TECHNICAL SUPPORT DOCUMENT

MIDWEST SUBREGIONAL MODELING:

EMISSIONS INVENTORY

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Section 1
Introduction

A new emissions inventory was prepared to support the latest round of subregional modeling. The purpose of the modeling is to provide an updated 1-hour attainment demonstration for the severe ozone nonattainment area in southeast Wisconsin, northeast Illinois, and northwest Indiana. This document provides a summary of the new inventory.

The inventory includes gridded, hourly estimates of speciated volatile organic compounds (VOC), oxides of nitrogen (NOx), and carbon monoxide (CO) for the modeling episodes for the entire modeling domain. The four modeling episodes are:

June 22 - 28, 1991
July 14 - 21, 1991
June 13 - 25, 1995
July 7 - 18, 1995

A map of the modeling domain (Grid M) is shown in Figure 1. Grid resolution consisted of both 4 and 12 km throughout the modeling domain. The emissions data were processed with the EMS-95 emissions model to generate the photochemical model-ready emissions input files (LADCO, 1999).

The new inventory (Base12) builds on other inventories (Base10 and Base11v2), which were developed for previous subregional modeling. Base10 was developed in December 1998 to support a modeling study to assess the effect of USEPA's NOx SIP call (LADCO, 1999a). The inventory was based primarily on the following data files provided by USEPA in mid-December 1998:

egu07.tar.gz	2007 point source EGU
negu95.tar.gz	1995 base non-EGU
egu96.tar.gz	1996 base EGU
bude.tar.gz	2007 budget EGU
area95.tar.gz	1995 base area
areagrow.tar.gz	growth and control for 2007 area
new07.tar.gz	2007 mobile VMT and MOBILE5a inputs
new95.tar.gz	1995 mobile VMT and MOBILE5a inputs
negucntl.tar.gz	non-EGU budget controls
negu07.tar.gz	non-EGU 2007 growth and controls

These files provide the basic information needed to derive emissions for a 1995 base year inventory, a 2007 Clean Air Act inventory, and a 2007 SIP call inventory. A few revisions to these data were provided by the Lake Michigan States, such as modified area source data for Illinois. Day-specific temperatures from the RAMS3a meteorological modeling were used in the calculation of motor vehicle and biogenic emissions. Biogenic emissions were based on USEPA's BEIS2 model.

Base11v2[1] was developed in September - October 1999 to support the initial modeling (Round 1) for the 1-hour attainment demonstration (LADCO, 1999b). The following updates were made to this inventory:

Point Sources	1996 state periodic emissions inventories and 2007 emissions inventories for IL, IN, WI 1996 state periodic emissions inventory for MO
Area Sources	1996 state periodic emissions inventories and 2007 emissions inventories for IL, IN, WI Area source temporal profiles[2]
Motor Vehicles	1996 and 2007 transportation network data (e.g., VMT, speed, and vehicle mix) for IL, IN, MI, MO, WI Motor vehicle temporal profiles

The new inventory (Base12) was developed in December 1999 to support the final modeling (Round 2) for the 1-hour attainment demonstration (LADCO, 1999c). The following updates were made to this inventory:

Point Sources	1996 base year data for IL, MI, WI 1996 base year data for IA, KY, MO, TN Growth and control information for IL, IN, MI, WI
Area Sources	1996 base year data for IL, IN, WI Revisions to the 1996 base year "other area source" emissions for KY[3] Growth data for IL, IN, WI Control information for IL, IN, WI Alternative nonroad control factors for all states, except IL

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1 The first version of Base11 was completed in September 1999. The second version (Base11v2) was prepared to correct a few problems with the first inventory (e.g., stack height errors in Illinois and Wisconsin, problems with the 'stackfix' program, no Illinois controls in SR3, and emission rate errors at several non-utilities in Illinois and Michigan).

2 Based on Gwen Judson's review of the existing area source temporal profiles, revisions were made for railroads, construction equipment, and farm equipment. Day-of-week VMT factors were supplied by each MPO/DOT. Hour-of-day VMT factors were developed based on traffic count data supplied by Wisconsin.

3 As noted by Kentucky in their comments to USEPA on the NOx SIP Call inventory, the small stationary combustion area source emissions are "grossly overestimated". To correct this problem, LADCO recalculated the emissions for this source category using a population-based emission factor consistent with other states. The revised area source emissions for Kentucky were reduced from 232 to 75 TPD.

