

DOCUMENTATION FOR THE 2008 MOBILE SOURCE NATIONAL EMISSIONS INVENTORY

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ACRONYMS

AEO	Annual Energy Outlook
CAP	criteria air pollutant
CMV	commercial marine vessel
CNG	compressed natural gas
CO	carbon monoxide
DOE	Department of Energy
DOT	Department of Transportation
EDMS	Emissions and Dispersion Modeling System
EGAS	Emissions Growth Analysis System
EIA	Energy Information Administration
EIS	Emissions Inventory System
EPA	Environmental Protection Agency
ETBE	ethyl tert-butyl ether
ETOH	ethanol
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FIPS	Federal Information Processing System
GIS	geographic information system
GSE	ground support equipment
HAPs	hazardous air pollutants
HC	hydrocarbons
HDDV	heavy duty diesel vehicle
HDGV	heavy duty gasoline vehicle
HHDDV	heavy heavy-duty vehicle
HPMS	Highway Performance Monitoring System
I/M	inspection and maintenance
LDDT	light-duty diesel truck
LDGT	light-duty gasoline truck
LDDV	light-duty diesel vehicle
LDGV	light-duty gasoline vehicle
LDV	light-duty vehicle
LEV	low emission vehicle
LHDDV	light heavy-duty diesel vehicle
LPG	liquefied petroleum gas
LTO	landing/take-off
MC	motorcycle
MTBE	methyl tert-butyl ether
NCD	NMIM County Database
NCDC	National Climatic Data Center
NEI	National Emissions Inventory
NGV	natural gas vehicle
NH ₃	ammonia
NMIM	National Mobile Inventory Model
OTAQ	Office of Transportation and Air Quality
PADDs	Petroleum Administration for Defense Districts

PM	particulate matter
PM10	particulate matter less than or equal to 10 micrometers
PM2.5	particulate matter less than or equal to 2.5 micrometers
RVP	Reid vapor pressure
RFG	reformulated gasoline
SCC	source classification code
SIC	standard industrial classification code
SIP	State Implementation Plan
S/L/T	State/Local/Tribal
SO ₂	sulfur dioxide
STEEM	Ship Traffic, Energy, and Environmental Model
TAF	Terminal Area Forecast
TAME	tertiary amyl methyl ether
U.S.	United States
VMT	vehicle miles traveled
VOC	volatile organic compound

1.0 INTRODUCTION

The National Emissions Inventory (NEI) is a comprehensive inventory covering criteria pollutants and hazardous air pollutants (HAPs) for the 50 United States (U.S.), Washington DC, Puerto Rico, and U.S. Virgin Islands. The NEI is developed by the U.S. Environmental Protection Agency (EPA)'s Emissions Inventory and Analysis Group in Research Triangle Park, North Carolina. The EPA is updating the NEI to a new computer system, the Emission Inventory System (EIS), which supports the collection and distribution of inventory information.

The NEI is used to support air quality modeling, rule development, international reporting, air quality trends analysis, and other activities. To support these ends, the EPA compiles comprehensive emissions data in the NEI for criteria and HAPs for nonroad mobile, onroad mobile, point, and nonpoint sources.

1.1 WHAT IS THE PURPOSE OF THIS REPORT?

This report summarizes the procedures EPA used to estimate annual emissions for the onroad mobile sector and a portion of the nonroad mobile source sector of EPA's 2008 general release NEI.

The nonroad sector is comprised of nonroad engines characterized in EPA's National Mobile Inventory Model (NMIM), as well as other engines not modeled in NMIM, including aircraft, commercial marine vessel, and locomotive engines. This report only addresses those nonroad categories included in EPA's NMIM. Methodologies for other nonroad mobile source categories are documented in the following reports:

- Documentation for the Commercial Marine Vessel Component of the National Emissions Inventory Methodology (ERG, 2010);
- Documentation for Locomotive Component of the National Emissions Inventory Methodology (ERG, 2011a); and
- Documentation for Aircraft Component of the National Emissions Inventory Methodology (ERG, 2011b).

1.2 WHAT CATEGORIES ARE COVERED IN THIS REPORT?

The onroad mobile source category includes motorized vehicles that are normally operated on public roadways. This includes passenger cars, motorcycles, minivans, sport-utility vehicles, light-duty trucks, heavy-duty trucks, and buses.

The nonroad categories in NMIM include recreational marine and land-based vehicles, farm and construction machinery, industrial, commercial, logging, and lawn and garden equipment, and rail maintenance equipment. These equipment are powered by compression-ignition engines, which are typically diesel-fueled, as well as spark-ignition (gasoline-fueled) engines. Compressed natural gas (CNG) and liquefied petroleum gas (LPG) engines may also power certain types of nonroad equipment. Although included in NMIM, aircraft ground support equipment (GSE) emissions are modeled separately in the NEI (see Section 4.2 for details).

1.3 HOW IS THIS REPORT ORGANIZED?

Section 2 provides an overview of the procedures used to develop the 2008 onroad and nonroad mobile source emission estimates, as well as a summary of methodologies used for developing pre-2008 year mobile source emission estimates. Section 3 presents a discussion of EPA's NMIM, as well as a description of the inputs used in the NMIM County Database (NCD). Section 4 describes the procedures used to process NMIM results for incorporation in the EIS. Section 5 presents the references cited in this document. Appendix A displays a detailed listing of the State/Local agency inputs incorporated into the NCD.

2.0 SUMMARY OF 2008 NONROAD AND ONROAD MOBILE SOURCE METHODOLOGIES

This section provides an overview of the methods used to develop the EPA estimates in the 2008 NEI. Although the focus of this documentation is on describing the methodologies and data used to develop 2008 emission estimates, Section 2.1 of this document provides an overview of the methodologies used to develop pre-2008 year onroad and nonroad mobile source category emission estimates.

2.1 WHAT ARE THE GENERAL METHODOLOGIES EPA USED TO DEVELOP PREVIOUS YEAR MOBILE SOURCE NEI'S?

Tables 2.1a and 2.1b summarize the year-specific emission estimation methodologies that EPA used to develop emission estimates for mobile source categories. Table 2.1a displays the onroad mobile source emission estimation methodologies, while Table 2.1b presents the nonroad methodologies. The entries in red boldface type summarize the 2008 NEI methods that are described in this report.

2.2 WHAT IS THE BASIS FOR THE 2008 EMISSIONS DATA LOADED INTO THE EIS?

The EPA developed the EIS to support the development of the 2008 and future year NEIs. The EIS is a data repository that collects and combines data contributions from EPA and State/Local/Tribal (S/L/T) agencies into a cohesive data set in a transparent manner. One of the primary tenets of the NEI is that S/L/T agency data take preference over EPA developed data. Therefore, with some exceptions noted herein, EPA default mobile source data were replaced with S/L/T submitted data.

For onroad and nonroad mobile source categories, EPA requested that S/L/T agencies submit model inputs for use in an EPA 2008 NEI run of NMIM. After EPA completed the NMIM runs for areas that submitted data, EPA then processed the emissions data for loading into the EIS for S/L/T agency review. If an agency submitted onroad emissions data rather than updated onroad NMIM inputs, then EPA compiled the vehicle miles traveled (VMT) from this submittal for use in EPA's NMIM run. As described in Section 3.2.3.1, this situation necessitated EPA efforts to allocate the SCC-level VMT in these submittals to the level of detail required by NMIM. Table 2-2 identifies the types of NMIM input updates that were provided by each State/Local agency. The "NCD Files" column indicates that an agency provided updates to the NCD. The NCD is the database that contains the input data needed by NMIM. The "Onroad SCC-based VMT" column is used to identify areas that supplied onroad emissions data to the EIS. In these cases, EPA extracted available SCC-based VMT data from these submittals, and further processed the VMT data for use in EPA onroad mobile source NMIM runs.

