1996 Inventory of Toxic Air Emissions

Part II: Mobile Sources

February 2000

Submitted by:
Great Lakes Commission
400 Fourth Street
Ann Arbor, MI 48103-4816

Submitted to:
U.S. Environmental Protection Agency
Region 5
77 West Jackson Blvd.
Chicago, IL 60604

On behalf of:
Illinois Environmental Protection Agency, Bureau of Air
Indiana Department or Environmental Management, Office of Air Management
Michigan Department of Environmental Quality, Air Quality Division
Minnesota Pollution Control Agency, Environmental Outcomes Division
New York Department of Environmental Conservation, Division of Air Resources
Ohio Environmental Protection Agency, Division of Air Pollution Control
Ontario Ministry of Environment, Environmental Monitoring and Reporting Branch
Pennsylvania Department of Environmental Protection, Air Quality Control
Wisconsin Department of Natural Resources, Bureau of Air Management

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PART5	U.S. EPA's Highway Vehicle Particulate Emission Factor Model
PDEP	Pennsylvania Department of Environmental Protection
PM	Particulate Matter
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
RAPIDS	Regional Air Pollutant Inventory Development System
RFG	Reformulated Gasoline
SAMS	SIP Air Pollutant Inventory Management System
SCC	Source Classification Code
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SSD	Source Summary Database
STEPS	State Environmental Programs Systems
TANKS	Storage Tank Emissions Software
TOG	Total Organic Gases
TRI	Toxic Release Inventory
U.S. EPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
VOC	Volatile Organic Compound
WDNR	Wisconsin Department of Natural Resources

Preface

The Great Lakes Regional Air Toxic Emissions Inventory Project conducted a regional emissions inventory of toxic air contaminants which are significant contributors to the environmental degradation of the Great Lakes and its urban areas.

The Inventory Project is an important step in meeting the goals of the 1986 Great Lakes Toxic Substances Control Agreement (signed by the Great Lakes governors and Premier of Ontario), and sections 112(c)(6), 112(k) and 112(m) of the 1990 U.S. Clean Air Act Amendments.

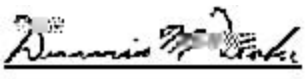
This project is a partnership between the eight Great Lakes states, the province of Ontario and the U.S. Environmental Protection Agency (U.S. EPA). The objective of this ongoing initiative is to present researchers and policy makers with detailed, basin wide data on the source and emission levels of toxic contaminants. This is the second compilation of a region wide inventory of toxic air pollutants. The initial inventory, published in October 1998, used 1993 data to focus on 49 pollutants of concern for point and area sources. This second regional inventory for 1996 was expanded to 82 pollutants to accommodate for the addition of mobile sources. Part I of the 1996 regional inventory (Point and Area Sources) was published in December 1999. Emissions from mobile sources are included in this Part II of the report.

The air toxic emission estimates contained in this report represent the best single compilation of such estimates, however, this inventory project has also identified the limitations which still exist in making such estimates. Results should therefore be viewed as an i 0 -14.25 cc coph TD3o TD

Great Lakes Regional Air Directors

Bernie Killian
Deputy Director
Bureau of Air
Illinois EPA

Janet McCabe
Assistant Commissioner
Office of Air Management
Indiana DEM



Dennis M. Drake
Chief

Acknowledgments

Executive Summary

Introduction and Inventory Objective

This report (Part II: Mobile Sources), a product of the Great Lakes Regional Air Toxic Emissions Inventory Project, presents a multijurisdictional inventory of mobile sources emissions of 82 toxic air contaminants that have the potential to impact environmental quality in the Great Lakes basin. Part I of this report, Point and Area Sources, was published in December 1999.

This initiative was undertaken through an intergovernmental partnership involving the eight Great Lakes states, the province of Ontario, and the U.S. Environmental Protection Agency (U.S. EPA). The objective of this ongoing initiative is to present researchers and policy makers with detailed, basin wide data on the source and emission levels of 82 toxic contaminants.

The development and release of the inventory is an important step in meeting the goals of the 1986 Great Lakes Toxic Substances Control Agreement (signed by the Great Lakes governors and Premier of Ontario), and sections 112(c)(6), 112(k) and 112(m) of the 1990 U.S. Clean Air Act Amendments (see http://www.cglg.org/pub/toxics/index.html and http://earth1.epa.gov/oar/caa.html for further details).

This inventory report presents a compilation of the best available data for calendar year 1996 emissions from mobile sources. Point and area source emission summaries in relation to mobile source emissions are also included. Information will be updated annually and the level of detail will increase year to year. This project also released version 2.0 of the *Regional Air Pollutant Inventory Development System (RAPIDS).* RAPIDS includes the capability of estimating emissions from mobile sources. The Great Lakes jurisdictions believe this work will provide a strong foundation upon which to build national and binational strategies to reduce toxic air emissions affecting the Great Lakes.

Part II of the inventory effort focused on the identification of mobile source categories that contribute to the total emissions of toxic contaminants listed in Table 1-1. Examples of mobile sources include: cars, trucks, trains, recreation vehicles, airplanes, marine vessels, farm equipment, construction equipment and other non-road engines such as lawnmowers and snowblowers.

Emission estimates for the 82 toxic compounds are presented in the first half of this report, with state reports and methodologies detailed in the appendices.

The inventory project is strengthening decision making capabilities in the basin by promoting interjurisdictional consistency in data collection and analysis, establishing standard procedures and protocols, developing and testing an automated emission estimation and inventory system, and demonstrating the value of client/server technology via the Internet to transmit and exchange environmental data among the Great Lakes jurisdictions and inform the larger Great Lakes community.

Inventory Scope and Findings

The 1996 emissions inventory effort began in September 1998 with primary funding provided by the U.S. EPA. Over the four previous years, the Great Lakes states, with support from the U.S. EPA and the Great Lakes Protection Fund developed and tested (through a Southwest Lake Michigan Inventory), the regional infrastructure and tools for emissions inventory compilation including the *Regional Air Pollutant Inventory Development System* (RAPIDS) versions 1.0 and 2.0 and the *Air Toxic Emissions Inventory Protocol for the Great Lakes States.*

- Assigns responsibilities and procedures to the states, Great Lakes Commission, U.S. EPA Great Lakes National Program Office (GLNPO);
- Outlines procedures to identify and locate emission sources of target compounds;
- Guides selection of specific emission estimation techniques;
- Instructs states on compiling and updating the regional repository at GLNPO;
- Outlines quality assurance/quality control procedures for emission data and estimates; and
- Identifies and explains the full suite of automated tools available for developing the regional inventory.

Because the inventory was a multi-state, regional effort, a high level of coordination and communication was necessary to ensure consistency among the states and province of Ontario in terms of data management, methodology, calculation methods and other issues. During the course of inventory development, the Great Lakes Regional Air Toxic Emissions Inventory Technical Steering Committee communicated via daily e-mail exchanges, weekly or biweekly conference calls, and bimonthly in-person meetings. In addition, the Steering Committee

Next steps

This inventory will serve as a template for future mobile source inventories for both this project and on an individual state and provincial basis, both within and beyond the Great Lakes region.

Through the continued efforts of the Steering Committee, the inventory will become more comprehensive over time and become an increasingly valuable tool for decision making within the Great Lakes basin. The Steering Committee will continue to meet on a regular basis to discuss inventory enhancements, both through defining data collection and refining and testing the RAPIDS software to accommodate continued expansion of this project.

The Steering Committee has developed RAPIDS to include a mobile source estimation module which is used by Great Lakes jurisdictions to estimate emissions from cars, trucks, trains, recreation vehicles, airplanes, marine vessels, farm equipment, construction equipment and other non-road engines. This expansion of RAPIDS provides a complete profile for air toxic emissions and expands the list of toxic compounds of concern to 82. The complete 1996 point, area and mobile source emissions inventory is available on the Great Lakes Information Network (GLIN) at http://great-lakes.net/envt/air/airtox.html.

Collection of 1997 and 1998 data for point and area sources is already underway. For the 1999 Inventory, the Steering Committee is also planning to expand its list from 82 pollutants to match the 188 hazardous air pollutants designated by the 1990 Clean Air Act Amendments.

1. Introduction

The Great Lakes Regional Air Toxic Emissions Inventory represents a unique milestone in the continuing effort to quantify and manage the toxic air emissions that impact the waters of the Great Lakes Basin. The air management programs in all eight Great Lakes states, Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin, and the province of Ontario, cooperated in compiling an emissions inventory of toxic air contaminants from mobile sources. Point and area source emissions were compiled and presented in Part I of the Great Lakes Commission's 1996 Inventory of Toxic Air Emissions, published December 1999.

The emission inventory effort was developed in support of the Great Lakes Toxic Substances Control Agreement signed in 1986 by the governors of eight Great Lakes states, and in 1988 by the premier of Ontario. This agreement contains a provision ensuring cooperation toward "quantifying the loadings of toxic substances originating from all sources, with the purpose of developing the most environmentally and economically sound control programs". Sharing emissions information of comparable and compatible quality across jurisdictions will ensure sound regulatory and policy decisions in the region.

Since 1989, the Great Lakes states and Ontario have been working together, through the Great Lakes Commission (GLC), to develop a regional database of toxic air emissions. In 1994, the Southwest Lake Michigan Air Toxics Pilot Inventory project was developed. This pilot inventory, led by the states of Michigan, Illinois, Indiana and Wisconsin, served to test the infrastructure for regional emissions inventory compilation and to develop the Regional Air Pollutant Inventory Development System, RAPIDS. The pilot inventory focused on emissions of 49 compounds from small point and area sources. In late 1995, the eight Great Lakes states and province of Ontario began compiling the first full inventory of toxic air emissions from point and area sources for the year 1993. That regional inventory was completed in 1998 while the states and province began work on the base year 1996 inventory. Compilation of the 1997 and 1998 inventories are currently underway with plans to develop a 1999 inventory the following year. The GLC will continue working with state and provincial agencies, organizations and industrial sectors in developing and implementing the latest emission estimation procedures.

In 1996, work began on the mobile source module for RAPIDS. RAPIDS 2.0 was designed with the ability to estimate emissions from on-road vehicles and non-road engines. This major addition, along with other enhancements, has made RAPIDS one of the most comprehensive multimedia inventory systems available. With the addition of mobile sources to the inventory, the database has been expanded to include 82 toxic air pollutants. The states and province began estimating mobile source emissions using RAPIDS 2.0 in late 1998.

Table 1-1: Great Lakes Commission's list of 82 targeted toxic air pollutants (continued).

16 PAHs (POM)			
Pollutant Name	**Cas No.**	**Pollutant Name**	**Cas No.**
Acenaphthene	83-32-9	Chrysene	218-01-9
Acenaphthylene	208-96-8	Dibenz(a,h)anthracene	53-70-3
Anthracene)	120-12-7	Fluoranthene	206-44-0
Benz(a)anthracene	56-55-3	Fluorene	86-73-7
Benzo(a)pyrene	50-32-8	Indeno(1,2,3-cd)pyrene	193-39-5
Benzo(b)fluoranthene	205-99-2	Naphthalene	91-20-3
Benzo(ghi)perylene	191-24-2	Phenanthrene	85-01-8
Benzo(k)fluoranthene	207-08-9	Pyrene	129-00-0
Metal Compounds			
Pollutant Name	**Cas No.**	**Pollutant Name**	**Cas No.**
Antimony	7440-36-0	Copper	7440-50-8
Arsenic	7440-38-2	Lead	7439-92-1
Beryllium	7440-41-7	Alkylated lead	
Cadmium	7440-43-9	Maganese	7439-96-5
Chromium	7440-47-3	Mercury	7439-97-6
Chromium (6)	18540-29-9	Nickel	7440-02-0
Cobalt	7440-48-4		

The 1996 reports are available as a printed document or online via the Great Lakes Information Network (GLIN, http://www.great-lakes.net). Additional information, including background documents, GIS maps depicting air emissions across the basin, the emissions protocol document and list of products for the project are located on the emission inventory project's web site (http://www.glc.org/air/air3.html).

The air emissions inventory project is funded primarily by the U.S. EPA under the auspices of the urban area sources program, Section 112(k), and the Great Waters program, Section 112(m).

The eight states and Ontario will continue to work collaboratively to improve and refine the toxic emissions inventory and strengthen its ability to support sound regulatory decisions at all levels of government.

2. Methodology

Emissions from mobile sources were calculated as part of the Great Lakes Regional Air Toxic Emissions Inventory Project. The inventory process focused on evaluating, and estimating emissions from on-road and non-road mobile sources that release one or more of the 82 toxic air pollutants of concern. Figure 2-1 presents the mobile source categories inventoried for this project. For additional discussion on the project's methodology, see The 1996 Great Lakes Regional Air Toxic Emissions Inventory report (Part I, Point and Area Sources) and the Air Toxic Emissions Inventory Protocol for the Great Lakes States.

Figure 2-1. Mobile sources included in the toxic air emissions inventory.

It should be noted that given variances in data availability and staffing resources from one jurisdiction to the next, coverage of above source categories might vary among jurisdictions.

Rather than comparing emissions state by state (or province), the emphasis of this project was to

Emission Estimation and Inventory Software: RAPIDS

Development of the Regional Air Pollutant Inventory Development System (RAPIDS) has been key to developing a comprehensive, accurate and consistent air toxic emissions inventory across eight states and one province.

During the course of this inventory, the regional steering committee worked closely with the project software development contractor, Windsor Technologies, Inc., to enhance and test RAPIDS. The RAPIDS enhancements during this phase of the project consisted of: the implementation of on-road mobile source emissions estimates capabilities using MOBILE5 and PART5 outputs, the non-road emissions estimation using NEVES data, aircraft emissions estimates using FAEED, mobile source growth algorithms to project emissions, and the incorporation of FIRE 6.0 emission factors. Additional emission factors and speciation profiles for mobile sources were obtained from the documentation for the 1996 Base Year National Toxic Inventory for Onroad Sources, the Documentation for 1996 Base Year National Toxic Inventory for Nonroad Sources, and U.S. EPA's Non-Road model. For pollutants not included in section 112(b) of the 1990 Clean Air Act Amendments, regional toxic speciation profiles for on-road gasoline and diesel exhaust and evaporative hydrocarbon were derived. These factors were developed using U.S. Department of Transportation data, oxygenated and reformulated fuels data from the National Renewable Energy Laboratory (NREL), and SPECIATE v.1.5 gasoline speciation profiles 1313 and 1305.

The mobile source module in RAPIDS includes import functions ("intelligent imports") that facilitated the input of user supplied data for emission estimation of on-road and non-road sources. There are three import methods for on-road sources, four for non-road and three for aircraft. Each of these "intelligent imports" functions checks the validity of the input data files through the use of valid values tables. Invalid entries are written to the exception log, and not incorporated into any RAPIDS tables. The user must review the exception log, and make the necessary corrections to the data. One or more of these data input methods was used by each of the states/province in estimating emissions from mobile sources.

ON-ROAD SOURCES

Method I - user supplies the following data files:

1. Speeds -- the vehicle speeds by vehicle type (e.g. light duty gasoline vehicles [consistent with MOBILE5a (OMS, 1998b) and PART5 (OMS, 1998c) vehicle classifications]), area typeej5g5ypeefrduty b.e

6. PART emissions factors -- PART derived emissions factors by vehicle type and pollutant (e.g. PM_{10}, exhausted sulfate [consistent with PART pollutants]).

Based on the contents of the user-supplied data files, RAPIDS will estimate on-road mobile source air toxic emissions.

Method II - the user supplies primary, on-road mobile source emissions estimates (e.g. TOG, PM_{10}); RAPIDS uses the state-computed on-road primary emissions estimates to compute air toxic emissions estimates from on-road mobile sources.

Method III - the user supplies estimates of on-road mobile source air toxic emissions estimates. RAPIDS stores these toxic emissions estimates after quality assurance checks have been successfully performed.

NON-ROAD SOURCES

Method I - user supplies the following data file:
Activity -- the SCC-specific activity data by season; and/or seasonal adjustment factors -- the seasonal adjustment factors (SAF) by SCC.

Based on the contents of the user-supplied data files, RAPIDS estimates non-road mobile source air toxic emissions. Of note, the use of the user-supplied activity data file is flexible enough to accommodate both surrogate activity data (e.g. population for actual number of non-road equipment) and actual activity data (e.g. equipment counts).

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AIRCRAFT

Method I - the user supplies the following data:

1. Landing/takeoff (LTO) counts -- the counts of landing/takeoff cycles by aircraft or aircraft/engine type on a county or airport level;
2. Time-in-Mode (TIM) data -- optional time-in-mode data for a specific county or airport location and aircraft types. This information will be used preferentially over the default values provided by the Federal Aviation Administration Aircraft Engine Emissions Database (FAEED; OMS, 1998a);

The following files, which were obtained from the FAEED system, are resident in the RAPIDS database:

1. Default aircraft/engine combinations -- LTO counts are sometimes collected by aircraft type rather than by aircraft and engine combination. This table contains the default engine type to use for each aircraft type;
2. Engine description -- Descriptive information about each engine type and aircraft combination, including the number of engines on each aircraft type, the category of the aircraft (e.g. jumbo jet, military transport) and the SCC, which is based on the aircraft category, applicable to the emissions;
3. Emission factors -- Emission factors for NO_X, TOG, CO, and SO_X, based on the engine type and operating mode (i.e. idle, takeoff, approach, climb out); and
4. Default TIM values -- Average time in mode values for each aircraft category.

Utilities are available to allow the user to upload new versions of the FAEED, or to add new aircraft and engine types. Based on the contents of these data files, RAPIDS estimates air toxic emissions from aircraft.

Method II - user supplies primary (TOG, NO_X, CO, PgmDuge4 x

3. Results

Overall Emissions from Mobile Sources

The 1996 emissions were estimated for 82 target compounds, however, data were only available to obtain emissions from mobile sources for 37 air toxins, including 13 polycyclic aromatic hydrocarbons (PAHs), 14 non-metal compounds and 10 metal compounds. The highest emissions were estimated for toluene at 280.66 million pounds, while the lowest emissions for Anthracene at 124.46 pounds. Among the 37 pollutants, on-road mobile sources contribute more that 50% emissions for two PAHs and almost all non-metal compounds (excluding PAHs) and metal compounds, except phenol and nickel. Non-road vehicles and equipment are the primary sources with more than 50% contributions for nickel and nine out of 13 PAHs. Aircraft dominates phenol emissions and account for about 23% of emissions for phenanthrene and acrolein while its contribution to emissions of other pollutants are insignificant. There are no emissions estimated from aircraft for metal compounds. Locomotives contribute very little to overall emissions. Also, information was not adequate to obtain PAH emissions for locomotives. Table 3-1 shows total mobile source emissions and percentage of contributions from each of the four categories.

Emissions from On-road Mobile Sources

The results shown in Table 3-1 suggest that on-road mobile sources are the most significant contributors to overall mobile source emissions. A close look was taken at the eight subcategories of highway vehicles. Two subcategories for Light Duty Gasoline Powered Trucks, LDGT1 and LDGT2, were combined as LDGT. Table 3-2 presents the emission distributions from the seven subcategories.

The LDGV are the dominant subcategory for on-road mobile source emissions. They contribute more than 86.6% of emissions for thirteen PAHs, more than 50% of emissions for 10 non-metal compounds (excluding PAHs) and eight metal compounds. The LDGT are the second significant contributor to the on-road mobile source emissions with contributions from 10.7% to 36.8% for two PAHs, 12 non-metal compounds, and ten metal compounds. The HDDV are listed as the third significant contributor, contributing about 9.2 to 32.7% of emissions to three non-metal compounds, and eight metal compounds. The HDDV also are responsible for 58.4, 45.2, and 32.7% of lead, mercury, and formaldehyde emissions, respectively. The contributions from other subcategories are insignificant. PAH missions were estimated at negligible levels for the LDDV and LDDT.

Emissions from All Sources

The point and area source emissions were analyzed in Part I of this report, released in December 1999. This section discusses the big picture of emissions in the Great Lakes region, including emissions from point, area, and mobile sources.

The 1996 emissions were obtained for 77 air toxins out of 82 target compounds: 16 PAHs, 49 non-metal compounds and 12 metal compounds. Table 3-3 shows pollutant names; total estimated emissions; and percentage of contributions from point, area, and mobile sources. Among the 77 pollutants, 76 pollutants are emitted from point sources, 62 pollutants from area sources and 37 from mobile source. Area sources contribute more than almost two thirds of total emissions for 15 PAHs, 7 non-metal compounds, and one metal compound. Point sources are responsible for more than two thirds of total emissions for one PAH, 27 non-metal compounds and ten metal compounds, while mobile sources account for almost more than two thirds emissions for seven non-metal compounds: acetaldehyde, acrolein, 1,3-butadiene, ethylbenzene, m-xylenes, o-xylenes, and p-xylenes. Mobile sources are also the primary emission sources for benzene, formaldehyde, toluene, and xylenes (isomers and mixture), with contributions from 51.4 to 63.2%.

The highest emissions were estimated for toluene at 545.82 million pounds, while the lowest emissions were recorded for 2,4,5-trichlorophenol at about 0.02 pounds. Detailed emission distributions by standard industrial classification (SIC .4644 Tw (The -acompoun7p9 8t sourceslFxptd4n;talI sou un7egoriurces.

Table 3-1: 1996 mobile source emissions in the Great Lakes region.

Table 3-2: 1996 On-road mobile source emissions in the Great Lakes region by subcategory.

Pollutant Name	Cas No.	On-road Total (lb)	LDGV (%)	LDGT (%)	HDGV (%)

Table 3-3: 1996 air toxics emissions from the Great Lakes region.

Pollutant Name	Cas No.	Total (lb)	Point (%)	Area (%)	Mobile (%)
PAHs					

Table 3-3: 1996 air toxics emissions from the Great Lakes region (continued).

Pollutant Name	Cas No.	Total (lb)	Point

Table 3 [redacted] mmarized by SCC/AMS codes. (Those less than 5% of the total were grouped as “Other”)

	escription	IL	IN	MI	MN	NY	OH	PA	WI	ON	Emissions (lbs)	Percentage (%)
		x	x		x	x	x	x	x	x	23,695,650.00	94
	Agricultural Tractors	x	x		x	x	x	x	x		1,485,874.90	6
		x	x		x	x	x	x	x	x	1,990,710.39	75

[redacted] Urban Total8 0.2204.1.745.655555Acrole176r648 .96 7.96 0.48 610516 176r648 5548 71.76 0.46916. T

Table 3-4: 1996 mobile source emissions in the Great Lakes region summarized by SCC/AMS codes. (Those less than 5% of the total were grouped as “Other”) (Continued)

Material Code	SCC/AMS	Description	IL	IN	MI	MN	NY	OH	PA	WI	ON	Emissions

Table 3-4: 1996 mobile source emissions in the Great Lakes region summarized by SCC/AMS codes. (Those less than 5% of the total were grouped as “Other”) (Continued)

Material Code	SCC/AMS	Description	IL	IN	MI	MN	NY	OH	PA

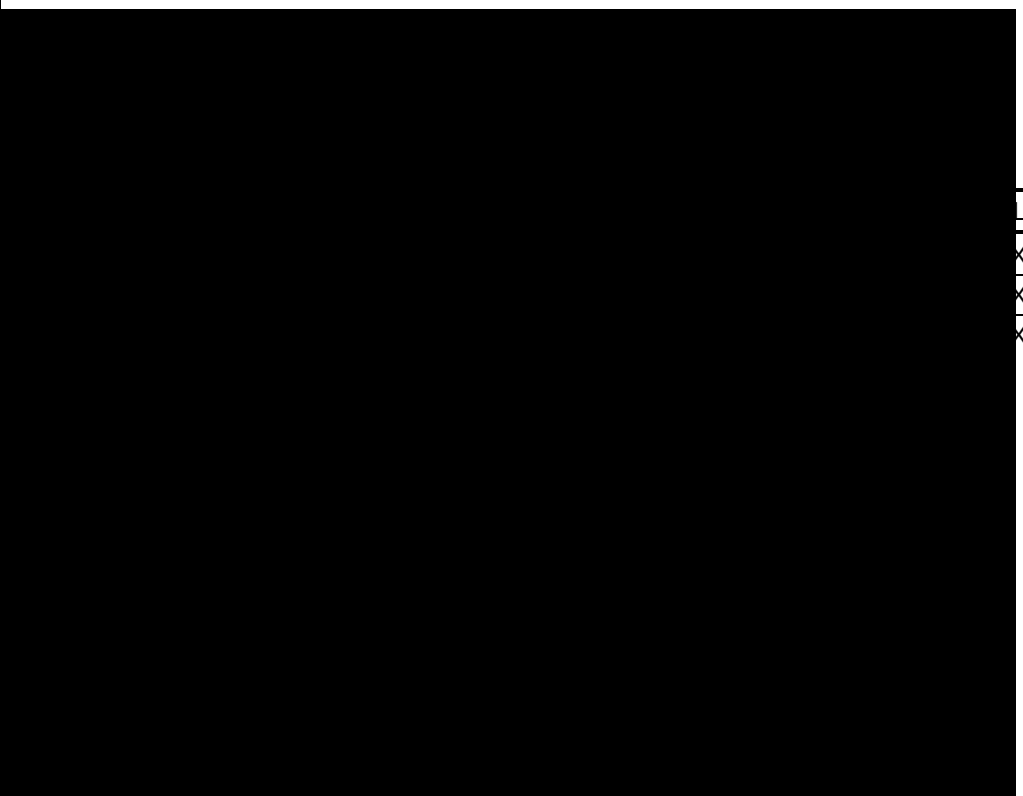
Figure 3-1:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	9,023,003.96	X	X	X	X	X	X	X	X	X
-------	LDGV	5,716,590.39	X	X		X	X	X	X	X	X
-------	HDDV	4,385,933.15	X	X	X	X	X	X	X		X
-------	Construction equipment	3,868,745.45	X	X		X	X	X	X		X

0.979 181.36 41.25 0 TD (X) Ti 20.25 0 TD (X) Ti 20.25 0 TD (X) Ti 21 0 TD (X) Ti 41.25 0 TD (X) Ti ET 52.5 229.5 1.5

Figure 3-2:

Figure 3-3:

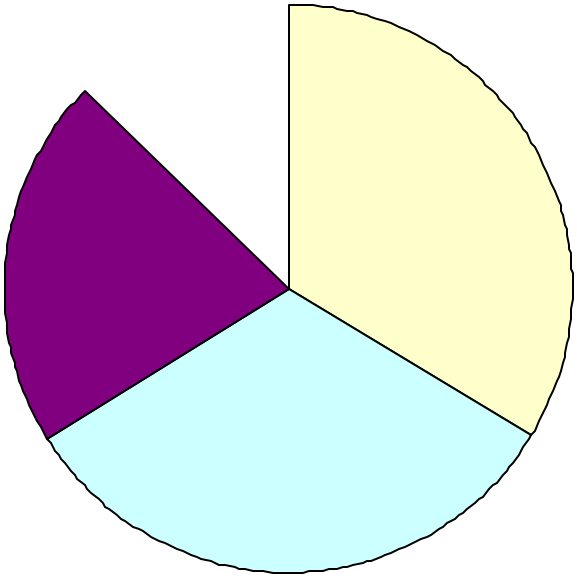


L	IN	MI	MN	NY	OH	ON	PA	WI
X	X	X	X		X	X		X
X	X					X		
X	X	X	X	X	X	X		

Figure 3-4:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON

Figure 3-5:



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
4911	Electric services	70,889.06	X	X	X	X	X		X	X	X
1011	Iron ores	68,367.33			X	X			X		
-------	Other Sources**	44,857.93	X	X	X	X	X	X	X	X	X
-------	LDGV	26,933.32	X	X							

Total Estimated Emissions: 211,047.65 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

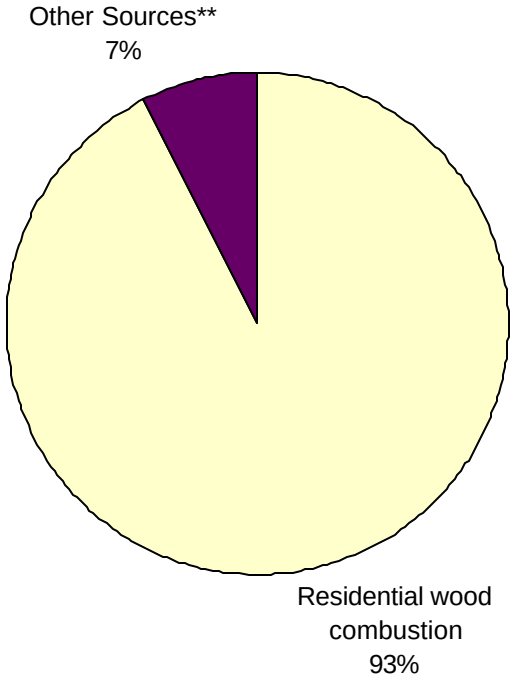
Figure 3-6:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	45,839,856.93	X	X	X	X		X	X		X
-------	Other Sources**	42,976,490.17	X	X	X	X	X	X	X	X	X
-------	LDGV	36,314,529.88	X	X	X	X	X	X	X	X	X
-------	LDGT1	12,276,948.74	X	X		X	X	X		X	X
-------	LDGT2	7,329,010.49	X	X		X	X	X		X	X

[redacted]

Figure 3-7:

BENZ(A)ANTHRACENE
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	661,215.70	X	X	X	X		X	X		X
-------	Other Sources**	53,144.78	X	X	X	X	X		X		X

Total Estimated Emissions: 714,360.48 lbs.