	Alternative temporal profile for motorboats
Motor Vehicles	Corrections to the VMT data for IL, IN, MI, WI Corrections in the seasonal adjustment factors for IL and MI Vehicle mix profile for IL HDDV NOx adjustment Use of higher trip lengths in MOBILE5b (i.e., 6.1 v. 5 miles) Use of 1996 emission factors in MOBILE5b
Biogenics	Isoprene emissions in the Ozarks reduced by factor of 2

The basis for the elements in the new inventory (Base12) is summarized in Table 1. The 1996 base, 2007 base, and Round 2 strategy/sensitivity Base12 inventories are addressed in more detail in the following sections.

Section 2
1996 Base Emissions

The base year inventory is used to both support base year (performance evaluation) modeling and future year (control strategy) modeling. The base year modeling needs emissions representative of the modeling episode dates to produce concentration estimates which can be compared to the actual observed concentrations[4]. The strategy modeling needs a base inventory which can be grown to the future year of interest and controlled to reflect particular control strategies. For the purposes of this study, the assumed base year is 1996. The 1996 base year data are summarized in the attached tables and figures:

Table 2	(a) Weekday/Saturday/Sunday point source emissions (1996 base year) (b) Weekday/Saturday/Sunday area source emissions (1996 base year) (c) Weekday/Saturday/Sunday motor vehicle emissions (1996 base year)[5]
Figure 2	Pie chart of VOC and NOx emissions for Grid M and Lake Michigan severe nonattainment area
Figure 3	Spatial VOC emission plots (a) Point sources (b) Area sources (c) Mobile sources (d) Biogenic sources
Figure 4	Spatial NOx emission plots (a) Point sources (b) Area sources (c) Mobile sources (d) Biogenic sources

Point and Area Sources: Emissions rates for point and area sources were either provided by USEPA or the States, as indicated in Table 1.

Mobile Sources: Emissions rates for on-road mobile sources were calculated by EMS-95 based on the activity level (i.e., vehicle miles traveled [VMT]) and the MOBILE5b emission factor model. The source of the VMT data is summarized in Table 1. The

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[4] For the two 1991 episodes, the 1996 base emissions had to be "backcast" to reflect 1991 conditions. The backcast factors were developed by comparing the 1991 LMOP inventory and the 1996 base inventory. The factors were; elevated NOx x 1.3; low-level NOx x 0.7; and low-level VOC x 1.6. For the two 1995 episodes, the 1996 base emissions were used as is.

[5] Point and area source emissions were developed for a typical summer weekday, Saturday, and Sunday. Day-specific motor vehicle and biogenic emissions were developed based on the meteorological conditions for the specific modeling days.

inputs for the MOBILE5b model include vehicle speed and vehicle mix data. The speeds in Base12 (and Base11v2) are generally greater than those in the previous version of the inventory (Base10). According to the MOBILE5b emission factor-speed curves, greater speeds result in less ROG and more NOx emissions, especially above 55 mph. Thus, there are more NOx emissions in the new inventory due to the new, faster speeds. The vehicle mix distribution for the new inventory reflects a lower percentage of LDGV, and a higher percentage of LDGT1 and LDGT2. This change is consistent with the increase in new vehicle sales of SUV's and small trucks.

One other change in Base12 is to include the excess NOx emissions produced by heavy-duty diesel vehicles (HDDV) as the result of built-in "defeat" devices. These excess emissions were estimated by applying a processor supplied by USEPA which calculates adjustment factors to the HDDV portion of the VMT (USEPA, 1999). The calculation is a two-part process. First, adjustment factors are established by link for the heavy duty vehicles. The factors are matched to the individual links based on the FHWA area(urban/rural) and facility types by speed. Second, after each link is assigned a road/speed specific adjustment factor, then emissions are calculated normally within EMS-95. The calculation is simply multiplication of the link specific adjustment factor and the emissions factor from MOBILE5b for HDDV times the hourly HDDV VMT. This processing is done with a modified version of the 'master.sas' processor called 'master.hddv.sas'. The approximate increase on the Grid M NOx base year inventory is 250 TPD.

Biogenic Sources: Day-specific biogenic emissions were calculated using USEPA's BEIS2 model. Biogenic isoprene emissions in Base12 were cut in half in the Ozarks based on preliminary analysis of the OZIE field data. Comparisons of emissions estimates and measured concentrations, and comparisons of modeled and measured concentrations indicate that the BEIS2 isoprene emissions in the Ozarks are overestimated by about a factor of 2 (LADCO, 1999e).

Modeling Adjustments: Spatial, temporal, and chemical species processing by EMS-95 is necessary to provide the model-ready emissions files needed by the photochemical model.

