Appendix III
Attachment 3

2007 Winter Carbon Monoxide Inventory Development

I. Overview

The 2007 Winter Carbon Monoxide (CO) emission Inventory is a compilation of "typical winter day" emissions from CO. The sources are divided into four sectors and each making up one component of the inventory: point sources (large stationary), area (nonpoint) sources (small stationary), onroad mobile sources, nonroad mobile sources.

II. Point Sources

For the purposes of this 2007 winter carbon monoxide emission inventory, a point source is defined as a stationary facility that emits or has the potential to emit at or above a threshold of 100 tons per year of carbon monoxide.

The remaining stationary sources are included in the area sources emission inventory.

A. Carbon Monoxide Emissions from Emission Statements

The 2007 point source inventory for carbon monoxide was developed using data reported by facilities to the NJDEP through the Emission Statement Program. Facilities are required to prepare an annual accounting of air emissions for each pollutant source at the facility and to report those emissions by submitting an Emission Statement to the NJDEP in accordance with N.J.A.C. 7:27-21. A total of 611 facilities were identified in New Jersey as meeting one of the required criteria in 2007.

Emission Statement data are submitted through NJDEP's data entry software, known as Remote Air Data Input Users System (RADIUS). Table 1 provides a brief description of the Emission Statement information collected.

Table 1: Emission Statement Information

Screen Name	Description of Emission Statement Data
Facility Profile (General)	Plant level data (Facility Information)
Facility Profile (Planning)	Estimates of plant activities for planning purposes
Non-Source Fugitive Emissions	Fugitive emissions
Insignificant Source Emissions	List of sources not requiring permits
Equipment Inventory	List of permitted sources
Control Device Inventory	List of control devices
Emission Point Inventory	List of emission points (stacks) for the permitted sources
Emission Unit/Batch Process Inventory	List of emission units and batch processes containing the permitted sources
Subject Item Group Inventory	List of sources grouped for various permitting purposes
Emission Statement	Process and emission data for all sources, including control efficiency and source details

B. Rule Effectiveness

Per the USEPA's guidance,[1][2] a rule effectiveness factor was applied to all applicable sources for the inventories. The purpose of the rule effectiveness factor is to account for noncompliance with existing rules, pollution control equipment failures and control equipment downtime. The USEPA guidance requires states to apply a default rule effectiveness factor of eighty percent unless other, state-specific data exist to justify the use of a different value. New Jersey has chosen to apply state-specific rule effectiveness factors to point sources in the 2007 inventory if the overall control efficiency is not reported in the Emission Statement Program. All remaining sources had the eighty percent rule effectiveness applied in accordance with USEPA guidance.

C. Summary of Point Source Inventory Data

Table II in Appendix III presents the 2007 point source emission inventory for the New Jersey Northeastern Carbon Monoxide Maintenance Area by county. Attachment 4 contains the detailed carbon monoxide point source emission inventory. This attachment is only available electronically.

III.   Area Sources

The area source component of the 2007 carbon monoxide winter emission inventory includes emissions from numerous facilities or activities that individually release small amounts of a given pollutant, but collectively they can release significant amounts of a pollutant. This includes small stationary sources that fall below required emission reporting thresholds by the Emission Statement Program. Area sources are small and numerous and have emissions which are not readily associated with a single point or a small set of points. Some of the stationary sources in this sector are sometimes referred to as minor point sources.

A. Carbon Monoxide Emission Calculation Procedures

The carbon monoxide emissions from area source categories were calculated, for the most part, by multiplying a USEPA published emission factor by a known indicator of activity for each source category, such as employment, population and fuel usage. The emissions were first calculated on an annual basis since most activity data was provided on an annual basis. The annual emission estimates were allocated to each season, based on seasonal adjustment factors. A calculation methodology sheet was created to document the data used to estimate the emissions from each area source category. In general, the calculation methodology sheets document the calculation methodology selected, the process used to estimate the emissions, all assumptions required to calculate the emissions, and all sources of data. A complete set of calculation methodology sheets is included in Attachment 5.

The following sections describe how the area source emission inventory was developed.

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[1] USEPA, "Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories", November 1992. Hereafter cited as Rule Effectiveness Guidance.
[2] USEPA, "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations", June 2003.

i. Annual Emissions

Most USEPA emission factors are in pounds of pollutant emitted per unit of activity. The general calculation methodology to estimate tons of pollutant emitted per year can be expressed as:

$$\text{Emissions}_{\text{Annual}} = \text{EF} \times \text{AL/CF} \qquad (1)$$

where:
$\text{Emissions}_{\text{Annual}}$ = Annual pollutant emissions in tons per year
EF   =   Annual emission factor
AL   =   Annual activity level
CF   =   Factor to convert pounds to tons

ii. Daily Emissions

Daily emissions were estimated by incorporating annual activity day factors for a given area source category operation into the annual emission estimate calculation. The annual activity day factor is determined by the activity of a given source category during a week. The annual activity day factors are calculated by:

$$\text{AADF} = \text{(WAF)} * \text{(52 weeks/year)} \qquad (2)$$

where:
AADF   =   Annual activity day factor
WAF   =   Weekly Activity Factor (Activity Days/Week)

iii. Seasonal Adjustment Factor

Winter daily carbon monoxide emissions were calculated by applying a winter seasonal adjustment factor. In order to estimate seasonal average daily emissions, the annual emissions are adjusted as follows:

$$\text{Emissions}_{\text{Season}} = \text{Emissions}_{\text{Annual}} * \text{WAF/AADF} \qquad (3)$$

where:
WAF   =   Winter Seasonal Adjustment Factor

iv. County Level Emissions

Depending on the activity data obtained for a particular category, emissions are either calculated on a statewide basis and allocated to the county level based on a secondary activity indicator, or are calculated on a county basis and totaled for statewide emissions. For example, residential natural gas combustion is calculated at the state level using statewide fuel use estimates published by the United States Department of Energy and is allocated to the county level based on census data regarding the number of houses using natural gas as a primary heat source.

v. Strategies to Eliminate Double Counting

Emissions for some CO source categories are estimated in both the area source portion of the inventory and in the point source inventory. Reporting the emissions in each category results in double counting of the emissions. Therefore, the area source portion of the inventory must be adjusted for the emissions already accounted for in the point source inventory. There are two ways to eliminate this double counting for CO emission categories. One approach is to delete a known point source from the database used to calculate the area source inventory. For example, if a particular incinerator submits an emission statement then it is included in the point source inventory and is not included in the area source inventory. A second approach involves adjusting the source category activity level by subtracting the activity reported in the point source inventory. For example, industrial fuel combustion emissions are estimated in both the point source and the area source inventories. Since the industrial fuel use activity level reported by facilities is accounted for in the point source inventory, this fuel can be subtracted from the area source statewide industrial fuel use activity level in the area source inventory. The resulting area source activity level is then utilized in the calculation to estimate the emissions for this category for area sources.

vi. Emission Controls

New Jersey has developed a number of air pollution control measures to reduce area source emissions. There are two regulations that apply directly to CO emissions. The first is the New Jersey Rule for the Control and Prohibition of Open Burning.[3] This rule applies to the open burning of residential leaves, residential brush, residential municipal solid waste, and municipal yard waste. The second is New Jersey's Incinerators Rule.[4] This rule regulates the construction and emissions of incinerators.

