate
PM _{2.5} = 2.38	5 Figure 1.2-1 total particulate
SO ₂ = 39*(wt% sulfur, S)*0.95(weight fraction of SO ₂ in SO _x)	5 Table 1.2-1 and 1.1-3
Pb = 0.0089	4a
NH ₃ = 0.03	4b ERTAC 2009

4. Weekly activity factor, WAF=6 days/week⁶

5. Seasonal adjustment factors, SAF

Summer Season Adjustment Factor	0.80
Fall Season Adjustment Factor	1.01
Winter Season Adjustment Factor	1.27
Spring Season Adjustment Factor	0.92

6. Wt% sulfur, S = 0.8⁷

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{COAL} * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP}) \\E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁸
2. All commercial anthracite coal burners are uncontrolled overfeed stokers.
3. All commercial coal consumption included in the State Energy Data Report is anthracite coal.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{\text{adj}} = (\text{COAL-PT}) * (\text{EF/CF}) * (\text{CEMP/NJEMP})$$

Where:

E_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting
PT = Commercial/Institutional point sources' anthracite coal use⁹ (tons)

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Factor Information Retrieval (FIRE) system, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection
8. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1,1999
9. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Bituminous/Subbituminous/Lignite Coal Combustion

SCC: 2103002000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO2), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5) and ammonia (NH3). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial bituminous coal are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional bituminous/lignite coal use, COAL² (tons)
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF (lbs/tons burned)^{4a}

$$\text{VOC} = (0.11 + 0.05 + 0.05 + 1.3 + 0.07 + 0.03 + 0.03) / 7 = 0.23$$

which is the average of uncontrolled emission factors for bituminous coal (AP-42 Table 1.1-19) and lignite (AP-42 Table 1.7-1) for the following furnaces: cyclone furnaces, spreader stoker, overfeed stokers, and underfeed stokers

$$\text{NOx} = (33 + 17 + 11 + 8.8 + 7.5 + 9.5 + 15 + 5.8) / 8 = 13.45$$

$$\text{CO} = (0.5 + 0.5 + 5 + 5 + 6 + 11) / 6 = 4.67$$

which is the average of uncontrolled emission factors for bituminous coal (AP-42 Table 1.1-3) and lignite (AP-42 Table 1.7-1) for the following furnaces: cyclone furnaces, spreader stoker, overfeed stokers, and underfeed stokers

$$\text{SO2} = 35 * (\text{wt\% sulfur, S}) * 0.95 (\text{weight fraction of SO2 in SOx})$$

$$\text{PM10} = (13.2 + 6.0 + 6.2) / 3 + (0.04 \text{lb/MMBTU} * 23 \text{ MMBTU/ton}) = 9.39$$

$$\text{PM2.5} = (4.6 + 2.2 + 3.8) / 3 + (0.04 \text{lb/MMBTU} * 23 \text{ MMBTU/ton}) = 4.45$$

which is the average of uncontrolled emission factors for bituminous coal for the following furnaces: spreader stoker (AP-42 Table 1.1-9), overfeed stokers (AP-42 Table 1.1-10), and underfeed stokers (AP-42 Table 1.1-11) for filterable particulates plus the condensible particulates in Table 1.1-5.

$$\text{NH3} = 0.03^{4b}$$

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.80
Fall Season Adjustment Factor	1.01
Winter Season Adjustment Factor	1.27
Spring Season Adjustment Factor	0.92

6. Wt% sulfur content, S = ⁶
- | | |
|-----|---|
| 1.0 | Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties |
| 0.2 | Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union |

Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= \text{COAL} * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP}) \\ Ep_s &= Ep_a * \text{SAF} / \text{AADF} \\ Ep_w &= Ep_a * \text{SAF} / \text{AADF} \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷
3. All commercial coal consumption included in the State Energy Data Report is anthracite coal.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$Ep_{adj} = (\text{COAL}-\text{PT}) * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP})$$

Where:

Ep_{adj} = (tons/yr) for an annual emission of pollutant by county excluding double counting
PT = Commercial/Institutional point sources' bituminous/subbituminous/lignite coal use (tons)⁸

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009

5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1,1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Distillate Oil Combustion

SCC: 2103004000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial distillate oil are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional distillate oil use, OIL (10³ gallons)²
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10³ gallons burned)

Emission Factor	Reference
VOC = 0.34	4a Table 1.3-3 commercial boilers distillate oil fired
NOx = 20	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
PM ₁₀ = (1.08+1.3)=2.38	4a Table 1.3-7 and 1.3-2 filterable plus condensible
PM _{2.5} = (0.83+1.3)=2.13	4a Table 1.3-7 and 1.3-2 filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
NH ₃ = 0.8	4b ERTAC 2009

4. Weekly activity, WAF=6 days/week⁵

5 Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.55
Fall Season Adjustment Factor	0.76
Winter Season Adjustment Factor	1.67
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=⁶
0.3: Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties
0.2: Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = OIL * (EF/CF) * (CEMP/NJEMP)$$

$$Ep_s = Ep_a * SAF/AADF$$

$$Ep_w = Ep_a * SAF/AADF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

CF = Conversion factor for units = 2000 lbs/ton

AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding counting

PT = Commercial/Institutional point sources' distillate oil use (10³ gallons)⁸

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026

2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC

3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.

4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC

4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009

5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1,1999

8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Residual Oil Combustion

SCC: 2103005000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial residual oil are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional residual oil use, OIL (10³ gallons)²
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF, (lbs/10³ gallons burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 1.13	4a Table 1.3-3 commercial boiler no 6 oil fired
NOx = 55	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
PM ₁₀ =(5.17*(1.12*Wt%sulfur, S)+0.37))+1.5	4a Table 1.3-2 and 7 filterable plus condensible
PM _{2.5} =(1.92*(1.12*Wt%sulfur, S)+0.37))+1.5	4a Table 1.3-2 and 7 filterable plus condensible
SO ₂ = 157*(Wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, no 6 oil fired
NH ₃ = 0.8	4b ERTAC 2009

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.55
Fall Season Adjustment Factor	0.76
Winter Season Adjustment Factor	1.67
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=⁶

2.0:	Atlantic, Cape May, Cumberland, and Ocean Counties
1.0:	Hunterdon, Sussex, Warren, and Salem Counties
0.5:	Burlington County, Camden, Gloucester, and Mercer Counties except those municipalities included below in Zone 6
0.3:	The municipalities of Bass River, Shamong, Southampton, Tabernacle, Washington, Woodland Townships in Burlington County, and Waterford Township in Camden County, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset and Union Counties.

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= OIL*(EF/CF)*(CEMP/NJEMP) \\E_{p_s} &= E_{p_a}*SAF/AADF \\E_{p_w} &= E_{p_a}*SAF/AADF\end{aligned}$$

Where:

$$\begin{aligned}E_{p_a} &= (\text{tons/yr}) \text{ for an annual emission of pollutant by county} \\E_{p_s} &= (\text{tons/day}) \text{ for a typical summer day emission of pollutant}\end{aligned}$$

E_{pw} = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting
 PT = Commercial/Institutional point sources' residual oil use (10^3 gallons)⁸

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1,1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Natural Gas Combustion

SCC: 2103006000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial natural gas are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional natural gas use, GAS (10⁶ cubic feet)²
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF, (lbs/10⁶ cubic feet burned)

Emission Factor	Reference
VOC = 5.5	4a Table 1.4-2
NOx = 100	4a Table 1.4-1 boilers<100 million btu/hr
CO = 84	4a Table 1.4-1 boilers<100 million btu/hr
PM ₁₀ = 0.52	4b ERTAC 2009
PM _{2.5} = 0.43	4b ERTAC 2009
SO ₂ = 0.6	4a Table 1.4-2
NH ₃ = 0.49	4b ERTAC 2009

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.58
Fall Season Adjustment Factor	0.81
Winter Season Adjustment Factor	1.64
Spring Season Adjustment Factor	0.97

Process:

The following equations are used to calculate the emissions (without rule effectiveness) for this source category.

$$\begin{aligned}Ep_a &= GAS*(EF/CF)*(CEMP/NJEMP) \\Ep_s &= Ep_a*SAF/AADF \\Ep_w &= Ep_a*SAF/AADF\end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the

preparation of the State Energy Data Report. ⁶

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (GAS-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Commercial/Institutional point sources' natural gas use (10⁶ cubic feet)⁷

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
7. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Liquefied Petroleum Gas Combustion

SCC: 2103007000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial liquid petroleum gas are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional liquefied petroleum gas use, LPG (10³ gallon)²
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF (lbs/10³ gallon burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC=(1.1-0.2)+(1.0-0.2)/2=0.05	4 Table 1.5-1, commercial boilers
NO _x =(15+13)/2=14	4 Table 1.5-1, commercial boilers
CO=(8.4+7.5)/2=7.95	4 Table 1.5-1, commercial boilers
PM ₁₀ =0.05	5 ERTAC 2009
PM _{2.5} =0.04	5 ERTAC 2009
SO ₂ =(0.09S+0.10S)/2=0.23	4 Table 1.5-1, commercial boilers
NH ₃ = 0.05	5 ERTAC 2009

4. Weekly activity, WAF=6 days/week⁶

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.55
Fall Season Adjustment Factor	0.76
Winter Season Adjustment Factor	1.67
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=2.456 gr/100cf⁷

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{LPG} * (\text{EF}/\text{CF}) * (\text{CEMP}/\text{NJEMP}) \\E_{p_s} &= E_{p_a} * \text{SAF}/\text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF}/\text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁸
2. Assumed 50/50 mixture of butane and propane in the development of the emission factors
3. All commercial/institution combustion liquid petroleum gas burned in New Jersey is included as liquid petroleum gas in the State Energy Data Report².

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (LPG-PT) * (EF/CF) * (CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting

PT = Commercial/Institutional point sources' liquified petroleum gas use (10^3 gallons)⁹

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
4. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
5. Eastern Regional Technical Advisory Committee (ERTAC) 2009
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. Nonroad Source Inventory Development for Nonroad Engines presentation, <http://www.epa.gov/ttn/chief/eidocs/partisec4.pdf>
8. Air Pollution Control Regulations, N.J.S.A. 7:27-10.2, Sulphur Contents Standards, Office of Administrative Law, CN 301, Trenton, New Jersey
9. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
10. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial/Institutional Kerosene Combustion

SCC: 2103011000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of commercial kerosene are calculated using statewide amount of fuel burned, allocated to the county level by commercial employees.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide commercial/institutional kerosene oil use, OIL² (10³ gallons)
2. County and statewide employment totals for SIC's 0850, 415,417,422-23,43,458,47-8,494-96,50-97, not including 881, or NAICS 1153, 2213, 42, 44 - 5, 48 - 9, 51 - 6, 61 - 2, 71 - 2, 81, not including 8141, 92, CEMP, NJEMP³
3. Emission Factors, EF, (lbs/10³ gallons burned)

Emission Factor	Reference
VOC = 0.34	4a Table 1.3-3 commercial boilers distillate oil fired
NOx = 20	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
CO = 5	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
PM ₁₀ = (1.08+1.3)=2.38	4a Table 1.3-7 and 1.3-2 filterable plus condensible
PM _{2.5} = (0.83+1.3)=2.13	4a Table 1.3-7 and 1.3-2 filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 boilers<100 million btu/hr, distillate oil fired
NH ₃ = 0.8	4b ERTAC 2009

4. Weekly activity, WAF=6 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.55
Fall Season Adjustment Factor	0.76
Winter Season Adjustment Factor	1.67
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=⁶
0.3: Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties
0.2: Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= OIL * (EF/CF) * (CEMP/NJEMP) \\E_{p_s} &= E_{p_a} * SAF/AADF \\E_{p_w} &= E_{p_a} * SAF/AADF\end{aligned}$$

Where:

- E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton

AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Assumptions:

1. Employment data is representative of the commercial establishments surveyed by Department of Energy in the preparation of the State Energy Data Report.⁷
2. Assume emission factors for kerosene are equivalent to distillate oil emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have also been reported in the point source inventory. The following methodology is used to adjust the area source emissions for this category to remove the emissions already accounted for in the point source inventory.

