DOCUMENTATION FOR THE FINAL 2002 NONPOINT SECTOR (FEB 06 VERSION) NATIONAL EMISSION INVENTORY FOR CRITERIA AND HAZARDOUS AIR POLLUTANTS

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DOCUMENTATION FOR THE FINAL 2002 NONPOINT SECTOR (FEB 06 VERSION) NATIONAL EMISSION INVENTORY FOR CRITERIA AND HAZARDOUS AIR POLLUTANTS

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ACRONYMS AND ABBREVIATIONS

AHS	American Housing Survey
ASCII	American Standard Code for Information Interchange
AvGas	aviation gasoline
BACM	best available control measure
BEIS	Biogenic Emission Inventory System
BELD	Biogenic Emissions Land Cover Database
BLS	Bureau of Labor Statistics
CAA	Clean Air Act
CAP	criteria air pollutant
CAS	Chemical Abstract Service (number)
CBP	*County Business Patterns*
CDD	cooling degree day
CE	control efficiency
CERR	Consolidated Emissions Reporting Rule
CMU	Carnegie Mellon University
CO	carbon monoxide
D&B	Dun & Bradstreet
DOC	Department of Commerce
EIAG	Emissions Inventory and Analysis Group
EIA	Energy Information Administration
EIIP	Emission Inventory Improvement Program
EPA	U.S. Environmental Protection Agency
ESD	Emission Standards Division
FHWA	Federal Highway Administration
FIRE	Factor Information REtrieval (database)
FIPS	Federal Information Processing Standards
HAP	hazardous air pollutant
HDD	heating degree day
IARC	International Agency for Research on Cancer
IC	internal combustion
ICI	industrial, commercial, and institutional
LPG	liquified petroleum gas
LTO	landing-take off
MACT	maximum achievable control technology
MMGAL	million gallons
MMGD	million gallons per day
MSW	municipal solid waste
MTBE	Methyl Tertiary-Butyl Ether
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industrial Classification System
NAPAP	National Acid Precipitation Assessment Program
NATA	National Air Toxics Assessment

ACRONYMS AND ABBREVIATIONS (continued)

NEI	National Emissions Inventory
NEMA	National Electrical Manufacturers Association
NH_3	ammonia
NIF	NEI Input Format
NMIM	National Mobile Inventory Model
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NOF	NEI Output Format
NTI	National Toxics Inventory
O_3	ozone
PAD	Petroleum Administration District
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PE	precipitation-evaporation
PM	particulate matter
PM-CON	condensible particulate matter
PM10-FIL	filterable particulate matter with a mass median aerodynamic diameter of 10 micrometers or less
PM10-PRI	primary particulate matter with a mass median aerodynamic diameter of 10 micrometers or less
PM2.5-FIL	filterable particulate matter with a mass median aerodynamic diameter of 2.5 micrometers or less
PM2.5-PRI	primary particulate matter with a mass median aerodynamic diameter of 2.5 micrometers or less
RPO	Regional Planning Organization
POM	polycyclic organic matter
POTW	Publicly-Owned Treatment Works
QA	quality assurance
QC	quality control
QCEW	Quarterly Census of Employment and Wages
RIPA	Reusable Industrial Packaging Association
RVP	Reid vapor pressure
RWC	residential wood combustion
SCAQMD	South Coast Air Quality Management District
SCC	source classification code
SIC	Standard Industrial Classification (code)
SIP	State Implementation Plan
S/L/T	State, Local, and Tribal
SO_2	sulfur dioxide
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	2,3,7,8-tetrachlorodibenzofuran
TEL	tetraethyl lead

ACRONYMS AND ABBREVIATIONS (continued)

TEQ	toxic equivalent
tpy	tons per year
U.S.	United States
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 What Is the National Emissions Inventory?

The National Emissions Inventory (NEI) is a comprehensive inventory of the amount and types of air pollutants emitted into the atmosphere annually by various sources for all areas of the United States. The air pollutants maintained in the NEI include the pollutants that contribute to the formation of one or more of the six criteria air pollutants (CAPs) and regional haze, and the 188 hazardous air pollutants (HAPs) listed in the Clean Air Act (CAA). Sources include point source facility-specific data, mobile source data, and nonpoint (area) source data. The emission estimates are based on many factors, including actual monitored readings, levels of industrial activity, fuel consumption, vehicle miles traveled, and other activities that cause air pollution. The NEI is created by the Emissions Inventory and Analysis Group (EIAG) of the United States Environmental Protection Agency (EPA) in Research Triangle Park, North Carolina. This report presents an overview of how the nonpoint source component of the final 2002 NEI was compiled.

1.2 What Are the Criteria and Hazardous Air Pollutants?

The CAA, as amended in 1990, established a list of 188 HAPs that cause or may cause cancer or other serious health effects in humans, and may also cause adverse environmental and ecological effects. The list of the 188 HAPs and their Chemical Abstract Service (CAS) numbers are available at, *http://www.epa.gov/ttn/atw/allabout.html#what*.

Under the CAA, EPA has established National Ambient Air Quality Standard (NAAQS) to protect the public health and public welfare. NAAQS have been established for ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), primary particulate matter with a mass median aerodynamic diameter of 10 and 2.5 micrometers (PM10-PRI and PM25-PRI) or less, and lead (Pb). These pollutants are referred to as the “criteria air pollutants” or CAPs (note that Pb is also included in the list of 188 HAPs and is typically tracked only as a

HAP). The EPA includes in the NEI emissions for the pollutants that contribute to the formation of CAPs. These pollutants include volatile organic compounds (VOC), CO, oxides of nitrogen (NO_x), SO_2, PM10-PRI and PM25-PRI, ammonia (NH_3), and Pb. In addition, because PM10-PRI and PM25-PRI are the sum of the filterable (FIL) and condensible (CON) fractions of PM10-PRI and PM25-PRI; PM10-FIL, PM25-FIL, and PM-CON are carried in the NEI when (1) provided by State, Local, and Tribal (S/L/T) agencies; or (2) when calculated by EPA to support development of PM10-PRI or PM25-PRI emissions.

1.3 Why Did the EPA Create the NEI for Criteria and Hazardous Air Pollutants?

The EPA produces the NEI for CAPs and HAPs for various base years. These data are needed by EPA, Regional Planning Organizations (RPOs), and S/L/T agencies to evaluate emissions trends in each State and to compare emission trends between States. The NEI is also used as a basis for various modeling and regulatory analyses. The CAA, as amended in 1990, includes many mandates for the EPA related to CAPs and HAPs. The NEI is a tool that EPA uses to meet the CAA mandates. Also, the NEI is used by RPOs and S/L/T agencies to evaluate air pollution trends and regulatory programs. Finally, the NEI contains the data used to produce EPA's *Air Trends Reports*.

Prior to the 2002 base year, the NEI and predecessor inventories for CAPs and HAPs were prepared separately. Starting with the 2002 base year, EPA synchronized the methodologies for preparing the CAP and HAP emissions in order to base the emissions on the same activity basis. However, as discussed later in this report, 2002 activity data were not available for calculating CAP and HAP emissions for all nonpoint source categories when the emissions inventories were prepared for the final 2002 NEI. Consequently, categories for which 2002 activity data are not available, emissions are carried forward from final Version 3 of the 1999 CAP and HAP NEI (EPA, 2004b; EPA, 2003).

1.4 What Are Nonpoint Sources?

For emission inventory development purposes, EPA has traditionally used the term “area sources” to refer to stationary air pollutant emission sources that are not inventoried at the facility-level. The Consolidated Emissions Reporting Rule (CERR) specifies reporting thresholds for point and area CAPs, which vary depending on the pollutant and the attainment status of a county (see http://www.epa.gov/ttn/chief/cerr/ index.html). The CAA also includes a specific definition of area HAP sources for the purpose of identifying regulatory applicability. In particular, the CAA defines an area HAP source as “any stationary source . . . that emits or has the potential to emit considering controls, in the aggregate, less than 10 tons per year of any HAP or 25 tons per year of any combination of HAPs.” Sources that emit HAPs above these thresholds are categorized as “major sources.” To reduce confusion between these two sets of area source definitions, EPA has adopted the term “nonpoint” to refer to all CAP and HAP stationary emission sources that are not incorporated into the point source component of the NEI.

Section 2.7 of this report identifies the nonpoint source categories included in the final 2002 NEI. The 2002 nonpoint source NEI includes approximately 520 source classification codes (SCCs) with CAP and/or HAP emissions, culminating in over 4.2 million county-level records in the NEI Input Format (NIF) 3.0 Emission table. Like other emissions inventories, the nonpoint source NEI has limitations based on the availability of data for some source categories and pollutants. These limitations are discussed in Section 3 of this document, and it is important to review them before interpreting the nonpoint source NEI data.

1.5 Evolution of the 2002 Nonpoint Source NEI

The EPA developed three versions (i.e., preliminary, draft, and final) of the 2002 nonpoint source NEI. This section provides a brief overview of how EPA prepared each version. For all three versions, EPA placed emphasis on integrating the methods used to prepare the CAP and HAP inventories to provide a consistent activity basis for estimating emissions for both types of pollutants.

1.5.1 Preliminary 2002 NEI (January 2004 Version)

The preliminary 2002 nonpoint NEI, that was released to the public during February 2004, is the first version of the 2002 nonpoint NEI (EPA, 2004a). The EPA prepared this inventory starting with nonpoint categories for which it prepared emissions using the most recent activity data available (i.e., 2000, 2001, or 2002). For all remaining categories, EPA carried forward the emissions data in final Version 3 of the 1999 NEI (EPA, 2003; EPA, 2004b). The preliminary 2002 NEI was provided to the S/L/T agencies to use as a starting point for preparing their 2002 inventories.

1.5.2 Draft 2002 NEI (March 2005 Version)

The draft 2002 NEI was prepared starting with the inventories that S/L/T agencies submitted to EPA by June 1, 2004. The EPA conducted QA review of the S/L/T inventories and communicated with the S/L/T agencies as needed to correct QA issues. On August 11, 2004, EPA distributed via e-mail an Excel workbook file containing a series of spreadsheets that identified QA issues, and identified how EPA would correct the issues if the S/L/T agencies did not provide alternative corrections to the issues. The S/L/T inventories were revised to incorporate corrections provided by the agencies and to apply the default corrections to the inventories for which agencies did not respond to the issues identified. After correcting the inventories, the preliminary 2002 NEI was merged with the S/L/T inventories to fill in missing categories and pollutants.

After release of the preliminary 2002 NEI, EPA continued work on preparing 2002 inventories for several categories. The data for these category-specific inventories were used to replace the old inventory data that were carried forward from the 1999 NEI and included in the preliminary 2002 NEI. The categories for which EPA prepared or updated inventories after the preliminary 2002 NEI was released are identified in Section 3 of the report for the draft 2002 NEI (EPA, 2005a).

1.5.3 Final 2002 NEI (February 2006 Version)

The EPA prepared the final 2002 NEI by revising the draft 2002 NEI to incorporate S/L/T agency comments on the draft. After incorporating comments, EPA added emissions data for missing pollutants (primarily HAPs) for the industrial, commercial, and institutional (ICI) fossil fuel combustion and solvent utilization categories. In addition, EPA ran many QA checks to identify and resolve QA issues with PM emissions, to reconcile HAP emissions where emissions for one pollutant code double-counted emissions for another pollutant code, and to identify remaining QA issues with invalid NIF codes (e.g., SCCs). Section 2 of this report provides more details on how EPA prepared the final NEI after incorporating S/L/T comments.

1.6 Uses of the Nonpoint Source NEI

The CERR required State agencies to submit their 2002 base year inventories for CAPs to EPA by June 1, 2004 (http://www.epa.gov/ttn/chief/cerr/index.html). The agencies could voluntarily submit HAPs with their 2002 CAP inventories. The EPA prepared the preliminary 2002 NEI for the agencies to use in supplementing their inventories with data for categories for which the agencies did not prepare 2002 emissions estimates. Some States used the preliminary NEI entirely for their submittals. The EPA also used the preliminary nonpoint source NEI to add categories and pollutants missing from the S/L/T inventories. The EPA prepared the draft 2002 NEI for review and comment by S/L/T agencies, and incorporated the comments into the final NEI.

The final 2002 base year NEI has multiple end uses. One of these uses is the production of EPA's *Air Trends Reports* available at, http://www.epa.gov/airtrends/reports.html. Also, for CAPs, the emissions data will be used to evaluate State Implementation Plans (SIPs) and support modeling studies for complying with the 8-hour ozone NAAQS, the fine PM NAAQS, and regional haze regulations. The EPA may also use the 2002 NEI as the basis for rulemaking support activities.

The NEI is a critical component of the EPA's National Air Toxics Program. The CAA presents a list of 188 HAPs for which EPA is to identify their sources, quantify their emissions by source category, develop regulations for each source category, and assess public health and environmental impacts after the regulations are put into effect. The initial objective is to make the data available to EPA modelers for use in the National Air Toxics Assessment (NATA). The goal of NATA is to identify those air toxics which are of greatest potential concern, in terms of contribution to population risk. The results will be used to set priorities for the collection of additional air toxics data (e.g., emissions data and ambient monitoring data). In addition, the emissions data compiled as part of this inventory effort will be used in residual risk assessments conducted by EPA.

1.7 Report Organization

This report is organized in the following structure:

Section 1. Provides background information on the NEI and its uses;

Section 2. Describes how the final 2002 nonpoint source NEI was developed;

Section 3. Describes how to interpret and use the nonpoint source NEI results, including a discussion of the inventory limitations;

Section 4. Provides the references used in the previous sections;

Appendix A. Lists the nonpoint source categories for which 2002 emissions were calculated by EIAG, and documents how nonpoint emission estimates were developed;

Appendix B. Documents electronic files containing data sets used to allocate 2002 national activity and emissions to States and counties;

Appendix C. Documents electronic files containing the emission factors and county-level activity data used to calculate 2002 emissions for the nonpoint source categories for which EIAG prepared an inventory for the 2002 NEI; and

Appendix D. Provides a tabular summary of the revisions that EPA made to S/L/T inventories to correct QA issues and to add source categories and pollutants missing from the S/L/T inventories. This appendix includes revisions completed on the original S/L/T agency inventory submittals to EIAG for preparing the draft NEI as well as revisions completed on S/L/T agency comments submitted on the draft NEI. The appendix is sorted by State.

2.0 DEVELOPMENT OF THE DRAFT 2002 NONPOINT SOURCE NEI

2.1 What is the Final 2002 Nonpoint Source NEI?

The EPA prepared the final 2002 nonpoint source NEI by incorporating comments that the S/L/T agencies submitted on the draft NEI. After incorporating S/L/T agency comments, EPA added emissions data for missing pollutants (primarily HAPs) for the ICI fossil fuel combustion and solvent utilization categories. In addition, EPA ran many QA checks to identify and resolve (1) QA issues with PM emissions, (2) double counting of HAP emissions reported under different pollutant codes in the same HAP group, and (3) QA issues with invalid NIF codes (e.g., SCCs). The EPA prepared and reviewed emissions summaries, charts, and graphs comparing the final 2002 NEI emissions to the final 1999 NEI emissions (Version 3). The EPA also compared the final 2002 NEI emissions by State to identify and resolve emissions data that showed unreasonably high emissions for a State relative to emissions for other States. In addition, EPA revised the Emission Process table to ensure the accuracy of Process MACT (maximum achievable control technology) Codes, Process MACT Compliance Status Codes, and MACT Flags.

This section of the report identifies the S/L/T agencies that submitted inventories that were included in the draft 2002 NEI, provided comments on the draft 2002 NEI, and details all of the augmentation procedures and the QA review that EPA completed on the final 2002 nonpoint NEI. Appendix D provides additional details on revisions that EPA made to the original S/L/T inventory submittals to EPA as well as the S/L/T comments provided on the draft NEI.

2.2 Who Provided an Original Inventory Submittal to EPA for the Draft NEI?

Table 2-1 shows the S/L agencies that provided original emission inventory submittals to EPA for inclusion in the draft 2002 NEI. This table provides information on the geographic and pollutant coverage of each inventory. A total of 34 States and 12 local agencies provided original emission inventory submittals to EPA. HAP emissions data provided by Duval and Pinellas Counties in FL were not included in the draft 2002 NEI due to QA issues.

Table 2-1. Summary of State and Local Agencies that Provided Original Emission Inventory Submittals for the Draft 2002 Nonpoint NEI

State	Geographic Coverage	Local Agency	FIPS Code[1]	Number of Counties in Inventory	Number of Counties in State	CAPs[2]	HAPs[2]	Notes
AL	Statewide		01	67	67	x		
AZ	Local	Maricopa County	04013	1	15	x	x	For HAPs, county submitted emissions for only lead. State agency did not submit any nonpoint source inventory data.
AR	Statewide		05	75	75	x	x	For HAPs, State submitted emissions for only lead and lead compounds.
CA	Statewide		06	58	58	x	x	
CO			08	63	64	x		State provided comments on the preliminary 2002 nonpoint NEI.
CT	Statewide		09	8	8	x	x	For CAPs, State submitted emissions for only VOC, NOX, and CO.
DE	Statewide		10	3	3	x	x	
DC	Statewide		11	1	1	x	x	
FL	Statewide		12	67	67	x		
FL	Local	Broward County	12011	1	67		x	
FL	Local	Duval County	12031	1	67		x	Inventory was not included in the draft 2002 NEI due to QA issues.
FL	Local	Pinellas County	12103	1	67		x	Inventory was not included in the draft 2002 NEI due to QA issues.
GA	Statewide		13	159	159	x		
ID	Statewide		16	44	44	x	x	
IL	Statewide		17	102	102	x	x	
IN	Statewide		18	92	92	x	x	For HAPs, State submitted emissions for only lead.
KS	Statewide		20	105	105	x	x	
KY	Local	Jefferson County	21111	1	120	x		State agency did not submit any nonpoint source inventory data.
ME	Statewide		23	16	16	x	x	
MD	Statewide		24	24	24	x	x	
MA	Statewide		25	14	14	x	x	For HAPs, State submitted emissions for only mercury.
MI	Statewide		26	83	83	x		
MN	Statewide		27	87	87	x	x	
MS	Statewide		28	82	82	x		
MO	Statewide		29	115	115	x	x	
NE	Local	Lancaster County	31109	1	93	x		State's nonpoint source inventory consisted of small point sources. State withdrew its nonpoint source inventory and submitted the emissions in point source format.
NV	Local	Clark County	32003	1	17	x		State agency did not submit any nonpoint source inventory data.
NH	Statewide		33	10	10	x		
NJ	Statewide		34	21	21	x		
NM	Local	Bernalillo County	35001	1	33	x	x	State agency did not submit any nonpoint source inventory data.
NY	Statewide		36	62	62	x	x	
OH	Statewide		39	88	88	x	x	
OH	Local	Regional Air Pollution Control Agency	39023, 39037, 39057, 39109, 39113,	6	88		x	For CAPs, inventory included VOC only. For HAPs, inventory contained emissions for trichloroethylene, tetrachloroethylene, and methylene chloride only.

Table 2-1 (continued)

State	Geographic Coverage	Local Agency	FIPS Code[1]	Number of Counties in Inventory	Number of Counties in State	CAPs[2]	HAPs[2]	Notes
			39135					
OK	Statewide		40	77	77	x		
OR	Statewide		41	36	36	x	x	
PA	Statewide		42	67	67	x	x	For HAPs, State submitted emissions for only lead
SC	Statewide		45	46	46	x		
TN	Local	Davidson County	47037	1	95			State agency did not submit any nonpoint source inventory data.
TN	Local	Knox County	47093	1	95	x	x	State agency did not submit any nonpoint source inventory data.
TX	Statewide		48	254	254	x	x	
UT	Statewide		49	29	29	x	x	
VT	Statewide		50	14	14	x	x	
VA	Statewide		51	134	134	x		For CAPs, State submitted emissions for only VOC, NOX, and CO.
WA	Statewide		53	35	39	x	x	
WA	Local	Puget Sound Clean Air Agency	53033, 53035, 53053, 53061	4	39	x	x	
WV	Statewide		54	55	55	x		
WI	Statewide		55	72	72	x	x	

[1] Federal Information Processing Standards (FIPS) code.

[2] An "x" in this column indicates the State or local agency included CAPs or HAPs in its inventory.

Table 2-1 (continued)

Table 2-2 shows the tribal inventories that were included in the draft 2002 nonpoint NEI. Twenty Three tribes submitted nonpoint source inventories to EPA. These data are not incorporated into the NEI because of difficulties of reconciling tribal and county boundaries, and also because of issues regarding double counting of emissions. These data are kept in a separate file.

Table 2-2. Summary of Tribal Authorities that Provided Original Emission Inventory Submittals Included in the Draft 2002 Nonpoint NEI

Tribal Agency	Tribal Code	CAP[1]	HAP[1]	Notes
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana	206	R-00-X	R-00-X	Tribal agency submitted inventory for draft 2002 NEI
Fond du Lac Band of the Minnesota Chippewa Tribe	405	R-01-X	R-01-X	Tribal agency submitted inventory for draft 2002 NEI
Confederated Tribes of the Umatilla Reservation, Oregon	143		R-98-F	Data carried forward from 1999 NEI
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, California	577	R-99-X		Data carried forward from 1999 NEI
Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico & Utah	751		R-99-F	Data carried forward from 1999 NEI
Penobscot Tribe of Maine	018	R-02-X	R-02-X	Tribal agency submitted inventory for draft 2002 NEI
Fort Belknap Indian Community of the Fort Belknap Reservation of Montana	204	R-02-X	R-02-X	Tribal agency submitted inventory for draft 2002 NEI
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	207	R-02-X	R-02-X	Tribal agency submitted inventory for draft 2002 NEI
Arapahoe Tribe of the Wind River Reservation, Wyoming	281	R-02-X	NA	Tribal agency submitted inventory for draft 2002 NEI
Leech Lake Band of Ojibwe	407	R-02-X	NA	Tribal agency submitted inventory for draft 2002 NEI
Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin	430	R-02-X	R-02-X	Tribal agency submitted inventory for draft 2002 NEI
Oneida Tribe of Indians of Wisconsin	433	R-02-X	R-02-X	Tribal agency submitted inventory for draft 2002 NEI
Cortina Indian Rancheria of Wintun Indians of California	513	R-01-F		Tribal agency submitted inventory for draft 2002 NEI
Paiute-Shoshone Indians of the Bishop Community of the Bishop Colony, California	549	R-01-F	R-01-F	Tribal agency submitted inventory for draft 2002 NEI
Pauma Band of Luiseno Mission Indians of the Pauma & Yuima Reservation, California	585	R-00-F	NA	Tribal agency submitted inventory for draft 2002 NEI
Gila River Indian Community of the Gila River Indian Reservation, Arizona	614	R-97-F	NA	Tribal agency submitted inventory for draft 2002 NEI
Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Arizona	615	R-97-F	NA	Tribal agency submitted inventory for draft 2002 NEI
Paiute-Shoshone Indians of the Lone Pine Community of the Lone Pine Reservation, California	624	R-00-F	NA	
Pueblo of Acoma, New Mexico	703	R-97-F	NA	
Pueblo of Laguna, New Mexico	707	R-96-F	NA	
Pueblo of Santa Ana, New Mexico	715	R-98-F	NA	
Navajo Nation, Arizona, New Mexico & Utah	780	R-02-X	NA	Tribal agency submitted inventory for draft 2002 NEI
Mississippi Band of Choctaw Indians, Mississippi	980	R-99-F	NA	

[1] The data source codes in this column are defined in section 2.6.2 of this report.

2.3 Who Provided Comments on the Draft NEI?

Table 2-3 shows the S/L agencies that provided comments to EPA on the draft 2002 nonpoint NEI, and Table 2-4 shows the tribal agencies that provided comments on the draft 2002 NEI or provided new inventories. A total of 23 States and 4 local agencies provided comments on the draft 2002 NEI. Washoe County, NV submitted an original inventory after the deadline for incorporating S/L/T data into the draft NEI. This inventory had minimal QA issues so EPA incorporated it into the final NEI.

2.4 What is EPA's Policy for Accepting State/Local/Tribal Inventories?

In general, the EPA preferentially uses S/L/T nonpoint source data in the NEI. This section of the report identifies the inventory data for which EPA did not accept S/L/T data and explains the reasons for not accepting the data.

2.4.1 Animal Husbandry NH_3 Emissions

Texas and Bernalillo County, New Mexico were the only agencies that provided comments on the NH_3 emissions inventory in the draft NEI. These comments were incorporated into the final NEI. Otherwise, the emissions in the final NEI are the same as those in the draft NEI. The inventory in the draft 2002 nonpoint source NEI is from Version 3.6 of the CMU NH_3 model. The CMU model was updated with 2002 activity data from the *Census of Agriculture* that was not available when the EPA inventory was prepared (EPA, 2004a). Also, many States or their RPOs submitted inventories to EPA based on an earlier version of the CMU model that did not included the 2002 *Census of Agriculture* activity data. Therefore, for the draft NEI, EPA replaced all State NH_3 emissions (except for four States) and NH_3 emissions originating from the preliminary NEI with the NH_3 inventory developed from Version 3.6 of the CMU model. Note that the CMU model creates NIF 3.0 files containing only monthly emissions. The monthly emissions were summed to create annual emissions and the annual emissions were inserted into the 2002 NEI.

Table 2-3. Summary of State and Local Agencies that Provided Comments Included in the Final 2002 Nonpoint NEI

State	Geographic Coverage	Local Agency	FIPS Code[1]	Number of Counties in Inventory	Number of Counties in State	CAPs[2]	HAPs[2]
AZ	Local	Maricopa County	04013	1	15	x	x
CO	Statewide		08	63	64	x	x
CT	Statewide		09	8	8	x	
DE	Statewide		10	3	3	x	x
DC	Statewide		11	1	1		x
FL[3]	Local	Pinellas County	12103	1	67	x	x
ID	Statewide		16	44	44	x	x
IL	Statewide		17	102	102	x	x
IN	Statewide		18	92	92	x	
ME	Statewide		23	16	16	x	x
MA	Statewide		25	14	14	x	x
MI	Statewide		26	83	83	x	x
MN	Statewide		27	87	87	x	x
NV[4]	Local	Washoe County	32031	1	17	x	
NH	Statewide		33	10	10	x	
NJ	Statewide		34	21	21	x	
NM	Local	Bernalillo County	35001	1	33	x	x
OH	Statewide		39	88	88	x	x
OR	Statewide		41	36	36	x	
RI	Statewide					x	x
SC	Statewide		45	46	46	x	x
TN[5]	Statewide						
TX	Statewide		48	254	254	x	x
UT	Statewide		49	29	29	x	x
VA	Statewide		51	134	134	x	
WA	Statewide		53	35	39	x	x
WV	Statewide		54	55	55	x	x
WI	Statewide		55	72	72	x	x

[1] Federal Information Processing Standards (FIPS) code.
[2] An "x" in this column indicates the State or local agency included CAPs or HAPs in its inventory.
[3] Local agency's comments were not incorporated into the final NEI due to QA issues.
[4] This county provided an original inventory to EPA after the submittal deadline for incorporating S/L/T agency inventories into the draft NEI. This inventory had minimal QA issues, and, therefore, was incorporated into the final NEI.

Table 2-4. Summary of Tribal Authorities Who Provided Comments for the Final 2002 Nonpoint NEI

Tribal Agency	Tribal Code	CAP[1]	HAP[1]	Notes
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation, California	577	R-99-X		Data carried forward from 1999 NEI
Cortina Indian Rancheria of Wintun Indians of California	513	R-01-X		
Penobscot Tribe of Maine	018	R-02-X	R-02-X	
Leech Lake Band of Ojibwe	407	R-02-X		

[1] The data source codes in this column are defined in section 2.6.2 of this report.

The exceptions are California, Kansas, Minnesota, and Missouri who requested that EPA keep their inventory in the 2002 NEI for this category. California believes its inventory is better than the inventory from the CMU model. In addition, California included emissions for PM10-FIL, PM25-FIL, VOC, and 11 HAPs along with NH_3 emissions for this category; therefore, by using California's data, the emissions for all of the pollutants are based on the same activity data. Kansas, Minnesota, and Missouri included NH_3 emissions for confined animal feeding operations in their point source inventories and adjusted their nonpoint source inventories to exclude the point source emissions. Therefore, their nonpoint source inventories were not replaced since the CMU model inventory is not adjusted for point source emissions. The EPA evaluated the final 2002 point source inventory for other States and determined that there is no double counting of NH_3 emissions in the final nonpoint source inventory. For the final nonpoint NEI, all CMU data for this category were assigned a data source code of P-02-X. In addition, the inventories for Kansas, Minnesota, and Missouri were assigned the same data source code (P-02-X) since their inventories were sponsored by their RPO.

Other S/L agencies included PM10-PRI or PM10-FIL and PM25-PRI or PM25-FIL in their animal husbandry inventories. The EPA kept the emissions for these pollutants in the final NEI since the CMU model does not provide estimates for these pollutants. The records for these pollutants were assigned the S-02-X data source code.

2.4.2 Agricultural Fertilizer NH_3 Emissions

This category covers NH_3 emissions associated with agricultural fertilizer application (SCC 28017xxxxx). Texas and Bernalillo County, New Mexico were the only agencies that provided comments on the NH_3 emissions inventory in the draft NEI. These comments were incorporated into the final NEI. Otherwise, the emissions in the final NEI are the same as those in the draft NEI. The inventory in the draft 2002 nonpoint source NEI is from Version 3.6 of the CMU NH_3 model. For the draft 2002 NEI, EPA replaced all State NH_3 emissions and NH_3 emissions originating from the preliminary NEI with the NH_3 inventory developed from Version 3.6 of the CMU model. The EPA included only annual NH_3 emissions in the NEI. California did not provide any data for this category so the CMU model inventory for California was added in the draft NEI. All CMU data for this category were assigned a data source code of P-02-X. Oregon provided NOx emissions for this category that were kept in the draft NEI (and assigned the S-02-X data source code).