County-level point source emissions are spatially distributed based on stack (or facility) coordinates, and county-level area source emissions based on surrogates, such as population or land use. Mobile and biogenic source emissions are calculated by EMS-95 for each grid cell and, thus, are already spatially distributed.

Daily average point source emissions are temporally allocated to individual hours using the reported operating schedule information, and daily average area source emissions by means of representative hourly profiles. Mobile and biogenic source emissions are calculated by EMS-95 for each hour and, thus, are already temporally allocated.

An important change in the assumed hourly profiles for Base12 was made for

recreational marine vessels (motorboats). The previous motorboat temporal profile assumed that weekend activity was five times greater than weekday activity. After further review, however, it was unclear whether the state emissions data for this source category was for a summer weekday or an average summer day. If the emissions are average summer day, then the “factor of 5" would incorrectly inflate the weekend emissions. In addition, although there is greater activity on weekends compared weekdays, there is some question about the validity of the “factor of 5" difference, which is based on limited studies. Consequently, a decision was made to use a “factor of 2", rather than a “factor of 5", as the weekend adjustment for this source category.

The speciation profiles in EMS-95 were obtained from the latest version of USEPA’s SPECIATE data base.

Inventory Evaluation: A top-down evaluation of the 1996 base inventory was performed using ambient ozone precursor data collected from Photochemical Assessment Monitoring Stations (PAMS) in the Lake Michigan region (LADCO, 2000a). The evaluation included comparisons of monitored and emissions VOC:NOx ratios, the relative amounts of individual VOC species, and the reactivity of the VOC compounds. Although the evaluation is not complete, the preliminary results are encouraging and suggest that the regional inventory is appropriate for use in the modeling.

Section 3
2007 Strategy Emissions

Two rounds of future year control strategy modeling were performed to support the updated 1-hour attainment demonstration:

Round 1

SR1	CAA controls
SR2	CAA controls + 0.25 utilities
SR3	CAA controls + 0.25 utilities + SIP Call non-utilities
SR4	CAA controls + 0.25 utilities + Tier II/Low S motor vehicles
SR5	CAA controls + 0.20 utilities
SR6	CAA controls + 0.15 utilities + SIP Call non-utilities
SR7	CAA controls + 0.25 utilities (IL,IN,WI) + SIP Call non-utilities (IL,IN,WI)

Round 2

SR1	CAA controls[6]
SR8	CAA controls + 0.25 utilities (IL,IN,WI) + 0.25 utilities (KY,MO,TN) + Tier II/Low S
SR9	CAA controls + 0.20 utilities (IL,IN,WI) + 0.25 utilities (KY,MO,TN) + Tier II/Low S
SR10	CAA controls + 0.20 utilities (IL,IN,WI) + 0.25 utilities (KY,MO,TN) + SIP Call non-utilities[7] (IL,IN,WI) + Tier II/Low S
SR11	CAA controls + 0.15 utilities (IL,IN,WI) + 0.25 utilities (KY,MO,TN) + SIP Call non-utilities (IL,IN,WI) + Tier II/Low S
SR12	CAA controls + 0.15 utilities + SIP Call non-utilities + Tier II/Low S (same as SIP Call)

In Round 2, Michigan utilities and non-utilities were modeled at their State rule [e.g., 0.25/65% utilities] in SR8 - SR11, and Indiana non-utilities were modeled at their State rule in SR10 - SR11.

The following sensitivity runs were also modeled as part of Round 2:

SR1a	CAA controls + Tier II/Low S
SR1b	CAA controls w/ boundary conditions based on 0.25 utilities
SR1c	CAA controls w/ boundary conditions based on SIP Call (utilities and non-utilities)
SR8a	SR8 w/ 0.25 utilities (IA)
SR12a	SR12 w/ -25% utility NOx reduction
SR12b	SR12 w/ -25% VOC reduction (Lake Michigan area only)

Following the completion of these runs, several changes to the emissions were

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[6] CAA controls include Title IV, RFP/ROP (15% plans, “9% by ‘99"), NLEV, and RFG-II. Assuming NOx substitution, SR8 - SR12 may include much of the remaining ROP requirement (24% by 2007).