$$E_{p_{adj}} = (OIL-PT)*(EF/CF)*(CEMP/NJEMP)$$

Where:

$E_{p_{adj}}$ = (tons/yr) for an annual emission of pollutant by county excluding double counting
 PT = Commercial/Institutional point sources' kerosene oil use⁸ (10³ gallons)

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2007 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection
7. Memo to file concerning discussion on fuel use sale data with Department of Energy officials, June 1, 1999
8. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Anthracite Coal Combustion

SCC: 2104001000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}), lead (Pb) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residential anthracite coal are calculated using statewide amount of coal burned, allocated to the county level by the number of housing units using coal for primary heat source.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide residential anthracite coal use, COAL (tons)²
2. County and state totals of housing units heated by anthracite coal burners, CHEAT, SHEAT³
3. Emission Factors, EF (lbs/ton of coal burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 0.07	4 SCC 10300102 commercial stoker-fired boiler
NO _x = 3.0	4 SCC 2104001000
CO = 0.6	5 Table 1.2-2
PM ₁₀ = 4.75	5 Figure 1.2-1 total particulate
PM _{2.5} = 2.38	5 Figure 1.2-1 total particulate
SO ₂ = 39*(wt% sulfur, S)*0.95(weight fraction of SO ₂ in SO _x)	6 Table 1.2-1 and 1.1-3
Pb = 0.0089	5
NH ₃ = 2.00	7 ERTAC 2009

4. Weekly activity factor, WAF=7 days/week⁶

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.81
Fall Season Adjustment Factor	1.00
Winter Season Adjustment Factor	1.27
Spring Season Adjustment Factor	0.92

6. Wt% sulfur, S = 0.8⁸

Process:

The following equations are used to calculate the emissions (without rule effectiveness) for this source category.

$$Ep_a = COAL * (CHEAT/SHEAT) * (EF/CF)$$

$$Ep_s = Ep_a * SAF/AADF$$

$$Ep_w = Ep_a * SAF/AADF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

CF = Conversion factor for units = 2000 lbs/ton

AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

Assumptions:

1. All residential anthracite coal burners are of the handfed design except for determination of sulfur dioxide

emissions which represents space heaters for commercial/institutional operations.
2. All residential coal consumption included in the State Energy Data Report is anthracite coal.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2006 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. 2007 American Community Survey (ACS) 1-Year Estimates, United States Department of Commerce, Bureau of the Census, Washington, DC
4. Factor Information Retrieval (FIRE) system, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 1995
5. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. Eastern Regional Technical Advisory Committee (ERTAC) 2009
8. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 10, N.J.A.C. 7:27-10, Sulfur in Solid Fuels, New Jersey State Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Distillate Oil Combustion

SCC: 2104004000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residential distillate oil are calculated using statewide amount of fuel burned, allocated to the county level by the number of housing units using distillate oil for primary heat source.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide residential distillate oil use, OIL (10³ gallons)²
2. County and state totals of housing units heated by distillate oil burners, CHEAT, SHEAT³
3. Emission Factors, EF (lbs/10³ gallons burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 0.71	4a Table 1.3-3 residential furnace, distillate oil fired
NOx = 18	4a Table 1.3-1 residential furnace
CO = 5	4a Table 1.3-1 residential furnace
PM ₁₀ = (0.22+1.3)=1.52	4a Table 1.3-1, 2 and 7 res. furnace, filterable plus condensible
PM _{2.5} = (0.17+1.3)=1.47	4a Table 1.3-1, 2 and 7 res. furnace, filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 residential furnace, distillate oil fired
NH ₃ = 1	4b ERTAC 2009

4. Weekly activity, WAF=7 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.41
Fall Season Adjustment Factor	0.66
Winter Season Adjustment Factor	1.91
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=⁶

0.3:	Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties
0.2:	Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}Ep_a &= OIL*(CHEAT/SHEAT)(EF/CF) \\Ep_s &= Ep_a*SAF/AADF \\Ep_w &= Ep_a*SAF/AADF\end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All residential distillate oil burned in New Jersey is included as residential distillate oil in the State Energy Data Report.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026

2. State Energy Data 2006 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC

3. 2007 American Community Survey (ACS) 1-Year Estimates, United States Department of Commerce, Bureau of the Census, Washington, DC

4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC

4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009

5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Natural Gas Combustion

SCC: 2104006000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residential natural gas are calculated using statewide amount of fuel burned, allocated to the county level by the number of housing units using natural gas for primary heat source.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total residential natural gas use, GAS² (10⁶ cubic feet)
2. County and state totals of housing units heated by natural gas burners, CHEAT, SHEAT³
3. Emission Factors, EF (lbs/10⁶ cubic feet burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 5.5	4a Table 1.4-2
NOx = 94	4a Table 1.4-1 residential furnaces
CO = 40	4a Table 1.4-1 residential furnaces
PM ₁₀ = 0.52	4b ERTAC 2009
PM _{2.5} = 0.43	4b ERTAC 2009
SO ₂ = 0.6	4a Table 1.4-2
NH ₃ = 0.49	4b ERTAC 2009

5. Weekly activity, WAF=7 days/week⁵

6. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.28
Fall Season Adjustment Factor	0.65
Winter Season Adjustment Factor	2.05
Spring Season Adjustment Factor	1.02

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = GAS \cdot (CHEAT/SHEAT) \cdot (EF/CF)$$

$$Ep_s = Ep_a \cdot SAF/AADF$$

$$Ep_w = Ep_a \cdot SAF/AADF$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All emission rates based on residential operations except for lead emissions which is based on Commercial/Institutional operations of <10MMBTU/hr.
2. All residential distillate oil burned in New Jersey is included as residential distillate oil in the State Energy Data Report¹.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2006 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. 2007 American Community Survey (ACS) 1-Year Estimates, United States Department of Commerce, Bureau of the Census, Washington, DC
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, , United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Liquefied Petroleum Gas Combustion

SCC: 2104007000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residential liquid petroleum gas are calculated using statewide amount of fuel burned, allocated to the county level by the number of housing units using liquid petroleum gas for primary heat source.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide residential liquefied petroleum gas use, LPG (10³ gallons)²
2. County and state totals of housing units heated by liquefied petroleum gas burners, CHEAT, SHEAT³
3. Emission Factors, EF, (lbs/10³ gallon burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC=(1.1-0.2)+(1.0-0.2)/2=0.05	4 Table 1.5-1, commercial boilers
NOx=(15+13)/2=14	4 Table 1.5-1, commercial boilers
CO =(8.4+7.5)/2=7.95	4 Table 1.5-1, commercial boilers
PM ₁₀ =0.05	5 ERTAC 2009
PM _{2.5} =0.04	5 ERTAC 2009
SO ₂ =(0.09S+0.10S)/2=0.23	4 Table 1.5-1, commercial boilers
NH ₃ = 0.05	5 ERTAC 2009

4. Weekly activity, WAF=7 days/week⁶

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.41
Fall Season Adjustment Factor	0.66
Winter Season Adjustment Factor	1.91
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=2.456 gr/100cf⁷

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{LPG} * (\text{CHEAT} / \text{SHEAT}) * (\text{EF} / \text{CF}) \\E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Assume residential liquid petroleum gas combustion has same emission factors as commercial/institution liquid

petroleum gas combustion.

2. Assumed 50/50 mixture of butane and propane in the development of the emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2006 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. 2007 American Community Survey (ACS) 1-Year Estimates, United States Department of Commerce, Bureau of the Census, Washington, DC
4. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
5. Eastern Regional Technical Advisory Committee (ERTAC) 2009
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
7. Nonroad Source Inventory Development for Nonroad Engines presentation, <http://www.epa.gov/ttn/chief/eidocs/partisec4.pdf>

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Wood Combustion

SCC: 2104008310, 2104008210, 2104008100, 2104008320, 2104008510, 2104008220, 2104008330, 2104009000, 2104008610, 2104008230, 2104008400

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀) and particulate matter less than or equal to 2.5 microns (PM_{2.5}). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:

1. USEPA Modeling¹

Emissions from the combustion of residential wood are calculated using USEPA's residential wood combustion tool.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

Listing and Descriptions of the Tables Included in the RWC Tool

Table Name	Table Description
County Populations	Entries contain the county, the number of occupied units in 2008, the appliance profile, the burn profile, and the climate zone.
Appliance Profiles:	Entries contain the appliance profile, the SCC, the burn purpose (Main, Secondary, or Pleasure) and the percentage of households with an appliance of the type corresponding to the SCC and purpose.
Burn Rates	Entries contain the burn profile, the SCC, the burn purpose, and the cords burned per year per appliance.
Density by County	Entries contain the county, the density in lb/ft ³ , the density in tons/cord, and the data source.
Other Appliance Populations	Entries contain the county, the SCC, the burn purpose, and the number of appliances in the county with an appliance of the type corresponding to the SCC.
Emission Factor by SCC	Entries contain the SCC, the pollutant, the emission factor with units, the emission factor converted to tons pollutant/tons of wood combusted, and the data source for the emission factor.

Process:

The emissions from RWC are calculated using the equation below.

$$E_{p_y} = u \times EF_y \times CF_y$$

where:

$$\begin{aligned} E_{p_y} &= \text{(tons/yr) for an annual emission of pollutant by county} \\ u &= \text{annual activity (tons of fuel burned),} \\ EF_y &= \text{emission factor (tons of pollutant emitted/mass of fuel used), and} \\ CF_y &= \text{control factor.} \end{aligned}$$

_y is a specific pollutant

Activity for the majority of appliance types was derived from census data.

Fireplaces, Inserts, and Woodstoves - activity in terms of tons of fuel burned was calculated based on several factors as shown in the equation below.

$$u = P \times AP \times BR \times D$$

where:

$$P = \text{Number of occupied units in a county in 2008,}$$

- AP = Percentage of occupied units for a specific appliance category (e.g. catalytic woodstoves used as main heating equipment, fireplaces without inserts used as other heating equipment, etc.),
- BR = Burn rate (cords/year), and
- D = average density of the wood fuel burned

Outdoor Hydronic Heaters, Indoor Furnaces, and Pellet Stoves

A second method, which applies to outdoor wood burning devices, indoor furnaces, and pellet stoves, estimates the number of appliances per county based on state level proportioned to the number of woodstoves per county. Activity is calculated using the following formula.

$$u = AN \times BR \times D$$

where:

- AN = Number of appliances in county,
- BR = Burn rate (cords/year), and
- D = average density of the wood fuel burned.

Assumptions:

1. CF_y was assumed to be 1 for all appliances because emission improvements for RWC are represented by improved appliance designs. These were accounted for by applying appropriately adjusted emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. New Methodology for Estimating Emissions from Residential Wood Combustion, January 28, 2010, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Inventory and Analysis Group (EIAG), Research Triangle Park, NC, and E.H. Pechan & Associates, Inc., Springfield, VA

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Residential Kerosene Oil Combustion

SCC: 2104011000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category:¹

1. Surveying individual facilities
2. Fuel consumption analysis

The fuel consumption analysis/methodology is selected because the input data elements are more readily available.