2.4.3 Dioxins and Furans

The emissions data for dioxins and furans were removed from the final NEI pending further QA review by EPA. Table 2-5 lists the dioxin and furan pollutant codes removed from the final NEI.

Table 2-5. Dioxin and Furan Pollutant Codes Removed from the Final 2002 NEI

Pollutant Code	Pollutant Name
123911	p-Dioxane
132649	Dibenzofuran
136677093	Dioxins, Total, W/O Individ. Isomers Reported {PCDDS}
136677106	Polychlorinated Dibenzofurans, Total
1746016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin
19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin
30402143	Total Tetrachlorodibenzofuran
30402154	Total Pentachlorodibenzofuran
3268879	Octachlorodibenzo-p-Dioxin
34465468	Hexachlorodibenzo-p-Dioxin
35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin
36088229	Total Pentachlorodibenzo-p-Dioxin
37871004	Total Heptachlorodibenzo-p-Dioxin
38998753	Total Heptachlorodibenzofuran
39001020	Octachlorodibenzofuran
39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin
40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin
51207319	2,3,7,8-Tetrachlorodibenzofuran
55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran
55684941	Total Hexachlorodibenzofuran
57117314	2,3,4,7,8-Pentachlorodibenzofuran
57117416	1,2,3,7,8-Pentachlorodibenzofuran
57117449	1,2,3,6,7,8-Hexachlorodibenzofuran
57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin
600	2,3,7,8-TCDD TEQ
60851345	2,3,4,6,7,8-Hexachlorodibenzofuran
626	Dioxins/Furans as 2,3,7,8-TCDD TEQs -I/89
67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran
70648269	1,2,3,4,7,8-Hexachlorodibenzofuran
72918219	1,2,3,7,8,9-Hexachlorodibenzofuran

2.4.4 Gasoline Distribution

On February 18, 2005, EPA sent a notice to all S/L agency nonpoint source inventory contacts that had supplied gasoline distribution emissions for incorporation in the draft NEI (Driver, 2005). The purpose of this notice was to notify S/L agencies that EPA intended to replace all gasoline distribution data incorporated into the draft 2002 NEI with newly prepared 2002 EPA estimates for the final 2002 NEI. The EPA requested that S/L agencies review EPA's gasoline distribution emission estimation methods and emission estimates and provide any necessary feedback to EPA. The EPA notified States that it would only retain the EPA’s new 2002 estimates unless S/L agencies directed EPA with new submissions (and documentation) or identified issues related to EPA’s emission estimation methods. This notice also transmitted a memorandum detailing EPA's methodology and a spreadsheet that compared EPA's new estimates with those reported in the draft 2002 NEI. Section 2.8.5 identifies (1) the reasons why EPA revised the draft 2002 NEI estimates, (2) the comments that were received from S/L agencies on the EPA prepared estimates, and (3) the steps EPA took to address each comment with respect to preparation of the final 2002 NEI.

2.4.5 Natural Sources

The EPA did not include emissions associated with natural sources that agencies included in their inventory submittals. Table 2-6 lists the SCCs, pollutants, and States for which EPA did not include emissions associated with natural sources in the draft NEI.

2.4.6 Portable Fuel Containers

The EPA did not accept inventories that some States submitted for portable fuel containers. The EPA’s Office of Transportation and Air Quality (OTAQ) will be preparing a national inventory for this nonpoint source category that EPA plans to use in future versions of the NEI. This is a new nonpoint category for the NEI and EPA wants to ensure consistency in both the methodology and geographic coverage of emissions for portable fuel containers. The EPA will provide the State data it received for this category in a separate database in NIF 3.0.

Table 2-6. Categories of Natural Sources (Biogenic and Geogenic) Removed from Draft 2002 Nonpoint NEI

SCC	SCC Description	State FIPS	State Name	Pollutant Code
2701010000	Natural Sources, Biogenic, Oak Forests, Total	48	TEXAS	NH3
2701020000	Natural Sources, Biogenic, Non-oak Forests, Total	48	TEXAS	NH3
2701400000	Natural Sources, Biogenic, Soil, Total	53	WASHINGTON	NH3
2701405000	Natural Sources , Biogenic , Unknown Land Use (Anderson Land Use Code 0) , Total	19	IOWA	NH3
2701405000	Natural Sources , Biogenic , Unknown Land Use (Anderson Land Use Code 0) , Total	20	KANSAS	NH3
2701405000	Natural Sources , Biogenic , Unknown Land Use (Anderson Land Use Code 0) , Total	22	LOUISIANA	NH3
2701405000	Natural Sources , Biogenic , Unknown Land Use (Anderson Land Use Code 0) , Total	31	NEBRASKA	NH3
2701405000	Natural Sources , Biogenic , Unknown Land Use (Anderson Land Use Code 0) , Total	40	OKLAHOMA	NH3
2701411000	Natural Sources , Biogenic , Urban or Built-Up Land/Residential (Anderson Land Use Code 11) , Total	19	IOWA	NH3
2701411000	Natural Sources , Biogenic , Urban or Built-Up Land/Residential (Anderson Land Use Code 11) , Total	20	KANSAS	NH3
2701411000	Natural Sources , Biogenic , Urban or Built-Up Land/Residential (Anderson Land Use Code 11) , Total	22	LOUISIANA	NH3
2701411000	Natural Sources , Biogenic , Urban or Built-Up Land/Residential (Anderson Land Use Code 11) , Total	31	NEBRASKA	NH3
2701411000	Natural Sources , Biogenic , Urban or Built-Up Land/Residential (Anderson Land Use Code 11) , Total	40	OKLAHOMA	NH3
2701412000	Natural Sources , Biogenic , Urban or Built-Up Land/Commercial Services (Anderson Land Use Code 12) , Total	19	IOWA	NH3
2701412000	Natural Sources , Biogenic , Urban or Built-Up Land/Commercial Services (Anderson Land Use Code 12) , Total	20	KANSAS	NH3
2701412000	Natural Sources , Biogenic , Urban or Built-Up Land/Commercial Services (Anderson Land Use Code 12) , Total	22	LOUISIANA	NH3
2701412000	Natural Sources , Biogenic , Urban or Built-Up Land/Commercial Services (Anderson Land Use Code 12) , Total	31	NEBRASKA	NH3
2701412000	Natural Sources , Biogenic , Urban or Built-Up Land/Commercial Services (Anderson Land Use Code 12) , Total	40	OKLAHOMA	NH3
2701413000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial (Anderson Land Use Code 13) , Total	19	IOWA	NH3
2701413000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial (Anderson Land Use Code 13) , Total	20	KANSAS	NH3
2701413000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial (Anderson Land Use Code 13) , Total	22	LOUISIANA	NH3
2701413000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial (Anderson Land Use Code 13) , Total	31	NEBRASKA	NH3
2701413000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial (Anderson Land Use Code 13) , Total	40	OKLAHOMA	NH3
2701414000	Natural Sources , Biogenic , Urban or Built-Up Land/Transportation, Communications (Anderson LUC14) , Total	19	IOWA	NH3
2701414000	Natural Sources , Biogenic , Urban or Built-Up Land/Transportation, Communications (Anderson LUC14) , Total	20	KANSAS	NH3
2701414000	Natural Sources , Biogenic , Urban or Built-Up Land/Transportation, Communications (Anderson LUC14) , Total	22	LOUISIANA	NH3
2701414000	Natural Sources , Biogenic , Urban or Built-Up Land/Transportation, Communications (Anderson LUC14) , Total	31	NEBRASKA	NH3
2701414000	Natural Sources , Biogenic , Urban or Built-Up Land/Transportation, Communications (Anderson LUC14) , Total	40	OKLAHOMA	NH3
2701415000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial and Commercial (Anderson LUC 15) , Total	19	IOWA	NH3
2701415000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial and Commercial (Anderson LUC 15) , Total	20	KANSAS	NH3
2701415000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial and Commercial (Anderson LUC 15) , Total	22	LOUISIANA	NH3
2701415000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial and Commercial (Anderson LUC 15) , Total	31	NEBRASKA	NH3
2701415000	Natural Sources , Biogenic , Urban or Built-Up Land/Industrial and Commercial (Anderson LUC 15) , Total	40	OKLAHOMA	NH3
2701416000	Natural Sources , Biogenic , Urban or Built-Up Land/Mixed Urban or Build-Up Land (Anderson LUC 16) , Total	19	IOWA	NH3
2701416000	Natural Sources , Biogenic , Urban or Built-Up Land/Mixed Urban or Build-Up Land (Anderson LUC 16) , Total	20	KANSAS	NH3
2701416000	Natural Sources , Biogenic , Urban or Built-Up Land/Mixed Urban or Build-Up Land (Anderson LUC 16) , Total	22	LOUISIANA	NH3
2701416000	Natural Sources , Biogenic , Urban or Built-Up Land/Mixed Urban or Build-Up Land (Anderson LUC 16) , Total	31	NEBRASKA	NH3
2701416000	Natural Sources , Biogenic , Urban or Built-Up Land/Mixed Urban or Build-Up Land (Anderson LUC 16) , Total	40	OKLAHOMA	NH3
2701417000	Natural Sources , Biogenic , Urban or Built-Up Land/Other Urban or Built-Up Land (Anderson LUC 17) , Total	19	IOWA	NH3
2701417000	Natural Sources , Biogenic , Urban or Built-Up Land/Other Urban or Built-Up Land (Anderson LUC 17) , Total	20	KANSAS	NH3
2701417000	Natural Sources , Biogenic , Urban or Built-Up Land/Other Urban or Built-Up Land (Anderson LUC 17) , Total	22	LOUISIANA	NH3
2701417000	Natural Sources , Biogenic , Urban or Built-Up Land/Other Urban or Built-Up Land (Anderson LUC 17) , Total	31	NEBRASKA	NH3
2701417000	Natural Sources , Biogenic , Urban or Built-Up Land/Other Urban or Built-Up Land (Anderson LUC 17) , Total	40	OKLAHOMA	NH3

Table 2-6 (continued)

SCC	SCC Description	State FIPS	State Name	Pollutant Code
2701420000	Natural Sources, Biogenic, Soil/Agriculture, Total	06	CALIFORNIA	PM, PM10-FIL, PM25-FIL, 7439921, 7439965, 7439976, 7440020, 7440360, 7440382, 7440439, 7440473, 7440484, 7723140, 7782492, 7782505
2701420000	Natural Sources, Biogenic, Soil/Agriculture, Total	25	MASSACHUSETTS	NH3
2701421000	Natural Sources , Biogenic , Agricultural Land/Cropland and Pasture (Anderson Land Use Code 21) , Total	19	IOWA	NH3
2701421000	Natural Sources , Biogenic , Agricultural Land/Cropland and Pasture (Anderson Land Use Code 21) , Total	20	KANSAS	NH3
2701421000	Natural Sources , Biogenic , Agricultural Land/Cropland and Pasture (Anderson Land Use Code 21) , Total	22	LOUISIANA	NH3
2701421000	Natural Sources , Biogenic , Agricultural Land/Cropland and Pasture (Anderson Land Use Code 21) , Total	31	NEBRASKA	NH3
2701421000	Natural Sources , Biogenic , Agricultural Land/Cropland and Pasture (Anderson Land Use Code 21) , Total	40	OKLAHOMA	NH3
2701422000	Natural Sources , Biogenic , Agricultural Land/Orchards, Groves, Vineyards, Nurseries (AndrsnLUC22) , Total	19	IOWA	NH3
2701422000	Natural Sources , Biogenic , Agricultural Land/Orchards, Groves, Vineyards, Nurseries (AndrsnLUC22) , Total	20	KANSAS	NH3
2701422000	Natural Sources , Biogenic , Agricultural Land/Orchards, Groves, Vineyards, Nurseries (AndrsnLUC22) , Total	22	LOUISIANA	NH3
2701422000	Natural Sources , Biogenic , Agricultural Land/Orchards, Groves, Vineyards, Nurseries (AndrsnLUC22) , Total	31	NEBRASKA	NH3
2701422000	Natural Sources , Biogenic , Agricultural Land/Orchards, Groves, Vineyards, Nurseries (AndrsnLUC22) , Total	40	OKLAHOMA	NH3
2701423000	Natural Sources , Biogenic , Agricultural Land/Confined Feeding Operations(Anderson LUC23) , Total	19	IOWA	NH3
2701423000	Natural Sources , Biogenic , Agricultural Land/Confined Feeding Operations(Anderson LUC23) , Total	20	KANSAS	NH3
2701423000	Natural Sources , Biogenic , Agricultural Land/Confined Feeding Operations(Anderson LUC23) , Total	22	LOUISIANA	NH3
2701423000	Natural Sources , Biogenic , Agricultural Land/Confined Feeding Operations(Anderson LUC23) , Total	31	NEBRASKA	NH3
2701423000	Natural Sources , Biogenic , Agricultural Land/Confined Feeding Operations(Anderson LUC23) , Total	40	OKLAHOMA	NH3
2701424000	Natural Sources , Biogenic , Agricultural Land/Other Agricultural Land (Anderson Land Use Code 24) , Total	19	IOWA	NH3
2701424000	Natural Sources , Biogenic , Agricultural Land/Other Agricultural Land (Anderson Land Use Code 24) , Total	20	KANSAS	NH3
2701424000	Natural Sources , Biogenic , Agricultural Land/Other Agricultural Land (Anderson Land Use Code 24) , Total	22	LOUISIANA	NH3
2701424000	Natural Sources , Biogenic , Agricultural Land/Other Agricultural Land (Anderson Land Use Code 24) , Total	31	NEBRASKA	NH3
2701424000	Natural Sources , Biogenic , Agricultural Land/Other Agricultural Land (Anderson Land Use Code 24) , Total	40	OKLAHOMA	NH3
2701431000	Natural Sources , Biogenic , Rangeland/Herbaceous Rangeland (Anderson Land Use Code 31) , Total	19	IOWA	NH3
2701431000	Natural Sources , Biogenic , Rangeland/Herbaceous Rangeland (Anderson Land Use Code 31) , Total	20	KANSAS	NH3
2701431000	Natural Sources , Biogenic , Rangeland/Herbaceous Rangeland (Anderson Land Use Code 31) , Total	22	LOUISIANA	NH3
2701431000	Natural Sources , Biogenic , Rangeland/Herbaceous Rangeland (Anderson Land Use Code 31) , Total	31	NEBRASKA	NH3
2701431000	Natural Sources , Biogenic , Rangeland/Herbaceous Rangeland (Anderson Land Use Code 31) , Total	40	OKLAHOMA	NH3
2701432000	Natural Sources , Biogenic , Rangeland/Shrub and Brush Rangeland (Anderson Land Use Code 32) , Total	19	IOWA	NH3
2701432000	Natural Sources , Biogenic , Rangeland/Shrub and Brush Rangeland (Anderson Land Use Code 32) , Total	20	KANSAS	NH3
2701432000	Natural Sources , Biogenic , Rangeland/Shrub and Brush Rangeland (Anderson Land Use Code 32) , Total	22	LOUISIANA	NH3
2701432000	Natural Sources , Biogenic , Rangeland/Shrub and Brush Rangeland (Anderson Land Use Code 32) , Total	31	NEBRASKA	NH3
2701432000	Natural Sources , Biogenic , Rangeland/Shrub and Brush Rangeland (Anderson Land Use Code 32) , Total	40	OKLAHOMA	NH3
2701433000	Natural Sources , Biogenic , Rangeland/Mixed Rangeland (Anderson Land Use Code 33) , Total	19	IOWA	NH3
2701433000	Natural Sources , Biogenic , Rangeland/Mixed Rangeland (Anderson Land Use Code 33) , Total	20	KANSAS	NH3
2701433000	Natural Sources , Biogenic , Rangeland/Mixed Rangeland (Anderson Land Use Code 33) , Total	22	LOUISIANA	NH3
2701433000	Natural Sources , Biogenic , Rangeland/Mixed Rangeland (Anderson Land Use Code 33) , Total	31	NEBRASKA	NH3
2701433000	Natural Sources , Biogenic , Rangeland/Mixed Rangeland (Anderson Land Use Code 33) , Total	40	OKLAHOMA	NH3
2701441000	Natural Sources , Biogenic , Forest Land/Deciduous Forest Land (Anderson Land Use Code 41) , Total	19	IOWA	NH3
2701441000	Natural Sources , Biogenic , Forest Land/Deciduous Forest Land (Anderson Land Use Code 41) , Total	20	KANSAS	NH3
2701441000	Natural Sources , Biogenic , Forest Land/Deciduous Forest Land (Anderson Land Use Code 41) , Total	22	LOUISIANA	NH3
2701441000	Natural Sources , Biogenic , Forest Land/Deciduous Forest Land (Anderson Land Use Code 41) , Total	31	NEBRASKA	NH3

Table 2-6 (continued)

SCC	SCC Description	State FIPS	State Name	Pollutant Code
2701441000	Natural Sources , Biogenic , Forest Land/Deciduous Forest Land (Anderson Land Use Code 41) , Total	40	OKLAHOMA	NH3
2701442000	Natural Sources , Biogenic , Forest Land/Evergreen Forest Land (Anderson Land Use Code 42) , Total	19	IOWA	NH3
2701442000	Natural Sources , Biogenic , Forest Land/Evergreen Forest Land (Anderson Land Use Code 42) , Total	20	KANSAS	NH3
2701442000	Natural Sources , Biogenic , Forest Land/Evergreen Forest Land (Anderson Land Use Code 42) , Total	22	LOUISIANA	NH3
2701442000	Natural Sources , Biogenic , Forest Land/Evergreen Forest Land (Anderson Land Use Code 42) , Total	31	NEBRASKA	NH3
2701442000	Natural Sources , Biogenic , Forest Land/Evergreen Forest Land (Anderson Land Use Code 42) , Total	40	OKLAHOMA	NH3
2701443000	Natural Sources , Biogenic , Forest Land/Mixed Forest Land (Anderson Land Use Code 43) , Total	19	IOWA	NH3
2701443000	Natural Sources , Biogenic , Forest Land/Mixed Forest Land (Anderson Land Use Code 43) , Total	20	KANSAS	NH3
2701443000	Natural Sources , Biogenic , Forest Land/Mixed Forest Land (Anderson Land Use Code 43) , Total	22	LOUISIANA	NH3
2701443000	Natural Sources , Biogenic , Forest Land/Mixed Forest Land (Anderson Land Use Code 43) , Total	31	NEBRASKA	NH3
2701443000	Natural Sources , Biogenic , Forest Land/Mixed Forest Land (Anderson Land Use Code 43) , Total	40	OKLAHOMA	NH3
2701451000	Natural Sources , Biogenic , Water/Streams and Canals (Anderson Land Use Code 51) , Total	19	IOWA	NH3
2701451000	Natural Sources , Biogenic , Water/Streams and Canals (Anderson Land Use Code 51) , Total	20	KANSAS	NH3
2701451000	Natural Sources , Biogenic , Water/Streams and Canals (Anderson Land Use Code 51) , Total	22	LOUISIANA	NH3
2701451000	Natural Sources , Biogenic , Water/Streams and Canals (Anderson Land Use Code 51) , Total	31	NEBRASKA	NH3
2701451000	Natural Sources , Biogenic , Water/Streams and Canals (Anderson Land Use Code 51) , Total	40	OKLAHOMA	NH3
2701452000	Natural Sources , Biogenic , Water/Lakes (Anderson Land Use Code 52) , Total	19	IOWA	NH3
2701452000	Natural Sources , Biogenic , Water/Lakes (Anderson Land Use Code 52) , Total	20	KANSAS	NH3
2701452000	Natural Sources , Biogenic , Water/Lakes (Anderson Land Use Code 52) , Total	22	LOUISIANA	NH3
2701452000	Natural Sources , Biogenic , Water/Lakes (Anderson Land Use Code 52) , Total	31	NEBRASKA	NH3
2701452000	Natural Sources , Biogenic , Water/Lakes (Anderson Land Use Code 52) , Total	40	OKLAHOMA	NH3
2701453000	Natural Sources , Biogenic , Water/Reservoirs (Anderson Land Use Code 53) , Total	19	IOWA	NH3
2701453000	Natural Sources , Biogenic , Water/Reservoirs (Anderson Land Use Code 53) , Total	20	KANSAS	NH3
2701453000	Natural Sources , Biogenic , Water/Reservoirs (Anderson Land Use Code 53) , Total	22	LOUISIANA	NH3
2701453000	Natural Sources , Biogenic , Water/Reservoirs (Anderson Land Use Code 53) , Total	31	NEBRASKA	NH3
2701453000	Natural Sources , Biogenic , Water/Reservoirs (Anderson Land Use Code 53) , Total	40	OKLAHOMA	NH3
2701454000	Natural Sources , Biogenic , Water/Bays and Estuaries (Anderson Land Use Code 54) , Total	19	IOWA	NH3
2701454000	Natural Sources , Biogenic , Water/Bays and Estuaries (Anderson Land Use Code 54) , Total	20	KANSAS	NH3
2701454000	Natural Sources , Biogenic , Water/Bays and Estuaries (Anderson Land Use Code 54) , Total	22	LOUISIANA	NH3
2701454000	Natural Sources , Biogenic , Water/Bays and Estuaries (Anderson Land Use Code 54) , Total	31	NEBRASKA	NH3
2701454000	Natural Sources , Biogenic , Water/Bays and Estuaries (Anderson Land Use Code 54) , Total	40	OKLAHOMA	NH3
2701461000	Natural Sources , Biogenic , Wetlands/Forested Wetlands (Anderson Land Use Code 61) , Total	19	IOWA	NH3
2701461000	Natural Sources , Biogenic , Wetlands/Forested Wetlands (Anderson Land Use Code 61) , Total	20	KANSAS	NH3
2701461000	Natural Sources , Biogenic , Wetlands/Forested Wetlands (Anderson Land Use Code 61) , Total	22	LOUISIANA	NH3
2701461000	Natural Sources , Biogenic , Wetlands/Forested Wetlands (Anderson Land Use Code 61) , Total	31	NEBRASKA	NH3
2701461000	Natural Sources , Biogenic , Wetlands/Forested Wetlands (Anderson Land Use Code 61) , Total	40	OKLAHOMA	NH3
2701462000	Natural Sources , Biogenic , Wetlands/Nonforested Wetlands (Anderson Land Use Code 62) , Total	19	IOWA	NH3
2701462000	Natural Sources , Biogenic , Wetlands/Nonforested Wetlands (Anderson Land Use Code 62) , Total	20	KANSAS	NH3
2701462000	Natural Sources , Biogenic , Wetlands/Nonforested Wetlands (Anderson Land Use Code 62) , Total	22	LOUISIANA	NH3
2701462000	Natural Sources , Biogenic , Wetlands/Nonforested Wetlands (Anderson Land Use Code 62) , Total	31	NEBRASKA	NH3
2701462000	Natural Sources , Biogenic , Wetlands/Nonforested Wetlands (Anderson Land Use Code 62) , Total	40	OKLAHOMA	NH3
2701471000	Natural Sources , Biogenic , Barren Land/Dry Salt Flats (Anderson Land Use Code 71) , Total	19	IOWA	NH3
2701471000	Natural Sources , Biogenic , Barren Land/Dry Salt Flats (Anderson Land Use Code 71) , Total	20	KANSAS	NH3
2701471000	Natural Sources , Biogenic , Barren Land/Dry Salt Flats (Anderson Land Use Code 71) , Total	22	LOUISIANA	NH3
2701471000	Natural Sources , Biogenic , Barren Land/Dry Salt Flats (Anderson Land Use Code 71) , Total	31	NEBRASKA	NH3

Table 2-6 (continued)

SCC	SCC Description	State FIPS	State Name	Pollutant Code
2701471000	Natural Sources , Biogenic , Barren Land/Dry Salt Flats (Anderson Land Use Code 71) , Total	40	OKLAHOMA	NH3
2701472000	Natural Sources , Biogenic , Barren Land/Beaches (Anderson Land Use Code 72) , Total	19	IOWA	NH3
2701472000	Natural Sources , Biogenic , Barren Land/Beaches (Anderson Land Use Code 72) , Total	20	KANSAS	NH3
2701472000	Natural Sources , Biogenic , Barren Land/Beaches (Anderson Land Use Code 72) , Total	22	LOUISIANA	NH3
2701472000	Natural Sources , Biogenic , Barren Land/Beaches (Anderson Land Use Code 72) , Total	31	NEBRASKA	NH3
2701472000	Natural Sources , Biogenic , Barren Land/Beaches (Anderson Land Use Code 72) , Total	40	OKLAHOMA	NH3
2701473000	Natural Sources , Biogenic , Barren Land/Sandy Areas Other than Beaches (Anderson Land Use Code 73) , Total	19	IOWA	NH3
2701473000	Natural Sources , Biogenic , Barren Land/Sandy Areas Other than Beaches (Anderson Land Use Code 73) , Total	20	KANSAS	NH3
2701473000	Natural Sources , Biogenic , Barren Land/Sandy Areas Other than Beaches (Anderson Land Use Code 73) , Total	22	LOUISIANA	NH3
2701473000	Natural Sources , Biogenic , Barren Land/Sandy Areas Other than Beaches (Anderson Land Use Code 73) , Total	31	NEBRASKA	NH3
2701473000	Natural Sources , Biogenic , Barren Land/Sandy Areas Other than Beaches (Anderson Land Use Code 73) , Total	40	OKLAHOMA	NH3
2701474000	Natural Sources , Biogenic , Barren Land/Bare Exposed Rock (Anderson Land Use Code 74) , Total	19	IOWA	NH3
2701474000	Natural Sources , Biogenic , Barren Land/Bare Exposed Rock (Anderson Land Use Code 74) , Total	20	KANSAS	NH3
2701474000	Natural Sources , Biogenic , Barren Land/Bare Exposed Rock (Anderson Land Use Code 74) , Total	22	LOUISIANA	NH3
2701474000	Natural Sources , Biogenic , Barren Land/Bare Exposed Rock (Anderson Land Use Code 74) , Total	31	NEBRASKA	NH3
2701474000	Natural Sources , Biogenic , Barren Land/Bare Exposed Rock (Anderson Land Use Code 74) , Total	40	OKLAHOMA	NH3
2701475000	Natural Sources , Biogenic , Barren Land/Strip Mines, Quarries, and Gravel Pits (Anderson LUC 75) , Total	19	IOWA	NH3
2701475000	Natural Sources , Biogenic , Barren Land/Strip Mines, Quarries, and Gravel Pits (Anderson LUC 75) , Total	20	KANSAS	NH3
2701475000	Natural Sources , Biogenic , Barren Land/Strip Mines, Quarries, and Gravel Pits (Anderson LUC 75) , Total	22	LOUISIANA	NH3
2701475000	Natural Sources , Biogenic , Barren Land/Strip Mines, Quarries, and Gravel Pits (Anderson LUC 75) , Total	31	NEBRASKA	NH3
2701475000	Natural Sources , Biogenic , Barren Land/Strip Mines, Quarries, and Gravel Pits (Anderson LUC 75) , Total	40	OKLAHOMA	NH3
2701476000	Natural Sources , Biogenic , Barren Land/Transitional Areas (Anderson Land Use Code 76) , Total	19	IOWA	NH3
2701476000	Natural Sources , Biogenic , Barren Land/Transitional Areas (Anderson Land Use Code 76) , Total	20	KANSAS	NH3
2701476000	Natural Sources , Biogenic , Barren Land/Transitional Areas (Anderson Land Use Code 76) , Total	22	LOUISIANA	NH3
2701476000	Natural Sources , Biogenic , Barren Land/Transitional Areas (Anderson Land Use Code 76) , Total	31	NEBRASKA	NH3
2701476000	Natural Sources , Biogenic , Barren Land/Transitional Areas (Anderson Land Use Code 76) , Total	40	OKLAHOMA	NH3
2701477000	Natural Sources , Biogenic , Barren Land/Mixed Barren Land (Anderson Land Use Code 77) , Total	19	IOWA	NH3
2701477000	Natural Sources , Biogenic , Barren Land/Mixed Barren Land (Anderson Land Use Code 77) , Total	20	KANSAS	NH3
2701477000	Natural Sources , Biogenic , Barren Land/Mixed Barren Land (Anderson Land Use Code 77) , Total	22	LOUISIANA	NH3
2701477000	Natural Sources , Biogenic , Barren Land/Mixed Barren Land (Anderson Land Use Code 77) , Total	31	NEBRASKA	NH3
2701477000	Natural Sources , Biogenic , Barren Land/Mixed Barren Land (Anderson Land Use Code 77) , Total	40	OKLAHOMA	NH3
2701481000	Natural Sources , Biogenic , Tundra/Shrub and Brush Tundra (Anderson Land Use Code 81) , Total	19	IOWA	NH3
2701481000	Natural Sources , Biogenic , Tundra/Shrub and Brush Tundra (Anderson Land Use Code 81) , Total	20	KANSAS	NH3
2701481000	Natural Sources , Biogenic , Tundra/Shrub and Brush Tundra (Anderson Land Use Code 81) , Total	22	LOUISIANA	NH3
2701481000	Natural Sources , Biogenic , Tundra/Shrub and Brush Tundra (Anderson Land Use Code 81) , Total	31	NEBRASKA	NH3
2701481000	Natural Sources , Biogenic , Tundra/Shrub and Brush Tundra (Anderson Land Use Code 81) , Total	40	OKLAHOMA	NH3
2701482000	Natural Sources , Biogenic , Tundra/Herbaceous Tundra (Anderson Land Use Code 82) , Total	19	IOWA	NH3
2701482000	Natural Sources , Biogenic , Tundra/Herbaceous Tundra (Anderson Land Use Code 82) , Total	20	KANSAS	NH3
2701482000	Natural Sources , Biogenic , Tundra/Herbaceous Tundra (Anderson Land Use Code 82) , Total	22	LOUISIANA	NH3
2701482000	Natural Sources , Biogenic , Tundra/Herbaceous Tundra (Anderson Land Use Code 82) , Total	31	NEBRASKA	NH3
2701482000	Natural Sources , Biogenic , Tundra/Herbaceous Tundra (Anderson Land Use Code 82) , Total	40	OKLAHOMA	NH3
2701483000	Natural Sources , Biogenic , Tundra/Bare Ground (Anderson Land Use Code 83) , Total	19	IOWA	NH3
2701483000	Natural Sources , Biogenic , Tundra/Bare Ground (Anderson Land Use Code 83) , Total	20	KANSAS	NH3
2701483000	Natural Sources , Biogenic , Tundra/Bare Ground (Anderson Land Use Code 83) , Total	22	LOUISIANA	NH3
2701483000	Natural Sources , Biogenic , Tundra/Bare Ground (Anderson Land Use Code 83) , Total	31	NEBRASKA	NH3