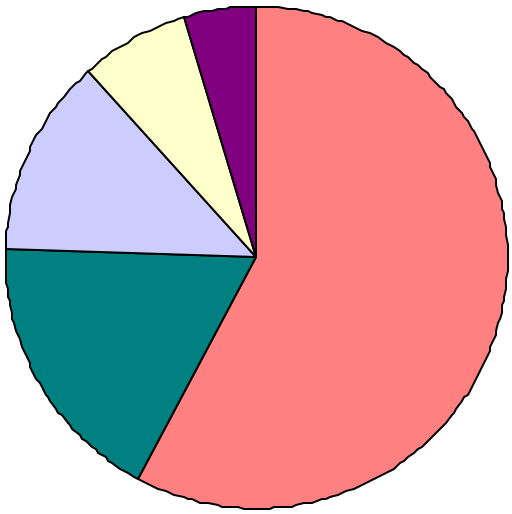
* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-8:

Figure 3-9:



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	126,625.57	X	X	X	X		X	X		X
2911	Petroleum refining	39,272.37	X	X	X	X	X		X		
3312	Blast furnaces and steel mills	28,054.35	X	X	X				X		
-------	Public owned treatment works	14,734.96									X
-------	Other Sources**	10,585.00	X	X	X	X	X		X		X

Total Estimated Emissions: 219,272.25 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.
** Other Sources: Individually less than five percent of the total.
(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-10:

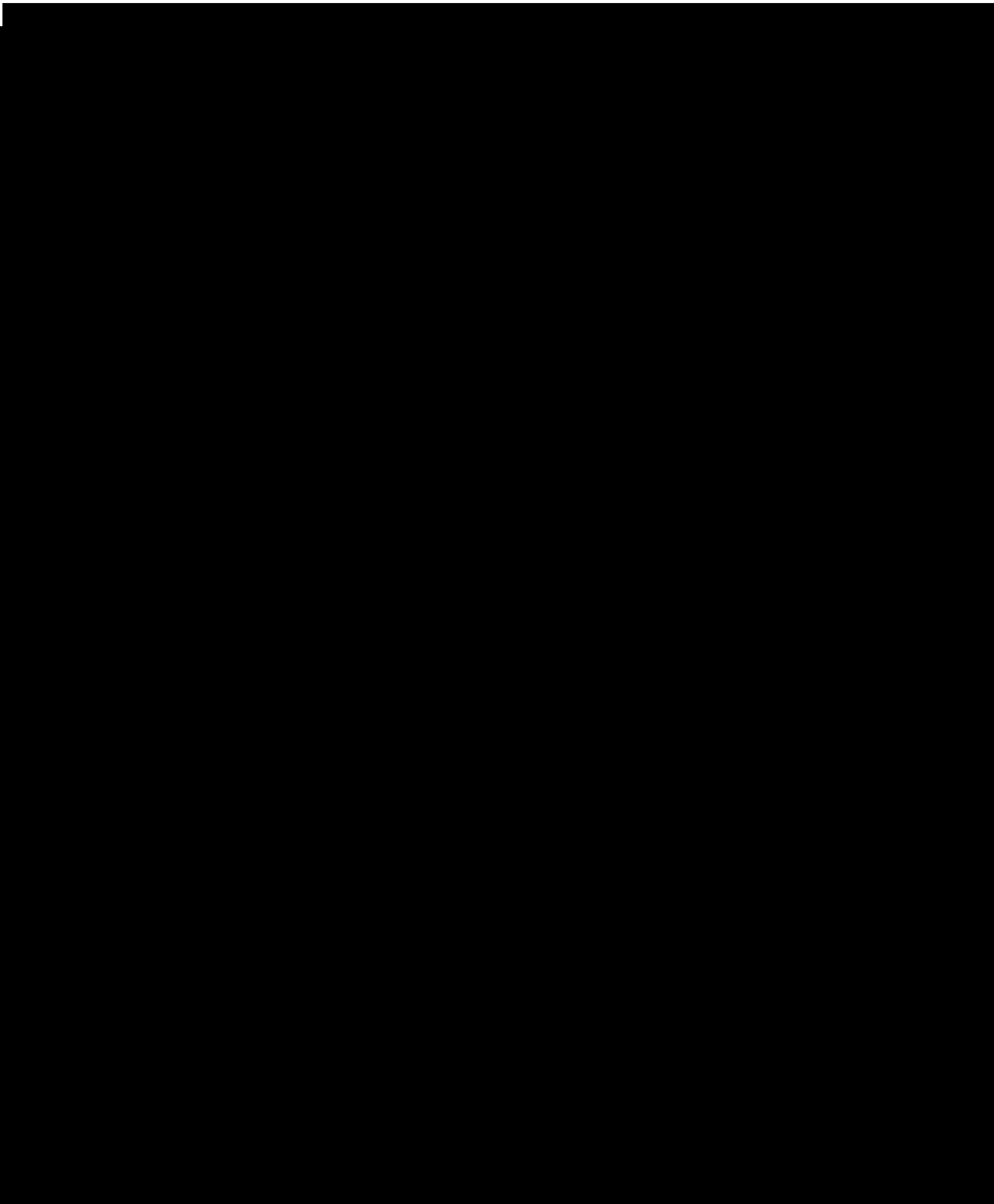
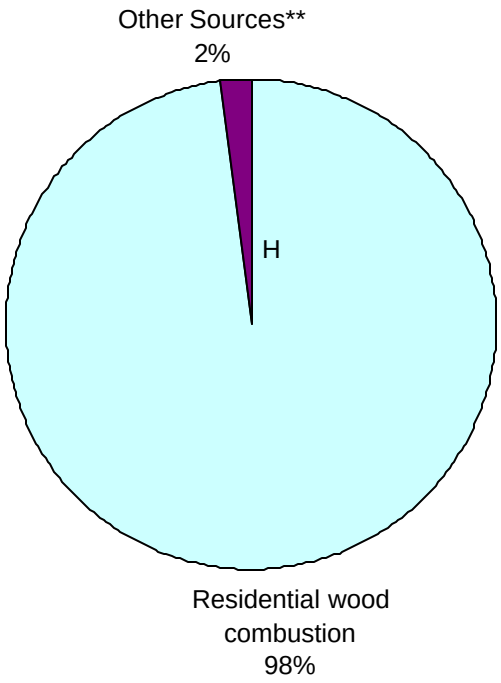


Figure 3-11:

BENZO(K)FLUORANTHENE
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



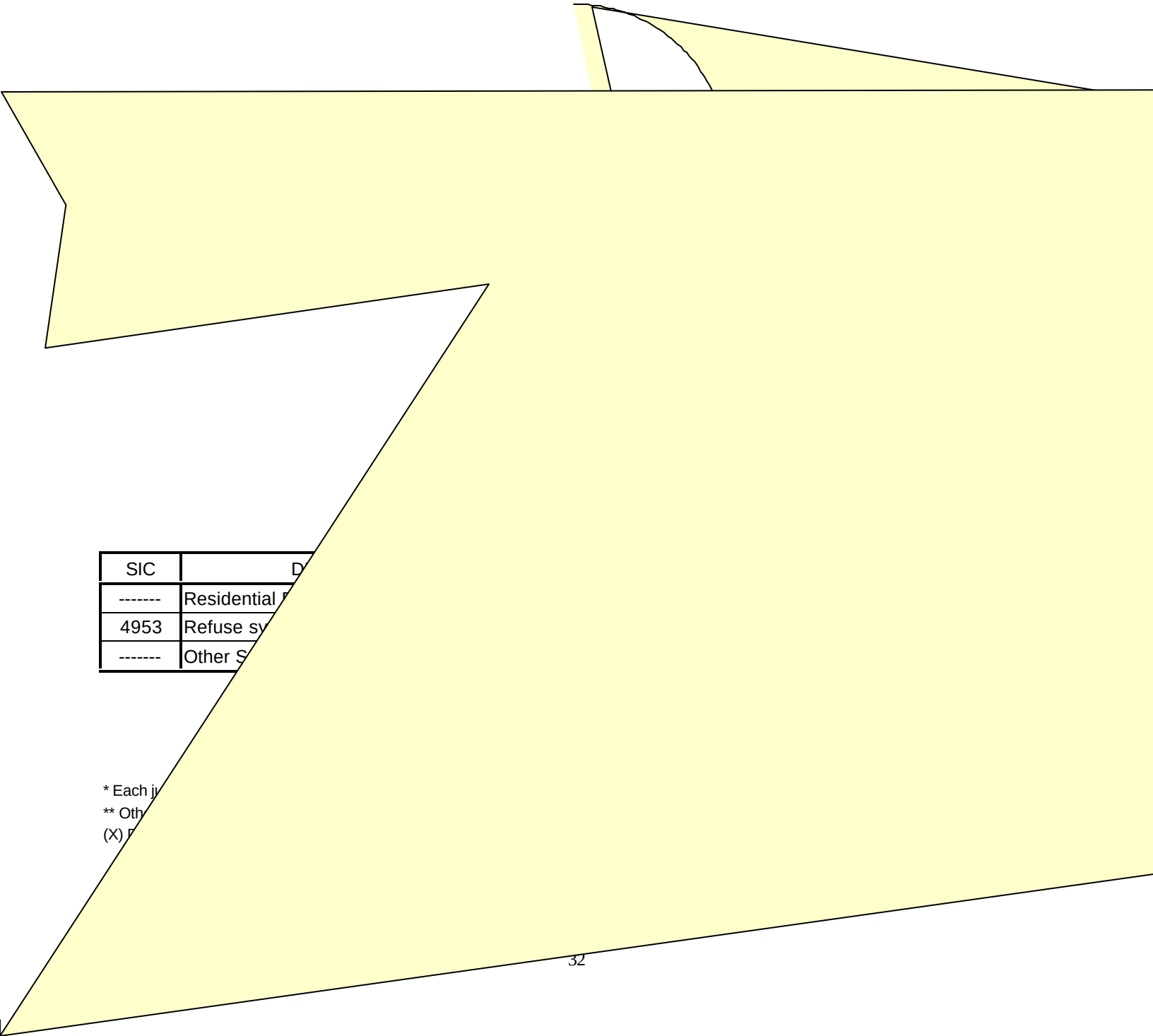
SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	58,418.44	X	X	X	X		X	X		X
-------	Other Sources**	1,132.42	X	X		X	X		X		

Total Estimated Emissions: 59,550.86 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.
** Other Sources: Individually less than five percent of the total.
(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

IN	MI	MN	NY	OH	ON	PA	WI
X		X	X	X	X	X	X
	X	X					X

Figure 3-13:



SIC	D
-------	Residential
4953	Refuse sv
-------	Other S

* Each ju
** Oth
(X) F

Figure 3-15:

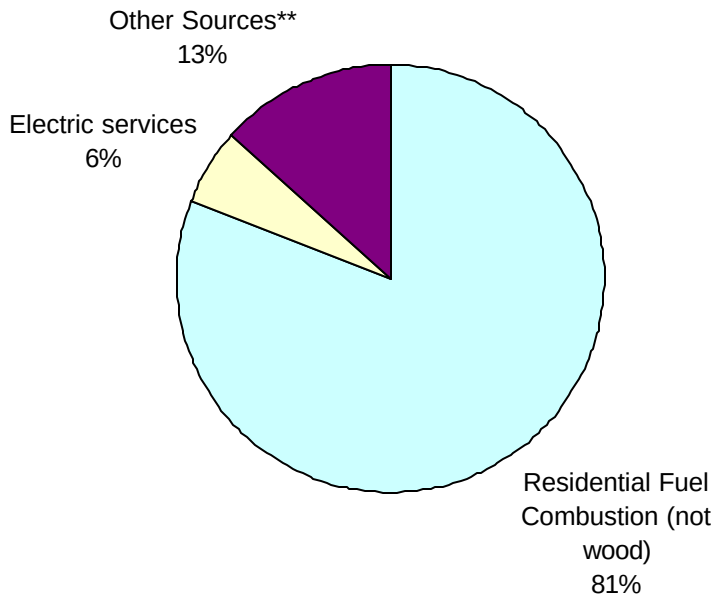
SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA

Figure 3-15:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
8299	Schools and Educational Services	2,165,301.60								X	
-------	Residential wood combustion	310,436.77	X	X	X	X		X	X		X
-------	Other Sources**	27,347.39	X	X	X	X	X		X		X

Figure 3-16:

COBALT
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential Fuel Combustion (not wood)	146,249.71		X		X			X		X
4911	Electric services	10,638.89	X	X	X	X	X		X		X
-------	Other Sources**	23,997.47	X	X	X	X	X	X	X		X

Total Estimated Emissions: 180,886.08 lbs.

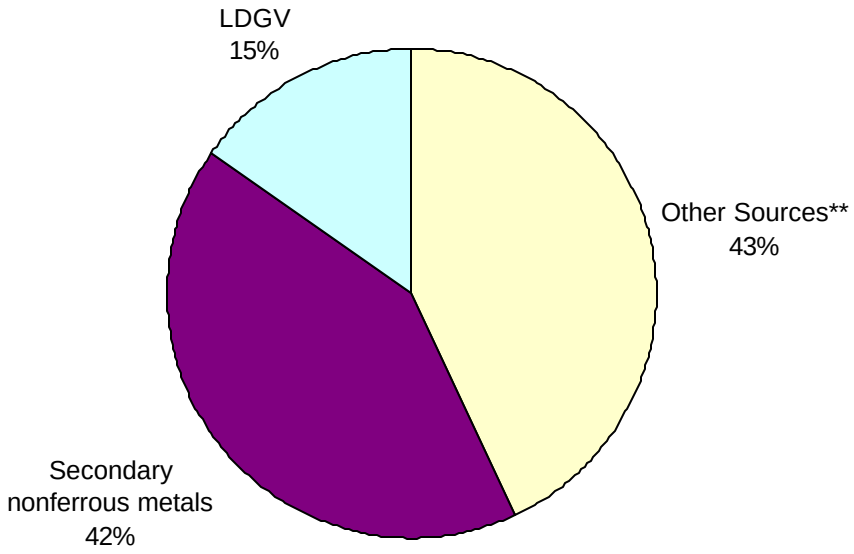
* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-17:

COPPER
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	475,071.53	X	X	X	X	X	X	X	X	X
3341	Secondary nonferrous metals	461,886.06	X	X		X	X	X		X	X
-------	LDGV	168,861.95	X	X		X	X	X	X	X	X

Total Estimated Emissions: 1,105,819.54 lbs.

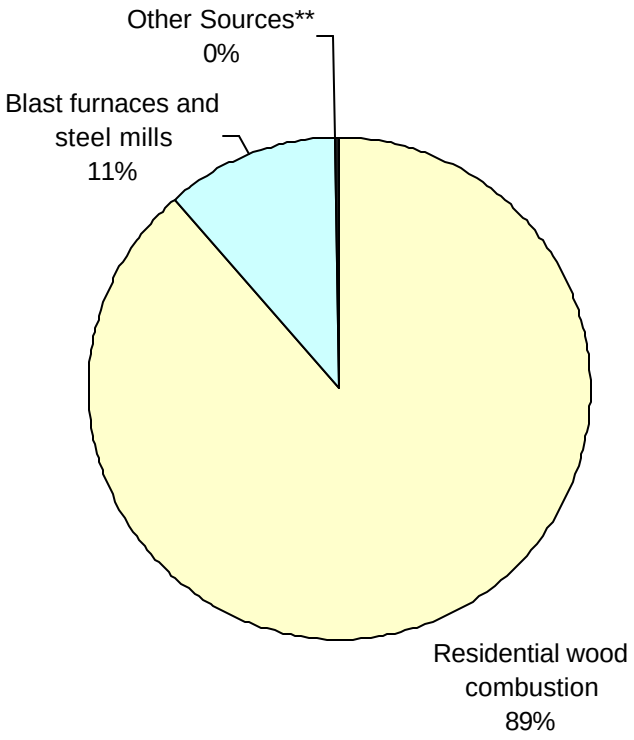
* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-18:

DIBENZAHAN
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	65,348.56	X	X	X	X		X	X		X
3312	Blast furnaces and steel mills	8,169.44	X						X		
-------	Other Sources**	211.34	X	X	X	X	X		X		

Total Estimated Emissions: 73,729.34 lbs.

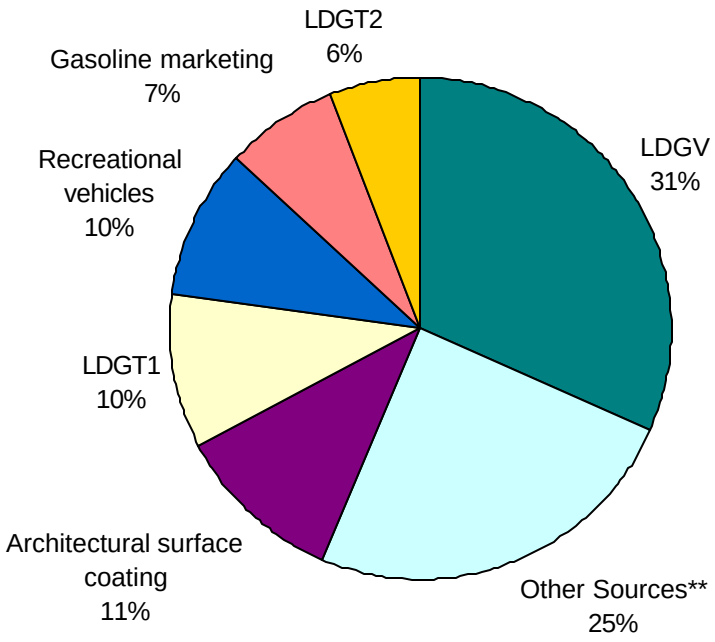
* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-19:

ETHYLBENZENE
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	LDGV	20,414,955.40	X	X		X	X	X	X	X	X
-------	Other Sources**	16,003,386.25	X	X	X	X	X	X	X	X	X
-------	Architectural surface coating	6,938,684.35	X	X	X	X	X	X	X	X	X
-------	LDGT1	6,463,623.42	X	X		X	X	X		X	X
-------	Recreational vehicles	6,214,316.33	X	X		X	X	X	X		X
-------	Gasoline marketing	4,810,030.13	X	X	X	X			X	X	X
-------	LDGT2	3,674,939.07	X	X		X	X	X		X	X

Total Estimated Emissions: 64,519,934.95 lbs.

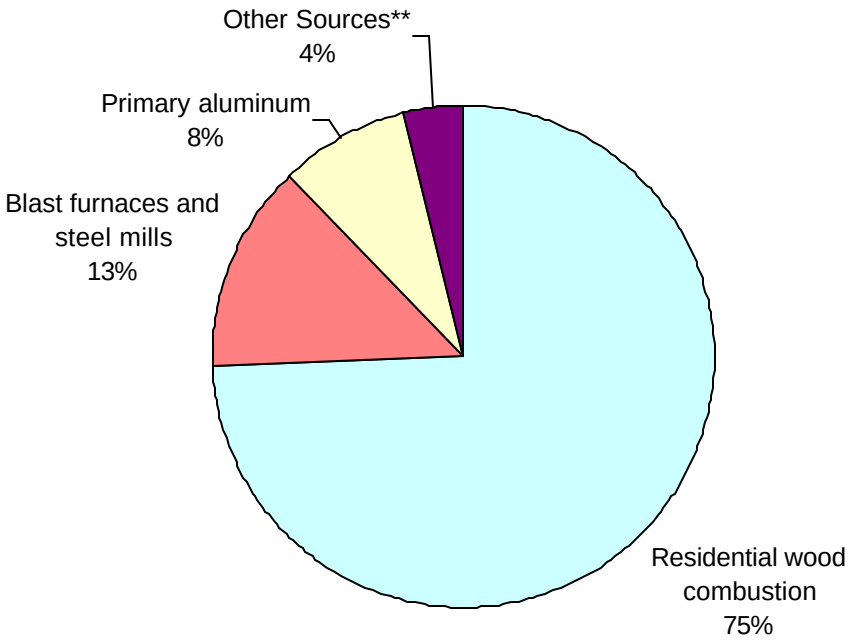
* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-20:

FLUORANTHENE
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	379,983.92	X	X	X	X		X	X		X
3312	Blast furnaces and steel mills	68,044.95	X	X					X	X	
3334	Primary aluminum	42,155.03		X			X				
-------	Other Sources**	19,987.21	X	X	X	X	X		X	X	X

Total Estimated Emissions: 510,171.11 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

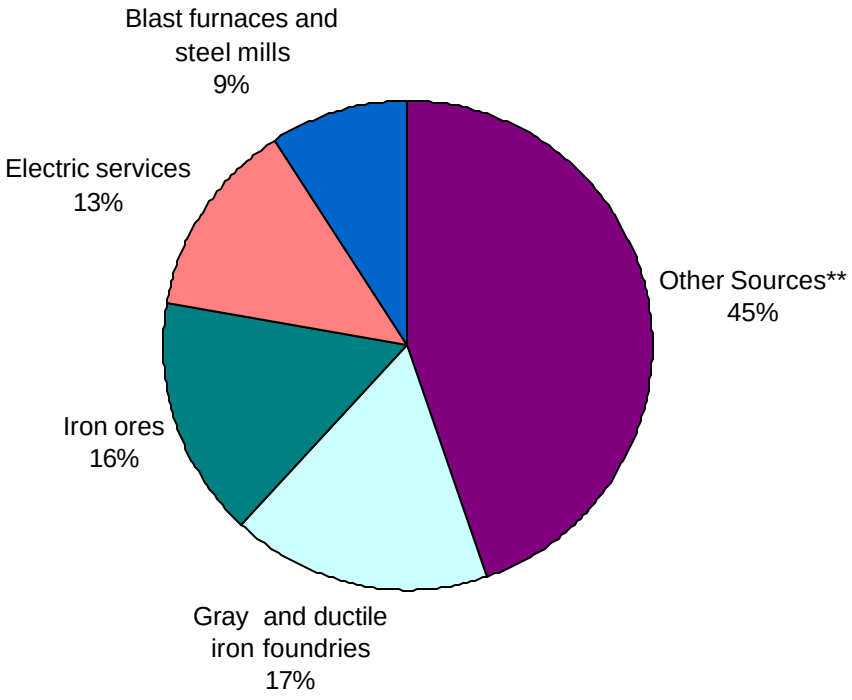
(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-21:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	56,160,105.34	X	X	X	X	X	X	X	X	X
-------	LDGV	15,214,642.79	X	X		X	X	X	X	X	X
-------	HDDV	12,858,248.16	X	X		X	X	X	X	X	X

Figure 3-23:

LEAD
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	399,604.12	X	X	X	X	X	X	X	X	X
3321	Gray and ductile iron foundries	152,167.76	X	X	X	X		X			X
1011	Iron ores	140,249.73			X	X			X		
4911	Electric services	117,813.18	X	X	X	X	X		X		X
3312	Blast furnaces and steel mills	80,929.68	X	X	X	X	X	X			X

Total Estimated Emissions: 890,764.49 lbss.

* Each jurisdiction estimated emissions for those sources for which they had data available.

** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-24:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
3312	Blast furnaces and steel mills	976,500.90	X	X	X	X	X	X	X	X	X
3241	Cement, hydraulic	752,891.65	X	X	X		X			X	
-------	Other Sources**	723,513.72	X	X	X	X	X	X	X	X	X
3313	Electrometallurgical products	668,204.00						X			
3321	Gray and ductile iron foundries	214,689.86	X	X	X	X		X		X	X

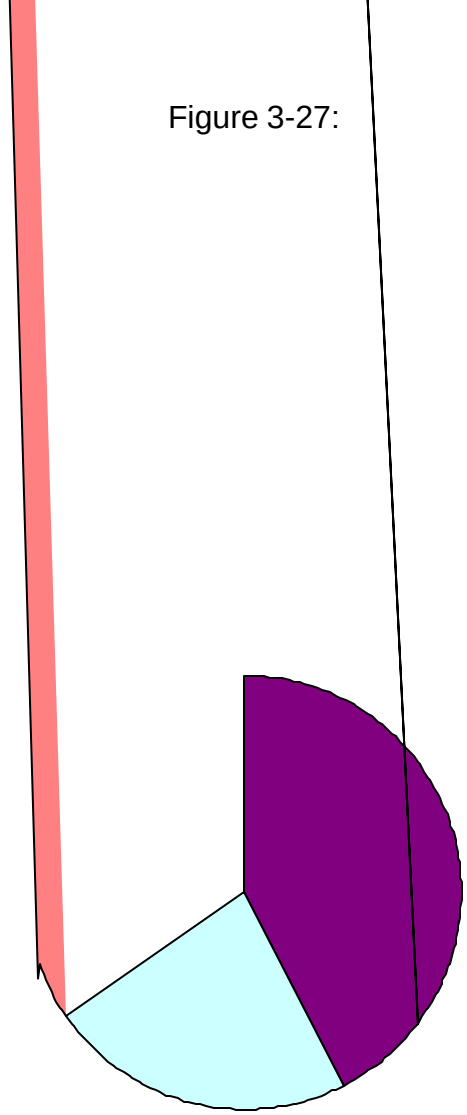
Total Estimated Emissions: 3,335,800.14 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.

MI	MN	NY	OH	ON	PA	WI
X	X	X		X	X	
X	X	X	X	X	X	X
	X				X	X
X	X	X		X	X	X

Electric serv

Figure 3-27:



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	293,826.01	X	X	X	X	X	X	X	X	X
3312	Blast furnaces and steel mills	159,155.32	X	X	X	X	X	X		X	X
4911	Electric services	116,721.05	X	X	X	X	X		X	X	X
-------	Commercial Marine	69,967.20							X		
-------	Residential Fuel Combustion (not wood)	53,588.68	X	X		X			X		X

Total Estimated Emissions: 693,258.26 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.
** Other Sources: Individually less than five percent of the total.
(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-28:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	5,967,145.20	X	X	X	X		X	X		X
3312	Blast furnaces and steel mills	459,767.27	X	X					X		
-------	Other Sources**	18,162.86	X	X	X	X	X	X	X	X	

Total Estimated Emissions: 6,445,075.33 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.