Table 2-1a. Methods Used to Develop Emission Estimates for Onroad Vehicle Sources

Base Year(s)	Pollutant(s)	Geographic Area	Emission Estimation Method
2008	All Criteria, HAPs	US, Puerto Rico, Virgin Islands	Emission estimates for all pollutants were developed using EPA's National Mobile Inventory Model (NMIM), which uses MOBILE6 (specifically, M6203ChcOxFixNMIM.exe) to calculate onroad emission factors. Where States provided alternate onroad MOBILE6 inputs or VMT, these data replaced EPA default inputs. Default VMT is based on FHWA 2008 data and 2008 Census population estimates.
2005	All Criteria, HAPs	US, Puerto Rico, Virgin Islands	Emission estimates for all pollutants were developed using EPA's NMIM, which uses MOBILE6 to calculate onroad emission factors. Where States provided alternate onroad MOBILE6 inputs or VMT, these data replaced EPA default inputs. Default VMT is based on FHWA 2005 data and 2005 Census population estimates.
2002	All Criteria, HAPs	US, Puerto Rico, Virgin Islands	Emission estimates for all pollutants were developed using EPA's NMIM, which uses MOBILE6 to calculate onroad emission factors. Where States provided alternate onroad MOBILE6 inputs or VMT, these data replaced EPA default inputs. California-supplied emissions data which replaced default EPA emission estimates for this state. Default VMT is based on FHWA 2002 data and population data from 2000 Census.
2001	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	California	Emissions and VMT provided by California at county/vehicle type level; State-provided emissions expanded to county/SCC level by EPA
2001	NH ₃	California	Calculated at State/county/SCC level by month using MOBILE6 emission factors with State-provided VMT data
2001	All Criteria	AL; CO; ME; MA; MS; OR; UT; VA; WV; Maricopa County, AZ; Hamilton County, TN	State-provided VMT grown to 2001; emissions calculated by EPA using MOBILE6 emission factors
2001	All Criteria	Rest of US	Calculated at State/county/SCC level by month using MOBILE6 and FHWA-based VMT
1999	All Criteria	AL; ME; MA; MS; UT; VA; WV; Maricopa County, AZ; Hamilton County, TN	Calculated at State/county/SCC level by month using MOBILE6; State-provided VMT data used
1999	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	California	Emissions and VMT provided by California at county/vehicle type level; State-provided emissions expanded to county/SCC level by EPA

Table 2-1a. Methods Used to Develop Emission Estimates for Onroad Vehicle Sources

Base Year(s)	Pollutant(s)	Geographic Area	Emission Estimation Method
1999	NH ₃	California	Calculated at State/county/SCC level by month using MOBILE6 emission factors with State-provided VMT data
1999	PM10 Exhaust	Colorado	PM10 emissions and VMT provided by State
1999	VOC, NO _x , CO, SO ₂ , PM10 brake and tire wear, PM2.5, NH ₃	Colorado	Calculated at State/county/SCC level by month using MOBILE6; State-provided VMT data used
1999	All Criteria	Oregon	Emissions and VMT provided by Oregon at county/vehicle type level; State-provided emissions expanded to county/SCC level by EPA
1999	All Criteria	Rest of US, Puerto Rico, and US Virgin Islands	Calculated at State/county/SCC level by month using MOBILE6 and FHWA-based VMT
1999	HAPs	California	HAP emissions and VMT provided by California at county/vehicle type level; emissions allocated to SCC level by EPA
1999	HAPs	Rest of US, Puerto Rico, and US Virgin Islands	MOBILE6 emission factors calculated at State/county/SCC level by season; applied to FHWA-based VMT
1997-1998	All Criteria	US	2-step linear interpolation at State/count/SCC level based on 1996 and 1999 State/count/SCC level data
1990, 1996	HAPs	US	MOBILE6 emission factors calculated at State/county/SCC level by season; applied to Federal Highway Administration (FHWA)-based vehicle miles traveled (VMT)
1991-1995	All Criteria	US	Linear interpolation at State/count/SCC level based on 1990 and 1996 State/count/SCC level data
1988-1989	All Criteria	US	Linear interpolation at State/count/SCC level based on 1987 and 1990 State/count/SCC level data
1979-1986	All Criteria	US	Linear interpolation at State/count/SCC level based on 1978 and 1987 State/count/SCC level data
1978, 1987, 1990, 1996, 2000	All Criteria	US	Calculated at State/county/source classification code (SCC) level by month using MOBILE6, no State data incorporated
1970, 1975	All Criteria	US	Linear extrapolation at national vehicle type level based on 1978 and 1987 national data

Table 2-1b. Methods Used to Develop Emission Estimates for Nonroad Mobile Sources

Category	Base Year	Pollutant(s)	Estimation Method*
NONROAD Categories			
Nonroad Gasoline, Diesel, LPG, CNG	2008	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , NH ₃ , & HAPs	Emission estimates for NONROAD model engines were developed using EPA's National Mobile Inventory Model (NMIM), which incorporates NONROAD2008. Where states provided alternate NMIM nonroad inputs, these data replaced EPA default inputs.
	2005	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , NH ₃ , & HAPs	Emission estimates for NONROAD model engines were developed using EPA's NMIM, which incorporates NONROAD2005. Where States provided alternate nonroad inputs, these data replaced EPA default inputs.
	2002	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , NH ₃ , & HAPs	Emission estimates for NONROAD model engines were developed using EPA's NMIM, which incorporates NONROAD2004. Where states provided alternate nonroad inputs, these data replaced EPA default inputs. State-supplied emissions data also replaced default EPA emission estimates.
	1999	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using emission estimates from two emission inventories including: 1) a 1996 county-level inventory, developed using EPA's October 2001 draft NONROAD model; and 2) an updated 1999 national inventory, based on EPA's draft Lockdown C NONROAD model (dated May 2002). Using the 1996 county-level emission estimates, seasonal and daily county-to-national ratios were then developed for application to updated national estimates per season estimated from the Lockdown C model. Replaced State-submitted data for California for all NONROAD model categories; Pennsylvania for recreational marine and aircraft ground support equipment, and Texas for select equipment categories.
	1996, 1997, 1998, 2000 & 2001	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using emission estimates from two emission inventories including: 1) a 1996 county-level inventory, developed using EPA's October 2001 draft NONROAD model; and 2) updated year-specific national and California inventories, based on EPA's draft Lockdown C NONROAD model (dated May 2002). Using the 1996 county-level emission estimates, seasonal and daily county-to-national ratios and California county-to-state ratios were then developed for application to updated national estimates per season estimated from the Lockdown C model. California results replace the diesel equipment emissions generated from prior application of county-to-national ratios.

**Table 2-1b. Methods Used to Develop Annual Emission Estimates for
Nonroad Mobile Sources (Continued)**

Category	Base Year	Pollutant(s)	Estimation Method*
Nonroad Gasoline, Diesel, LPG, and CNG (Continued)	1991-1995	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , NH ₃	Using 1990 and 1996 county-level emissions inventories, estimated emissions using linear interpolation of national emissions between 1990 and 1996. From these emissions, calculated the average annual growth rate for each pollutant/SCC combination for each year, and then applied the growth factors to 1990 county-level emissions to estimate 1991-1995 emissions.
	1990	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using emission estimates from two emission inventories including: 1) a 1996 county-level inventory, developed using EPA's October 2001 draft NONROAD model; and 2) updated 1990 national inventory, based on EPA's draft Lockdown C NONROAD model (dated May 2002). Using the 1996 county-level emission estimates, seasonal and daily county-to-national ratios were then developed for application to updated national estimates per season estimated from the Lockdown C model.
	1986, 1988, & 1989	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , NH ₃	Using 1985 and 1990 county-level emissions inventories, estimated emissions using linear interpolation of national emissions between 1985 and 1990. From these emissions, calculated the average annual growth rate for each pollutant/SCC combination for each year, and then applied the growth factors to 1985 county-level emissions to estimate 1986-1989 emissions.
	1987	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using EPA's draft Lockdown C NONROAD model (dated May 2002), developed updated national emissions for 1987 by running 4 seasonal NONROAD model runs to estimate annual criteria pollutant emissions. Also performed national NONROAD model runs to estimate typical summer weekday emissions.
	1985	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using emission estimates from two emission inventories including: 1) a 1996 county-level inventory, developed using EPA's October 2001 draft NONROAD model; and 2) updated 1985 national inventory, based on EPA's draft Lockdown C NONROAD model (dated May 2002). Using the 1996 county-level emission estimates, seasonal and daily county-to-national ratios were then developed for application to updated national estimates per season estimated from the Lockdown C model.
	1970, 1975, 1978, & 1980	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Using EPA's draft Lockdown C NONROAD model (dated May 2002), developed updated national emissions for all years by running 4 seasonal NONROAD model runs to estimate annual criteria pollutant emissions. Also performed national NONROAD model runs to estimate typical summer weekday emissions.