Table 2-6 (continued)

SCC	SCC Description	State FIPS	State Name	Pollutant Code
2701483000	Natural Sources , Biogenic , Tundra/Bare Ground (Anderson Land Use Code 83) , Total	40	OKLAHOMA	NH3
2701484000	Natural Sources , Biogenic , Tundra/Wet Tundra (Anderson Land Use Code 84) , Total	19	IOWA	NH3
2701484000	Natural Sources , Biogenic , Tundra/Wet Tundra (Anderson Land Use Code 84) , Total	20	KANSAS	NH3
2701484000	Natural Sources , Biogenic , Tundra/Wet Tundra (Anderson Land Use Code 84) , Total	22	LOUISIANA	NH3
2701484000	Natural Sources , Biogenic , Tundra/Wet Tundra (Anderson Land Use Code 84) , Total	31	NEBRASKA	NH3
2701484000	Natural Sources , Biogenic , Tundra/Wet Tundra (Anderson Land Use Code 84) , Total	40	OKLAHOMA	NH3
2701485000	Natural Sources , Biogenic , Tundra/Mixed Tundra (Anderson Land Use Code 85) , Total	19	IOWA	NH3
2701485000	Natural Sources , Biogenic , Tundra/Mixed Tundra (Anderson Land Use Code 85) , Total	20	KANSAS	NH3
2701485000	Natural Sources , Biogenic , Tundra/Mixed Tundra (Anderson Land Use Code 85) , Total	22	LOUISIANA	NH3
2701485000	Natural Sources , Biogenic , Tundra/Mixed Tundra (Anderson Land Use Code 85) , Total	31	NEBRASKA	NH3
2701485000	Natural Sources , Biogenic , Tundra/Mixed Tundra (Anderson Land Use Code 85) , Total	40	OKLAHOMA	NH3
2701491000	Natural Sources , Biogenic , Perennial Snow and Ice/Perennial Snowfields (Anderson LUC 91) , Total	19	IOWA	NH3
2701491000	Natural Sources , Biogenic , Perennial Snow and Ice/Perennial Snowfields (Anderson LUC 91) , Total	20	KANSAS	NH3
2701491000	Natural Sources , Biogenic , Perennial Snow and Ice/Perennial Snowfields (Anderson LUC 91) , Total	22	LOUISIANA	NH3
2701491000	Natural Sources , Biogenic , Perennial Snow and Ice/Perennial Snowfields (Anderson LUC 91) , Total	31	NEBRASKA	NH3
2701491000	Natural Sources , Biogenic , Perennial Snow and Ice/Perennial Snowfields (Anderson LUC 91) , Total	40	OKLAHOMA	NH3
2701492000	Natural Sources , Biogenic , Perennial Snow and Ice/Glaciers (Anderson Land Use Code 92) , Total	19	IOWA	NH3
2701492000	Natural Sources , Biogenic , Perennial Snow and Ice/Glaciers (Anderson Land Use Code 92) , Total	20	KANSAS	NH3
2701492000	Natural Sources , Biogenic , Perennial Snow and Ice/Glaciers (Anderson Land Use Code 92) , Total	22	LOUISIANA	NH3
2701492000	Natural Sources , Biogenic , Perennial Snow and Ice/Glaciers (Anderson Land Use Code 92) , Total	31	NEBRASKA	NH3
2701492000	Natural Sources , Biogenic , Perennial Snow and Ice/Glaciers (Anderson Land Use Code 92) , Total	40	OKLAHOMA	NH3
2730050000	Natural Sources, Geogenic, Geyser/Geothermal, Total	06	CALIFORNIA	VOC, 108883, 71432
2730100000	Natural Sources / Geogenic / Wind Erosion / Total	04013	ARIZONA, MARICOPA COUNTY	PM10-PRI, PM25-PRI
2730100000	Natural Sources / Geogenic / Wind Erosion / Total	05	ARKANSAS	PM10-PRI, PM25-PRI
2730100000	Natural Sources / Geogenic / Wind Erosion / Total	06	CALIFORNIA	PM, PM10-PRI, PM10-FIL, PM25-PRI, PM25-FIL, 7439921, 7439965, 7439976, 7440020, 7440360, 7440382, 7440439, 7440473, 7440484, 7723140, 7782492, 7782505

2.4.7 Tribal Inventories

Due to time and resource constraints, EPA was unable to reconcile the tribal emissions data with State emissions data to ensure that double counting of emissions was eliminated. Therefore, the tribal inventory data were removed from the final NEI and placed in a separate database that will be made available to the public.

2.4.8 Wildfires, Prescribed Burning, and Rangeland Burning

For these categories, EPA has prepared a 2002 inventory in point source format. This inventory provides much more detail and accuracy than the nonpoint source inventory methods applied previously. Thus, all S/L and EPA data for the following SCCs were removed from the nonpoint NEI to avoid double counting of the emissions in the final point source NEI:

SCC	SCC Description
2810001000	Miscellaneous Area Sources : Other Combustion : Forest Wildfires : Total
2810015000	Miscellaneous Area Sources : Other Combustion : Prescribed Burning for Forest Management : Total
2810020000	Miscellaneous Area Sources : Other Combustion : Prescribed Burning of Rangeland : Total

For more information on how the point source fire inventory was developed, go to the CHIEF website http://www.epa.gov/ttn/chief/net/2002inventory.html#point.

2.5 What did EPA do with the State/Local Comments on the Draft NEI?

This section of the report provides an overview of how EPA processed S/L comments on the draft NEI and conducted QA review of the NEI after incorporating the S/L comments. Appendix D provides documentation of the revisions that EPA performed on the draft NEI after incorporating S/L comments. Appendix D also includes the revisions that EPA performed on the NEI after incorporating the original S/L inventories into the NEI (i.e., the data provided in Appendix D of the report for the draft NEI dated March 2005). Appendix D is sorted by State to facilitate identification of revisions to your inventory.

2.5.1 Initial Processing and QA of Inventories

Each file that S/L agencies submitted to EPA was logged into a spreadsheet to identify the submitting agency, name of the file, date the file was received, and record counts by submittal flag for each NIF 3.0 table. The valid NIF 3.0 submittal flag code values A; D; RD; or RA for Add, Delete, Revise/Delete, or Revise/Add, respectively, indicate the corrective action for each record included in a S/L agency's comment file. Revisions to data elements for a record require a copy of the record as it existed in the draft NEI noted with an "RD" submittal flag, and the same record containing the revised data elements noted with an "RA" submittal flag. The S/L agency was contacted and requested to provide corrections or guidance for correcting the following QA issues:

- When the number of "RA" and "RD" records was unequal;
- When the submittal flag field held a null or invalid submittal flag; and
- When the table in the comment file contained duplicate records. Note that the submittal flag field was included as a part of the data key when checking for duplicate records.

After correcting for submittal flag and duplicate record issues, the comment files were compared to the draft NEI to verify that the submittal flags were correct. For example, if a record in the comment file had a submittal flag of "A" but the record had a data key match in the draft NEI, the submittal flag was changed to "RA". If a record in the comment file had a submittal flag of "RA" but there was no data key match in the draft NEI, the submittal flag was changed to "A".

QA checks were also run on the S/L comment files to identify invalid NIF 3.0 codes. After incorporating S/L comments into the NEI, EPA also ran QA checks to identify and resolve referential integrity issues.

2.5.2 Feedback to the S/L/T Agencies

The EPA provided each agency that submitted comments on the NEI with acknowledgment of receipt of their data file submittal to EPA. In addition, the agencies were contacted on an as needed basis to obtain corrections to the comment files or guidance for correcting submittal flag and invalid NIF 3.0 code issues.

2.5.3 Additional QA Review and Resolution of QA Issues

The EPA prepared and reviewed emissions summaries, charts, and graphs comparing the final 2002 NEI emissions by State and pollutant. The EPA also compared the final 2002 NEI emissions to the emissions in the final 1999 NEI (Version 3) by State and pollutant and by source category and pollutant. If emissions data appeared to be suspect based on these comparisons, EPA contacted the S/L agency for clarification of potential emissions data issues. Section 2.8.10 of the report provides more details on the types of QA review EPA completed on the final NEI after completing the revisions to the final NEI discussed in section 2.8 of this report.

2.6 How do I Find My Inventory Data?

This section identifies the emissions summaries that EPA prepared for the final 2002 nonpoint NEI and the data source codes used to identify the origin and year of the data included in the final 2002 nonpoint NEI. The emissions summaries as well as the data in NEI output format (NOF) is available at the CHIEF website at the following web address; (ftp://ftp.epa.gov/EmisInventory/2002finalnei/nonpoint_sector_data/).

2.6.1 Summary Files

The EPA prepared the following summary files to assist agencies in reviewing the 2002 nonpoint source NEI:

• County-level emissions by SCC, for the criteria pollutants only

• Emissions summed by SCC to the State level for hazardous and criteria pollutants; and

• County-level emissions by SCC with data source codes, annual emissions only for hazardous and criteria pollutants (broken up into 5 files by EPA regions to reduce file size);

These files are available in ASCII text. They have been zipped and each includes a README file. The summary files can be downloaded from the following web link: ftp://ftp.epa.gov/EmisInventory/2002finalnei/nonpoint_sector_data/

2.6.2 Data Source Codes

Data source codes are included in the NIF plus field named "Data Source" of the Emission table in NIF 3.0 to document the origin of the emissions data. You should use these data source codes when reviewing the draft 2002 nonpoint source NEI to identify your data and identify data that originate from previous versions of the NEI or RPO inventories. The remainder of this section explains the codes that are used in the final 2002 nonpoint NEI. Examples of how the codes are used are presented at the end of this section.

The data source codes are based on the following 9-character format:

[Data Origin]-[Year]-[Grown/Not Grown/Carried Forward]-[PM Augmentation Code]

Code	**Field Length**
Data Origin	1
Year	3 (including leading hyphen)
Grown/Not Grown/Carried Forward	2 (including leading hyphen)
PM Augmentation	3 (including leading hyphen)

Data Origin Codes

Code	Description
S	State agency-supplied data
L	Local agency-supplied data
P	RPO-generated data either supplied by the S/L agency or by an RPO
E	EIAG-generated data
M	ESD-generated data

Year Codes

Year for which data are supplied (e.g., Year = -02 for 2002), or from which prior year data are taken (e.g., Year = -99 for 1999).

In addition, for winter season emissions that cover the period from December 1 to February 28 (or 29 for a leap year), the Start Date and End Date is coded as usual. For example, for winter season emissions for 2002, the Start Date is December 1, 2001 and the End Date is February 28, 2002. The year in the data source code is 2002.

Grown/Carried Forward/Not Grown Codes/Generate Parent Record

Code	Description
-G	Used when emissions in a pre-2002 inventory are grown to represent 2002 emissions.
-F	Used when emissions in a pre-2002 inventory are carried forward and included in the 2002 inventory without adjustment for growth.
-X	Used when the emissions are not grown or are not carried forward. For example, X is used when emissions are calculated for the 2002 inventory using 2002 activity, or when data are replaced with data that S/L/T agencies submit for inclusion in the 2002 base year inventory.
-GP	Used to identify records generated and added to the Emission Period table to fulfill referential integrity requirements. This code was used when a S/L/T

inventory submitted to EPA contained an Emission table record but not a parent Emission Period table record. If necessary, an Emission Process table record was also added if missing from the S/L/T inventory.

Augmentation Codes

Extensions are added to the end of the data source codes to identify records where EIAG applied augmentation procedures to either correct S/L-supplied emissions or to add emissions for pollutants not supplied by the S/L agency. The following explains these extension codes:

PM Augmentation Codes

-PA Used to identify PM_{10}/$PM_{2.5}$ emission records that were revised or added using ad-hoc updates.

-PC Used to identify records added for PM_{10}/$PM_{2.5}$ emissions estimated using the PM Calculator.

-PR Used to identify records added for PM_{10}/$PM_{2.5}$ emissions estimated using ratios of PM_{10}-to-PM or $PM_{2.5}$-to-PM_{10}.

Augmentation Codes for Industrial and Commercial/Institutional Fossil Fuel Combustion and Solvent Utilization

If a S/L/T agency provided VOC, NOX, or SO2 emissions for one or more of the ICI fossil fuel combustion categories, EPA applied ratios to the agency-supplied emissions to calculate missing CAP and HAP emissions. For the solvent utilization categories for which an agency supplied VOC but not HAP emissions, EPA applied speciation profiles to the agency-supplied VOC emissions to estimate HAP emissions. To identify records containing emissions calculated from these methods, EPA added the following extensions to the VOC, NOX, or SO2 data source codes used as the base pollutant for estimating missing pollutant emissions:

-VR Record added for pollutant emissions missing from S/L/T inventory using ratio of missing pollutant emission factor to VOC emission factor times S/L-supplied VOC emissions. This code is also used to identify HAP records for which EIAG estimated emissions by applying a speciation profile to the S/L-supplied VOC emissions.

-NR Record missing pollutant emissions using ratio of missing pollutant emission factor to NOX emission factor times S/L-supplied NOX emissions.

-SR Record missing pollutant emissions using ratio of missing pollutant emission factor to SO2 emission factor times S/L-supplied SO2 emissions.

Augmentation Codes Used for the First Time in the Final 2002 Nonpoint NEI

-X1 Used to identify residential wood combustion records in New Jersey for which EPA reallocated New Jersey-supplied data for counties with emissions to counties that did not have emissions in the New Jersey's inventory submittal to EPA. This data source code extension is used for the first time in the final 2002 nonpoint NEI.

-SUM Used to identify records added to the NEI for PM10-PRI, PM25-PRI, or VOC when the S/L agency did not provide emissions for these pollutants but provided emissions for other pollutants that could be used to calculate the missing pollutant emissions. VOC emissions were calculated as the sum of the S/L-supplied HAP emissions classified as ozone precursor emissions. PM10-PRI emissions were calculated as the sum of the S/L-supplied PM10-FIL and PM-CON emissions, and PM25-PRI emissions were calculated as the sum of the S/L-supplied PM25-FIL and PM-CON emissions. This data source code extension is used for the first time in the final 2002 nonpoint NEI.

Examples of Data Source Code Uses

Using the coding scheme previously described, examples of how the data source codes are applied are as follows:

Code	Data Source

E-02-X	Data generated by EIAG using EPA methods and 2002 or most recent activity data (e.g., 2002 activity and 2002 allocation factors) (E = EPA-generated data; -02 = year 2002; -X = emissions are not grown or carried forward). The documentation explains the source of the allocation factors.
S-02-X	State-submitted data for 2002 that replaced EIAG estimates for the source category (S = State data; -02 = year 2002 data; -X = emissions are not grown or carried forward).
S-02-X-VR	The data source code for emissions calculated by applying a ratio to the State-supplied VOC emissions is S-02-X-VR. If NOX or SO2 is used as the base pollutant, the data source code is S-02-X-NR or S-02-X-SR, respectively.
E-99-F	The data source code to identify EIAG-generated emissions data carried forward from the 1999 NEI. If State or local data are carried forward from the 1999 NEI, the data source code is S-99-F or L-99-F, respectively.
E-99-G	The data source code to identify EIAG-generated emissions data grown from the 1999 NEI. If State or local data are grown from the 1999 NEI, the data source code is S-99-G or L-99-G, respectively.

2.7 What are the Categories in the Final 2002 NEI for which EPA Prepared 2002 Estimates or Carried Forward Estimates from the 1999 NEI?

Table 2-7 lists the nonpoint categories for which EPA prepared a 2002 inventory and included in the final NEI if a S/L agency did not provide any data for the category. This table also identifies the categories for which emissions were estimated for the territories of Puerto Rico and U.S. Virgin Islands. Emission activity data are not available for these territories for most source categories. Section 3.5 of the report for the draft NEI discusses the procedure that was used to estimate emissions for these U.S. territories when activity data were not available (EPA, 2005a).

Emissions were estimated using various types of data and calculations depending on the source category. Appendix A presents the methodologies used to estimate 2002 emissions for the source categories listed in Table 2-7. The appendix provides detailed descriptions of the emission factors, the activity and allocation data information sources, and the procedures used to estimate county-level emissions. The allocation data are provided in an Access 2000 database described in Appendix B. The county-level activity data and the emission factors for each nonpoint source category used to calculate 2002 emissions are provided in an Access 2000 database described in Appendix C.

Table 2-7. Source Categories for which EPA Prepared an Emissions Inventory for the 2002 Nonpoint NEI

Source Category	SCC	Maximum Achievable Control Technology (MACT) Category	Point Source Component	Emissions for Puerto Rico and U.S. Virgin Islands
Agricultural Tilling	2801000003		No	
Animal Husbandry (Ammonia Emissions)	2805001100 - 2805053100		Yes[1]	
Aviation Gasoline Distribution: Stage I	2501080050	0601	No	
Aviation Gasoline Distribution: Stage II	2501080100		No	
Commercial Cooking	2302002100, 2302002200, 2302003000, 2302003100, 2302003200		No	
Cotton Ginning[2]	2801000000		Yes[1]	
Construction				
Non-Residential	2311020000		Yes[1]	
Residential	2311010000		Yes[1]	
Roadway	2311030000		No	
Drum and Barrel Reclamation	2461160000		Yes[1]	

Table 2-7 (continued)

Source Category	SCC	Maximum Achievable Control Technology (MACT) Category	Point Source Component	Emissions for Puerto Rico and U.S. Virgin Islands
Fertilizer Application	2801700001, 2801700002, 2801700003, 2801700004, 2801700005, 2801700006, 2801700007, 2801700008, 2801700009, 2801700010,		No	
Fossil Fuel Combustion, Commercial/Institutional				
Anthracite Coal (Total: All Boiler Types)	2103001000	0107-1	Yes	
Bituminous/ Subbituminous Coal (Total: All Boiler Types)	2103002000	0107-1	Yes	Puerto Rico and U.S. Virgin Islands
Distillate Oil (Total: Boilers and Internal Combustion [IC] Engines)	2103004000	0107-3	Yes	Puerto Rico and U.S. Virgin Islands
Residual Oil (Total: All Boiler Types)	2103005000	0107-3	Yes	Puerto Rico and U.S. Virgin Islands
Natural Gas (Total: Boilers and IC Engines)	2103006000	0107-2	Yes	Puerto Rico and U.S. Virgin Islands
Kerosene (Total: All Combustor Types)	2103011000	0107	No	Puerto Rico and U.S. Virgin Islands
Fossil Fuel Combustion, Industrial				
Anthracite Coal (Total: All Boiler Types)	2102001000	0107-1	Yes	
Bituminous/Subbituminous Coal (Total: All Boiler Types)	2102002000	0107-1	Yes	Puerto Rico and U.S. Virgin Islands
Distillate Oil (Total: Boilers and IC Engines)	2102004000	0107-3	Yes	Puerto Rico and U.S. Virgin Islands
Residual Oil (Total: All Boiler Types)	2102005000	0107-3	Yes	Puerto Rico and U.S. Virgin Islands
Natural Gas (Total: Boilers and IC Engines)	2102006000	0107-2	Yes	Puerto Rico and U.S. Virgin Islands
Liquified Petroleum Gas (LPG) (Total: All Boiler Types)	2102007000	0107-2	Yes	
Kerosene (Total: All Boiler Types)	2102011000	0107	No	Puerto Rico and U.S. Virgin Islands
Gasoline Marketing				
Gasoline Distribution Stage I - Bulk Terminals	2501050120	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
Gasoline Distribution Stage I - Bulk Plants	2501055120	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
Gasoline Distribution Stage I - Tank Trucks in Transit	2505030120	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
Gasoline Distribution Stage I - Pipelines	2505040120	0601	Yes[1]	Puerto Rico
Gasoline Distribution Stage I - Gasoline Service Stations: Submerged Filling	2501060051	0601	Yes[1]	
Gasoline Distribution Stage I - Gasoline Service Stations: Splash Filling	2501060052	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
Gasoline Distribution Stage I - Gasoline Service Stations: Balanced Submerged Filling	2501060053	0601	Yes[1]	
Gasoline Distribution Stage II	2501060100	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
Gasoline Distribution Stage I - Gasoline Service Stations: Underground Tank: Breathing and Emptying	2501060201	0601	Yes[1]	Puerto Rico and U.S. Virgin Islands
General Laboratory Activities	2851001000[3]		No	Puerto Rico and U.S. Virgin Islands

Table 2-7 (continued)

Source Category	SCC	Maximum Achievable Control Technology (MACT) Category	Point Source Component	Emissions for Puerto Rico and U.S. Virgin Islands
Lamp Breakage	2861000000		No	U.S. Virgin Islands
Lamp (Fluorescent) Recycling	2861000010[4]		No	
Open Burning				
Scrap Tires	2830000000		No	
Household Waste	2610030000		No	Puerto Rico and U.S. Virgin Islands
Yard Waste - Leaves	2610000100		No	Puerto Rico and U.S. Virgin Islands
Yard Waste - Brush	2610000400		No	Puerto Rico and U.S. Virgin Islands
Land Clearing Debris	2610000500		No	
Publically Owned Treatment Works (POTWs)	2630020000	0803	Yes[1]	Puerto Rico and U.S. Virgin Islands
Residential Heating				
Anthracite Coal	2104001000		No	
Bituminous & Lignite	2104002000		No	
Distillate Oil	2104004000		No	
Kerosene	2104011000		No	
Liquified Petroleum Gas (LPG)	2104007000		No	
Natural Gas	2104006000		No	
Wood	2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, 2104008050		No	
Solvent Utilization				
Autobody Refinishing Paint Application, all solvents	2401005000		No	
Commercial Pesticide Application - agricultural pesticides, total	2461850000		No	
Consumer and Commercial Products Usage: Household Products, all types	2460200000		No	
Consumer Products Usage - Automotive Aftermarket Products	2465400000		No	
Consumer Products Usage - Household Products	2465200000		No	
Consumer Products Usage - Personal Care Products	2465100000		No	
Consumer Products Usage - Pesticide Application	2465800000		No	
Degreasing - All Industries: Cold Cleaning, all solvent types	2415300000	1614	Yes	
Degreasing - All Industries: Open Top, all solvent types[5]	2415100000	1614	No	
Graphic Arts	2425000000		Yes	
Industrial Adhesive Application	2440020000		Yes	
Miscellaneous Industrial Solvent Usage: All Solvent Types	2440000000		Yes	
Pharmaceutical Manufacturing	2301030000			
Solvent Use on Rubber/Plastics	2430000000		Yes	
Surface Coatings: Architectural, all coating types	2401001000			
Surface Coatings: Electronic and Other Electrical, all coating types	2401065000		Yes	
Surface Coatings: Factory-finished Wood, all coating types	2401015000		Yes	
Surface Coating: Industrial Maintenance	2401100000		Yes	
Surface Coatings: Large Appliances	2401060000		Yes	
Surface Coatings: Machinery and Equipment, all coating types	2401055000		Yes	
Surface Coatings: Marine, all coating types	2401080000		Yes	
Surface Coatings: Metal Cans	2401040000		Yes	
Surface Coatings: Metal Furniture, all coating types	2401025000		Yes	
Surface Coatings: Miscellaneous Finished Parts	2401050000		Yes	
Surface Coatings: Miscellaneous Metals Manufacturing	2401090000		Yes	
Surface Coatings: Motor Vehicles	2401070000		Yes	

Table 2-7 (continued)

Source Category	SCC	Maximum Achievable Control Technology (MACT) Category	Point Source Component	Emissions for Puerto Rico and U.S. Virgin Islands
Surface Coatings: Other Special Purpose Coatings	2401200000		Yes	
Surface Coatings: Paper, all coating types	2401030000		Yes	
Surface Coatings: Traffic Markings, all coating types	2401008000		No	
Surface Coatings: Wood Furniture, all coating types	2401020000		Yes	

[1] See Appendix A for discussion of point SCCs or North American Standard Industrial Classification (NAICS) codes associated with these emission processes.
[2] For the final NEI, the point SCC 30200410 in the draft NEI under which Texas reported HAP emissions was changed to the nonpoint SCC 2801000000 in the final NEI to be consistent with the SCC EPA uses for this category.
[3] The emissions for this category were previously reported under the point SCC 31503001 in the draft and preliminary 2002 NEI and in the 1999 NEI. For the final 2002 NEI, the point SCC was changed to the new nonpoint SCC 2851001000 (Miscellaneous Area Sources : Laboratories : Bench Scale Reagents : (probably "Total")).
[4] The emissions for this category were previously reported under the point SCC 31301200 in the draft and preliminary 2002 NEI and in the 1999 NEI. For the final 2002 NEI, the point SCC was changed to the new nonpoint SCC 2861000010 (Miscellaneous Area Sources : Fluorescent Lamp Breakage : Recycling Related Emissions : Total).
[5] The EPA solvent inventory estimated zero emissions for this SCC; therefore, point source backouts were not required.

For many of the source categories identified, calendar year 2002 activity data and/or allocation data were not available during the time-frame for completing this project. For these categories, EIAG decided to carry forward the emissions estimates contained in final Version 3 of the 1999 nonpoint source NEI (EPA, 2004b; EPA, 2003). Tables 2-8 and 2-9 present the source categories for which emissions from final Version 3 of the 1999 nonpoint source NEI were included in the 2002 NEI in the absence of S/L agency data. Table 2-8 identifies categories for which the emissions in the 1999 NEI are based on estimates prepared by EPA's Emissions Standards Division (ESD) or for which EPA data were carried forward from the 1999 NEI because there were not resources for calculating 2002 emissions. Table 2-8 also identifies the MACT source categories included in the 2002 nonpoint source NEI. The emission factors, activity data, and/or emissions data for many of these source categories were provided by EPA/ESD.

Table 2-9 shows the categories for which EPA carried forward S/L-supplied HAP and CAP daily, monthly, and seasonal emissions included in final Version 3 of the 1999 NEI if the S/L agency did not provide 2002 data in their inventory submittals to EPA.

Table 2-8. Source Categories for Which 1999 NEI Emissions Were Carried Forward to the 2002 NEI (1999 NEI Emissions Estimated by EPA)

Source Category	SCC Used in the Draft NEI	SCC Used in the Final NEI	Rationale for Carrying Forward	Maximum Achievable Control Technology (MACT) Category
Asphalt Concrete Manufacturing	2305070000	2305070000	Emission Standards Division (ESD) estimates	
Asphalt Paving	2461020000	2461020000	See Footnote 2	
Asphalt Roofing Materials Manufacturing	2306010000	2306010000	ESD estimates	
Beef Cattle Feedlots (Fugitive Dust Emissions)[3]	2805001000		See Footnote 3	
Cremation - Human	2810060100	2810060100	See Footnote 2	
Cremation - Animal	2810060200	2810060200	See Footnote 2	
Chromic Acid Anodizing	2309100050	2309100050	See Footnote 2	
Chromium Electroplating - Decorative	2309100030	2309100030	See Footnote 2	1610
Chromium Electroplating - Hard	2309100010	2309100010	See Footnote 2	1615
Dental Preparation and Use	31502500 [1]	2850001000	See Footnote 2	
Flexible Polyurethane Foam Fabrication Operations	30101880 [1]	2301050001	ESD estimates	
Flexible Polyurethane Foam Production	30801005 [1]	2301050002	ESD estimates	
Grain Elevators: Terminal	30200512 [1]	2801000007	See Footnote 2	
Halogenated Solvent Cleaners	2415000000	2415000000	See Footnote 2	1614
Hospital Sterilization	2850000010	2850000010	See Footnote 2	1644
Industrial Boilers: Distillate Oil	10200501 [1]	2102004000	ESD estimates	0107-3
Industrial Boilers: Waste Oil	10201302 [1]	2102012000	ESD estimates	0107-3
Industrial Boilers: Wood (Total: All Boiler Types)	2102008000	2102008000	See Footnote 2	0107-4
Institutional/Commercial Fuel Combustion: Wood (Total: All Boiler Types)	2103008000	2103008000	ESD estimates grown from 1996 to 1999	0107-4
Institutional/Commercial Heating: Public Owned Treatment Works (POTW) Digester Gas	10300701 [1]	2103010000	ESD estimates	0107-2
Mining and Quarrying	2325000000	2325000000	See Footnote 2	
Miscellaneous Organic Chemical Processes	30199999 [1]	Removed	ESD estimates; see Footnote 4	1640
Natural Gas Transmission and Storage	31000299 [1]	2310020000	ESD estimates	0504
Oil and Natural Gas Production	2310000000, 2310020000, 2310030000	2310000000, 2310020000	ESD estimates	0501
Paint Stripping Operations	68240059 [1]	2402000000	ESD estimates	1621
Perchloroethylene Dry Cleaning	2420000055	2420000055	See Footnote 2	1643
Refractories Manufacturing	2305000000	2305000000	ESD estimates	
Steel Pickling with Hydrochloric Acid (HCL)	2303000000	2303000000	ESD estimates	
Structure Fires	2810030000	2810030000	See Footnote 2	
Swimming Pools	2862000000	2862000000	See Footnote 2	
Synthetic Fiber Manufacturing	2301020000	Removed	See Footnote 5	

[1] The EPA did not carry forward 1999 CAP emissions for these point source categories that were included in the 1999 HAP NEI.
[2] Emissions not estimated due to budget limitations.
[3] For the draft NEI, the 1999 PM10-PRI/-FIL and PM25-PRI/-FIL emissions for the beef cattle feedlots category were not carried forward because of the uncertainty with the default NEI estimates prepared by EPA. For the draft NEI, S/L data are included if submitted to EPA.
[4] This category was included in the preliminary 2002 NEI but EPA removed the category from the draft and final 2002 NEI because the emissions for the category are accounted for in the draft and final 2002 point source NEI.
[5] This category was included in the preliminary and draft 2002 NEI but EPA removed the category from the final 2002 NEI for all States except CA because the emissions for the category are accounted for in the final 2002 point source NEI. CA provided 2002 data for this SCC; therefore, CA's data were kept in the final 2002 NEI.