Control efficiency factors have been developed to adjust the emission inventory in response to New Jersey APC measures. For example, the control efficiency for open burning must be 100% in accordance with New Jersey's Open Burning rule.

The USEPA requires that rule effectiveness and rule penetration factors be applied to adjust the emission inventory whenever control measures have been applied to an inventory.[5] The purpose of the rule effectiveness factor is to account for the underestimation of emissions due to noncompliance with the existing control measures, control device equipment downtime or operating problems, process upsets, and the inability of most emission estimate calculation procedures to incorporate these problems.[6] Rule penetration is a measure of the extent to which a rule applies to a given source category.

Whenever a control measure is applied to a specific area source category, the three factors of control efficiency (CE), rule effectiveness (RE), and rule penetration (RP) are incorporated into the two emission estimation equations (1) and (3) as follows:

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[3] 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
[4] 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
[5] Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories, Office of Air Quality Planning and Standards, USEPA, November 1992, page 21.
[6] Ibid. page 3.

$$\text{Emissions}_{\text{Annual}} = \{EF \times AL \times [1 - (CE \times RE \times RP)]\}/CF \qquad (5)$$

$$\text{Emissions}_{\text{Daily}} = \{EF \times AL \times SAF \times [1 - (CE \times RE \times RP)]\}/(AADF \times CF) \qquad (6)$$

Control efficiency, rule effectiveness, and rule penetration are normally expressed as percentages but used as fractions in the above equations. For the area emission inventory, the USEPA default rule effectiveness value of eighty percent and rule penetration value of 100 percent was used the majority of the time.

B. Summary of Area Source Inventory Data

Table II in Appendix III presents the 2007 winter day carbon monoxide area source emission inventory for the Northeastern New Jersey carbon monoxide maintenance area by county. Attachment 6 contains the detailed carbon monoxide area source emission inventory. This attachment is only available electronically.

IV. Onroad Sources

The onroad source component of the 2007 Carbon Monoxide emission inventory is an estimate of exhaust (i.e., tailpipe) emissions from all onroad vehicles (gasoline, diesel and natural gas fueled) operating in the New Jersey counties within the maintenance area. In general, the emissions from this component of the emission inventory are calculated by multiplying activity levels (including vehicle starts, operation times, speeds and miles traveled) by emission factors. Activity estimates are generated using a travel demand model (TDM). The emissions are calculated using the USEPA MOVES computer model (MOVES2010a Version 2010/08/26). The MOVES model is run in the inventory mode. A custom software package (PPSUITE), developed and licensed by AECOM, is used to preprocess the MOVES input data (including the TDM outputs), run MOVES, and post-process the emissions from the MOVES model including the generation of reports for the presentation of emission inventory results.

A. Activity Estimates

The vehicle activity estimates used in this emission inventory were calculated with a TDM used by the Metropolitan Planning Organization that covers the five counties of concern in this Carbon Monoxide maintenance plan. The Metropolitan Planning Organization is the North Jersey Transportation Planning Authority (NJTPA).

In general, the TDM uses demographic data, such as population, employment, housing density, and shopping patterns, to estimate the demand for travel in the modeled area. This travel demand is then distributed throughout the available roadways and transit routes, referred to as links. The model is based on an algorithm which takes into account factors such as transit fares, tolls, traffic volume, and time of day to estimate how many people travel from one point to another on any given link. The number of vehicles traveling on each link is then used to estimate the speed of travel and the total number of vehicle miles traveled in a day (DVMT). The TDM output is adjusted for any vehicle miles traveled that are not accounted for in the model, such as reductions due to transportation control measures or increases due to local roadway traffic. Attachment 4 presents the DVMT used for the 2007 inventory by roadway class and MOVES vehicle type.

The current North Jersey Regional Transportation Model Enhanced (NJRTM-E) was revalidated for the year 2008. The NJRTM-E estimated DVMT is approximately 101% of the regional observed DVMT. The comparisons between estimated and observed DVMT by facility type were within a range of 92% to 119%.

For the purpose of emissions analyses, Highway Performance Monitoring System (HPMS) adjustment files for 2007 were created to account for the DVMT taking place on the non-modeled roads within the MPO region. The HPMS adjustment files account for the differences between model DVMT and the regional DVMT data collected by the HPMS.

The NJRTM-E DVMT values were adjusted into two seasons (summer and winter). The adjustment factors were developed by first comparing model DVMT with the DVMT values from the Highway Performance Management System database, thus correcting for any variation between the annual average daily traffic volumes. A second adjustment addresses seasonal variation using seasonal factors by both facility and county. This results in two seasonal adjustment files (winter and summer) that are used in the emissions forecasting process. The Carbon Monoxide inventory is calculated for an average winter work weekday (meteorology is the average of December, January and February).

The emission estimates include all activity within the model region, including local "off-model" roadways. Since the highway network covers the entire maintenance area, there are no areas for which activity is not included.

The NJRTM-E contains two types of external trips (External-External, External-Internal) used to estimate activity from vehicles moving into and out of the NJTPA region. The External-External purpose represents trips that have both origin and destination outside of the modeled region. These trips are referred to as "pass-through" trips. The External-Internal trip purpose includes trips for which one of the trip "ends" occurs inside the model region while the other is outside of the region. The vehicle trips at the edge of the respective Metropolitan Planning Organization models are obtained from observed counts provided by the New Jersey Department of Transportation and other agencies such as the Port Authority of New York and New Jersey, to help ensure traffic volume consistency at the boundaries between the Metropolitan Planning Organizations.

B. MOVES Model Inputs

The NJDEP used the USEPA's MOVES2010a (MOtor Vehicle Emission Simulator) to estimate air pollution emissions from onroad mobile sources including buses, cars, trucks and motorcycles. MOVES2010a replaced MOBILE6.2, the previous mobile source model. MOVES input files are somewhat more detailed than the MOBILE6.2 input files. To assist in the transition to the new model, the USEPA developed software tools to convert MOBILE6.2 inputs for MOVES. In addition, the MOVES model includes a preprocessing tool called the County Data Manager (CDM) to convert spreadsheet based information to MySQL database files required by MOVES.

The MOVES input files that contain local (non-default) data are included in Attachment 5 and include:

- I/M Coverage
- Early NLEVs and MYLEVS Tables

- AgeDistribution
- AverageSpeedDistribution
- FuelSupply
- FuelFormulation
- MeteorologyData
- RampFraction
- RoadTypeDistribution
- SourceTypePopulation
- HPMSVTypeYear
- MonthVMTFraction
- DayVMTFraction
- HourVMTFraction

The development of each of these MOVES inputs is discussed in subsequent subsections.