**Table 2-1b. Methods Used to Develop Annual Emission Estimates for
Nonroad Mobile Sources (Continued)**

Category	Base Year	Pollutant(s)	Estimation Method*
Nonroad Gasoline, Diesel, LPG, and CNG (Continued)	1996, 1997, 1998, 1999, 2000, & 2001	NH ₃	Obtaining national fuel consumption estimates from the Lockdown C NONROAD model, multiplying by NH ₃ emission factors, and distributing to counties using 1996 inventory, based on October 2001 draft NONROAD. NH ₃ emissions for California were also recalculated using updated diesel fuel consumption values generated for California-specific runs, and assuming the 1996 county-level distribution.
	1985 & 1990	NH ₃	Obtaining national fuel consumption estimates from the Lockdown C NONROAD model, multiplying by NH ₃ emission factors, and distributing to counties using 1996 inventory, based on October 2001 draft NONROAD.
	1987	NH ₃	Obtaining 1987 national fuel consumption estimates from Lockdown C NONROAD model and multiplying by NH ₃ emission factors.
	1970, 1975, 1978, & 1980	NH ₃	Obtaining national fuel consumption estimates from the Lockdown C NONROAD model and multiplying by NH ₃ emission factors.
	1990, 1996, & 1999	HAPs	Speciation profiles applied to county VOC and PM estimates. Metal HAPs were calculated using fuel and activity-based emission factors. Some state data were provided and replaced national estimates. (2003)
Aircraft			
Commercial Aircraft	2008	Criteria and HAPs	Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS) - Version 5.1 was run using BTS T-100 LTO data. (2009)
	2002 and 2005	Criteria and HAPs	Federal Aviation Administration (FAA) Emissions and Dispersion and Modeling System (EDMS) was run for criteria pollutants, VOC and PM emissions were speciated into HAP components. (2004)
	1990, 1996, 1999, 2000, 2001	VOC, NO _x , CO, SO _x	Input landing and take-off (LTO) data into FAA EDMS. National emissions were assigned to airports based on airport specific LTO data and BTS GIS data. State data replaced national estimates. (2003)
	1970-1998	VOC, NO _x , CO, SO _x	Estimated emissions for interim years using linear interpolation between available base years. (2003)
	1990, 1996, 1999	HAPs	Speciation profiles were applied to VOC estimates to get national HAP estimates. State data replaced national estimates. (2003)

**Table 2-1b. Methods Used to Develop Annual Emission Estimates for
Nonroad Mobile Sources (Continued)**

Category	Base Year	Pollutant(s)	Estimation Method*
General Aviation, Air Taxis	2008	Criteria and HAPs	Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS) - Version 5.1 was run using BTS T-100 LTO for aircraft identified as Air taxis. (2010) Used FAA LTO data from TAF and OTAQ provided activity data for smaller airports derived from FAA 5010 master plans. EPA approved generic emission factors for criteria estimates. Speciation profiles were applied to VOC and PM estimates to get national HAP estimates. (2010)
	2005	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	2002 emissions for approximately 4,000 largest airports were calculated via EDMS and SIP guidance and included in the 2005 NEI as point sources. Only airports in FAA's T100 and TAF databases were included. State point source submittals were incorporated.
	1978, 1987, 1990, 1996, 1999, 2000, 2001, & 2002	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Used FAA LTO data and EPA approved emission factors for criteria estimates. Speciation profiles were applied to VOC estimates to get national HAP estimates. State data replaced national estimates. (2004)
	1970-1998	VOC, NO _x , CO, SO _x , PM ₁₀ , PM _{2.5}	Estimated emissions for interim years using linear interpolation between available base years. (2003)
	1990, 1996, 1999, & 2002	HAPs	Used FAA LTO data and EPA approved emission factors for criteria estimates. Speciation profiles were applied to VOC estimates to develop national HAP estimates. (2004)
	1990, 1996, 1999, & 2002	Pb	Used Department of Energy (DOE) aviation gasoline usage data with lead concentration of aviation gasoline. (2004)
	1996	NH ₃	Applied NH ₃ emissions factors to 1996 national jet fuel and aviation gasoline consumption estimates.
Military Aircraft	2008	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Used FAA LTO data as reported in TAF and EPA approved emission factors for criteria estimates. Representative HAP profiles were not readily available, therefore HAP estimates were not developed. (2010)
	2005	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	2002 emissions were included in the 2005 NEI as point sources similar to other TAF reported data.
	1978, 1987, 1990, 1996, 1999, 2000, 2001, 2002, 2008	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Used FAA LTO data as reported in TAF and EPA approved emission factors for criteria estimates. Representative HAP profiles were not readily available, therefore HAP estimates were not developed.
	1970-1998	VOC, NO _x , CO, SO _x , PM ₁₀ , PM _{2.5}	Estimated emissions for interim years using linear interpolation between available base years. (2003)

**Table 2-1b. Methods Used to Develop Annual Emission Estimates for
Nonroad Mobile Sources (Continued)**

Category	Base Year	Pollutant(s)	Estimation Method*
Auxiliary Power Units and Ground Support Equipment	2008	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , HAPs	Federal Aviation Administration (FAA) Emissions and Dispersion and Modeling System (EDMS) - Version 5.1 was run using BTS T-100 LTO data. (2009)
	2002 and 2005	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5} , HAPs	Computed via NONROAD2005 model runs
	1985-2001	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Grew 1996 emissions to each year using LTO operations data from the FAA. Estimation methods prior to 1996 reported in EPA, 1998.
Unpaved Airstrips ¹	1985-2001	PM ₁₀ , PM _{2.5}	Grew 1996 emissions to each year using SIC 45-Air Transportation growth factors, consistent with the current draft version of EGAS. Estimation methods prior to 1996 reported in EPA, 1998.
Aircraft Refueling	1985-2001	VOC	Grew 1996 emissions to each year using SIC 45-Air Transportation growth factors, consistent with the current draft version of EGAS. Estimation methods prior to 1996 reported in EPA, 1998.
Commercial Marine Vessel (CMV)			
All CMV Categories	2008	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	OTAA provided CAP emission estimates for all CMV categories. Note that the SCCs for this category have changed such that the Diesel category refers to smaller vessels (Category 1 and 2) using distillate fuels and the Residual category refers to larger (Category 3) vessels using a blend of residual fuels. Emissions were allocated to segments using GIS shapefiles and adjusted based on limited state data (2010)
	2008	HAPs	OTAA's 2008 estimates were speciated into HAP components using EPA profiles (2009)
CMV Diesel	2002 and 2005	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	2001 Estimates carried over. Used state data when provided. (2004)
		HAPs	1999 Estimates carried over. Used state data when provided. (2004)
	1978, 1987, 1990, 1996, 1999, 2000, & 2001	VOC, NO _x , CO, SO _x , PM ₁₀ , & PM _{2.5}	Used criteria emission estimates in the background document for marine diesel regulations for 2000. Adjusted 2000 criteria emission estimates for other used based on fuel usage. Emissions were disaggregated into port traffic and underway activities. Port emissions were assigned to specific ports based on amount of cargo handled. Underway emissions were allocated based on Army Corp of Engineering waterway data. State data replaced national estimates. (2003)
	1970-1998	VOC, NO _x , CO, SO _x , PM ₁₀ , PM _{2.5}	Estimated emissions for interim years using linear interpolation between available base years. (2003)
	1990, 1996, 1999	HAPs	VOC and PM emission estimates were speciated into HAP components. State data replaced national estimates. (2003)
	1996	NH ₃	Applied NH ₃ emissions factors to 1996 distillate and residual fuel oil estimates (i.e., as reported in EIA, 1996).
	1990-1995	NH ₃	Estimation methods reported in EPA, 1998.