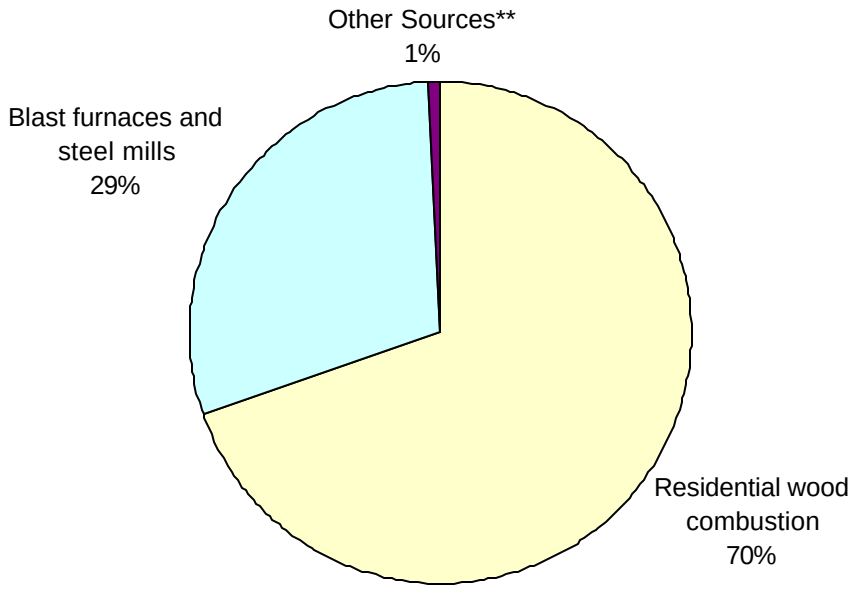
** Other Sources: Individually less than five percent of the total.

Figure 3-29:

SIC DESCRIPTION EMISSIONS (CRIPT7 Tf 0.822 Tf 0.822 Tf 0.d748

Figure 3-30:

PYRENE
1996 Estimated Emissions* by Source Category for Point, Area & Mobile Sources



SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Residential wood combustion	343,173.69	X	X	X	X		X	X		X
3312	Blast furnaces and steel mills	144,959.85	X	X					X		
-------	Other Sources**	3,688.72	X	X	X	X	X		X		

Total Estimated Emissions: 491,822.26 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.

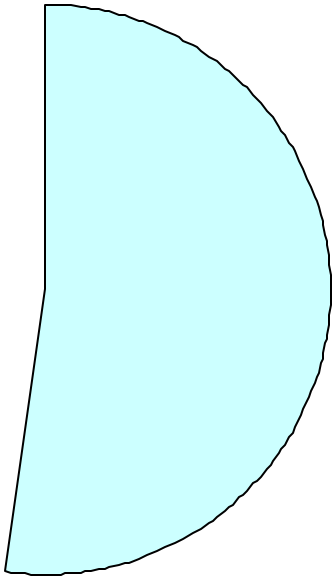
** Other Sources: Individually less than five percent of the total.

(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

Figure 3-32:

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	Other Sources**	261,424,401.31	X	X	X	X	X	X	X	X	X
-------	LDGV	142,633,753.80	X	X		X	X	X	X	X	X
-------	Industrial surface coating	54,103,261.14	X	X	X	X				X	X
-------	LDGT1	45,561,296.62	X	X		X	X	X		X	X

Figure 3-33:



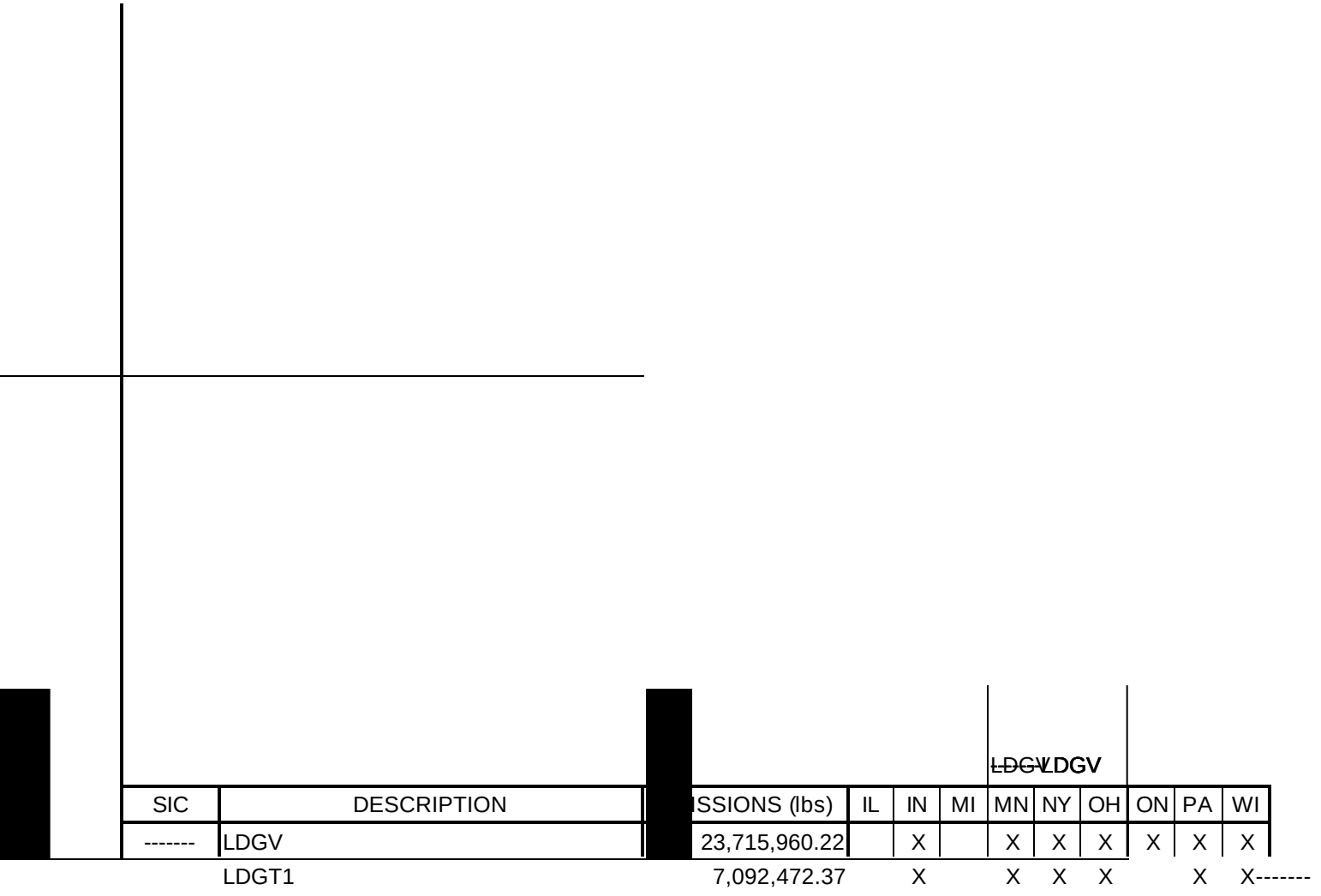
SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	LDGV	12,174,626.71				X				X	X
-------	LDGT1	4,916,897.05				X				X	X
-------	LDGT2	2,648,693.42				X				X	X
-------	Other Sources**	1,849,853.93		X	X	X	X	X	X	X	X
-------	HDGV	1,680,231.90		X		X	X			X	X

Total Estimated Emissions: 23,270,303.00 lbs.

* Each jurisdiction estimated emissions for those sources for which they had data available.
** Other Sources: Individually less than five percent of the total.
(X) Denotes jurisdictions that have contributed emissions data for this pollutant.

XYLENES(META)

Figure 3-34:



SIC	DESCRIPTION	SSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	LDGV	23,715,960.22		X		X	X	X	X	X	X
	LDGT1	7,092,472.37		X		X	X	X		X	X-------

Figure 3-35:

[redacted]

SIC	DESCRIPTION	EMISSIONS (lbs)	IL	IN	MI	MN	NY	OH	ON	PA	WI
-------	LDGV	22,087,386.24		X	X	X					X
-------	LDGT1	5,762,628.94				X			X		X
-------	LDGT2	3,575,752.92		X		X					X
-------	Other Sources**	3,884,924.59		X	X	X	X		X-------		

Figure 3-36:

SIC

4. Conclusion

However, this flexibility also has the potential to create inconsistencies in the data. For example, different emissions estimation methodologies could lead to vastly different emissions estimates between states. This is especially true for the non-road portion of the inventory which does not have an established protocol. To calculate the non-road inventory, the agencies used either the NONROAD model or U.S. EPA studies as the base methodology to estimate emissions. Both of these methodologies are acceptable, but can lead to widely different results. In addition, several agencies were unable to gather the raw data to calculate certain portions of the non-road inventory (locomotives, aircraft and commercial marine vessels). Therefore in future inventories, the air regulatory agencies need to work together to minimize these inconsistencies. This would, at a minimum, include the review and update of the protocol, training (especially for mobile source inventory personnel) and the continued development of RAPIDS software.

While the States and Ontario are committed to compiling annual inventories to assess and analyze the contribution of toxic air emissions to the Great Lakes and other water bodies, these inventories can also serve a number of other very important purposes as well.

This inventory will assist the United States Environmental Protection Agency in assessing the impact of hazardous air pollutants (HAPs). U.S. EPA has prepared a National Toxic Inventory (NTI), in order to perform a risk-based assessment associated with the exposure to HAPs. This assessment, known as the National Air Toxics Assessment (NATA), can be enhanced by the use of State specific inventories. The Great Lakes Regional Air Toxic Inventory can provide better spatial and temporal resolution of emissions through the use of more representative activity data such as local traffic counts and county level data for non-road sources. The list of contaminants for the Great Lakes air toxic inventory would need to be expanded to include the full list of 188 HAPs as delineated in Section 112(b) of the Clean Air Act to support the NTI and NATA activities. In addition, the mobile source inventory module could be used as a national model for preparing state-specific mobile source air toxic inventories.

The Great Lakes emissions inventory can also be used to assist the states and Ontario in completing their other air emissions inventory needs. States with ozone nonattainment areas are required to complete comprehensive periodic (every 3 years) inventories for those areas. Some states have expanded this effort to include the entire state. Much of the mobile source information collected is directly transferable to the inventory project, as well as other efforts.

The data collected from this inventory can also be used to assist in other ongoing assessments. The U.S. EPA is currently developing a national database that will contain a state's comprehensive emission inventory that will provide other entities with access to the state's inventory to perform these assessments. If a state does not provide its own inventory, the U.S. EPA will estimate emissions for that state or portion therein. It is preferable for a state to complete this on its own to provide a more accurate picture of its own air emissions. Ontario would benefit similarly and is encouraged to do the same as the Great Lakes states.

The Great Lakes states and Ontario have developed protocols to provide consistencies within the emissions inventory process. These have had limited success because of the difference in available resources and the lack of an overarching authority requiring a complete inventory. A

comprehensive federal emissions reporting rule that consolidates all emissions inventory requirements could provide consistency for the States and Ontario.

In summary, the Great Lakes states and the province of Ontario have successfully implemented a system, the Great Lakes Regional Air Toxic Emissions Inventory, to compile and analyze air toxic emissions from mobile sources for the Great Lakes region. Beyond the periodic air toxic inventory work that the States and Ontario will be compiling as part of the assessment of airborne toxic emissions in the Great Lakes region, this system can be used for a variety of other purposes. These include:

1. The NTI and NATA;
2. Regional inventories for ozone, particulate matter and haze;
3. The urban air toxic program;
4. Mercury deposition studies; and,
5. Acid deposition studies.

The Great Lakes Regional Air Toxic Emissions Inventory is an unprecedented regional study of air pollutant emissions and as such is an example of the cooperation that is possible nationally and internationally. It can be used as a model for states, provinces and countries compiling air emissions inventories of regional interest, including the NTI, the National Emissions Trends Inventory and other regional assessments of various air toxic pollutants.

5. References

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- "Document for the 1996 Base Year National Toxics Inventory for On-road Vehicle Mobile Sources"(Prepared by Eastern Research Group, Inc., Morrisville, NC. July 26, 1999; ftp://ftp.epa.gov/pub/EmisInventory/nti_96/mustread/mobiledocumentation/ONR
- "Use of RAPIDS to Develop a Regional Air Toxic Inventory." Michael Donahue, Julie Wagemakers, and Derek Moy of the Great Lakes Commission; Orlando Cabrera-Rivera of the Wisconsin Department of Natural Resources; Chun Yi Wu of the Minnesota Pollution Control Agency; David Asselmeier of the Illinois EPA; Gary Baker of the Michigan DEQ; Rob McDonough of the New York Department of Environmental Conservation; Jon Bates of the Indiana Department of Environmental Management; Peter Wong of the Ontario Ministry of Energy and the Environment; Suzanne King of the US EPA and Robert Emigh, Mark Young, and Suzanne Strasser of Windsor Technologies, Inc. Paper presented at the Emission Inventory: Regional Strategies for the Future, U.S. EPA/Air Waste Management Association Specialty Conference, Raleigh, North Carolina, October 26-28, 1999.

6. Appendices

Appendix A: Illinois Toxic Emissions Inventory

CALCULATION METHODS

Aircraft

The number of operations (landings and takeoffs) for each airport were obtained from Illinois' 1996 ozone inventory. For O'Hare and Midway airports, data had been previously obtained from Landrum & Brown via the Chicago Department of Aviation (March 1998) on the design day flights from those airports. This data included operations for specific aircraft types and engine types.

For O'Hare and Midway, emissions were calculated by using emission factors from the FAA Engine Emission Database (FAEED) version 2.1 specific to the engine type being inventoried. Default time-in-modes (TIM) were used. Since the daily count of flights was given, this value was multiplied by 366 to obtain the annual number of flights. For airports other than O'Hare and Midway, emissions were calculated by using "average" emission factors from AP-42. Once VOC emissions were calculated, they were converted to TOG and speciated to obtain the pollutants of interest.

Off-road Mobile Sources

Off-road mobile sources were calculated using USEPA's NONROAD model with the default parameters. Output from the model was for the pollutant TOG which was then speciated to obtain the pollutants of interest.

On-road Mobile Sources

Annual VMT by road type for each county was obtained from the Illinois Department of Transportation. Using conversion factors, these values were converted to monthly VMT values and then apportioned to vehicle types.

Next, USEPA's MOBILE 5b model was run for each county for each month of 1996 to obtain emission factors of TOG. The inputs into the model included average speed for the road type, monthly maximum and average temperatures from the National Weather Service, fleet mix and appropriate inspection and maintenance values (if appropriate). If a county did not have a National Weather Service site which recorded temperature, the nearest site to that county was used. Emission factors output from the MOBILE model were then multiplied by VMT to obtain TOG emissions. These emissions were then speciated to obtain the pollutants of interest.

Particulate matter emissions from on-road mobile sources were calculated using USEPA's PART5 model. The inputs into the model included average speed for the road type, fleet mix, particle size, average vehicle weight, number of wheels and number of precipitation days. The number of precipitation days was obtained from the National Weather Service. Emission factors output from the

PART5 model were then multiplied by VMT to obtain particulate emissions. These emissions were then speciated to obtain the pollutants of interest.

INFORMATION

For more information about Illinois' air toxics inventory, please contact:

Buzz Asselmeier
Bureau of Air
IL Environmental Protection Agency
P.O. Box 19276
Springfield, IL 62794-9276

(P) 217-782-5811
(F) 217-782-6348
(E) epa2110@epa.state.il.us

n pounds/year

Boone	Brown
14,519.82	2,797.70
1,233.82	141.69
65.90	8.14
123.75	15.29
25,565.09	3,376.74
26,691.83	3,406.49
32.95	4.07
61.00	7.07
0.89	0.11
425.50	52.24
14,088.30	1,865.61
41,857.26	8,124.63
56.71	3.37
210.37	25.52
10.37	1.15
71.40	5.10
19.35	2.19
30.80	2.20
51.80	3.70
103,694.38	13,946.99
69,964.87	9,131.47

93,424.25

Cass	Champaign
6,338.36	54,000.50
292.83	4,522.36
16.26	227.49
30.54	427.18
7,943.30	93,424.25
7,778.43	98,891.17
8.13	113.74
14.12	211.73

Table A-1: Illinois emissions by county in pounds/year (continued)

	Douglas	DuPage	Edgar	Edwards	Effingham
Acetaldehyde	12,034.90	212,848.82	10,549.58	3,414.12	20,456.65
Acrolein	546.64	21,264.51	387.07	144.01	1,169.14
Antimony	39.50	1,085.21	25.05	10.74	88.17
Arsenic	74.17	2,037.82	47.04	20.16	165.57
Benzene	14,249.04	520,785.62	10,723.24	4,159.97	31,256.75
Butadiene,13	14,043.55	554,650.58	10,417.35	4,032.38	31,894.40
Cadmium	19.75	542.60	12.52	5.37	44.08
Chromium	37.51	982.40	21.75	9.36	84.59
Cobalt	0.53	14.74	0.34	0.14	1.19
Copper	255.71	6,990.74	160.72	68.94	571.40
Ethylbenzene	7,919.33	292,074.43	5,879.44	2,338.11	17,533.76
Formaldehyde	34,972.42	603,311.66	30,737.17	9,902.51	58,985.95
Lead	41.44	758.73	10.23	4.72	99.27
Manganese	127.03	3,441.56	78.52	33.71	284.43
Mercury	6.48	164.56	3.53	1.52	14.72
Naphthalene	11.47	370.80	3.82		7.65
Nickel	12.01	308.81	6.73	2.90	27.18
Phenol	4.95	159.87	1.65		3.30
Styrene	8.32	268.14	2.77		5.55
Toluene	60,528.06	2,192,303.09	43,598.10	18,402.96	134,224.84
Xylenes,Iso	38,182.61	1,445,478.69	28,641.28	11,079.85	85,164.89

	Fayette	Ford	Franklin	Fulton	Gallatin
Acetaldehyde	16,136.02	10,267.89	12,862.67	12,372.47	4,749.99
Acrolein	896.21	370.84	1,026.41	769.70	180.14
Antimony	60.29	23.20	67.87	47.86	10.83
Arsenic	113.22	43.56	127.46	89.88	20.34
Benzene	21,735.90	9,483.67	26,551.26	20,579.76	5,160.57
Butadiene,13	22,428.91	9,261.53	27,897.93	21,411.55	5,044.04
Cadmium	30.14	11.60	33.93	23.93	5.41
Chromium	58.23	21.28	63.45	41.65	9.42
Cobalt	0.81	0.31	0.92	0.65	0.14
Copper	391.01	149.65	438.68	307.16	69.53
Ethylbenzene	12,152.05	5,174.92	15,100.39	11,534.25	2,864.77

Table A-1: Illinois emissions by county in pounds/year (continued)

	Greene	Grundy	Hamilton	Hancock	Hardin
Acetaldehyde	7,873.22	20,646.62	5,130.53	12,453.06	935.89
Acrolein	335.45	1,400.59	170.70	617.29	93.93
Antimony	17.99	81.61	12.44	31.69	6.24
Arsenic	33.78	153.26	23.36	59.50	

Table A-1: Illinois emissions by county in pounds/year (continued)

	Jefferson	Jersey	JoDaviess	Johnson	Kane	
Acetaldehyde	17,965.48	6,326.93	8,288.08	6,268.71	97,737.15	
Acrolein	[redacted]	419.01	609.68	429.94	7,917.16	
Antimony	[redacted]	26.89	33.40	32.31	367.30	
Arsenic	[redacted]	50.49	62.72	60.68	689.72	
Benzene	[redacted]	11,215.56	15,752.87	11,450.59	186,968.10	
Butadiene,13	[redacted]	11,732.34	16,790.59	12,038.41	195,703.86	
Cadmium	[redacted]	13.44	16.70	16.15	183.65	
[redacted]hromium	[redacted]	23.35	29.02	31.96	331.07	
Cobalt	1.26	0.36	0.45	0.43	4.99	
Copper	604.35	172.52	214.32	210.09	2,365.08	16,

Table A-1: Illinois emissions by county in pounds/year (continued)

Table A-1: Illinois emissions by county in pounds/year (continued)

	Marion	Marshall	Mason	Massac	Menard
Acetaldehyde	15,251.11	8,428.17	8,938.97	5,522.41	5,285.37
Acrolein	1,148.18	529.93	388.03	384.83	201.84
Antimony	69.54	27.04	17.70	28.66	13.96
Arsenic	130.58	50.78	33.24	53.83	26.21
Benzene	26,240.78	11,610.89	10,497.77	9,772.42	5,745.87
Butadiene,13	26,397.83	12,032.67	10,724.64	9,933.66	5,651.76
Cadmium	34.77	13.52	8.85	14.33	6.98
Chromium	64.51	25.27	15.38	27.01	12.17
Cobalt	0.94	0.36	0.24	0.38	0.18
Copper	449.08	174.77	113.58	185.42	89.61
Ethylbenzene	14,736.57	6,419.81	5,766.31	5,574.72	3,186.48
Formaldehyde	43,987.90	24,413.35	25,929.34	15,856.32	15,361.27
Lead	60.98	25.16	7.34	28.42	6.07
Manganese	222.12	86.56	55.50	91.98	43.81
Mercury	10.98	4.32	2.50	4.64	1.98
Naphthalene	52.27	25.50	1.27	7.65	
Nickel	20.48	8.04	4.76	8.62	3.77
Phenol	22.55	11.00	0.55	3.30	
Styrene	37.92	18.50	0.92	5.55	
Toluene	115,286.46	47,642.19	41,754.87	44,654.54	24,102.18
Xylenes,Iso	70,600.55	31,716.67	28,707.24	26,477.23	15,431.55

	Mercer	Monroe	Montgomery	Morgan	Moultrie
Acetaldehyde	9,177.94	9,952.43	19,000.96	14,058.72	6,671.05
Acrolein	420.01	734.77	1,035.29	874.36	323.17
Antimony	20.62	40.99	72.16	50.85	21.63
Arsenic	38.72	76.98	135.51	95.49	40.62
Benzene	11,257.51	19,323.81	25,972.43	21,876.30	9,053.58
Butadiene,13	11,620.09	20,405.32	26,743.73	22,518.36	9,048.90
Cadmium	10.31	20.49	36.08	25.42	10.81
Chromium	17.91	37.01	69.14	46.14	18.88

[redacted]

[redacted]nty in pounds/year (continued)

[redacted]	Perry	Piatt	Pike
[redacted]	,301.42	11,023.42	12,089.16
[redacted]	425.85	460.05	619.63
[redacted]	27.53	33.04	37.21
[redacted]	51.69	62.04	69.87
[redacted]	,395.80	12,056.35	16,078.86
[redacted]	,942.14	12,039.92	16,648.40
[redacted]	13.76	16.52	18.60
[redacted]	23.99	31.89	34.04
[redacted]	0.37	0.44	0.50
[redacted]	176.67	214.26	239.95
[redacted]	,358.57	6,712.55	8,939.06
[redacted]	,003.85	32,046.84	34,955.26
[redacted]	11.97	38.75	28.86
[redacted]	86.38	106.78	118.37
[redacted]	3.90	5.57	5.74
[redacted]	8.92	7.65	6.37
[redacted]	7.44	10.27	10.75
[redacted]	3.85	3.30	2.75
[redacted]	6.47	5.55	4.62
[redacted]	,657.63	51,119.42	66,447.04
[redacted]	,171.89	32,515.81	44,139.13

[redacted]	Putnam	Randolph	Richland
[redacted]	,031.91	9,756.31	7,091.86
[redacted]	190.34	704.55	400.03
[redacted]	9.40	39.21	22.93
[redacted]	17.66	73.64	43.06
[redacted]	,103.17	17,712.95	10,445.27
[redacted]	,329.54	18,044.37	10,078.70
[redacted]	4.70	19.60	11.46
[redacted]	8.24	34.11	19.83
[redacted]	0.13	0.53	0.31

[redacted]1310824Formaldehyd75 (

Table A-1: Illinois emissions by county in pounds/year (continued)

	Rock Island	St. Clair	Saline	Sangamon	Schuyler
Acetaldehyde	37,900.80	65,436.57	6,487.32	59,656.07	4,533.12
Acrolein	5,213.18	8,982.03	494.37	7,406.89	204.14
Antimony	183.46	362.82	34.94	271.07	14.40
Arsenic	344.50	681.33	65.61	509.01	27.04
Benzene	87,325.19	155,628.30	13,143.06	116,495.65	5,679.95
Butadiene,13	94,032.53	164,001.13	13,421.73	124,725.15	5,715.98
Cadmium	91.73	181.41	17.47	135.53	7.20
Chromium	163.01	331.75	30.41	247.37	12.55

Cobalt 2.45 f 540 630 0.75 10.90.5 re1z114.75 0.T.si6375 ren2.4.75 0.T.si6375 re0TD (87

Appendix B: Indiana Toxic Emissions Inventory

BACKGROUND

The Indiana Department of Environmental Management, Office of Air Management, has developed a statewide inventory of the 82 target air toxic compounds for the Great Lakes Air Toxic Emissions Inventory Project for calendar year 1996. The inventory covers point, area and mobile sources. The point and area source portion of the inventory was previously released under a separate report. This report documents the mobile source inventory methodology and results.

MOBILE SOURCES

Indiana's mobile source inventory includes estimates for onroad mobile sources and nonroad mobile sources. The onroad mobile source category includes estimates for vehicles which are typically driven on the road, such as cars, trucks, and motorcycles. The nonroad mobile source category includes estimates for equipment that are not typically driven on the road, such as trains, boats, lawn and garden equipment, aircraft and construction equipment.

ONROAD MOBILE SOURCES

DATA SOURCES

Onroad mobile source air toxic estimates were made using U.S.EPA's Mobile 5b and Part 5 models, activity data supplied by the Indiana Department of Transportation (INDOT), and speciation profiles from RAPIDS. Onroad mobile source vehicles included in the inventory are shown below:

Vehicle Types

Heavy Duty Diesel Vehicles (HDDV)
Heavy Duty Gas Vehicles (HDGV)
Light Duty Diesel Trucks (LDDT)
Light Duty Diesel Vehicles (LDDV)
Light Duty Gas Trucks (LDGT1, LDGT2)
Light Duty Gas Vehicles (LDGV)
Motorcycles (MC)

MOBILE 5B

Mobile 5b is the mobile source model used to develop emission factors for volatile organic compounds, and other criteria pollutants (except lead and particulate matter) for on road vehicles. The model takes into account the effect of temperatures, vehicle fleet mix, average speeds, reid vapor pressure of gasoline, and the effects of state Inspection and Maintenance (I/M) programs to develop area specific emission factors. The mobile 5b emission factors are then multiplied by activity data and toxic pollutant

speciation profiles to estimate emissions. Interested persons can find this model and supporting documentation at U.S.EPA's Office of Mobile Sources (OMS) website[1].

Temperature Data

Temperature data were obtained electronically from Purdue University's website[2]. One set of monthly average high and low temperatures was used for the state.

Fuel Specifications, Model Year Registration Distribution Rates And Speeds Inputs

Fuel specifications, speeds for each vehicle and road type, and model year registration distribution rates used were obtained from U.S.EPA's mobile source inventories developed as part of the regional ozone control program (October 1998).

Fleet Mixes and I/M programs

National default fleet mix information included in the Mobile 5b model was used. Three different mobile 5b scenarios were run in order to accommodate areas with fuel requirements and I/M programs. These scenarios are:

1. Counties with a vehicle Inspection and Maintenance program and federal Reformulated Gasoline (RFG) requirements (Lake and Porter Counties),
2. Counties with a vehicle Inspection and Maintenance program and summertime fuel RVP requirements (Clark and Floyd Counties), and
3. Counties with no I/M or fuel requirements (rest of the state).

PART 5

The part 5 model provides PM and lead emission factors for exhaust emissions, brake and tire wear, and road dust. The Part 5 model provided an emission factor for lead with a value of zero for on road gasoline powered vehicles. Lead estimates were included for diesel exhaust emissions. The part 5 model and supporting documentation can also be obtained from the OMS website[1].

ACTIVITY DATA

Average daily vehicles miles traveled (DVMT) by vehicle type and road type were obtained from INDOT[3]. Road types include:

Road Types

Collector: Urban Total
Major Collector: Rural Total
Interstate: Rural Total
Interstate: Urban Total
Local: Rural Total
Local: Urban Total
Minor Arterial: Rural Total
Minor Arterial: Urban Total
Minor Collector: Rural Total

Other Freeways And Expressways: Urban Total
Other Principal Arterial: Rural Total
Other Principal Arterial: Urban Total

Monthly correction factors were applied since vehicle activity varies from month to month. Monthly correction factors used were 0.8 for January and February, 0.9 for March and December, 1 for April, May, September, October, and November, and 1.1 for June, July and August.

IDEM is currently working with the Northwest Regional Planning Commission to refine the activity data used in the Northwest Indiana mobile source inventory for transportation conformity purposes. The results of this effort were not available at the time this inventory was developed and are therefore not reflected in the annual estimates provided for Lake and Porter Counties.