Emissions from the combustion of residential kerosene are calculated using statewide amount of fuel burned, allocated to the county level by the number of housing units using kerosene for primary heat source.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Total statewide residential kerosene oil use, OIL (10³ gallons)²
2. County and state totals of housing units heated by kerosene oil burners, CHEAT, SHEAT³
3. Emission Factors, EF, (lbs/10³ gallons burned)

<u>Emission Factor</u>	<u>Reference</u>
VOC = 0.71	4a Table 1.3-3 residential furnace, distillate oil fired
NOx = 18	4a Table 1.3-1 residential furnace
CO = 5	4a Table 1.3-1 residential furnace
PM ₁₀ = (0.22+1.3)=1.52	4a Table 1.3-1, 2 and 7 res. furnace, filterable plus condensible
PM _{2.5} = (0.17+1.3)=1.47	4a Table 1.3-1, 2 and 7 res. furnace, filterable plus condensible
SO ₂ = 142*(wt% sulfur, S)	4a Table 1.3-1 residential furnace, distillate oil fired
NH ₃ = 0.77	4b ERTAC 2009

4. Weekly activity, WAF=7 days/week⁵

5. Seasonal adjustment factor, SAF²

Summer Season Adjustment Factor	0.41
Fall Season Adjustment Factor	0.66
Winter Season Adjustment Factor	1.91
Spring Season Adjustment Factor	1.02

6. Wt% sulfur content, S=⁶
0.3: Atlantic, Cape May, Cumberland, Ocean Counties, Hunterdon, Sussex, and Warren Counties
0.2: Burlington, Camden, Gloucester, Mercer, Salem, Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Passaic, Somerset, and Union Counties

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{OIL} * (\text{CHEAT}/\text{SHEAT}) * (\text{EF}/\text{CF}) \\E_{p_s} &= E_{p_a} * \text{SAF}/\text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF}/\text{AADF}\end{aligned}$$

Where:

- E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

Assumptions:

1. All residential kerosene oil burned in New Jersey is included as residential kerosene oil in the State Energy Data Report.
2. Assume emission factors for kerosene are equivalent to distillate oil emission factors.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for Emission Inventory Preparation Vol III: Area Sources, September 1981, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-81-026
2. State Energy Data 2006 Consumption Tables (formerly the State Energy Data Report), United States Department of Energy, Energy Information Administration, Office of Energy Markets and End Use, Washington, DC
3. 2007 American Community Survey (ACS) 1-Year Estimates, United States Department of Commerce, Bureau of the Census, Washington, DC
- 4a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
- 4b. Eastern Regional Technical Advisory Committee (ERTAC) 2009
5. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
6. New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 9, N.J.A.C. 7:27-9, Sulfur in Fuels, New Jersey State Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

On-Site Incineration, Industrial

SCC: 2601010000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and lead (Pb). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Emission limits from NJDEP permits

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Emission limits from NJDEP permits
2. Weekly activity, WAF=7 days/week
3. Seasonal adjustment factor, SAF=1 ²

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} E_{p_a} &= \text{NJDEP Permit Data}^1 \\ E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\ E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF} \end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All industrial incinerators are single or multiple chamber design for industrial sources.
2. All incinerators are assumed to be without controls.
3. Assume that 2007 permit data approximates current incinerator activity given that any incinerator known to have been closed has been deleted.
4. Assume incinerator operates for 40 hours over a 7 day week unless otherwise specified through the conductance of a survey of a specific incinerator.
5. Assume seasonal adjustment factor of 1

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 11, N.J.A.C. 7:27-11, New Jersey State Department of Environmental Protection, April 15, 1991

Double Counting:

Emissions for this source category may have also been reported in the point source inventory. ³ If so the incinerator was deleted from the area source inventory prior to calculation of area source emissions.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day

CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. 2007 NJDEP Permit Data

2. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

3. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

On-Site Incineration, Municipal Solid Waste Incinerator

SCC: 2601030000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and lead (Pb). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Emission limits from NJDEP permits

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Emission limits from NJDEP permits
2. Weekly activity, WAF=7 days/week
3. Seasonal adjustment factor, SAF=1 ²

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = \text{NJDEP Permit Data}^1$$

$$Ep_s = Ep_a * \text{SAF} / \text{AADF}$$

$$Ep_w = Ep_a * \text{SAF} / \text{AADF}$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All municipal solid waste incinerators represent multiple chamber design for the burning of municipal solid waste.
2. All apartment incinerators are flue fed without afterburners for the burning of residential waste.
3. All incinerators are assumed to be without controls.
4. Assume that 2007 permit data approximates current incinerator activity given that any incinerator known to have been closed has been deleted.
5. Assume incinerator operates for 40 hours over a 7 day week unless otherwise specified through the conductance of a survey of a specific incinerator.
6. Municipal solid waste combustion is similar to commercial refuse combustion.
7. Assume seasonal adjustment factor of 1

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 11, N.J.A.C. 7:27-11, New Jersey State Department of Environmental Protection, April 15, 1991

Double Counting:

Emissions for this source category may have also been reported in the point source inventory.³ If so the incinerator was deleted from the area source inventory prior to calculation of area source emissions.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day

NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. 2007 NJDEP Permit Data

2. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

3. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

On-Site Incineration, Pathological Incinerator

SCC: 2601000000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and lead (Pb). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Emission limits from NJDEP permits

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Emission limits from NJDEP permits
2. Weekly activity, WAF=7 days/week
3. Seasonal adjustment factor, SAF=1 ²

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = \text{NJDEP Permit Data}^1$$

$$Ep_s = Ep_a * \text{SAF} / \text{AADF}$$

$$Ep_w = Ep_a * \text{SAF} / \text{AADF}$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All pathological incinerators represent crematory or pathological waste incinerators.
2. All incinerators are assumed to be without controls.
3. Assume incinerator operates for 40 hours over a 7 day week unless otherwise specified through the conductance of a survey of a specific incinerator.
4. Assume that 2007 permit data approximates current incinerator activity given that any incinerator known to have been closed has been deleted.
5. Assume seasonal adjustment factor of 1

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 11, N.J.A.C. 7:27-11, New Jersey State Department of Environmental Protection, April 15, 1991

Double Counting:

Emissions for this source category may have also been reported in the point source inventory.³ If so the incinerator was deleted from the area source inventory prior to calculation of area source emissions.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO ₂	tons/yr	tons/day	tons/day

PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. 2007 NJDEP Permit Data

2. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

3. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

On-Site Incineration, Sewage Sludge

SCC: 2601030000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and lead (Pb). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Emission limits from NJDEP permits

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Emission limits from NJDEP permits
2. Weekly activity, WAF=7 days/week
3. Seasonal adjustment factor, SAF=1 ²

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = \text{NJDEP Permit Data}^1$$

$$Ep_s = Ep_a * \text{SAF} / \text{AADF}$$

$$Ep_w = Ep_a * \text{SAF} / \text{AADF}$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. All incinerators are assumed to be without controls.
2. Assume weekly activity factor of 7 days per week
3. Assume seasonal adjustment factor of 1

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 11, N.J.A.C. 7:27-11, New Jersey State Department of Environmental Protection, April 15, 1991

Double Counting:

Emissions for this source category may have also been reported in the point source inventory.³ If so the incinerator was deleted from the area source inventory prior to calculation of area source emissions.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO ₂	tons/yr	tons/day	tons/day
PM ₁₀	tons/yr	tons/day	tons/day
PM _{2.5}	tons/yr	tons/day	tons/day

References:

1. 2007 NJDEP Permit Data
2. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c
3. NJ Point Source Emission Inventory for 2007, New Jersey Department of Environmental Protection

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Open Burning

SCC: 2610000100, 2610000400, 2610030000, 2610040400

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀) and particulate matter less than or equal to 2.5 microns (PM_{2.5}). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology is used for this source category: ¹

1. MARAMA survey and calculations

Emissions from open burning are calculated using MARAMA's state specific survey and calculations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Emission calculated by Pechan for MARAMA ¹
2. Emission factors, EF (lb/ton burned) ¹

	Residential Leaf	Residential Brush	Residential Municipal Solid Waste	Municipal Yard Waste
VOC	28	19	19	8.56
NOx	6.2	5	5	6
CO	112	140	140	85
SO ₂	0.76	1.66	1.66	1
PM ₁₀	22	19.73	19.73	38
PM _{2.5}	22	1.26	1.26	34.8

3. Weekly activity, WAF=7 days/week

4. Seasonal adjustment factors, SAF ¹

	Residential Leaf	Residential Brush	Residential Municipal Solid Waste	Municipal Yard Waste
Summer	0	0.24	1	0.24
Fall	4	1.12	1	1.12
Winter	0	0.80	1	0.80
Spring	0	1.84	1	1.84

5. Growth factors = 1, no growth is anticipated for this category

Process:

The following equations are used to calculate the emissions without control for this source category.

$$E_{p_a} = \text{MARAMA}^1$$

$$E_{p_s} = E_{p_a} * \text{SAF} / \text{AADF}$$

$$E_{p_w} = E_{p_a} * \text{SAF} / \text{AADF}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:

New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. MANE-VU Open Burning in Residential Areas, Emissions Inventory Development Report, E.H. Pechan & Associates, for Mid-Atlantic/Northeast Visibility Union (MANE-VU) organized by the Mid-Atlantic Regional Air Management Association (MARAMA)., January 31, 2004.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Agricultural Field Burning, Land Clearing

SCC: 2801500600

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), carbon monoxide (CO), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5) and ammonia (NH3). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning agricultural field burning
This is the only recommended method and was employed in developing the inventory.

Emissions from agricultural field burning are calculated using the number of county and section specific permits.

Required Input Parameters:

The following input data was obtained to calculate emissions for this source category:

1. Total agricultural field burning land clearing permits issued by county for New Jersey Divisions A and B and by section for New Jersey Division C, CPER ^{2,3,4}
2. Average Acreage per permit (average acres/permit): ACRE ⁴
Division A,B,C: 7.5 acres per permit
3. Fuel loading factors (ton matter burned/permit): FL ⁵
Division A : 20.0 tons per acre
Division B,C: 13.5 tons per acre
4. Percentage of each municipality in each NJDEP Forestry Section ⁶
5. Area of each municipality, square miles ⁷
6. Emission Factors, EF, (lbs/ton burned) ^{8a, 8b}

VOC=Non Methane Hydrocarbons (NMHC):	19
CO:	140
PM10:	17
PM2.5:	17
NH3:	1.3
7. Weekly activity, WAF=7 days/week ⁹
8. Seasonal adjustment factors, SAF ⁴

Summer Season Adjustment Factor	0.69
Fall Season Adjustment Factor	0.02
Winter Season Adjustment Factor	2.62
Spring Season Adjustment Factor	0.67

Process:

The following equations are used to calculate the emissions without control for this source category.

STEP 1: For Division C calculate the number of permits issued at the municipal level based on the # permits in each section and the % of each municipality in each section.

STEP 2: For Division C total the number of permits at the municipal level to obtain the number of permits at the county level.

STEP 3: For Divisions A, B and C, calculate the amount of agricultural land clearing material burned ALCTON (tons material burned) :

$$ALCTON = CPER * ACRE * FL$$

STEP 4: Calculate Emissions:

$$\begin{aligned} Ep_a &= EF * ALCTON \\ Ep_s &= Ep_a / AADF * SAF \\ Ep_w &= Ep_a / AADF * SAF \end{aligned}$$

Where:

- E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. Acreage of agricultural fields burned in each county based on the number of agricultural field burning permits issued in each county and represents the best available estimate of acreage burned per permit that can be provided by the NJ Forestry Service.
2. Assume that tons of matter burned per acreage is uniform across the specified division and represents the best available estimate that can be provided by NJ Forestry Service.
3. Assume particulate matter from most agricultural burning is within the submicrometer size range.⁸
4. Assume that the EF for NMHC is equivalent to the EF for VOC.
5. North of the Raritan represents Division A and the Mullica River divides B and C division.^{5,6}
6. Assume that approximately 5/6 of Somerset County belongs to Division A and the remaining 1/6 belongs to Division B.^{2,3}
7. Assume that 1/2 of Mercer County belongs to Division A and the other 1/2 belongs to Division B.^{5,6}

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
NH3	tons/yr	tons/day	tons/day

References

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. NJDEP Division A Permit Log for 2007 by County, April 1, 2009
3. NJDEP Division B Permit Log for 2007 by Township, April 1, 2009
4. NJDEP Division C Permit Log for 2007 by Section, April 1, 2009
5. Memo to File on Phone Conversations with NJ Forestry Service
6. Administrative Map, State of New Jersey, NJDEP, Forestry Service, November 1984
7. Estimate of 1996 Total Resident Population and Square Mile Area by Counties and Municipalities, US Bureau of the Census, Population Data Division, 6/30/99
- 8a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Table 2.5-5, Unspecified Forest Residue and Note b.

8b. Eastern Regional Technical Advisory Committee (ERTAC) 2009.

9. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Agricultural Field Burning, Herbaceous

SCC: 2801500170

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), carbon monoxide (CO), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5) and ammonia (NH3). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning agricultural field burning. This is the only recommended method and was employed in developing the inventory. Emissions from agricultural field burning are calculated using the number of county and section specific permits.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Total agricultural field burning herbaceous permits issued by county for New Jersey Divisions A and B and by section for New Jersey Division C, CPER ^{2,3,4}
2. Average Acreage per permit (average acres/permit): ACRE ⁴
Division A,B,C: 3 acres per permit
3. Fuel loading factors (ton matter burned/permit): FL ⁵
Division A, B, C: 1.0 tons per acre
4. Percentage of each municipality in each NJDEP Forestry Section ⁶
5. Area of each municipality, square miles ⁷
6. Emission Factors, EF, (lbs/ton burned) ^{8a, 8b}

VOC=Non Methane Hydrocarbons (NMHC):	9
CO:	85
PM10:	15
PM2.5:	15
NH3:	1.3
7. Weekly activity, WAF=7 days/week ⁹
8. Seasonal adjustment factors, SAF ¹⁰

Summer Season Adjustment Factor	0.55
Fall Season Adjustment Factor	0.78
Winter Season Adjustment Factor	1.16
Spring Season Adjustment Factor	1.51

Process:

The following equations are used to calculate the emissions without control for this source category.

STEP 1: For Division C calculate the number of permits issued at the municipal level based on the # permits in each section and the % of each municipality in each section.

STEP 2: For Division C total the number of permits at the municipal level to obtain the number of permits at the county level.

STEP 3: For Divisions A, B and C, calculate the amount of agricultural herbaceous material burned HERBTON (tons material burned) :

$$\text{HERBTON} = \text{CPER} * \text{ACRE} * \text{FL}$$

STEP 4: Calculate Emissions:

$$\begin{aligned} \text{Ep}_a &= \text{EF} * \text{ALCTON} \\ \text{Ep}_s &= \text{Ep}_a / \text{AADF} * \text{SAF} \\ \text{Ep}_w &= \text{Ep}_a / \text{AADF} * \text{SAF} \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

- Ep_s = (tons/day) for a typical summer day emission of pollutant
- Ep_w = (tons/day) for a typical winter day emission of pollutant
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

Assumptions:

1. Acreage of agricultural fields burned in each county based on the number of agricultural field burning permits issued in each county and represents the best available estimate of acreage burned per permit that can be provided by the NJ Forestry Service.
2. Assume that tons of matter burned per acreage is uniform across the specified division and represents the best available estimate that can be provided by NJ Forestry Service.
3. Assume particulate matter from most agricultural refuse burning is within the submicrometer size range.⁸
4. Assume that the EF for NMHC is equivalent to the EF for VOC.
5. North of the Raritan represents Division A and the Mullica River divides B and C division.^{5,6}
6. Assume that approximately 5/6 of Somerset County belongs to Division A and the remaining 1/6 belongs to Division B.^{2,3}
7. Assume that 1/2 of Mercer County belongs to Division A and the other 1/2 belongs to Division B.^{5,6}

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
NH3	tons/yr	tons/day	tons/day

References

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. NJDEP Division A Permit Log for 2007 by County, April 1, 2009
3. NJDEP Division B Permit Log for 2007 by Township, April 1, 2009
4. NJDEP Division C Permit Log for 2007 by Section, April 1, 2009
5. Memo to File on Phone Conversations with NJ Forestry Service
6. Administrative Map, State of New Jersey, NJDEP, Forestry Service, November 1984
7. Estimate of 1996 Total Resident Population and Square Mile Area by Counties and Municipalities, US Bureau of the Census, Population Data Division, 6/30/99
- 8a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Table 2.5-5, Unspecified Weeds and Note b.
- 8b. Eastern Regional Technical Advisory Committee (ERTAC) 2009.
9. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory

10. NJDEP Division A Fire Call in Log for 2007, September 21, 2009

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Agricultural Field Burning, Infested

SCC: 2801500100

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), carbon monoxide (CO), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5) and ammonia (NH3). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning agricultural field burning. This is the only recommended method and was employed in developing the inventory. Emissions from agricultural field burning are calculated using the number of county and section specific permits.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Total agricultural field burning infested permits issued by county for New Jersey Divisions A and B and by section for New Jersey Division C, CPER ^{2,3,4}
2. Average Acreage per permit (average acres/permit): ACRE ⁴
Division A,B,C: 1.5 acres per permit
3. Fuel loading factors (ton matter burned/permit): FL ⁵
Division A, B, C: 2.0 tons per acre
4. Percentage of each municipality in each NJDEP Forestry Section ⁶
5. Area of each municipality, square miles ⁷
6. Emission Factors, EF, (lbs/ton burned) ^{8a, 8b}
VOC=Non Methane Hydrocarbons (NMHC): 18
CO: 117
PM10: 21
PM2.5: 21
NH3: 1.3
7. Weekly activity, WAF=7 days/week ⁹
8. Seasonal adjustment factors, SAF ¹⁰
Summer Season Adjustment Factor 0.55
Fall Season Adjustment Factor 0.78
Winter Season Adjustment Factor 1.16
Spring Season Adjustment Factor 1.51

Process:

The following equations are used to calculate the emissions without control for this source category.

STEP 1: For Division C calculate the number of permits issued at the municipal level based on the # permits in each section and the % of each municipality in each section.

STEP 2: For Division C total the number of permits at the municipal level to obtain the number of permits at the county level.

STEP 3: For Divisions A, B and C, calculate the amount of agricultural infested material burned INFTON (tons material burned) :

$$\text{INFTON} = \text{CPER} * \text{ACRE} * \text{FL}$$

STEP 4: Calculate Emissions:

$$\begin{aligned} \text{Ep}_a &= \text{EF} * \text{ALCTON} \\ \text{Ep}_s &= \text{Ep}_a / \text{AADF} * \text{SAF} \\ \text{Ep}_w &= \text{Ep}_a / \text{AADF} * \text{SAF} \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

- Ep_s = (tons/day) for a typical summer day emission of pollutant
- Ep_w = (tons/day) for a typical winter day emission of pollutant
- AAADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

Assumptions:

1. Acreage of agricultural fields burned in each county based on the number of agricultural field burning permits issued in each county and represents the best available estimate of acreage burned per permit that can be provided by the NJ Forestry Service.
2. Assume that tons of matter burned per acreage is uniform across the specified division and represents the best available estimate that can be provided by NJ Forestry Service.
3. Assume particulate matter from most agricultural refuse burning is within the submicrometer size range.⁸
4. Assume that the EF for NMHC is equivalent to the EF for VOC.
5. North of the Raritan represents Division A and the Mullica River divides B and C division.^{5,6}
6. Assume that approximately 5/6 of Somerset County belongs to Division A and the remaining 1/6 belongs to Division B.^{2,3}
7. Assume that 1/2 of Mercer County belongs to Division A and the other 1/2 belongs to Division B.^{5,6}

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
NH3	tons/yr	tons/day	tons/day

References

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. NJDEP Division A Permit Log for 2007 by County, April 1, 2009
3. NJDEP Division B Permit Log for 2007 by Township, April 1, 2009
4. NJDEP Division C Permit Log for 2007 by Section, April 1, 2009
5. Memo to File on Phone Conversations with NJ Forestry Service
6. Administrative Map, State of New Jersey, NJDEP, Forestry Service, November 1984
7. Estimate of 1996 Total Resident Population and Square Mile Area by Counties and Municipalities. US Bureau of the Census, Population Data Division, 6/30/99
- 8a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Table 2.5-5, Unspecified Field Crops and Note b.
- 8b. Eastern Regional Technical Advisory Committee (ERTAC) 2009.
9. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

10. NJDEP Division A Fire Call in Log for 2007, September 21, 2009

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Agricultural Field Burning, Orchard

SCC: 2801500300

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), carbon monoxide (CO), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5) and ammonia (NH3). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning agricultural field burning. This is the only recommended method and was employed in developing the inventory. Emissions from agricultural field burning are calculated using the number of county and section specific permits.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Total agricultural field burning orchard permits issued by county for New Jersey Divisions A and B and by section for New Jersey Division C, CPER ^{2,3,4}
2. Average Acreage per permit (average acres/permit): ACRE ⁴
Division A,B,C: 7.5 acres per permit
3. Fuel loading factors (ton matter burned/permit): FL ⁵
Division A, B, C: 9.0 tons per acre
4. Percentage of each municipality in each NJDEP Forestry Section ⁶
5. Area of each municipality, square miles ⁷
6. Emission Factors, EF, (lbs/ton burned) ^{8a, 8b}
VOC=Non Methane Hydrocarbons (NMHC): 8
CO: 52
PM10: 6
PM2.5: 6
NH3: 1.3
7. Weekly activity, WAF=7 days/week ⁹
8. Seasonal adjustment factors, SAF ¹⁰
Summer Season Adjustment Factor 0.55
Fall Season Adjustment Factor 0.78
Winter Season Adjustment Factor 1.16
Spring Season Adjustment Factor 1.51

Process:

The following equations are used to calculate the emissions without control for this source category.

STEP 1: For Division C calculate the number of permits issued at the municipal level based on the # permits in each section and the % of each municipality in each section.

STEP 2: For Division C total the number of permits at the municipal level to obtain the number of permits at the county level.

STEP 3: For Divisions A, B and C, calculate the amount of agricultural orchard material burned ORCTON (tons material burned) :

$$\text{ORCTON} = \text{CPER} * \text{ACRE} * \text{FL}$$

STEP 4: Calculate Emissions:

$$\begin{aligned} \text{Ep}_a &= \text{EF} * \text{ALCTON} \\ \text{Ep}_s &= \text{Ep}_a / \text{AADF} * \text{SAF} \\ \text{Ep}_w &= \text{Ep}_a / \text{AADF} * \text{SAF} \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

- Ep_s = (tons/day) for a typical summer day emission of pollutant
- Ep_w = (tons/day) for a typical winter day emission of pollutant
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

Assumptions:

1. Acreage of agricultural fields burned in each county based on the number of agricultural field burning permits issued in each county and represents the best available estimate of acreage burned per permit that can be provided by the NJ Forestry Service.
2. Assume that tons of matter burned per acreage is uniform across the specified division and represents the best available estimate that can be provided by NJ Forestry Service.
3. Assume particulate matter from most agricultural refuse burning is within the submicrometer size range.⁸
4. Assume that the EF for NMHC is equivalent to the EF for VOC.
5. North of the Raritan represents Division A and the Mullica River divides B and C division.^{5,6}
6. Assume that approximately 5/6 of Somerset County belongs to Division A and the remaining 1/6 belongs to Division B.^{2,3}
7. Assume that 1/2 of Mercer County belongs to Division A and the other 1/2 belongs to Division B.^{5,6}

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
 New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
NH3	tons/yr	tons/day	tons/day

References

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. NJDEP Division A Permit Log for 2007 by County, April 1, 2009
3. NJDEP Division B Permit Log for 2007 by Township, April 1, 2009
4. NJDEP Division C Permit Log for 2007 by Section, April 1, 2009
5. Memo to File on Phone Conversations with NJ Forestry Service
6. Administrative Map, State of New Jersey, NJDEP, Forestry Service, November 1984
7. Estimate of 1996 Total Resident Population and Square Mile Area by Counties and Municipalities, US Bureau of the Census, Population Data Division, 6/30/99
- 8a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Table 2.5-5, Unspecified Orchard Crops and Note b.
- 8b. Eastern Regional Technical Advisory Committee (ERTAC) 2009.
9. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory

10. NJDEP Division A Fire Call in Log for 2007, September 21, 2009

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Forest Wildfires

SCC: 2810010000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning wildfire burning

This is the only recommended method and was employed in developing the inventory.

Emissions from forest wildfires are calculated using county specific acres burned.