**Table 2-1b. Methods Used to Develop Annual Emission Estimates for
Nonroad Mobile Sources (Continued)**

Category	Base Year	Pollutant(s)	Estimation Method*
CMV Steam Powered	2005	VOC, NO _x , CO, SO _x , PM ₁₀ , & PM _{2.5} , HAPs	2002 estimates grown to 2005 (2008).
	2002	VOC, NO _x , CO, SO _x , PM ₁₀ , & PM _{2.5} , HAPs	2002 based estimates were developed for port and underway category 3 (C3) vessels as part of a rulemaking effort. Emissions were developed separately for near port and underway emissions. For near port emissions, inventories for 2002 were developed for 89 deep water and 28 Great Lake ports in the U.S. The Waterway Network Ship Traffic, Energy, and Environmental Model (STEEM) was used to provide emissions from ships traveling in shipping lanes between and near individual ports (2008)
	1978, 1987, 1990, 1996, 1999, 2000, & 2001	VOC, NO _x , CO, SO _x , PM ₁₀ , & PM _{2.5}	Calculated criteria emissions based on EPA SIP guidance. Emissions were disaggregated into port traffic and under way activities. Port emissions were assigned to specific ports based on amount of cargo handled. Underway emissions were allocated based on Army Corp of Engineering waterway data. State data replaced national estimates. (2003)
	1970-1998	VOC, NO _x , CO, SO _x , PM ₁₀ , PM _{2.5}	Estimated emissions for interim years using linear interpolation between available base years. (2003)
	1990, 1996, & 1999	HAPs	VOC and PM emission estimates were speciated into HAP components. State data replaced national estimates. (2003)
Military Marine	1997-2001	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Applied EGAS growth factors to 1996 emissions estimates for this category.
CMV Coal, ² CMV, Steam powered, CMV Gasoline ²	1997-1998	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Applied EGAS growth factors to 1996 emissions estimates for this category.
CM Coal, CMV, Steam powered, CMV Gasoline, Military Marine	1991-1995	VOC, NO _x , CO, SO ₂ , PM ₁₀ , PM _{2.5}	Estimation methods reported in EPA, 1998.
Locomotives			
Class I, II, III and Yard operations	2008	VOC, NO _x , CO, PM ₁₀ , PM _{2.5} , SO _x & HAPs	Criteria emission estimates were provided to EPA by ERTAC. These data were assigned to individual railway segments using DOT shapefiles and guidance from ERTAC. HAP emissions were calculated by applying speciation profiles to VOC and PM estimates. (2010)

Table 2-1b. Methods Used to Develop Annual Emission Estimates for

Category	Base Year	Pollutant(s)	Estimation Method*
Class I, Class II, Commuter, Passenger, and Yard Locomotives	1978, 1987, 1990, 1996, 1999, 2000, 2000, 2002, & 2005	VOC, NO _x , CO, PM ₁₀ , PM _{2.5}	Criteria pollutants were estimated by using locomotive fuel use data from DOE EIA and available emission factors. County-level estimates were obtained by scaling the national estimates with the rail GIS data from DOT. State data replaced national estimates. (2004)
	1978, 1987, 1990, 1996, 1999, 2000, 2001, 2002, & 2005	SO ₂	SO _x emissions were calculated by using locomotive fuel use and fuel sulfur concentration data from EIA. County-level estimates were obtained by scaling the national estimates with the county level rail activity data from DOT. State data replaced national estimates. (2004)
	1970-1998	VOC, NO _x , CO, SO _x , PM ₁₀ , PM _{2.5}	Estimated emissions for interim years using linear interpolation between available base years. (2003)
	1990, 1996, 1999, & 2002	HAPs	HAP emissions were calculated by applying speciation profiles to VOC and PM estimates. County-level estimates were obtained by scaling the national estimates with the county level rail activity from DOT. State data replaced national estimates. (2004)
	1997-1998	NH ₃	Grew 1996 base year emissions using EGAS growth indicators.
	1996	NH ₃	Applied NH ₃ emissions factors to diesel consumption estimates for 1996.
	1990-1995	NH ₃	Estimation methods reported in EPA, 1998.

Notes:

* Dates included at the end of Estimation Method represent the year that the section was revised.

¹ Emission estimates for unpaved airstrips and aircraft refueling are included in the nonpoint source NEI, since they represent non-engine emissions.

² National Emission estimates for CMV Coal and CMV Gasoline were not developed, though states and local agencies may have submitted estimates for these source categories.

EPA, 1998: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Factors and Inventory Group, National Air Pollutant Emission Trends, Procedures Document, 1900–1996, EPA-454/R-98-008. May 1998.

Table 2-2. Summary of Onroad and Nonroad 2008 NMIM Data Submissions

State Name	Data Provided For (all counties unless otherwise noted)	NCD Files	Onroad SCC- based VMT
Alabama			
Alaska			
Arizona	Maricopa County		✓
Arkansas		✓	
California			
Colorado			
Connecticut			
Delaware			
Washington DC		✓	
Florida			
Georgia		✓	
Hawaii		✓	
Idaho			✓
Illinois			✓
Indiana			
Iowa			
Kansas		✓	
Kentucky	Jefferson County		✓
Louisiana		✓	
Maine		✓	
Maryland		✓	
Massachusetts		✓	
Michigan		✓	
Minnesota		✓	
Mississippi		✓	
Missouri		✓	
Montana			
Nebraska			
Nevada	All counties except Clark and Washoe	✓	
New Hampshire		✓	
New Jersey			
New Mexico			
New York			
North Carolina		✓	
North Dakota			
Ohio		✓	
Oklahoma			
Oregon			
Pennsylvania		✓	
Rhode Island			
South Carolina		✓	
South Dakota			
Tennessee	Davidson County	✓	
Texas			✓
Utah			
Vermont		✓	
Virginia		✓	
Washington			
West Virginia			

State Name	Data Provided For (all counties unless otherwise noted)	NCD Files	Onroad SCC- based VMT
Wisconsin		✓	
Wyoming			
Puerto Rico			
Virgin Islands			

The EPA developed the 2008 mobile source NEI in multiple phases. In the first phase, EPA ran NMIM for year 2008 for the entire country. This NMIM run used EPA default modeling inputs incorporated into “NCD20090327” (the naming convention reflects the NCD’s lock-down date). These default inputs represented EPA’s initial assumptions concerning key modeling parameters such as fuel blends, ambient temperatures, and onroad VMT. The 2008 mobile source emission estimates from this phase were listed in the EIS under the data set descriptions “EPA Nonroad using NCD20090327” and “EPA Onroad using NCD20090327.” The EPA then discovered a need to update some of the fuel parameter values from the assumptions used in NCD20090327. Consequently, EPA developed an updated NCD reflecting the revised values, which was posted under the name “EPA NMIM Activity NCD20090531.” This NCD was then posted for review/update by S/L/T agencies.

For the second phase, EPA set a deadline of June 1, 2010 for agencies to submit changes to the NCD20090531 values for their areas. After obtaining any necessary clarification on these changes from S/L/T agencies, EPA modified the NCD to reflect S/L/T updates, ran NMIM for 2008 for the entire country, and processed annual NMIM emissions output for loading into the EIS. This 2008 mobile source NEI development phase resulted in the data sets “EPA Nonroad using NCD20100602” and “EPA Onroad using NCD20100602.”

In the third and final phase, agencies were afforded the opportunity to review EPA’s emission estimates and provide additional revisions to NMIM inputs. After updating the NCD to reflect these revisions, EPA ran NMIM a final time and produced the data sets described as “EPA Nonroad using NCD20101201” and “EPA Onroad using NCD20101201.” This data set only covers the geographical areas that submitted changes between July 2010 and November 2010.¹

2.3 WHAT IS THE MAGNITUDE OF THE MOBILE SOURCE EMISSIONS ESTIMATED FOR 2008?

Tables 2-3 and 2-4 display the national onroad and nonroad mobile source emission totals reflecting each area’s latest emission estimates (i.e., emissions computed using NCD20101201 for areas for which agencies submitted changes between July 2010 and November 2010, and emissions computed using NCD20100602 for all other areas). These tables do not reflect any State/Local agency-submitted 2008 emissions data.