B.1 I/M Coverage

General

- As a first step, all rows of data in the MOVES default tables for New Jersey counties for a given year need to be copied into the IMCoverage file and designated "N" in the "useIMyn" column. If this is not done MOVES will not run; error messages will be generated.
- It is necessary to develop a unique I/M input representation for each analysis year because the model years (MYs) that specific programs cover are sometimes a function of analysis year.
- The pollutant processes covered by I/M were assumed to be the same as the pollutant processes from the MOVES I/M default tables for New Jersey counties.
- The MOVES I/M defaults included representations for both fuel type 1 (gasoline) and fuel type 5 (ethanol –anything greater than E10). No appreciable amounts of E85 are currently used in New Jersey. In case appreciable amounts of E85 are used in NJ in future years, the IM program representations for fuel type 1 were copied (added) for fuel type 5 for the 2013, 2014, 2015, 2017, 2020, and 2025 representations.
- No adjustments were made of the compliance factors for portions of vehicle types (such as certain vehicle weight ranges) that are exempt from the I/M program because that is not a significant factor for New Jersey. In some cases vehicles over 8500 lbs are currently subject to an idle test instead of the more stringent TSI or OBD test but MOVES does not allow the specification of more than one test for a given vehicle type/model year/pollutant process. Therefore, the most accurate MOVES input representation is to assume that, for a given model year range, the entire vehicle class receives the test that is administered to the majority of the vehicles in that class.

- The new vehicle exemption is 4 years for the 2007, and 2009 representations and 5 years for the 2013, 2014, 2015, 2017, 2020, and 2025 representations.

- IM Program ID's were established as summarized in the following table.
  In the table:

  D = IMProgramID used in MOVES default table (not used to avoid confusion)

  endModelYearID for 2007, 2009, 2013, 2014, 2015, 2017, 2020 and 2025 IM programs shown

IMProgramID	InspectFreq	testStandardsID	begModelYearID	endModelYearID
1	D	D	D	D
2	2	11 (idle)	1970	2003, 2005, 2008, 2009, 2010, 2012, 2015, 2020
3	2	11	1970	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
4	2	22 (5015)	1981	1995
5	D	D	D	D
6	2	41 (gas cap)	1970	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
7	D	D	D	D
8	D	D	D	D
9	2	51 (exhOBD)	1996	2003, 2005, 2008, 2009, 2010, 2012, 2015, 2020
10	D	D	D	D
11	2	12 (TSI)	1981	1995
12	1	41	1970	1995
13	1	45 (GC/evOBD)	1996	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
14	1	22	1981	1995
15	2	41	1970	1995
16	1	51	1996	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
17	2	41	1970	2003, 2005, 2008, 2009, 2010, 2012, 2015, 2020
18	2	45	1996	2003, 2005, 2008, 2009, 2010, 2012, 2015, 2020
19	1	12	1981	1995
20	1	11	1970	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
21	2	41	1970	1995
22	2	45	1996	2000
23	2	43 (evOBD)	2001	2003, 2005, 2008, 2009, 2010, 2012, 2015, 2020
24	1	41	1970	1995
25	1	45	1996	2000
26	1	43	2001	2007, 2009, 2013, 2014, 2015, 2017, 2020, 2025
27	1	41	1970	2000

2007 and 2009 IM Representations

- Compliance Factor inputs were calculated as follows:
  First the overall effectiveness of the NJ I/M program was calculated assuming an 80/20 CIF/PIF split and that PIFs are 80% as effective as CIFs: 0.8(1.0) + 0.2(0.8) = 0.96.
  Then, based on recent data, the waiver rate is either 0.01% for exhaust OBD and ASM 5015 tests or 0.0% for the other exhaust and all evaporative tests.
  Also, based on recent data, the compliance rate is currently about 96%.
  Therefore the overall compliance factors are:
  0.96 X 0.9999 X 0.96 = 0.9215 for programs with a waiver and
  0.96 X 1.0000 X 0.96 = 0.9216 for programs without a waiver.

2007 and 2009 Exhaust I/M Programs

MOVES use type	Description	MY Range	Test Type	Freq	New Vehicle Exemption?
21. Passenger Car		1981 - 1995 1996 – 2003/5	ASM 5015 init exhOBD	2 2	NA Yes
31. Passenger Truck	Minivans, pickups, SUVs and other 2-axle / 4-tire trucks used primarily for personal transportation	1981 - 1995 1996 – 2003/5	ASM 5015 init exhOBD	2 2	NA Yes
32. Light Commercial Truck	Minivans, pickups, SUVs and other trucks 2-axle / 4-tire trucks used primarily for commercial applications. Expected to differ from passenger trucks in terms of annual mileage, operation by time of day	1981 - 1995 1996 – 2003/5	ASM 5015 init exhOBD	2 2	NA Yes
51. Refuse Truck	Garbage and recycling trucks Expected to differ from other single unit trucks in terms of drive schedule, roadway type distributions, operation by time of day	NA	None – fleet is assumed to be all diesel	NA	NA
52. Single-Unit Short-Haul Truck	Single-unit trucks with majority of operation within 200 miles of home base	1970 – 2007/9	idle	2	No
53. Single-Unit Long-Haul Truck	Single-unit trucks with majority of operation outside of 200 miles of home base	1970 – 2007/9	idle	2	No
54. Motor Home		1970 – 2003/5	idle	2	Yes
41. Intercity Bus	Buses which are not transit buses or school buses, e.g. those used primarily by commercial carriers for city-to-city transport.	NA	None – fleet is assumed to be all diesel	NA	NA
42. Transit Bus	Buses used for public transit.	NA	None – fleet is assumed to be all diesel	NA	NA
43. School Bus	School and church buses.	1981 - 1995 1996 – 2007/9	ASM 5015 init exhOBD	1 1	NA No
61. Combination Short-Haul Truck	Combination trucks with majority of operation within 200 miles of home base	NA	None – fleet is assumed to be all diesel	NA	NA
62. Combination Long-Haul Truck	Combination trucks with majority of operation outside of 200 miles of home base	NA	None – fleet is assumed to be all diesel	NA	NA

MOVES use type	Description	MY Range	Test Type	Freq	New Vehicle Exemption?
11. Motorcycle		NA	None	NA	NA

2007 and 2009 Evaporative I/M Programs

MOVES use type	Description	MY Range	Test Type	Freq	New Vehicle Exemption?
21. Passenger Car		1970 - 1995 1996 – 2003/5	Gascap Gascap/evpOBD	2 2	NA Yes
31. Passenger Truck	Minivans, pickups, SUVs and other 2-axle / 4-tire trucks used primarily for personal transportation	1970 - 1995 1996 – 2003/5	Gascap Gascap/evpOBD	2 2	NA Yes
32. Light Commercial Truck	Minivans, pickups, SUVs and other trucks 2-axle / 4-tire trucks used primarily for commercial applications. Expected to differ from passenger trucks in terms of annual mileage, operation by time of day	1970 - 1995 1996 – 2003/5	Gascap Gascap/evpOBD	2 2	NA Yes
51. Refuse Truck	Garbage and recycling trucks Expected to differ from other single unit trucks in terms of drive schedule, roadway type distributions, operation by time of day	NA	None – fleet is assumed to be all diesel	NA	NA
52. Single-Unit Short-Haul Truck	Single-unit trucks with majority of operation within 200 miles of home base	1970 – 2007/9	Gascap	2	No
53. Single-Unit Long-Haul Truck	Single-unit trucks with majority of operation outside of 200 miles of home base	1970 – 2007/9	Gascap	2	No
54. Motor Home		1970 – 2003/5	Gascap	2	Yes
41. Intercity Bus	Buses which are not transit buses or school buses, e.g. those used primarily by commercial carriers for city-to-city transport.	NA	None – fleet is assumed to be all diesel	NA	NA
42. Transit Bus	Buses used for public transit.	NA	None – fleet is assumed to be all diesel	NA	NA
43. School Bus	School and church buses.	1970 - 1995 1996 – 2007/9	Gascap Gascap/evpOBD	1 1	NA No
61. Combination	Combination trucks with majority of	NA	None – fleet is	NA	NA