Table 2-9. Source Categories for Which 1999 NEI Emissions Were Carried Forward to the 2002 NEI (1999 NEI Emissions Estimated by a State or Local Agency)

SCC Used in the Final NEI	SCC 3 Description	SCC 6 Description	SCC 10 Description	Record Count	State Count
Stationary Source Fuel Combustion					
2102004000[1]	Industrial	Distillate Oil	Total: Boilers and IC Engines	195	1
2102005000[2]	Industrial	Residual Oil	Total: All Boiler Types	78	1
2102006000[2]	Industrial	Natural Gas	Total: Boilers and IC Engines	12	1
2102008000[3]	Industrial	Wood	Total: All Boiler Types	40	1
2103002000[2]	Commercial/Institutional	Bituminous/Subbituminous Coal	Total: All Boiler Types	6	1
2103004000[2]	Commercial/Institutional	Distillate Oil	Total: Boilers and IC Engines	2	1
2103008000	Commercial/Institutional	Wood	Total: All Boiler Types	377	2
2104001000	Residential	Anthracite Coal	Total: All Combustor Types	12	1
2104005000	Residential	Residual Oil	Total: All Combustor Types	34	1
Mobile Sources					
2275900000	Aircraft	Refueling: All Fuels	All Processes ** (Use 25-01-080-xxx)	1	1
Industrial Processes					
2301050001[4]	Chemical Manufacturing: SIC 28	Plastics Production	Reactor (Polyurethane)	108	2
2302050000	Food and Kindred Products: SIC 20	Bakery Products	Total	5	1
2302070001	Food and Kindred Products: SIC 20	Fermentation/Beverages	Breweries	1	1
2305070000	Mineral Processes: SIC 32	Concrete, Gypsum, Plaster Products	Total	2	1
2306010000	Petroleum Refining: SIC 29	Asphalt Paving/Roofing Materials	Total	21	1
2308000000	Rubber/Plastics: SIC 30	All Processes	Total	27	1
2309100010	Fabricated Metals: SIC 34	Coating, Engraving, and Allied Services	Electroplating	3	2
2309100030	Fabricated Metals: SIC 34	Coating, Engraving, and Allied Services	Plating: Metal Deposition	2	1
2310000000	Oil and Gas Production: SIC 13	All Processes	Total: All Processes	54	2
2325000000	Mining and Quarrying: SIC 14	All Processes	Total	2140	2
2399000000	Industrial Processes: NEC	Industrial Processes: NEC	Total	441	4
Solvent Utilization					
2401045000	Surface Coating	Metal Coils: SIC 3498	Total: All Solvent Types	422	2
2401075000	Surface Coating	Aircraft: SIC 372	Total: All Solvent Types	318	3
2401085000	Surface Coating	Railroad: SIC 374	Total: All Solvent Types	80	1

Table 2-9 (continued)

SCC Used in the Final NEI	SCC 3 Description	SCC 6 Description	SCC 10 Description	Record Count	State Count
Solvent Utilization (continued)					
2402000000[5]	Paint Strippers	Chemical Strippers	Application, Degradation, and Coating Removal Steps: Other Not Listed	24	1
2420000000	Dry Cleaning	All Processes	Total: All Solvent Types	73	3
2420000055	Dry Cleaning	All Processes	Perchloroethylene	24	3
2420010000	Dry Cleaning	Commercial/Industrial Cleaners	Total: All Solvent Types	77	1
2420010055	Dry Cleaning	Commercial/Industrial Cleaners	Perchloroethylene	289	4
2420010370	Dry Cleaning	Commercial/Industrial Cleaners	Special Naphthas	139	1
2420020055	Dry Cleaning	Coin-operated Cleaners	Perchloroethylene	127	2
2461020000[2]	Miscellaneous Non-industrial: Commercial	Asphalt Application: All Processes	Total: All Solvent Types	744	1
2461021000	Miscellaneous Non-industrial: Commercial	Cutback Asphalt	Total: All Solvent Types	254	6
2461022000	Miscellaneous Non-industrial: Commercial	Emulsified Asphalt	Total: All Solvent Types	165	4
Storage and Transport					
2505000120	Petroleum and Petroleum Product Transport	All Transport Types	Gasoline	5	1
2505020030	Petroleum and Petroleum Product Transport	Marine Vessel	Crude Oil	8	1
2505020090	Petroleum and Petroleum Product Transport	Marine Vessel	Distillate Oil	8	1
2505020120	Petroleum and Petroleum Product Transport	Marine Vessel	Gasoline	32	3
2505020150	Petroleum and Petroleum Product Transport	Marine Vessel	Jet Naphtha	16	2
2505020180	Petroleum and Petroleum Product Transport	Marine Vessel	Kerosene	8	1
2515020000	Organic Chemical Transport	Marine Vessel	Total: All Products	24	1
Waste Disposal, Treatment, and Recovery					
2601000000	On-site Incineration	All Categories	Total	74	3
2601010000[6]	On-site Incineration	Industrial	Total	895	2
2601020000	On-site Incineration	Commercial/Institutional	Total	2174	4
2610000300	Open Burning	All Categories	Yard Waste - Weed Species Unspecified (incl Grass)	16	1
2620000000	Landfills	All Categories	Total	270	1
2620030000	Landfills	Municipal	Total	59	3
2630000000	Wastewater Treatment	All Categories	Total Processed	918	3
2630020001	Wastewater Treatment	Public Owned	Flaring of Gases	2	1
2640000000	TSDFs	All TSDF Types	Total: All Processes	41	2

Table 2-9 (continued)

SCC Used in the Final NEI	SCC 3 Description	SCC 6 Description	SCC 10 Description	Record Count	State Count
Miscellaneous Area Sources					
2801500000	Agriculture Production - Crops	Agricultural Field Burning - whole field set on fire	Total, all crop types	96	2
2801500100	Agriculture Production - Crops	Agricultural Field Burning - whole field set on fire	Field Crops Unspecified	16	1
2801500170	Agriculture Production - Crops	Agricultural Field Burning - whole field set on fire	Field Crop is Grasses: Burning Techniques Not Important	16	1
2801500300	Agriculture Production - Crops	Agricultural Field Burning - whole field set on fire	Orchard Crop Unspecified	1	1
2801500360	Agriculture Production - Crops	Agricultural Field Burning - whole field set on fire	Orchard Crop is Citrus (orange, lemon)	16	1
2805001000	Agriculture Production - Livestock	Beef cattle - finishing operations on feedlots (drylots)	Dust Kicked-up by Hooves (use 28-05-020, -001, -002, or -003 for Waste	1516	1
2810005000	Other Combustion	Managed Burning, Slash (Logging Debris)	Total	82	1
2810030000	Other Combustion	Structure Fires	Total	2561	11
2810050000	Other Combustion	Motor Vehicle Fires	Total	78	1
2810060100	Other Combustion	Cremation	Humans	947	3
2810060200	Other Combustion	Cremation	Animals	200	2
2830000000	Catastrophic/Accidental Releases	All Catastrophic/Accidental Releases	Total	236	1
2850000010	Health Services	Hospitals	Sterilization Operations	8	2

[1] Point SCC 10200501 in the preliminary and draft NEI was changed to the nonpoint SCC 2102004000 in the final NEI.
[2] Texas added this SCC in its comments on the draft NEI; the data are either carried forward or grown from the 1999 NEI depending on the SCC.
[3] Point SCC 10200901 in the preliminary and draft NEI was changed to the nonpoint SCC 2102008000 in the final NEI.
[4] Point SCC 30101880 in the preliminary and draft NEI was changed to the nonpoint SCC 2301050001 in the final NEI.
[5] Point SCC 68240059 in the preliminary and draft NEI was changed to the nonpoint SCC 2402000000 in the final NEI.
[6] Point SCC 50490004 in the preliminary and draft NEI was changed to the nonpoint SCC 2601010000 in the final NEI.

2.8 What Revisions did EPA Make to the Final NEI After Incorporating State/Local Comments on the Draft NEI?

This section of the report documents revisions that EPA completed on the final NEI after revising the draft NEI to incorporate S/L comments on the draft NEI.

2.8.1 Corrections to Source Classification Codes (SCCs)

Table 2-10 shows changes that EIAG made to SCCs or SCC descriptions that are incorporated into the final nonpoint NEI. This table identifies the SCC used in the draft 2002 NEI and the SCC to which it was changed in the final NEI. Also, this table lists SCCs that were classified as invalid (i.e., not in EPA's master SCC list) or inactive (i.e., in EPA's master SCC list but no longer used) in the draft NEI but have been added or re-activated for the final NEI.

2.8.2 Corrections to Pollutant Codes

Table 2-11 shows the revisions to pollutant codes for the final nonpoint NEI. The old pollutant codes were previously used in the NEI as place holders until official, new codes could be issued by the Chemical Registry System. Therefore, in the final nonpoint NEI, the old codes were updated with the new codes.

The pollutant 16-polycyclic aromatic hydrocarbons (PAH) (pollutant code 40) includes all 15-PAH species plus naphthalene (pollutant code 91203). For the final NEI, EPA reported naphthalene under its own pollutant code and eliminated the use of the pollutant code for 16-PAH. Therefore, 16-PAH was mapped to either naphthalene or 15-PAH depending on the source category (see Table 2-12). For fuel combustion sources, it was assumed that emissions associated with 16-PAH are mostly if not all 15-PAH. For non-fuel combustion sources, it was assumed that the majority of the 16-PAH emissions are naphthalene.

Table 2-10. Revisions to SCCs in the Final Nonpoint NEI

SCC Used in Draft Nonpoint NEI	SCC Description	SCC Used in Final Nonpoint NEI	New SCC Created for Final NEI	SCC Description
Mapping of Point SCCs in Draft NEI to Nonpoint SCCs in Final NEI				
10200501[1]	External Combustion Boilers : Industrial : Distillate Oil : Grades 1 and 2 Oil	2102004000	No	Stationary Source Fuel Combustion : Industrial : Distillate Oil : Total: Boilers and IC Engines
10200901[1]	External Combustion Boilers : Industrial : Wood/Bark Waste : Bark-fired Boiler	2102008000	No	Stationary Source Fuel Combustion : Industrial : Wood : Total: All Boiler Types
10201302[1]	External Combustion Boilers : Industrial : Liquid Waste : Waste Oil	2102012000	Yes	Stationary Source Fuel Combustion : Industrial : Waste oil : Total
10300701[1]	External Combustion Boilers : Commercial/Institutional : Process Gas : POTW Digester Gas-fired Boiler	2103010000	Yes	Stationary Source Fuel Combustion : Commercial/Institutional : Process gas : POTW Digester Gas-fired Boiler
20300101[1]	Internal Combustion Engines : Commercial/Institutional : Distillate Oil (Diesel) : Reciprocating	2103004000	No	Stationary Source Fuel Combustion : Commercial/Institutional : Distillate Oil : Total: Boilers and IC Engines
20300201[1,2]	Internal Combustion Engines : Commercial/Institutional : Natural Gas : Reciprocating	2103006000	No	Stationary Source Fuel Combustion : Commercial/Institutional : Natural Gas : Total: Boilers and IC Engines
30101880[1]	Industrial Processes : Chemical Manufacturing : Plastics Production : Reactor (Polyurethane)	2301050001	Yes	Industrial Processes : Chemical Manufacturing: SIC 28 : Plastics Production : Reactor (Polyurethane)
30199999[1]	Industrial Processes : Chemical Manufacturing : Other Not Classified : Specify in Comments Field	2301000000	No	Industrial Processes : Chemical Manufacturing: SIC 28 : All Processes : Total
30200410[1]	Industrial Processes : Food and Agriculture : Cotton Ginning : General - Entire Process, Sum of Typical Equip Used	2801000000	No	Miscellaneous Area Sources : Agriculture Production - Crops : Agriculture - Crops : Total
30200512[1]	Industrial Processes : Food and Agriculture : Feed and Grain Terminal Elevators : Country Elevators: General	2801000007	No	Miscellaneous Area Sources : Agriculture Production - Crops : Agriculture - Crops : Loading
30500205[1,3]	Industrial Processes : Mineral Products : Asphalt Concrete : Drum Dryer: Drum Mix Plant (see 3-05-002-55 thru -63 for subtypes)	2305000000	No	Industrial Processes : Mineral Processes: SIC 32 : All Processes : Total
30500609[1,2]	Industrial Processes : Mineral Products : Cement Manufacturing (Dry Process) : Primary Crushing	2305070000	No	Industrial Processes : Mineral Processes: SIC 32 : Concrete, Gypsum, Plaster Products : Total
30502701	Industrial Processes : Mineral Products : Industrial Sand and Gravel : Primary Crushing of Raw Material	2325030000	No	Industrial Processes : Mining and Quarrying: SIC 14 : Sand and Gravel : Total
30801005[1]	Industrial Processes : Rubber and Miscellaneous Plastics Products : Plastic Products Manufacturing : Foam Production - General Process	2301050002	Yes	Industrial Processes : Chemical Manufacturing: SIC 28 : Plastics Production : Foam Production - General Process
30901201[1]	Industrial Processes : Fabricated Metal Products : Precious Metals Recovery : Reclamation Furnace	2309010000	Yes	Industrial Processes : Fabricated Metals: SIC 34 : Precious Metals Recovery : Reclamation Furnace
31000299[1]	Industrial Processes : Oil and Gas Production : Natural Gas Production : Other Not Classified	2310020000	No	Industrial Processes : Oil and Gas Production: SIC 13 : Natural Gas : Total: All Processes
31301200[1]	Industrial Processes : Electrical Equipment : Fluorescent Lamp Recycling : Fluorescent Lamp Recycling: Lamp Crusher	2861000010	Yes	Miscellaneous Area Sources : Fluorescent Lamp Breakage : Recycling Related Emissions : Total
31502500[1]	Industrial Processes : Photo Equip/Health Care/Labs/Air Condit/SwimPools : Dental Alloy (Mercury Amalgams) Production : Dental Alloy (Mercury Amalgams) Production: Overall Process	2850001000	Yes	Miscellaneous Area Sources : Health Services : Dental Alloy Production : Overall Process
31503001[1]	Industrial Processes : Photo Equip/Health Care/Labs/Air Condit/SwimPools : Laboratories : Bench Scale Reagents: Research	2851001000	Yes	Miscellaneous Area Sources : Laboratories : Bench Scale Reagents : (probably "Total")
50100410	Waste Disposal : Solid Waste Disposal - Government : Landfill Dump : Waste Gas Destruction: Waste Gas Flares	2620030000	No	Waste Disposal, Treatment, and Recovery : Landfills : Municipal : Total
50490004[1]	Waste Disposal : Site Remediation : : General Processes Incinerators: Process Gas	2601010000	No	Waste Disposal, Treatment, and Recovery : On-site Incineration : Industrial : Total
68240059[1]	MACT Source Categories : Miscellaneous Processes : Paint Stripper Users - Chemical Strippers : Application, Degradation, and Coating Removal Steps: Other Not Listed	2402000000	Yes	Solvent Utilization : Paint Strippers : Chemical Strippers : Application, Degradation, and Coating Removal Steps: Other Not Listed

Table 2-10 (continued)

SCC Used in Draft Nonpoint NEI	SCC Description	SCC Used in Final Nonpoint NEI	New SCC Created for Final NEI	SCC Description
Mapping of Invalid to Valid Nonpoint SCCs				
2420000999	Solvent Utilization : Dry Cleaning : All Processes : Solvents: NEC	2420000000	No	Solvent Utilization : Dry Cleaning : All Processes : Total: All Solvent Types
New SCC Added in Final NEI				
Not Applicable		2501055120	Yes	Storage and Transport : Petroleum and Petroleum Product Storage : Bulk Plants : Breathing Loss : Gasoline
SCC Description Revised				
2501050120	Storage and Transport : Petroleum and Petroleum Product Storage : Bulk Stations/Terminals: Breathing Loss : Gasoline	2501050120	No	Storage and Transport : Petroleum and Petroleum Product Storage : Bulk Terminals Breathing Loss : Gasoline
2861000000	Miscellaneous Area Sources : Fluorescent Lamp Breakage : Total : Total	2861000000	No	Miscellaneous Area Sources : Fluorescent Lamp Breakage : Non-recycling Related Emissions : Total
SCCs Added to EPA's Master List				
2104008070	Stationary Source Fuel Combustion : Residential : Wood : Outdoor Wood Burning Equipment	2104008070	No	Stationary Source Fuel Combustion : Residential : Wood : Outdoor Wood Burning Equipment
2399010000	Industrial Processes: Industrial Refrigeration: Refrigerant Losses: All Processes	2399010000		Industrial Processes: Industrial Refrigeration: Refrigerant Losses: All Processes
2630020010	Waste Disposal, Treatment, and Recovery : Wastewater Treatment : Public Owned : Wastewater Treatment Processes Total	2630020010		Waste Disposal, Treatment, and Recovery : Wastewater Treatment : Public Owned : Wastewater Treatment Processes Total
2630020020	Waste Disposal, Treatment, and Recovery: Wastewater Treatment : Public Owned : Biosolids Processes Total	2630020020		Waste Disposal, Treatment, and Recovery: Wastewater Treatment : Public Owned : Biosolids Processes Total
2630050000	Waste Disposal, Treatment and Recovery; Wastewater Treatment; Public Owned; Land Application - Digested Sludge	2630050000		Waste Disposal, Treatment and Recovery; Wastewater Treatment; Public Owned; Land Application - Digested Sludge
2870000002	Miscellaneous Area Sources : Humans : Infant Diapered Waste : Total			
2870000011	Miscellaneous Area Sources : Domestic Activity : Household Products : Total			
2870000015	Miscellaneous Area Sources : Domestic Activity : Non-agricultural Fertilizers : Total			
SCCs Revised from Invalid to Valid in EPA's Master List				
		2311010040		Industrial Processes : Construction: SIC 15 - 17 : Residential : Ground Excavations
		2311020040		Industrial Processes : Construction: SIC 15 - 17 : Industrial/Commercial/Institutional : Ground Excavations
2601030000	Waste Disposal, Treatment, and Recovery : On-site Incineration : Residential : Total	2601030000		Waste Disposal, Treatment, and Recovery : On-site Incineration : Residential : Total
2610000000	Waste Disposal, Treatment, and Recovery : Open Burning : All Categories : Total	2610000000		Waste Disposal, Treatment, and Recovery : Open Burning : All Categories : Total
2610010000	Waste Disposal, Treatment, and Recovery : Open Burning : Industrial : Total	2610010000		Waste Disposal, Treatment, and Recovery : Open Burning : Industrial : Total
2610020000	Waste Disposal, Treatment, and Recovery : Open Burning : Commercial/Institutional : Total	2610020000		Waste Disposal, Treatment, and Recovery : Open Burning : Commercial/Institutional : Total
2805000000	Miscellaneous Area Sources : Agriculture Production - Livestock : Agriculture - Livestock : Total	2805000000		Miscellaneous Area Sources : Agriculture Production - Livestock : Agriculture - Livestock : Total

[1] For the draft NEI, this point SCC was for a MACT category carried forward from 1999 HAP NEI.
[2] Changing this point SCC to the nonpoint SCC shown in this table resulted in double counting of emissions with State or local data; therefore, the emissions for this point SCC were removed to avoid double counting of State and local data.
[3] This point SCC was removed from the draft NEI as a result of incorporating State, local, and EPA comments.

Table 2-11. Revisions to Pollutant Codes

Old Pollutant Code[1]	Old Pollutant Code Description	HAP Category for Old Pollutant Code	New Pollutant Code[2]	New Pollutant Code Description	HAP Category for New Pollutant Code	Notes
331	Cresols (Includes o, m, & p) / Cresylic Acids	Cresol/Cresylic Acid (Mixed Isomers)	1319773	Cresol	Cresols (Includes o, m, & p) / Cresylic Acids	New code replaces old for all SCCs
247	Methylbenzopyrenes	Polycyclic Organic Matter	65357699	Methylbenzopyrene	Polycyclic Organic Matter as non-15 PAH	New code replaces old for all SCCs
248	Methylchrysene	Polycyclic Organic Matter	41637905	Methylchrysene	Polycyclic Organic Matter as non-15 PAH	New code replaces old for all SCCs
234	PAH, Total	Polycyclic Organic Matter as 7-PAH	130498292	PAH, total	Polycyclic Organic Matter as 7-PAH	New code replaces old for all SCCs
40	16-PAH	Polycyclic Organic Matter as 7-PAH	249	15-PAH	Polycyclic Organic Matter as 15-PAH	If a fuel combustion SCC, code was changed to 249
40	16-PAH	Polycyclic Organic Matter as 7-PAH	91203	Naphthalene	Naphthalene	If a non-fuel combustion SCC, code was changed to 91203

[1] The old pollutant codes were used in the draft and preliminary 2002 NEI as well as previous versions (e.g., 1999 NEI).
[2] The new pollutant code is used in the final 2002 NEI for the first time.

Table 2-12. SCCs for which 16-PAH was Changed to 15-PAH or Naphthalene in the Final Nonpoint NEI

SCC	SCC Description	Revised Pollutant Code[1]	Revised Pollutant Code Description
Fuel Combustion Sources			
2102004000	Stationary Source Fuel Combustion : Industrial : Distillate Oil : Total: Boilers and IC Engines	249	15-PAH
2102005000	Stationary Source Fuel Combustion : Industrial : Residual Oil : Total: All Boiler Types	249	15-PAH
2102008000	Stationary Source Fuel Combustion : Industrial : Wood : Total: All Boiler Types	249	15-PAH
2103002000	Stationary Source Fuel Combustion : Commercial/Institutional : Bituminous/Subbituminous Coal : Total: All Boiler Types	249	15-PAH
2103004000	Stationary Source Fuel Combustion : Commercial/Institutional : Distillate Oil : Total: Boilers and IC Engines	249	15-PAH
2103005000	Stationary Source Fuel Combustion : Commercial/Institutional : Residual Oil : Total: All Boiler Types	249	15-PAH
2104002000	Stationary Source Fuel Combustion : Residential : Bituminous/Subbituminous Coal : Total: All Combustor Types	249	15-PAH
2104004000	Stationary Source Fuel Combustion : Residential : Distillate Oil : Total: All Combustor Types	249	15-PAH
2104008000	Stationary Source Fuel Combustion : Residential : Wood : Total: Woodstoves and Fireplaces	249	15-PAH
2104008001	Stationary Source Fuel Combustion : Residential : Wood : Fireplaces: General	249	15-PAH
2104008070	Stationary Source Fuel Combustion : Residential : Wood : Outdoor Wood Burning Equipment	249	15-PAH
2601020000	Waste Disposal, Treatment, and Recovery : On-site Incineration : Commercial/Institutional : Total	249	15-PAH
2801500000	Miscellaneous Area Sources : Agriculture Production - Crops : Agricultural Field Burning - whole field set on fire : Total, all crop types	249	15-PAH
2810001000	Miscellaneous Area Sources : Other Combustion : Forest Wildfires : Total	249	15-PAH
2810005000	Miscellaneous Area Sources : Other Combustion : Managed Burning, Slash (Logging Debris) : Total	249	15-PAH
2810015000	Miscellaneous Area Sources : Other Combustion : Prescribed Burning for Forest Management : Total	249	15-PAH
2810020000	Miscellaneous Area Sources : Other Combustion : Prescribed Burning of Rangeland : Total	249	15-PAH
2810060100	Miscellaneous Area Sources : Other Combustion : Cremation : Humans	249	15-PAH
2810060200	Miscellaneous Area Sources : Other Combustion : Cremation : Animals	249	15-PAH
Non-Fuel Combustion Sources			
2305070000	Industrial Processes : Mineral Processes: SIC 32 : Concrete, Gypsum, Plaster Products : Total	91203	Naphthalene
2401008000	Solvent Utilization : Surface Coating : Traffic Markings : Total: All Solvent Types	91203	Naphthalene
2401100000	Solvent Utilization : Surface Coating : Industrial Maintenance Coatings : Total: All Solvent Types	91203	Naphthalene
2505020120	Storage and Transport : Petroleum and Petroleum Product Transport : Marine Vessel : Gasoline	91203	Naphthalene
2830010000	Miscellaneous Area Sources : Catastrophic/Accidental Releases : Transportation Accidents : Total	91203	Naphthalene

[1] This column shows the pollutant code to which 16-PAH (pollutant code 40) was changed. For fuel combustion sources, it was assumed that emissions associated with 16-PAH are mostly if not all 15-PAH. For non-fuel combustion sources, it was assumed that the majority of the 16-PAH emissions are naphthalene.

For the phosphorus compounds HAP category, only elemental phosphorus (pollutant code 7723140) is classified as a HAP. The final NEI was reviewed for all species associated with the phosphorus compounds HAP category, and phosphorothioic acid (pollutant code 2921882) and phosphoric acid (pollutant code 7664382) species were identified and removed.

2.8.3 Solvent Utilization HAP Emissions

The EPA prepared a VOC and HAP inventory for the 2002 NEI for the categories shown in Table 2-13. The detailed methods and data EPA used to prepare the VOC and HAP inventory for these SCCs is provided in Appendices A through C.

The VOC inventory was included in the draft 2002 NEI, and S/L comments on the VOC emissions were incorporated into the final 2002 NEI. After incorporating S/L comments, EPA applied speciation profiles to the VOC emissions in the final 2002 NEI to estimate HAPs. The speciation profiles were applied to the S/L-supplied VOC emissions as well as the EPA VOC inventory emissions. Note that the S/L SCCs were preserved in the NEI. In addition, EPA replaced S/L-supplied HAPs with the HAP emissions estimated by applying the HAP speciation profiles to the S/L-supplied VOC emissions to ensure consistency in the methods for estimating HAPs. For example, this approach ensures that the sum of the HAPs classified as ozone precursors does not exceed the VOC emissions for a given State and county FIPS code, SCC, start date, end date, and emission type combination.

For the draft NEI, EPA added VOC emissions for categories for which S/L agencies did not provide any data. The VOC emissions were adjusted to account for emissions included in the draft point source NEI. Table 2-13 identifies the nonpoint categories for which point source adjustments were completed. The VOC emissions in the draft point source NEI changed after incorporating S/L comments. Therefore, before calculating HAPs for the EPA inventory, EPA recalculated the point source adjustments using the VOC emissions in the final 2002 point source NEI. In general, the methods outlined in Chapter 6 of the report documenting the draft solvent

Table 2-13. Solvent Categories for which EPA Prepared a 2002 Emissions Inventory for VOC and HAPs

SCC	SCC Description	Point Source Adjustments Applied to Nonpoint Emissions
2401001000	Surface Coating : Architectural Coatings : Total: All Solvent Types	No
2401005000	Surface Coating : Auto Refinishing: SIC 7532 : Total: All Solvent Types	No
2401008000	Surface Coating : Traffic Markings : Total: All Solvent Types	No
2401015000	Surface Coating : Factory Finished Wood: SIC 2426 thru 242 : Total: All Solvent Types	Yes
2401020000	Surface Coating : Wood Furniture: SIC 25 : Total: All Solvent Types	Yes
2401025000	Surface Coating : Metal Furniture: SIC 25 : Total: All Solvent Types	Yes
2401030000	Surface Coating : Paper: SIC 26 : Total: All Solvent Types	Yes
2401040000	Surface Coating : Metal Cans: SIC 341 : Total: All Solvent Types	Yes
2401050000	Surface Coating : Miscellaneous Finished Metals: SIC 34 - (341 + 3498) : Total: All Solvent Types	Yes
2401055000	Surface Coating : Machinery and Equipment: SIC 35 : Total: All Solvent Types	Yes
2401060000	Surface Coating : Large Appliances: SIC 363 : Total: All Solvent Types	Yes
2401065000	Surface Coating : Electronic and Other Electrical: SIC 36 - 363 : Total: All Solvent Types	Yes
2401070000	Surface Coating : Motor Vehicles: SIC 371 : Total: All Solvent Types	Yes
2401080000	Surface Coating : Marine: SIC 373 : Total: All Solvent Types	Yes
2401090000	Surface Coating : Miscellaneous Manufacturing : Total: All Solvent Types	Yes
2401100000	Surface Coating : Industrial Maintenance Coatings : Total: All Solvent Types	Yes
2401200000	Surface Coating : Other Special Purpose Coatings : Total: All Solvent Types	Yes
2415100000[1]	Degreasing : All Industries: Open Top Degreasing : Total: All Solvent Types	No
2415300000	Degreasing : All Industries: Cold Cleaning : Total: All Solvent Types	Yes
2425000000	Graphic Arts : All Processes : Total: All Solvent Types	Yes
2430000000	Rubber/Plastics : All Processes : Total: All Solvent Types	Yes
2440000000	Miscellaneous Industrial : All Processes : Total: All Solvent Types	Yes
2440020000	Miscellaneous Industrial : Adhesive (Industrial) Application : Total: All Solvent Types	Yes
2460200000	Miscellaneous Non-industrial: Consumer and Commercial : All Household Products : Total: All Solvent Types	No
2461850000	Miscellaneous Non-industrial: Commercial : Pesticide Application: Agricultural : All Processes	No
2465100000	Miscellaneous Non-industrial: Consumer : Personal Care Products : Total: All Solvent Types	No
2465200000	Miscellaneous Non-industrial: Consumer : Household Products : Total: All Solvent Types	No
2465400000	Miscellaneous Non-industrial: Consumer : Automotive Aftermarket Products : Total: All Solvent Types	No
2465800000	Miscellaneous Non-industrial: Consumer : Pesticide Application : Total: All Solvent Types	No

[1] The EPA inventory has zero VOC emissions for this category for all counties in the U.S. All non-zero values are from States/Locals

inventory were followed in applying the point source adjustments (EPA, 2005b). These procedures involved back-calculating uncontrolled emissions for emission processes in the point source inventory equipped with one of the destructive VOC control devices shown in Table 2-14.