CALCULATION METHOD

Monthly volatile organic compound (VOC) emissions were estimated outside of RAPIDS using the adjusted DVMT and monthly VOC emission factors obtained from Mobile 5b. Monthly VOC totals (by vehicle and road type by county) were then summed to obtain an annual total VOC estimate. VOC estimates were converted to Total Organic Gases (TOG) using conversion factors obtained from RAPIDS. PM emission estimates were made by multiplying the PM emission factor from the Part 5 model times the DVMT times 366 days per year for 1996. Speciation profiles taken from RAPIDS in March 1999 were used to estimate air toxic emissions.

Onroad Speciation Profiles

Code	Vehicle Category	Emission Type	Material Speciated
1101	LDGV	EXHAUST/EVAPORATIVE	TOG
1101	LDGT	EXHAUST/EVAPORATIVE	TOG
1101	MC	EXHAUST/EVAPORATIVE	TOG
1186	HDGV	EXHAUST/EVAPORATIVE	TOG
1201	LDDT	EXHAUST	TOG
1201	LDDV	EXHAUST	TOG
1201	HDDV	EXHAUST	TOG
31203	LDGV	EXHAUST	PM
31203	LDGT	EXHAUST	PM
31203	HDGV	EXHAUST	PM
31203	MC	EXHAUST	PM
32104	LDDV	EXHAUST	PM
32206	HDDV	EXHAUST	PM
32206	LDDT	EXHAUST	PM
34004	ALL VEHICLES	BRAKE WEAR	PM
41130	ALL VEHICLES	ROAD DUST	PM

For onroad sources the following air toxics were inventoried: acetaldehyde, acrolein, antimony, arsenic, benzene, Butadiene,13, cadmium, chromium, cobalt, copper, ethylbenzene, formaldehyde, lead, manganese, mercury, nickel, toluene, m-xylene, o-xylene, p-xylene.

NONROAD MOBILE SOURCES

DATA SOURCES

The primary data source used for making the nonroad estimates was U.S.EPA's nonroad model, issued June 1998, and revised July and October 1998. U.S.EPA's nonroad model and supporting documentation can also be downloaded from the OMS website[1]. The nonroad model provides emission estimates for VOC, particulate matter and other criteria pollutants by SCC in each county. Non road equipment types included in U.S.EPA's nonroad model and included in this inventory are shown below:

Equipment Types From U.S.EPA's Nonroad Model

Construction Equipment
Farm Equipment
Industrial Equipment
Lawn & Garden Equipment
Light Commercial Equipment
Logging Equipment
Recreational Boats
Recreational Vehicles
Service Equipment

Equipment Types Not Included in U.S.EPA's Nonroad Model

Aircraft
Commercial Marine Vessels
Railroads

VOC emissions were converted to TOG, and then speciation profiles from RAPIDS were applied. Speciation profiles obtained from RAPIDS as of March 1999 were used for non road mobile source HAP estimates.

Nonroad Mobile Speciation Profiles

Code	Category	Fuel	Material Speciated
1098	Air Taxi	Gas	TOG
1098	Aircraft	Gas	TOG
1201	Commercial Marine Vessels	Diesel	TOG
0001	Commercial Marine Vessels	Residual	TOG
1186	Construction Equipment	Gas	TOG
1201	Construction Equipment	Diesel	TOG
31203	Construction Equipment	Gas	PM
32104	Construction Equipment	Diesel	PM
1186	Farm Equipment	Gas	TOG

1201	Farm Equipment	Diesel	TOG
31203	Farm Equipment	Gas	PM
32104	Farm Equipment	Diesel	PM
1099	General Aviation	Gas	TOG
1101	Industrial Equipment	Gas	TOG
1186	Industrial Equipment	Gas	TOG

For nonroad source estimates obtained using the U.S.EPA nonroad model the following air toxics were inventoried: acetaldehyde, acrolein, arsenic, benzene, Butadiene,13, chromium, copper, ethylbenzene, formaldehyde, lead, manganese, mercury, naphthalene, nickel, phenol, styrene, toluene, m-xylene, o-xylene, and p-xylene.

For categories not included in U.S.EPA's nonroad model, the remainder of this document explains how those categories were inventoried.

RAILROADS

The SCC used for railroads is 2285002005. Air toxics inventoried include acetaldehyde, arsenic, chromium, copper, formaldehyde, lead, manganese, mercury and nickel. The activity is gallons of diesel fuel consumed. Railroad activity for 1996 was estimated from data developed for the 1990 ozone inventory. The 1990 railroad activity was based on measured county miles of tracks, traffic density, and a fuel consumption index for class 1 railroads. A growth factor of 1.05 was developed using the estimated change in the total nationwide miles of railroad travel between 1990-1996 obtained from the 1997 Statistical Abstract of United States[4]. It was assumed the national change in the total miles of railroad travel was representative of the change in railroad miles for Indiana. It was also assumed that Class II and Class III railroads changed at the same rate as the Class I railroads.

The VOC and particulate emission factors used for this category were obtained from the U.S. EPA Office of Mobile Sources[1] in a fact sheet released in December, 1997. The emission factors used are:

EMISSION FACTORS

Pollutant	lb/1000 gals
PM	17.53
VOC	34.17

VOC emissions were then converted to TOG using conversion factors from RAPIDS. Air toxics were estimated using speciation profiles from RAPIDS.

SAMPLE CALCULATION

Adams County

905,873 gallons * 34.17 lbs VOC/1000 gallons * 1 lb TOG/lb VOC * 0.0291 lbs acetaldehyde/lb TOG = 901 lbs acetaldehyde

COMMERCIAL MARINE VESSELS

The SCCs for this category are 2280002000, for diesel fuel usage, and 2280003000, for residual fuel usage. The air toxics inventoried include acetaldehyde and formaldehyde.

This category consists of the emissions that result from waterborne commercial activities. It does not include estimates for recreational boating activities which are included in U.S.EPA's Nonroad Model. This category includes ports in Lake and Porter Counties along Lake Michigan in Northwest Indiana. The ports included are the Indiana Harbor in Lake County, and Burns Harbor in Porter County. No air emission estimates were made for the ports or commercial marine vessel activities along the Ohio River.

The 1996 Waterborne Commerce of the United States: Waterways and Harbors on the Great Lakes[5] was used to estimate the level of activity. The activity is the number of reported vessels entering and leaving these ports and the draft size of those vessels. The methodology followed was from U.S.EPA's Procedures for Emission Inventory Preparation, Volume IV (July 1989)[6]. Following this methodology there are two activities that must be estimated to account for commercial marine vessel emissions, underway and dockside emissions. Underway emissions are emissions that result in combustion of fuel while moving. Dockside emissions result from ships sitting at rest along the dock, but with the engines idling.

UNDERWAY EMISSIONS

The underway emissions calculation uses average fuel consumption rates for vessels of different drafts, emission factors based upon draft, and the area of Lake Michigan that is under Indiana's jurisdiction. The surface area (228 square miles) of Lake Michigan in Indiana is multiplied by 0.275 to determine the average hours of travel (62.7 hours).

Using this estimate of time in travel an estimate of the fuel consumed can be made using the average he u06ties along t9s

DOCKSIDE EMISSIONS

To calculate dockside emissions it was assumed that all foreign vessels use residual fuel and all domestic vessels use diesel fuel, that vessels spend three days at dock, and that residual fuel is consumed at a rate of 660 gallons per day and diesel fuel at a rate of 1,900 gallons per day. To estimate the amount of fuel consumed, data on the number of foreign and domestic vessels from the 1996 Waterborne Commerce[5] were used.

DOCKSIDE FUEL CONSUMPTION RATES AND EMISSIONS FACTORS FOR COMMERCIAL MARINE VESSELS

Vessel Draft	Consumption Rates	Emission Factors (lb/1000 gallon)
	Gallon/day	VOC
Foreign (residual fuel)	660	59.0
Domestic (diesel fuel)	1,900	3.2

SAMPLE CALCULATION

Lake County dockside residual emissions

68 vessels * 3 days * 660 gallons/day * 59 lbs VOC/1000 gallons * 1.72 lb TOG/lb VOC * 0.42 lbs formaldehyde/lb TOG = 5738 lbs formaldehyde

Air toxic emissions were calculated using speciation profiles obtained from RAPIDS. Underway estimates were totaled and combined with the dockside estimates by fuel type and entered as a county total into RAPIDS.

AIRCRAFT

Aircraft emissions were estimated from operations data obtained from the Indiana Department of Transportation Aeronautics Division[7]. INDOT maintains operations information for four general types of aircraft (commercial, air taxi, general aviation and military) at its website. Each operation represents either a landing or a takeoff, so the county total number of operations were divided by two to match the emission factors. If a county has multiple airports, the operations at each airport were combined for a county total number of operations.

Due to the lack of aircraft and engine specific data at Indiana airports, composite emission factors for a combined landing and takeoff operation (LTO) were developed from the Federal Aviation Administration FAA Aircraft Engine and Emission Database (FAAED)[8] using data from table S_lto.dbf. The factors used are shown below:

SCC/AMS CODE	AIRCRAFT	LB VOC/LTO
2275001000	Military	27.10
2275020000	Commercial	7.16
2275060000	Air taxi	1.23
2275050000	General aviation	0.39

VOC were converted to TOG and air toxics were estimated using speciation profiles from RAPIDS. Air toxics inventoried include acetaldehyde, acrolein, benzene, Butadiene,13, ethylbenzene, formaldehyde, naphthalene, phenol, styrene, toluene, and o-xylene.

SAMPLE CALCULATION

Adams County Commercial Aircraft Estimate

471 operations/year * 1 LTO/2 operations * 7.16 lbs VOC/LTO * 1.18 lbs TOG/lb VOC * 0.047 lbs acetaldehyde/lb TOG = 93 lbs acetaldehyde/year

RESULTS

The attached table provides mobile source emission totals by county.

REFERENCES

1. United States Environmental Protection Agency, Office of Mobile Sources, Emissions Estimation/Modeling Software & Databases, December, 1998 available at http://www.epa.gov/oms/
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6. United States Environmental Protection Agency, Procedures for Emission Inventory Preparation, Volume IV Mobile Sources, EPA-450/4-81-026(d), July 1989.
7. Indiana Department of Transportation, Intermodal Transportation Division, Aeronautics Section, December, 1998 available at http://www.state.in.us/dot/intermodal/aero.htm
8. FAA Aircraft Engine Emission Database (FAAED) and Users Guide, Version 2.0, December 1998, available at http://www.epa.gov/oms/nonrdmd1.htm

INFORMATION

For more information about Indiana's air toxics inventory, please contact:

Jon Bates
Office of Air Mgmt.
IN Dept. of Envir. Mgmt.
P.O. Box 6015
101 N. Senate Ave.-Room 1001
Indianapolis, IN 46206

(P) 317-233-4226
(F) 317-233-5697
(E) jbate@opn.dem.state.in.us

Table B-1: Indiana Mobile Source emissions by county in pounds/year (continued)

	Clinton	Crawford	Daviess	Dearborn	Decatur	Dekalb	Delaware	Dubois	Elkhart	Fayette	Floyd	
Acetaldehyde	19619.71	7400.35	12777.13	18700.18	17043.46	24345.8	55728.17	22739.43	83110.09	9437.34	22706.35	
Acrolein	1486.62	501.88	834.29	1370.71	1248.83	1809.54	8127.48	1655.59	9566.4	1003.81	1860.6	
Antimony	67.68	29.91	34.83	76.01	63.39	74.77	226.79	66.15	247.12	32.71	108.41	
Arsenic	136.38	54.87	65.39	147.33	120.09	144.74	428.71	130.93	476.15	64.57	207.42	2 0.775

Table B-1: Indiana Mobile Source emissions by county in pounds/year (continued)

	Fountain	Franklin	Fulton	Gibson	Grant	Greene	Hamilton	Hancock	Harrison	Hendricks	Henry
Acetaldehyde	11412.03	9450.43	12109.81	19466.75	32986.59	18473.88	81201.98	39912.3	15161.07	45050.65	27003.06
Acrolein	699.17	722.15	1196.25	1379.85	3489.68	1286.55	8969.26	5741.62	1188.89	3377.71	2037.83
Antimony	35.1	34.55	37.06	67.63	116.97	57.22	241.23	142.64	67.31	141.66	105.39

Table B-1: Indiana Mobile Source emissions by county in pounds/year (continued)

	Huntington	Jackson	Jasper	Jay	Jefferson	Jennings	Johnson	Knox	Kosciusko	Lagrange	Lake	
cetaldehyde	23014.84	25830.1	22875.54	11373.18	12920.49	11073.74	41105.03	20924.18	31040.71	19954.56	176730.4	
crolein	2066.07	2187.04	1552.2	1236.49	1918.1	1618.97	4344.93	1445.92	3459.1	1641.51	16803.6	
ntimony	83.1	97.32	80.85	37.88	42.55	41.49	122.85	70.08	109.81	77.87	662.46	
rsenic	157.32	179.91	156.62	75.03	80.93	77.21	238.32	137.78	206.35	151.44	1254.04	
enzene	43346.95	46810.18	37020.73	21740.03	26815.12	21779.32	73310.5	37542.13	69426.38	43052.85	330102	26879

Table B-1: Indiana Mobile Source emissions by county in pounds/year (continued)

	Laporte	Lawrence	Madison	Marion	Marshall	Martin	Miami	Monroe	Montgomery	Morgan	Newton
Acetaldehyde	60888.52	16901.22	55708.74	376862.9	26195.24	4604.28	17918.15	36877.51	22558.74	26207.73	12049.39
Acrolein	5232.8	1825.84	5914.59	51563.4	2292.07	332.96	1084.07	4868.57	2069.72	2113.42	789.93
Antimony	205.16	62.68	206.48	1410.35	98.45	18.46	56.04	135.11	80.9	103.66	32.5
Arsenic	396.54	120.99	398.65	2680.11	190.89	33.72	106.74	257.34	156.73	202.18	62
Benzene	110722.7	37184.52	128940.7	846408.1	50472.43	8213.81	28213.59	84717.04	42775.33	55221.5	15717.28
Butadiene,13	116577	39986	135375	885682	54411	9280.9	30369.6	90152	44613	59141.5	17145.3
Cadmium	101.18	29.32	105.53	707	50.34	8.56	28.39	68.53	42.2	51.7	15.53
Chromium	204.48	59.53	196.06	1347.24	94.15	17.22	55.6	124.64	79.61	104.18	31.49
Cobalt	2.72	0.83	2.84	18.01	1.36	0.25	0.78	1.79	1.1	1.36	0.42
Copper	1372.64	413.92	1377.18	9198.93	660.97	119.86	375.76	880.82	532.15	689.7	217.77
Ethylbenzene	57925.65	19501.96	67332.54	441958.5	26337.12	4411.06	14943.93	44006.29	21944.31	29221.24	8286.16
Formaldehyde	171601.7	47736.95	154615.4	1052623	74540.05	13129.09	51103.81	103336.3	64155.99	73411.01	34852.98
Lead	341.45	80.56	249.82	1601.79	138.96	28.97	107.59	153.59	126.53	147	73.56
Manganese	732.14	217.84	704.55	4604.62	345.01	61.52	197.71	443.82	269.71	352.67	117.57
Mercury	12.72	3.06	9.93	63.05	4.68	1.08	3.74	5.79	4.39	5.45	2.55
Naphthalene	275	104	280	5152	90			426	122.5		46
Nickel	70.29	20.58	67.32	434.15	32.15	6.36	18.84	38.9	25.72	34.04	12.19
Phenol	116	44	120	2173	38			182	52.2		19.5
Styrene	189	72	192	3528	62			292	85.4		32.5
Toluene	375645.2	127192.6	436661.1	2851237	172368.5	29113.23	97465.85	286235.2	142710.1	190358.7	54183.32
Xylene,M	13339.83	3584.63	15554.72	116425.1	4173.64	452.62	2849.3	8817.04	4558.43	5869.12	1326.48
Xylene,O	114073	38616.8	132590.9	865997.2	52334.62	8841.64	29592.35	86921.93	43333.22	57794.25	16453.21
Xylene,P	176326	60441	204941	1324830	82484	14140.2	46269.8	135332	67386	90123.8	25910.5

Table B-1: Indiana Mobile Source emissions by county in pounds/year (continued)

	Noble	Ohio	Orange	Owen	Parke	Perry	Pike	Porter	Posey	Pulaski	Putnam	
Acetaldehyde	24558.44	1647.46	6841.54	7594.78	8588.91	8278.98	7867.98	80100.46	17961.07	9971.21	24508.78	
Acrolein	1821.18	141.31	873.45	527.44	723.94	787.75	539	5960.59	1168.79	700.81	2493.29	
Antimony	73.82	7.59	26.95	29.05	34.84	32.71	26.89	244.86	57.67	29.64	85.15	
Arsenic	147.08	13.03	49.91	54.15	68.07	61.33	53.55	476.99	111.33	55.06	164.29	
Benzene	40604.07	3675.45	14170.62	13447.12	18968.22	18323.7	13893.2	118205.7	30892.47	16108.26	40219.33	
Butadiene,13	42544	3907.8	15352.6	14749.2	20305.1	19370.5	15082.94	121808	32805.6	17340.3	42808.5	
Cadmium	36.46	3.51	13.58	12.96	16.5	16.05	13.3	122.28	29.54	12.96	44.95	
Chromium	70.99	6.41	24.69	28.09	33.95	31.28	28.16	247.23	58.17	28.97	87.76	
Cobalt	1.05	0.1	0.38	0.37	0.47	0.47	0.34	3.39	0.76	0.4	1.11	
Copper	522.98	45.56	174.68	189.37	226.87	217.5	185.84	1673.76	384.87	182.85	570.66	
Ethylbenzene	20792.92	1894.86	7352.21	7158.8	9912.59	9588.93	7143.71	61195.15	16152.52	8493.12	20784.22	
Formaldehyde	70373.32	4666.46	19635.64	21686.75	24360.92	23261.3	22487.97	272379.8	51124.54	28634.66	70362.61	
Lead	128.54	8.5	34.71	42.38	45.1	47.08	40.92	440.28	107.94	54.27	152.72	
Manganese	288.47	22.84	87.61	100.97	113.89	107.45	102.04	904.32	200.08	94.55	294.47	
Mercury	4.51	0.33	1.38	1.63	1.61	1.91	1.65	16.38	3.97	1.99	6.12	
Naphthalene	78		85			26.05		417		22	249	
Nickel	26.79	2.2	8.19	10	11.12	10.69	9.08	85.94	18.88	9.2	28.7	
Phenol	33.5		36.4			10.53		177		9	106	
Styrene	54		58.5			17.05		286		16	171	85.9

Appendix C: Michigan Toxic Emissions Inventory

Michigan's portion of the mobile sources toxic inventory was unavailable at time of publication.

For further information please contact:

Mr. Gary Baker
Michigan Department of Environmental Quality
Air Quality Division
Hollister Building, 4th Floor
P.O. Box 30270
106 W. Allegan
Lansing, MI 48909

(P) 517.373.7058
(F) 517.919.1265
(E) gbaker@great-lakes.net

Appendix D: Minnesota Toxic Emissions Inventory

Each of the emission factors were combined with the appropriate activity factor, vehicle miles traveled (VMT), to obtain TOG and PM10 emissions.

The source of the VMT data and the specific inputs to the US EPA models will be discussed further.

Mobile5b Emission Factors For TOG

U.S. EPA's Mobile5b model uses many factors to create TOG emission factors for on-road vehicles, including ambient temperature, gasoline type, and inspection/maintenance program effects. The model also accounted for the use of ethanol in fuel in Minnesota. To account for some of these factors, the MPCA calculated TOG emission factors for four different areas of the state:

1. Twin Cities Metropolitan Area: Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington counties. Some vehicles in the metro area were required to participate in an inspection/maintenance (I/M) program in 1996.
2. Northeast Minnesota
3. Northwest Minnesota
4. Central Minnesota

The latter three areas did not have an I/M program, but TOG emission factors were calculated separately to account for variations in ambient temperature. In addition, separate emission factors were calculated for each season to account for seasonal temperature changes on emissions. Average temperatures were calculated for the four seasonal divisions: March to May, June to August, September to November, and December to February. Since the inventory was for the calendar year 1996, the 'winter division' was not continuous so January, February, and December 1996 were calculated individually.

MPCA calculated TOG emission factors for seven speed classes that represent 12 roadway functional classes.

Functional Class	**Speed (MPH)**
Rural Interstate	60
Rural Principal Arterial	45
Rural Minor Arterial	40
Rural Major Collector	40
Rural Minor Collector	40
Rural Local	20
Urban Interstate	50
Urban Freeway	50
[redacted]rincipal Arterial	33

40

Urban Collector	30
Urban Local	20

The factors were specific to vehicle type, season, geographic area, and roadway type. The emission factors were combined with county and functional class specific VMT activity data to obtain TOG estimates for all 87 counties in Minnesota.

Part5 Emission Factors For PM10

U.S. EPA's Part5 model produces VMT-based PM10 emission factors but with fewer inputs than the

PM10 emission factors based on the amount of fuel used were used[5]. HC emissions were converted to TOG using appropriate conversion factors. Air toxics were speciated from those emissions data from EPA's NTI and SPECIATE database[6].

AIRCRAFT

MPCA estimated air toxics emissions from three types of aircraft: commercial, air taxis, and general aviation. Insufficient information was available to estimate emissions for military aircraft. TOG emissions were estimated using emission factors based on default time-in-mode (TIM)[7] and state-specific landing and takeoff operations (LTO) data. The U.S. Department of Transportation provided detailed LTO information. Air toxics emissions were speciated from the TOG emissions.

LOCOMOTIVES

Locomotive emissions were calculated using fuel use-based emission factors for volatile organic compounds (VOC) and PM10[8]. Individual railway companies with operations in Minnesota provided information on fuel use for their line and yard haul operations. Line haul operations emitted 0.0211 pounds of hydrocarbons (HC) per gallon of fuel used and 0.0116 lb/gal of PM10. Yard haul operations emitted 0.0506 lb/gal and 0.0138 lb/gal of HC and PM10, respectively. HC emissions were converted to VOC using appropriate conversion factors. Fuel use was apportioned to the counties in which the railways operated. The VOC and PM10 emissions were speciated to obtain air toxics emissions from locomotives.

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5. *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*

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INFORMATION

For more information about Minnesota's air toxics inventory, please contact:

Ms. Chun Yi Wu
Environmental Outcomes Division
MN Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55155-4194

(P) 651-282-5855
(F) 651-297-7709
(E) chun.yi.wu@pca.state.mn.us

Table D-1: Minnesota Mobile Source emissions by county in pounds/year (continued)

	Hubbard	Isanti	Itasca	Jackson	Kanabec	Kandiyohi	Kittson
Acetaldehyde	17,567.61	19,059.81	15,134.42	21,246.59	18,114.89	15,094.97	34,886.97
Acrolein	896.20	980.12	1,498.31	980.68	730.04	1,376.94	1,005.50
Anthracene	0.15	0.11	0.11	0.19	0.16	0.11	0.32
Arsenic	0.02	0.03	0.04	0.02	0.01	0.04	0.01
Benz(a)anthracene	2.07	1.40	1.28	2.54	2.26	1.30	4.61
Benz(ghi)perylene	4.16	2.84	2.66	5.06	4.51	2.69	9.10
Benzene	56,864.66	57,156.52	74,514.10	60,670.02	50,330.15	73,036.25	68,870.37
Benzo(a)pyrene	1.30	0.92	0.91	1.57	1.39	0.91	2.74
Benzo(b)fluoranthene	1.28	0.97	1.07	1.50	1.32	1.07	

Table D-1: Minnesota Mobile Source emissions by county in pounds/year (continued)

	Koochiching	Lac Qui Parle	Lake	Lake of the Woods	Le Sueur	Lincoln	Lyon
Acetaldehyde	14,989.13	23,834.77	23,245.20	46,625.39	14,042.75	28,668.16	13,965.51
Acrolein	728.48	804.55	1,012.95	1,072.18	907.66	773.52	953.57
Anthracene	0.13	0.22	0.20	0.45	0.11	0.27	0.11
Arsenic	0.01	0.01	0.02	0.00	0.02	0.01	0.03
Benz(a)anthracene	1.82	3.06	2.72	6.44	1.48	3.87	1.41
Benz(ghi)perylene	3.64	6.06	5.41	12.70	2.98	7.64	2.86
Benzene	44,075.08	52,929.69	55,444.17	89,070.53	51,204.78	58,537.95	50,710.34
Benzo(a)pyrene	1.13	1.84	1.66	3.81	0.96	2.30	0.92
Benzo(b)fluoranthene	1.08	1.67	1.55	3.36	0.99	2.05	0.96
Benzo(k)fluoranthene	1.08	1.74	1.57	3.58	0.93	2.17	0.89
Butadiene,13	5,632.65	6,897.26	7,139.92	11,832.63	6,412.39	7,712.45	6,341.42
Chromium	9.16	14.91	13.53	30.77	7.81	18.60	7.53
Chrysene	3.45	3.71	4.13	5.59	4.34	3.86	4.32
Copper	99.24	67.26	100.78	34.54	154.43	44.92	156.41
Dibenz(a,h)anthracene	0.18	0.28	0.26	0.58	0.15	0.35	0.15
Ethylbenzene	19,723.88	26,167.97	25,398.01	48,169.81	20,169.23	30,551.39	19,916.97
Fluoranthene	1.29	2.07	1.88	4.25	1.12	2.57	1.08

Table D-1: Minnesota Mobile Source emissions by county in pounds/year (continued)

	Mower	Murray	Nicollet	Nobles	Norman	Olmsted	Otter Tail
Acetaldehyde	13,597.28	21,365.78	14,238.49	15,867.86	25,481.84	30,685.85	19,540.79
Acrolein	1,193.82	672.14	1,039.72	1,030.54	781.45	5,392.10	2,058.72
Anthracene	0.10	0.20	0.11	0.13	0.24	0.23	0.13
Arsenic	0.03	0.01	0.03	0.02	0.01	0.09	0.06
Benz(a)anthracene	1.26	2.83	1.41	1.69	3.40	1.90	1.51
Benz(ghi)perylene	2.60	5.60	2.88	3.41	6.73	3.97	3.18
Benzene	66,916.85	48,954.32	61,672.31	57,288.41	56,621.99	165,976.89	108,465.13
Benzo(a)pyrene	0.88	1.70	0.95	1.09	2.04	1.49	1.12
Benzo(b)fluoranthene	1.01	1.54	1.04	1.12	1.84	1.95	1.41
Benzo(k)fluoranthene	0.88	1.61	0.93	1.06	1.92	1.51	1.15
Butadiene,13	8,262.70	6,378.75	7,658.74	7,180.66	7,400.36	21,963.49	13,298.93
Chromium	7.19	13.74	7.75	8.90	16.47	11.90	9.30
Chrysene	6.01	3.43	5.41	4.84	3.91	15.34	10.01
Copper	241.64	61.84	207.88	170.54	63.79	666.27	424.58
Dibenz(a,h)anthracene	0.14	0.26	0.15	0.17	0.31	0.25	0.19
Ethylbenzene	24,751.77	24,259.87	22,402.12	23,344.16	28,762.65	55,868.42	37,999.58
Fluoranthene	1.07	1.91	1.13	1.28	2.29	2.07	1.41
Formaldehyde	35,931.82	46,014.72	36,329.98	38,771.88	54,551.56	91,103.49	54,805.74
Indeno(1,2,3-cd)pyrene	0.17	0.27	0.17	0.19	0.32	0.31	0.23
Lead	53.69	13.72	48.28	42.81	14.16	150.03	100.57
Manganese	6.02	17.17	7.22	9.25	20.71	6.19	6.18
Mercury	1.82	3.42	2.02	2.41	4.10	3.12	2.59
Naphthalene	3,171.31	825.68	2,523.17	2,263.02	913.48	8,607.00	5,486.57
Nickel	5.26	9.20	5.57	6.28	11.00	9.31	7.10
Phenanthrene	0.49	0.71	0.49	0.53	0.85	1.90	0.69
Phenol						286.92	0.00
Pyrene	1.05	1.32	1.04	1.08	1.57	2.38	1.55
Styrene	13,105.61	4,462.46	11,108.38	9,564.36	4,122.66	36,247.07	22,729.04
Toluene	155,053.92	111,378.83	134,017.47	133,233.76	131,067.58	375,563.53	248,850.43
Xylene,M	41,697.57	10,846.81	33,129.26	29,766.29	12,082.15	112,655.21	72,116.37
Xylene,O	22,907.75	5,984.66	18,324.61	16,322.98	6,446.58	62,340.35	39,681.11