Short-Haul Truck	operation within 200 miles of home base		assumed to be all diesel		
62. Combination Long-Haul Truck	Combination trucks with majority of operation outside of 200 miles of home base	NA	None – fleet is assumed to be all diesel	NA	NA
11. Motorcycle		NA	None	NA	NA

B.2 Early NLEVs and MYLEVS Tables

The MOVES inputs to represent New Jersey's participation in the National Low Emitting Vehicle (NLEV) and New Jersey Low Emission Vehicle (adoption of the California Low Emission Vehicle (LEV) program) programs were developed pursuant to the USEPA instructions at http://www.epa.gov/otaq/models/moves/tools.htm . The USEPA instructions are for using California Low Emission Vehicle (LEV) inputs, Zero Emission Vehicle (ZEV) inputs, and National Low Emitting Vehicle (NLEV) inputs in certain northeast states in MOVES. The USEPA provided these inputs in the form of two databases and one spreadsheet file. The emission rates in these files are for use only in states other than California that adopted California LEV standards, and states in the Ozone Transport Commission (OTC) that received early implementation of NLEV standards. The New Jersey inputs were developed to represent the state's early participation in the NLEV program and the implementation of the California LEV program starting with the 2009 model year. The two databases are provided electronically in Attachment 5.

B.3 Age Distribution

The age distribution factors for each MOVES vehicle type have been estimated for the New Jersey fleet using a combination of: New Jersey vehicle registration data, MOVES default data, and converted MOBILE6 data. The data from the various sources were used to estimate the coefficients of a polynomial that represented a best fit of the data based on maximizing the R-squared for the curve fitting process. The values from the polynomial were then used for each year for the age distribution fractions. This resulted in a smooth curve of the age distribution factors; as expected by the steady real-world retirement of vehicles as they age. For year zero the actual age fractions were used, instead of the values from the curve, because for the first year represents a partial year of vehicle sales. Further details regarding the establishment of the age distribution factors for the New Jersey fleet are provided electronically in Attachment 5.

B.4 Average Speed Distribution

The average speed distribution is based on outputs from the NJTPA regional transportation model.

B.5 Fuel Supply and Fuel Formulation

The MOVES inputs for gasoline formulations were consolidated from reformulated gasoline (RFG) survey data received by New Jersey from the USEPA (via email from Robert Anderson of the USEPA dated 6/21/2011). The RFG data was combined to form three gasoline types:

summer gasoline representing the months of May, June, July, August, and September; winter gasoline representing the months of December, January and February; and shoulder gasoline representing the months of March, April, October, and November. Gasoline types were developed for 12 northern New Jersey counties (County ID's: 3, 13, 17, 19, 23, 25, 27, 31, 35, 37, 39 and 41) and 9 southern New Jersey counties (County ID's: 1, 5, 7, 9, 11, 15, 21, 29 and 33). These county groups correspond to the ozone nonattainment area boundaries. Gasoline types were developed for years 2007, 2008, 2009, and 2010. The projected gasoline types for 2011 and 2012 were assumed to be the same as 2010. The MOVES model assumes that the fuel parameters for any years beyond 2012 are the same as the inputs for 2012. Gasoline parameters were estimated to be the average of all available sampling data for each year/period/area. The only data missing from the USEPA RFG data, but required as a MOVES input, is the RVP for the non-summer months; data for this parameter were based on the MOVES defaults for New Jersey (note that this is generally not critical because RVP affects only VOCs emissions which are an ozone precursor concern during the summer months). The 2012 RVP MOVES defaults for the winter and shoulder fuels were used for 2010, 2011 and 2012 fuels.

Diesel sulfur levels are based on USEPA survey data for Petroleum Administration for Defense District 1 (PADD 1) received from the USEPA on July 14, 2009 which indicated actual average sulfur levels of 32 ppm for 2007 and 15 ppm for 2008. A sulfur level of 11 ppm was assumed for 2009+ based on USEPA guidance (EPA420-R-04-013, August 2004, Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation, pg 64). Partial PADD 1 survey data for 2009 from the USEPA was less than 11ppm.

B.6 Meteorology Data

The meteorology data required by MOVES are hourly values for temperature and relative humidity. The meteorology data for the Carbon Monoxide inventory was for an average winter day (i.e., average of the months of December, January, and February). The USEPA data converter was used to change meteorology data from a MOBILE6 format to a MOVES format. The data converter is available at: http://www.epa.gov/otaq/models/moves/tools.htm#mobile6inputs . It consists of an EXCEL file that converts MOBILE6 formatted meteorological data to the format needed by the MOVES ZoneMonthHour table. The MOBILE6 meteorology was the average winter day data used for previous MOBILE6-generated carbon monoxide inventories. The MOVES meteorology file is provided electronically in Attachment 5.

B.7 Ramp Fraction

The fraction of travel that occurs on highway ramps is generated by the PPSUITE software based on outputs from the NJTPA regional transportation model.

B.8 Road Type Distribution

The fraction of travel that occurs on each road type is generated by the PPSUITE software based on outputs from the NJTPA regional transportation model and VMT aggregation by facility type.

B.9 Source Type Population

Source type population (VPOP) is used by MOVES to calculate start and evaporative emissions. In MOVES emissions are related to the population of vehicles in an area in addition to the VMT for those vehicles and therefore local data must be developed for this input.

The MOVES model characterizes vehicles into 13 source types, which are subsets of the 6 HPMS MOVES vehicle types. The USEPA believes that states should be able to develop population data for many of these source type categories from state motor vehicle registration data (for motorcycles, passenger cars, passenger trucks and light commercial trucks), transit agencies, school districts, bus companies, and refuse haulers (for intercity, transit, school buses and refuse trucks). The population for other source types may be based on the application of local VMT to national default travel rates.

New Jersey motor vehicle registration was assembled and aggregated by NJDEP. It was collected for 2007 and arranged in MOVES input format for each individual county. If accurate local vehicle population data are not available for a particular source type, the USEPA recommends applying a national default population rate to local VMT in order to estimate VPOP (Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity, USEPA, April 2010, page 21). Local VMT times the ratio of MOVES default population to MOVES default VMT provides an estimate of local population.

During several technical meetings with NJDOT, NJDEP, and the MPOs, it was decided to use motor vehicle registration data for all vehicle types except for the long and short haul trucks. VMT-based data were used for short and long haul trucks (source types 52, 53, 61 and 62). New Jersey believes that registration data are the most accurate data currently available for all source type populations except for the short and long haul trucks. The VMT based population developed pursuant to USEPA guidance was used for these source types since the registration numbers are not as representative of actual time spent in each county for these types of vehicles. MOVES runs with national default data were conducted and VMT/Population ratios (daily miles) were estimated for each source type. This ratio was applied during the PPSUITE network analysis to create VPOP input for each county in the analysis year from the travel model generated VMT.

For New Jersey emission analysis, MOVES source type population inputs were developed using a combination of vehicle registration and VMT-based methods as summarized below.