If the control efficiency was not available in the point source NEI, a default control efficiency of 70 percent was used to back-calculate emissions. Note, however, that the control efficiencies used to back-calculate uncontrolled emissions for destructive controls (i.e., 70 or 98 percent) do not match the default control efficiency values listed in Chapter 6 of the draft report for the EPA inventory (EPA, 2005b). This is because the draft report has not yet been revised to reflect the revised methods applied for back-calculating uncontrolled emissions for both the draft and final 2002 point source NEI. To be consistent with the methods documented in Chapter 6 of the report for the draft solvent inventory, rule effectiveness was not included in these calculations because of the expected high variability of its applicability in the NEI (EPA, 2005b).

Table 2-14. Destructive VOC Control Devices for Point Source Solvent Utilization Categories

Control Device Code	Control Device Description
019	CATALYTIC AFTERBURNER
020	CATALYTIC AFTERBURNER WITH HEAT EXCHANGER
021	DIRECT FLAME AFTERBURNER
022	DIRECT FLAME AFTERBURNER WITH HEAT EXCHANGER
023	FLARING
024	MODIFIED FURNACE OR BURNER DESIGN
025	STAGED COMBUSTION
027	REDUCED COMBUSTION - AIR PREHEATING
065	CATALYTIC REDUCTION
080	CHEMICAL OXIDATION
081	CHEMICAL REDUCTION
082	OZONATION
109	CATALYTIC OXIDIZER
112	AFTERBURNER
116	CATALYTIC INCINERATOR
131	THERMAL OXIDIZER
133	INCINERATOR
138	BOILER AT LANDFILL
203	CATALYTIC CONVERTER

If the point source VOC control device was not destructive (e.g., a carbon adsorber), the solvent was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the controlled VOC emissions were treated as uncontrolled VOC emissions in the point source subtraction step, as were the VOC emissions from solvent sources without control devices (EPA, 2005b).

The uncontrolled VOC emissions for all processes within a solvent category were then summed to the county-level by the 6-digit point source SCC for each category. For each solvent category, the county-level point source emissions developed from the final point source NEI were then subtracted from the county-level point source emissions from the draft point source NEI, and then the difference in the VOC emissions was used to adjust the draft nonpoint VOC emissions. Matching was performed at the 6-digit point and 7-digit nonpoint SCC levels. The table named "Solvent Nonpoint to Point SCC Crosswalk" in Appendix C provides the crosswalk that matches the point and nonpoint SCCs for each category.

Point source emissions for SCCs associated with "thinning" or "oven" activity were equally distributed to the several nonpoint SCCs mapped to the point source SCCs. The procedures for performing this allocation are documented in Chapter 6, section 6 of the report for the draft solvent inventory (EPA, 2005b).

2.8.4 Fossil Fuel Combustion

This section of the report documents revisions that EPA made to the emissions for the fossil fuel combustion categories after completing the draft NEI. The following explains the revisions to (1) emissions EPA added to the draft NEI for pollutants missing in S/L inventories, (2) the EPA inventories for the industrial coal combustion categories (i.e., anthracite and bituminous/ subbituminous) to remove activity associated with coke plants included in the final point source NEI, (3) HAP emission factors for ICI coal combustion; and (4) the point source adjustments to the EPA inventories for all of the ICI fossil fuel combustion categories. This section also explains the methods EPA applied to all S/L and EPA PM emissions for the ICI and residential natural gas and LPG categories to account for new data indicating that PM-CON emissions are approximately 10 times lower than the PM-CON emission factors published in AP-42 and the Factor Information REtrieval (FIRE) Data System (http://www.epa.gov/ttn/chief/ software/fire/index.html).

Methods for Estimating Missing Pollutant Emissions from S/L-Supplied Emissions

If a S/L inventory included VOC, NOX, or SO2 emissions, EPA used the ratio of the uncontrolled emission factor for the missing pollutant to the uncontrolled emission factor for VOC, NOX, or SO2 and applied the ratio to the VOC, NOX, or SO2 emissions (in this order) to estimate emissions for the missing CAPs and/or HAPs. The records for which emissions were estimated using this ratio method were assigned the S/L agency data source code with an extension of -VR, NR, or -SR indicating that the ratio was applied to the S/L agency-supplied VOC, NOX, or SO2 emissions, respectively. The emission factors used to prepare the ratios are those documented in the NEI method for the ICI fossil fuel combustion categories (see Appendix A for the emissions factors). Note that EPA applied this same method for estimating missing pollutant emissions for the draft NEI. Because the base pollutant emissions changed as a result of incorporating S/L comments on the draft NEI, all records estimated using the method were removed and the method was re-applied to ensure that the missing pollutant emissions were estimated using the final base pollutant emissions.

Revisions to Industrial Coal Combustion to Remove Coke Coal Activity Data

For the final NEI, EPA revised the activity data and emissions for the industrial coal combustion category to remove activity associated with coke coal consumption since the emissions data for coke plants are included in the point source inventory. Appendix A identifies the 11 States with industrial coke coal consumption available from the Energy Information Administration's (EIA) State Energy Data (SED) reports. In the final NEI, the EPA inventory for this category was used for 4 of the 11 States (i.e., IL, KY, OH, and WV). For the remaining

7 States that supplied data included in the final NEI, it was assumed that these States excluded coke coal consumption from their nonpoint inventories for industrial coal combustion.

Revisions to ICI Coal Combustion HAP Emission Factors

The EPA/ESD provided new emission factors for some of the HAPs for anthracite and bituminous/subbituminous coal combustion. The new emission factors are shown in Table 2-15. These emission factors were used in the final NEI to calculate emissions using the EPA/NEI method and to calculate missing pollutant emissions from S/L-supplied VOC, NOX, or SO2 emissions.

Table 2-15. Revised HAP Emission Factors for ICI Coal Combustion

Pollutant Code	Pollutant Name	Uncontrolled Emission Factor (Lb/Ton)
Anthracite Coal (SCCs 2102001000 and 2103001000)		
7439965	Manganese	0.00049
7439976	Mercury	0.000083
7440020	Nickel	0.00028
7440382	Arsenic	0.00041
7440417	Beryllium	0.000021
7440439	Cadmium	0.000051
7440473	Chromium	0.00026
7439921	Lead	0.00042
Bituminous/Subbituminous Coal (SCCs 2102002000 and 2103002000)		
7440473	Chromium	0.00026
50000	Formaldehyde	0.00024
7439921	Lead	0.00042
7440382	Arsenic	0.00041
7440439	Cadmium	0.000051

Revisions to Point Source Adjustments

As a result of incorporating S/L comments on the draft point source NEI, the methods used to calculate point source adjustments to the ICI fuel combustion categories were revised to account for changes in point source throughput data. Thus, the final nonpoint NEI estimates were revised to reflect point source throughput estimated using the final point source NEI. The remainder of this section explains the methods for estimating point source throughput using CO emissions from the final point source NEI and uncontrolled CO emission factors.

State-level point source fuel consumption was subtracted from the State-level fuel consumption obtained from the EIA SED reports. The EPA reviewed the S/L inventories and found that many S/L agencies did not report point source fuel consumption data. Consequently, EPA back-calculated point source fuel consumption by dividing the point source CO emissions in the final 2002 point source NEI by the uncontrolled point source CO emission factors available in AP-42 and the FIRE database. Emissions for CO were used to back-calculate fuel consumption because CO is typically not controlled for these ICI fossil fuel combustion categories. This calculation was performed for each SCC by summing CO emissions to the State-level, back-calculating the throughput, and subtracting the throughput from the State-level SED fuel consumption estimates. The SED reports provide total coal consumption by State. Thus, the back-calculated point source anthracite and bituminous/subbituminous coal consumption was summed and subtracted from the SED fuel consumption. After adjusting the SED fuel consumption for point source fuel consumption, any remaining activity was allocated to counties using employment data (see Appendix A for details on the State-to-county allocation methods and Appendix B for employment data used in the allocation procedures). Note that if the fuel consumption was negative or zero, the emissions for the nonpoint source inventory were set to zero and records were not added to the draft nonpoint source inventory. Appendix C provides an Access table containing the crosswalk between the point and nonpoint SCCs and the uncontrolled CO emission factors for the point source SCCs.

Revisions to PM Emissions for Natural Gas and LPG

On August 11, 2005, EPA issued an NEI Listserv notice indicating its intent to revise the PM emissions from natural gas combustion and LPG in the final version of the 2002 NEI. This adjustment was applied to all of the PM emissions (i.e., S/L and EPA) in the final 2002 nonpoint NEI. The adjustment decreased the emissions of PM10-PRI, PM2.5-PRI, and PM-CON by 93 to

95 percent. The reason for this adjustment is that EPA believes that the current AP-42 factors for condensable emissions are too high. The EPA based this adjustment on some limited data from the draft EPA dilution method that is similar to Conditional Test Method (CTM) 39 (http://www.epa.gov/ttn/emc/ctm.html) that measures PM10-PRI and PM2.5-PRI directly. The data that this adjustment is based on can be found at http://www.nyserda.org/programs/Environment/emepreports.asp#FineParticulates.

Table 2-16 lists the ICI and residential SCCs to which the adjustments were made; the adjustment ratio; and the PM10-PRI, PM25-PRI, and PM-CON emissions before and after applying the adjustments. For cases where PM10-FIL emissions were provided for the same State and county FIPS code, SCC, start date, end date, and emission type combination, the PM10-FIL emissions were recalculated by subtracting PM-CON emissions from the PM10-PRI emissions. The PM25-FIL emissions were recalculated by subtracting PM-CON emissions from the PM25-PRI emissions.

Note that the PM emission factors and national emissions presented in Appendix A for the NEI methods for the ICI and residential fuel combustion categories are not adjusted with the ratios shown in Table 2-16.

Table 2-16. Adjustments to PM Emissions for ICI and Residential Natural Gas and LPG Stationary Source Fuel Combustion

		PM10-PRI			PM25-PRI			PM-CON		
SCC	SCC Description	National Emissions Before Applying Ratio (Tons)	National Emissions After Applying Ratio (Tons)	Ratio	National Emissions Before Applying Ratio (Tons)	National Emissions After Applying Ratio (Tons)	Ratio	National Emissions Before Applying Ratio (Tons)	National Emissions After Applying Ratio (Tons)	Ratio
2101006000	Electric Utility : Natural Gas : Total: Boilers and IC Engines	249.9	17.1	0.0684211	149.9	8.5	0.0565789			
2101006002	Electric Utility : Natural Gas : All IC Engine Types	1.2	0.1	0.0684211	1.2	0.1	0.0565789			
2102006000	Industrial : Natural Gas : Total: Boilers and IC Engines	13,840.2	947.0	0.0684211	13,737.9	777.3	0.0565789	7,837.1	443.4	0.0565789
2102006001	Industrial : Natural Gas : All Boiler Types	824.0	56.4	0.0684211	823.7	46.6	0.0565789	14.0	0.8	0.0565789
2102006002	Industrial : Natural Gas : All IC Engine Types	154.5	10.6	0.0684211	154.2	8.7	0.0565789			
2102007000	Industrial : Liquified Petroleum Gas (LPG) : Total: All Boiler Types	1,013.0	69.3	0.0684211	989.3	56.0	0.0565789	174.7	9.9	0.0565789
2103006000	Commercial/Institutional : Natural Gas : Total: Boilers and IC Engines	16,583.9	1,134.7	0.0684211	16,565.5	937.3	0.0565789	8,013.7	453.4	0.0565789
2103007000	Commercial/Institutional : Liquified Petroleum Gas (LPG) : Total: All Combustor Types	730.2	50.0	0.0684211	730.2	41.3	0.0565789	235.4	13.3	0.0565789
2103007005	Commercial/Institutional : Liquified Petroleum Gas (LPG) : All Boiler Types	0.1	0.0	0.0684211	0.1	0.0	0.0565789			
2104006000	Residential : Natural Gas : Total: All Combustor Types	20,574.7	1,407.7	0.0684211	20,560.9	1,163.3	0.0565789	9,985.9	565.0	0.0565789
2104006010	Residential : Natural Gas : Residential Furnaces	2,357.3	161.3	0.0684211	2,357.3	133.4	0.0565789	58.1	3.3	0.0565789
2104007000	Residential : Liquified Petroleum Gas (LPG) : Total: All Combustor Types	2,836.6	194.1	0.0684211	2,761.1	156.2	0.0565789	1,084.2	61.3	0.0565789
2199007000	Total Area Source Fuel Combustion : Liquified Petroleum Gas (LPG) : Total: All Boiler Types	117.6	8.0	0.0684211	117.6	6.7	0.0565789			
	Totals	59,283.1	4,056.2	0.0684211	58,948.8	3,335.3	0.0565789	27,403.0	1,550.4	0.0565789

2.8.5 Gasoline Distribution

The EPA received comments from one local and six State agencies on its plans for incorporating EPA Gasoline Distribution emissions data into the final NEI. As noted in the February 18, 2005 memorandum, there were two main reasons for replacing the draft 2002 NEI estimates, which reflect both S/L agency-supplied 2002 data and 1999 NEI estimates that were carried forward to 2002 (when S/L 2002 data were not provided), with the new EPA-prepared 2002 estimates:

(1) For some categories, the draft 2002 NEI contained more criteria air pollutants (CAPs) and more hazardous air pollutants (HAPs) than EPA intended to retain. Similarly, the draft 2002 NEI contained records for SCCs that EPA did not plan to maintain in the final NEI. EPA has determined that it is important to maintain consistency in these areas to avoid potential double-counting; the final NEI provided an opportunity to remove suspect records (e.g., NOx emission records) for these categories. In addition, because EPA required a Gasoline Distribution inventory to support an upcoming rulemaking (Mobile Source Air Toxics Rule), the new EPA inventory provided a consistent data set for evaluating the impacts of potential regulatory alternatives.

(2) The new EPA inventory uses an improved set of emission estimation methods in relation to those used for the 1999 NEI. These improvements include: (a) for source categories where activity-based emission factors are available (all except Bulk Terminals and Pipelines), EPA has established methods that maintain mass balance for storage and transfer activities, such that there is agreement with the activity estimates used for each of the different distribution sectors; (b) EPA has developed CAP and HAP emission estimates using the same activity data and a consistent set of speciation profiles; and © EPA has developed county-specific methyl tertiary-butyl ether (MTBE) and benzene speciation profiles reflecting fuel parameters for each county. These profiles reflect compliance with regulatory requirements (e.g., reformulated gasoline programs).

EPA reviewed the comments and conducted follow-up with each of the S/L agency contacts to ensure a complete understanding of each comment. This follow-up included a detailed description of how EPA planned to address each comment with respect to the final 2002 nonpoint source NEI. Table 2-17 provides a summary of the S/L agency comments, and how EPA addressed each comment with respect to the final 2002 nonpoint source NEI.

2.8.6 PM Augmentation

For fuel combustion sources that have both filterable and condensible emissions, the methods for estimating primary emissions missing from S/L inventories are detailed in section 2.9 of the report for the draft 2002 NEI. Note that time and resource constraints precluded application of these procedures to correct PM data in S/L comments on the draft 2002 NEI. Consequently, in some cases EPA set the primary emissions equal to the S/L-supplied filterable emissions if the S/L agency did not supply condensible emissions with their filterable emissions.

For non-fuel combustion categories that have only filterable emissions, the primary and filterable emissions are equal. For S/L agencies that provided only PM10-FIL and PM25-FIL emissions, PM10-PRI emissions were set equal to PM10-FIL emissions and PM25-PRI emissions were set equal to PM25-FIL emissions. The PM10-PRI and PM25-PRI emissions that were added to the inventory were assigned a data source code of S-02-X-PR where S-02-X represents the code assigned to the PM10-FIL and PM25-FIL emissions provided by the S/L agency and the "-PR" indicates that the ratio was applied to estimate the primary emissions (in this case, the ratio of primary to filterable emissions is "1").

Table 2-17. Summary of State/Local Agency Comments and EPA Disposition of Comments

Geographic Area	SCC	S/L Agency Comment	EPA Resolution	Notes
Bernalillo County, New Mexico	2501060050	Local agency had service stations develop their tank filling and UST breathing and emptying emissions based on their station's throughput and an emissions factor representing the sum of factors for each process. Agency requested that EPA use the resulting VOC emission estimates, which were reported in SCC 2501060050 (Stage I: Total).	Because local agency reported VOC emissions in an SCC that EPA was not supporting, EPA split the county's emissions into individual SCCs used by EPA (2501060053 and 2501060201). The split was computed using the EIIP emission factors for each process. EPA computed HAP emissions from the resulting VOC emissions by applying EPA HAP speciation profiles.	EPA notes that use of local agency supplied estimates results in loss of gasoline throughput mass balance across gasoline distribution source categories.
	2501050000	Requested replacement of EPA bulk terminal emissions with local agency supplied emissions. These estimates were from bulk annual criteria pollutant emission inventory reports prepared by bulk terminals. These emissions were reported in SCC 2501050000 (All Petroleum Products) because agency was unable to determine the products reflected in the bulk terminal reports.	EPA did not use the local agency's criteria pollutant emission estimates because HAP emissions were not supplied and it was not possible for EPA to calculate HAP emissions from the reported VOC emissions because the product(s) associated with the estimates were unknown. Also, EPA prefers to use product-specific SCCs, which assist in ensuring that double-counting of emissions does not occur. EPA incorporated EPA's emission estimates, which are reported using the gasoline bulk terminal SCC (2501050120).	Local agency noted that future Bernalillo County submittals will report all bulk terminal emissions in the point source inventory.
Maryland	2501060100 2501060053 2501060201 2505030120	Replace EPA VOC emission estimates with estimates supplied by State.	Replaced EPA VOC emission estimates with MD's estimates and calculated HAP emission estimates by multiplying EPA speciation profiles by MD's VOC estimates.	

Table 2-17 (continued)

Geographic Area	SCC	S/L Agency Comment	EPA Resolution	Notes
Massachusetts	2501050120 2501055120	State commented that all bulk terminal and bulk plant emissions are reported in point source inventory.	Removed all bulk terminal and bulk plant emissions from nonpoint source inventory.	
	2501060053 2501060201 2505030120	Requested that State's VOC emission estimates be used in place of EPA's estimates.	Replaced EPA VOC emission estimates with State-supplied estimates. EPA calculated HAP emissions from State-supplied VOC emissions using the EPA speciation profiles identified in Appendix A.	Although MA's VOC emission estimates for 2501060201 are similar to EPA's ; their estimates for other two SCCs are more than double EPA's. EPA recommends that State compare their emission estimation methods to EPA's methods for SCC 2505030120 and 2501060053.
New Hampshire	2501060201 2505030120	Replace EPA's VOC emission estimates with State-supplied emissions that reflect State controls.	Replaced EPA's VOC emission estimates with NH's estimates and calculated HAP emissions by multiplying VOC emissions by EPA HAP speciation profiles.	
New Jersey	2501060053	Replace EPA's VOC emission estimates with State-supplied estimates.	Replaced EPA VOC emissions with NJ's estimates and calculated HAP emissions by applying EPA HAP speciation profiles to State-supplied VOC estimates.	
	2501060100	EPA should calculate Stage II emissions using a control efficiency of 62 percent rather than EPA's estimate of 86 percent.	EPA was unable to develop revised emission estimates based on the 62 percent control efficiency value due to budget constraints. However, EPA incorporated the 62 percent value into the National Mobile Inventory Model (NMIM) database.	EPA notes that the final NEI may slightly overstate NJ's emissions for this category.
	2501050120 2501055120 2505040120	Remove all EPA pipeline, bulk terminal, and bulk plant emission estimates from nonpoint source inventory because all emissions are categorized in the point source inventory.	Removed EPA's emissions for these SCCs from the nonpoint source NEI.	

Table 2-17 (continued)

Geographic Area	SCC	S/L Agency Comment	EPA Resolution	Notes
Ohio	2501060052	Revise assumption of percentage of throughput in each county of State that is splash fill to 5 percent.	EPA recalculated splash fill VOC and HAP emissions to reflect the throughput filling method percentage value supplied by Ohio.	
	2501060053	Revise assumption of percentage of throughput in each county that is balanced submerged fill to 95 percent.	EPA recalculated balanced submerged fill VOC and HAP emissions to reflect the throughput filling method percentage value supplied by Ohio.	
Vermont	2501055120	Replace EPA VOC emission estimates with controlled emission estimates supplied by VT.	Incorporated VT's bulk plant VOC emissions and calculated bulk plant HAP emissions by applying EPA HAP speciation profiles.	
	2501050120	Remove EPA's bulk terminal emission estimates from nonpoint source NEI	Removed EPA's nonpoint source bulk terminal emissions from final nonpoint source NEI.	

If time and resource constraints permitted, PM25-PRI emissions missing from S/L inventories were estimated by applying a ratio of PM25-PRI to PM10-PRI emissions to the PM10-PRI emissions provided by the S/L agency. Table 2-18 identifies the agencies with SCCs for which ratios were applied to estimate PM25-PRI emissions. This table also shows the ratios and the reference for the ratios. Otherwise, the PM25-PRI emissions were set equal to the S/L-supplied PM25-FIL emissions to ensure that the final NEI contained a complete set of both PM10-PRI and PM25-PRI emissions for all nonpoint sources of PM.

Table 2-18. SCCs for which PM25-PRI Emissions were Estimated by Applying a Ratio to the PM10-PRI Emissions in the S/L/T inventory

SCC	SCC Description	Ratio of PM25-PRI to PM10-PRI	Reference
2294000000	Mobile Sources : Paved Roads : All Paved Roads : Total: Fugitives	0.25	NEI Method.
2296000000	Mobile Sources : Unpaved Roads : All Unpaved Roads : Total: Fugitives	0.15	NEI Method.
2309100010	Industrial Processes: Fabricated Metals: SIC 34: Coating, Engraving, and Allied Services: Electroplating	0.947	AP-42 emission factors for hard chrome plating tank controlled with mist eliminator. AP-42 (Table 12.20-3) shows 94.7% of total PM as less than 2.35 micrometers. Applied factor to state-supplied PM10-PRI emissions to estimate PM25-PRI emissions.
2461023000	Solvent Utilization: Miscellaneous Non-industrial: Commercial: Asphalt Roofing: Total: All Solvent Types	1	No data available; assumed PM25-PRI equals PM10-PRI.
2505020000	Storage and Transport : Petroleum and Petroleum Product Transport : Marine Vessel : Total: All Products	1	No data available; assumed PM25-PRI equals PM10-PRI.
2535010000	Storage and Transport : Bulk Materials Transport : Rail Car : Total: All Products	1	No data available; assumed PM25-PRI equals PM10-PRI.
2601000000	Waste Disposal, Treatment, and Recovery: On-site Incineration: All Categories: Total	1	No data available; assumed PM25-PRI equals PM10-PRI.
2610000100	Waste Disposal, Treatment, and Recovery: On-site Incineration: All Categories: Yard Waste - Leaf Species Unspecified	1	No data available; assumed PM25-PRI equals PM10-PRI.
2810001000	Miscellaneous Area Sources: Other Combustion: Forest Wildfires: Total	1	No data available; assumed PM25-PRI equals PM10-PRI.
2810015000	Miscellaneous Area Sources: Other Combustion: Prescribed Burning for Forest Management: Total	1	No data available; assumed PM25-PRI equals PM10-PRI.
2810020000	Miscellaneous Area Sources: Other Combustion: Prescribed Burning of Rangeland: Total	0.86	Based on ratio of PM25-PRI to PM10-PRI for same SCC used by states in 2002 NEI.
2810030000	Miscellaneous Area Sources: Other Combustion: Structure Fires: Total	0.91	NEI Method.
2810050000	Miscellaneous Area Sources: Other Combustion: Motor Vehicle Fires: Total	0.91	NEI Method.

Information developed by the Western Regional Air Partnership and EPA indicate that, for paved and unpaved roads and the construction nonpoint source categories, the PM2.5-to-PM10 ratio is lower than the ratio used in the NEI method to estimate PM25-PRI/-FIL emissions from PM10-PRI/-FIL emissions. Therefore, for the final NEI, EPA applied an adjustment factor to the PM25-PRI/-FIL emissions to correct for overestimates of PM25-PRI/-FIL emissions for these categories. Table 2-19 identifies the categories to which this adjustment was applied, the old and new PM2.5-to-PM10 ratios, and the adjustment factors applied to the PM25-PRI/-FIL emissions in the final NEI.

Table 2-19. Revisions to PM25-PRI and PM25-FIL Emissions for Paved and Unpaved Roads and Construction

SCC	SCC Description	Original $PM_{2.5}$-to-PM_{10} Ratio	Revised $PM_{2.5}$-to-PM_{10} Ratio	NEI Adjustment Factor[1]
2294000000	Mobile Sources : Paved Roads : All Paved Roads : Total: Fugitives	0.25	0.15	0.6
2296000000	Mobile Sources : Unpaved Roads : All Unpaved Roads : Total: Fugitives	0.15	0.1	0.67
2296005000	Mobile Sources : Unpaved Roads : Public Unpaved Roads : Total: Fugitives	0.15	0.1	0.67
2296010000	Mobile Sources : Unpaved Roads : Industrial Unpaved Roads : Total: Fugitives	0.15	0.1	0.67
2311000000	Industrial Processes : Construction: SIC 15 - 17 : All Processes : Total	0.15	0.1	0.67
2311010000	Industrial Processes : Construction: SIC 15 - 17 : Residential : Total	0.15	0.1	0.67
2311010040	Industrial Processes : Construction: SIC 15 - 17 : Residential : Ground Excavations	0.15	0.1	0.67
2311020000	Industrial Processes : Construction: SIC 15 - 17 : Industrial/Commercial/Institutional : Total	0.15	0.1	0.67
2311020040	Industrial Processes : Construction: SIC 15 - 17 : Industrial/Commercial/Institutional : Ground Excavations	0.15	0.1	0.67
2311030000	Industrial Processes : Construction: SIC 15 - 17 : Road Construction : Total	0.15	0.1	0.67

[1] For these categories, filterable and primary emissions are equal because they are not sources of condensible emissions. Therefore, the NEI adjustment factor was applied to both the PM25-PRI and PM25-FIL emissions in the NEI.

2.8.7 HAP Reconciliation

Background

The CAA list of 188 HAPs includes several HAP groups in addition to individual chemicals. Examples of some HAP groups are metal compounds, cresols/cresylic acid (isomers and mixture), polycyclic organic matter (POM), dioxins, and furans. The nonpoint NEI data structure allows information on individual chemicals in these HAP groups to be retained, and their emissions could be reported either as the individual chemicals or as a combination of emissions that represent the entire HAP group. In the nonpoint source NEI, emissions were estimated for the individual HAPs, and not grouped together. However, if only a HAP group estimate was available, no attempt was made to disaggregate the HAP group emissions into the individual HAPs.

For POM, emissions are listed in the nonpoint source NEI as either the more general POM HAP group, individual POM HAPs, or as two subsets of the POM groups that EPA developed for other national inventories. The first subset consists of 7 PAHs, and the other consists of 15 PAHs. Individual POM chemicals that are not in either the 7-PAH or 15-PAH groups, or emissions defined simply as POM, are reported as POM in the nonpoint source component of the NEI.

The compounds listed below constitute the 7-PAH (marked with asterisks) and the 15-PAH compounds. The 7-PAH compounds have been determined by the International Agency for Research on Cancer (IARC) (http://www.iarc.fr/) to be animal carcinogens. The sum of these 7 compounds represents the 7-PAH emission subset that is used in this inventory, and the sum of the 15 compounds represents the 15-PAH emission subset used in this inventory.

Acenaphthene	Benzo(b)fluoranthene*	Fluoranthene
Acenaphthylene	Benzo(ghi)perylene	Fluorene
Anthracene	Benzo(k)fluoranthene*	Indeno(1,2,3-cd)pyrene*
Benz(a)anthracene*	Chrysene*	Phenanthrene
Benzo(a)pyrene*	Dibenz(a,h)anthracene*	Pyrene

Thus, an estimate of the emissions for all the POM compounds in the nonpoint source NEI is the sum of the 15-PAH (group or individual), the non-15-PAH individual HAPs, and the unspeciated POM emissions.