Wildfire emissions were calculated for the years 2000-2007 and were averaged to establish a representative year.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Annual Acres burned by county and month, ACRES ²
2. Fuel loading factor, FL ³
Division A, B, C = 11 tons/acre
3. Emission Factors, EF, (lbs/ton burned)

VOC = (296kg/hect*2.2046lb/kg)/(25Mgfuel/hect*1.1023tonfuel/Mg)=	23.7	⁴
NOx = (49kg/hect*2.2046lb/kg)/(25Mgfuel/hect*1.1023tonfuel/Mg)=	4	⁴
CO = (1730kg/hect*2.2046lb/kg)/(25Mgfuel/hect*1.1023tonfuel/Mg)=	140	⁴
PM10 = (15kg/Mg*2.2046lb/kg)/(1.1023tonfuel/Mg) =	30	⁵
PM2.5 = (13.5kg/Mg*2.2046lb/kg)/(1.1023tonfuel/Mg) =	27	⁵
NH3=	1.3	⁶

4. Weekly activity, WAF=7 days/week ⁷

5. Seasonal adjustment factors, SAF ²

Summer Season Adjustment Factor	0.54
Fall Season Adjustment Factor	0.03
Winter Season Adjustment Factor	0.01
Spring Season Adjustment Factor	3.42

Process:

The following equations are used to calculate the emissions without control for this source category:

$$\begin{aligned}E_{p_a} &= EF \cdot ACRES \cdot FL \\E_{p_s} &= E_{p_a} / AADF \cdot SAF \\E_{p_w} &= E_{p_a} / AADF \cdot SAF\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. The NJ Forest Service fuel loadings factors are assumed to be valid.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
NH3	tons/yr	tons/day	tons/day

References:

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. Wildfire Acres Burned 2000 to 2007, May 24, 2012 from James Dunn, NJDEP, Forestry Service
3. Memo to File on Phone Conversations with NJ Forestry Service
4. Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Table 13.1-2, Eastern Group
5. Development of Emissions Inventory Methods for Wildland Fires, February 2002, Table 22, Average Wildfires
6. Eastern Regional Technical Advisory Committee (ERTAC) 2009
7. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Managed Burning

SCC: 2810015000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀), particulate matter less than or equal to 2.5 microns (PM_{2.5}) and ammonia (NH₃). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Contacting the Bureau of Forest Fire Management for information concerning managed burning

This is the only recommended method and was employed in developing the inventory.

Emissions from managed burning are calculated using county specific acres burned.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Annual Acres burned by county and month, ACRES ²
2. Fuel loading factor, FL ³
Division A, B, C = 4 tons/acre
3. Emission Factors, EF, (lbs/ton burned)

VOCA = (6.4 g/kg) * (907kg/ton)/(454 g/lb) =	12.8	⁴ (Table 13.1-3 Hardwood Fire)
VOCBC = (3.5 g/kg) * (907kg/ton)/(454 g/lb) =	7	⁴ (Table 13.1-3 Short Needle)
NO _x = (4 g/kg) * (907kg/ton)/(454 g/lb) =	8	⁴ (Section 13.1 page 13.1-6)
CO = (143.8 g/kg) * (907kg/ton)/(454 g/lb) =	287.6	⁴ (Table 13.1-4 North and Central Eastern Region, Average for the Region)
PM ₁₀ = (14 g/kg) * (907kg/ton)/(454 g/lb) =	28	⁴ (Table 13.1-4 North and Central Eastern Region, Average for the Region)
PM _{2.5} = (12 g/kg) * (907kg/ton)/(454 g/lb) =	24	⁴ (Table 13.1-3 Short Needle Conifer)
NH ₃ =	1.3	⁵ ERTAC 2009

4. Weekly activity, WAF=7 days/week ⁶

5. Seasonal adjustment factors, SAF ²	
Summer Season Adjustment Factor	0
Fall Season Adjustment Factor	0
Winter Season Adjustment Factor	1.24
Spring Season Adjustment Factor	2.75

Process:

The following equations are used to calculate the emissions without control for this source category:

$$\begin{aligned}E_{p_a} &= EF \cdot ACRES \cdot FL \\E_{p_s} &= E_{p_a} / AADF \cdot SAF \\E_{p_w} &= E_{p_a} / AADF \cdot SAF\end{aligned}$$

Where:

E _{p_a}	= (tons/yr) for an annual emission of pollutant by county
E _{p_s}	= (tons/day) for a typical summer day emission of pollutant
E _{p_w}	= (tons/day) for a typical winter day emission of pollutant
AADF	= Annual activity day factor (WAF * 52 weeks/year)
SAF	= Seasonal adjustment factor

Assumptions:

1. The NJ Forest Service fuel loadings factors are assumed to be valid.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule:
New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 2, N.J.A.C. 7:27-2, New Jersey State Department of Environmental Protection, June 20, 1994

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. Prescribed Fire in 2007, October 2, 2009, Michael Drake NJDEP, Forestry Service
3. Memo to File on Phone Conversations with NJ Forestry Service
4. Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC
5. Eastern Regional Technical Advisory Committee (ERTAC) 2009
6. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial Cooking: Conveyor Charbroiling

SCC: 2302002100

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5), and carbon monoxide (CO). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. USEPA 2008 National Emissions Inventory Calculation Methodology

Emissions from commercial cooking are calculated using the USEPA calculation methodology and allocating emissions to the county level using population.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. County population, CPOP ²
2. Emission Factors, EF, (lbs/year/capita) ¹
 - VOC= 1.89
 - PM10= 0.05
 - PM2.5= 0.05
 - CO= 0.04
3. Weekly activity, WAF= 7 days/week
4. Seasonal adjustment factor, SAF = 1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= CPOP * EF / CF \\ Ep_s &= Ep_a * SAF / AADF \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day

References:

1. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.
2. Estimate of 2007 Total Resident Population by County, NJDOT, July 17, 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial Cooking: Underfired Charbroiling

SCC: 2302002200

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5), and carbon monoxide (CO). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. USEPA 2008 National Emissions Inventory Calculation Methodology

Emissions from commercial cooking are calculated using the USEPA calculation methodology and allocating emissions to the county level using population.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. County population, CPOP ²
2. Emission Factors, EF, (lbs/year/capita) ¹
 - VOC= 0.04
 - PM10= 0.35
 - PM2.5= 0.34
 - CO= 0.14
3. Weekly activity, WAF= 7 days/week
4. Seasonal adjustment factor, SAF = 1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= CPOP * EF / CF \\ Ep_s &= Ep_a * SAF / AADF \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day

References:

1. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.
2. Estimate of 2007 Total Resident Population by County, NJDOT, July 17, 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial Cooking: Flat Griddle Frying

SCC: 2302003100

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), particulate matter less than or equal to 10 microns (PM10), particulate matter less than or equal to 2.5 microns (PM2.5), and carbon monoxide (CO). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. USEPA 2008 National Emissions Inventory Calculation Methodology

Emissions from commercial cooking are calculated using the USEPA calculation methodology and allocating emissions to the county level using population.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. County population, CPOP ²
2. Emission Factors, EF, (lbs/year/capita) ¹
 - VOC= 0.01
 - PM10= 0.10
 - PM2.5= 0.08
 - CO= 0.01
3. Weekly activity, WAF= 7 days/week
4. Seasonal adjustment factor, SAF = 1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= CPOP * EF / CF \\ Ep_s &= Ep_a * SAF / AADF \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day

References:

1. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.
2. Estimate of 2007 Total Resident Population by County, NJDOT, July 17, 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Commercial Cooking: Clamshell Griddle Frying

SCC: 2302003200

The following describes the emission calculation methodology for this source category for the following pollutants: particulate matter less than or equal to 10 microns (PM10) and particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. USEPA 2008 National Emissions Inventory Calculation Methodology

Emissions from commercial cooking are calculated using the USEPA calculation methodology and allocating emissions to the county level using population.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. County population, CPOP ²
2. Emission Factors, EF, (lbs/year/capita) ¹
PM10= 0.01
PM2.5= 0.01
3. Weekly activity, WAF= 7 days/week
4. Seasonal adjustment factor, SAF = 1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} Ep_a &= CPOP * EF / CF \\ Ep_s &= Ep_a * SAF / AADF \end{aligned}$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
VOC	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day

References:

1. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.

2. Estimate of 2007 Total Resident Population by County, NJDOT, July 17, 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Structural Fires

SCC: 2810030000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀) and particulate matter less than or equal to 2.5 microns (PM_{2.5}). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Local fire department information
2. Population based estimate of the number of structural fires

Local fire department information was used because the input data elements were readily available

Emissions from structural fires are calculated using fire department specific number of fires.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Number of fires per county in 2007, FIRE ²
3. Fuel loading factor: FL = 1.15 tons burned/fire ³
4. Emission Factors, EF, (lbs/ton burned) ³
 - VOC = 11
 - NOx = 1.4
 - CO = 60
 - PM₁₀ = 10.8
 - PM_{2.5} = 10.8
5. Weekly activity, WAF=7 days/week ⁴
6. Seasonal adjustment factor, SAF ⁴

Summer Season Adjustment Factor	0.8
Fall Season Adjustment Factor	0.94
Winter Season Adjustment Factor	1.32
Spring Season Adjustment Factor	0.94

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned}E_{p_a} &= \text{FIRE} * \text{FL} * \text{EF} / \text{CF} \\E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF}\end{aligned}$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
CF = Conversion factor for units = 2000 lbs/ton
AADF = Annual activity day factor (WAF * 52 weeks/year)
SAF = Seasonal adjustment factor

Assumptions:

1. PM 2.5 and PM₁₀ emission factors are conservatively assumed to be equal to PM.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. 2007 Structural Fire Data, Number of Fires per county, Heather Puskar, NJ Division of Fire Safety, April 30, 2009.
3. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 18 - Structure Fires, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c, Table 18.4-1
4. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Vehicle Fires

SCC: 2810050000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀) and particulate matter less than or equal to 2.5 microns (PM_{2.5}). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Local fire department information
2. Population based estimate of the number of structural fires

Local fire department information was used because the input data elements were readily available

Emissions from vehicle fires are calculated using fire department specific number of fires.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Number of fires per county in 2007, FIRE ²
3. Fuel loading factor: FL = 500 pounds burned/fire ³
4. Emission Factors, EF, (lbs/ton burned) ³
 - VOC = 32
 - NO_x = 4
 - CO = 125
 - PM₁₀ = 100
 - PM_{2.5} = 100

5. Weekly activity, WAF=7 days/week ⁴

6. Seasonal adjustment factor, SAF = 1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$\begin{aligned} E_{p_a} &= \text{FIRE} * \text{FL} * \text{EF} / \text{CF} \\ E_{p_s} &= E_{p_a} * \text{SAF} / \text{AADF} \\ E_{p_w} &= E_{p_a} * \text{SAF} / \text{AADF} \end{aligned}$$

Where:

- E_{p_a} = (tons/yr) for an annual emission of pollutant by county
- E_{p_s} = (tons/day) for a typical summer day emission of pollutant
- E_{p_w} = (tons/day) for a typical winter day emission of pollutant
- CF = Conversion factor for units = 2000 lbs/ton
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

Assumptions:

1. PM 2.5 and PM₁₀ emission factors are conservatively assumed to be equal to PM.
2. VOC emission factor is equal to nonmethane TOC

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
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VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. 2007 Vehicle Fire Data, Number of Fires per county, Heather Puskar, NJ Division of Fire Safety, April 30, 2009.
3. EIIP Volume III, Area Sources Preferred and Alternative Methods, Area Source Category Method Abstract-Vehicle Fires, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/R-97-004c, May 15, 2004
4. EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 1 - Introduction, Emission Inventory Improvement Program, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Cigarette Smoking

SCC: 2810003000

The following describes the emission calculation methodology for this source category for the following pollutants: volatile organic compounds (VOC), oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter less than or equal to 10 microns (PM₁₀) and particulate matter less than or equal to 2.5 microns (PM_{2.5}). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodologies are recommended for this source category: ¹

1. Obtaining state specific data on cigarette smoking

This is the only recommended method and was used in developing the emission inventory.

Emissions from cigarette smoking are calculated using statewide packs of cigarettes sold, allocated to the county level using population.

Required Input Parameters:

The following input data is required to calculate emissions for this source category.