Table D-1: Minnesota Mobile Source emissions by county in pounds/year (continued)

	Pennington	Pine	Pipestone	Polk	Pope	Ramsey	Red Lake	
Acetaldehyde	16,786.51	20,310.57	20,883.07	15,274.30	20,373.23	185,385.32	42,481.11	
Acrolein	679.08	1,570.12	752.53	1,379.46	753.82	11,513.93	1,030.02	
Anthracene	0.15	0.16	0.19	0.11	0.19	0.67	0.40	
Arsenic	0.01	0.04	0.01	0.04	0.01	0.36	0.01	
Benz(a)anthracene	2.11	1.93	2.64	1.36	2.60	6.74	5.81	
Benz(ghi)perylene	4.20	3.96	5.23	2.79	5.16	14.63	11.46	
Benzene	41,848.58	88,670.66	48,393.07	67,437.38	49,947.25	727,909.79	81,212.38	
Benzo(a)pyrene	1.29	1.31	1.59	0.93	1.58	5.51	3.44	
Benzo(b)fluoranthene	1.19	1.45	1.46	1.05	1.46	7.62	3.04	7.621.19

[redacted]

ls/year (continued)

	Scott	Sherburne
7.70	39,464.64	17,755.29
4.62	2,384.97	1,689.68
9.14	0.16	0.13
9.01	0.07	0.05
1.96	1.72	1.45
3.91	3.66	3.02
5.66	147,304.38	92,708.09
1.21	1.32	1.05
1.16	1.70	1.27
1.16	1.36	1.78
9.58	15,234.50	11,394.23
9.81	10.91	8.66
3.58	12.67	0.47
9.43	543.89	353.43
9.19	0.22	0.17
1.09	43,643.36	31,616.52
1.38	1.67	1.30
7.59	72,073.38	48,788.73
9.20	0.27	0.21
2.33	125.97	84.86

Table D-1: Minnesota Mobile Source emissions by county in pounds/year (continued)

	Sibley	St. Louis	Stearns	Steele	Stevens	Swift	Todd
Acetaldehyde	17,013.88	51,534.52	30,705.77	15,682.61	20,141.44	20,999.42	14,374.45
Acrolein	766.64	7,234.64	3,687.25	1,303.91	696.51	810.35	945.55
Anthracene	0.15	0.33	0.20	0.12	0.18	0.19	0.11
Arsenic	0.01	0.18	0.11	0.04	0.01	0.02	0.02
Benz(a)anthracene	2.08	3.27	2.06	1.43	2.57	2.61	1.49
Benz(ghi)perylene	4.14	7.04	4.44	2.93	5.09	5.19	3.01
Benzene	50,704.08	317,143.12	191,526.79	70,360.92	44,581.39	50,679.09	52,655.52
Benzo(a)pyrene	1.29	2.65	1.65	0.98	1.55	1.59	0.96
Benzo(b)fluoranthene	1.24	3.63	2.23	1.10	1.40	1.47	1.00
Benzo(k)fluoranthene	1.23	2.77	1.72	0.97	1.46	1.50	0.94
Butadiene,13	6,457.10	39,156.40	23,379.87	8,705.54	5,808.02	6,548.11	6,588.31
Chromium	10.43	21.81	13.74	8.05	12.53	12.86	7.89
Chrysene	3.99	29.79	17.98	6.27	3.13	3.71	4.48
Copper	115.53	1,308.75	785.56	248.70	57.24	83.70	160.90
Dibenz(a,h)anthracene	0.20	0.45	0.28	0.16	0.24	0.25	0.15
Ethylbenzene	21,957.45	113,742.79	65,833.72	25,939.60	22,100.64	23,931.90	20,589.62
Fluoranthene	1.47	3.48	2.14	1.18	1.74	1.79	1.13
Formaldehyde	38,821.02	152,986.80	89,960.78	41,140.94	43,968.03	46,655.08	35,505.06
Indeno(1,2,3-cd)pyrene	0.21	0.57	0.35	0.18	0.25	0.26	0.17
Lead	25.71	314.13	182.95	62.22	18.91	25.38	42.00
Manganese	12.06	10.06	6.89	7.02	15.62	15.68	8.07
Mercury	2.61	6.45	3.81	2.28	3.34	3.45	2.20
Naphthalene	1,455.12	18,221.41	10,283.34	3,185.68	752.20	1,066.86	2,020.62
Nickel	7.13	17.41	10.82	5.90	8.43	8.72	5.60
Phenanthrene	0.58	2.00	1.10	0.53	0.65	0.68	0.47
Phenol		112.73					
Pyrene	1.12	4.21	2.55	1.13	1.20	1.28	0.97
Styrene	6,860.10	54,812.29	41,258.24	13,059.22	4,122.00	5,459.22	8,862.97
Toluene	113,348.07	781,528.74	445,214.91	159,971.32	101,348.04	114,218.53	117,845.96
Xylene,M	19,107.10	241,218.03	135,257.31	41,905.32	9,880.76	14,012.18	26,549.28
Xylene,O	10,564.93	127,970.05	74,178.71	22,971.42	5,453.60	7,738.97	14,635.29
Xylenes,Iso	87,511.13	444,578.96	255,368.24	101,637.56	88,913.65	95,958.67	81,188.39

Appendix E: New York Toxic Emissions Inventory

ON-ROAD SOURCES

Speed and Hot/Cold start data was obtained from the March 1993 report New York State 1990 Base Ozone Year Carbon Monoxide and Ozone Precursor On-Road Mobile Source Inventory by Radian Corporation and the New York State Department of Environmental Conservation.

Vehicle Miles Traveled information was obtained through the NYSDOT from 1996 Highway Performance Monitoring System (HPMS) data. This HPMS count data was then adjusted for each month using a Seasonal Adjustment Factor (SAF) before being apportioned to the county roadway level.

NON-ROAD SOURCES

Nonroad mobile source emissions were estimated using two separate methodologies. New York is modeled for all sixty-two counties separately. In addition, New York is separated into two areas due to the federally mandated Reformulated Gas (RFG) Program. This program is in place in the New York City Metropolitan Area.

Emissions from 2-stroke gasoline, 4-stroke gasoline and diesel fueled off-highway vehicles as well as emissions from recreational marine vessels, were estimated using the U.S. EPA Draft Nonroad Model. Emissions from aircraft, commercial marine vessels and locomotives were estimated using New York's 1990 Baseline mobile source emissions. This data was then grown to a value for 1996 using Bureau of Economic Analysis (BEA) growth factors.

Using the EPA Nonroad Model, nonroad emissions from New York were estimated for each individual county for each month of the year. Temperature and fuels blend data varied by month for each county across the state.

Temperature data for 1996 was acquired from the National Weather Service which included historical weather data from thirteen airport locations across the state of New York as well as surrounding locations. This information was used to develop average high and low temperatures for each month on a county by county basis. The results were input into the Nonroad Model.

Fuels blend data for 1996 was acquired from the New York State Department of Agriculture and Markets. This data is based on thousands of samples collected across the state from fueling stations and retention areas. These samples are then analyzed for many profiles including oxygen content, Reid Vapor Pressure (RVP) and sulfur content. The data provided average monthly fuels profiles on a county by county basis. The results were input into the Nonroad Model.

Aircraft, commercial marine and locomotive data was downloaded from the U.S. EPA inventory website. This data is grouped by SCC codes. 1990 nonroad emissions for New York were then grown to 1996 using BEA growth factors based on gross state product.

Speciation of all pollutants to develop an air toxics inventory was completed using the RAPIDS emission estimator. Results for New York include twenty-five TOG speciated pollutants and six PM speciated pollutants.

INFORMATION

For more information about New York's air toxics inventory, please contact:

Mr. Rob McDonough
Div. of Air Resources
NY Dept. of Envir. Conser.
P.O. Box 3250
Albany, NY 12233

(P) 2NY 12233

Table E-1: New York Mobile Source emissions by county in pounds/year (continued)

Table E-1: New York Mobile Source emissions by county in pounds/year (continued)

	Orange	Orleans	Oswego	Otsego	Putnam	Queens	Rensselaer
Acetaldehyde	171197.75	21198.06	48197.89	33314.05	41285.58	668971.04	59522.55
Acrolein	23164.44	1648.63	4992.43	3164.49	4915.69	138132.09	6034.47
Anthracene	0.69	0.23	0.59	0.44	0.31	3.94	0.43
Arsenic	0	0	0	0	0	1	0
Benz(a)anthracene	9.62	3.27	8.53	6.31	4.56	22.41	6.17
Benz(ghi)perylene	18.91	6.45	16.81	12.43	8.98	39.27	12.16
Benzene	454462.59	69660.8	198506.49	127832.73	166636.9	1157211.02	215761.32
Benzo(a)pyrene	5.67	1.93	5.02	3.72	2.69	13.33	3.64
Benzo(b)fluoranthene	4.93	1.68	4.38	3.24	2.34	10.17	3.17
Benzo(k)fluoranthene	5.29	1.8	4.71	3.48	2.51	10.93	3.4
Butadiene,13	119546.78	14009.17	41382.91	25047.39	39999.07	358895.38	51434.83
Chromium	42.45	5.72	10.87	7.93	7.87	146.17	14.32
Chrysene	7.26	2.47	6.45	4.77	3.45	15.47	4.67
Copper	52.37	5.05	17.14	11.07	15.1	91.28	18.18

15611.0715.191.28

Table E-1: New York Mobile Source emissions by county in pounds/year (continued)

	St. Lawrence	Steuben	Suffolk	Sullivan	Tioga	Tompkins	Ulster
Acetaldehyde	20114.92	72699.15	547068.65	55586.32	26906.2	39708.93	82252.04
Acrolein	1747.31	6066.58	59301.32	7038.14	2744.94	3426.94	8795.49
Anthracene	0.03	0.55	2	2.2	0.23	0.33	1.14
Arsenic	0	0	1	0	0	0	0
Benz(a)anthracene	0.49	7.92	28.4	31.86	3.4	4.76	16.53
Benz(ghi)perylene	0.97	15.61	55.88	62.77	6.69	9.36	32.58
Benzene	53144.74	213164.28	1746380.25	407416.02	99808.43	128641.32	357573.34
Benzo(a)pyrene	0.29	4.67	16.74	18.78	2	2.8	9.75
Benzo(b)fluoranthene	0.25	4.07	14.57	16.36	1.74	2.44	8.49
Benzo(k)fluoranthene	0.27	4.37	15.64	17.57	1.87	2.62	9.12
Butadiene,13	14707.92	47095.29	461763.39	56281.17	22687.92	28702.05	71760.96
Chromium	5.86	19.45	134.58	8.29	6.29	11.05	19.08
Chrysene	0.37	5.99	21.45	24.09	2.57	3.59	12.5
Copper	7.04	25.11	171.56	11.08	11.06	9.11	29.19
Dibenz(a,h)anthracene	0.03	0.81	2.72	3.55	0.36	0.49	1.79
Ethylbenzene	35966.6	157890.2	1185617.56	347985.39	74041.3	94238	275872.92
Fluoranthene	0.32	5.19	18.69	20.85	2.22	3.12	10.82
Formaldehyde	54629	189443.33	1516507.59	127681.95	72024.74	103403.99	215295.24
Indeno(1,2,3-cd)pyrene	0.03	0.82	2.75	3.6	0.36	0.49	1.82

Table E-1: New York Mobile Source emissions by county in pounds/year (continued)

	Warren	Washington	Wayne	Westchester	Wyoming	Yates	**State Total**
Acetaldehyde	49812.9	27537.81	38216.09	365858.93	24692.47	14579.51	**6674915.99**
Acrolein	5238.2	2407.53	2960.94	35106.9	1718.43	1259.86	**705584.39**
Anthracene	1.27	0.18	0.27	1.57	0.36	0.28	**41.79**
Arsenic	0	0	0	1	0	0	**6.00**
Benz(a)anthracene	18.34	2.58	3.9	22.56	5.22	3.99	**565.00**
Benz(ghi)perylene	36.13	5.09	7.69	44.44	10.29	7.87	**1107.61**
Benzene	267100.94	87322.44	113024.57	1073360.72	84712.5	61224.96	**20089655.11**
Benzo(a)pyrene	10.81	1.52	2.3	13.3	3.08	2.35	**333.19**
Benzo(b)fluoranthene	9.42	1.33	2	11.58	2.68	2.05	**288.62**
Benzo(k)fluoranthene	10.11	1.42	2.15	12.44	2.88	2.2	**309.92**
Butadiene,13	41892.57	20683.48	25527.64	271339.94	14499.34	10073.62	**4883721.18**
Chromium	11.63	7.5	10.9	95.57	7.3	4	**1772.53**
Chrysene	13.86	1.95	2.95	17.06	3.95	3.02	**425.49**
Copper	12.07	8.07	9.11	118.03	4.05	3.03	**1724.89**
Dibenz(a,h)anthracene	2.02	0.26	0.39	2.19	0.55	0.43	**56.19**
Ethylbenzene	220249.07	62927.71	81169.71	744940.09	66408.01	49334.01	**14037505.92**
Fluoranthene	12	1.69	2.55	14.79	3.42	2.61	**377.98**
Formaldehyde	120597.14	72717.99	99137.4	995654.21	59802.02	35526.68	**17893044.51**
Indeno(1,2,3-cd)pyrene	2.04	0.26	0.4	2.22	0.56	0.44	**56.88**
Lead	137.68	86.64	108.65	1336.47	47.65	37.45	**19739.90**
Manganese	14.26	8.79	13.33	119.63	8.56	4.17	**2154.15**
Mercury	5.4	3.55	4.51	44.84	2.78	1.84	**750.07**
Naphthalene	3462.62	2618	3098	35955.62	1329	877	**605604.14**
Nickel	7.09	4.5	7.03	64.21	3.84	2.38	**1106.19**
Phenanthrene	4.31	0.61	0.92	5.42	1.22	0.94	**180.65**
Phenol	15.84	0	0	246.98	0	0	**18161.47**
Pyrene	7.71	1.08	1.64	9.5	2.19	1.68	**245.16**
Styrene	21681.77	10849.41	13153.85	143558.09	7350.99	5184.11	**2485813.22**
Toluene	1054413.97	377144.8	472735.27	4660754.24	331335.31	240706.88	**84538479.51**
Xylene,M	3667.11	2054.41	2712.7	35656.85	1314.58	984.4	**529270.73**
Xylene,O	66261.05	50175.91	59436.14	684563.42	25575.82	16747.49	**11472055.99**
Xylene,p	79896	60515	71516	828604	30694	20278	**13826101.00**
Xylenes,Iso	949141.47	257186.57	332538.35	2999454.93	282422.15	211673.07	**56932625.09**

Appendix F: Ohio Toxic Emissions Inventory

DATA SOURCES

On-Road Mobile Sources

Construction of the on-road inventory required coordination with the Ohio Department of Transportation (ODOT) and Ohio EPA's Mobile Source Section. ODOT has provided Ohio EPA with average daily vehicles-miles of travel (VMT) for each of the eight types of highway vehicles and for each arterial classification (road type) . EPA's Mobile Source Section generated TOG and PM10 emission factors by running U.S.EPA's Mobile5a and Part5 Models. The TOG emission factors included tailpipe exhaust and evaporative organic compounds except emissions from vehicle refueling and the PM10 emission factors included tailpipe exhaust, break-wear and tire-wear emissions. The emission inventory program utilized the daily VMT data file and the emission factors to construct intelligent import data files and import into the Regional Air Pollutant Inventory Development System (RAPIDS). RAPIDS accepted the raw data and calculated TOG and PM10 emissions for each one of the Ohio's 88 counties, vehicle type and arterial classification. Toxic emissions were calculated using RAPIDS speciation profiles.

Off-Road Mobile Sources

Ohio crea Tc -0ya thefInv

INFORMATION

For more information about Ohio's air toxics inventory, please contact:

Mr. Tom Velalis
Div. of Air Pollution Control
OH Environmental Protection Agency
P.O. Box 1049
Columbus, OH 42315

(P) 614-644-4837
(F) 614-644-3681
(E) tom.velalis@epa.state.oh.us

Table F-1: Ohio's Mobile Source emissions by county in pounds/year (continued)

	Brown	Butler	Carroll	Champaign	Clark	Clermont	Clinton
Acetaldehyde	10700.88	28919.56	9519.96	9541.22	22615.77	20649.56	12483.90
Acrolein	914.15	4215.23	600.80	793.89	3046.24	2845.71	1192.64
Anthracene	0.05	0.01	0.07	0.05	0.01	0.01	0.05
Benz(a)anthracene	0.77	0.09	1.01	0.74	0.18	0.18	0.76
Benzene	26044.45	118677.01	25142.20	25874.52	70353.91	74255.57	34440.01
Benzo(a)pyrene	0.45	0.05	0.60	0.44	0.11	0.10	0.45
Benzo(b)fluoranthene	0.39	0.05	0.52	0.38	0.09	0.09	0.39
Benzo(k)fluoranthene	0.42	0.05	0.56	0.41	0.10	0.10	0.42
Butadiene,13	8743.38	32103.63	9280.10	8754.37	18829.85	19994.41	10974.26
Chromium	7.08	21.60	7.15	6.54	14.90	15.44	8.61
Chrysene	0.58	0.07	0.76	0.56	0.14	0.13	0.57
Dibenz(a,h)anthracene	0.07	0.01	0.09	0.07	0.02	0.02	0.07

Table F-1: Ohio's Mobile Source emissions by county in pounds/year (continued)

	Columbiana	Coshocton	Crawford	Cuyahoga	Darke	Defiance	Delaware
Acetaldehyde	15314.57	10267.42	8410.89	149681.40	9628.04	9849.60	20440.51
Acrolein	2009.90	901.19	791.63	29646.16	998.70	896.58	2584.13
Anthracene	0.02	0.05	0.04	0.26	0.03	0.05	0.03
Benz(a)anthracene	0.25	0.76	0.56	0.28	0.50	0.68	0.40
Benzene	51618.63	30006.49	26149.04	558811.04	29394.87	28755.91	62840.18
Benzo(a)pyrene	0.15	0.45	0.33	0.18	0.29	0.40	0.24
Benzo(b)fluoranthene	0.13	0.39	0.29	0.01	0.26	0.35	0.21
Benzo(k)fluoranthene	0.14	0.42	0.31	0.01	0.28	0.38	0.22
Butadiene,13	14367.81	9905.65	8395.44	155466.40	9015.95	9423.51	17485.85
Chromium	10.88	7.07	5.98	109.63	6.92	6.77	12.84
Chrysene	0.19	0.57	0.42	0.06	0.38	0.52	0.30
Dibenz(a,h)anthracene	0.02	0.07	0.05	0.00	0.05	0.06	0.04
Ethylbenzene	36492.26	20043.26	17643.54	392887.11	20059.41	19322.89	44196.56
Fluoranthene	0.16	0.50	0.37	0.90	0.33	0.45	0.26
Formaldehyde	44850.27	26468.32	22069.73	459382.41	26084.90	25659.26	59307.81
Indeno(1,2,3-cd)pyrene	0.02	0.07	0.05	0.00	0.05	0.06	0.04
Manganese	4.60	5.69	4.43	36.82	4.48	5.18	5.94
Mercury	0.27	0.84	0.62	0.02	0.55	0.75	0.44
Naphthalene	2285.23	961.81	896.55	28512.40	1091.45	945.23	2739.14
Nickel	7.72	4.91	4.11	79.77	4.77	4.69	9.20
Phenanthrene	0.06	0.18	0.13	4.28	0.12	0.16	0.09
Phenol				1115.64			
Pyrene	0.10	0.32	0.23	0.80	0.21	0.29	0.17
Styrene	7656.72	3419.65	3132.27	86039.96	3727.48	3378.81	9144.44
Toluene	243533.69	120863.00	108767.93	2687051.32	125975.29	117645.89	291309.20
Xylene,O	42479.39	17835.91	16652.01	482461.63	20191.60	17573.53	50667.03
Xylenes,Iso	141126.78	78475.97	68980.34	1518943.70	77971.15	75657.46	170383.91

Table F-1: Ohio’s Mobile Source emissions by county in pounds/year (continued)

	Erie	Fairfield	Fayette	Franklin	Fulton	Gallia	Geauga	
Acetaldehyde	18581.82	15431.57	13505.85	149791.48	12576.42	11893.03	12498.52	12498.52 1189305.85

1575.75 124.318 157.442

ions by county in pounds/year (continued)

a	Meigs	Mercer	Miami	Monroe
.46	11136.20	9824.45	16739.20	14374.69
.53	686.23	897.11	2210.67	727.73
.01	0.08	0.05	0.02	0.12
.22	1.17	0.68	0.29	1.73
.77	25744.74	29319.47	60311.85	32714.91
.13	0.69	0.40	0.17	1.02
.11	0.60	0.35	0.15	0.89
.12	0.64	0.37	0.16	0.95
.65	9765.85	9507.16	16719.19	13142.45
.19	7.51	7.21	12.30	9.99
.17	0.88	0.51	0.22	1.31

Table F-1: Ohio's Mobile Source emissions by county in pounds/year (continued)

	Montgomery	Morgan	Morrow	Muskingum	Noble	Ottawa	Paulding
Acetaldehyde	100068.28	14307.10	29107.69	32737.70	18384.13	11299.08	11223.40
Acrolein	48702.78	611.29	2572.91	4426.11	807.85	1077.01	601.12
Anthracene	1.19	0.13	0.13	0.02	0.16	0.05	0.09
Benz(a)anthracene	1.26	1.89	1.93	0.33	2.37		

Table F-1: Ohio's Mobile Source emissions by county in pounds/year (continued)

	Wayne	Williams	Wood	Wyandot	**State Total**
Acetaldehyde	17914.34	12054.20	25550.38	13671.68	**1892409.38**
~~Acrolein~~	~~2356.85~~	~~1130.00~~	~~3426.55~~	~~993.66~~	**~~290547.34~~**
Anthracene	0.02	0.05	0.02	0.08	**5.63**
Benz(a)anthracene	0.26	0.73	0.24	1.21	**55.42**
Benzene	58696.92	30116.23	81535.25	30733.04	**5974988.07**
Benzo(a)pyrene	0.16	0.43	0.14	0.71	**32.75**
Benzo(b)fluoranthene	0.14	0.37	0.12	0.62	**27.41**
Benzo(k)fluoranthene	0.15	0.40	0.13	0.66	**29.43**
Butadiene,13	16287.68	9623.12	21626.77	11105.80	**1756712.20**

Appendix G: Ontario Toxic Emissions Inventory

BACKGROUND

The Province of Ontario, Canada, has developed a mobile source air toxic emissions inventory on the target compounds for the Great Lakes Regional Air Toxic Emissions Inventory Project for calendar year 1996. In 1996, Ontario had a population of 10,753,573 million people, which represented 11.7 percent of the total population of the Great Lakes region. The table below provides a brief demographic overview of the province of Ontario.

Demographic Characteristics for the Ontario Area of Great Lakes Regional Air Toxics Emissions Inventory

	Ontario
Total Population, 1996	10,753,573
Urban Population, 1996	8,958,741
Rural Population, 1996	1,794,832

Source: 1996 Statistics Canada Census

This inventory is Part 2 of a comprehensive 1996 air toxic emissions inventory which included point, area, and mobile sources. The point and area source emission inventory had been developed in Part 1 and completed in November 1999. Ontario followed the Air Toxic Emissions Inventory Protocol and the transportation sources methodologies agreed upon by the project's Technical Steering Committee in developing the regional inventory where applicable. Targeted emissions information were estimated from domestic activities and statistics from various organizations (e.g., Ontario Ministry of Transportation, Statistics Canada). These sources of information were deposited into Ontario's Regional Air Pollution Inventory Development System (RAPtl re f 0V c334n nventory el is Part 2 of 9S147 0.75 re f

Aviation

The aircraft movement statistics for each airport were obtained from the Ministry of Transportation to derive the landing-takeoff (LTO) cycles. Corresponding toxic substance speciation profiles were then applied to the estimated VOC and PM emissions to obtain the toxic emissions.

QUALITY CHECK ACTIVITIES

During the development of this air toxic emissions inventory, quality check activities, such as technical reviews and accuracy checks, were performed to ensure that representative activity information was obtained and that the most appropriate emission profiles were used for each source.

UNCERTAINTIES

Most of the emission estimates in this air toxic emissions inventory were based on the best available activity information and source emission profiles.

Uncertainties also exist on the use of emission factor tables which vary in terms of data quality. In preparing this emission inventory, Ontario has further updated some of the RAPIDS emission factor tables with the most recent information from FIRE, AP-42, and EIIP.

RESULTS

Ontario's 1996 Great Lakes Toxic Emissions Inventory for mobile sources included toxic estimates of 31 substances out of 82 Great Lakes air toxic substances. The emissions from mobile sources for each county in Ontario are provided in the County Emissions table at the end of Ontario's portion of the report document.

INFORMATION

For more information about Ontario's air toxics inventory, please contact:

Mr. Peter Wong
Envir. Monitoring & Reporting Branch
Ontario Ministry of Environment
125 Resources Rd. - East Wing
Etobicoke, ON M9P 3V6

(P) 416-235-6130
(F) 416-235-5818
(E) wongpe@ene.gov.on.ca

Table G-1: Ontario Mobile Source emissions by county in pounds/year (continued)

	Hastings	Huron	Kenora	Kent	Lambton	Lanark	Leeds and Grenville
Acetaldehyde	50,708	49,481	35,593	80,592	61,772	24,756	47,707
Acrolein	4,775	2,041	3,324	5,481	3,938	1,896	4,605
Anthracene	5.300E-01	4.200E-01	4.100E-01	5.600E-01	5.200E-01	2.700E-01	4.700E-01
Arsenic	3.300E-01	1.300E-01	1.900E-01	4.500E-01	2.400E-01	1.300E-01	3.300E-01
Benz(a)Anthracene	9	6	6	9	8	4	8
Benzene	134,729	81,133	90,308	129,375	123,420	62,443	125,361
Benzo(a)pyrene	7	5	5	7	7	3	7

Table G-1: Ontario Mobile Source emissions by county in pounds/year (continued)

	Lennox and Addington	Manitoulin	Middlesex	Muskoka	Niagara	Nipissing	Northumberland
Acetaldehyde	21,264	6,206	120,998	27,527	131,556	36,781	53,997
Acrolein	2,063	485	11,560	2,934	12,334	4,271	4,741
Anthracene	2.000E-01	8.000E-02	1.140E+00	3.700E-01	1.270E+00	5.200E-01	4.700E-01
Arsenic	1.500E-01	4.000E-02	7.300E-01	1.900E-01	8.300E-01	2.500E-01	3.600E-01
Benz(a)Anthracene	3	1	18	6	20	8	7
Benzene	54,525	17,870	293,294	82,629	339,367	111,806	121,417
Benzo(a)pyrene	3	1	15	4	18	6	6
Benzo(b)fluoranthene	4	1	20	5	23	7	8
Benzo(g,h,i)perylene	8	3	40	12	46	17	1746

Table G-1: Ontario Mobile Source emissions by county in pounds/year (continued)

	Ottawa-Carleton	Oxford	Parry Sound	Peel	Perth	Peterborough	Prescott and Russell
Acetaldehyde	199,268	57,482	24,586	375,727	36,566	37,776	30,669
Acrolein	35,537	4,612	2,949	103,839	2,247	3,341	2,685
Anthracene	2.250E+00	4.400E-01	3.400E-01	4.140E+00	3.300E-01	4.600E-01	3.400E-01
Arsenic	1.190E+00	3.400E-01	2.200E-01	1.400E+00	1.500E-01	2.100E-01	2.000E-01
Benz(a)Anthracene	30	7	5	36	5	7	5
Benzene	519,542	117,944	76,995	670,318	77,329	108,083	80,253
Benzo(a)pyrene	27	6	4	32	4	6	4
Benzo(b)fluoranthene	35	8	5	41	5	7	5
Benzo(g,h,i)perylene	67	16	12	79	12	16	12
Benzo(k)fluoranthene	26	6	4	30	4	6	4

Table G-1: Ontario Mobile Source emissions by county in pounds/year (continued)

	Prince Edward	Rainy River	Renfrew	Simcoe	Stormont, Dundas	Sudbury District	Sudbury Region
Acetaldehyde	9,111	13,146	39,278	126,421	51,804	25,251	33,382
Acrolein	696	1,075	3,501	12,993	4,461	2,950	3,812
Anthracene	1.000E-01	1.900E-01	4.800E-01	1.470E+00	5.000E-01	5.700E-01	3.700E-01
Arsenic	5.000E-02	7.000E-02	2.300E-01	8.900E-01	3.100E-01	2.000E-01	2.200E-01
Benz(a)Anthracene	2	3	8	23	8	8	6
Benzene	23,350	36,374	111,258	373,376	128,207	99,877	100,505
Benzo(a)pyrene	1	2	6	20	7	6	5
Benzo(b)fluoranthene	2	2	7	25	9	6	7
Benzo(g,h,i)perylene	3	6	17	53	18	17	13
Benzo(k)fluoranthene	1	2	6	19	7	5	5
Butadiene,13	4,842	6,751	22,703	81,732	28,509	14,772	24,256
Chromium	5	8	22	76	30	16	15
Chrysene	1	2	7	21	7	7	5
Copper	5	6	23	112	37	24	23
Dibenzo(a,h)anthracene	2.000E-01	3.300E-01	1.000E+00	3.310E+00	1.110E+00	1.040E+00	8.400E-01
Ethylbenzene	16,437	27,515	81,052	267,366	89,541	85,805	65,072
Fluoranthene	1	2	6	21	7	6	5
Formaldehyd1,052							

Table G-1: Ontario Mobile Source emissions by county in pounds/year (continued)

Thunder Bay	Timiskaming	Toronto	Victoria	Waterloo

Appendix H: Pennsylvania Toxic Emissions Inventory

ON-ROAD EMISSIONS

Highway Vehicles

Highway vehicle emissions comprise a significant portion of Pennsylvania's toxic emission inventory. This impact is due to both tailpipe and evaporative emissions from vehicles operating in both urban and surrounding areas. DEP has coordinated with the Pennsylvania Department of Transportation (PennDOT) to develop the necessary data to produce highway vehicle emission estimates.