HAP Reconciliation

This section documents the methods applied to reconcile emissions within a HAP category to eliminate double-counting of emissions reported, for example, under a pollutant code representing total emissions for all individual species for the HAP group and under one or more different pollutant codes for individual species that belong to the HAP group. Table 2-20 lists the HAP categories for which reconciliation was performed. This table also identifies for each HAP category the pollutant names and their pollutant codes that were identified in the final 2002 NEI with overlapping emissions for the same State and county FIPS code, SCC, start date, end date, and emission type combination. Note that the HAP reconciliation procedures were applied after incorporating all S/L comments and after applying all augmentation procedures to add HAP emissions not supplied by S/L agencies.

Table 2-20. HAP Categories Reviewed for Double Counting of Emissions

HAP Category	Reconciliation Required	Overlapping Pollutants Identified and Corrected in the Final 2002 Nonpoint NEI[1]
Antimony Compounds	No	No overlap between Antimony & Compounds (92) and Antimony Metal (7440360) or species
Arsenic Compounds	Yes	Arsenic & Compounds (Inorganic Including Arsine) (93) overlapped with Arsenic Metal (7440382)
Beryllium Compounds	Yes	Beryllium & Compounds (109) overlapped with Beryllium Metal (7440417)
Cadmium Compounds	Yes	Cadmium & Compounds (125) overlapped with Cadmium Metal (7440439)
Chromium Compounds	Yes	Chromium & Compounds (136) overlapped with Chromium (VI) (18540299) and Chromium Metal (7440473)
Cobalt Compounds	No	No overlap between Cobalt & Compounds (139) and Cobalt Metal (7440484) or species
Cresol/Cresylic Acid (Mixed Isomers)	No	No overlap between Cresols (Includes o, m, & p)/Cresylic Acids (331) and Cresol (1319773) or species
Cyanide Compounds	Yes	Cyanide & Compounds (144) overlapped with Hydrogen Cyanide (74908)
Glycol Ethers	Yes	Glycol Ethers Total (171) overlapped with the following Glycol Ether species: Cellosolve Solvent (110805); Cellosolve Acetate (111159); Butyl Cellosolve (111762); Diethylene Glycol Monomethyl Ether (111773); Diethylene Glycol Monoethyl Ether (111900); Diethylene Glycol Monobutyl Ether (112345); Di(Ethylene Glycol Monobutyl Ether) Phthalate (16672392); and Diethylene Glycol Monovinyl Ether (929373).
Lead Compounds	Yes	Lead & Compounds (195) overlapped with Lead Metal (7439921)
Manganese Compounds	Yes	Manganese & Compounds (198) overlapped with Manganese Metal (7439965)
Mercury Compounds	Yes	Mercury & Compounds (199) overlapped with Mercury Metal (7439976)
Nickel Compounds	Yes	Nickel & Compounds (226) overlapped with Nickel Metal (7440020)
Polycyclic Organic Matter as 7-PAH	Yes	Benzo_bk_Fluoranthene (102) overlapped with Benzo_b_Fluoranthene (205992) and Benzo_k_Fluoranthene Emissions (207089). 7-PAH Total (75) overlapped with the following 7-PAH species: Benzo[b+k]Fluoranthene (102): Indeno[1,2,3-c,d]Pyrene (193395); Chrysene (218019): Polycyclic Organic Matter (246): Benzo[a]Pyrene (50328): Dibenzo[a,h]Anthracene (53703): and Benz[a]Anthracene (56553).

Table 2-20 (continued)

HAP Category	Reconciliation Required	Overlapping Pollutants Identified and Corrected in the Final 2002 Nonpoint NEI[1]
Polycyclic Organic Matter as 15-PAH	Yes	15-PAH Total (249) overlapped with the following 7-PAH Total or species: 7-PAH (75): Benzo[b]Fluoranthene (205992); Benzo[k]Fluoranthene (207089); Benzofluoranthenes (56832736); Benzo[b+k]Fluoranthene (102); Indeno[1,2,3-c,d]Pyrene (193395); Chrysene (218019); Benzo[a]Pyrene (50328); Dibenzo[a,h]Anthracene (53703); and Benz[a]Anthracene (56553). 15-PAH Total (249) overlapped with the following 15-PAH species: Anthracene (120127); Pyrene (129000); Benzo[g,h,i,]Perylene (191242); Fluoranthene (206440); Acenaphthylene (208968); Acenaphthene (83329); Phenanthrene (85018); and Fluorene (86737).
Selenium Compounds	Yes	Selenium & Compounds (253) overlapped with Selenium Metal (7782492)
Xylenes (Mixed Isomers)	Yes	Xylene Isomers Total (1330207) overlapped with m-Xylene (108383), o-Xylene (95476), and p-Xylene (106423)

[1] This column lists the pollutant names (and pollutant codes) that were identified in the final 2002 NEI with overlapping emissions for the Emission table data key minus the pollutant code (i.e., pollutant emissions occurred for the same State and county FIPS code, SCC, start date, end date, and emission type).

The emissions reported for the pollutant code for aggregated emissions were compared to the sum of the emissions reported for the individual species within each HAP group. If the data source code was the same for all pollutants, the emissions for the species were kept in the NEI if the sum of the species' emissions was greater than or equal to the emissions reported for the pollutant code for aggregated emissions. Otherwise, the emissions for the pollutant code for aggregated emissions were kept in the NEI if the emissions were greater than the sum of the species. The following provides an example for the lead HAP group:

1. If the sum of the speciated lead emissions was greater than or equal to lead and compounds emissions, lead and compounds emissions were deleted from the NEI.

2. If lead and compounds emissions were greater than the sum of the speciated lead emissions, speciated lead emissions were deleted from the NEI.

3. If emissions were speciated and no lead and compounds were reported (lead and lead oxide for example), all records were kept in the NEI.

Where the data source codes for the pollutant code for aggregated emissions and the pollutant codes for the species were different, preference was given to keeping S/L-supplied data in the final NEI. For example, if State-supplied emissions for lead and compounds was less than emissions for lead metal originating from an NEI method, the State-supplied emissions for lead and compounds were kept in the final NEI.

2.8.8 Assignment of Process MACT Codes, MACT Compliance Status Codes, and MACT Flags

The Emission Process table includes fields for holding the Process MACT Code, Process MACT Compliance Status Code, and the MACT Flag. This section of the report explains how these fields were populated for the final 2002 nonpoint NEI.

Table 2-21 provides an unique list of the MACT categories, their Process MACT Codes, and Process MACT Compliance Status Codes assigned to nonpoint source categories in the final 2002 NEI. This table also identifies the SCCs associated with the Process MACT Codes, and Process MACT Compliance Status Codes.

The categories for which the MACT codes are assigned are based on the expected applicability of MACT rules to nonpoint sources. Note that in prior versions of the nonpoint NEI (i.e., draft and preliminary 2002 NEI and the 1999 NEI), several other categories were identified as covered by MACT rules. Therefore, for the final NEI, EPA removed the Process MACT Codes and Process MACT Compliance Status Codes previously supplied by either S/L agencies or by EPA in prior versions of the NEI. The EPA also removed invalid MACT codes provided by S/L agencies. Table 2-22 lists the MACT source categories and codes removed from the final NEI.

Table 2-21. Summary of Process MACT Codes and Process MACT Compliance Status Codes Used in the Final 2002 Nonpoint NEI

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
Industrial/Commercial/ Institutional Boilers & Process Heaters - coal	**0107-1**		**Stationary Source Fuel Combustion : Coal**	
		03	2102001000	Industrial : Anthracite Coal : Total: All Boiler Types
		03	2102002000	Industrial : Bituminous/Subbituminous Coal : Total: All Boiler Types
		03	2103001000	Commercial/Institutional : Anthracite Coal : Total: All Boiler Types
		03	2103002000	Commercial/Institutional : Bituminous/Subbituminous Coal : Total: All Boiler Types
		03	2199001000	Total Area Source Fuel Combustion : Anthracite Coal : Total: All Boiler Types
		03	2199002000	Total Area Source Fuel Combustion : Bituminous/Subbituminous Coal : Total: All Boiler Types
Industrial/Commercial/ Institutional Boilers & Process Heaters - gas	**0107-2**		**Stationary Source Fuel Combustion : Natural Gas, LPG, and Process Gas**	
		03	2102006000	Industrial : Natural Gas : Total: Boilers and IC Engines
		03	2102006001	Industrial : Natural Gas : All Boiler Types
		03	2102007000	Industrial : Liquified Petroleum Gas (LPG) : Total: All Boiler Types
		03	2102010000	Industrial : Process Gas : Total: All Boiler Types
		03	2103006000	Commercial/Institutional : Natural Gas : Total: Boilers and IC Engines
		03	2103007000	Commercial/Institutional : Liquified Petroleum Gas (LPG) : Total: All Combustor Types
		03	2103007005	Commercial/Institutional : Liquified Petroleum Gas (LPG) : All Boiler Types
		03	2103010000	Commercial/Institutional : Process gas : POTW Digester Gas-fired Boiler
		03	2199006000	Total Area Source Fuel Combustion : Natural Gas : Total: Boilers and IC Engines
		03	2199006001	Total Area Source Fuel Combustion : Natural Gas : All Boiler Types
		03	2199007000	Total Area Source Fuel Combustion : Liquified Petroleum Gas (LPG) : Total: All Boiler Types

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
Stationary Reciprocal Internal Combustion Engines - gas	**0105-2**		**Stationary Source Fuel Combustion : Natural Gas, LPG, and Process Gas**	
		03	2102006002	Industrial : Natural Gas : All IC Engine Types
Industrial/Commercial/ Institutional Boilers & Process Heaters - oil	**0107-3**		**Stationary Source Fuel Combustion : Oil**	
		03	2102004000	Industrial : Distillate Oil : Total: Boilers and IC Engines
		03	2102005000	Industrial : Residual Oil : Total: All Boiler Types
		03	2102012000	Industrial : Waste oil : Total
		03	2103004000	Commercial/Institutional : Distillate Oil : Total: Boilers and IC Engines
		03	2103005000	Commercial/Institutional : Residual Oil : Total: All Boiler Types
		03	2199004000	Total Area Source Fuel Combustion : Distillate Oil : Total: Boilers and IC Engines
		03	2199004001	Total Area Source Fuel Combustion : Distillate Oil : All Boiler Types
		03	2199005000	Total Area Source Fuel Combustion : Residual Oil : Total: All Boiler Types
Stationary Reciprocal Internal Combustion Engines - oil	**0105-3**		**Stationary Source Fuel Combustion : Oil**	
		03	2199004002	Total Area Source Fuel Combustion : Distillate Oil : All IC Engine Types
Industrial/Commercial/ Institutional Boilers & Process Heaters - wood or waste	**0107-4**		**Stationary Source Fuel Combustion : Wood**	
		03	2102008000	Industrial : Wood : Total: All Boiler Types
		03	2103008000	Commercial/Institutional : Wood : Total: All Boiler Types
		03	2199008000	Total Area Source Fuel Combustion : Wood : Total: All Boiler Types
Industrial/Commercial/ Institutional Boilers & Process Heaters	**0107**		**Stationary Source Fuel Combustion : Kerosene**	
		03	2102011000	Industrial : Kerosene : Total: All Boiler Types
		03	2103011000	Commercial/Institutional : Kerosene : Total: All Combustor Types
		03	2103011005	Commercial/Institutional : Kerosene : All Boiler Types

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
		03	2199011000	Total Area Source Fuel Combustion : Kerosene : Total: All Heater Types
			Industrial Processes : Fabricated Metals: SIC 34 : Coating, Engraving, and Allied Services	
Hard Chromium Electroplating	**1615**	03	2309100010	Electroplating
Decorative Chromium Electroplating	**1610**	03	2309100030	Plating: Metal Deposition
Oil & Natural Gas Production	**0501**		**Industrial Processes : Oil and Gas Production: SIC 13 :**	
		03	2310000000	All Processes : Total: All Processes
		03	2310001000	All Processes : On-shore : Total: All Processes
		03	2310002000	All Processes : Off-shore : Total: All Processes
		03	2310010000	Crude Petroleum : Total: All Processes
		03	2310020000[2]	Natural Gas : Total: All Processes
		03	2310030000	Natural Gas Liquids : Total: All Processes
Natural Gas Transmission & Storage	**0504**		**Industrial Processes : Oil and Gas Production: SIC 13 :**	
		06	2310020000[2]	Natural Gas : Total: All Processes
Paint Stripping Operations	**1621**		**Solvent Utilization : Paint Strippers**	
		03	2402000000	Chemical Strippers : Application, Degradation, and Coating Removal Steps: Other Not Listed
Halogenated Solvent Cleaners	**1614**		**Solvent Utilization : Degreasing :**	
		03	2415000000	All Processes/All Industries : Total: All Solvent Types
		03	2415005000	Furniture and Fixtures (SIC 25): All Processes : Total: All Solvent Types
		03	2415015000	Secondary Metal Industries (SIC 33): All Processes : Total: All Solvent Types
		03	2415020000	Fabricated Metal Products (SIC 34): All Processes : Total: All Solvent Types
		03	2415025000	Industrial Machinery and Equipment (SIC 35): All Processes : Total: All Solvent Types
		03	2415030000	Electronic and Other Elec. (SIC 36): All Processes : Total: All Solvent Types
		03	2415035000	Transportation Equipment (SIC 37): All Processes : Total: All Solvent Types

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
		03	2415040000	Instruments and Related Products (SIC 38): All Processes : Total: All Solvent Types
		03	2415045000	Miscellaneous Manufacturing (SIC 39): All Processes : Total: All Solvent Types
		03	2415055000	Automotive Dealers (SIC 55): All Processes : Total: All Solvent Types
		03	2415060000	Miscellaneous Repair Services (SIC 76): All Processes : Total: All Solvent Types
		03	2415065000	Auto Repair Services (SIC 75): All Processes : Total: All Solvent Types
		03	2415100000	All Industries: Open Top Degreasing : Total: All Solvent Types
		03	2415105000	Furniture and Fixtures (SIC 25): Open Top Degreasing : Total: All Solvent Types
		03	2415110000	Primary Metal Industries (SIC 33): Open Top Degreasing : Total: All Solvent Types
		03	2415120000	Fabricated Metal Products (SIC 34): Open Top Degreasing : Total: All Solvent Types
		03	2415125000	Industrial Machinery and Equipment (SIC 35): Open Top Degreasing : Total: All Solvent Types
		03	2415130000	Electronic and Other Elec. (SIC 36): Open Top Degreasing : Total: All Solvent Types
		03	2415135000	Transportation Equipment (SIC 37): Open Top Degreasing : Total: All Solvent Types
		03	2415140000	Instruments and Related Products (SIC 38): Open Top Degreasing : Total: All Solvent Types
		03	2415145000	Miscellaneous Manufacturing (SIC 39): Open Top Degreasing : Total: All Solvent Types
		03	2415150000	Transportation Maintenance Facilities (SIC 40-45): Open Top Degreasing : Total: All Solvent Types
		03	2415155000	Automotive Dealers (SIC 55): Open Top Degreasing : Total: All Solvent Types
		03	2415160000	Auto Repair Services (SIC 75): Open Top Degreasing : Total: All Solvent Types
		03	2415165000	Miscellaneous Repair Services (SIC 76): Open Top Degreasing : Total: All Solvent Types
		03	2415200000	All Industries: Conveyerized Degreasing : Total: All Solvent Types

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
		03	2415205000	Furniture and Fixtures (SIC 25): Conveyerized Degreasing : Total: All Solvent Types
		03	2415210000	Primary Metal Industries (SIC 33): Conveyerized Degreasing : Total: All Solvent Types
		03	2415220000	Fabricated Metal Products (SIC 34): Conveyerized Degreasing : Total: All Solvent Types
		03	2415225000	Industrial Machinery and Equipment (SIC 35): Conveyerized Degreasing : Total: All Solvent Types
		03	2415230000	Electronic and Other Elec. (SIC 36): Conveyerized Degreasing : Total: All Solvent Types
		03	2415235000	Transportation Equipment (SIC 37): Conveyerized Degreasing : Total: All Solvent Types
		03	2415240000	Instruments and Related Products (SIC 38): Conveyerized Degreasing : Total: All Solvent Types
		03	2415245000	Miscellaneous Manufacturing (SIC 39): Conveyerized Degreasing : Total: All Solvent Types
		03	2415250000	Trans. Maintenance Facilities (SIC 40-45): Conveyerized Degreasing : Total: All Solvent Types
		03	2415255000	Automotive Dealers (SIC 55): Conveyerized Degreasing : Total: All Solvent Types
		03	2415265000	Miscellaneous Repair Services (SIC 76): Conveyerized Degreasing : Total: All Solvent Types
		03	2415300000	All Industries: Cold Cleaning : Total: All Solvent Types
		03	2415305000	Furniture and Fixtures (SIC 25): Cold Cleaning : Total: All Solvent Types
		03	2415310000	Primary Metal Industries (SIC 33): Cold Cleaning : Total: All Solvent Types
		03	2415320000	Fabricated Metal Products (SIC 34): Cold Cleaning : Total: All Solvent Types
		03	2415325000	Industrial Machinery and Equipment (SIC 35): Cold Cleaning : Total: All Solvent Types
		03	2415330000	Electronic and Other Elec. (SIC 36): Cold Cleaning : Total: All Solvent Types
		03	2415335000	Transportation Equipment (SIC 37): Cold Cleaning : Total: All Solvent Types

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
		03	2415340000	Instruments and Related Products (SIC 38): Cold Cleaning : Total: All Solvent Types
		03	2415345000	Miscellaneous Manufacturing (SIC 39): Cold Cleaning : Total: All Solvent Types
		03	2415350000	Transportation Maintenance Facilities (SIC 40-45): Cold Cleaning : Total: All Solvent Types
		03	2415355000	Automotive Dealers (SIC 55): Cold Cleaning : Total: All Solvent Types
		03	2415360000	Auto Repair Services (SIC 75): Cold Cleaning : Total: All Solvent Types
		03	2415365000	Miscellaneous Repair Services (SIC 76): Cold Cleaning : Total: All Solvent Types
Dry Cleaning: Perchloroethylene	**1643**		**Solvent Utilization : Dry Cleaning**	
			2420000000	All Processes : Total: All Solvent Types
		03	2420000055	All Processes : Perchloroethylene
		03	2420010055	Commercial/Industrial Cleaners : Perchloroethylene
		03	2420020055	Coin-operated Cleaners : Perchloroethylene
Gasoline Distribution (Stage I)	**0601**		**Storage and Transport : Petroleum and Petroleum Product Storage**	
		02	2501050120	Bulk Terminals: Breathing Loss : Gasoline
			2501055120	Bulk Plants: Breathing Loss, Gasoline
			2501060051	Gasoline Service Stations : Stage 1: Submerged Filling
			2501060052	Gasoline Service Stations : Stage 1: Splash Filling
			2501060053	Gasoline Service Stations : Stage 1: Balanced Submerged Filling
			2501060100	Gasoline Service Stations : Stage 2: Total
			2501060201	Gasoline Service Stations : Underground Tank: Breathing and Emptying
			2501080050	Airports : Aviation Gasoline : Stage 1: Total
Gasoline Distribution (Stage I)	**0601**		**Storage and Transport : Petroleum and Petroleum Product Transport**	
		03	2505030120	Truck : Gasoline
		02	2505040120	Pipeline : Gasoline

Table 2-21 (continued)

Process MACT Code Description	Process MACT Code	Process MACT Compliance Status[1]	SCC	SCC Description
Publicly Owned Treatment Works (POTW) Emissions	**0803**		**Waste Disposal, Treatment, and Recovery : Wastewater Treatment :**	
			2630000000	All Categories : Total Processed
		03	2630020000	Public Owned : Total Processed
		03	2630020001	Public Owned : Flaring of Gases
		03	2630020010	Public Owned : Wastewater Treatment Processes Total
		03	2630020020	Public Owned : Biosolids Processes Total
Hospital Sterilizers	**1644**		**Miscellaneous Area Sources**	
		03	2850000010	Health Services : Hospitals : Sterilization Operations

[1] Definitions for the codes shown in this column are as follows:
02 = Major source (>10/25 tpy), compliance date has occurred:
03 = Area source (<10/25tpy) category listed in, and subject to, Section 112 &129 standards;
06 = Rule only affects major sources; area may be flagged; and
Null = the EP

[2] If a State or local agency provided MACT code 0501 for this SCC, the MACT code was not changed; otherwise EPA assigned the default MACT code 0504 to the SCC. The point SCC 31000299 (Industrial Processes : Oil and Gas Production : Natural Gas Production : Other Not Classified) in the draft NEI was changed to the nonpoint SCC 2310020000 in the final NEI. This category was assigned the process MACT code 0504 in the draft and; therefore, this process MACT code was not changed for the final. If a county had both the point and nonpoint SCCs, the point SCC was removed to avoid double counting of emissions in the final NEI.

Table 2-22. Source Categories for Process MACT Codes that were Removed from the NEI

Source Category	Maximum Achievable Control Technology (MACT) Category
Engine Test Facilities	0101
Engine Test Facilities	0101
Rocket Engine Test Firing	0101
Stationary Reciprocal Internal Combustion Engines	0105
Steel Pickling - HCL Process	0310
Refractory Products Manufacturing	0406
Asphalt Roofing and Processing	0418
Marine Vessel Loading Operations	0603
Aerospace Industries	0701
Auto & Light Duty Truck (Surface Coating)	0702
Wood Building Products (Surface Coating)	0703
Large Appliance (Surface Coating)	0704
Metal Can (Surface Coating)	0707
Metal Coil (Surface Coating)	0708
Metal Furniture (Surface Coating)	0709
Miscellaneous Metal Parts & Products (Surface Coating)	0710
Paper & Other Webs (Surface Coating)	0711
Printing, Coating & Dyeing Of Fabrics	0713
Printing/Publishing (Surface Coating)	0714
Shipbuilding & Ship Repair (Surface Coating)	0715
Wood Furniture (Surface Coating)	0716
Municipal Landfills	0802
Site Remediation	0805
Boat Manufacturing	1305
Flexible Polyurethane Foam Production	1314
Flexible Polyurethane Foam Fabrication Operations	1341
Chlorine Production	1403
Chromic Acid Anodizing	1607
Medical Waste Incinerators	1801
Invalid	1807-1

In general, the Process MACT Compliance Status Code of 03 (area source (<10/25 tons per year) category listed in, and subject to, Section 112 &129 standards) was assigned to the majority of the MACT categories. One exception was for the Gas Transmission & Storage category that was assigned a default Process MACT Compliance Status Code of 06 (rule only affects major sources; area may be flagged). The other exception was for the gasoline marketing sector where a the Process MACT Compliance Status Code of 02 (major source (>10/25 tons per year), compliance date has occurred) was assigned to the gasoline bulk terminals and pipeline categories. MACT code 02 was assigned to these two categories because 95 percent of the emissions for the categories are in the nonpoint NEI after removing point source emissions. The Process MACT Compliance Status Code was not assigned to some of the categories because it was uncertain what code should be assigned.

The EPA added the MACT Flag field to the NEI Output Format (NOF) to track how MACT codes were assigned in the Emission Process table. The following MACT Flag codes were assigned in the order shown in the final 2002 nonpoint NEI are:

1. STATE-BASED - Identifies MACT code supplied by the State agency;
2. LOCAL-BASED - Identifies MACT code supplied by the local agency;
3. ESD-BASED - Identifies categories for which the emissions are based on EPA/ESD estimates; and
4 SCC-DEFAULT - Used when the MACT code was not supplied by the State or local agency or ESD.

The MACT flags were assigned in sequential order using the data source codes to identify S/L-supplied data and emissions data based on ESD estimates. The flags for State and local agency codes were assigned first, the ESD-BASED code was assigned next, and the SCC-DEFAULT code was assigned last. If the MACT Flag was null after assigning the STATE-BASED, LOCAL-BASED, and ESD-BASED codes, the SCCs shown in Table 2-21 were used to assign the SCC-DEFAULT code to the MACT Flag field.

For SCC 2310020000 (Industrial Processes : Oil and Gas Production: SIC 13 : Natural Gas : Total: All Processes), two MACT codes have been assigned (see Table 2-21). If a State or local agency provided MACT code 0501 (Oil & Natural Gas Production) for this SCC, the MACT code was not changed; otherwise EPA assigned the default MACT code 0504 to the SCC. The point SCC 31000299 (Industrial Processes : Oil and Gas Production : Natural Gas Production : Other Not Classified) in the draft 2002 NEI was changed to the nonpoint SCC 2310020000 in the final 2002 NEI. This category was assigned the process MACT code 0504 (Natural Gas Transmission & Storage) in the draft, and, therefore, this process MACT code was not changed for the final. If a county had both the point and nonpoint SCCs, the point SCC was removed to avoid double counting of emissions in the final NEI.

2.8.9 Point Source Adjustments for Nonpoint Categories Other Than ICI Fossil Fuel Combustion and Solvent Utilization

Table 2-7 identifies each nonpoint source category that has a point source component. In addition to performing point source adjustments to the nonpoint emissions for the animal husbandry, solvent utilization, and ICI fossil fuel combustion categories discussed in sections 2.4.1, 2.8.3, and 2.8.4 of this report, respectively, EPA also performed point source adjustments to the EPA's PM inventory for cotton ginning.

For cotton ginning, uncontrolled point source PM10-PRI/-FIL and PM25-PRI/-FIL emissions were back-calculated using the reported point source control efficiency, summed to the county level, and subtracted from the county-level nonpoint PM10-PRI/-FIL and PM25-PRI/-FIL emissions. For this category, there are no PM-CON emissions so the primary and filterable emissions are equal. If the subtraction resulted in a negative or zero number for one or more of the pollutants, the nonpoint emissions for all of the pollutants (i.e., PM10-PRI/-FIL and PM25-PRI/-FIL) were set to zero. Note that EPA performed point source adjustments to the nonpoint emissions originating from EPA's inventory. It was assumed that the agencies completed point source adjustments to the nonpoint emissions they provided EPA.

Due to time and resource constraints for completing the final 2002 nonpoint NEI, point source adjustments were not completed for the following categories: POTWs; drum and barrel cleaning; open burning of landclearing debris; and construction (residential, non-residential, and road). It should be noted that the point source adjustments are needed to EPA emissions that are used in the final nonpoint NEI due to the lack of S/L data for the categories. Many of the S/L agencies did provide emissions for these categories and it was assumed that the agencies completed point source adjustments to their nonpoint emissions.

2.8.10 Additional QA Review

The following explains additional QA and data tracking that was performed on the S/L comments on the draft NEI and the final NEI after incorporating S/L comments and completing the other revisions and augmentation procedures previously discussed in this report:

- PM Emissions Consistency and Completeness;
- Control Device Codes and Control Efficiency Values;
- Start and End Dates; and
- Annual and Daily Emissions Comparison.

PM Emissions Consistency and Completeness Review

The following consistency checks were performed at the Emission table data key level (for annual emissions) to compare PM emissions:

- If an SCC was associated with a PM emission record, but was missing one or more of the following (as appropriate for the SCC [i.e., PM-CON is associated with fuel combustion only]): PM10-FIL, PM10-PRI, PM25-FIL, PM25-PRI, or PM-CON, the record was flagged for review.

- The following equations were used to determine consistency:

  PM10-FIL + PM-CON = PM10-PRI
  PM25-FIL + PM-CON = PM25-PRI

- The following comparisons were made to determine consistency:

  PM10-PRI >= PM10-FIL
  PM25-PRI >= PM25-FIL
  PM10-PRI >= PM-CON
  PM25-PRI >= PM-CON
  PM10-FIL >= PM25-FIL
  PM10-PRI >= PM25-PRI

If the data failed one of these checks it was diagnosed as an error. If a S/L agency did not provide corrections to these errors, the errors were corrected/filled in according to the augmentation procedures explained in section 2.8.6.

Control Device Type and Control Efficiency Data Review

The “Primary Device Type Code” and “Secondary Device Type Code” fields in the control Equipment (CE) table were reviewed to identify invalid codes (i.e., codes that did not exist in the NIF 3.0 reference table) and missing codes (e.g., records with a null or uncontrolled code of 000 but with control efficiency data). QA review of control efficiency data involved diagnosis of two types of errors. First, records were reviewed to identify control efficiency values that were reported as a decimal rather than as a percent value. Records with control efficiencies with decimal values were flagged as a potential error (although not necessarily an error, since the real control efficiency may be less than 1%). The second check identified records where 100% control was reported in the Control Equipment table, but the emissions in the Emission table were greater than zero and the rule effectiveness value in the Emission table was null, zero, or 100% (implying 100% control of emissions). Because many agencies did not populate the rule effectiveness field or a default value of zero was assigned, records with null or zero rule effectiveness values were included where the Control Equipment was 100% and emissions were greater than zero. If these QA checks identified records with errors, EPA corrected the errors.

Start and End Date Checks

The values in the start date and end date fields in the Emission Period and Emission tables were reviewed to confirm consistency with the inventory year in the transmittal table, and to confirm that the end date reported was greater than the start date reported. For dates that contained a year other than 2002, the year provided by the S/L agency was recorded in the data source code and the year in the start and end date fields was changed to 2002.

Annual and Daily Emissions Comparison

The S/L inventories were reviewed to determine if any of the following conditions existed:

- Multiple records coded at the SCC level as emission type 30, but with different start and end dates. While not a true duplicate, this may indicate an error or inclusion of both annual and seasonal values.
- Multiple records coded at the SCC level as a daily emission type (27, 29, etc.) but with different start and end dates. While not a true duplicate, this may indicate an error or just inclusion of additional types of daily emissions.
- Multiple records coded at the SCC level with the same start and end date, but different emission types. While not a true duplicate, this may indicate an error or just inclusion of additional types of daily emissions.
- Any "DAILY" type record that was missing its associated "ANNUAL" record was removed from the NEI.
- Any "DAILY" type record that was greater than its associated "ANNUAL" record was removed from the NEI.