¹ Although Lincoln County Nebraska data were provided in time for the June submittal deadline, EPA uploaded the NMIM results in the NCD20101201 data set rather than the NCD20100602 data set.

Table 2-3. 2008 Onroad Mobile NEI National Emission Totals

Pollutant	Emissions (tons)
VOC	3,812,673
NOX	4,988,311
CO	41,373,673
PM10-PRI	147,328
PM25-PRI	94,372
SO ₂	44,722
NH ₃	306,952

Table 2-4. 2008 Nonroad Mobile NEI National Emission Totals

Pollutant	Emissions (tons)
VOC	2,492,230
NOX	1,882,841
CO	18,214,682
PM10-PRI	185,572
PM25-PRI	176,931
SO ₂	32,214
NH ₃	2,093

3.0 NATIONAL MOBILE INVENTORY MODEL (NMIM)

3.1 BACKGROUND

This subsection provides a brief overview of EPA's NMIM. Readers that are interested in a more detailed understanding of NMIM should refer to EPA's NMIM webpage for further model documentation: <http://www.epa.gov/otaq/nmim.htm>.

The NMIM is a consolidated emissions modeling system that houses EPA's onroad mobile source (MOBILE6) and nonroad mobile source (NONROAD) emission models. It was developed to produce, in a consistent and automated way, national, county-level mobile source emission inventories. When national inventories have previously been constructed from MOBILE6 and NONROAD, the necessary input data have been widely scattered in disparate formats and have required additional specialized software to: convert these data into input files for MOBILE6 and NONROAD; run the models; integrate the results into a final inventory; and post-process the results into forms suitable for the national inventories. NMIM is designed to accomplish these tasks via a single package. Further details on EPA's MOBILE6 and NONROAD models are available from the following web pages: <http://www.epa.gov/otaq/mobile.htm> and <http://www.epa.gov/otaq/nonrdmdl.htm>, respectively.

3.2 THE NMIM COUNTY DATABASE

3.2.1 Database Structure

The NCD contains all the county-specific information needed to run MOBILE6 and NONROAD. It also contains the ratios that are applied to MOBILE6/NONROAD outputs to estimate emissions of HAPs, dioxins/furans, and some metals. The NCD is a relational database management system available from www.mysql.com. Table 3-1 displays the tables that comprise the NCD.

3.2.1.1 EIS Interface

To speed the interchange of mobile source activity data between S/L/T agencies and EPA, the EIS was designed to exclude NCD tables that should not generally be revised. Therefore, only the following tables were required to be included in an EIS mobile source activity data submission: baseyearvmt, county, countynrfile, countyvmtmonthallocation, countyyear, countyyearmonth, countyyearmonthhour, diesel, gasoline, natural gas, and state. A separate folder for the various external files was also required, along with a text file detailing changes that were made to each table.

To facilitate interaction with S/L/T agencies on the 2008 NEI, the EPA provided NCD activity data in separate files by State. The EPA then reintegrated the updated data provided by S/L/T agencies into a single NCD for the 2008 NMIM run. The EPA's instructions for reporting NCD data to the EIS are available from http://www.epa.gov/ttn/chief/net/neip/section_9.pdf.

Table 3-1. Tables in the NMIM County Database (NCD)

Table	Contents
BaseYearVMT	VMT by year, county, M6Vclass, and HPMSRoadType.
County	For each county, Federal Information Processing System (FIPS) codes for the county and State, altitude, beginning and end of ozone season, Stage 2 information, Natural Gas Vehicle (NGV) fraction file name
CountyMap	The representing county for each county/county group, one for NONROAD and one for MOBILE6.
CountyMonth	Defines the set of possible county-month combinations.
CountyMonthHour	Monthly average hourly temperature and humidity table used if "Use Yearly Weather Data" option is not selected or data are not available for the requested year in the CountyYearMonthHour table.
County NRFile	References to external NONROAD files pertaining to a county.
CountyVMTMonthAllocation	Mileage allocation factors for the 12 months of the year, by county.
CountyYear	Stage2 percent input to the NONROAD model, plus external file references for MOBILE6 and NONROAD.
CountyYearMonth	Gasoline, diesel, and natural gas fuel IDs for each county for each year and month.
CountyYearMonthHour	Historical hourly temperature and relative humidity.
DataSource	Defines the data source identifiers used in other tables.
Diesel	Diesel sulfur content associated with each diesel ID.
EmissionType	Associates emission types (exhaust, evap, brake, tire) with EmissionTypeID used in other tables
FileType	Defines the set of valid external files and their 3-character extensions.
Gasoline	Detailed fuel properties associated with each gasoline ID.
Hour	Defines the hour identifiers.
HPMSRoadType	Defines the 12 HPMS road type identifiers.
M6Vclass	Defines the 28 vehicle classes used in MOBILE6. These are the valid combinations of M6Vtype and fuel.
M6Vtype	Defines the fuel-independent vehicle types used in MOBILE6.
NaturalGas	Natural gas sulfur content associated with each natural gas ID.
PollutantCode	Associates NIF pollutant codes and pollutant names with PollutantCodeID used in other tables.
SCC	Associates an SCC code and description for each SCCID, and ratios for NH ₃ , PM ₂₅ , and for converting between HC forms.
SCCToxics	SCC and fuel property-dependent ratios for calculating HAPs, dioxin/furans, and metals.
State	Associates State names and abbreviations with State FIPS codes used in other tables.
VMTGrowth	The annual VMT growth rate for a M6Vclass by county and year.
VMTMonthAllocation	Factors for allocating annual VMT to the 12 months, by M6Vtype and HPMSRoadType, used if there are no county-specific values in CountyVMTMonthAllocation.

3.2.2 EPA Default 2008 NCD Inputs

This section describes how EPA developed default 2008 NCD inputs for the following: vehicle miles traveled; temperature and humidity; and gasoline and diesel fuel parameters.

3.2.2.1 Vehicle Miles Traveled

The VMT data in the NCD is contained in the BaseYearVMT table. For each county in this table, VMT data are reported for each of the 12 Highway Performance Monitoring System (HPMS) functional roadway types and the 28 MOBILE6 vehicle classes, for a total of 336 records per county.

The EPA developed 2008 vehicle miles traveled (VMT) data by allocating Federal Highway Administration (FHWA) VMT data to the county/road type/vehicle class-level required by NMIM. The EPA initially developed 2008 VMT data in NCD20090327 by growing 2007 State-level VMT from FHWA's HPMS to 2008 using VMT growth factors (FHWA, 2007). The 2007 to 2008 growth factors were calculated from the 2007 and 2008 FHWA's Travel Volume Trends reports (FHWA, 2009a).

For NCD20100602, 2008 HPMS State-level VMT totals by road type were allocated to the county/road type/vehicle class-level using VMT data submitted for earlier NEIs (FHWA, 2009b). For agencies that submitted data in 2005, the following formula was used:

$$2008 \text{ County VMT}_{VClass, Road Type} = 2008 \text{ State VMT} * (2005 \text{ County VMT}_{VClass, Road Type} / 2005 \text{ State VMT})$$

An analogous formula was used for agencies that submitted 2002, but not 2005, VMT data.

If a geographic area did not submit VMT data in either 2005 or 2002, then EPA allocated FHWA data from its HPMS urban and small urban area data sets, and the *Highway Statistics* rural VMT data by State and roadway class, to the county level using 2008 population data (Census, 2009a and 2009b). The HPMS data sets included VMT by roadway class for urban and small urban areas, which EPA then allocated to the counties included in these areas using population data. Rural VMT at the State and roadway class level was obtained from *Highway Statistics* and allocated to the rural counties in a State by roadway class using rural interstate mileage and rural population for the allocations. The EPA allocated the resulting VMT at the county and roadway class level to each of the 28 MOBILE6 vehicle types based on the default VMT allocations by vehicle type for 2008 in MOBILE6. See Section 3.2.2.1.2 of the 2005 Mobile NEI Version 2 report for a more detailed explanation of how these default allocations were performed (EPA/Pechan, 2008).