[7] Non-utility SIP Call controls are: Non-EGU boilers and turbines (-60%), Stationary internal combustion engines (-90%), Cement manufacturing plants (-30%).

identified and five additional strategy runs (SR13 - SR17) were performed. SR13 and SR15 reflect a “0.25 utility” control scenario (similar to SR8), while SR14, SR16, and SR17 reflect a “0.15 utility” control scenario (similar to SR12). The additional runs incorporate the following changes relative to SR8 and SR12:

0.25 SCENARIO

SR8

Point Sources:	IL, IN, MI, WI, KY, MO, TN EGUs @ 0.25
	MI nonEGU @ state rule
Motor Vehicle:	Tier II/Low S

SR13 Changes

Point Sources:	TVA sources @ 0.15
	(Paradise 1-3; Allen 1-3; Cumberland 1-2; Kingston Stacks 1 and 2)
	New ROG controls in IL (ERMS rule)
	IN non-utility sources @ proposed State rule
	WI @ proposed State rule
	MO @ State rule
Motor Vehicle:	Increased VMT growth scenario for SE WI (high plus 7%)
	Proposed diesel sulfur rule (-0.1%)
Low-Level Emissions:	Reduce CO emissions by 12.5% (due to Low S and nonroad controls)
Boundary Conditions:	New point source file (W MO @ 0.35, OTC States @
(CAA12 file)	SIP Call, TVA sources in AL, TN @ 0.15, Texas sources reduced by 50%)
	Reduce low-level NOx emissions by 6.5% (due to Tier II/Low S and nonroad controls)

Note: except for these specific changes, the boundary conditions reflect CAA controls

SR15 Changes

Point Sources:	WI @ revised state rule
Motor Vehicle:	WI with NOx I/M cut-points
(base12v4)	Revised CATS network data
	Updated MOBILE5 inputs for IL, WI
	Corrected MOBILE5 inputs for OH

0.15 SCENARIO

SR12

Point Sources:	EGUs @ 0.15 (SIP Call)
	NonEGUs @ SIP Call
Motor Vehicle:	Tier II/Low S

SR14 Changes

Point Sources:	TVA sources @ 0.15
	(Paradise 1-3; Allen 1-3; Cumberland 1-2; Kingston Stacks 1 and 2)
	New ROG controls in IL (ERMS rule)
	WI @ proposed State rule
	MO @ State rule
	IC engines @ CAA
Motor Vehicle:	Increased VMT growth scenario for SE WI (high plus 7%)
	Proposed diesel sulfur rule (-0.1%)
Low-Level Emissions:	Reduce CO emissions by 12.5% (due to Low S and nonroad controls)

Boundary Conditions:	New point source file (W MO @ 0.35, OTC States @
(CAA12 file)	SIP Call, TVA sources in AL, TN @ 0.15, Texas sources reduced by 50%)
	Reduce low-level NOx emissions by 6.5% (due to Tier II/Low S and nonroad controls)

Note: except for these specific changes, the boundary conditions reflect CAA controls

SR16 Changes	
Point Sources:	WI @ revised state rule
Motor Vehicle:	WI with NOx I/M cut-points
(base12v4)	Revised CATS network data
	Updated MOBILE5 inputs for IL, WI
	Corrected MOBILE5 inputs for OH
SR17 Changes	
Point Sources:	WI @ revised state rule
	Eastern MO EGU and nonEGU @ SIP Call
Motor Vehicle:	WI with NOx I/M cut-points
(base12v4)	Revised CATS network data
	Updated MOBILE5 inputs for IL, WI
	Corrected MOBILE5 inputs for OH

This section will focus on the emissions for the Round 2 modeling. The 2007 year inventories are summarized in the attached tables and figure:

Table 3	Domain-wide total point, area, motor vehicle, and biogenic emissions
Table 4	(a) Weekday/Saturday/Sunday point source emissions (SR1) (b) Weekday/Saturday/Sunday area source emissions (SR1) (c) Weekday/Saturday/Sunday motor vehicle emissions (SR1) (d) Weekday/Saturday/Sunday motor vehicle emissions (SR1a)
Table 5	(a) Weekday/Saturday/Sunday point source emissions (SR8) (b) Weekday/Saturday/Sunday point source emissions (SR9) (c) Weekday/Saturday/Sunday point source emissions (SR10) (d) Weekday/Saturday/Sunday point source emissions (SR11) (e) Weekday/Saturday/Sunday point source emissions (SR12) (f) Weekday/Saturday/Sunday point source emissions (SR13) (g) Weekday/Saturday/Sunday point source emissions (SR14) (h) Weekday/Saturday/Sunday point source emissions (SR15) (i) Weekday/Saturday/Sunday point source emissions (SR16) (j) Weekday/Saturday/Sunday point source emissions (SR17) (k) Weekday/Saturday/Sunday motor vehicle emissions (SR13-4) (l) Weekday/Saturday/Sunday motor vehicle emissions (SR15-17)
Table 6	Control measures
Figure 5	Bar chart showing the VOC and NOx emissions by strategy

Point and Area Sources: Future year point and area source emissions for 2007 (i.e., the statutory attainment date for the severe nonattainment counties in the Lake Michigan area) were prepared by projecting the 1996 base emissions using growth and

control factors provided by USEPA or the States, as indicated in Table 1.