1. Packs of cigarettes sold in New Jersey in 2007, PCIG ²
2. Cigarettes per pack, #CIGPP = 20
3. County and State population, CPOP, SPOP ³
4. Emission Factors, EF, (mg/cigarette smoked) ¹

VOC = 6.75

NOx = 0.35

CO = 19.0

PM₁₀ = 22.5

PM_{2.5} = 22.5

5. Weekly activity, WAF=7 days/week

6. Seasonal adjustment factor, SAF=1

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = PCIG * \#CIGPP * EF * (CPOP / SPOP) * CF1 / CF2$$

$$Ep_s = Ep_a * SAF / AADF$$

$$Ep_w = Ep_a * SAF / AADF$$

Where:

PCIG = Number of cigarettes sold in New Jersey per capita * SPOP

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

CF1 = Conversion factor for units = 2.205*10⁶ pounds/miligrams

CF2 = Conversion factor for units = 2000 lbs/ton

AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

Assumptions:

1. Assume a weekly activity factor of 7 days per week

2. Assume a seasonal adjustment factor of 1

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
VOC	tons/yr	tons/day	tons/day
NOx	tons/yr	tons/day	tons/day
CO	tons/yr	tons/day	tons/day
SO2	tons/yr	tons/day	tons/day
PM10	tons/yr	tons/day	tons/day
PM2.5	tons/yr	tons/day	tons/day

References:

1. Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Vol. I: General Guidance for Stationary Sources, May 1991, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-450/4-91-016
2. State Tobacco Activities Tracking and Evaluation (STATE) System. Cigarette Sales New Jersey 2007. Centers for Disease Control and Prevention (CDC). Accessed from <http://apps.nccd.cdc.gov/StateSystem>.
3. Estimate of 2007 Total Resident Population by County, NJDOT, July 17, 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Paved Roads

SCC: 229400000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology/State specific VMT ^{1,2}

The paved road dust category includes emissions of fugitive dust particulate matter entrained by vehicular travel on paved roads.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Daily vehicle miles traveled by county, roadway type (Freeway, Arterial, Local) and season, VMT ³
2. Average vehicle weight by county, W
Calculated by taking average vehicle weight by vehicle class from EPA Mobile 6 model ^{4,5} and averaging by vehicle class and county using average annual VMT ³

County	Mean Vehicle Weight
Atlantic	2.33
Bergen	2.49
Burlington	3.22
Camden	3.22
Cape May	2.31
Cumberland	2.60
Essex	2.53
Gloucester	3.22
Hudson	2.96
Hunterdon	3.32
Mercer	3.22
Middlesex	3.13
Monmouth	2.58
Morris	2.73
Ocean	2.49
Passaic	2.66
Salem	3.28
Somerset	2.76
Sussex	3.05
Union	2.67
Warren	4.12
Statewide Average	2.90

3. Precipitation data, # of Days > 0.01 inches precipitation per season, p ⁶

4. Silt Loading, sL g/m²

Calculated by taking silt loading factors in EPA NEI guidance ^{1,5} and averaging by county using urban and rural roadway mileage ⁷

County	Silt Loading Factors (g/m ²)		
	Freeway	Arterial	Local
Atlantic	0.02	0.08	0.20
Bergen	0.02	0.05	0.20
Burlington	0.02	0.08	0.20
Camden	0.02	0.05	0.20
Cape May	0.02	0.11	0.20
Cumberland	0.02	0.09	0.20
Essex	0.02	0.05	0.20
Gloucester	0.02	0.08	0.20
Hudson	0.02	0.05	0.20
Hunterdon	0.02	0.13	0.20
Mercer	0.02	0.06	0.20
Middlesex	0.02	0.06	0.20
Monmouth	0.02	0.07	0.20
Morris	0.02	0.06	0.20
Ocean	0.02	0.08	0.20
Passaic	0.02	0.05	0.20
Salem	0.02	0.12	0.20
Somerset	0.02	0.07	0.20
Sussex	0.02	0.12	0.20
Union	0.02	0.05	0.20
Warren	0.02	0.11	0.20

Constants ²	PM 2.5	PM 10	
5. Base emission factor, empirical constant, k	1.1	7.3	g/mile
6. c, emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear	0.1617	0.2119	g/mile

- 7. Weekly activity, WAF=7 days/week
- 8. Seasonal adjustment factors, SAF, calculated see below
 - Summer Season Adjustment Factor 1.02
 - Fall Season Adjustment Factor 1.01
 - Winter Season Adjustment Factor 0.96
 - Spring Season Adjustment Factor 1.01

Process:

The following equations are used to calculate the emissions without control for this source category.^{1,2}

$$EF = (((k * (sL/2)^{0.65} * (W/3)^{1.5}) - c) * (1 - p/4N)) / CF1$$

$$Ep_d = (VMT * EF) / CF2 * DAF$$

$$Ep_{sea} = (Ep_{dfreeway} + Ep_{dfarterial} + Ep_{dlocal}) * DAF$$

$$Ep_a = ((Ep_s * N) + (Ep_w * N) + (Ep_{sp} * N) + (Ep_r * N)) * DAF$$

$$SAF = (Ep_s / Ep_a) * N$$

Where:

EF = emission factor by roadway type (freeway, arterial, local) and season (summer, winter, spring, fall) (pounds per mile)

CF1 = Conversion factor for units = 453.59237 grams/pound

Ep_d = (tons/day) for a typical day emission of pollutant by roadway type and season

Ep_{sea} = (tons/day) for a typical day emission of pollutant by season

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

Ep_{sp} = (tons/day) for a typical spring day emission of pollutant

Ep_f = (tons/day) for a typical fall day emission of pollutant

N = number of days in averaging period (summer=92, winter = 90, spring = 92, fall = 91)

CF2 = Conversion factor for units = 2000 lbs/ton

SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.

2. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.1, Paved Roads, Revised November 2006.

3. New Jersey's Roadway Mileage and Daily VMT by Functional Classification Distributed by County, 2007, New Jersey Department of Transportation, <http://www.state.nj.us/transportation/refdata/roadway/vmt.shtm>.

4. USEPA Mobile6 Model User's Guide, Mobile6 Vehicle Classifications, March 13, 2002

5. Email from Megan Schuster of MARAMA dated November 30, 2004 containing latest "Fugitive Dust From Paved Roads" Methodology Sheet from E.H. Pechan and Associates.

6. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ

7. New Jersey's Roadway Mileage and Daily VMT by Functional Classification Distributed by County, 2007, New Jersey Department of Transportation, <http://www.state.nj.us/transportation/refdata/roadway/vmt.shtm>.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Unpaved Roads

SCC: 2296000000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology ^{1,2}

This source category provides estimates of the entrained geologic particulate matter emissions that result from vehicular travel over non-agricultural unpaved roads. The emissions result from the mechanical disturbance of the roadway and the vehicle generated air turbulence effects.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Unpaved Road Mileage, statewide, UPRM ³
2. Average daily traffic volume, vehicles per day, statewide, ADTV ³
3. 2000 Rural population by county, CRPOP, SRPOP ⁴
4. Precipitation data, # of Days > 0.01 inches precipitation per season, p ⁵
5. Mean vehicle speed, S = 33 mph ²
6. Silt Content percent, s = 22% ⁶
7. Moisture content percent, M = 0.50% ⁷

Constants ²	PM 2.5	PM 10	
8. Base emission factor, empirical constant, k	0.18	1.80	lbs/mile
9. empirical constant, a	1.00	1.00	lbs/mile
10. empirical constant, b			
11. empirical constant, c	0.20	0.20	lbs/mile
12. empirical constant, d	0.50	0.50	lbs/mile
13. c, emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear	0.00036	0.00047	lbs/mile

14. Weekly activity, WAF=7 days/week
15. Seasonal adjustment factors, SAF, calculated see below

Summer Season Adjustment Factor	1.06
Fall Season Adjustment Factor	1.08
Winter Season Adjustment Factor	0.84
Spring Season Adjustment Factor	1.02

Process:

The following equations are used to calculate the emissions without control for this source category.

Equations 1b and 2: ²

$$EF = (([k * (s/12)^a * (S/30)^d] / [(M/0.5)^c]) - c) * [(365 - p * 4)/365]$$

$$Ep_d = [(UPRM*(CRPOP/SRPOP))*(ADTV*(CRPOP/SRPOP))* EF/CF] * DAF$$

$$Ep_a = [(Ep_s*N) + (Ep_w*N) + (Ep_{sp}*N) + (Ep_f*N)] * DAF$$

$$SAF = (Ep_d/Ep_a)*N$$

Where:

EF = seasonal emission factor (pounds per mile)

Ep_d = (tons/day) for a typical day emission of pollutant by season (summer, winter, spring, fall)

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

Ep_{sp} = (tons/day) for a typical spring day emission of pollutant

Ep_f = (tons/day) for a typical fall day emission of pollutant

N = number of days in averaging period (summer=92, winter = 90, spring = 92, fall = 91)

CF = Conversion factor for units = 2000 lbs/ton

SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, Revised November 2006.
3. 2007 Highway Statistics, U.S. Department of Transportation, Federal Highway Administration, Table HM-51, October 2008
4. US Census Bureau, Urban and Rural Population, New Jersey and Counties: 2000
5. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ
6. Evaluation of Potential Improvements in the Estimation of unpaved Road Fugitive Emission Inventories, William Barnard, Gary Stensland, Donald Gatz, Illinois State Water Survey, June 1987.
7. Documentation for the 2008 Non-point Source National Emission Inventory for Criteria and Hazardous Air Pollutants (September 2009 Version), E.H. Pechan & Associates for EPA, September 2009.

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Construction - Residential

SCC: 2311010000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology¹

Residential building construction includes the construction of single-family units, two family units, and apartments buildings. The emissions result predominantly from site preparation work which may include scraping, grading, loading, digging, compacting, light-duty vehicle travel, and other operations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. The county-level number of housing permits issued for single-family units, two-family units, and apartment buildings, $B_{p\text{-single}}$, $B_{p\text{-two}}$, $B_{p\text{-apartment}}$ ²

2. The regional-level percentage of new single-family units that do not have basements, %NOBM = 11%³

3. The regional-level percentage of new single-family units that have basements, %BM = 89%³

4. Building-to-acre conversion factor¹

$$f_{\text{single}} = 1/4 \text{ acre/building}$$

$$f_{\text{two}} = 1/3 \text{ acre/building}$$

$$f_{\text{apartment}} = 1/2 \text{ acre/building}$$

5. Emission factors, EF¹

$$\text{PM10}_{\text{single and two, no basement}} = 0.032 \text{ tons/acre-month}$$

$$\text{PM10}_{\text{single and two, basement}} = 0.011 \text{ tons/acre-month}$$

$$\text{PM10}_{\text{apartment}} = 0.11 \text{ tons/acre-month}$$

$$\text{PM2.5}_{\text{single and two, no basement}} = \text{PM10} * 0.2 = 0.0064 \text{ tons/acre-month}$$

$$\text{PM2.5}_{\text{single and two, basement}} = \text{PM10} * 0.2 = 0.0022 \text{ tons/acre-month}$$

$$\text{PM2.5}_{\text{apartment}} = \text{PM10} * 0.2 = 0.022 \text{ tons/acre-month}$$

$$\text{PM10}_{\text{dirt}} = 0.058 \text{ tons/1,000 cubic yards dirt moved}$$

$$\text{PM2.5}_{\text{dirt}} = \text{PM10} * 0.2 = 0.0118 \text{ tons/1,000 cubic yards dirt moved}$$

6. Duration of construction activity¹

$$m_{\text{single and two}} = 6 \text{ months}$$

$$m_{\text{apartment}} = 12 \text{ months}$$

7. Quantity of dirt moved during single-family unit basement construction, $d = 652 \text{ cubic yards/building}$ ¹

8. Precipitation-Evaporation Value (PE) = 124⁴

4. Silt Content percentage (s) = 18%⁵

6. Weekly activity, WAF=7 days/week

7. Seasonal adjustment factors, SAF

$$\text{Summer Season Adjustment Factor} = 1.60$$

$$\text{Fall Season Adjustment Factor} = 1.00$$

$$\text{Winter Season Adjustment Factor} = 0.52$$

$$\text{Spring Season Adjustment Factor} = 0.96$$

SAF based on activity and precipitation variations. Activity variations for summer, fall, winter and spring are as follows: 1.60, 1.00, 0.52 and 0.96⁶. Precipitation variations based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2⁷. This equation = ((total days - p) / total days), where the total days is equal to the number of days for each season and p is the number of days with at least 0.01 inches of precipitation.⁸ The precipitation variations for summer, fall, winter and spring are as follows: 1.05, 1.07, 0.86 and 1.02. The total SAF is the product of the activity SAF and the precipitation SAF (summer SAF = 1.53 * 1.05; fall SAF = 0.94 * 1.07; winter SAF = 0.60 * 0.86; and spring SAF = 0.94 * 1.02).