If these checks identified potential errors, EPA consulted with the S/L agency to determine if and how the errors should be corrected.

Comparisons of CAP and HAP Fields

The EPA prepared summaries using the CAP_HAP NOF field to identify SCCs for which only CAPs or only HAPs were included in the final NEI. This summary was prepared for the Emission table data key minus the pollutant code (i.e., State and county FIPS code, SCC, start date, end date, and emission type) as a crosstab summing the emissions reported in the emission ton value field by CAP and HAP. The EPA reviewed the records where the CAP emissions were more than zero and the HAP emissions were null or zero and vice versa. Categories that had only HAPs were removed from the review. These categories include, for example, ESD data carried forward from the 1999 NEI for which only HAP emissions are available, chromium electroplating (both hard and decorative), chromic acid anodizing, as well as other categories. The EPA then reviewed summary data to determine if CAPs were reported under one SCC and HAPs were reported under a different SCC for the same category and eliminated these records from further review (e.g., residential wood combustion is a good example where this situation exists in the final NEI). For the remaining records, EPA added CAPs or HAPs if missing in the NEI but available from an EPA inventory prepared for the 2002 NEI. For some of the solvent utilization categories, HAP data carried forward from the 1999 NEI or originating from the preliminary 2002 NEI did not get removed when EPA augmented the NEI to add its new VOC and HAP inventory because the old data were reported under SCCs not used in EPA's new inventory. Therefore, the old HAP data for the solvent utilization categories were removed.

Comparison of VOC Emissions to Sum of Emissions for HAPs Classified as Ozone Precursors

The EPA prepared a crosstab summary to compare VOC emissions and the sum of the emissions for HAPs classified as ozone precursors. This summary was prepared for the Emission table data key minus the pollutant code (i.e., State and county FIPS code, SCC, start date, end date, and emission type. Records where the VOC emissions were significantly less than the sum of the HAP emissions were reviewed further to determine if any records should be removed or if HAPs should be revised so that the sum of their emissions are less than or equal to the VOC emissions. Note that due to time and resource constraints, EPA did not correct every case where the sum of the HAPs exceeded the VOC emissions. The EPA focused on correcting only those cases were the sum of the HAP emissions were significantly higher than the VOC emissions.

3.0 INTERPRETATION AND USE OF THE 2002 NONPOINT SOURCE INVENTORY

3.1 What Are the Limitations to the Source Categories Included Here?

3.1.1 General

Nonpoint source inventories contain emission estimates for the smaller and more diffuse sources within a geographic area of study. Any nonpoint source inventory can have limitations, usually due to a lack of emission activity data and emission factors for some CAPs and HAPs and source categories. Planning for this inventory began with compiling a list of potential nonpoint source categories. The primary resource for this list was Version 3 of the 1999 nonpoint source NEI. As the information-gathering phase progressed, it was determined that emissions could not be estimated for some of the categories because of budget limitations.

3.1.2 Non-2002 Data

For source categories where 2002 base year emissions could not be estimated, data for other base years were used if S/L data were not submitted to EPA. In many cases, the 1999 NEI data were carried forward in the 2002 NEI (see Tables 2-8 and 2-9). For some of these carry-forward source categories, ESD provided emissions data for a year other than 1999 and noted that the data are the best available to represent 1999. For MACT source categories, the 1996 nonpoint source NEI was also used to fill these gaps (EPA, 2001). For other source categories, activity data or emission estimates from a different year were used that should approximate 1999. For these non-MACT source categories, a variety of resources was used to best estimate emissions. Table 3-1 provides a list of the 2002 NEI carry-forward source categories with data from a base year other than 1999.

Table 3-1. 2002 NEI Nonpoint Carry Forward Source Categories That Do Not Have a 1999 Base Year

Source Category Group	Year
Asphalt Concrete Manufacturing[1]	1996
Asphalt Roofing and Processing	1996
Flexible Polyurethane Foam Fabrication Operations	1993
Flexible Polyurethane Foam Production	1993
Industrial Boilers: Waste Oil[1]	1996
Institutional/Commercial Heating: POTW Digester Gas	1996
Natural Gas Transmission and Storage	1998
Oil and Natural Gas Production	1993
Paint Stripping Operations	1998
Refractory Products Manufacturing	1996
Steel Pickling HCl Process	1991

[1] Non-MACT Source Category Groups.

3.1.3 Categories Not Included

During preparation of the preliminary NEI, EPA did not run an evaluation to determine if there were any categories with CAPs in the 1999 NEI that were not carried forward and included in the preliminary 2002 NEI. Subsequently, residential kerosene and LPG combustion were identified as categories in the 1999 CAP NEI that were not included in the preliminary NEI. For the draft 2002 NEI, EPA prepared 2002 inventories for these categories. Time and resource constraints have limited further evaluations to determine if there were any additional categories in the 1999 NEI that are not included in the preliminary or draft 2002 NEI.

As discussed in Section 2.4.8, EPA prepared an inventory for wildfires, prescribed burning for forest management, and prescribed burning of rangeland in point source format. Therefore, the nonpoint inventories for these categories that EPA included in the preliminary and draft 2002 NEI were removed from the final nonpoint NEI.

3.1.4 Coverage gaps

For some source categories, there may be gaps in the coverage of pollutants, or the available activity data may only partially represent the category.

A notable example is the source category for open burning of scrap tires. The activity estimate for this category was very difficult to obtain and most likely underestimates activity for a given State or county. For this inventory, a literature search via the internet and Lexis-Nexis® provided major incidences of open burning of scrap tires, which were used to estimate activity data for specific counties.

3.1.5 Category Double Counting

Section 2.8.9 of this report identifies the categories for which EPA prepared a 2002 inventory and completed point source adjustments to the nonpoint emissions using the emissions in the final point source NEI. This section also identifies the categories for which EPA prepared a 2002 inventory and did not complete point source adjustments due to time and resource constraints for completing the final 2002 nonpoint NEI.

For the carry-forward categories, double counting of emissions may occur when, for example, a S/L agency's inventory is included in the 1999 point NEI, but the S/L agency did not provide an inventory for the 1999 nonpoint NEI. In this example, the 1999 nonpoint NEI would have been grown from a prior year inventory (e.g., 1996) which may account for emissions that the agency included in its 1999 point source inventory.

Table 2-7 presents the list of source categories for which EPA prepared 2002 emission estimates. To identify source categories for which 2002 estimates were not developed, but estimates were included in the 1999 NEI, EPA compared the list of 1999 NEI HAP source categories with the categories in Table 2-7. Emissions for the 1999 NEI HAP source categories that are listed in Table 2-7 were not carried forward to the 2002 NEI. In several cases, the 1999

HAP NEI reported emissions for the categories in Table 2-7, but these emissions were reported in similar but different SCCs. To eliminate the possibility of double-counting in the 2002 NEI for these categories, EPA did not carry forward their 1999 NEI emissions. For example, the 1999 NEI includes emission estimates for the Residential Natural Gas combustion source category in both SCC 2014006000 (Residential Natural Gas, Total: All Combustor Types) and in SCC 2104006010 (Residential Furnaces). The SCC 2014006010 emissions were not carried forward to the 2002 NEI because EPA estimated and reported 2002 emissions for the Residential Natural Gas combustion source category under SCC 2014006000.

3.2 What Are the Limitations of the Emissions Data?

3.2.1 Methods

Nonpoint source methods and emission factors necessarily simplify processes and emissions. When national-level emissions are calculated, the methods and factors cannot take into account local variations or use locally available activity data. Emissions estimated using national-level methods calculate average emissions, not true local emissions. Emission factors may not reflect materials used or controls in place within a particular locality.

3.2.2 Facility Double Counting

Double counting can also occur when facility-specific data (from the 2002 point source NEI) overlaps with nonpoint source categories that have emissions estimated using top-down methods. A potential example of this type of double-counting is the POTW nonpoint source category (SCC 2630020000) overlapping with POTW-related point SCCs (50100701 through 50100781 and 50100791 through 50182599).

3.2.3 Spatial Allocation

National- and State-level emissions in the nonpoint source NEI were allocated to the county level using allocation factors. An allocation factor was identified for each source category, with typical allocation factors being county-level population or employment within a certain industry. Category emissions attributed to a specific county were assigned only where the county information was available. Detailed discussions of the spatial allocation procedures are in Appendix A. Appendix B provides spatial allocation data used for many nonpoint source categories.

3.2.4 Emission Reductions Due to State/Local Regulations

A national-level inventory consists of emissions typically calculated for the entire United States, using national activity factors, national average emission factors, and considering only national regulations. It generally does not take into account emission reductions due to State and Local regulations. The methods in Appendix A indicate if State or Local regulations were incorporated into the estimate of 2002 emissions for a source category.

3.3 How Does This Inventory Comply with the Information Quality Guidelines?

3.3.1 Purpose

The NEI is a comprehensive inventory covering all CAPs and HAPs for all areas of the United States. The 2002 base year NEI will be used to support emission trends analyses, air quality modeling, and other activities. To this end, the EPA established a goal to compile a comprehensive, 2002 base year nonpoint source inventory, in addition to facility-specific point source data, and mobile source data.

3.3.2 Product Content - Inputs, Methodologies, and Outputs

The scope of the inventory effort was to compile 2002 base year CAP and HAP emissions data for nonpoint sources in the United States and its territories. If 2002 activity data were not available for a source category, emissions from final Version 3 of the 1999 NEI were incorporated into the 2002 inventory. The 2002 NEI is compiled in the NIF 3.0 database structure.

For the categories for which 2002 emissions were calculated, the county-level activity and emissions data were compiled into a common flat file format using NIF 3.0 fields. The data were then converted to NIF 3.0. The categories for which emissions were carried forward from final Version 3 of the 1999 CAP NEI were in NIF 2.0 in an Oracle database. The 1999 CAP NEI was converted to NIF 3.0 in an Access database. The categories for which emissions were carried forward from final Version 3 of the 1999 HAP NEI were in NIF 3.0. The 1999 CAP and HAP inventory data and the 2002 inventory data were combined into a single NIF 3.0 data set. The EPA's QA software was run on the NIF 3.0 data files to identify data format and data quality issues. The issues were then resolved. The data and summary files and documentation for the final 2002 nonpoint source inventory are available on the CHIEF website http://www.epa.gov/ttn/chief/eiinformation.html.

3.3.3 Product Limitations and Caveats

The March 2005 version of the draft 2002 nonpoint source NEI is a composite of emission estimates developed by EPA. Because the estimates originated from a variety of sources and estimation methods, as well as differing purposes, they will in turn vary in quality, including pollutant coverage, level of detail, and geographic coverage. However, this compilation of emissions estimates represents the best available information to date.

For some source categories, emissions estimates were not available for 2002. In these cases, data were carried froward from the 1999 NEI. Within the 1999 NEI, data for other base years were used as well. When data are reported for a year other than 2002, it is noted in the data source code field of the Emission table of the NEI.

Users of the data should consider that pollutants emitted from a particular source may have little impact on the immediate geographic area, and the amount of pollutants emitted does not indicate whether the source is complying with applicable regulations.

3.3.4 Contact Information

NEI nonpoint sector questions should be forwarded to:

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919-541-1060

U.S. Environmental Protection Agency
Emissions Inventory and Analysis Group (C339-02)
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Appendix A

Criteria and HAP Emissions Estimation Methodology

AGRICULTURAL TILLING A-4
AVIATION GASOLINE DISTRIBUTION: STAGE I A-8
AVIATION GASOLINE DISTRIBUTION: STAGE II A-13
COMMERCIAL COOKING A-16
CONSTRUCTION - NON-RESIDENTIAL A-23
CONSTRUCTION - RESIDENTIAL A-25
CONSTRUCTION - ROAD A-29
COTTON GINNING A-32
DRUM AND BARREL RECLAMATION A-35
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL A-38
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: DISTILLATE OIL A-44
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: KEROSENE A-47
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: LIQUEFIED PETROLEUM GAS . . A-50
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: NATURAL GAS A-53
FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: RESIDUAL OIL A-56
FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL A-59
FOSSIL FUEL COMBUSTION - INDUSTRIAL: DISTILLATE OIL A-66
FOSSIL FUEL COMBUSTION - INDUSTRIAL: KEROSENE A-69
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SOLVENT UTILIZATION - PROCESS SOLVENTS . . . . A-
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AGRICULTURAL TILLING
SCC: 2801000003

2002 Methodology

Primary PM_{10} emissions estimates for agricultural tilling for calendar year 2002 are grown from 1998 PM_{10} emissions. Emissions for this source category are all filterable; there are no condensible emissions. The 1998 PM_{10} particulate matter emissions are calculated using a database containing county-level data on the number acres planted by type of tilling and crop type that was purchased by EPA from the Conservation Technology Information Center at Purdue University.[1] PM_{10} emissions from agricultural tilling are a function of the acres planted, the PM emission factors, the silt content of the surface soil, and the number of passes or tillings in a year.[2]

Emission estimates for 2002 are grown from national-level data on the number of acres tilled by tilling type. Puerto Rico and the U.S. Virgin Islands are assumed not to have emissions from agriculture tilling. The *2002 National Crop Residue Management Survey*[2] presents the total number of acres planted in the United States for 1998 and 2002 by type of tilling. The five types of tilling used in growing emissions are: No Tilling, Mulch Tilling, Ridge Tilling, Reduced-Tilling (15 to 30 percent residue tilling), and Intensive Tilling (zero to 15 percent residue tilling). The growth factor for 2002 emissions is determined by dividing the number of acres tilled by tillage type in 2002 by the number of acres tilled in 1998. Table 1 presents the acres tilled by type for 1998 and 2002 and the calculated growth factor.

Table 1. Acres Planted and Growth Factor for 2002

Tillage System	Actual National Number of Acres Planted (Million Acres) 1998	2002	2002 Growth Factor
No-Till/Strip Till	47.8	55.3	1.1569
Ridge-Till	3.5	2.8	0.8000
Mulch-Till	57.9	45	0.7772
Conservation	109.2	103.1	N/A[a]
Reduced-Till (15-30% cover)	78.1	64.1	0.8207
Intensive-Till (<15% cover)	106.1	114.1	1.0754
Total	293.4[b]	281.4[b]	

[a] Conservation is not utilized to calculate emissions.
[b] Totals do not include acreage for conservation tillage system.

For each type of tillage and crop type, the county-level 1998 PM_{10} emissions were multiplied by the 2002 growth factors from Table 1 to obtain PM_{10} emissions by tillage type for 2002. These emissions were summed to get total county-level PM_{10} emissions. Once PM_{10} estimates were developed, $PM_{2.5}$ emissions were estimated by applying a particle size multiplier of 0.20 to PM_{10} emissions.[3] Table 2 presents a summary of the 2002 national emissions for agricultural tilling.

AGRICULTURAL TILLING (continued)
SCC: 2801000003

Table 2. National Criteria Pollutant Emissions Summary

Pollutant Description and NIF 3.0 Pollutant Code	1998 National Emissions (tons)	2002 Growth Factor	2002 National Activity for Tilling (acres tilled)	2002 National Emissions (tons)
PM10-PRI[a]	4,366,404	See Table 1	281.4	4,202,411
PM25-PRI	873,281	Not Applicable	281.4	840,482

[a] Emissions are all filterable; there are no condensible emission.

1998 Methodology

The basis of agricultural tilling emission estimates was the number of acres of crops tilled in each county by crop type and tillage type. This data was obtained from the *National Crop Residue Management Survey*, developed by the Conservation Technology Information Center (CTIC).[4] The survey is released in November of even numbered years. Data summarizations are available on the CTIC web site at: http://www.ctic.purdue.edu/CTIC/CTIC.html

The five types of tilling for which emissions estimates are calculated are as follows:

Conservation Till	Conventional Till
No till/strip till	0 to 15 percent residue till (Intensive Till)
Mulch till	15 to 30 percent residue till (Reduced till)
Ridge till	

Note that for the 1998 activity data for Highly Erodable Land (HEL) is a total of the amount of land in a county that is HEL or Treated HEL for all crop types. That is, this data overlaps the other crop-type-specific data. The HEL and Treated HEL data is not included for the calculation of emissions estimates.

Emission Factors

The emission factors for agricultural tilling (in lbs per acre) are calculated using the following equation:[5,6]

$$EF = 4.8 \cdot k \cdot s^{0.6} \cdot p$$

where:

k = dimensionless particle size multiplier (PM_{10} = 0.21; $PM_{2.5}$ = 0.042),
s = silt content of surface soil (%),
p = number of passes or tillings in a year.

The silt content of surface soil is defined as the percentage of particles (mass basis) of diameter smaller than 25 micrometers (μm) found in the soil to a depth of 10 centimeters (cm). Silt contents were assigned by comparing the U.S. Department of Agriculture (USDA) surface soil survey map to a USDA county map and assigning a soil type to each county. Table 3 shows silt content assumed for each soil type.

Table 3. Silt content for soil types in USDA surface soil map.

Soil Type	Silt Content (%)
Silt Loam	52
Sandy Loam	33
Sand	12
Loamy Sand	12
Clay	29
Clay Loam	29
Organic Material	10-82
Loam	40

Table 4 shows the number of passes or tillings in a year for each crop for conservation use and conventional use.[7] No till, mulch till, and ridge till tillage systems are classified as conservation use, while 0 to 15 percent residue and 15 to 30 percent residue tillage systems are classified as conventional use.

Table 4. Number of Passes or Tillings Per Year.

Crop	Conservation Use	Conventional Use
Corn	2	6
Spring Wheat	1	4
Rice	5	5
Fall-Seeded Small Grain	3	5
Soybeans	1	6
Cotton	5	8
Sorghum	1	6
Forage	3	3
Permanent Pasture	1	1
Other Crops	3	3
Fallow	1	1

1998 Emissions

The following equation[5,6] was used to determine the emissions from agricultural tilling for 1998. The county-level activity data is the acres of land tilled. The equation is adjusted to estimate PM10-FIL and PM25-FIL using the following parameters: the silt content of the surface soil, a particle size multiplier, and the number of tillings per year.

$$E = c \times k \times s^{0.6} \times p \times a$$

AGRICULTURAL TILLING (continued)
SCC: 2801000003

where:	E	=	PM10-FIL or PM25-FIL emissions
	c	=	constant 4.8 lbs/acre-pass
	k	=	dimensionless particle size multiplier (PM_{10}=0.21; $PM_{2.5}$=0.042)
	s	=	percent silt content of surface soil, defined as the mass fraction of particles smaller than 75 µm diameter found in soil to a depth of 10 cm
	p	=	number of passes or tillings in a year
	a	=	acres of land tilled (activity data)

The EPA's Temporal Allocation Factor File (TAFF) was used to calculate seasonal activity. Daily emissions for agricultural tilling are calculated for the summer season (i.e., June through August), a time span of 92 days. For SCC 2801000003, the TAFF assumes that 25% of the emissions occur during the summer season. Thus, the county-level annual emissions were multiplied by the ratio of 0.25/92 to calculate daily emissions.

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2. *National Crop Residue Management Survey*, Conservation Technology Information Center, 2002 http://www.ctic.purdue.edu/CTIC/CTIC.html

3. Agricultural Activities Influencing Fine Particulate Matter Emissions, Woodard, Kenneth R., Midwest Research Institute, March 1996.

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6. Memorandum from Chatten Cowherd of Midwest Research Institute, to Bill Kuykendal of the U.S. Environmental Protection Agency, Emission Factors and Inventory Group, and W.R. Barnard of E.H. Pechan & Associates, Inc., September 1996.

7. *Agricultural Activities Influencing Fine Particulate Matter Emissions*, Woodard, Kenneth R., Midwest Research Institute, March 1996.

AVIATION GASOLINE DISTRIBUTION: STAGE I
SCC: 2501080050

Aviation gasoline (also called "AvGas") is the only aviation fuel that contains tetraethyl lead (TEL) as a knock-out component for small reciprocating, piston-engine crafts in civil aviation.[1] Commercial and military aviation rarely use this fuel. AvGas is shipped to airports and is filled into bulk terminals, and then into tanker trucks. These processes fall under the definition of stage I, displacement vapors during the transfer of gasoline from tank trucks to storage tanks, and vice versa. These processes are subject to EPA's maximum available control technology (MACT) standards for gasoline distribution.[2]

The amount of AvGas consumed was obtained from the Petroleum Supply Annual[3] for designated Petroleum Administration Districts, or PADs. A nationwide total of 6,682,000 barrels of AvGas were consumed in 2002[3] (Table 1). This information was used to calculate national-level emissions estimates for one criteria pollutant and ten hazardous air pollutants (HAPs). Assumptions for bulk plant processes are summarized in Table 2. Emission factors were provided by ESD and EIAG publications[1,4,5,6] (Tables 3 and 4). The national-level emissions estimates were first allocated based on consumption reported for each PAD, and then allocated to the counties within the PADs based on 2002 Landing-Take Off (LTO) data for General aviation flights.[7] Appendix B contains this data in database format. General aviation flights were used in this allocation because they are the primary consumers of AvGas.

There are five PADs across the United States[8]:
PAD 1 comprises seventeen States plus the District of Columbia along the Atlantic Coast;
PAD 2 comprises fifteen States in the Midwest;
PAD 3 comprises six States in South Central U.S.;
PAD 4 comprises five States in the Rocky Mountains; and
PAD 5 comprises seven States along the West Coast.

Table 1 - Summary of AvGas Consumed and LTOs by PAD in 2002

PAD	AvGas Consumed (barrels)	LTOs
1	1,019,000	204,000
2	2,391,000	186,368
3	1,757,000	138,401
4	399,000	20,625
5	1,116,000	184,271
	6,682,000	733,665

<u>National-Level Calculations</u>

Amount of AvGas consumed in 2002 (barrels) = 6,682,000

Conversion: *1 barrel = 42 gallons*
1 gallon = 3.78 liters
1 kg = 2.205 lb
1 kg = 1,000,000 mg
1 ton = 2000 lb

AVIATION GASOLINE DISTRIBUTION: STAGE I (continued)
SCC: 2501080050

Step 1 - Convert AvGas consumption into gallons and liters using conversion factors.

Amount of AvGas consumed in 2002 (gallons) = 6,682,000 barrels * 42 gallons/barrel
Amount of AvGas consumed in 2002 (gallons) = 280,644,000

Amount of AvGas consumed in 2002 (liters) = 280,644,000 gallons * 3.78 liters/gal
Amount of AvGas consumed in 2002 (liters) = 1,060,834,320

Step 2 - Use the liters of AvGas consumed and apply the non-fugitive VOC emission factors in Table 3 to calculate non-fugitive VOC estimates. VOC emission factors for the four non-fugitive processes are listed in Table 3.

Unloading/Tank Filling: tank fill VOC emissions = 1081 mg/L * 1,060,834,320 L * 1.1025E-9 ton/mg
Unloading/Tank Filling: tank fill VOC emissions = **1,264.30** tpy

Unloading/Tank Filling: Storage tank VOC emissions = (432 mg/L) * 1,060,834,320 L * 1.1025E-9 ton/mg
Unloading/Tank Filling: Storage tank VOC emissions = **505.25** tpy

Tank Truck Filling - Composite VOC Emissions = (1235 mg/L) * 1,060,834,320 L * 1.1025E-9 ton/mg
Tank Truck Filling - Composite VOC Emissions = **1,444.42** tpy

Storage Tank - Breathing losses VOC Emissions = (203 mg/L) * 1,060,834,320 L * 1.1025E-9 ton/mg
Storage Tank - Breathing losses VOC Emissions = **237.42** tpy

Total non-fugitive VOC emissions = 1,264.30 tpy + 505.25 tpy + 1,444.42 tpy + 237.42 tpy = 3,451.39 tpy

Step 3 - Use the assumptions in Table 2 and the fugitive VOC emission factors in Table 3 to generate fugitive VOC emissions.

AvGas - Fugitive from valves VOC Emissions = (# Bulk Plant Equivalents)*(#valves/plant)*EF*days
AvGas - Fugitive from valves VOC Emissions = (2442 plants) * (50 valves/plant) * (0.26 kg/valve/day)* 300 days * 1.1025E-3 ton/kg
AvGas - Fugitive from valves VOC Emissions = **10,499.99** tpy

AvGas - Fugitive from pumps VOC Emissions = (# Bulk Plant Equivalents)*(#pumps/plant)* (#seals/pump) * EF * days
AvGas - Fugitive from pumps VOC Emissions = (2442 plants) * (2 pumps/plant) * (4 seals/pump) * (2.7 kg/seal/day)* 300 days * 1.1025E-3 ton/kg
AvGas - Fugitive from pumps VOC Emissions = **17,446.14** tpy

Total fugitive VOC emissions = 10,499.99 tpy + 17,446.14 tpy
Total fugitive VOC emissions = 27,946.04 tpy

Step 4 - Sum the fugitive and non-fugitive VOC emissions together for total VOC emissions.

Total VOC emissions = 3,451.39 tpy + 27,946.04 tpy = 31,397.43 tpy

Step 5 - Apply the speciation emission factors in Table 4 for tetraethyl lead, 2,2,4-trimethylpentane, benzene, cumene, ethylbenzene, hexane, naphthalene, toluene, and xylene to calculate HAP emissions.

Tetraethyl Lead emissions = 31,397.43 tpy VOC * 0.000978 % = 0.31 tpy
2,2,4-Trimethylpentane emissions = 31,397.43 tpy VOC * 0.8 % = 251.18 tpy
Benzene emissions = 31,397.43 tpy VOC * 0.9 % = 282.58 tpy

AVIATION GASOLINE DISTRIBUTION: STAGE I (continued)
SCC: 2501080050

Cumene emissions = 31,397.43 tpy VOC * 0.01 % = 3.14 tpy
Ethylbenzene emissions = 31,397.43 tpy VOC * 0.10 % = 31.40 tpy
Hexane emissions = 31,397.43 tpy VOC * 1.60 % = 502.36 tpy
Naphthalene emissions = 31,397.43 tpy VOC * 0.05 % = 15.70 tpy
Toluene emissions = 31,397.43 tpy VOC * 1.30 % = 408.17 tpy
Xylene emissions = 31,397.43 tpy VOC * 0.5 % = 156.99 tpy

Step 6 - Use the ethylene dichloride emission factor in Table 4 to calculate ethylene dichloride emissions.

Ethylene dichloride emissions = 280,644,000 gal * 2.167E-6 LB/gal * ton/2000 LB = 0.30 tpy

Data Tables

Table 2 - Assumptions Used For Bulk Terminals Using AvGas

Parameter	**Data**	**Reference**
Number of Bulk Plant Equivalents (U.S.)	2,442 plants	1
Number of valves per bulk plant	50 valves/plant	
Number of pumps per bulk plant	2 pumps/plant	
Number of seals per bulk plant	4 seals/pump	
Number of days per year used	300 days	

Table 3 - VOC Emission Factors and National-Level Emissions

Pollutant Description and NIF 3.0 Pollutant Code	**Emission Source**	**Emission Factor**	**Emission Factor Units**	**Emissions (tpy)**	**Factor Reference**
VOC	Aviation Gas Unloading/ Tank Filling - tank fill	1081	mg/L AvGas	**31,397.43**	1
	Aviation Gas Unloading/ Tank Filling - Storage tank working	432			
	Aviation Gas Tank Truck Filling - Composite	1235			
	Aviation Gas Storage Tank - Breathing losses	203			
	Aviation Gas - Fugitive from valves	0.26	kg/valve/day		
	Aviation Gas - Fugitive from pumps	2.7	kg/seal/day		

AVIATION GASOLINE DISTRIBUTION: STAGE I (continued)
SCC: 2501080050

Table 4 - HAP Emission Factors and National-Level Emissions

Pollutant Description	NIF 3.0 Pollutant Code	Emission Source	Emission Factor	Emission Factor Units	Emissions (tpy)	Factor Reference
Ethylene Dichloride	107062	All processes	2.167 E-6	lb/gal AvGas	0.30	4
Tetraethyl Lead (TEL)	78002	All processes	9.78 E-6	kg/kg VOC	0.31	1
2,2,4-Trimethylpentane	540841	All processes	0.80	lb/100 lb VOC	251.18	5
Benzene	71432	All processes	0.90		282.58	
Cumene	98828	All processes	0.01		3.14	6
Ethylbenzene	100414	All processes	0.10		31.40	5
Hexane	110543	All processes	1.60		502.36	
Naphthalene	110543	All processes	0.05		15.70	
Toluene	108883	All processes	1.30		408.17	
Xylene (Mixture of o, m, and p isomers)	1330207	All processes	0.50		156.99	

<u>Example Calculations for Wake County, NC</u>

Wake County VOC emissions = (National VOC emissions) * (PAD 1 consumption/Total consumption) * (Wake County LTOs/PAD 1 LTOs)

Wake County VOC emissions = (31,397.43 tpy) * (1,019,000 bbl/6,682,000 bbl) * (4,387 LTOs/204,000 LTOs)

Wake County VOC emissions = **102.97** tpy

Wake County Benzene Emissions = (Wake County VOC emissions)*(Benzene Emission Factor)

Wake County Benzene Emissions = (102.97 tpy VOC) * (0.90 lb benzene/100 lb VOC)* (2000 lb VOC/2000 lb benzene)

Wake County Benzene Emissions = **0.93** tpy

AVIATION GASOLINE DISTRIBUTION: STAGE I (continued)
SCC: 2501080050

References

1. TRC Environmental Corporation. *Estimation of Alkylated Lead Emissions, Final Report*. Prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC 1993.