Motor Vehicles: Similar to the base year emissions, the future year emissions rates for on-road mobile sources were calculated in EMS-95 based on the activity level (i.e., vehicle miles traveled [VMT]) and the MOBILE5b emission factor model. The source of the VMT data is summarized in Table 1. MOBILE5b reflects most, but not all, Federal and State control measures. Separate adjustments were made to reflect Tier II/Low S controls and CO emission reduction credits.

Two approaches were used to model the Tier II/Low S controls. First, in the initial inventory (Base11v2), across-the-board control factors (4% for VOC and 18% for NOx) were applied to the motor vehicle emissions (see USEPA, 1999b). Second, in the new inventory (Base12), the new Tier II/Low S control factors were derived based on the "multiplicative adjustment factors" (MAFs) (USEPA, 1999c). These MAF's reflect the difference between MOBILE5 and MOBILE6, the effect of air conditioner usage, and the effect of the proposed Tier II/Low S program. For now, only the Tier II/Low S effects are included in the modeling analysis. (This will be done by calculating ratios of the 2007 baseline and 2007 control MAF's.) A later analysis may be performed which incorporates the other effects (i.e., MOBILE5 v. MOBILE6, and air conditioner usage).

Credit for CO emission reductions for nonroad and motor vehicle sources was included in SR13 - SR17. The CO credits were estimated to be 40% for Federal nonroad controls and 15% for Tier II/Low S controls (LADCO, 2000b). The CO credits were accounted for by applying an adjustment factor to the low-level emissions file. A net adjustment factor of -12.5% was calculated based on the control factors identified above and the relative amounts of nonroad (about 5%) and motor vehicle (about 70%) emissions in the regional inventory.

Credit for USEPA's proposed heavy-duty engine and vehicle standards and proposed highway diesel S rule was included in SR13 - SR17. Both VOC and NOx low-level (anthropogenic) emissions were reduced by 0.1% based on information provided in USEPA's May 2000 Regulatory Impact Analysis.

Section 4
Quality Assurance Activities

To enhance the reliability of the modeling inventory, several quality assurance activities were performed by the state inventory contacts, the emissions modelers, and the photochemical modelers. A summary of these activities is provided below.

Emissions Quality Assurance Plan: A standardized set of data and file checks are documented in LADCO's Draft Emissions QA Plan (LADCO, 1999f). The plan identifies the quality assurance procedures to be followed by the state inventory contacts. Each State attempted to comply with these procedures before providing their updated emissions data to LADCO for the current modeling study. The quality assurance procedures to be followed by the emissions modelers include the review and analysis of the many EMS-95 reports discussed below.

Emission Reports: EMS-95 performs a number of checks and generates several reports, as documented in the EMS-95 User's Guide (LADCO, 1999a). The QA checks, which are listed in Table 7, include for point sources, for example, duplicate or missing keys (stid, cyid, fcid, stkid, dvid, prid, polid), missing UTM coordinates and mismatched UTM zone, missing or invalid FIPS state and county codes, missing facility name missing or invalid SIC, and missing or out-of-range stack parameters. The reports include tabular summaries of the state- and county-level emissions for point, area, and mobile sources; and various spatial plots of emissions.

Review by Photochemical Modelers: The photochemical modelers review the emissions files by generating a spatial plot for each source sector using the SAIPLOT software[8]. The plots are examined for anomalies in the spatial patterns (e.g., missing or misplaced emissions). The domainwide emission totals listed on these plots are also compared to the EMS-95 emission reports for each source sector. These spatial and emissions total checks here found no problem with the EMS-95 emissions files.

Stack Parameters: Alpine Geophysics discovered an error in the exit velocities for many point sources in a previous version of the modeling inventory (Alpine, 1999). A review of the data files found that there was a units problem with the calculated volume flow rates, which was corrected in Base11v2 and Base12 for Grid M. This review, however, raised questions about the reliability of all stack parameters. To help prioritize the States' review of their stack parameters, a summary report was prepared which identified stacks with the highest volume flow rates, highest ratio of emissions to volume

[8] Two additional checks by the photochemical modelers which should be considered are: (1) generating time series emissions plots for each source sector and comparing to EMS-95 reports; and (2) generating a list (and map) of PiG sources and comparing to the EMS-95 PiG reports.

flow rates, lowest ratio of emissions to volume flow rates, and highest exit velocities. The new point source files supplied by the Lake Michigan States reflect many corrected stack parameters.