Vehicle Population Sources for the MOVES Source Types

	MOVES Source Type	Population Source
11	Motorcycle	Registration
21	Passenger Car	Registration
31	Passenger Truck	Registration
32	Light Commercial Truck	Registration
41	Intercity Bus	Registration
42	Transit Bus	Registration
43	School Bus	Registration

51	Refuse Truck	Registration
52	Single Unit Short-Haul Truck	VMT-Based
53	Single Unit Long-Haul Truck	VMT-Based
54	Motor Home	Registration
61	Combination Short-haul Truck	VMT-Based
62	Combination Long-haul Truck	VMT-Based

B.10 HPMS VType Year

The VMT by vehicle type is based on the HPMS VMT data from the New Jersey Department of Transportation. Growth factors for future years are from the NJTPA regional transportation model.

B.11 Month VMT Fraction

The VMT monthly fractions are based on the HPMS VMT seasonal factors provided by the New Jersey Department of Transportation.

B.12 Day VMT Fraction

The VMT daily fractions are based on MOVES default values and/or outputs from the NJTPA regional transportation model.

B.13 Hour VMT Fraction

The VMT hourly fractions are based on MOVES default values and/or post-processing of outputs from the NJTPA regional transportation model including pattern matching and run-time adjustments.

C. Summary of Onroad Inventory Data

Table II in Appendix III presents the 2007 Carbon Monoxide onroad source emission inventory by county. Table 2 presents the 2007 Carbon Monoxide onroad source emission inventory by MOVES source type. Attachment 7 contains the detailed Carbon Monoxide onroad emission inventory by county and MOVES vehicle type.

Table 2:

2007 Onroad Source Carbon Monoxide Emission Inventory by MOVES Source Type

MOVES Source Type	Bergen	Essex	Hudson	Passaic	Union	Area Totals
1) Motorcycle	2.77	2.26	1.18	0.76	2.41	9.38
2) Passenger Car	168.00	102.22	55.23	70.14	82.98	478.57
3) Passenger Truck	76.51	38.90	23.42	33.03	34.27	206.13
4) Light Commercial Truck	25.57	13.17	7.91	11.21	11.66	69.50
5) Intercity Bus	0.38	0.48	0.37	0.23	0.18	1.64
6) Transit Bus	0.19	0.23	0.16	0.12	0.08	0.78
7) School Bus	0.27	0.21	0.15	0.20	0.39	1.22
8) Refuse Truck	0.27	0.17	0.10	0.12	0.16	0.82
9) Single-Unit Short-Haul Truck	7.22	4.18	1.92	3.14	5.28	21.73
10) Single-Unit Long-Haul Truck	0.38	0.23	0.08	0.22	0.27	1.19
11) Motor Home	0.34	0.11	0.04	0.27	0.15	0.90
12) Combination Short-Haul Truck	1.73	1.07	0.67	0.34	1.24	5.05
13) Combination Long-Haul Truck	1.71	1.02	0.60	0.32	1.18	4.83
Totals:	285.35	164.26	91.81	120.09	140.25	801.75

V. Nonroad Sources

Non-road Mobile Sources include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and locomotives, the inventory was developed using the most current version of USEPA's NONROAD model NONROAD2008a (July 2009 version). Since the NONROAD model does not include emissions from marine vessels, airplanes, and locomotives, these emissions were estimated using the latest USEPA guidance or by following the methodology developed by groups such as the Eastern Regional Technical Advisory Committee (ERTAC) and Starcrest.

V.1. NONROAD Model

The USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, lawn and garden equipment, aircraft ground support equipment (GSE) and rail maintenance equipment. This equipment is powered by diesel, gasoline, compressed natural gas or liquefied petroleum gas engines.

New Jersey ran the non-road model for each county included in the CO MA by inputting its own specific fuel parameters and climatological data. New Jersey utilized 2007 year specific meteorology data from the National Oceanic and Atmospheric Administration Climatological Data and fuel oil property revisions based on a New Jersey review of a USEPA gasoline formulation survey data (Reid vapor pressure, sulfur content, oxygenate fractions and ethanol

volume and content) and diesel fuel sulfur content included in the USEPA's "Suggested Nationwide Average Fuel Properties".

V.1.1   NONROAD Model Inputs

The normal maximum and minimum and average ambient monthly winter season (December, January and February) temperatures were compiled from those reported at Newark Airport in 2007 for application to the North New Jersey (NNJ) Counties located in the CO MA (Bergen, Essex, Hudson, Passaic and Union) as specified in Exhibit V.1.1. Similarly, New Jersey compiled seasonal USEPA Reformulated Fuel Gasoline (RFG) formulations survey data into monthly daily averages for application to the NNJ counties as also specified in Exhibit V.1.1.

Exhibit V.1.1
Temperatures and Fuel Oil Specification Inputs Used in
2007 USEPA NONROAD Model Runs

Gasoline Specifications Used for 2007 in the MOBILE Model	Northern RFG – ANNUAL[*]
Fuel Reid Vapor Pressure (psi)	12.8
Fuel Oxygen Content (% by weight)	3.5
Gasoline sulfur Level	.003162
Ethanol Volume	10.0
Ethanol Market Share	1.0000
Diesel Sulfur %	0.1139
Marine Diesel Sulfur%	0.1332
CNG/LPG Sulfur%	0.0030
Minimum Temperature	27.1
Maximum Temperature	40.53
Average Ambient Temperature	33.83
Stage II Control	0

V.1.2   Update of NONROAD Allocation Files for Population and Housing

Several NONROAD categories use housing unit or population data to allocate the emissions to the county level from State calculations. MARAMA States identified some discrepancies in the housing and population data contained in the NONROAD model and requested that the Contractor update the allocation files for those categories. As a consequence, the Contractor obtained 1 and 2 unit housing information and updated 2007 population estimates. Data were obtained from the sources listed in Exhibit V.1.2.

Exhibit V.1.2
Data Sources for Population and Housing Data

Source Type	Data Source
2007 Population Data Source	http://www.census.gov/popest/counties/CO-EST2008-01.html
Total Housing Data Source	http://www.census.gov/popest/housing/HU-EST2007-CO.html

1 yr – 1 and 2 Unit Housing Data	2007 American Community Survey 1-Year Estimates
3 yr – 1 and 2 Unit Housing Data	B25024. UNITS IN STRUCTURE - Universe: HOUSING UNITS Data Set: 2005-2007 American Community Survey 3-Year Estimates, Survey: American Community Survey

Three sources for the housing unit data were required to evaluate all counties within the MARAMA region. Census data are frequently withheld when the data reporting can lead to disclosure of confidential business information or due to incomplete survey response. For the 1 and 2 unit housing data, the predominant source was the 1 year -1 and 2 unit housing data. If that was unavailable due to either confidentiality issues or lack of survey response, then the 3 year data was used by determining an average value for the three year period. Finally if no data were available for the 3 year 1 and 2 unit housing information, total housing unit data were utilized. The revised housing unit data affected the allocation of residential lawn and garden equipment.

NJ provided revised human population data for 2002, 2005, 2010, 2015 and 2020. This human population data is the same as those used by the Metropolitan Planning Organizations in their travel demand models to calculate on-road sector emissions.

V.1.3   Recreational Marine Vessel Population Revision

Total New Jersey default populations for each of the three major recreational marine vessel categories contained in the NONROAD model (outboard, inboard/sterndrive and personal watercraft) were updated. The National Marine Manufacturers Association (NMMA) provided updated populations for the outboard and personal watercraft vessel engine categories for the year 2007. Because the population files used by the NONROAD model were configured with population values for various horsepower categories, the contractor determined the fraction of the total for each marine vessel type in each horsepower category from the NONROAD default population files. These fractions were then used to allocate the total state population obtained from NMMA to the various horsepower categories. The only exception to this was the addition of data for sailboats. The sailboat populations were split among the outboard and inboard/sterndrive watercraft vessels.