3.2.2.2 Temperature and Humidity

NMIM requires that each county have both hourly average temperature and hourly relative humidity values for each month of the year. The NO_x emission results from MOBILE6 are sensitive to humidity levels, and hourly humidity levels are the most accurate way to represent daily humidity. MOBILE6 allows users to supply daily temperatures as either minimum/maximum values or as hourly averages. Because MOBILE6 calculates emissions separately for each hour of the day, user-supplied minimum and maximum temperatures are used to internally derive hourly temperatures, using a default diurnal temperature profile. MOBILE6 also allows users to supply hourly relative humidity levels.

The NCD contains a full set of default hourly average temperatures and hourly relative humidity values for each county for each month. These temperature and humidity values were derived from raw measurement data obtained from the National Climatic Data Center (NCDC). The procedures used to develop the default NMIM temperature and relative humidity values are discussed in more detail in the report, "Derivation of By-Month, By-County, By-Hour

Temperature and Relative Humidity with Monthly Data,” by Air Improvement Resources, Inc. (AIR, 2004).

3.2.2.3 Gasoline

The default year 2008 EPA gasoline parameters were generally developed by interpolating between historical 2005 values compiled in support of the 2005 NEI and 2012 values developed in support of modeling for the Renewable Fuel Standards established by the Energy Independence and Security Act of 2007 (RFS2) (EPA, 2009). The following identifies the instances where EPA deviated from this approach in developing NCD20090531 gasoline parameter values.

For ethyl tert-butyl ether (ETBE), methyl tert-butyl ether (MTBE), and tertiary amyl methyl ether (TAME), EPA set 2008 year volume and market share values to zero.² For gasoline sulfur, gasoline maximum sulfur, and benzene content, EPA set 2008 values to the 2012 RFS2 values. For the reformulated gasoline (RFG) and RVP Oxy Waiver fields, EPA retained the 2005 values for 2008. For ethanol volumes and market shares, EPA used one of two different interpolation procedures to estimate 2008 values. If RFG was used in the given area, then EPA added the 2005 NEI ETBE, MTBE, and TAME values to the 2005 NEI ethanol values before performing the interpolation. If RFG was not used, EPA did not include the 2005 values for ETBE, MTBE, and TAME in the interpolation procedure. Further details on the interpolation procedures are available in the NMIM ChangeLog under NCD20090531.

3.2.2.4 Diesel

Diesel sulfur values were developed in support of the renewable fuel standard work performed as part of the 2002 Version 3 Modeling Platform (EPA, 2010). The year 2008 sulfur values were interpolated from 2005 values developed for the 2005 NEI and 2009 values developed from Annual Energy Outlook 2007 (additional details are provided in the ChangeLog under NCD20070727).

3.2.3 State/Local Agency-Submitted Inputs

State/Local agencies were provided the opportunity to provide NCD input data to override EPA defaults. The EIS performed a number of automated checks on the agency submissions. As described below, it was necessary for EPA to perform detailed review/manipulation of some S/L agency data before incorporating the data into the NCD.

3.2.3.1 VMT

If an agency submitted onroad mobile source emissions data, the SCC-level VMT data were extracted from the submission. Since NMIM maintains 28 vehicle classes and 12 road types (336 combinations total) to the SCC’s 12 vehicle classes and 12 road types (144 combinations total), some effort was necessary to split SCC-level VMT to the level required by NMIM. Table

² However, a MOBILE6 anomaly results in a national estimate of onroad MTBE emissions of 0.31 pounds.

3-2 shows the mapping between HPMS vehicle categories to both SCC and NMIM/MOBILE6-level vehicle classes.

Table 3-2. Mapping of HPMS Vehicle Categories to NMIM/MOBILE6 and SCC-Level Vehicle Classes

HPMS Vehicle Category	SCC-Level Vehicle Classes	NMIM/MOBILE6 Vehicle Classes
Passenger Cars	LDGV (2201001) LDDV (2230001)	LDGV LDDV
Motorcycles	MC (2201080)	MC
Other 2-Axle 4-Tire Vehicles	LDGT1 (2201020) LDGT2 (2201040) LDDT (2230060) HDGV (2201070) 2BHDDV (2230071)	LDGT1 LDGT2 LDGT3 LDGT4 LDDT12 LDDT34 HDGV2B HDDV2B
Single-Unit 2-Axle 6-Tire or More Trucks	HDGV (2201070) LHDDV (2230072) MHDDV (2230073)	HDGV3 HDGV4 HDGV5 HDGV6 HDGV7 HDDV3 HDDV4 HDDV5 HDDV6 HDDV7
Combination Trucks	HDGV (2201070) HHDDV (2230074)	HDGV8A HDGV8B HDDV8A HDDV8B
Buses	HDGV (2201070) BUS (2230075)	HDGB HDDBT HDDBS

If an agency had submitted VMT data to the 2005 or 2002 NEIs, the most recent NEI data submission was used to allocate the SCC-level VMT to the NMIM vehicle classes. In the case of Illinois and Texas there were county-SCC combinations for which VMT data were submitted in 2008 that did not appear in their 2005 submission. Therefore, EPA used default MOBILE6 data to allocate each State's SCC-level VMT data to the required NMIM vehicle classes. After performing the allocation to NMIM vehicle classes, the EPA compared the resulting VMT estimates to EPA's default VMT estimates. The EPA contacted agencies to confirm the validity of their SCC-level VMT data when estimates differed by more than 10 percent. In several cases, agencies submitted revised VMT data for use by EPA. Appendix Table A-2 summarizes the data sources/methods used to develop the VMT data incorporated into the 2008 NCD.

3.2.3.2 Temperature and Humidity

Maryland was the only State that submitted temperature and humidity data updates. A review of the methodology used to generate the temperature data showed that there was no spatial interpolation performed between airports and neighboring counties, and that the documentation did not identify how monthly averaging was performed. The EPA decided not to incorporate Maryland's temperature/humidity data because of these concerns.

3.2.3.3 Gasoline Parameters

The GasolineId is a code used in the Gasoline table to identify a unique gasoline profile. A gasoline profile identifies the values for various fuel properties (e.g., the percent by volume of ethanol in the fuel). The EPA's instructions for reporting new gasoline profiles to the EIS identifies the naming convention for the GasolineId field as *SSNNNN*, where *SS* indicates the State's Federal Information Processing System (FIPS) code and *NNNN* is a unique number chosen by the State. In cases where agencies submitted a new GasolineId that did not follow this numbering convention, EPA revised the GasolineId to match the convention, starting each State's new GasolineIds with "0001" (e.g., two new submittals by Kansas would be assigned GasolineIds 200001 and 200002). The countyyearmonth table was also revised to reflect the revised numbering.

3.2.3.4 CountyYear

The countyyear table is one of the four tables that NMIM uses to determine which (if any) external files to use when preparing a run. The external files referenced in the countyyear table are all onroad-specific. The EPA used the description of changes provided in each agency's submission to identify the columns that should be updated in this table. See Appendix Table A-1 for a list of agencies that supplied updates to the countyyear table.

3.2.3.5 CountyNRFile

The CountyNRFile table is another of the tables NMIM uses to determine which (if any) external files to use when preparing a run. Files listed in this table are nonroad-specific. Appendix Table A-4 lists the State specific external files supplied by State agencies (no Local agencies submitted CountyNRfile updates)--the last column in this table indicates if the file was new in 2008.

3.2.3.6 External Files

External files were included if: (a) agencies noted them in their submission comments; (b) they were identified in the county, countyyear, countynrfile, or state tables; or (c) if the modified date on the file was later than the existing file in the NCD. In some cases, NMIM would output an error flag after running NMIM with the updated external files. When this occurred, EPA contacted the agency to identify the necessary fix.

In the case of Arkansas and Missouri, NMIM runs with updated external files resulted in atypically large increases in evaporative VOC emissions relative to previous runs before these updates. The EPA performed a sample county analysis in each State, and determined that the large increase occurred due to each State's updated registration distribution file. A review of the old and new files determined that the average age of vehicles was older in the updated files (on the order of 2-3 years). Based on this analysis, EPA determined that large evaporative VOC emission increases seen in other States (e.g., Georgia, Kansas, Minnesota, and Ohio) may also be attributable to similar registration distribution revisions.