Further review of the stack file identified a number of stacks with very low emissions, and physical and effective stack heights which place them in the elevated point source file. To reduce the number of stacks in the elevated point source file (and to address concerns about the reasonableness of the assumed stack parameters), a stack was reassigned to the low-level point source file if the following conditions were met: ROG plus NOx emissions < 0.75 TPD; physical stack height < 33 m; and effective stack height > 100 m. This reassignment, which was implemented using a program known as 'stackfix', affected only about 2 - 4% of the point source ROG and NOx emissions, and reduced by about half the number of stacks in the elevated point source file. This fix was applied in both Base11v2 and Base12.

Plume-in-Grid (PiG) Sources: Of the approximately 1850 stacks in the elevated point source file, 134 were flagged as PiG sources for the photochemical grid modeling. A special program was written to ensure that the same stacks were treated as PiG for all modeling runs. These 134 stacks were selected based on magnitude of NOx emissions (i.e., the top 100 ranked stacks) and location (i.e., 34 of the next top ranked stacks in the Lake Michigan and St. Louis areas). A list of the PiG stacks is provided in Table 8.

Section 5
References

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USEPA, 1999c, “Development of On-Highway Inventory Adjustment Factors Used in the Tier 2 Final Rule Air Quality Analysis”, October 18, 1999

USEPA, 2000a, e-mail from Doug Solomon, USEPA, OAQPS, March 1, 2000

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Table 1. Overview of New (Base12) Inventory

Point Sources (Electrical Generating Units [EGUs])

IL, IN, WI, MO:	1996 state periodic emissions inventories, with base12 updates for IL, WI
	2007 base inventories, with base12 updates for IL, WI
	2007 SIP Call inventories, with base12 updates for IL, WI
MI:	2007 State rule inventory
Other States:	1996 inventory (based on CEM data) supplied by USEPA (SIP Call inventory)[9], with base12 updates for IA, KY, TN
	2007 base inventory (1996 data with IPM growth factors, and CAA control) supplied by USEPA (SIP Call inventory)
	2007 SIP Call inventory (1996 data with IPM growth factors, and CAA plus SIP Call controls) supplied by USEPA (SIP Call inventory)

Point Sources (nonEGUs)

IL, IN, MI, WI:	1996 state periodic emissions inventories, with base12 updates for IL, MI, WI
	2007 growth and control factors, with base12 updates for IL, MI, WI
	2007 SIP Call control factors, with base12 updates for IL, WI
IN, MI;	2007 State rule control factors
MO:	1996 state periodic emissions inventory, with base12 updates
Other States:	1995 non-EGU point source data supplied by USEPA (SIP Call inventory), with base12 updates for IA, KY, TN
	2007 growth factors supplied by USEPA (SIP Call inventory)
	2007 base and SIP Call control factors supplied by USEPA (SIP Call inventory)

Area Sources

IL, IN, MI, WI:	1996 state periodic emissions inventories, with base12 updates for IL, IN, WI
	2007 growth factors, with base12 updates for IL, IN, WI
	2007 control factors, with base12 updates for IL, IN, WI
Other States:	1995 area source data supplied by USEPA (SIP Call inventory), with revised stationary source combustion NOx emissions for KY
All States:	Alternative nonroad 2007 control factors for all states, except IL
	Updated temporal profiles, including alternative temporal profile for motorboats

Motor Vehicles

IL, IN, MI, MO, WI:	Updated 1996 and 2007 transportation network data (e.g., VMT, speed, and vehicle mix), with base12 updates and corrections
Other States:	1995 and 2007 VMT supplied by USEPA (SIP Call inventory)
All States:	MOBILE5b input files supplied by USEPA (as part of Tier II/Low S and HDDV adjustments), with IL, WI state-specific data
	Use of 1996 emission factors in MOBILE5b
	HDDV NOx adjustment supplied by USEPA
	Tier II/Low S control factors supplied by USEPA
	Use of higher trip lengths in MOBILE5b (i.e., 6.1 v. 5 miles)
	Updated seasonal and temporal profiles (day-of-week, hour-of-day)
	Day-specific temperatures from RAMS3a

Biogenic Sources

Biogenic emissions from BEIS2, with isoprene emissions in Ozarks (southeast MO) reduced by a factor of two and day-specific temperature from RAMS3a

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[9] These files were provided by USEPA in mid-December 1998 via their web site and reflect the version of the "final" SIP Call inventory as it existed at that time. Since then, USEPA requested and received a number of corrections to that inventory. When the Round 2 modeling began, USEPA had yet to release another version of the SIP Call inventory. Consequently, the December 1998 version of the SIP Call inventory is used for the current subregional modeling analysis.