Pennsylvania's emission inventory includes the following vehicle classifications:

Light-Duty Gasoline Vehicles (passenger cars) [LDGV]
Light-Duty Gasoline Trucks 0-6000 lbs. gross vehicle weight rating [LDGT1]
Light-Duty Gasoline Trucks 6001-8500 lbs. gross vehicle weight rating [LDGT2]
Heavy-Duty Gasoline Vehicles [HDGV]
Light-Duty Diesel Vehicles [LDDV]
Light-Duty Diesel Trucks [LDDT]
Heavy-Duty Diesel Vehicles [HDDV]
Motorcycles [MC]

The inventory illustrates each county's emissions. The data and methods presented in the inventory represent the Commonwealth's approach based on EPA guidance. The MOBILE Model is used for

PennDOT's official source of highway information. Like the RMS, the HPMS is a data storage and maintenance facility and contains additional information required by the FHWA.

PPAQ is Post Processor for Air Quality - provides a flexible linkage between network-based transportation demand forecasting systems and EPe0 -15 TD yMOBILE modelke UsysteragePe0ardway.info0 -15 BEA)ke TS, ityе as are MS,anPppl thPo0 -15T*581 380 0.398 380 0.3ans

distributions are compiled and adjusted to match recorded and estimated truck volumes on each highway segment or link.

NON-ROAD MOBILE SOURCES

Pennsylvania assembled a 1996 inventory of Volatile Organic Compound (VOC) for each of the 67 counties following the methodologies listed below. Those data were then exported into the Regional Air Pollutant Inventory Development System (RAPIDS) where they were speciated into their toxic components.

Lawn and Garden Equipment

This category includes off-highway exhaust emissions from small engines that would typically have residential applications such as lawn mowers, garden tractors, electric generators, etc. Emissions from lawn and garden equipment are calculated by apportioning state off-highway fuel use to the local level to determine an activity factor, then apply emission factors from Tables I-03 and I-04 of the *EPA Non-road Engine and Vehicle Emission Study-Report*[6]. The emission factors are weighted assuming the reference above. The activity factor used for calculating these emissions is the quantity of fuel used annually by lawn and garden equipment. The state off-highway gasoline fuel usage for 1995 is 68,550,000 gallons from *Highway Statistics 1995*[5]. The national average of off highway fuel used for lawn and garden equipment is 20 percent based on *NEDS Fuel Use Report*[8] and the Highway Statistics. It is therefore assumed that 20 percent of the statewide off-highway fuel use is used by lawn and garden equipment. The 20 percent statewide fuel use is then multiplied by the housing density that is apportioned to the county which determines the activity factor in gallons. The housing density for a

Emission factors for farm equipment were from *Compilation of Air Pollutant Emission Factors*[3]. Hydrocarbon emissions for gasoline powered equipment is the sum of exhaust, crankcase, and evaporative loss. Diesel emissions are reflective of exhaust only.

The *1992 Census of Agriculture*, Pennsylvania was the latest available data as of July 1, 1994. The report is issued every five years and then takes approximately a year to be released for publication. The 1992 edition was compared to the 1987 edition to determine if enough variations exist to make projections.

Vessels (Commercial)

Commercial and military vessel emissions were estimated based on the quantity of fuel sold for marine use. The emissions are estimated using a standard set of assumptions regarding the percentage of fuel sold that is actually used within the port area, and the emission rate associated with the use of the fuel.

Sales data for residual and distillate oil use for marine purposes in the state were found in the *National Petroleum Factbook*[7] published as state summaries. To apportion state fuel sales to a particular port or harbor, the relative level of port activity must be established. To do this, an inventory of vessel activity for port and state was obtained from *Waterborne Commerce of the Unites States*[9]. In part 2 of that document, a table is provided for each port within the state, indicating the number of commercial vessels, by size (draft), that enter and leave.

In apportioning total statewide marine fuel sales, distillate fuel and residual fuel are considered separately. To apportion residual fuel, the assumption is made that only vessels with a draft of 18 feet or more use residual oil. The quantity of distillate oil sold in port is estimated in a similar fashion using *Waterborne Commerce of the Unites States*[9]. to determine the total number of vessels with drafts of 18 feet or more and those with drafts of less than 18 feet. The proportioning equations for distillate and residual fuel oil are found *in Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*[2].

All of the fuel sold in port is not used there. An assumption can be made, however, that 25 percent of the residual oil and 75 percent of the distillate oil sold in port is used there. This is based on method developed by the EPA.

To estimate emissions, an emission factor is applied to the quantities of residual and distillate fuel oils used in port. These emission factors are found in *Compilation of Air Pollutant Emission Factors*[3] for motor vessels and steamships. An assumption is made that all distillate oil is used by motorships, while all residual oil is used by steamships.

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2. Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-450/4-81-026d (Revised) December 1988.

3. Compilation of Air Pollutant Emission Factors, Fourth Edition and Supplements, AP-42, U.S. EPA, Research Triangle Park, NC 27711, September 1985.
4. 1987 Census of Agriculture, Pennsylvania: State and County Data, Geographic Area Series, Volume 1, Part 38, U.S. Department of Commerce, Washington, D.C., April 1989.
5. Highway Statistics 1995, Unites States Department of Transportation, Federal Highway Administration, Washington, D.C.
6. Non-road Engine and Vehicle Study-Report, EPA-21A-2001 Certification Division, Office of Mobile Sources, Air and Radiation Division, U.S. EPA, Washington, D.C., November 1991.

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

	Bradford	Bucks	Butler	Cambria	Cameron	Carbon	Centre
Acetaldehyde	13888.56	121520.76	33556.25	28722.64	1598.92	15547.54	32842.95

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

	Chester	Clarion	Clearfield	Clinton	Columbia	Crawford	Cumberland
Acetaldehyde	105125.69	15701.46	25354.89	14512.99	16971.23	20144.07	59441.36
Acrolein	9638.07	1907.74	3279.15	1873.99	2072.72	2356.49	7676.38
Arsenic	0.31	0.09	0.14	0.08	0.07	0.08	0.29
Benzene	447033.92	76191.68	132303.66	78940.38	99853.01	115419.28	333289.69
Butadiene,13	55308.45	9498.59	16753.16	9981.24	12273.91	14012.58	41938.05
Chromium	10.15	2.40	4.10	2.17	2.27	2.69	8.19
Copper	2394.42	376.25	654.22	360.77	411.66	534.89	1516.05
Ethylbenzene	181849.88	31473.29	55043.67	32533.36	40809.27	46983.78	136735.21
Formaldehyde	287571.21	42426.10	67909.80	38704.88	45005.29	53655.15	158076.06
Lead	554.63	162.59	267.60	140.89	132.60	149.59	524.73
Manganese	18.00	3.95	6.85	3.64	3.94	4.76	13.75

f 409.5 388.5 77

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

	Lancaster	Lawrence	Lebanon	Lehigh	Luzerne	Lycoming	Mc Kean
Acetaldehyde	92933.16	19050.55	24195.95	67819.84	67684.10	26537.58	3433.10

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

	Mercer	Mifflin	Monroe	Montgomery	Montour	Northampton	Northumberland
Acetaldehyde	31872.42	10173.87	29018.04	169165.47	7012.94	44742.29	17392.50
Acrolein	3892.39	1214.57	3950.67	15599.88	846.61	5792.94	2139.73
Arsenic	0.14	0.04	0.14	0.45	0.04	0.15	0.07
Benzene	175331.91	61057.38	181493.47	748727.01	35787.99	285872.31	106883.72
Butadiene,13	21595.62	7434.71	23187.77	90898.42	4415.38	36072.83	13118.19
Chromium	4.30	1.37	4.40	15.69	1.04	5.32	2.49
Copper	760.58	256.69	853.02	3964.74	175.29	1143.00	486.46
Ethylbenzene	71424.41	25000.47	74131.63	302689.44	14783.95	115959.36	43821.50
Formaldehyde	85138.58	26947.07	76017.53	461946.56	18875.93	117073.87	45893.46
Lead	265.89	74.61	258.66	820.26	68.23	282.32	133.91
Manganese	7.32	2.43	7.62	28.21	1.73	9.52	4.43
Mercury	6.18	1.53	5.74	15.97	1.67	5.60	2.70
Naphthalene	10453.41	3609.86	11232.38	43917.49	2146.20	17447.74	6371.27
Nickel	5.75	1.77	5.80	20.04	1.42	6.82	3.20
Styrene	27879.51	10382.19	30441.22	110501.10	6423.87	45103.77	18461.17
Toluene	487299.09	169940.05	512325.97	2060443.85	100469.55	800067.90	298588.02
Xylene,M	147584.79	51621.67	151330.14	632069.16	30170.05	238995.89	90193.76
Xylene,O	76898.99	27071.11	79226.81	327513.36	15881.17	124526.56	47363.64
Xylenes,Iso	267608.40	92587.51	287500.04	1120692.57	55288.04	445296.61	163466.89

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

Table H-1: Pennsylvania Mobile Source emissions by county in pounds/year (continued)

	Wayne	Westmoreland	Wyoming	York	**State Total**

Appendix I: Wisconsin Toxic Emissions Inventory

DATA SOURCES

network VMT (about 10% of the total VMT). The Wisconsin Department of Transportation (WDOT) provided estimated 1996 VMTs for the remaining 65 counties of Wisconsin. These estimates were obtained from the Highway Performance Monitoring System (HPMS), a nationwide system for compiling transportation data. The WDNR allocated the VMT to the eight vehicle types based on:

(1) Vehicle type distributions compiled by SEWRPC.

(2) Vehicle type distributions compiled by WDOT (for HPMS).

(3) Statistical summaries of the number of LDGVs, LDGT1s, and LDGT2s tested in Wisconsin's motor vehicle inspection and maintenance (I/M) program.

A summary of the resulting 1996 statewide VMT estimates follows:

Wisconsin 1996 Statewide VMT Estimates

Vehicle Type	Average Daily VMT	Annual VMT	

are subject to both a vehicle inspection and maintenance (I/M) program and to federal reformulated gasoline (RFG).)

(2) Walworth County. (This is the only county in the SEWRPC planning region that is not subject to I/M and not subject to RFG.)

(3) Sheboygan County. (This is the only county outside of the SEWRPC planning region that is subject to I/M. It is not subject to RFG.)

(4) Remaining 64 Counties of Wisconsin. (These counties, all outside of the SEWRPC planning region, are not subject to I/M and are not subject to RFG.)

For regions (1) and (2), which comprise the seven SEWPPC counties, WDNR computed month-specific and vehicle-type-specific emission factors for the 14 different speed classes provided by SEWRPC. And, for regions (3) and (4), which comprise the 65 non-SEWRPC counties, WDNR computed month-specific and vehicle-type-specific emission factors for 12 different speeds provided by WDOT (one speed for each of the 12 HPMS functional classes).

For each of the eight vehicle types within each of the 72 counties, WDNR then computed final monthly emission factors for each of the 12 months by taking a VMT-weighted average of the month-specific emission factors for each of the different speeds. These monthly emission factors were then multiplied by the monthly VMT to obtain monthly emission estimates for each of the eight vehicle types within each of the 72 counties. These monthly emission estimates were then summed to obtain annual emission estimates.

PART5 Emission Factors for PM10

The WDNR's methodology for calculating PM10 emission factors was consistent with its methodology for calculating VOC emission factors described above. Since the PART5 model required a smaller set of inputs than MOBILE5a, some of the complexities of the VOC emission factor calculation were not necessary in calculating the PM10 emission factors. For example, the calculation of monthly emission factors was not necessary since the PART5 model does not include inputs for the modeling parameters that vary significantly by month of the year (e.g., ambient temperature and fuel volatility).

Toxic Emission Estimation

Emissions were calculated by speciating the relevant GLC toxic pollutants from the TOG and PM10 emission estimations. VMT emission factors were used for four pollutants (acetaldehyde, benzene, formaldehyde, and 1,3 butadiene). These emission factors were obtained from the Wisconsin portion of the Mobile5 run for the 1996 National Toxics Inventory. VOC estimations from MOBILE5a were converted to TOG by applying a TOG to VOC emission factor. For accurate toxics estimations TOG and PM10 data were broken out into the component parts. For TOG the components are tailpipe exhaust (EXHC) and all evaporative emissions (EVHC) except emission from vehicle refueling. PM10 components included tailpipe exhaust emissions (EXPM), break-wear emissions (BW10), and tire-wear emissions (TW10). Fugitive dust emissions were not included.

Off-Road Sources

This report section describes the WDNR's estimation procedures for toxic air pollutant emissions from off-road sources. In general, toxic pollutants were speciated from EXHC and PM10 data estimations for each off-road equipment type.

A more detailed description of the components and procedures used follows.

EXHC and PM10 Estimation

EXHC and PM10 data were calculated from the application of an emission factor based on horsepower hour (HP-HR), for which default data was used based on equipment type, and equipment population. The evaporative component of the VOC data (EVHC) was not available. For off-road sources EXHC represents the total VOC emissions.

Equipment Population

Equipment population is defined by the total number of a certain type of equipment being use in a particular county. Some examples of equipment types are lawnmowers, outdoor grills, construction equipment, chain saws, and off-road recreational equipment. Equipment population data were obtained from the 1992 USEPA publication/database called Methodology to Calculate Non-Road Emissions Inventories at the County and Sub-County Level. The database had equipment population activity for the 6 county area (Kenosha, Milwaukee, Ozaukee, Racine, Washington, and Waukesha Counties), as well as Sheboygan County. The equipment populations were estimated from surveys on suppliers and users of non-road equipment. We then apportioned the equipment to rest of the counties using per capita estimates. This state specific equipment population was incorporated into RAPIDS using intelligent import Method I. Intelligent import Method I allows the user to supply SCC specific activity data by season for the purposes of emission estimation.

AIRCRAFT SOURCES

This report section describes the WDNR's estimation procedures for toxic air pollutant emissions from aircraft sources. In general, toxic pollutants were speciated from TOG data estimations for each aircraft type.

A more detailed description of the components and procedures used follows.

TOG Estimation

TOG data were calculated from the application of an emission factor based on time-in-mode (TIM), the amount of time spent in each phase of the lift off and landing cycle for a particular aircraft, and the number of landings and take-offs for the same aircraft type (LTO). Default data were used for the TIM estimates. LTO data for each county were obtained from the US Department of Transportation, Bureau of Transportation Statistics; 1996 Airport Activity Statistics document. TOG estimates were incorporated into RAPIDS using intelligent import Method II. Intelligent import Method II allows the user to supply pre-calculated TOG estimates by aircraft type for emission estimation.

INFORMATION

For more information about Pennsylvania's air toxics inventory, please contact:

Mr. Orlando Cabrera-Rivera
Bureau of Air Mgmt.
WI Dept. of Natural Resources
P.O. 7921 , 101 S. Webster St. - 7th Floor
Madison, WI 53707

(P) 608-267-2466
(F) 608-267-0560
(E) cabreo@mail01.dnr.state.wi.us

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year

	Adams	Ashland	Barron	Bayfield	Brown	Buffalo
Acetaldehyde	6931.03	5982.44	16375.78	7240.82	68509.00	5604.39
Acrolein	656.97	681.30	1706.97	730.59	8595.10	546.01
Anthracene	0.06	0.06	0.16	0.06	0.78	0.05
Arsenic	0.03	0.03	0.08	0.04	0.27	0.03
Benz(a)anthracene	1.07	0.99	2.67	1.01	12.58	0.92
Benzene	44814.64	38802.05	105942.62	47695.14	424679.70	37489.27
Benzo(a)pyrene	0.52	0.49	1.32	0.48	6.49	0.45
Benzo(b)fluoranthene	0.45	0.43	1.15	0.42	5.64	0.39
Benzo(ghi)perylene	1.74	1.65	4.43	1.60	21.63	1.51
Benzo(k)fluoranthene	0.49	0.46	1.24	0.45	6.06	0.42
Butadiene,13	6168.82	5387.78	14656.31	6376.42	61097.07	5109.81
Chromium	4.22	3.74	10.03	4.26	43.18	3.47
Chrysene	0.67	0.63	1.70	0.61	8.31	0.58
Copper	147.05	123.91	340.11	163.36	1262.21	121.06
Dibenz(a,h)anthracene	0.09	0.09	0.24	0.09	1.18	0.08
Ethylbenzene	19048.13	19522.01	49148.40	20141.71	226507.95	16198.62
Fluoranthene	0.58	0.55	1.47	0.53	7.27	0.50
Formaldehyde	18168.65	15453.14	42617.14	19257.23	174702.66	14704.31
Indeno(1,2,3-cd)pyrene	0.10	0.09	0.24	0.09	1.19	0.08
Lead	30.50	24.57	70.89	34.74	250.41	23.93
Manganese	3.89	3.55	9.43	3.66	44.35	3.23
Mercury	0.94	0.80	2.26	0.99	9.19	0.72
Naphthalene	1241.85	1193.38	3049.11	1397.64	12536.96	1033.35
Nickel	3.47	3.07	8.27	3.50	35.80	2.87
Phenanthrene	0.21	0.20	0.53	0.19	2.97	0.18
Phenol					103.02	
Pyrene	0.37	0.35	0.94	0.34	4.68	0.32
Styrene	6490.74	6569.68	16251.31	7228.56	69648.03	5504.37
Toluene	109428.81	114093.90	283514.03	118680.27	1293203.19	92543.22
Xylene,M	22527.64	24470.74	59073.31	25899.68	263262.31	18783.65
Xylene,O	12160.18	13112.42	31718.85	13946.72	140669.80	10158.02
Xylenes,Iso	77585.97	79356.70	199949.51	81658.12	924224.34	66064.98

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Burnett	Calumet	Chippewa	Clark	Columbia	Crawford
Acetaldehyde	5419.58	12165.52	19677.27	12494.12	27229.70	6942.25
Acrolein	544.37	1294.73	2151.01	1216.10	2927.91	757.62
Anthracene	0.05	0.13	0.20	0.12	0.17	0.06
Arsenic	0.03	0.05	0.09	0.06	0.16	0.03

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

Pollutant	Dane	Dodge	Door	Douglas	Dunn	Eau Claire
Butadiene,13	118973.99	25270.25	10187.91	14388.99	15090.25	26650.12
Acetaldehyde	138912.53	28065.66	11368.71	15866.94	18432.42	30337.98
Acrolein	17312.29	2803.82	1192.31	1905.51	2017.70	3486.61

1192.31

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Florence	Fond Du Lac	Forest	Grant	Green	Green Lake
Acetaldehyde	1986.76	31998.38	4062.65	17486.40	10232.84	6473.14
Acrolein	189.60	3394.20	403.86	1702.69	1056.11	643.02
Anthracene	0.02	0.34	0.03	0.18	0.12	0.07
Arsenic	0.01	0.14	0.02	0.08	0.04	0.03
Benz(a)anthracene	0.31	5.66	0.61	3.01	1.91	1.22
Benzene	12407.58	205992.41	26802.89	110300.05	65688.21	42227.35
Benzo(a)pyrene	0.15	2.87	0.29	1.53	0.98	0.63
Benzo(b)fluoranthene	0.13	2.50	0.26	1.33	0.86	0.55
Benzo(ghi))perylene	0.51	9.60	0.98	5.10	3.28	2.09
Benzo(k)fluoranthene	0.14	2.69	0.27	1.43	0.92	0.59
Butadiene,13	1700.77	28935.52	3615.30	12856.53	7625.36	4905.26
Chromium	1.22	20.17	2.42	10.87	6.51	4.12
Chrysene	0.19	3.68	0.38	1.96	1.26	0.80
Copper	40.83	635.58	89.04	342.84	197.36	126.72
Dibenz(a,h)anthracene	0.03	0.52	0.05	0.28	0.18	0.11
Ethylbenzene	5494.74	100552.60	11419.95	50768.09	32135.56	19903.36
					1.09	0.69
					26156.08	16606.21

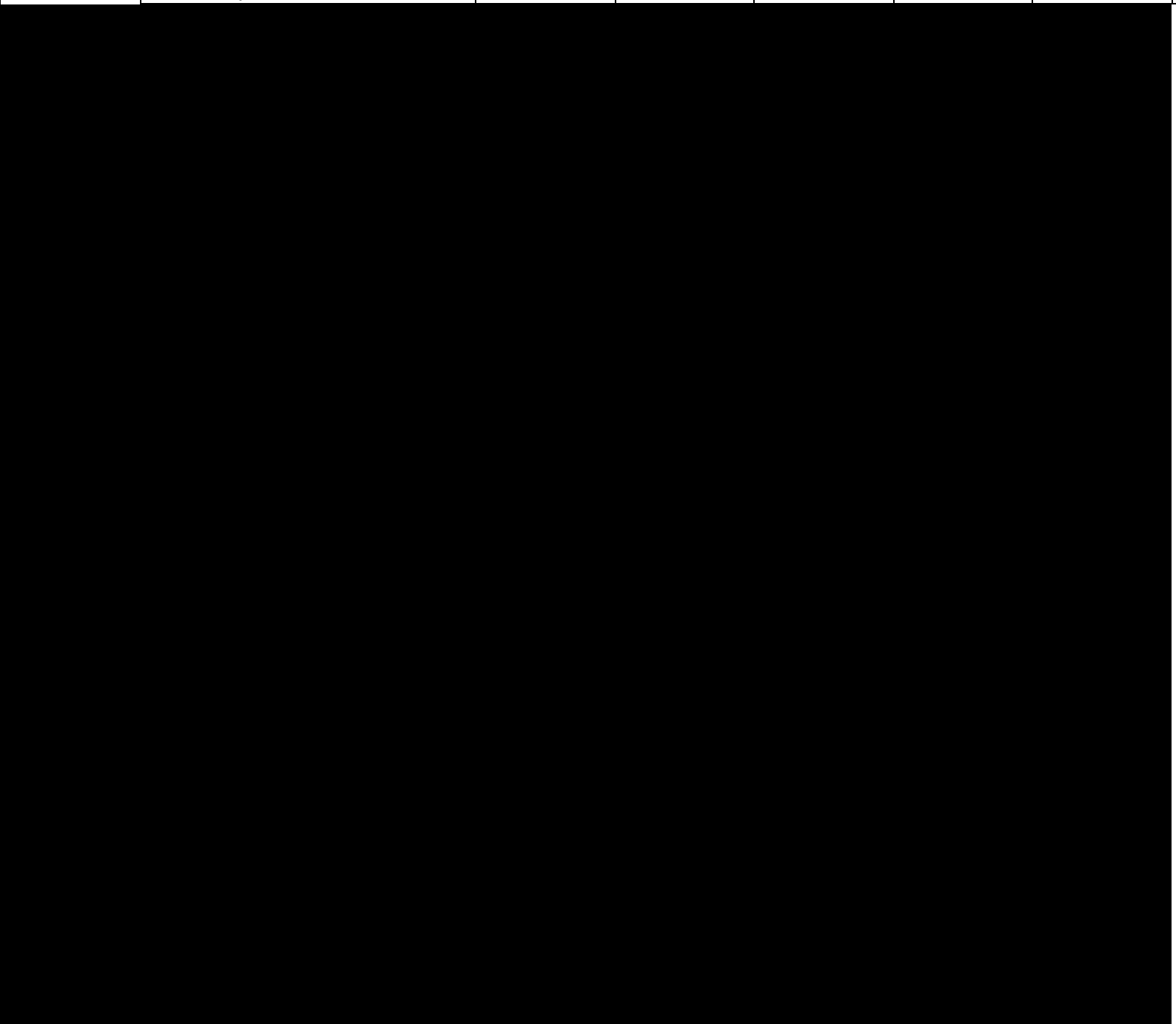
Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Kewaunee	La Crosse	Lafayette	Langlade	Lincoln	Manitowoc
Butadiene,13	4722.29	23489.25	4890.87	5374.15	8969.57	19567.75
Acetaldehyde	6233.61	32457.45	6474.04	7146.86	11895.59	27588.66
Acrolein	587.26	4015.57	640.37	756.35	1226.01	2972.65

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Marathon	Marinette	Marquette	Menominee	Milwaukee	Monroe
Acetaldehyde	41625.70	17618.92	7537.82	2120.49	307671.75	22033.03



2461.14

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Polk	Portage	Price	Racine	Richland	Rock
Acetaldehyde	12781.05	24258.64	6755.01	57679.23	6338.78	50683.56
Acrolein	1220.02	2605.82	672.32	4112.34	662.08	5723.92
Anthracene	0.13	0.24	0.06	0.66	0.06	0.52
Arsenic	0.06	0.11	0.03	0.18	0.03	0.23
Benz(a)anthracene	2.26	4.01	1.00	10.59	1.08	8.71
Benzene	82279.83	148514.39	43602.37	227821.98	41413.86	310835.36
Benzo(a)pyrene	1.14	2.03	0.49	5.65	0.54	4.43
Benzo(b)fluoranthene	1.00	1.77	0.42	4.92	0.47	3.86
Benzo(ghi))perylene	3.83	6.78	1.62	18.88	1.81	14.82
Benzo(k)fluoranthene	1.07	1.90	0.45	5.29	0.51	4.15
Butadiene,13	9564.83	17443.44	5084.01	26394.71	4838.08	36360.57
Chromium	8.01	14.55	4.02	32.69	3.98	31.22
Chrysene	1.47	2.60	0.62	7.25	0.70	5.69
Copper	254.24	472.47	145.76	800.68	129.36	970.02
Dibenz(a,h)anthracene	0.21	0.37	0.09	1.03	0.10	0.81
Ethylbenzene	37218.33	72931.70	18933.01	140896.24	19424.25	161628.61
Fluoranthene	1.27	2.25	0.54	6.27	0.60	4.92
Formaldehyde	32948.55	62560.11	17773.5Tj 70.50.75 T 73	TD (1.03) Tj 69.71	164 6626(19424.25) Tj 65.29	297T 7