Process:

The following equations are used to calculate the emissions without control for this source category:

Single and two family, no basement, (tons/yr) for an annual emission of pollutant by county:

$$Ep_{\text{single and two, no basement}} = [((B_{p\text{-single}} * f + B_{p\text{-two}} * f) * \%NOBM) * EF * m * (24/PE) * (s/9)] * DAF$$

Single and two family, with basement, (tons/yr) for an annual emission of pollutant by county:

$$Ep_{\text{single and two, basement}} = [(((B_{p\text{-single}} * f + B_{p\text{-two}} * f) * \%BM) * EF * m * (24/PE) * (s/9)) + ((B_{p\text{-single}} + B_{p\text{-two}}) * \%BM) * EF_{\text{dirt}} * d/1000)] * DAF$$

Apartment, (tons/yr) for an annual emission of pollutant by county:

$$Ep_{\text{apartment}} = [(B_{p\text{-apartment}} * f) * EF * m * (24/PE) * (s/9)] * DAF$$

$$Ep_a = [Ep_{\text{single and two, no basement}} + Ep_{\text{single and two, basement}} + Ep_{\text{apartment}}] * DAF$$

$$Ep_s = [Ep_a * SAF/AADF] * DAF$$

$$Ep_w = [Ep_a * SAF/AADF] * DAF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

AADF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.

2. Bureau of the Census. Building Permits website - <http://censtats.census.gov/bldg/bldgprmt.shtml>. Annual data for New Jersey by county.
3. Bureau of the Census. Characteristics of New Housing website - <http://www.census.gov/const/www/charindex.html> Characteristics of New One-Family Houses Completed, Type of Foundation history table. Annual data for the Northeast Region.
4. Estimating Particulate Matter Emissions From Construction Operations, Final Report, Midwest Research Institute, for Eastern Research Group, for USEPA, September 30, 1999.
5. Summary of Approaches Available for Fugitive Dust Sources Technical Memorandum, E.H. Pechan & Associates, for MARAMA, May 21, 2004.
6. Seasonal and Monthly Activity Allocation Fractions for Nonroad Engine Emissions Modeling, EPA 420-P-02-010, Table 4, Mid-Atlantic Region.
7. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, December 2003.
8. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Construction - Commercial

SCC: 2311020000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology/State specific construction square footage ¹

Commercial construction includes the construction of Assembly buildings, education buildings, factories, office buildings, storage facilities, hazardous uses, hotels, motels and guest houses, retail buildings, signs, fences. The emissions result predominantly from site preparation work which may include scraping, grading, loading, digging, compacting, light-duty vehicle travel, and other operations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Construction activity from permits, new and additions, by construction type and county (square feet) CON ²

Commercial construction includes the construction of Assembly buildings, education buildings, factories, office buildings, storage facilities, hazardous uses, hotels, motels and guest houses, retail buildings, signs, fences.

2. Project Duration, m: ¹

Signs, fences, misc	1	months
Retail	6	months
Other	12	months

3. Precipitation-Evaporation Value (PE) = 124 ³

4. Silt Content percentage (s) = 18% ⁴

5. Emission factors, EF (tons/acres/month) ¹

PM10 =	0.19
PM2.5 = PM10*0.2 =	0.038

6. Weekly activity, WAF=7 days/week

7. Seasonal adjustment factors, SAF

Summer Season Adjustment Factor	1.60
Fall Season Adjustment Factor	1.00
Winter Season Adjustment Factor	0.52
Spring Season Adjustment Factor	0.96

SAF based on activity and precipitation variations. Activity variations for summer, fall, winter and spring are as follows: 1.60, 1.00, 0.52 and 0.96 ⁵. Precipitation variations based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2 ⁶. This equation = ((total days - p) / total days), where the total days is equal to the number of days for each season and p is the number of days with at least 0.01 inches of precipitation. ⁷ The precipitation variations for summer, fall, winter and spring are as follows: 1.05, 1.07, 0.86 and 1.02. The total SAF is the product of the activity SAF and the precipitation SAF (summer SAF = 1.53 * 1.05; fall SAF = 0.94 * 1.07; winter SAF = 0.60 * 0.86; and spring SAF = 0.94 * 1.02).

Process:

The following equations are used to calculate the emissions without control for this source category:

$$E_{p_a} = [CON/CF * m * EF * (24/PE) * (s/9)] * DAF$$

$$Ep_s = [Ep_a * SAF / AADF] * DAF$$

$$Ep_w = [Ep_a * SAF / AADF] * DAF$$

Where:

Ep_a = (tons/yr) for an annual emission of pollutant by county
 Ep_s = (tons/day) for a typical summer day emission of pollutant
 Ep_w = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 43,560 sf/acre
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days
2. Assume a project duration of one month for signs and fences, 6 months for retail facilities and 12 months for all other.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. 2007 Construction activity from permits, new and additions, by construction type and county (square feet), New Jersey Department of Community Affairs.
3. Estimating Particulate Matter Emissions From Construction Operations, Final Report, Midwest Research Institute, for Eastern Research Group, for USEPA, September 30, 1999.
4. Summary of Approaches Available for Fugitive Dust Sources Technical Memorandum, E.H. Pechan & Associates, for MARAMA, May 21, 2004.
5. Seasonal and Monthly Activity Allocation Fractions for Nonroad Engine Emissions Modeling, EPA 420-P-02-010, Table 4, Mid-Atlantic Region.
6. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, December 2003.
7. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Construction - Institutional

SCC: 2311020000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology¹

Heavy miscellaneous construction includes construction of private driveways and parking areas, bridges, tunnels and elevated highways, sewers, water mains, pipelines other than sewer and water, power plants, sewage treatment plants, water treatment plants and other. The emissions result predominantly from site preparation work which may include scraping, grading, loading, digging, compacting, light-duty vehicle travel, and other operations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Value of Construction Work in New Jersey, \$CON:²

	New \$1000	Additions, alterations or reconstruction \$1000	Total \$
private driveways and parking areas	235,900	119,828	355,728,000
bridges, tunnels and elevated highways	187,256	295,133	482,389,000
sewers, water mains and related facilities	794,694	233,708	1,028,402,000
sewers, sewer lines, septic systems, and related facilities	491,223	136,129	627,352
water mains, storage, and related facilities	303,471	97,579	401,050,000
power and communication transmission lines, cables, towers, and related facilities	347,695	120,715	468,410,000
other	1,338,231	543,972	1,882,203,000
Total	3,698,470	1,547,064	5,245,534,000

2. County and state construction employment other than residential, commercial and roadway for NAICs 236210, 237110, 237120, 237130, 237310, 237990, CEMP, SEMP.³

3. Dollars-to-acres conversion factor, $f = 1.6 \text{ acres}/\$1,000,000$ ⁴

4. Duration of construction activity, $m = 12 \text{ months/year}$ ¹

5. Precipitation-Evaporation Value (PE) = 124⁵

6. Silt Content percentage (s) = 18%⁴

7. Emission factors, EF(tons/acre-month)¹

PM-10 = 0.19
 PM-2.5 = PM10*0.2= 0.038

8. Weekly activity, WAF=7 days/week

9. Seasonal adjustment factors, SAF			
Summer Season Adjustment Factor			1.60
Fall Season Adjustment Factor			1.00
Winter Season Adjustment Factor	0.52		
Spring Season Adjustment Factor			0.96

SAF based on activity and precipitation variations. Activity variations for summer, fall, winter and spring are as follows: 1.60, 1.00, 0.52 and 0.96⁶. Precipitation variations based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2⁷. This equation = ((total days - p) / total days), where the total days is equal to the number of days for each season and p is the number of days with at least 0.01 inches of precipitation.⁸ The precipitation variations for summer, fall, winter and spring are as follows: 1.05, 1.07, 0.86 and 1.02. The total SAF is the product of the activity SAF and the precipitation SAF (summer SAF = 1.53 * 1.05; fall SAF = 0.94 * 1.07; winter SAF = 0.60 * 0.86; and spring SAF = 0.94 * 1.02).

Process:

The following equations are used to calculate the emissions without control for this source category:

$$Ep_a = [\text{CON}/\$1000000] * (\text{CEMP}/\text{SEMP}) * f * m * \text{EF} * (24/\text{PE}) * (\text{s}/9) * \text{DAF}$$

$$Ep_s = [Ep_a * \text{SAF}/\text{AADF}] * \text{DAF}$$

$$Ep_w = [Ep_a * \text{SAF}/\text{AADF}] * \text{DAF}$$

Where:

- Ep_a = (tons/yr) for an annual emission of pollutant by county
- Ep_s = (tons/day) for a typical summer day emission of pollutant
- Ep_w = (tons/day) for a typical winter day emission of pollutant
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days
2. Assume a project duration of 12 months.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. New Jersey 2002 Economic Census, Construction, US Census Bureau, August 2005, Table 7
3. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.

4. Summary of Approaches Available for Fugitive Dust Sources Technical Memorandum, E.H. Pechan & Associates, for MARAMA, May 21, 2004.
5. Estimating Particulate Matter Emissions From Construction Operations, Final Report, Midwest Research Institute, for Eastern Research Group, for USEPA, September 30, 1999.
6. Seasonal and Monthly Activity Allocation Fractions for Nonroad Engine Emissions Modeling, EPA 420-P-02-010, Table 4, Mid-Atlantic Region.
7. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, Revised November 2006.
8. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Construction - Roadway

SCC: 2311030000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology/State specific roadway mileage ¹

The road construction dust source category provides estimates of the fugitive dust particulate matter due to construction activities while building roads. The emissions result from site preparation work which may include scraping, grading, loading, digging, compacting, light-duty vehicle travel, and other operations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. New Jersey roadway mileage 2006 by county and roadway type, RM2006 ²
2. New Jersey roadway mileage 2007 by county and roadway type, RM2007 ²
3. Conversion of miles to acres for each road type using estimates of acres disturbed per mile (f): ¹

Interstate, urban and rural; Other arterial, urban, RC1 -	15.2 acres/mile
Other arterial, rural, RC2 -	12.7 acres/mile
Collectors, urban, RC3 -	9.8 acres/mile
Collectors, rural, RC4 -	7.9 acres/mile
4. Emission factors, EF (tons/acres/month) ¹

PM-10 = 0.42
PM-2.5 = 0.0840
5. Duration of construction activity m , = 12 months ¹
6. Precipitation-Evaporation Value (PE) = 124 ³
7. Silt Content percentage (s) = 18% ⁴
8. Weekly activity, WAF=7 days/week
9. Seasonal adjustment factors, SAF

Summer Season Adjustment Factor	1.60
Fall Season Adjustment Factor	1.00
Winter Season Adjustment Factor	0.52
Spring Season Adjustment Factor	0.96

SAF based on activity and precipitation variations. Activity variations for summer, fall, winter and spring are as follows: 1.60, 1.00, 0.52 and 0.96 ⁵. Precipitation variations based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2 ⁶. This equation = ((total days - p) / total days), where the total days is equal to the number of days for each season and p is the number of days with at least 0.01 inches of precipitation. ⁷ The precipitation variations for summer, fall, winter and spring are as follows: 1.05, 1.07, 0.86 and 1.02. The total SAF is the product of the activity SAF and the precipitation SAF (summer SAF = 1.53 * 1.05; fall SAF = 0.94 * 1.07; winter SAF = 0.60 * 0.86; and spring SAF = 0.94 * 1.02).