4.0 POST-PROCESSING OF NMIM OUTPUT

Because of specific design decisions in the EIS, it was necessary for EPA to post-process some of the NMIM output to be able to successfully post the data to the EIS. The following summarizes the NMIM post-processing procedures that EPA implemented for the 2008 NEI.

4.1 POLLUTANT CODE REVISIONS

Table 4-1 lists the pollutant codes no longer considered valid in the EIS. To prepare the emissions for loading into the EIS, Pollutant 93 was changed to the valid code 7440382 (Arsenic). The mercury codes (200, 201, and 202) were summed together and reported under the code 7439976 (Mercury). SOA data were removed completely.

Table 4-1. Pollutant Code Revisions

Pollutant Code	Pollutant Description	Revision
93	Arsenic & compounds	Updated to 7440382 (Arsenic)
200	Mercury (elemental gaseous)	Combined into 7439976 (Mercury)
201	Mercury (divalent gaseous)	
202	Mercury (particulate)	
SOA	Secondary Organic Aerosols	Removed

4.2 REMOVAL OF GROUND SUPPORT EQUIPMENT

Airport GSE is a category computed by NMIM. The EPA used the Federal Aviation Administration (FAA)'s *Emissions and Dispersion Modeling System (EDMS) - Version 5.1* to estimate aircraft emissions. This model also calculates GSE emissions using take-off and landing data. NMIM does not have this level of detail, so emissions for the three GSE SCCs (2265008005, 2267008005, and 2270008005) were removed before emissions were loaded into the EIS. Please see "Documentation for Aircraft Component of the National Emissions Inventory Methodology" for information on how EPA used the EDMS to calculate airport GSE emissions (ERG, 2011b).

4.3 STAGE II ONROAD VEHICLE REFUELING

Stage II refueling data for onroad vehicles are categorized in the nonpoint source NEI rather than the mobile source NEI. Therefore, all NMIM onroad refueling emission type records were removed before loading the NMIM output to the EIS. The nonpoint source NEI documentation describes the development of Stage II onroad vehicle emission estimates (EPA, 2011).

5.0 REFERENCES

- AIR, 2004: “Derivation of By-Month, By-County, By-Hour Temperature and Relative Humidity with Monthly Data,” by Air Improvement Resources, Inc. December 8, 2004.
- Census, 2009a: U.S Department of Commerce, Bureau of the Census, “Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2008,” data file NST-EST2008-01.csv, <http://www.census.gov/popest/states/NST-ann-est.html>, downloaded on February 23, 2009.
- Census, 2009b: U.S Department of Commerce, Bureau of Census, “International Database – U.S. Virgin Island Total Midyear Population,” <http://www.census.gov/cgi-bin/ipc/idbsprd>, downloaded on February 23, 2009.
- EPA, 2011: U.S. Environmental Protection Agency, “2008 National Emissions Inventory Data & Documentation,” <http://www.epa.gov/ttn/chief/net/2008inventory.html> (see Nonpoint/Stage 2 Gasoline Refueling section), accessed March 2011.
- EPA, 2010: U.S. Environmental Protection Agency, “2002-Based Modeling Platform,” <http://www.epa.gov/ttn/chief/emch/index.html#2002>, last updated November 2010.
- EPA, 2009: U.S. Environmental Protection Agency, “Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Proposed Rule,” http://www.epa.gov/otaq/renewablefuels/rfs2_1-5.pdf, May 26, 2009.
- EPA/Pechan, 2008: U.S. Environmental Protection Agency, Office of Transportation and Air Quality, and E.H. Pechan & Associates, Inc., “Documentation for the 2005 Mobile National Emissions Inventory, Version 2,” prepared for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, December 2008.
- ERG, 2011a: Eastern Research Group, “Documentation for Locomotive Component of the National Emissions Inventory Methodology,” prepared under contract to E.H. Pechan & Associates, Inc., for U.S. Environmental Protection Agency, January 6, 2011.
- ERG, 2011b: Eastern Research Group, “Documentation for Aircraft Component of the National Emissions Inventory Methodology,” prepared under contract to E.H. Pechan & Associates, Inc., for U.S. Environmental Protection Agency, January 27, 2011.
- ERG, 2010: Eastern Research Group, “Documentation for the Commercial Marine Vessel Component of the National Emissions Inventory Methodology,” prepared under contract to E.H. Pechan & Associates, Inc., for U.S. Environmental Protection Agency, March 30, 2010.

FHWA, 2009a: U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, “2007 and 2008 Monthly Traffic Volume Trends,” <http://www.fhwa.dot.gov/ohim/tvtw/tvtpage.cfm>, downloaded on February 19, 2009.

FHWA, 2009b: U.S. Department of Transportation, Federal Highway Administration, HPMS 2008 Summary Data (summary_dvmt_2008.xls), HPMS 2008 Sample Data (Sample2008.csv and sample2008.schema), and HPMS2008 Universe Data (Universe2008.csv and Universe2008.schema) electronic files, 2009.

FHWA, 2008: U.S. Department of Transportation, Federal Highway Administration, HPMS 2007 Summary Data (summary_dvmt_2007.xls), HPMS 2007 Sample Data (Sample2007.csv and sample2007.schema), and HPMS 2007 Universe Data (Universe2007.csv and Universe2007.schema), electronic files, December 1, 2008.

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APPENDIX A. TABLES UPDATED WITH EIS SUBMISSIONS

This Appendix presents tables summarizing the 2008 NCD updates provided by State/Local agencies. Table A-1 lists, for each jurisdiction, the specific NCD tables that were submitted. Table A-2 identifies the source of the VMT data incorporated into the 2008 NCD by jurisdiction. The “2008 VMT Allocation Data Source” column should be interpreted as follows:

- *State 2002* indicates that State-supplied 2002 NEI VMT data was used to allocate 2008 VMT data.
- *Local 2002* indicates that Local agency-supplied 2002 NEI VMT data were used to allocate 2008 VMT data.
- *State 2005* indicates that State-supplied 2005 NEI VMT data was used to allocate 2008 VMT data.
- *MOBILE6* indicates that the State or Local agency did not supply VMT updates in the 2002 or 2005 NEI so MOBILE6 default allocations were used to allocate 2008 VMT data.
- *n/a* indicates that agency-submitted VMT data were provided at the level of detail required by NMIM—(i.e., it was not necessary for EPA to perform VMT allocations).

Table A-3 lists the MOBILE6-specific external file types submitted by S/L agencies. Table A-4 displays the State agency-supplied external files used by NONROAD. The last column in this table identifies if the file was submitted for the 2008 NEI.

Table A-1. 2008 NMIM County Database Table Updates by Jurisdiction

Jurisdiction	Base Year VMT	County	County NR File	County VMT Month Allocation	County Year	County Year Month	County Year Month Hour	Diesel	Gasoline	Natural Gas	State
AL											
AK											
AZ											
AZ Maricopa County	SCC ¹										
AR	✓				✓						
CA	SCC ^{1*}										
CO											
CT											
DE											
DC	✓				✓						✓
FL											
GA	✓	✓			✓						
HI	✓	**				**			**		
ID	SCC ¹										
IL	SCC ¹										
IN											
IA											
KS	✓				✓						
KY											
KY Jefferson County	SCC ¹										
LA	✓	✓		✓	✓						
ME	✓	✓			✓	✓			✓		✓

Jurisdiction	Base Year VMT	County	County NR File	County VMT Month Allocation	County Year	County Year Month	County Year Month Hour	Diesel	Gasoline	Natural Gas	State
MD	✓	✓		✓	✓	✓	***	✓	✓		✓
MA		✓			✓						✓
MI	✓		✓		✓	✓			✓		
MN	✓		✓		✓						
MS											
MO	✓				✓						
MT											
NE											
NV	✓		✓		✓	✓		✓	✓		
NH	✓	✓			✓						
NJ											
NM											
NY											
NC	✓				✓	✓			✓		
ND											
OH	✓				✓	✓					
OK											
OR											
PA	✓			✓	✓	✓			✓		✓
RI											
SC	✓										
SD											
TN											
TN Davidson County	✓										
TX	SCC ¹										
UT											
VT	✓				✓						
VA	✓	✓			✓						
WA											
WV											
WI	✓		✓		✓	✓			✓		
WY											
PR											
VI											

¹ Jurisdiction supplied emissions data, EPA extracted SCC-level VMT data from this submittal.