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Rusk	Sauk	Sawyer	Shawano	Sheboygan	St. Croix
Acetaldehyde	5721.14	22627.64	6341.69	14841.71	48773.65	26688.37
Acrolein	563.58	2425.94	625.15	1513.60	3516.85	2888.72
Anthracene	0.06	0.18	0.06	0.14	0.51	0.20
Arsenic	0.03	0.12	0.03	0.07	0.14	0.14
Benz(a)anthracene	0.97	3.20	0.99	2.38	8.08	3.55
Benzene	36906.75	138268.43	41995.77	95301.12	171828.78	159921.56
Benzo(a)pyrene	0.48	1.55	0.48	1.18	4.31	1.70
Benzo(b)fluoranthene	0.42	1.35	0.42	1.03	3.76	1.48
Benzo(ghi))perylene	1.62	5.18	1.62	3.94	14.42	5.69
Benzo(k)fluoranthene	0.45	1.45	0.45	1.10	4.04	1.59
Butadiene,13	4284.93	16327.98	4874.52	11100.15	20103.58	19033.87
Chromium						

Table I-1: Wisconsin Mobile Source emissions by county in pounds/year (continued)

	Washington	Waukesha	Waupaca	Waushara	Winnebago	Wood	**State Total**
Acetaldehyde	37504.72	129780.41	16592.45	10899.59	46590.46	22554.90	**1867624.42**
Acrolein	3151.92	9179.75	1678.39	1125.75	5180.86	2467.13	**190251.17**
Anthracene	0.41	1.24	0.18	0.08	0.54	0.28	**19.29**
Arsenic	0.17	0.45	0.07	0.06 0	TD 2482A		

Appendix J: Index of SIC Code

SIC	DESCRIPTION
01	Agricultural Production-crops
011	Cash Grains
0111	Wheat
0112	Rice
0115	Corn
0116	Soybeans
0119	Cash Grains, n.e.c.
0130	Field Crops, Except Cash Grains
0131	Cotton
0132	Tobacco
0133	Sugar Crops
0134	Irish Potatoes
0139	Field Crops Except Cash Grains
016	Vegetables and Melons
0161	Vegetables and Melons
017	Fruits and Tree Nuts
0171	Berry Crops
0172	Grapes
0173	Tree Nuts
0174	Citrus Fruits
0175	Deciduous Tree Fruits
0179	Fruits and Tree Nuts, n.e.c.
018	Horticultural Specialties
0181	Ornamental Nursery Products
0182	Food Crops Grown under Cover
0189	Horticultural Specialties, n.e.c.
019	General Farms, Primarily Crop
0191	General Farms Primarily Crop
02	Agricultural Production-livestock & Animal Special
021	Livestock, Except Dairy and Poultry
0211	Beef Cattle Feedlots
0212	Beef Cattle Except Feedlots
0213	Hogs
0214	Sheep and Goats
0219	General Livestock, n.e.c.
024	Dairy Farms
0241	Dairy Farms
025	Poultry and Eggs
0251	Broiler, Fryer, and Roaster Chickens
0252	Chicken Eggs
0253	Turkeys and Turkey Eggs
0254	Poultry Hatcheries
0259	Poultry and Eggs, n.e.c.
027	Animal Specialties
0271	Fur-bearing Animals and Rabbit
0272	Horses and Other Equines
0273	Animal Aquaculture
0279	Animal Specialties, n.e.c.
029	General Farms, Primarily Livestock and Animal Specialties
0291	General Farms Primarily Livestock
07	Agricultural Services
071	Soil Preparation Services
0711	Soil Preparation Services
072	Crop Services
0721	Crop Planting and Protection
0722	Crop Harvesting
0723	Crop Prep Services for Market
0724	Cotton Ginning
0729	General Crop Services
074	Veterinary Services
0741	Veterinary Services Farm Livestock
0742	Veterinary Services Specialties
075	Animal Services, Except Veterinary
0751	Livestock Services, Except Specialties
0752	Animal Specialty Services
076	Farm Labor and Management Services
0761	Farm Labor Contractors
0762	Farm Management Services
078	Landscape and Horticultural Services
0781	Landscape Counseling and Planning
0782	Lawn and Garden Services
0783	Ornamental Shrub and Tree Services
08	Forestry
081	Timber Tracts
0811	Timber Tracts
0821	Forest Nurseries & Seed Gather
083	Forest Nurseries & Gathering of Forest Products
0831	Forest Products
0843	Extraction of Pine Gum
0849	Gathering of Forest Products
085	Forestry Services
0851	Forestry Services
09	Fishing, Hunting and Trapping
091	Commercial Fishing
0912	Finfish
0913	Shellfish
0919	Miscellaneous Marine Products
092	Fish Hatcheries and Preserves
0921	Fish Hatcheries and Preserves
097	Hunting, Trapping, & Game Propagation
0971	Hunting, Trapping, & Game Propagation
10	Metal Mining
101	Iron Ores
1011	Iron Ores
102	Copper Ores
1021	Copper Ores
103	Lead and Zinc Ores
1031	Lead and Zinc Ores
104	Gold and Silver Ores
1041	Gold Ores
1044	Silver Ores

SIC	DESCRIPTION
1051	Bauxite and Other Aluminum Ore
106	Ferroalloy Ores, Except Vanadium
1061	Ferroalloy Ores Except Vanadium
108	Metal Mining Services
1081	Metal Mining Services
109	Miscellaneous Metal Ores
1092	Mercury Ores
1094	Uranium-Radium-Vanadium Ores
1099	Metal Ores, n.e.c.
111	Anthracite
1112	Anthracite Mining Services
12	Coal Mining
1211	Bituminous Coal and Lignite
1213	Bituminous & Lignite Mine Services
122	Bituminous Coal and Lignite Mining
1221	Bituminous Coal & Lignite - Surface
1222	Bituminous Coal & Lignite - Underground
123	Anthracite Mining
1231	Anthracite Mining
124	Coal Mining Services
1241	Coal Mining Services
13	Oil and Gas Extraction
131	Crude Petroleum and Natural Gas
1311	Crude Petroleum & Natural Gas
132	Natural Gas Liquids
1321	Natural Gas Liquids
138	Oil and Gas Field Services
1381	Drilling Oil and Gas Wells
1382	Oil and Gas Exploration Service
1389	Oil and Gas Field Services, n.e.c.
14	Mining and Quarrying of Nonmetallic Minerals
141	Dimension Stone
1411	Dimension Stone
142	Crushed & Broken Stone, Including Riprap
1422	Crushed and Broken Limestone
1423	Crushed and Broken Granite
1429	Crushed and Broken Stone, n.e.c.
144	Sand and Gravel
1442	Construction Sand and Gravel
1446	Industrial Sand
145	Clay, Ceramic, and Refractory Minerals
1452	Bentonite
1453	Fire Clay
1454	Fullers Earth
1455	Kaolin and Ball Clay
1459	Clay and Related Minerals, n.e.c.
147	Chemical & Fertilizer Mineral Mining
1472	Barite
1473	Fluorspar
1474	Potash Soda & Borate Minerals
1475	Phosphate Rock
1476	Rock Salt
1477	Sulfur
1479	Chemical and Fertilizer Mining
148	Nonmetallic Minerals Services, Except Fuels
1481	Nonmetallic Minerals Services
149	Miscellaneous Nonmetallic Minerals, Except Fuels
1492	Gypsum
1496	Talc Soapstone & Pyrophyllite
1499	Nonmetallic Minerals, n.e.c.
15	Building Construction-General Contractors & Builders
152	General Building Contractors-Residential Buildings
1521	Single-family Housing Construction
1522	Residential Construction, n.e.c.
153	Operative Builders
1531	Operat

SIC	DESCRIPTION

SIC	DESCRIPTION

SIC	DESCRIPTION
2675	Die-cut Paper and Board
2676	Sanitary Paper Products
2677	Envelopes
2678	Stationery Products
2679	Converted Paper Products, n.e.c.
27	Printing, Publishing and Allied Industries
271	Newspapers: Publishing, or Publishing & Printing
2711	Newspapers
272	Periodicals: Publishing, or Publishing & Printing
2721	Periodicals
273	Books
2731	Book Publishing
2732	Book Printing
274	Miscellaneous Publishing
2741	Miscellaneous Publishing
275	Commercial Printing
2751	Commercial Printing Letterpress
2752	Commercial Printing Lithograph
2753	Engraving and Plate Printing
2754	Commercial Printing, Gravure
2759	Commercial Printing, n.e.c.
276	Manifold Business Forms
2761	Manifold Business Forms
277	Greeting Cards
2771	Greeting Card Publishing
278	Blankbooks, Looseleaf Binders, & Bookbinding & Related Work
2782	Blankbooks & Looseleaf Binders
2789	Bookbinding and Related Work
279	Service Industries for the Printing Trade
2791	Typesetting
2793	Photoengraving
2794	Electrotyping and Stereotyping
2795	Lithographic Platemaking Services
2796	Platemaking Services
28	Chemicals and Allied Products
281	Industrial Inorganic Chemicals
2812	Alkalies and Chlorine
2813	Industrial Gases
2816	Inorganicoduc

SIC	DESCRIPTION
3142	House Slippers
3143	Men's Footwear, Except Athletic
3144	Women's Footwear, Except Athletic
3149	Footwear, Except Rubber, n.e.c.
315	Leather Gloves and Mittens

SIC	DESCRIPTION
345	Screw Machine Products, Bolts, Nuts, Screws, Rivets, and Washers
3451	Screw Machine Products
3452	Bolts Nuts Rivets & Washers
346	Metal Forgings and Stampings
3462	Iron and Steel Forgings
3463	Nonferrous Forgings
3465	Automotive Stampings
3466	Crowns and Closures
3469	Metal Stampings, n.e.c.
347	Coating, Engraving, and Allied Services
3471	Electroplating, Polishing, Anodizing, and Coloring
3479	Metal Coating and Allied Services, n.e.c.
348	Ordnance and Accessories, Except Vehicles and Guided Missiles
3482	Small Arms Ammunition
3483	Ammunition, Exc. For Small Arm
3484	Small Arms
3489	Ordnance and Accessories, n.e.c.
349	Misc. Fabricated Metal Products
3491	Industrial Valves
3492	Fluid Power Valves and Hose Fittings
3493	Steel Springs, Except Wire
3494	Valves and Pipe Fittings
3495	Wire Springs
3496	Misc. Fabricated Wire Products
3497	Metal Foil and Leaf
3498	Fabricated Pipe and Fittings
3499	Fabricated Metal Products, n.e.c.
35	Industrial and Commercial Machinery & Computer Equipment
351	Engines and Turbines
3511	Turbines and Turbine Generator
3519	Internal Combustion Engines
352	Farm and Garden Machinery and Equipment
3523	Farm Machinery and Equipment
3524	Lawn and Garden Equipment
353	Construction, Mining, and Materials Handling Machinery & Equipment
3531	Construction Machinery
3532	Mining Machinery
3533	Oil Field Machinery
3534	Elevators and Moving Stairways
3535	Conveyors and Conveying Equipment
3536	Hoists, Cranes, and Monorails
3537	Industrial Trucks and Tractors
354	Metalworking Machinery and Equipment
3541	Machine Tools Metal Cutting Types
3542	Machine Tools Metal Forming Types
3543	Industrial Patterns
3544	Special Dies/Tools/Jigs/Fixtures
3545	Machine Tool Accessories
3546	Power Driven Hand Tools
3547	Rolling Mill Machinery
3548	Welding Apparatus
3549	Metalworking Machinery, n.e.c.
355	Special Industry Machinery, Except Metalworking Machinery

SIC	DESCRIPTION
3551	Food Products Machinery
3552	Textile Machinery

SIC	DESCRIPTION
3636	Sewing Machines
3639	Household Appliances, n.e.c.
364	Electric Lighting and Wiring Equipment
3641	Electric Lamps
3643	Current-carrying Wiring Device
3644	Noncurrent-carrying Wiring Devices
3645	Residential Lighting Fixtures
3646	Commercial Lighting Fixtures
3647	Vehicular Lighting Equipment
3648	Lighting Equipment, N.e.c.
365	Household Audio and Video Equipment, and Audio Recordings
3651	Radio and TV Receiving Sets
3652	Phonograph Records
366	Communications Equipment
3661	Telephone/Telegraph Apparatus
3662	Radio & TV Communication Equipment
3663	Radio and TV Communications Equipment
3669	Communications Equipment, n.e.c.
367	Electronic Components and Accessories
3671	Electron Tubes, Receiving Type

SIC	DESCRIPTION
3991	Brooms and Brushes
3993	Signs and Advertising Displays
3995	Burial Caskets
3996	Hard Surface Floor Coverings
3999	Manufacturing Industries, n.e.c.
40	Railroad Transportation
401	Railroads
4011	Railroads, Line-haul Operating
4013	Switching & Terminal Services
4041	Railway Express Service
41	Local & Suburban Transit & Interurban Hwy Pass
411	Local and Suburban Passenger Transportation
4111	Local and Suburban Transit
4119	Local Passenger Transportation
412	Taxicabs
4121	Taxicabs
413	Intercity and Rural Bus Transportation
4131	Intercity Hwy Transportation
414	Bus Charter Service
4141	Local Passenger Charter Service
4142	Charter Service, Except Local
415	School Buses
4151	School Buses
417	Terminal & Service Facilities: Motor Vehicle Passenger Transportation
4171	Bus Terminal Facilities
4172	Bus Service Facilities
4173	Bus Terminal and Service Facilities
42	Motor Freight Transportation and Warehousing
421	Trucking and Courier Services, Except Air
4212	Local/Trucking w/o Storage
4213	Trucking, Except Local
4214	Local Trucking and Storage
4215	Courier Services, Except by Air
422	Public Warehousing and Storage

n733 Td[(4171)-213.4(Bus)6.1(T)14.4(e)7.4(rm)2 o25(Tc8(8(nd W(c)]TJ)1iI)46nT*[(h)-1.2(c1.9(t L)15.641.4(s)6.8(porD)7L)16.3()16.3(o)-1

SIC	DESCRIPTION
4789	Transportation Services, n.e.c.
48	Communications
481	Telephone Communications
4811	Telephone Communication
4812	Radio Telephone Communications
4813	Telephone Communications, Except Radio
482	Telegraph and Other Message Communications
4821	Telegraph Communication
4822	Telegraph and Other Communications
483	Radio & Television Broadcasting Stations
4832	Radio Broadcasting
4833	Television Broadcasting
484	Cable and Other Pay Television Services
4841	Cable and Other Pay TV Services

SIC	DESCRIPTION

SIC	DESCRIPTION
639	Insurance Carriers, n.e.c.
6399	Insurance Carriers, n.e.c.
64	Insurance Agents, Brokers and Service
641	Insurance Agents, Brokers, and Service
6411	Insurance Agents, Brokers & Service
65	Real Estate
651	Real Estate Operators (Except Developers) & Lessors
6512	Nonresidential Building Operators
6513	Apartment Building Operators
6514	Dwelling Operators, Except Apart
6515	Mobile Home Site Operators
6517	Railroad Property Lessors
6519	Real Property Lessors, n.e.c.
653	Real Estate Agents and Managers
6531	Real Estate Agents and Manager
654	Title Abstract Offices
6541	Title Abstract Offices
655	Land Subdividers and Developers
6552	Subdividers & Developers, Except Cemeteries
6553	Cemetery Subdividers and Developers
6611	Combined Real Estate, Insurance
67	Holding and Other Investment Offices
671	Holding Offices
6711	Holding Offices
6712	Bank Holding Companies
6719	Holding Companies, n.e.c.
672	Investment Offices
6722	Management Investment, Open-end
6723	Management Investment, Closed-end
6724	Unit Investment Trusts
6725	Face-amount Certificate Offices
6726	Investment Offices, n.e.c.
673	Trusts
6732	Educational, Religious, and Charitable Trusts
6733	Trusts, n.e.c.
679	Miscellaneous Investing
6792	Oil Royalty Traders
6793	Commodity Traders
6794	Patent Owners and Lessors
6798	Real Estate Investment Trusts
6799	Investors, n.e.c.
70	Hotels, Rooming Houses, Camps, & Other Lodging Place
701	Hotels and Motels
7011	Hotels and Motels
702	Rooming and Boarding Houses
7021	Rooming and Boarding Houses
703	Camps and Recreational Vehicle Parks
7032	Sporting and Recreational Camp
7033	Recreational Vehicle Parks and Campsites
704	Membership-basis: Organization Hotels &

SIC	DESCRIPTION
8071	Medical Laboratories
8072	Dental Laboratories
808	Home Health Care Services
8081	Outpatient Care Facilities
8082	Home Health Care Services
809	Misc. Health & Allied Services, n.e.c.
8091	Health and Allied Services, n.e.c.
8092	Kidney Dialysis Centers
8099	Health and Allied Services, n.e.c.
81	Legal Services
811	Legal Services
8111	Legal Services
82	Educational Services
821	Elementary and Secondary Schools
8211	Elementary and Secondary Schools
822	Colleges, Universities, Professional Schools, & Junior Colleges
8221	Colleges and Universities, n.e.c.
8222	Junior Colleges
823	Libraries
8231	Libraries and Information Centers
824	Vocational Schools
8241	Correspondence Schools
8243	Data Processing Schools
8244	Business and Secretarial Schools
8249	Vocational School, n.e.c.
829	Schools & Educational Services, n.e.c.
8299	Schools & Educational Services
83	Social Services
832	Individual and Family Social Services
8321	Individual and Family Services
8322	Individual and Family Services
833	Job Training, Vocational Rehabilitation Services
8331	Job Training and Related Services
835	Child Day Care Services
8351	Child Day Care Services
836	Residential Care
8361	Residential Care
839	Social Services, n.e.c.
8399	Social Services, n.e.c.
84	Museums, Art Galleries & Botanical & Zoological Gardens
841	Museums and Art Galleries
8411	Museums and Art Galleries
8412	Museums and Art Galleries
842	Arboreta, Botanical, or Zoological Gardens
8421	Botanical and Zoological Gardens
8422	Botanical and Zoological Gardens
86	Membership Organizations
861	Business Associations
8611	Business Associations
862	Professional Membership Organizations
8621	Professional Organizations
863	Labor Unions/similar Labor Organizations
8631	Labor Organizations
864	Civic, Social, & Fraternal Associations
8641	Civic and Social Associations
865	Political Organizations
8651	Political Organizations
866	Religious Organizations
8661	Religious Organizations
869	Membership Organizations, n.e.c.
8699	Membership Organizations, n.e.c.
87	Engineering, Accounting, Research, Management
871	Engineering, Architectural, & Surveying Services
8711	Engineering Services
8712	Architectural Services

SIC	DESCRIPTION
9431	Public Health Program Administration
944	Social, Human Resource & Income Maintenance Program Administration
9441	Admin of Social & Manpower Programs
945	Veterans' Affairs (Except Health & Insurance) Administration
9451	Administration of Veterans' Affairs
95	Admin. of Environmental, Quality & Housing Program
951	Environmental Quality Programs Administration
9511	Air, Water, & Solid Waste Management
9512	Land, Mineral, Wildlife Conservation
953	Housing & Urban Development Programs Administration
9531	Housing Programs
9532	Urban and Community Development
96	Administration of Economic Programs
961	General Economic Program Administration
9611	Admin of General Economic Programs
962	Transportation Programs Regulation & Administration
9621	Regulation, Administration of Transportation
963	Communications, electric, gas, & Utilities Regulation & Administration
9631	Regulation, Admin of Utilities
964	Agricultural Marketing & Commodities Regulation
9641	Regulation of Agricultural Marketing & Commodities
965	Misc. Commercial Sectors Regulation, Licensing, & Inspection
9651	Regulation Misc. Commercial Sectors
966	Space Research and Technology
9661	Space Research and Technology
97	National Security and International Affairs
971	National Security
9711	National Security
972	International Affairs
9721	International Affairs
999	Nonclassifiable Establishments
9999	Nonclassifiable Establishments

SCC Code	Description

SCC Code	Description
2201020251	Light Duty Gasoline Trucks 1 (LDGT1), Other Freeways and Expressways: Urban Time 1
2201020252	Light Duty Gasoline Trucks 1 (LDGT1), Other Freeways and Expressways: Urban Time 2
2201020253	Light Duty Gasoline Trucks 1 (LDGT1), Other Freeways and Expressways: Urban Time 3
2201020254	Light Duty Gasoline Trucks 1 (LDGT1), Other Freeways and Expressways: Urban Time 4
2201020270	Light Duty Gasoline Trucks 1 (LDGT1), Other Principal Arterial: Urban Total
2201020271	Light Duty Gasoline Trucks 1 (LDGT1), Other Principal Arterial: Urban Time 1
2201020272	Light Duty Gasoline Trucks 1 (LDGT1), Other Principal Arterial: Urban Time 2
2201020273	Light Duty Gasoline Trucks 1 (LDGT1), Other Principal Arterial: Urban Time 3
2201020274	Light Duty Gasoline Trucks 1 (LDGT1), Other Principal Arterial: Urban Time 4
2201020290	Light Duty Gasoline Trucks 1 (LDGT1), Minor Arterial: Urban Total
2201020291	Light Duty Gasoline Trucks 1 (LDGT1), Minor Arterial: Urban Time 1
2201020292	Light Duty Gasoline Trucks 1 (LDGT1), Minor Arterial: Urban Time 2
2201020293	Light Duty Gasoline Trucks 1 (LDGT1), Minor Arterial: Urban Time 3
2201020294	Light Duty Gasoline Trucks 1 (LDGT1), Minor Arterial: Urban Time 4
2201020310	Light Duty Gasoline Trucks 1 (LDGT1), Collector: Urban Total
2201020311	Light Duty Gasoline Trucks 1 (LDGT1), Collector: Urban Time 1
2201020312	Light Duty Gasoline Trucks 1 (LDGT1), Collector: Urban Time 2
2201020313	Light Duty Gasoline Trucks 1 (LDGT1), Collector: Urban Time 3
2201020314	Light Duty Gasoline Trucks 1 (LDGT1), Collector: Urban Time 4
2201020330	Light Duty Gasoline Trucks 1 (LDGT1), Local: Urban Total
2201020331	Light Duty Gasoline Trucks 1 (LDGT1), Local: Urban Time 1
2201020332	Light Duty Gasoline Trucks 1 (LDGT1), Local: Urban Time 2
2201020333	Light Duty Gasoline Trucks 1 (LDGT1), Local: Urban Time 3
2201020334	Light Duty Gasoline Trucks 1 (LDGT1), Local: Urban Time 4
2201040000	Light Duty Gasoline Trucks 2 (LDGT2), Total: All Road Types
2201040110	Light Duty Gasoline Trucks 2 (LDGT2), Interstate: Rural Total
2201040111	Light Duty Gasoline Trucks 2 (LDGT2), Interstate: Rural Time 1
2201040112	Light Duty Gasoline Trucks 2 (LDGT2), Interstate: Rural Time 2
2201040113	Light Duty Gasoline Trucks 2 (LDGT2), Interstate: Rural Time 3
2201040114	Light Duty Gasoline Trucks 2 (LDGT2), Interstate: Rural Time 4
2201040130	Light Duty Gasoline Trucks 2 (LDGT2), Other Principal Arterial: Rural Total
2201040131	Light Duty Gasoline Trucks 2 (LDGT2), Other Principal Arterial: Rural Time 1
2201040132	Light Duty Gasoline Trucks 2 (LDGT2), Other Principal Arterial: Rural Time 2
2201040133	Light Duty Gasoline Trucks 2 (LDGT2), Other Principal Arterial: Rural Time 4

59.25 0.75 re 8321.7f 46.5

SCC Code	Description
2201040213	

SCC Code	Description
2201060190	Light Duty Gasoline Trucks 1 & 2 (LDGT), Minor Collector: Rural Total
2201060191	Light Duty Gasoline Trucks 1 & 2 (LDGT), Minor Collector: Rural Time 1
2201060192	Light Duty Gasoline Trucks 1 & 2 (LDGT), Minor Collector: Rural Time 2
2201060193	Light Duty Gasoline Trucks 1 & 2 (LDGT), Minor Collector: Rural Time 3
2201060194	Light Duty Gasoline Trucks 1 & 2 (LDGT), Minor Collector: Rural Time 4
2201060210	Light Duty Gasoline Trucks 1 & 2 (LDGT), Local: Rural Total
2201060211	Light Duty Gasoline Trucks 1 & 2 (LDGT), Local: Rural Time 1
2201060212	Light Duty Gasoline Trucks 1 & 2 (LDGT), Local: Rural Time 2
2201060213	Light Duty Gasoline Trucks 1 & 2 (LDGT), Local: Rural Time 3
2201060214	Light Duty Gasoline Trucks 1 & 2 (LDGT), Local: Rural Time 4
2201060230	Light Duty Gasoline Trucks 1 & 2 (LDGT), Interstate: Urban Total
2201060231	Light Duty Gasoline Trucks 1 & 2 (LDGT), Interstate: Urban Time 1
2201060232	Light Duty Gasoline Trucks 1 & 2 (LDGT), Interstate: Urban Time 2
2201060233	Light Duty Gasoline Trucks 1 & 2 (LDGT), Interstate: Urban Time 3
2201060234	Light Duty Gasoline Trucks 1 & 2 (LDGT), Interstate: Urban Time 4
2201060250	Light Duty Gasoline Trucks 1 & 2 (LDGT), Other Freeways and Expressways: Urban Total

SCC Code

SCC Code	Description
2201080332	Motorcycles (MC), Local: Urban Time 2
2201080333	Motorcycles (MC), Local: Urban Time 3
2201080334	Motorcycles (MC), Local: Urban Time 4
2230001000	Light Duty Diesel Vehicles (LDDV), Total: All Road Types
2230001110	Light Duty Diesel Vehicles (LDDV), Interstate: Rural Total
2230001111	Light Duty Diesel Vehicles (LDDV), Interstate: Rural Time 1
2230001112	Light Duty Diesel Vehicles (LDDV), Interstate: Rural Time 2
2230001113	Light Duty Diesel Vehicles (LDDV), Interstate: Rural Time 3
2230001114	Light Duty Diesel Vehicles (LDDV), Interstate: Rural Time 4
2230001130	Light Duty Diesel Vehicles (LDDV), Other Principal Arterial: Rural Total
2230001131	Light Duty Diesel Vehicles (LDDV), Other Principal Arterial: Rural Time 1
2230001132	Light Duty Diesel Vehicles (LDDV), Other Principal Arterial: Rural Time 2
2230001133	Light Duty Diesel Vehicles (LDDV), Other Principal Arterial: Rural Time 3
2230001134	Light Duty Diesel Vehicles (LDDV), Other Principal Arterial: Rural Time 4
2230001150	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Rural Total
2230001151	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Rural Time 1
2230001152	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Rural Time 2
2230001153	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Rural Time 3
2230001154	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Rural Time 4
2230001170	Light Duty Diesel Vehicles (LDDV), Major Collector: Rural Total
2230001171	Light Duty Diesel Vehicles (LDDV), Major Collector: Rural Time 1
2230001172	Light Duty Diesel Vehicles (LDDV), Major Collector: Rural Time 2
2230001173	Light Duty Diesel Vehicles (LDDV), Major Collector: Rural Time 3
2230001174	Light Duty Diesel Vehicles (LDDV), Major Collector: Rural Time 4
2230001190	Light Duty Diesel Vehicles (LDDV), Minor Collector: Rural Total
2230001191	Light Duty Diesel Vehicles (LDDV), Minor Collector: Rural Time 1
2230001192	Light Duty Diesel Vehicles (LDDV), Minor Collector: Rural Time 2
2230001193	Light Duty Diesel Vehicles (LDDV), Minor Collector: Rural Time 3
2230001194	Light Duty Diesel Vehicles (LDDV), Minor Collector: Rural Time 4
2230001210	Light Duty Diesel Vehicles (LDDV), Local: Rural Total
2230001211	Light Duty Diesel Vehicles (LDDV), Local: Rural Time 1
2230001212	Light Duty Diesel Vehicles (LDDV), Local: Rural Time 2