Process:

The following equations are used to calculate the emissions without control for this source category:

$$E_{pRC} = [(RM2007-RM2006) * f * EF * m * (24/PE) * (s/9)] * DAF$$

$$E_{pa} = [E_{pRC1} + E_{pRC2} + E_{pRC3} + E_{pRC4}] * DAF$$

$$Ep_s = [Ep_a * SAF / AADF] * DAF$$

$$Ep_w = [Ep_a * SAF / AADF] * DAF$$

Where:

Ep_{RC} = (tons/yr) for an annual emission of pollutant by roadway category and county

Ep_a = (tons/yr) for an annual emission of pollutant by county

Ep_s = (tons/day) for a typical summer day emission of pollutant

Ep_w = (tons/day) for a typical winter day emission of pollutant

AA DF = Annual activity day factor (WAF * 52 weeks/year)

SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. New Jersey's Roadway Mileage and Daily VMT by Functional Classification Distributed by County, 2006 and 2007, New Jersey Department of Transportation, <http://www.state.nj.us/transportation/refdata/roadway/vmt.shtml>.
3. Estimating Particulate Matter Emissions From Construction Operations, Final Report, Midwest Research Institute, for Eastern Research Group, for USEPA, September 30, 1999.
4. Summary of Approaches Available for Fugitive Dust Sources Technical Memorandum, E.H. Pechan & Associates, for MARAMA, May 21, 2004.
5. Seasonal and Monthly Activity Allocation Fractions for Nonroad Engine Emissions Modeling, EPA 420-P-02-010, Table 4, Mid-Atlantic Region.
6. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, Revised November 2006.
7. Local Climatological Data 2007, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Mining and Quarrying - Sand and Gravel

SCC: 2325030000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology ^{1,2}

Emissions for mining and quarrying for sand and gravel include: overburden removal, loading and unloading, and overburden replacement. According to the USEPA, "Transfer and conveyance operations, crushing and screening operations, storage and travel on haul roads are not included because these activities are the most likely to have some type of control implemented." ¹ In addition, NJDEP has determined that the majority of these types of emissions are included in the point source inventory.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. New Jersey statewide sand and gravel production 2005, SAND&GRAVEL ³
= 23,020 thousand metric tons*1000*1.1023113 = 25,375,206 tons
2. County and state sand and gravel mining employment for NAICS: 21232x, CEMP, SEMP. ⁴
3. Moisture content %, M = 7.9% ²
4. Emissions Factors, EF lb/ton : ^{1,2}

	TSP lb/ton (AP-42 Table 11.9-4)	PM10 equation (AP-42 Table 11.9-1)	PM2.5 equation (AP-42 Table 11.9-1)	PM10 lb/ton	PM2.5 lb/ton
Overburden removal, OB	0.058	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.0435	0.0061
Loading, L		PM10 = (0.119/(M) ^{0.9})*0.75	PM2.5 = (1.16/(M) ^{1.2})*0.019	0.014	0.002
Unloading end dump, ULED	0.007	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.00525	0.0007
Unloading bottom dump, ULBD	0.066	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.0495	0.0069

5. Weekly activity, WAF=7 days/week
6. Seasonal adjustment factors, SAF

Summer Season Adjustment Factor	1.13
Fall Season Adjustment Factor	0.94
Winter Season Adjustment Factor	1.07
Spring Season Adjustment Factor	0.86

Seasonal production is assumed to be constant throughout the year. Factor based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2. ⁵ This equation = ((total days - p) / total days), where the total days is equal to the number of days during each season and p is the number of days with at least 0.01 inches of precipitation. ⁶ The precipitation variations for summer, fall, winter and spring are as follows: 1.13, 0.94, 1.07 and 0.86.

Process:

The following equations are used to calculate the emissions without control for this source category:

Equation 4.8-19: ¹

$$E_{pa} = [SAND\&GRAVEL * (CEMP/SEMP) * (OB + L + 0.5*ULED + ULBD)/CF] * DAF$$

$$E_{ps} = [E_{pa} * SAF / AADF] * DAF$$

$$E_{pw} = [E_{pa} * SAF / AADF] * DAF$$

Where:

- E_{pa} = (tons/yr) for an annual emission of pollutant by county
- E_{ps} = (tons/day) for a typical summer day emission of pollutant
- E_{pw} = (tons/day) for a typical winter day emission of pollutant
- CF = Conversion factor for units = 2000 lbs/ton
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days
2. Blasting does not occur for sand and gravel mining based on conversations with William Layton of the New Jersey Concrete & Aggregate Association.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category regarding overburden removal, drilling and blasting, loading and unloading, and overburden replacement, have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required. Transfer and conveyance operations, crushing and screening operations, storage and travel on haul roads are included in the point source inventory.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 11.9, Western Surface Coal Mining October 1998.
3. U.S. Geological Survey Minerals Yearbook, 2005, Table 1, Nonfuel Raw Mineral Production in New Jersey.
4. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
5. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, December 2003.
6. Local Climatological Data 2002, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Mining and Quarrying - Stone

SCC: 2325020000

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology ^{1,2}

Emissions for mining and quarrying of stone include: overburden removal, drilling and blasting, loading and unloading, and overburden replacement. According to the USEPA, "Transfer and conveyance operations, crushing and screening operations, storage and travel on haul roads are not included because these activities are the most likely to have some type of control implemented." ¹ In addition, NJDEP has determined that the majority of these types of emissions are included in the point source inventory.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. New Jersey statewide stone production 2005, STONE ³
= 22,700 thousand metric tons*1000*1.1023113 = 25,022,467 tons
2. County and state stone mining employment for NAICS: 21231x, 213115, CEMP, SEMP. ⁴
3. Moisture content %, M = 7.9% ²
4. Area of blast, AB = 16,000 sf ²
5. Depth of blast. DB = 5 ft
6. # blasts = (STONE * 2000lb/ton) / AB * DB * 163lb/cf = 4700 blasts
7. Emissions Factors, EF lb/ton : ^{1,2}

	TSP lb/ton (AP-42 Table 11.9-4)	PM10 equation (AP-42 Table 11.9-1)	PM2.5 equation (AP-42 Table 11.9-1)	PM10 lb/ton	PM2.5 lb/ton
Overburden removal, OB	0.058	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.0435	0.0061
Blasting, B		PM10 = (0.000014 * (AB) ^{1.5}) * 0.52 * #blasts	PM2.5 = (0.000014 * (AB) ^{1.5}) * 0.03 * #blasts	0.020	0.001
Loading, L		PM10 = (0.119/(M) ^{0.9})*0.75	PM2.5 = (1.16/(M) ^{1.2})*0.019	0.014	0.002
Unloading end dump, ULED	0.007	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.00525	0.0007
Unloading bottom dump, ULBD	0.066	PM10 = TSP * (bulldozing overburden scaling factor, 0.75)	PM2.5 = TSP * (bulldozing overburden scaling factor, 0.105)	0.0495	0.0069

8. Weekly activity, WAF=7 days/week

9. Seasonal adjustment factors, SAF

Summer Season Adjustment Factor	1.13
Fall Season Adjustment Factor	0.94
Winter Season Adjustment Factor	1.07
Spring Season Adjustment Factor	0.86

Seasonal production is assumed to be constant throughout the year. Factor based on number of days with at least 0.01 inches of precipitation and the precipitation control portion of Equation 2 of AP-42 Section 13.2.2.⁵ This equation = ((total days - p) / total days), where the total days is equal to the number of days during each season and p is the number of days with at least 0.01 inches of precipitation.⁶ The precipitation variations for summer, fall, winter and spring are as follows: 1.13, 0.94, 1.07 and 0.86.

Process:

The following equations are used to calculate the emissions without control for this source category:

Equation 4.8-19:¹

$$E_{pa} = [STONE * (CEMP/SEMP) * (OB + B + L + 0.5*ULED + ULBD)/CF] * DAF$$

$$E_{ps} = [E_{pa} * SAF / AADF] * DAF$$

$$E_{pw} = [E_{pa} * SAF / AADF] * DAF$$

Where:

- E_{pa} = (tons/yr) for an annual emission of pollutant by county
- E_{ps} = (tons/day) for a typical summer day emission of pollutant
- E_{pw} = (tons/day) for a typical winter day emission of pollutant
- CF = Conversion factor for units = 2000 lbs/ton
- AADF = Annual activity day factor (WAF * 52 weeks/year)
- SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days
2. Assume depth of blast equal to 5 feet based on conversations with William Layton of the New Jersey Concrete & Aggregate Association and an area of blast based on AP-42. The size and # of blasts is conservatively overestimated.

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category regarding overburden removal, drilling and blasting, loading and unloading, and overburden replacement, have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required. Transfer and conveyance operations, crushing and screening operations, storage and travel on haul roads are included in the point source inventory.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

Pollutant	Annual	Summer day	Winter day
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 11.9, Western Surface Coal Mining October 1998.
3. U.S. Geological Survey Minerals Yearbook, 2005, Table 1, Nonfuel Raw Mineral Production in New Jersey.

4. Total 2007 employment by 6 digit NAICS code and by county, New Jersey Department of Labor.
5. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, Section 13.2.2, Unpaved Roads, December 2003.
6. Local Climatological Data 2002, National Climatic Data Center, Newark and Atlantic City, NJ

Area Sources Calculation Methodology Sheets for the 2007 Periodic Emission Inventory

Agricultural Tilling

SCC: 2801000003

The following describes the emission calculation methodology for this source category for the following pollutants: fugitive dust particulate matter less than or equal to 10 microns (PM10) and fugitive dust particulate matter less than or equal to 2.5 microns (PM2.5). The emissions are calculated on an annual basis and for a typical summer and winter day for each county and statewide. Superscripts refer to references listed at the end of each calculation methodology sheet.

Calculation Methodology:

The following calculation methodology was used for this source category:

1. USEPA Methodology ¹

Fugitive dust emissions are produced by the mechanical disturbance of the soil during tilling operations.

Required Input Parameters:

The following input data is required to calculate emissions for this source category:

1. Acres of Land Tilled by county and crop type ("a") ²
2. Number of tillings per year by crop type ("p") ²

Crop	Number of Tillings	
	Conservation Use	Conventional Use
Corn	2	6
Spring Wheat	1	4
Rice	5	5
Fall-Seeded Small Grain	3	5

Crop	Number of Tillings	
	Conservation Use	Conventional Use
Soybeans	1	6
Cotton	5	8
Sorghum	1	6
Forage	3	3
Permanent Pasture	1	1
Other Crops	3	3
Fallow	1	1

3. Silt content fraction ("s") = 0.18 ³

4. c = constant 4.8 lbs/acre-pass ¹

5. k = dimensionless particle size multiplier ¹
 PM10=0.21
 PM2.5=0.042

7. Weekly activity, WAF=7 days/week

8. Seasonal adjustment factors, SAF ⁴

Summer Season Adjustment Factor	1.6
Fall Season Adjustment Factor	1.08
Winter Season Adjustment Factor	0.24
Spring Season Adjustment Factor	1.08

Process:

The following equations are used to calculate the emissions without control for this source category.

$$Ep_a = [c * k * s^{0.6} * p * a/CF] * DAF$$

$$Ep_s = [Ep_a * SAF/AADF] * DAF$$

$$Ep_w = [Ep_a * SAF/AADF] * DAF$$

Where:

E_{p_a} = (tons/yr) for an annual emission of pollutant by county
 E_{p_s} = (tons/day) for a typical summer day emission of pollutant
 E_{p_w} = (tons/day) for a typical winter day emission of pollutant
 CF = Conversion factor for units = 2000 lbs/ton
 AADF = Annual activity day factor (WAF * 52 weeks/year)
 SAF = Seasonal adjustment factor

DAF = Dust adjustment factor, see "Fugitive Dust Inventory Discussion and Summary" in attachment to 2007 Periodic Emission Inventory.

Assumptions:

1. Assume a weekly activity of 7 days

Rule Effectiveness:

The emissions from this source category are regulated by the following rule: None

Double Counting:

Emissions for this source category have not been reported in the point source inventory, therefore no adjustment of the area source emissions was required.

Output:

The emissions will be calculated on a county and statewide basis for the following pollutants and seasons:

<u>Pollutant</u>	<u>Annual</u>	<u>Summer day</u>	<u>Winter day</u>
Fugitive Dust PM10	tons/yr	tons/day	tons/day
Fugitive Dust PM2.5	tons/yr	tons/day	tons/day

References

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Procedures Document for National Emission Inventory, Criteria Air Pollutants, 1985-1999. EPA-454/R-01-006. Section 4.8.1.7.2.2. March 2001.
2. National Crop Residue Management Survey New Jersey 2004, Conservation Technology Information Center, <http://www.ctic.purdue.edu/CTIC/CRM.html>
3. Summary of Approaches Available for Fugitive Dust Sources Technical Memorandum, E.H. Pechan & Associates, for MARAMA, May 21, 2004.
4. Seasonal and Monthly Activity Allocation Fractions for Nonroad Engine Emissions Modeling, EPA 420-P-02-010, Table 4, Mid-Atlantic Region.