*Although CA submitted data, the submitted detail (i.e., SCC and pollutants) is substantially different from that used by other States. Therefore, the VMT submitted in CA's emissions file was not used in NMIM.

** Submitted revisions were inadvertently excluded.

*** MD countyyearmonthhour changes not included due to differences in estimation methodology

Table A-2. Summary of 2008 NEI Vehicle Miles Traveled Data by Jurisdiction

Jurisdiction	2008 VMT Data Source	Agency Provided Level of Detail	2008 VMT Allocation Data Source
AL	EPA		State 2002
AK	EPA		MOBILE6
AZ Maricopa County	Local	SCC	Local 2002
AZ – Rest of State	EPA		MOBILE6
AR	State	NMIM	n/a
CA	EPA		State 2005
CO	EPA		State 2005
CT	EPA		MOBILE6
DE	EPA		State 2005
DC	State	NMIM	n/a
FL	EPA		MOBILE6
GA	State	NMIM	n/a
HI	State	NMIM	n/a
ID	State	SCC	State 2005
IL	State	SCC	MOBILE6^
IN	EPA		MOBILE6
IA	EPA		MOBILE6
KS	State	NMIM	n/a
KY Jefferson County	Local	SCC	State 2002
KY – Rest of State	EPA		MOBILE6
LA	State	NMIM	n/a
ME	State	NMIM	n/a
MD	State	NMIM	n/a
MA	EPA		State 2002
MI	State	NMIM	n/a
MN	State	NMIM	n/a
MS	EPA		State 2002
MO	State	NMIM	n/a
MT	EPA		MOBILE6
NE Lancaster County	EPA		State 2002
NE	EPA		MOBILE6
NV Clark County	EPA		State 2002
NV Washoe County	EPA		MOBILE6
NV – Rest of State	State	NMIM	n/a
NH	State	NMIM	n/a
NJ	EPA		State 2002
NM	EPA		MOBILE6
NY	EPA		State 2002

Jurisdiction	2008 VMT Data Source	Agency Provided Level of Detail	2008 VMT Allocation Data Source
NC	State	NMIM	n/a
ND	EPA		MOBILE6
OH	State	NMIM	n/a
OK	EPA		MOBILE6
OR	EPA		State 2002
PA	State	NMIM	n/a
RI	EPA		State 2002
SC	State	NMIM	n/a
SD	EPA		MOBILE6
TN Davidson County	Local	NMIM	n/a
TN – Rest of State	EPA		State 2005
TX	State	SCC	MOBILE6^
UT	EPA		State 2005
VT	State	NMIM	n/a
VA	State	NMIM	n/a
WA	EPA		State 2002
WV	EPA		State 2005
WI	State	NMIM	n/a
WY	EPA		MOBILE6
PR	EPA		MOBILE6
VI	EPA		MOBILE6

n/a- not applicable (data supplied at necessary NMIM-level of detail)

^ - Pre-2008 state supplied data were available (IL-2002; TX-2005), but could not be used as they did not cover all required categories.

Table A-3. External Onroad Files Updated for the 2008 NEI

Jurisdiction	ATP	IM	Reg Dist	VMT By Hour	Trip Length	Diesel Fract	Avg Speed Dist Base	NLEV File	T2 Exh Phase In File	T2 Evap Phase In File	T2 Cert File
AL											
AK											
AZ											
AR			✓								
CA											
CO											
CT											
DE											
DC	✓	✓	✓		✓	✓	✓				
FL											
GA	✓		✓								
HI											
ID											
IL											
IN											
IA											
KS			✓			✓					
KY											
KY Jefferson County											
LA	✓	✓	✓								
ME	✓	✓						✓	✓	✓	✓
MD	✓	✓	✓	✓		✓	✓				
MA		✓	✓					✓	✓	✓	✓
MI			✓								
MN			✓								
MS											
MO			✓								
MT											
NE											
NV			✓								
NH	✓	✓						✓			
NJ											
NM											
NY											
NC	✓	✓	✓	✓			✓				
ND											
OH	✓	✓	✓								
OK											
OR											
PA	✓	✓	✓	✓			✓	✓	✓	✓	✓
RI											
SC											
SD											
TN											
TN Davidson County											
TX											
UT											
VT											

Jurisdiction	ATP	IM	Reg Dist	VMT By Hour	Trip Length	Diesel Fract	Avg Speed Dist Base	NLEV File	T2 Exh Phase In File	T2 Evap Phase In File	T2 Cert File
VA		✓	✓				✓				
WA											
WV											
WI		✓	✓				✓				
WY											
PR											
VI											

Table A-4. NONROAD Model Parameters Provided by State Agencies

State	Description	File Type	Added in 2008
Colorado	Oil production equipment allocations.	oil	
Delaware	Airport equipment allocations.	air	
Delaware	Golf equipment allocations.	gc	
Delaware	Household allocations.	hou	
Delaware	Logging equipment allocations.	log	
Delaware	Source populations.	pop	
Delaware	Recreational vehicle park allocations.	rvp	
Illinois	Nonroad activity	act	
Illinois	Growth rates.	grw	
Illinois	Source populations.	pop	
Illinois	Seasonal allocations.	sea	
Illinois	Inboard watercraft allocations.	wib	
Illinois	Outboard watercraft allocations.	wob	
Indiana	Nonroad activity	act	
Indiana	Growth rates.	grw	
Indiana	Source populations.	pop	
Indiana	Seasonal allocations.	sea	
Indiana	Inboard watercraft allocations.	wib	
Indiana	Outboard watercraft allocations.	wob	
Iowa	Nonroad activity	act	
Iowa	Seasonal allocations.	sea	
Iowa	Inboard watercraft allocations.	wib	
Iowa	Outboard watercraft allocations.	wob	
Michigan	Nonroad activity	act	
Michigan	Growth rates.	grw	
Michigan	Source populations.	pop	
Michigan	Seasonal allocations.	sea	
Michigan	Inboard watercraft allocations.	wib	
Michigan	Outboard watercraft allocations.	wob	
Minnesota	Nonroad activity	act	
Minnesota	Growth rates.	grw	✓
Minnesota	Seasonal allocations.	sea	
Minnesota	Snowmobile populations.	snm	
Minnesota	Inboard watercraft allocations.	wib	
Minnesota	Outboard watercraft allocations.	wob	
Nevada	Census population	cen	
Nevada	Wholesale Establishments	com	
Nevada	Harvested acres	frm	
Nevada	Golf equipment allocations.	gc	✓

State	Description	File Type	Added in 2008
Nevada	Landscaping employment allocations	wib	✓
Nevada	Oil production equipment allocations.	oil	✓
Nevada	Recreational vehicle park allocations.	rvp	✓
Nevada	Commercial snowblower allocations	sea	✓
Nevada	Residential snowblower allocations	sea	✓
Nevada	Snowmobile populations.	snm	✓
North Carolina	Residential snowblower allocations	sea	
Ohio	Nonroad activity	act	
Ohio	Growth rates.	grw	
Ohio	Source populations.	pop	
Ohio	Seasonal allocations.	sea	
Ohio	Inboard watercraft allocations.	wib	
Ohio	Outboard watercraft allocations.	wob	
Rhode Island	Source populations.	pop	
Washington	Inboard watercraft allocations.	wib	
Washington	Outboard watercraft allocations.	wob	
Wisconsin	Nonroad activity	act	
Wisconsin	Growth rates.	grw	
Wisconsin	Source populations.	pop	
Wisconsin	Seasonal allocations.	sea	
Wisconsin	Inboard watercraft allocations.	wib	
Wisconsin	Outboard watercraft allocations.	wob	