SCC Code	Description
2230001294	Light Duty Diesel Vehicles (LDDV), Minor Arterial: Urban Time 4
2230001310	Light Duty Diesel Vehicles (LDDV), Collector: Urban Total
2230001311	Light Duty Diesel Vehicles (LDDV), Collector: Urban Time 1
2230001312	Light Duty Diesel Vehicles (LDDV), Collector: Urban Time 2
2230001313	Light Duty Diesel Vehicles (LDDV), Collector: Urban Time 3
2230001314	Light Duty Diesel Vehicles (LDDV), Collector: Urban Time 4
2230001330	Light Duty Diesel Vehicles (LDDV), Local: Urban Total
2230001331	Light Duty Diesel Vehicles (LDDV), Local: Urban Time 1
2230001332	Light Duty Diesel Vehicles (LDDV), Local: Urban Time 2
2230001333	Light Duty Diesel Vehicles (LDDV), Local: Urban Time 3
2230001334	Light Duty Diesel Vehicles (LDDV), Local: Urban Time 4
2230060000	Light Duty Diesel Trucks (LDDT), Total: All Road Types
2230060110	Light Duty Diesel Trucks (LDDT), Interstate: Rural Total
2230060111	Light Duty Diesel Trucks (LDDT), Interstate: Rural Time 1
2230060112	Light Duty Diesel Trucks (LDDT), Interstate: Rural Time 2
2230060113	Light Duty Diesel Trucks (LDDT), Interstate: Rural Time 3
2230060114	Light Duty Diesel Trucks (LDDT), Interstate: Rural Time 4
2230060130	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Rural Total
2230060131	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Rural Time 1
2230060132	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Rural Time 2
2230060133	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Rural Time 3
2230060134	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Rural Time 4
2230060150	Light Duty Diesel Trucks (LDDT), Minor Arterial: Rural Total
2230060151	Light Duty Diesel Trucks (LDDT), Minor Arterial: Rural Time 1
2230060152	Light Duty Diesel Trucks (LDDT), Minor Arterial: Rural Time 2
2230060153	Light Duty Diesel Trucks (LDDT), Minor Arterial: Rural Time 3
2230060154	Light Duty Diesel Trucks (LDDT), Minor Arterial: Rural Time 4
2230060170	Light Duty Diesel Trucks (LDDT), Major Collector: Rural Total
2230060171	Light Duty Diesel Trucks (LDDT), Major Collector: Rural Time 1
2230060172	Light Duty Diesel Trucks (LDDT), Major Collector: Rural Time 2
2230060173	Light Duty Diesel Trucks (LDDT), Major Collector: Rural Time 3
2230060174	Light Duty Diesel Trucks (LDDT), Major Collector: Rural Time 4
2230060190	Light Duty Diesel Trucks (LDDT), Minor Collector: Rural Total
2230060191	Light Duty Diesel Trucks (LDDT), Minor Collector: Rural Time 1
2230060192	Light Duty Diesel Trucks (LDDT), Minor Collector: Rural Time 2
2230060193	Light Duty Diesel Trucks (LDDT), Minor Collector: Rural Time 3
2230060194	Light Duty Diesel Trucks (LDDT), Minor Collector: Rural Time 4
2230060210	Light Duty Diesel Trucks (LDDT), Local: Rural Total
2230060211	Light Duty Diesel Trucks (LDDT), Local: Rural Time 1
2230060212	Light Duty Diesel Trucks (LDDT), Local: Rural Time 2
2230060213	Light Duty Diesel Trucks (LDDT), Local: Rural Time 3
2230060214	Light Duty Diesel Trucks (LDDT), Local: Rural Time 4
2230060230	Light Duty Diesel Trucks (LDDT), Interstate: Urban Total
2230060231	Light Duty Diesel Trucks (LDDT), Interstate: Urban Time 1
2230060232	Light Duty Diesel Trucks (LDDT), Interstate: Urban Time 2
2230060233	Light Duty Diesel Trucks (LDDT), Interstate: Urban Time 3
2230060234	Light Duty Diesel Trucks (LDDT), Interstate: Urban Time 4
2230060250	Light Duty Diesel Trucks (LDDT), Other Freeways and Expressways: Urban Total
2230060251	Light Duty Diesel Trucks (LDDT), Other Freeways and Expressways: Urban Time 1
2230060252	Light Duty Diesel Trucks (LDDT), Other Freeways and Expressways: Urban Time 2
2230060253	Light Duty Diesel Trucks (LDDT), Other Freeways and Expressways: Urban Time 3
2230060254	Light Duty Diesel Trucks (LDDT), Other Freeways and Expressways: Urban Time 4
2230060270	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Urban Total

SCC Code	Description
2230060271	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Urban Time 1
2230060272	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Urban Time 2
2230060273	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Urban Time 3
2230060274	Light Duty Diesel Trucks (LDDT), Other Principal Arterial: Urban Time 4
2230060290	Light Duty Diesel Trucks (LDDT), Minor Arterial: Urban Total
2230060291	Light Duty Diesel Trucks (LDDT), Minor Arterial: Urban Time 1
2230060292	Light Duty Diesel Trucks (LDDT), Minor Arterial: Urban Time 2
2230060293	Light Duty Diesel Trucks (LDDT), Minor Arterial: Urban Time 3
2230060294	Light Duty Diesel Trucks (LDDT), Minor Arterial: Urban Time 4
2230060310	

SCC Code	Description
2230070233	Heavy Duty Diesel Vehicles (HDDV), Interstate: Urban Time 3

SCC Code	Description
2260002054	Gasoline, 2-Stroke, Construction Equipment, Crushing/Processing Equipment
2260002057	Gasoline, 2-Stroke, Construction Equipment, Rough Terrain Forklifts
2260002060	Gasoline, 2-Stroke, Construction Equipment, Rubber Tire Loaders
2260002063	Gasoline, 2-Stroke, Construction Equipment, Rubber Tire Dozers
2260002066	Gasoline, 2-Stroke, Construction Equipment, Tractors/Loaders/Backhoes
2260002069	Gasoline, 2-Stroke, Construction Equipment, Crawler Tractors
2260002072	Gasoline, 2-Stroke, Construction Equipment, Skid Steer Loaders
2260002075	Gasoline, 2-Stroke, Construction Equipment, Off-Highway Tractors
2260002078	Gasoline, 2-Stroke, Construction Equipment, Dumpers/Tenders
2260002081	Gasoline, 2-Stroke, Construction Equipment, Other Construction Equipment
2260003000	Gasoline, 2-Stroke, Industrial Equipment, Total
2260003010	Gasoline, 2-Stroke, Industrial Equipment, Aerial Lifts
2260003020	Gasoline, 2-Stroke, Industrial Equipment, Forklifts
2260003030	Gasoline, 2-Stroke, Industrial Equipment, Sweepers/Scrubbers
2260003040	Gasoline, 2-Stroke, Industrial Equipment, Other General Industrial Equipment
2260003050	Gasoline, 2-Stroke, Industrial Equipment, Other Material Handling Equipment
2260004000	

SCC Code	Description
2260007020	Gasoline, 2-Stroke, Logging Equipment, Fellers/Bunchers
2260008000	Gasoline, 2-Stroke, Airport Service Equipment, Total
2260008005	Gasoline, 2-Stroke, Airport Service Equipment, Airport Support Equipment
2260008010	Gasoline, 2-Stroke, Airport Service Equipment, Terminal Tractors
2265000000	All Off-highway Vehicle: Gasoline, 4-Stroke, Total
2265001000	Gasoline, 4-Stroke, Recreational Vehicles, Total
2265001010	Gasoline, 4-Stroke, Recreational Vehicles, Motorcycles: Off-Road
2265001020	Gasoline, 4-Stroke, Recreational Vehicles, Snowmobiles
2265001030	Gasoline, 4-Stroke, Recreational Vehicles, All Terrain Vehicles
2265001040	Gasoline, 4-Stroke, Recreational Vehicles, Minibikes
2265001050	Gasoline, 4-Stroke, Recreational Vehicles, Golf Carts
2265001060	Gasoline, 4-Stroke, Recreational Vehicles, Speciality Vehicle Carts
2265002000	Gasoline, 4-Stroke, Construction Equipment, Total
2265002003	Gasoline, 4-Stroke, Construction Equipment, Asphalt Pavers
2265002006	Gasoline, 4-Stroke, Construction Equipment, Tampers/Rammers
2265002009	Gasoline, 4-Stroke, Construction Equipment, Plate Compactors
2265002012	Gasoline, 4-Stroke, Construction Equipment, Concrete Pavers
2265002015	Gasoline, 4-Stroke, Construction Equipment, Rollers
2265002018	Gasoline, 4-Stroke, Construction Equipment, Scrapers
2265002021	Gasoline, 4-Stroke, Construction Equipment, Paving Equipment
2265002024	Gasoline, 4-Stroke, Construction Equipment, Surfacing Equipment
2265002027	Gasoline, 4-Stroke, Construction Equipment, Signal Boards
2265002030	Gasoline, 4-Stroke, Construction Equipment, Trenchers
2265002033	Gasoline, 4-Stroke, Construction Equipment, Bore/Drill Rigs
2265002036	Gasoline, 4-Stroke, Construction Equipment, Excavators
2265002039	Gasoline, 4-Stroke, Construction Equipment, Concrete/Industrial Saws
2265002042	Gasoline, 4-Stroke, Construction Equipment, Cement and Mortar Mixers
2265002045	Gasoline, 4-Stroke, Construction Equipment, Cranes
2265002048	Gasoline, 4-Stroke, Construction Equipment, Graders
2265002051	Gasoline, 4-Stroke, Construction Equipment, Off-highway Trucks
2265002054	Gasoline, 4-Stroke, Construction Equipment, Crushing/Processing Equipment
2265002057	Gasoline, 4-Stroke, Construction Equipment, Rough Terrain Forklifts
2265002060	Gasoline, 4-Stroke, Construction Equipment, Rubber Tire Loaders
2265002063	Gasoline, 4-Stroke, Construction Equipment, Rubber Tire Dozers
2265002066	Gasoline, 4-Stroke, Construction Equipment, Tractors/Loaders/Backhoes
2265002069	Gasoline, 4-Stroke, Construction Equipment, Crawler Tractors
2265002072	Gasoline, 4-Stroke, Construction Equipment, Skid Steer Loaders
2265002075	Gasoline, 4-Stroke, Construction Equipment, Off-Highway Tractors
2265002078	Gasoline, 4-Stroke, Construction Equipment, Dumpers/Tenders
2265002081	Gasoline, 4-Stroke, Construction Equipment, Other Construction Equipment
2265003000	Gasoline, 4-Stroke, Industrial Equipment, Total
2265003010	Gasoline, 4-Stroke, Industrial Equipment, Aerial Lifts
2265003020	Gasoline, 4-Stroke, Industrial Equipment, Forklifts
2265003030	Gasoline, 4-Stroke, Industrial Equipment, Sweepers/Scrubbers
2265003040	Gasoline, 4-Stroke, Industrial Equipment, Other General Industrial Equipment
2265003050	Gasoline, 4-Stroke, Industrial Equipment, Other Material Handling Equipment
2265004000	Gasoline, 4-Stroke, Lawn and Garden Equipment, Total
2265004010	Gasoline, 4-Stroke, Lawn and Garden Equipment, Lawn mowers
2265004015	Gasoline, 4-Stroke, Lawn and Garden Equipment, Rotary Tillers < 5 HP
2265004020	Gasoline, 4-Stroke, Lawn and Garden Equipment, Chain Saws < 4 HP
2265004025	Gasoline, 4-Stroke, Lawn and Garden Equipment, Trimmers/Edgers/Brush Cutters
2265004030	Gasoline, 4-Stroke, Lawn and Garden Equipment, Leafblowers/Vacuums
2265004035	Gasoline, 4-Stroke, Lawn and Garden Equipment, Snowblowers

SCC Code	Description
2265004040	Gasoline, 4-Stroke, Lawn and Garden Equipment, Rear Engine Riding Mowers
2265004045	Gasoline, 4-Stroke, Lawn and Garden Equipment, Front Mowers
2265004050	Gasoline, 4-Stroke, Lawn and Garden Equipment, Shredders < 5 HP
2265004055	Gasoline, 4-Stroke, Lawn and Garden Equipment, Lawn and Garden Tractors
2265004060	Gasoline, 4-Stroke, Lawn and Garden Equipment, Wood Splitters
2265004065	Gasoline, 4-Stroke, Lawn and Garden Equipment, Chippers/Stump Grinders
2265004070	Gasoline, 4-Stroke, Lawn and Garden Equipment, Commercial Turf Equipment
2265004075	Gasoline, 4-Stroke, Lawn and Garden Equipment, Other Lawn and Garden Equipment
2265005000	Gasoline, 4-Stroke, Farm Equipment, Total
2265005010	Gasoline, 4-Stroke, Farm Equipment, 2-Wheel Tractors
2265005015	Gasoline, 4-Stroke, Farm Equipment, Agricultural Tractors
2265005020	Gasoline, 4-Stroke, Farm Equipment, Combines
2265005025	Gasoline, 4-Stroke, Farm Equipment, Balers
2265005030	Gasoline, 4-Stroke, Farm Equipment, Agricultural Mowers
2265005035	Gasoline, 4-Stroke, Farm Equipment, Sprayers
2265005040	Gasoline, 4-Stroke, Farm Equipment, Tillers > 5 HP
2265005045	Gasoline, 4-Stroke, Farm Equipment, Swathers
2265005050	Gasoline, 4-Stroke, Farm Equipment, Hydro-power Units
2265005055	Gasoline, 4-Stroke, Farm Equipment, Other Agricultural Equipment
2265006000	Gasoline, 4-Stroke, Light Commercial, Total
2265006005	

SCC Code	Description
2270002033	Diesel, Construction Equipment, Bore/Drill Rigs
2270002036	Diesel, Construction Equipment, Excavators
2270002039	Diesel, Construction Equipment, Concrete/Industrial Saws
2270002042	Diesel, Construction Equipment, Cement and Mortar Mixers
2270002045	Diesel, Construction Equipment, Cranes
2270002048	Diesel, Construction Equipment, Graders
2270002051	Diesel, Construction Equipment, Off-highway Trucks
2270002054	Diesel, Construction Equipment, Crushing/Processing Equipment
2270002057	Diesel, Construction Equipment, Rough Terrain Forklifts
2270002060	Diesel, Construction Equipment, Rubber Tire Loaders
2270002066	Diesel, Construction Equipment, Tractors/Loaders/Backhoes
2270002069	Diesel, Construction Equipment, Crawler Tractors
2270002072	Diesel, Construction Equipment, Skid Steer Loaders
2270002075	Diesel, Construction Equipment, Off-Highway Tractors
2270002078	Diesel, Construction Equipment, Dumpers/Tenders
2270002081	Diesel, Construction Equipment, Other Construction Equipment
2270003000	Diesel, Industrial Equipment, Total
2270003010	Diesel, Industrial Equipment, Aerial Lifts
2270003020	Diesel, Industrial Equipment, Forklifts
2270003030	Diesel, Industrial Equipment, Sweepers/Scrubbers
2270003040	Diesel, Industrial Equipment, Other General Industrial Equipment
2270003050	Diesel, Industrial Equipment, Other Material Handling Equipment
2270004000	Diesel, Lawn and Garden Equipment, Total
2270004010	Diesel, Lawn and Garden Equipment, Lawn mowers
2270004015	Diesel, Lawn and Garden Equipment, Rotary Tillers < 5 HP
2270004020	Diesel, Lawn and Garden Equipment, Chain Saws < 4 HP

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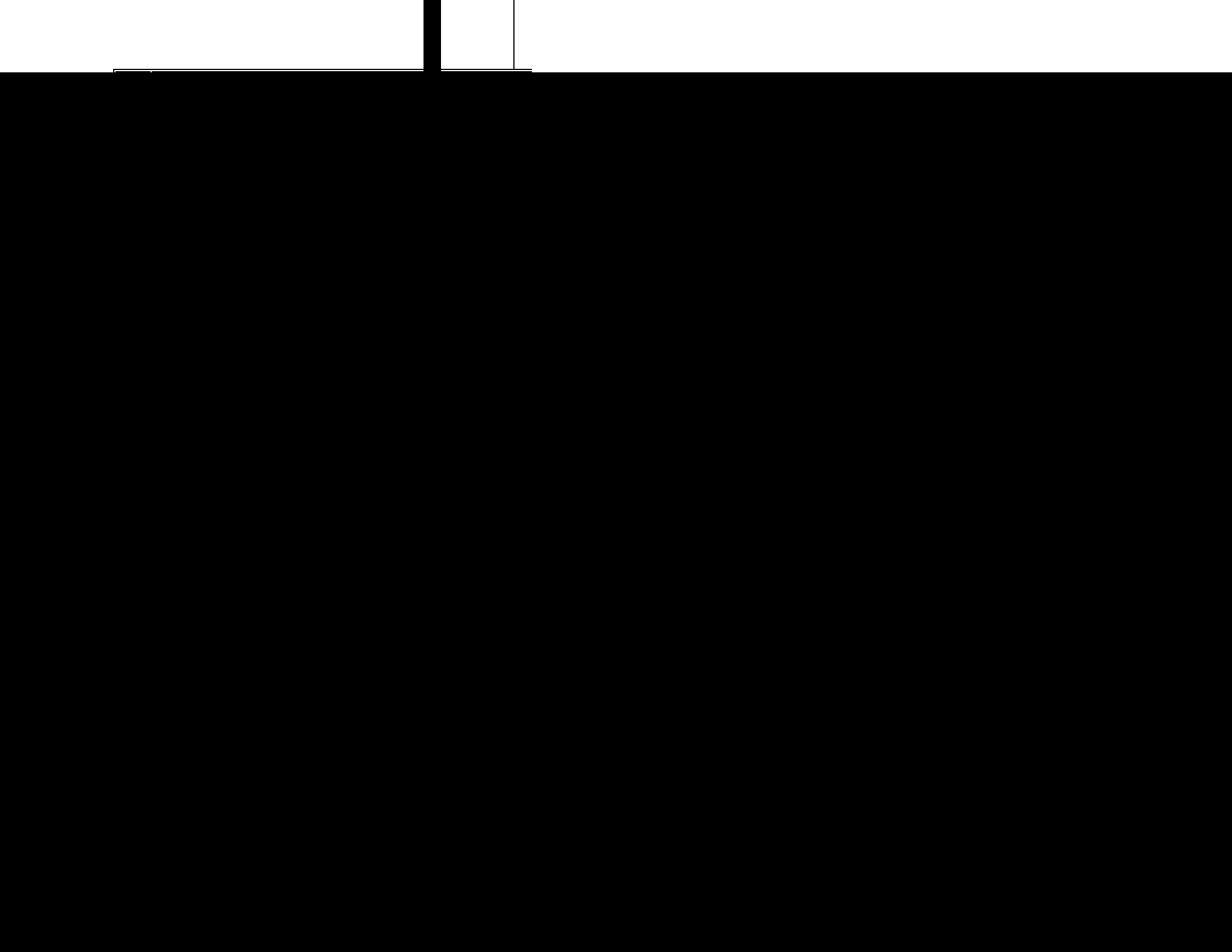

SCC Code	Description
2282010015	Pleasure Craft, Gasoline 4-Stroke, Sterndrive
2282010020	Pleasure Craft, Gasoline 4-Stroke, Sailboat Auxiliary Inboard
2282010025	Pleasure Craft, Gasoline 4-Stroke, Sailboat Auxiliary Outboard
2282020000	Pleasure Craft, Diesel, Total
2282020005	Pleasure Craft, Diesel, Inboards
2282020010	Pleasure Craft, Diesel, Outboards
2282020015	Pleasure Craft, Diesel, Sterndrive
2282020020	Pleasure Craft, Diesel, Sailboat Auxiliary Inboard
2282020025	Pleasure Craft, Diesel, Sailboat Auxiliary Outboard
2285002000	Diesel, Total
2285002005	Diesel, Line Haul Locomotives
2285002010	Diesel, Yard Locomotives
2294000000	All Paved Roads, Total: Fugitives
2294000001	All Paved Roads, Total: Average Conditions - Fugitives
2294000002	All Paved Roads, Total: Sanding/Salting - Fugitives
2294005000	Interstate/Arterial, Total: Fugitives
2294005001	Interstate/Arterial, Total: Average Conditions - Fugitives
2294005002	Interstate/Arterial, Total: Sanding/Salting - Fugitives
2294010000	All Other Public Paved Roads, Total: Fugitives
2294010001	All Other Public Paved Roads, Total: Average Conditions - Fugitives
2294010002	All Other Public Paved Roads, Total: Sanding/Salting - Fugitives
2294015000	Industrial Roads, Total: Fugitives
2294015001	Industrial Roads, Total: Average Conditions - Fugitives
2294015002	Industrial Roads, Total: Sanding/Salting - Fugitives
2296000000	All Unpaved Roads, Total: Fugitives
2296005000	Public Unpaved Roads, Total: Fugitives
2296010000	Industrial Unpaved Roads, Total: Fugitives

Appendix

Table L-1: Carcinogenicity Ratings for Target Compounds Included in the Regional Toxic Air Emissions Inventory Based on the U.S. EPA's Integrated Risk Information System (IRIS) Database

Pollutant Name	CAS No.	Key for U.S. EPA IRIS Ratings
Non-Metal Compounds (Excluding PAHs)		
Actetaldehyde	75-07-0	B2
Acrolein	107-02-8	C
Acrylamide	79-06-1	B2
Acrylonitrile	107-13-1	B1
Atrazine	1912-24-9	Under Review
Benzene (including benzene from gasoline)	71-43-2	A
1,3-Butadiene	106-99-0	B2
Carbon Tetrachloride	56-23-5	B2
Chlordane	57-74-9	B2
Chloroform	67-66-3	B2
Coke Oven Emissions	8007-45-2	A
Dibutyl Phthalate	84-74-2	D
Dioctyl Phthalate	117-84-0	Under Review
Dichloroethyl ether	111-44-4	B2
Diethylhexyl Phthalate	117-81-7	B2
Ethylbenzene	100-41-4	D
Ethylene dibromide	106-93-4	B2
1,2-Dichloroethane	107-06-2	B2
Ethylene oxide	75-21-8	
Formaldehyde	50-00-0	B1
Glycol ethers		
Heptachlor	76-44-8	B2

2,4,6-Trichlorophenol	88-06-2	B2
Trifluralin	1582-09-8	C
PAH (EPA's 16 PAH approach)		

Appendix

Great Lakes Commission Regional Air Toxic Emissions Inventory Project Steering Committee

MEMBERS

Mr. David 'Buzz' Asselmeier
Bureau of Air
IL Envir. Protection Agency
P.O. Box 19276
Springfield, IL 62794-9276
T: 217-782-5811
F: 217-782-6348
E: epa2110@epa.state.il.us

Mr. John Bates
Office of Air Management
IN Dept. of Envir. Mgmt.
P.O. Box 6015
101 N. Senate Ave.-Room 1001
Indianapolis, IN 46206-6015
T: 317-233-4226
F: 317-233-5697
E: jbates@dem.state.in.us

Mr. Shane Moore
Office of Air Management
IN Dept. of Envir. Mgmt.
P.O. Box 6015
101 N. Senate Ave.-Room 1001
Indianapolis, IN 46206-6015
T: 317-233-0119
F: 317-233-5697
E: smoore@dem.state.in.us

Mr. Gary Baker
Air Quality Division
MI Dept. of Envir. Quality
Hollister Building, 4th Floor
P.O. Box 30260 106 W. Allegan
Lansing, MI 48909-7760
T: 517-373-7058
F: 517-373-1265
E: gbaker@great-lakes.net

Ms. Chun Yi Wu
Environmental Outcomes Division
MN Pollution Control Agency
520 Lafayette Rd.
St. Paul, MN 55155-4194
T: 651-282-5855
F: 651-297-7709
E: chun.yi.wu@pca.state.mn.us

Mr. Chris Nelson
Environmental Outcomes Division
MN Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55155-4194
T: 651-296-7750
F: 651-297-7709
E: christopher.nelson@pca.state.mn.us

Mr. Rob Sliwinski
Division of Air Resources
NY Dept. of Envir. Conservation
P.O. Box 3250
Albany, NY 12233
T: 518-457-2823
F: 518-457-0794
E: rgsliwin@gw.dec.stat.ny.us

Mr. Rob McDonough
Div. of Air Resources
NY Dept. of Envir. Conservation
P.O. Box 3250
Albany, NY 12233
T: 518-457-2823
F: 518-457-0794
E: rsmcdono@gw.dec.state.ny.us

Mr. Mike Hopkins
Div. of Air Pollution Control
OH Envir. Protection Agency
P.O. Box 1049
Columbus, OH 43215
T: 614-644-3611
F: 614-644-3681
E: mike.hopkins@epa.state.oh.us

Mr. Tom Velalis
Div. of Air Pollution Control
OH Envir. Protection Agency
P.O. Box 1049
Columbus, OH 43215
T: 614-644-4837
F: 614-644-3681
E: tom.velalis@epa.state.oh.us

Mr. Rick St. Louis
Bureau of Air Quality
Rachel Carson State Office Building
PA Dept. of Envir. Protection
P.O. Box 8468
Harrisburg, PA 17105-8468
T: 717-787-4310
F: 717-772-2303
E: stlouis.richard@a1.dep.pader.pa.us

Mr. Rob Altenburg
Bureau of Air Quality
Rachel Carson State Office Building
PA Dept. of Envir. Protection
P.O. Box 8468
Harrisburg, PA 17105-8468
T: 717-787-4310
F: 717-772-2303
E: altenburg.robert@a1.dep.pader.pa.us

* Mr. Orlando Cabrera-Rivera
Bureau of Air Management
WI Dept. of Natural Resources
P.O. 7921
101 S. Webster St. - 7th Floor
Madison, WI 53707
T: 608-267-2466
F: 608-267-0560
E: cabr

OBSERVERS

Dr. Suzanne King
Air Division
U.S. EPA-Region V - AR-18J
77 W. Jackson Blvd.
Chicago, IL 60604-3950
T: 312-886-6054
F: 312-886-0716
E: king.suzanne@epamail.epa.gov

Ms. Anne Pope
Environmental Engineer
Emission Factor and Methodologies Sections
Office of Air Quality Planning and Standards, USEPA
Research Triangle Park, NC 27711
T: 919-541-5373
F: 919-541-0684

Mr. Chuck Mann
Office of Research and Development
USEPA (MD 62)
Research Triangle Park, NC 27711
T: 919-541-4593
F: 919-541-7891

Dr. P.K. Misra
Atmospheric Quality and Meteorology Section
Envir. Monitoring & Reporting Branch
Ontario Ministry of Environment
125 Resources Rd., E. Wing
Etobicoke, ON M9P 3V6
T: 416-235-5768
F: 416-235-6037

Mr. Brulette
Ministry of the Environment
Province of Quebec
3900 Rue De Marly
Ste-Foy, QC GIX 4E4
T: 418-643-8209
F: 418-644-4598

Mr. Wilfred Jan
Pollution Data Analysis Division
Environment Canada
351 St. Joseph Blvd., 10th Floor
Hull, QC K1A 0X3
T: 613-994-3098
F: 613-953-9542

Mr. Robert Kelly
Regional Air Modeler
Air Programs Branch
USEPA Region 2, 20th Floor
290 Broadway
New York, NY 10007-1866
T: 212-637-4225
F: 212-637-3958
E: kelly.bob@epamail.epa.gov

Mr. Pranas E. Pranckevicius
Data Integration Unit
GLNPO - U.S. EPA - G-9J
77 West Jackson Blvd.
Chicago, IL 60604-3590
T: 312-353-3437
F: 312-353-2018
E: pprancke@ges1.r05.epa.gov

Mr. William Benjey
ORD - USEPA
Research Triangle Park, NC 27711
T: 919-541-0821
F: 919-541-1379
E: benjey@hpcc.epa.gov

GREAT LAKES COMMISSION- STAFF

Ms. Julie Wagemakers
Program Manager
Communications and Information Management
The Argus II Building
400 Fourth Street
Ann Arbor, MI 48103-4816
T: 313-665-9135
F: 313-665-4370
E: juliew@glc.org

Mr. Derek Moy
Project Specialist
Communications and Information Management
The Argus II Building
400 Fourth Street
Ann Arbor, MI 48103-4816
T: 313-665-9135
F: 313-665-4370
E: dmoy@glc.org

Group email: airtoxics@great-lakes.net
URL: http://www.glc.org/air/air3.html