V.1.4   Airport Ground Support Equipment Removal

New Jersey provided revised equipment population values for Airport Ground Support Equipment. As discussed in Section V.3.4 of this document, emissions from airport ground support equipment is also included in USEPA's aircraft inventory prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by the NONROAD model. For this reason, all emissions calculated by the NONROAD model for airport ground support equipment were removed from the inventory to avoid double counting.

V.1.5 NONROAD Model Run Operation

The NONROAD model run operation comprises the inputting of the climatic and fuel specification data and New Jersey specific files into the model template panels, the running of the model, and the selection of the model run output format included in reporting utility panels.

The settings for each template and reporting utility panel in the NONROAD model are detailed below.
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NONROAD MODEL TEMPLATE SETTINGS

- OPTIONS: A short descriptive term for the run is entered for each State specific run and also all the temperature and fuel oil parameters included in Exhibit V.1.1 above.

- GEOGRAPHY: The "county" option was selected for each State specific run. All counties within the New Jersey were selected for the run.

- PERIOD: Includes the episode, growth and technology panels. On the episode panel, the year 2007 was selected in the drop down box and added to the year selections area. This automatically directs the model to grow emissions and apply all phased-in nonroad control measures to the end of this episode year unless the user specifies that a different year be used as the technology year to end all control measure phase-ins. This is an important feature of the nonroad model because nonroad control measures usually phase-in over a certain number of years. This is unlike point and area sector control measures which are generally effective on a particular date. Additionally, selections were made to specify emissions for an average weekday during the winter season.

- SOURCES: All sources were selected. Thus all fuels and all vehicle types were selected for each State run. Aircraft ground support equipment was included in the run specifications but those records were removed during post-processing steps.

- REGION: The "county" option was selected for the state of New Jersey. Thus all counties in New Jersey were selected for the 5 runs to be conducted for each of the 5 counties included within the North New Jersey CO MA.

- ADVANCED OPTIONS: GEOGRAPHIC ALLOCATION: The NONROAD model default file for housing "NJ_HOUSE.ALO" was replaced with the updated New Jersey housing file created by AMEC "34000hou.ALO" discussed in Section V.1.2 above. Additionally, the NONROAD model default file for population "NJ_POP.ALO" was replaced with the updated New Jersey population file "34000cen.ALO". These files can be found in the 2007 Non-Road Model Inputs directory included in Attachment 9B-1. This attachment is only available electronically.

- ADVANCED OPTIONS: EQUIP. POPULATION: The NONROAD model default nonroad equipment population, "NJ.POP", was replaced with the updated New Jersey nonroad equipment population "34000.pop". This file can be found in the 2007 Non-Road Model Inputs directory included in Attachment 9B-1. This attachment is only available electronically.

- MODEL: Select RUN with template options to run model.

REPORTING UTILITY SETTINGS

- REPORTS: Select the Emissions Totals by SCC.
- SELECT RUN TO USE: Select the desired run imported from the output file of the NONROAD MODEL
- REPORT ONE STATE/COUNTY: Select desired county in New Jersey.
- POLLUTANTS TO REPORT: Select all pollutants.
- SELECT THE HC: Select VOC.
- SELECT THE PM SIZE: Select $PM_{2.5}$.

Specifics on the runs conducted with these template and reporting utility settings, other assumptions and references for data can be found in the 2007 Non-Road Model Output files included in Attachment 9B-2. This attachment is only available electronically.

V.1.6 NON-ROAD Model Equipment Emission Inventory

Table 3 summarizes the 2007 non-road model source CO emission inventory, for the winter season average daily workday, and for every county included in the NNJ CO MA. Attachment 9B-2 contains the detailed nonroad source emission inventories. This attachment is only available electronically.

Table 3:

2007 NON-ROAD Model Equipment CO Emission Inventory, Winter Season Average Daily Weekday, North New Jersey (NNJ) CO Maintenance Area (MA), by County, Tons Per Day (TPD)

County	CO Tons per Day
Bergen	135.3
Essex	54.3
Hudson	34.1
Passaic	41.8
Union	51.2
Total NNA CO MA	**316.7**

V.2   Commercial Marine Vessels (CMV)

For the purpose of emission calculations, CMV engines are divided into three categories based on displacement (swept volume) per cylinder. Category 1 and Category 2 marine diesel engines typically range in size from about 500 to 8,000 kW (700 to 11,000 hp). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around ports. They are also used as stand-alone generators for auxiliary electrical power on vessels. Category 3 marine diesel engines typically range in size from 2,500 to 70,000 kW (3,000 to 100,000 hp). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers and cruise ships.

The majority of marine vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of emission inventories, USEPA has assumed that Category 3 vessels primarily use residual blends while Category 1 and 2 vessels typically use distillate fuels.

CMV emission inventories for Category 1,2 and 3 vessels were available from USEPA 2008 National Emission Inventory (NEI)7. This NEI database included residual and diesel fueled CMV emissions for both the port and underway operation modes of Cruise (C), Maneuver (M), Reduced Speed Zone (Z) and Hotelling (H) that can be configured into CMV Category 1, 2 and 3 vessels emission inventories. This database was matched to GIS ArcInfo shape files for use in plotting emissions.

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7 U.S. Environmental Protection Agency. Documentation for the Commercial Marine Vessel Component of the National Emissions Inventory Methodology, Eastern Research Group report # 0245.02.302.001, USEPA Contract number EP-D-07-097. March 30, 2010.

New Jersey indicated that they had developed CMV emission inventories that they preferred over those provided by USEPA for certain counties. However, these emissions were only available in NIF area source file format (county/SCC summary level) and not spatially allocated. Thus for consistency, NJDEP mapped the shape files to determine exactly what constituted the port and underway areas in both South and North New Jersey. New Jersey visually determined that the USEPA shape files for the port mainly constituted the docking facilities themselves while those for the underway region constituted almost all the waterborne area outside or adjacent to the docking facilities. On this basis and following guidance included in a September 28, 2011 email from Laurel Driver of the USEPA, New Jersey classified all residual fueled (Category 3) vessels not otherwise docked as conducting either a C or Z mode of underway operation and all residual fueled (Category 3) docked vessels as conducting an H mode of port operation. For all diesel fueled (Category 2) vessels, New Jersey classified them as mainly conducting either a C mode of underway operation, and in a few instances where EPA made this determination, as conducting a M mode of port operation. Exhibit V.2 provides a summary of these determinations as well as the Source Category Code (SCC) designation of each CMV operation included in the 2007 emission inventory:

Exhibit V.2
CMV SCC, Description, Mode and Vessel Category

SCC	Description	Emission Mode	Vessel Category
2280002100	Diesel Port	M	Category 1 & 2
2280002200	Diesel Underway	C	Category 1 & 2
2280003100	Residual Port	H or M	Category 3
2280003200	Residual Port	C or Z	Category 3

A description of how CMV emissions were determined for the North New Jersey counties included in the CO MA follows below.