Table 7. EMS-95 Standardized QA Checks

Point Sources

ptqafac.sas

Performs the following checks on the point source ASCII facility foundation file.

a. duplicate or missing keys (stid, cyid, fcid)
b. missing UTM coordinates and mismatched UTM zone
c. missing or invalid FIPS state and county codes
d. missing facility name

ptqadev.sas

Performs the following checks on the point source ASCII device foundation file.

a. duplicate, missing, or invalid keys (stid, cyid, fcid, stkid, dvid)
b. missing or invalid SIC
c. missing or invalid FIPS state and county codes

ptqastk.sas

Performs the following checks on the point source ASCII stack foundation file.

a. duplicate, missing, or invalid keys (stid, cyid, fcid, stkid)
b. missing UTM coordinates
c. missing or out-of-rang stack parameters

ptqaproc.sas

Performs the following checks on the point source ASCII process foundation file

a. duplicate, missing, or invalid keys (stid, cyid, fcid, stkid, dvid, prid)
b. missing or invalid FIPS state and county codes
c. missing or invalid SCC

ptqaemis.sas

Performs the following checks on the point source ASCII emission foundation file.

a. duplicate, missing, or invalid keys (stid, cyid, fcid, stkid, dvid, prid, polid)
b. invalid emissions estimate temporal basis
c. missing or invalid actual emissions estimates and/or control efficiencies
d. missing or invalid FIPS state and county codes

qarept.sas

Generates QA/QC reports.

Area Sources

arqatprl.sas

Performs the following checks on the area source ASCII temporal foundation file.

a. duplicate or missing keys (stid, cyid, fcid)
b. missing or invalid FIPS state and county codes

arqaemis.sas

Performs the following checks on the area source ASCII emissions foundation file.

a. duplicate, missing, or invalid keys (stid, cyid, asct, polid)
b. invalid emissions estimate temporal basis
c. missing or invalid actual emissions estimates and/or control efficiencies
d. missing or invalid FIPS state and county codes

qarept.sas

Generates QA/QC reports.

Mobile Sources

mvqaonim.sas

Performs the following checks on the motor vehicle on-network i/m program factors ASCII file

a. duplicate and/or missing keys (stid, cyid, linkid)
b. missing vmt (imvmt)
c. invalid state and/or county id code
d. state id, county id and link id in ONNETIM file with no match in ONNET file

mvqaovmt.sas

Performs the following checks on the motor vehicle on-network vmt ASCII file

a. duplicate and/or missing keys (stid, cyid, linkid)
b. missing and/or invalid vmt values (must be greater than 0)
c. invalid FIPS state code
d. invalid state and/or county id code
e. state id, county id, and link id in ONNETVMT file with no match in ONNET file
f. missing link id (linkid) or invalid vmt (H for hourly or D for daily)

mvqavmix.sas

Performs the following checks on the motor vehicle network vehicle mix ASCII file

a. duplicate and/or missing keys (stid, cyid, areatype, factype, linkid, hour)
b. stateid, county id, link id in NETVMIX file with no match in ONNET file
c. missing and/or invalid vehicle mix values (must be greater than 1)
d. missing areatype and facetype if linkid is supplied

mvqafvmt.sas

Performs the following checks on the motor vehicle county vmt ASCII foundation file

a. duplicate and/or missing keys (stid, cyid, areatype, facetype)

mvqavmtp.sas

Performs the following checks on the motor vehicle off-network vmt for public land 1/4 sections ASCII foundation file

a. duplicate and/or missing keys (stid, cyid, polyid, areatype, factype)
b. missing polygon id
c. missing and/or invalid vehicle vmt values (must not be equal to 0)
d. out-of-range average speed (2.5 to 65 mph)
e. invalid vehicle mix values (must be equal to 1)

mvqaadj.sas

Performs the following checks on the motor vehicle seasonal and daily vmt adjustment factors ASCII foundation file

a. duplicate and/or missing keys (stid, cyid, polyid, areatype, factype)
b. missing vmt values for 7 days of the week and all 12 months of the year
c. missing daily fractional value when at least one day's value is present
d. missing monthly values when values for at least one month in the year is present

mvqacomm.sas

Performs the following checks on the motor vehicle network vehicle mix, county vmt, off-network vmt for public land 1/4 sections, and seasonal and daily vmt adjustment factors ASCII foundation files

a. invalid FIPS state code, state id, or county id
b. area type and facility type with no match in AREAFAC file
c. facility type with no match in FACCLAS file
d. facility type is supplied if area type is given