V.2.1   New Jersey Portion of the NYNNJ Harbor System

The most significant New Jersey CMV operations occur in the NJ portion of the NYNNJ Harbor system. This encompasses the NNJ counties of Bergen, Hudson, Essex, Union, Middlesex and Monmouth. CMV emissions for this harbor system were mainly developed from the information included in the CMV Emission Inventory Report prepared by Starcrest Consulting Croup, LLC.[8] This inventory was prepared as a part of the New York Harbor Deepening Project. This report relied on actual operational data, to the extent such information was available, and then used local activity parameters to extend emission estimates to those portions not directly inventoried. Actual operational data was obtained from extensive interviews with vessel operators, crew, pilots, and the United States Coast Guard's vessel traffic system that tracks oceangoing commercial marine vessels from points of origin and destination. From these emission estimates were prepared based on estimated horsepower demand. The original inventory was conducted for the year 2000 and did not consider USEPA Tier 1 or MARPOL control measures for CMV.   Therefore, NJDEP needed to grow the emissions to 2007 and then apply USEPA Tier 1/MARPOL control factors to the grown emissions.

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8 Starcrest Consulting Group, LLC, 2003, "The New York, Northern New Jersey, Long Island Nonattainment Area Commercial Marine Vessel Emissions Inventory"

New York New Jersey Port Authority (NYNJPA) Trade Statistics were used to grow the North NJ Starcrest emissions from 2000 to 2007. These trade statistics provide the total bulk and general cargo tonnage and the number of motor vehicles and twenty foot equivalent containers (TEUs) delivered to or from Northern Jersey ports from 2000 to 2007. New Jersey divided the amount of cargo, TEUs and cars delivered in 2007 over those delivered in 2000 to obtain growth factors to be applied to each type of category 3 vessel emissions associated with their delivery to and from the port. This is a direct correspondence because the Starcrest report includes separate emissions for each major type of category 3 vessel that operates in the port. For example, the growth in containers delivered to and from the port in 2000 to 2007 relates directly to the growth in containerships and hence the growth in their emissions during this period. Similarly, the growth in bulk and general cargo and cars respectively relates to the growth in category 3 bulk carriers, RoRo vessels and car carriers emissions. In concern for category 3 tankers, the growth rate was based on the increase in petroleum products delivered to New Jersey from 2000 and 2007 as determined by the Energy Information Administration (EIA), United States Department of Energy.

The Starcrest report also specifically relates emissions from harborcraft such as assist tug boats to the specific type of OGV that they assist in their harbor maneuvering and docking so that the same OGV growth factors may be applied to them. In concern for towboats which represent the other major contributor of harborcraft emissions that operates in the New York and North New Jersey harbor, New Jersey assumed that their growth would relate to the increase in bulk and general cargo from 2000 to 2007. This is because towboats pull or push barges that transport bulk and general cargo.

Only one county in the North New Jersey CO MA, Passaic County, was not associated with the NYNNJ Harbor system and so was not included in the Starcrest report. Therefore, New Jersey relied upon the USEPA 2008 NEI to determine cmv emissions for this county.

V.2.2 Commercial Marine Vessel Emission Inventory

Table 4 summarizes the 2007 CMV source CO emission inventory, for the winter season average daily workday, and for every county included in the NNJ CO MA. Attachment 9D contains the detailed CMV source emission inventories. This attachment is only available electronically.

Table 4:
2007 Commercial Marine Vessel CO Daily Emission Inventory, Winter Season Average Daily Weekday, North New Jersey (NNJ) CO Maintenance Area (MA), by County, Tons Per Day (TPD)

County	CO Tons per Day (TPD)
Bergen	0.096
Essex	0.149
Hudson	1.332
Passaic	0.003
Union	1.122
Total NNJ CO MA	**2.701**

V.3 Aircraft

Aircraft emissions in the 2007 inventory are available in either a county-by-county or airport-by-airport basis for six types of aircraft operations:

- Air carrier operations represent landings and take-offs (LTOs) of commercial aircraft with seating capacity of more than 60 seats (SCC 22-75-020-000);

- Commuter/air taxi operations are one category. Commuter operations include LTOs by aircraft with 60 or fewer seats that transport regional passengers on scheduled commercial flights. Air taxi operations include LTOs by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights (SCC 22-75-060-011 (Piston) or 012 (Turbine);

- General aviation represents all civil aviation LTOs not classified as commercial (SCC 22-75-050-011 (Piston) or 012 (Turbine):

- Military operations represent LTOs by military aircraft (SCC 22-75-001-000);

- Ground Support Equipment (GSE) typically includes aircraft refueling and baggage handling vehicles and equipment, aircraft towing vehicles, and passenger buses (SCC 22-65-008-005 (4-Stroke Gasoline), 22-67-008-005 (LPG), 22-68-008-005 (CNG), 22-70-008-005 (Diesel); and

- Auxiliary power units (APUs) provide power to start the main engines and run the heating, cooling, and ventilation systems prior to starting the main engines. (SCC 22-75-070-000).

V.3.1 Emission Dispersion Modeling of New Jersey Airports

New Jersey aircraft emissions were calculated based on the number of landing and take-off (LTO) cycles generated at each airport. Nine Airports which are Jersey Newark Liberty International, Teterboro, Atlantic City, Morris Municipal, Essex County, Mercer County, Naval Lakehurst Base, Monmouth Executive and Millville Municipal supplied New Jersey with LTO counts for each specific aircraft type (i.e., Boeing 707, AirBus 300) that operated at their airport in 2007. A compilation of the nine airports LTO counts can be found in the 2007 Aircraft Inputs directory included in Attachment 9C-3. This attachment is only available electronically. These LTO counts were applied to the Emissions and Dispersion Modeling System (EDMS), the Federal Aviation Agency (FAA) aircraft emissions modeling tool, to determine their emissions. The emission outputs generated from the EDMS can be found in the 2007 Aircraft Outputs directory included in Attachment 9C-2. This attachment is only available electronically.

V.3.2 Federal Aviation Agency (FAA) Airports

For all other remaining public use airports, total LTO numbers for the aircraft categories of commercial, military, air taxi and general aviation airports as reported in the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System for the year 2007 was obtained.[9]

9 Federal Aviation Administration, Terminal Area Forecast 2007 Database Fi

A compilation of these airports LTO counts can be found in the 2007 Aircraft Inputs directory included in Attachment 9C-3. This attachment is only available electronically. An average aircraft emission factor developed from the most common aircraft types for a given category was applied to the total aircraft category counts.

V.3.3 New Jersey Department of Transportation (NJDOT) Private Use Airports and Heliports

For private use airports and heliports, total LTO numbers for the general aviation category was obtained from the New Jersey Department of Transportation (NJDOT). A compilation of these airports LTO counts can be found in the 2007 Aircraft Inputs directory included in Attachment 9C-3. This attachment is only available electronically. An average aircraft emission factor developed from the most common aircraft type for these facilities was applied to the total aircraft category counts.