Table 6. Control Measures

NOx RUN	UTILITY	NONUTILITY	NONROAD/OTHER AREA	MOTOR VEHICLE
96bas	* Title IV controls (Phase 1)	* RACT at major sources in non-waiver areas	* Fed RFG - Phase I[1]	* Fed RFG - Phase 1[1] * Enhanced I/M[1] * Basic I/M[1]
SR1	* Title IV controls (Phases 1 and 2 for all boiler types) * 250 ton PSD,NSPS * RACT and NSR in non-waiver areas	* RACT at major sources in non-waiver areas * 250 ton PSD, NSPS * NSR in non-waiver areas	* Fed Phase II small engine standards * Fed Marine engine standards * Fed HDV (≥50 hp) standards-Phase1 * Fed RFG - Phase II[1] * Fed locomotive standards (in. Rebuilds) * HC engine 4 gm standard	* Tier I LDV and HDV standards * Fed RFG - Phase II[1] * Enhanced I/M[1] * Basic I/M[1] * Clean fuel fleets[1] * National LEV * HDV 3 gm standard
SR8	* SR1 plus 0.25 lb/MMBTU (IL, IN, WI, KY, MO, TN), and State rule (MI)	* SR1 plus State rule (MI)	Same as SR1	* SR1 plus Tier II/Low S
SR9	* SR1 plus 0.20 lb/MMBTU (IL, IN, WI), 0.25 lb/MMBTU (KY, MO, TN), and State rule (MI)	* SR1 plus State rule (MI)	Same as SR1	* SR1 plus Tier II/Low S
SR10	* SR1 plus 0.20 lb/MMBTU (IL, IN, WI), 0.25 lb/MMBTU (KY, MO, TN), and State rule (MI)	* SR1 plus SR12 (IL, WI), and State rule (IN, MI)	Same as SR1	* SR1 plus Tier II/Low S
SR11	* SR1 plus 0.15 lb/MMBTU (IL, IN, WI), 0.25 lb/MMBTU (KY, MO, TN), and State rule (MI)	* SR1 plus SR12 (IL,WI), and State rule (IN, MI)	Same as SR1	* SR1 plus Tier II/Low S
SR12	* 0.15 lb/MMBTU in 22 affected States	* 60% large boilers,turbines 90% large I.C. engines 30% large cement plants	Same as SR1	* SR1 plus Tier II/Low S

[1] In mandatory areas

SR13	* SR1 plus 0.25 lb/MMBTU (IL, IN, KY, TN), and State rule (MI, MO, WI)	* SR1 plus State rule (MI, IN)	Same as SR1	* SR1 plus Tier II/Low S
SR14	* 0.15 lb/MMBTU in 20 affected States * State rule (WI, MO)	* 60% large boilers,turbines 30% large cement plants	Same as SR1	* SR1 plus Tier II/Low S
SR15	* SR1 plus 0.25 lb/MMBTU (IL, IN, KY, TN), and State rule (MI, MO, WI)	* SR1 plus State rule (MI, IN)	Same as SR1	* SR1 plus Tier II/Low S
SR16	* 0.15 lb/MMBTU in 20 affected States * State rule (WI, MO)	* 60% large boilers,turbines 30% large cement plants	Same as SR1	* SR1 plus Tier II/Low S
SR17	* 0.15 lb/MMBTU in 21 affected States * State rule (WI)	* 60% large boilers,turbines 30% large cement plants	Same as SR1	* SR1 plus Tier II/Low S
VOC				
96bas	* CTG and Non-CTG RACT at major sources in NA areas * NSR LAER and Offsets in NA areas		* Fed RFG - Phase I[1]	* Fed RFG - Phase 1[1] * Enhanced I/M[1] * Basic I/M[1]
SR1	Same as 96bas		* Fed Phase II small engine standards * Fed Marine engine standards * Fed HDV (≥50 hp) standards-Phase1 * Fed RFG - Phase II[1] * C/C solvent and arch. coating controls * Stage I, II in NA areas * Autobody, degreasing, and dry cleaning controls in NA areas	* Tier I LDV and HDV standards * Fed RFG - Phase II[1] * 9.0 RVP fuel elsewhere in domain * Enhanced I/M[1] * Basic I/M[1] * Clean fuel fleets[1]
SR8 - SR17	Same as SR1		Same as SR1	* SR1 plus Tier II/Low S

[1] In mandatory areas