V.3.4 Aircraft Ground Support Equipment (GSE)

NJ provided GSE/Auxiliary Power Unit (APU) emissions for each of the seven major airports that submitted LTO fleet mix counts. The EDMS model determined these emissions by applying default GSE/APU equipment to those aircraft types that are known to use these units. These emissions had GSE emissions as a single value without an indication of the fuel type of the equipment. In this case, the fuel type ratios used in the USEPA NEI were used to divide GSE emissions by their SCC designated fuel type. Those ratios are included in Exhibit V.3.4:

Exhibit V.3.4
GSE Fractional Apportionment

SCC	SCC Level Two	Fraction
2265008005	Off-highway Vehicle Gasoline, 4-Stroke	0.1686
2267008005	LPG	0.0165
2268008005	CNG	0.0131
2270008005	Off-highway Vehicle Diesel	0.8017

In concern for those smaller airports whose emissions were not determined by the EDMS, they can be considered to not generate any GSE/APU emissions because many Air Taxis, General Aviation and Military aircraft do not use GSE/APU.

V.3.5 Aircraft Emission Inventory

Table 5 summarizes the 2007 aircraft CO emission inventory, for the winter season average daily workday, and for every county included in the NNJ CO MA. Attachment 9C-1 contains the detailed aircraft source emission inventories. This attachment is only available electronically.

Table 5:
2007 Total Aircraft CO Emission Inventory, Winter Season Average Daily Weekday, North New Jersey (NNJ) CO Maintenance Area (MA), by County, Tons Per Day (TPD)

County	CO Tons per Day (TPD)
Bergen	4.001
Essex	20.607
Hudson	0.003
Passaic	0.497
Union	1.117
Total NNJ CO MA	**26.224**

V.4 Railroad Diesel Locomotives

Railroad diesel locomotive engines are classified into the following categories:

- Class I line haul diesel locomotives are operated by large freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-006);

- Class II/III line haul diesel locomotives are operated by smaller freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-007);

- Inter-city passenger train diesel locomotives are operated primarily by Amtrak to provide inter-city passenger transport (SCC 22-85-002-008);

- Independent commuter diesel rail systems operate locomotives provide passenger transport within a metropolitan area (SCC 22-85-002-009); and

- Yard/switch diesel locomotives are used in freight yards to assemble and disassemble trains, for short hauls of trains that are made up of only a few cars (SCC 22-85-002-010).

V.4.1 Class II/III Line Haul, Yard, Commuter and Passenger Diesel Locomotives

USEPA has developed fuel usage based emission factors for each of the above referenced locomotive engine categories. New Jersey developed its emission inventory for these categories by applying these emission factors to specific 2007 fuel usage data received from Class II/III line haul and independent commuter rail systems and yard/switch freight and commuter rail yards. An estimation of fuel consumption based on gross tons miles (tons of freight and number of cars multiplied by the miles traveled) and a fuel consumption index (gross ton miles per gallon of fuel) was prepared for those railroads that did not submit statewide fuel data.

In concern for passenger locomotive emissions (AMTRAK), there were no emissions. This is because AMTRAK only used electric powered locomotives on the Northeast corridor line in New Jersey. These electric engines do not generate any emissions.

V.4.2 Class I Line Haul Diesel Locomotives

In concern for the Class 1 line haul locomotives, New Jersey elected to use the Class I Line Haul ERTAC 2008 inventory that was made available to the MARAMA states.[10] The ERTAC rail inventory included both the State and the County level Class 1 line haul emissions in NIF format. This inventory was developed from national locomotive fuel consumption data and additional confidential information provided by the two major Class 1 line-haul railroads that operate in New Jersey (Norfolk Southern and CSX). All 2008 emissions were assumed to equal 2007 emissions.

V.4.3 Railroad Diesel Hydrocarbon Emissions

Both Class I and Class II/III emissions were reported as hydrocarbons (HC). These emissions were converted to VOC emissions by multiplying the HC emissions by a factor of 1.053.[11]

V.4.4 Railroad Diesel Locomotive Emission Inventory

Table 6 summarizes the 2007 railroad diesel locomotive emission inventory, for the winter season average daily workday, and for every county included in the NNJ CO MA. Attachment 9E contains the detailed railroad dliesel locomotive source emission inventories. This attachment is only available electronically.

Table 6:
2007 Railroad Diesel Locomotive CO Emission Inventory, Winter Season Average Daily Weekday, North New Jersey (NNJ) CO Maintenance Area (MA), by County Tons Per Day (TPD)

County	CO Tons per Day (TPD)
Bergen	0.266
Essex	0.145
Hudson	0.204
Passaic	0.077
Union	0.142
Total NNJ CO MA	**0.833**

V.5. Total Nonroad Emission Inventory

Table II in Appendix III summarizes the total 2007 nonroad sources emission inventory, for the winter season average daily workday, and for every county included in the NNJ CO MA. This inventory provides a summation of the NONROAD model equipment, CMV, Aircraft and Locomotive sources 2007 daily emissions. Attachment 9A contains the detailed nonroad source emission inventories. This attachment is only available electronically.

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10 Eastern Regional Technical Advisory Committee. ERTAC Rail Emissions Inventory Part 1: Class I Line-Haul Locomotives. October 2010.
11 U.S. Environmental Protection Agency. Emission Factors for Locomotives; EPA-420F09025, 2009.

VI Quality Assurance

A. Point Sources

This section outlines and discusses the quality assurance checks performed on the point source emission statement data submitted to the NJDEP.

i. Data Entry Checks

Pursuant to N.J.A.C. 7:27-21 et seq., 2007 point source emissions were reported by applicable facilities to the NJDEP through the Emission Statement Program. All applicable facilities reported their 2007 emissions in electronic format; therefore, no data entry quality assurance was necessary.

ii. Completeness Checks & Reasonableness Checks

All of the 611 Emission Statements submitted by applicable facilities in 2007 were checked for completeness. The checklist in Attachment 7 was used for emission statement review. NJDEP staff accessed data from both the New Jersey Environmental Management System (NJEMS) and the NJDEP Emission Statement Program Confidential Cabinet and compiled data into various reports using the Web Intelligence Software and Microsoft Access software (Access) to assist in determining responses to the questions in this checklist. NJEMS is the database that the NJDEP uses to store all emission statement data. The Confidential Cabinet contains all the confidential process data, which are manually reviewed by the NJDEP staff. Web Intelligence Software is the report writer software that the NJDEP uses to access the data stored in the New Jersey Environmental Management System, while Access is the software that the NJDEP uses to configure the data from Web Intelligence Software into other useful reports for error checks. The data source used for determining the response to each specific question in the checklist is identified after each question.

B. Area Sources

The CO emissions from area source categories were calculated, for the most part, by multiplying a USEPA published emission factor by a known indicator of activity for each source category such as employment, population and fuel usage. There are several area source categories and methodologies, resulting in numerous calculations. The area source emissions calculations were checked for accuracy by adding county emission totals and comparing them with the statewide emission totals. The calculations were randomly reviewed by NJDEP Bureau of Air Quality Planning staff to check for accuracy.

C. Onroad Sources

The onroad calculations were randomly reviewed by NJDEP Bureau of Air Quality Planning staff to check for accuracy.

D. Nonroad Sources

The nonroad calculations were randomly reviewed by NJDEP Bureau of Air Quality Planning staff to check for accuracy. The quality assurance review for the NONROAD Model equipment emissions estimates included New Jersey conducting a visual spot check of Model pollutant results presented on the computer monitor with those included in the corresponding exported spreadsheet. For the CMV, aircraft and locomotive emission estimates, New Jersey conducted

a visual spot check of the columns of calculations performed on each excel spreadsheet that was used for these emission estimates.