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AVIATION GASOLINE DISTRIBUTION: STAGE II
SCC: 2501080100

AvGas is the only aviation fuel that contains TEL as a knock-out component for small reciprocating, piston-engine crafts in civil aviation.[1] Commercial and military aviation rarely use this fuel. AvGas is shipped to airports and is filled into bulk terminals, and then into tanker trucks. These transfer processes fall under the definition of stage I, and are subject to MACT standards for gasoline distribution.[2] Stage II, discussed here, involves the transfer of fuel from the tanker trucks into general aviation aircraft.

The amount of AvGas consumed was retrieved from the Petroleum Supply Annual for designated PADs. A nationwide total of 6,682,000 barrels of AvGas were consumed in 2002[3] (Table 1). This information was used to calculate national-level emissions estimates for one criteria pollutant and ten HAPs. Emission factors were obtained from ESD and the EIAG publications[1,4,5,6] (Table 2). The national-level emissions estimates were first allocated based on consumption reported for each PAD, and then allocated to the counties within the PADs based on 2002 LTO data for General aviation flights.[7] Appendix B contains this data in database format. General aviation flights were used in this allocation because they are the primary consumers of AvGas.

There are five PADs across the United States[8]:
PAD 1 comprises seventeen States plus the District of Columbia along the Atlantic Coast;
PAD 2 comprises fifteen States in the Midwest;
PAD 3 comprises six States in South Central U.S.;
PAD 4 comprises five States in the Rocky Mountains; and
PAD 5 comprises seven States along the West Coast.

Table 1 - Summary of AvGas Consumed and LTOs by PAD in 2002

PAD	AvGas Consumed (barrels)	LTOs
1	1,019,000	204,000
2	2,391,000	186,368
3	1,757,000	138,401
4	399,000	20,625
5	1,116,000	184,271
	6,682,000	733,665

National-Level Calculations

Amount of AvGas consumed in 2002 (barrels) = 6,682,000

Conversion: *1 barrel = 42 gallons*
1 gallon = 3.78 liters
1 kg = 2.205 lb
1 kg = 1,000,000 mg
1 ton = 2000 lb

AVIATION GASOLINE DISTRIBUTION: STAGE II (continued)
SCC: 2501080100

Step 1 - Convert AVGas consumption into gallons and liters using conversion factors.

Amount of AvGas consumed in 2002 (gallons) = 6,682,000 barrels * 42 gallons/barrel
Amount of AvGas consumed in 2002 (gallons) = 280,644,000

Amount of AvGas consumed in 2002 (liters) = 280,644,000 gallons * 3.78 liters/gal
Amount of AvGas consumed in 2002 (liters) = 1,060,834,320

Step 2 - Use the gallons of AvGas consumed and apply the refueling VOC emission factors to first calculate refueling VOC estimates.

AvGas Refueling VOC emissions = (1.36 E-2 LB/gal AvGas) * 280,644,000 gallons * 1 ton/2000 LB
AvGas Refueling VOC emissions = **1,908.38** tpy

Step 3 - Apply the HAP speciation emission factors in Table 2 for 2,2,4-trimethylpentane, benzene, cumene, ethylbenzene, hexane, naphthalene, toluene, and xylene to calculate HAP emissions. The VOC estimate is then speciated to yield the HAP estimate.

2,2,4-Trimethylpentane emissions = 1,908.38 tpy VOC * 0.8 % = 15.27 tpy
Benzene emissions = 1,908.38 tpy VOC * 0.9 % = 17.18 tpy
Cumene emissions = 1,908.38 tpy VOC * 0.01 % = 0.19 tpy
Ethylbenzene emissions = 1,908.38 tpy VOC * 0.10 % = 1.91 tpy
Hexane emissions = 1,908.38 tpy VOC * 1.60 % = 30.53 tpy
Naphthalene emissions = 1,908.38 tpy VOC * 0.05 % = 0.95 tpy
Toluene emissions = 1,908.38 tpy VOC * 1.30 % = 24.81 tpy
Xylene emissions = 1,908.38 tpy VOC * 0.5 % = 9.54 tpy

Step 4 - Use the ethylene dichloride and tetraethyl lead emission factors in Table 2 to calculate ethylene dichloride and tetraethyl lead emissions.

Ethylene dichloride emissions = 280,644,000 gal * 1.883 E-6 LB/gal * ton/2000 LB = 0.26 tpy
Tetraethyl Lead emissions = 1,060,834,320 L * 1.59 E-2 mg/L * 1.1025E-9 ton/mg = 0.019 tpy

Table 2 - Emission Factors and National-Level Emissions

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emissions (tpy)	Factor Reference
VOC	VOC	1.36 E-2	lb/gal AvGas	1,908.38	1
2,2,4-Trimethylpentane	540841	0.80	lb/100 lb VOC	15.27	5
Benzene	71432	0.90		17.18	
Cumene	98828	0.01		0.19	6
Ethylbenzene	100414	0.10		1.91	5
Hexane	110543	1.60		30.53	
Naphthalene	91203	0.05		0.95	
Toluene	108883	1.30		24.81	
Xylene	1330207	0.50		9.54	
Ethylene Dichloride	107062	1.883 E-6	lb/gal AvGas	0.26	4
Tetraethyl Lead (TEL)	78002	1.59 E-2	mg/L AvGas	0.019	1

AVIATION GASOLINE DISTRIBUTION: STAGE II (continued)
SCC: 2501080100

Example Calculations for Wake County, NC

Wake County VOC emissions = (National VOC emissions) * (PAD 1 consumption/Total consumption) * (Wake County LTOs/PAD 1 LTOs)

Wake County VOC emissions = (1,908.38 tpy) * (1,019,000 bbl/6,682,000 bbl) * (4,387 LTOs/204,000 LTOs)

Wake County VOC emissions = **6.26** tpy

Wake County Benzene Emissions = (Wake County VOC emissions)*(Benzene Emission Factor)

Wake County Benzene Emissions = (6.26 tpy VOC) * (0.90 lb benzene/100 lb VOC)* (2000 lb VOC/2000 lb benzene)

Wake County Benzene Emissions = **0.056** tpy

References

1. TRC Environmental Corporation. *Estimation of Alkylated Lead Emissions, Final Report*. Prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC 1993.

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COMMERCIAL COOKING
SCCs: 2302002100, 2302002200, 2302003000, 2302003100, & 2302003200

Commercial cooking emissions were estimated for five source categories, which are based on equipment type. The equipment types include: chain-driven (conveyorized) charbroilers (SCC 2302002100), under-fired charbroilers (2302002200), deep-fat fryers (2302003000), flat griddles (2302003100), and clamshell griddles (2302003200). Source categories comprise emissions from all meat types for a particular piece of equipment. The following types of meat are included: hamburger, steak, fish, pork, and chicken. Emissions for deep-fat frying of french fries were also estimated.

With the exception of deep-fat frying of french fries, commercial cooking activity was developed from survey data obtained from a Public Research Institute (PRI) report on charbroiling activity estimation in the State of California.[1] Table 1 presents the average pounds of meat cooked on each type of equipment per week. Tables 2 and 3 provide data from the PRI survey that were also used to construct the activity data. Table 2 presents the percent of restaurants by restaurant type with each cooking equipment type. Table 3 presents the average number of equipment pieces by restaurant type. Weekly commercial cooking activity data for meat were estimated by first multiplying the county number of restaurants in Dun & Bradstreet (D&B) industry classifications that use commercial cooking equipment by the percentage of restaurants with each type of cooking equipment (Table 2).[2] The resulting product is then multiplied by the number average number of equipment pieces by restaurant type (Table 3), and then by the average weekly pounds of meat cooked by equipment type (Table 1). Table 4 presents the D&B restaurant classifications used in this procedure. Commercial cooking activity data for each combination of equipment type and meat type were developed for each of the five restaurant types, and then summed to get county-level pounds of meat cooked on each type of equipment for all restaurants.

The mass of frozen potatoes sold in 2001 (6,736,530 lbs) was obtained from the U.S. Department of Agriculture (USDA).[3] French fries sold by fast food restaurants account for 91 percent (6,130,242 lbs) of frozen potatoes sold; 9,338 lbs of french fries were sold by other restaurant types.[4] County-level activity data for deep fat frying of french fries at fast food restaurants were developed by applying county-to-national proportions to the national amount of french fries sold by these restaurants. These proportions were compiled using the number of fast food restaurants reported by D&B. County-level activity data for deep fat frying of french fries at all other restaurants were estimated by applying similar county-to-national proportions to the 9,338 lbs of french fries sold nationally by these restaurants. The D&B count of the number of these other restaurants was used to calculate these proportions.

The activity data were converted to tons of meat and french fries cooked on each type of equipment by dividing by 2000. The NIF allows only one entry for activity data for each SCC and county combination. Due to this limitation, county-level composite activity data were calculated by first summing the activity to get county-level tons of all food cooked on each type of equipment per week. Tons of food cooked per week were then converted to annual tons by multiplying by 52 weeks/year.

Table 1. Average Weekly Pounds of Meat Cooked by Equipment Type

Type of Meat	Chain-Driven Charbroilers	Underfired Charbroilers	Deep-Fat Fryers	Flat Griddles	Clamshell Griddles
Steak	236	180	181	166	94
Hamburger	798	270	274	362	1314
Poultry, With Skin	147	144	365	88	113
Poultry, Skinless	266	179	208	111	108
Pork	57.6	148	58.6	112	118
Seafood	119	143	159	92.1	632
Other	-	41.5	274	57.5	-

Table 2. Percent of Restaurants with Each Type of Cooking Equipment

Restaurant Category	Chain-Driven Charbroilers	Underfired Charbroilers	Deep-Fat Fryers	Flat Griddles	Clamshell Griddles
Ethnic	3.5	47.5	81.9	62.7	4
Family	10.1	60.9	91.4	82.9	1.4
Fast Food	18.6	30.8	96.8	51.9	14.7
Seafood	0	52.6	100	36.8	10.5
Steak & Barbeque	6.9	55.2	82.8	89.7	0

Table 3. Average Number of Equipment Pieces by Restaurant Type[1]

Restaurant Category	Chain-Driven Charbroilers	Underfired Charbroilers	Deep-Fat Fryers	Flat Griddles	Clamshell Griddles
Ethnic	1.62	1.54	1.63	1.88	1.8
Family	1.71	1.29	2.34	2.03	–[1]
Fast Food	1.07	1.58	3.1	1.43	2.09
Seafood	–	1.1	2.47	1.11	1.5
Steak & Barbeque	–[2,3]	1.63	2.42	1.35	–

[1] Average number of equipment pieces only for the segment of restaurants estimated as having such equipment.
[2] Not clear why the number of pieces of equipment was not reported for this category.
[3] Steak and barbeque restaurants are not likely to employ chain-driven charbroilers.

Table 4. Dun & Bradstreet Restaurant Classifications

Restaurant Type	Dun & Bradstreet Code
Ethnic food	5812-01
Fast food	5812-03
Family	5812-05
Seafood	5812-07
Steak & Barbecue	5812-08

To develop emissions (in lb/year), the mass of meat and french fries cooked on each equipment type was multiplied by an appropriate emission factor. Emissions were then divided by 1ton/2000 lb to convert the emissions to ton/year. Commercial cooking criteria air pollutant and HAP emission factors can be found in the EPA report *Methods for Developing a National Emission Inventory for Commercial Cooking Processes: Technical Memorandum.*[5] The emission factors are expressed in lb/ton and g/kg, and are by equipment and food type. The NIF allows only one emission factor for each SCC and pollutant combination. Due to this limitation, weighted composite emission factors, in lb/ton, were calculated by dividing emissions by the mass of meat and french fries cooked, multiplying by 2000 lb/ton; and then incorporated into the NIF.

COMMERCIAL COOKING (continued)
SCCs: 2302002100, 2302002200, 2302003000, 2302003100, & 2302003200

The only known area with controls in place for commercial charbroiling is the South Coast Air Quality Management District (SCAQMD) in California. Controls consistent with the requirements of Rule 1138 currently only affect chain-driven charbroilers.[6] A control efficiency (CE) of 86% was applied for VOC and a CE of 83% was applied for PM10-PRI and PM2.5-PRI to uncontrolled chain-driven charbroiler emissions in the following SCAQMD counties: Los Angeles, Orange, Riverside, and San Bernardino. The CE that was used to estimate controlled VOC emissions or the CE used to estimate controlled PM10-PRI and PM2.5-PRI emissions was applied to the uncontrolled HAP emissions in these counties. Controlled emissions of volatile organic HAP species were estimated by using the VOC CE, while those associated with PM10-PRI and PM2.5-PRI were estimated using the PM10-PRI CE. Table 5 lists each HAP and the CE assumption that was used to estimate controlled HAP emissions. Rule effectiveness for the four controlled counties was set to 100%. Los Angeles and Orange counties are assumed to have 100% rule penetration. San Bernardino and Riverside counties were assumed to have 80% rule penetration, since about 80% of the population of these counties resides within the SCAQMD.

Table 5. HAP Pollutants and CE

Pollutant Description	NIF 3.0 Pollutant Code	CE Used	Pollutant Description	NIF 3.0 Pollutant Code	CE Used
4-Nitrophenol	100027	PM_{10}	Fluorene	86737	PM_{10}
Acenaphthene	83329	PM_{10}	Formaldehyde	50000	VOC
Acenaphthylene	208968	PM_{10}	Indeno[1,2,3-c,d]Pyrene	193395	PM_{10}
Acetaldehyde	75070	VOC	m,p-xylenes	1330207	VOC
Acetophenone	98862	VOC	Naphthalene	91203	VOC
Anthracene	120127	PM_{10}	o-Cresol	95487	VOC
Benz[a]Anthracene	56553	PM_{10}	o-Xylene	95476	VOC
Benzene	71432	VOC	p-Cresol	106445	VOC
Benzo[a]Pyrene	50328	PM_{10}	Phenanthrene	85018	PM_{10}
Benzo[g,h,i,]Perylene	191242	PM_{10}	Phenol	108952	VOC
Biphenyl	92524	PM_{10}	Propionaldehyde	123386	VOC
Dibutyl Phthalate	84742	PM_{10}	Pyrene	129000	PM_{10}
Ethyl Benzene	100414	VOC	Styrene	100425	VOC
Ethylene Dichloride	107062	VOC	Toluene	108883	VOC
Fluoranthene	206440	PM_{10}	Total PAH[1]	130498292	PM_{10}

[1] Pollutant code 234 for Total PAH in draft NEI was changed to pollutant code 130498292 for the final NEI.

Table 6 summarizes the national CAP and HAP composite emission factors, annual activity, and emissions by SCC and pollutant

COMMERCIAL COOKING (continued)
SCCs: 2302002100, 2302002200, 2302003000, 2302003100, & 2302003200

Table 6. National Emissions Summary

SCC	Cooking Device	Pollutant Description	NIF 3.0 Pollutant Code	Composite Emission Factor (lb/ton)	Emission Factor Reference	Annual Activity (ton)	National Emissions (tons)
2302002100	Conveyorized Charbroiling	Volatile Organic Compounds	VOC	4.002084	See footnote a	1,107,492	2,116.1
2302002100	Conveyorized Charbroiling	Carbon Monoxide	CO	13.364824	See footnote a	1,107,492	7,400.7
2302002100	Conveyorized Charbroiling	PM10-PRI	PM10-PRI	15.996058	See footnote a	1,107,492	8,857.7
2302002100	Conveyorized Charbroiling	PM25-PRI	PM25-PRI	15.506208	See footnote a	1,107,492	8,586.6
2302002100	Conveyorized Charbroiling	4-NITROPHENOL	100027	0.003826	See footnote a	1,107,492	2.1
2302002100	Conveyorized Charbroiling	ACENAPHTHENE	83329	0.000415	See footnote a	1,107,492	0.2
2302002100	Conveyorized Charbroiling	ACENAPHTHYLENE	208968	0.007423	See footnote a	1,107,492	4.1
2302002100	Conveyorized Charbroiling	ACETALDEHYDE	75070	0.163475	See footnote a	1,107,492	90.5
2302002100	Conveyorized Charbroiling	ACETOPHENONE	98862	0.001409	See footnote a	1,107,492	0.8
2302002100	Conveyorized Charbroiling	ANTHRACENE	120127	0.001669	See footnote a	1,107,492	0.9
2302002100	Conveyorized Charbroiling	BENZ[A]ANTHRACENE	56553	0.000477	See footnote a	1,107,492	0.3
2302002100	Conveyorized Charbroiling	BENZENE	71432	0.292169	See footnote a	1,107,492	161.8
2302002100	Conveyorized Charbroiling	BENZO[A]PYRENE	50328	0.000275	See footnote a	1,107,492	0.2
2302002100	Conveyorized Charbroiling	BENZO[G,H,I,]PERYLENE	191242	0.000256	See footnote a	1,107,492	0.1
2302002100	Conveyorized Charbroiling	BIPHENYL	92524	0.003623	See footnote a	1,107,492	2.0
2302002100	Conveyorized Charbroiling	DIBUTYL PHTHALATE	84742	0.001113	See footnote a	1,107,492	0.6
2302002100	Conveyorized Charbroiling	ETHYL BENZENE	100414	0.023188	See footnote a	1,107,492	12.8
2302002100	Conveyorized Charbroiling	ETHYLENE DICHLORIDE	107062	0.008116	See footnote a	1,107,492	4.5
2302002100	Conveyorized Charbroiling	FLUORANTHENE	206440	0.001863	See footnote a	1,107,492	1.0
2302002100	Conveyorized Charbroiling	FLUORENE	86737	0.001806	See footnote a	1,107,492	1.0
2302002100	Conveyorized Charbroiling	FORMALDEHYDE	50000	0.227822	See footnote a	1,107,492	126.2
2302002100	Conveyorized Charbroiling	INDENO[1,2,3-C,D]PYRENE	193395	0.000162	See footnote a	1,107,492	0.1
2302002100	Conveyorized Charbroiling	NAPHTHALENE	91203	0.034368	See footnote a	1,107,492	19.0
2302002100	Conveyorized Charbroiling	O-CRESOL	95487	0.000974	See footnote a	1,107,492	0.5
2302002100	Conveyorized Charbroiling	O-XYLENE	95476	0.019130	See footnote a	1,107,492	10.6
2302002100	Conveyorized Charbroiling	PAH, TOTAL	130498292	0.081077	See footnote a	1,107,492	44.9
2302002100	Conveyorized Charbroiling	P-CRESOL	106445	0.001988	See footnote a	1,107,492	1.1
2302002100	Conveyorized Charbroiling	PHENANTHRENE	85018	0.008221	See footnote a	1,107,492	4.6
2302002100	Conveyorized Charbroiling	PHENOL	108952	0.013333	See footnote a	1,107,492	7.4
2302002100	Conveyorized Charbroiling	PROPIONALDEHYDE	123386	0.044057	See footnote a	1,107,492	24.4
2302002100	Conveyorized Charbroiling	PYRENE	129000	0.002508	See footnote a	1,107,492	1.4
2302002100	Conveyorized Charbroiling	STYRENE	100425	0.110143	See footnote a	1,107,492	61.0
2302002100	Conveyorized Charbroiling	TOLUENE	108883	0.115940	See footnote a	1,107,492	64.2
2302002100	Conveyorized Charbroiling	XYLENES	1330207	0.016232	See footnote a	1,107,492	9.0
2302002200	Under-fired Charbroiling	Volatile Organic Compounds	VOC	3.918318	See footnote a	3,692,145	7,233.5
2302002200	Under-fired Charbroiling	Carbon Monoxide	CO	12.817540	See footnote a	3,692,145	23,662.1
2302002200	Under-fired Charbroiling	PM10-PRI	PM10-PRI	32.666124	See footnote a	3,692,145	60,304.0
2302002200	Under-fired Charbroiling	PM25-PRI	PM25-PRI	31.577929	See footnote a	3,692,145	58,295.1
2302002200	Under-fired Charbroiling	4-NITROPHENOL	100027	0.005624	See footnote a	3,692,145	10.4
2302002200	Under-fired Charbroiling	ACENAPHTHENE	83329	0.000219	See footnote a	3,692,145	0.4
2302002200	Under-fired Charbroiling	ACENAPHTHYLENE	208968	0.005542	See footnote a	3,692,145	10.2
2302002200	Under-fired Charbroiling	ACETALDEHYDE	75070	0.340875	See footnote a	3,692,145	629.3
2302002200	Under-fired Charbroiling	ACETOPHENONE	98862	0.002804	See footnote a	3,692,145	5.2
2302002200	Under-fired Charbroiling	ANTHRACENE	120127	0.001622	See footnote a	3,692,145	3.0
2302002200	Under-fired Charbroiling	BENZ[A]ANTHRACENE	56553	0.000441	See footnote a	3,692,145	0.8
2302002200	Under-fired Charbroiling	BENZENE	71432	0.586544	See footnote a	3,692,145	1,082.8
2302002200	Under-fired Charbroiling	BENZO[A]PYRENE	50328	0.000187	See footnote a	3,692,145	0.3
2302002200	Under-fired Charbroiling	BENZO[G,H,I,]PERYLENE	191242	0.000196	See footnote a	3,692,145	0.4
2302002200	Under-fired Charbroiling	BIPHENYL	92524	0.002233	See footnote a	3,692,145	4.1

COMMERCIAL COOKING (continued)
SCCs: 2302002100, 2302002200, 2302003000, 2302003100, & 2302003200

Table 6. National Emissions Summary (continued)

SCC	Cooking Device	Pollutant Description	NIF 3.0 Pollutant Code	Composite Emission Factor (lb/ton)	Emission Factor Reference	Annual Activity (ton)	National Emissions (tons)
2302002200	Under-fired Charbroiling	DIBUTYL PHTHALATE	84742	0.002049	See footnote a	3,692,145	3.8
2302002200	Under-fired Charbroiling	ETHYL BENZENE	100414	0.044503	See footnote a	3,692,145	82.2
2302002200	Under-fired Charbroiling	ETHYLENE DICHLORIDE	107062	0.018742	See footnote a	3,692,145	34.6
2302002200	Under-fired Charbroiling	FLUORANTHENE	206440	0.002287	See footnote a	3,692,145	4.2
2302002200	Under-fired Charbroiling	FLUORENE	86737	0.001698	See footnote a	3,692,145	3.1
2302002200	Under-fired Charbroiling	FORMALDEHYDE	50000	0.469920	See footnote a	3,692,145	867.5
2302002200	Under-fired Charbroiling	INDENO[1,2,3-C,D]PYRENE	193395	0.000115	See footnote a	3,692,145	0.2
2302002200	Under-fired Charbroiling	NAPHTHALENE	91203	0.022748	See footnote a	3,692,145	42.0
2302002200	Under-fired Charbroiling	O-CRESOL	95487	0.001799	See footnote a	3,692,145	3.3
2302002200	Under-fired Charbroiling	O-XYLENE	95476	0.037336	See footnote a	3,692,145	68.9
2302002200	Under-fired Charbroiling	PAH, TOTAL	130498292	0.066015	See footnote a	3,692,145	121.9
2302002200	Under-fired Charbroiling	P-CRESOL	106445	0.003632	See footnote a	3,692,145	6.7
2302002200	Under-fired Charbroiling	PHENANTHRENE	85018	0.007460	See footnote a	3,692,145	13.8
2302002200	Under-fired Charbroiling	PHENOL	108952	0.026010	See footnote a	3,692,145	48.0
2302002200	Under-fired Charbroiling	PROPIONALDEHYDE	123386	0.092009	See footnote a	3,692,145	169.9
2302002200	Under-fired Charbroiling	PYRENE	129000	0.003087	See footnote a	3,692,145	5.7
2302002200	Under-fired Charbroiling	STYRENE	100425	0.222409	See footnote a	3,692,145	410.6
2302002200	Under-fired Charbroiling	TOLUENE	108883	0.232132	See footnote a	3,692,145	428.5
2302002200	Under-fired Charbroiling	XYLENES	1330207	0.033076	See footnote a	3,692,145	61.1
2302003000	Deep Fat Frying	Volatile Organic Compounds	VOC	0.129029	See footnote a	18,180,911	1,172.9
2302003100	Flat Griddle Frying	Volatile Organic Compounds	VOC	0.355080	See footnote a	5,294,678	940.0
2302003100	Flat Griddle Frying	Carbon Monoxide	CO	0.733239	See footnote a	5,294,678	1,941.1
2302003100	Flat Griddle Frying	PM10-PRI	PM10-PRI	5.922517	See footnote a	5,294,678	15,678.9
2302003100	Flat Griddle Frying	PM25-PRI	PM25-PRI	4.501113	See footnote a	5,294,678	11,916.0
2302003100	Flat Griddle Frying	ACENAPHTHENE	83329	0.000055	See footnote a	5,294,678	0.1
2302003100	Flat Griddle Frying	ACENAPHTHYLENE	208968	0.000271	See footnote a	5,294,678	0.7
2302003100	Flat Griddle Frying	ANTHRACENE	120127	0.000478	See footnote a	5,294,678	1.3
2302003100	Flat Griddle Frying	BENZ[A]ANTHRACENE	56553	0.000158	See footnote a	5,294,678	0.4
2302003100	Flat Griddle Frying	BENZO[A]PYRENE	50328	0.000030	See footnote a	5,294,678	0.1
2302003100	Flat Griddle Frying	BIPHENYL	92524	0.000153	See footnote a	5,294,678	0.4
2302003100	Flat Griddle Frying	FLUORANTHENE	206440	0.001409	See footnote a	5,294,678	3.7
2302003100	Flat Griddle Frying	FLUORENE	86737	0.000362	See footnote a	5,294,678	1.0
2302003100	Flat Griddle Frying	NAPHTHALENE	91203	0.007855	See footnote a	5,294,678	20.8
2302003100	Flat Griddle Frying	PAH, TOTAL	130498292	0.015412	See footnote a	5,294,678	40.8
2302003100	Flat Griddle Frying	PHENANTHRENE	85018	0.003628	See footnote a	5,294,678	9.6
2302003100	Flat Griddle Frying	PYRENE	129000	0.001878	See footnote a	5,294,678	5.0
2302003200	Clamshell Griddle Frying	Volatile Organic Compounds	VOC	0.036472	See footnote a	2,132,336	38.9
2302003200	Clamshell Griddle Frying	PM10-PRI	PM10-PRI	1.006137	See footnote a	2,132,336	1,072.7
2302003200	Clamshell Griddle Frying	PM25-PRI	PM25-PRI	0.852257	See footnote a	2,132,336	908.6

a - Composite emission factor developed by dividing national emissions by the national mass of meat and french fries cooked, then multiplying by 2000 lb/ton. Emission factors that were used to estimate national emissions are in Tables 1A, 2A, 1B, and 2B of the EPA document *Methods for Developing a National Emission Inventory for Commercial Cooking Processes: Technical Memorandum* (Reference 5).

COMMERCIAL COOKING (continued)
SCCs: 2302002100, 2302002200, 2302003000, 2302003100, & 2302003200

Sample Calculations

The following sample calculations illustrate how activity data (pounds of meat) were estimated for SCC 2302002200 (Under-fired Charbroiling) for one county. The facility counts for each type of restaurant in the county were used with the survey data in the above tables to estimate activity. The steps in this process are:

Step 1. Multiply county-level facility counts by the fraction of each restaurant type with each type of cooking equipment:

$$N_{ethnic} * f_{ethnic,\ ufc} = N_{ethnic,\ ufc}$$

where:	N_{ethnic}	=	Number of ethnic food restaurants in county;
	$f_{ethnic,\ ufc}$	=	fraction of ethnic food rest. with under-fired charbroilers; and
	$N_{ethnic,\ ufc}$	=	Number of ethnic food rest. with under-fired charbroilers.

538 restaurants x 0.475 = 256 ethnic food rest. with under-fired charbroilers

Step 2. Multiply number of restaurants with each type of cooking equipment by number of pieces of equipment:

$$N_{ethnic,\ ufc} * e_{ethnic,\ ufc} = E_{ethnic,\ ufc}$$

where:	$\mathrm{N}_{\mathrm{ethnic,\ ufc}}$	=	Number of ethnic food rest. with under-fired charbroilers;
	$e_{ethnic,\ ufc}$	=	Number of under-fired charbroilers at ethnic food restaurants with at least one under-fired charbroiler;
	$E_{ethnic,\ ufc}$	=	Total number of under-fired charbroilers at ethnic food restaurants.

256 ethnic food rest. with under-fired charbroilers * 1.54 *under-fired charbroilers*
= 394 under-fired charbroilers *at ethnic food restaurants*

Step 3. Sum number of pieces of cooking equipment across restaurant types:

$$E_{ethnic,ufc} + E_{family,ufc} + E_{fast,ufc} + E_{seafood,ufc} + E_{S\&B,ufc} = E_{all,ufc}$$

where:	$E_{ethnic,ufc}$	=	Total number of under-fired charbroilers at ethnic food restaurants;
	$E_{family,ufc}$	=	Total number of under-fired charbroilers at family restaurants;
	$E_{fast,ufc}$	=	Total number of under-fired charbroilers at fast food restaurants;
	$E_{seafood,ufc}$	=	Total number of under-fired charbroilers at seafood restaurants;
	$E_{S\&B,ufc}$	=	Total number of under-fired charbroilers at steak & barbecue restaurants; and
	$E_{all,ufc}$	=	Total number of under-fired charbroilers at all restaurants.

394 ethnic + 238 family + 62 fast food + 14 seafood + 32 steak & barbecue
= 737 under-fired charbroilers at all restaurants

COMMERCIAL COOKING (continued)
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Step 4. Multiply total number of under-fired charbroilers by average pounds of meat cooked on each type of equipment per week:

$$E_{all,ufc} * m_{steak,ufc} = M_{steak,ufc}$$

where:

where:	$E_{all,ufc}$	=	Total number of under-fired charbroilers at all restaurants
	$m_{steak,ufc}$	=	Average pounds per week of steak cooked on one under-fired charbroiler
	$M_{steak,ufc}$	=	Total pounds per week of steak cooked on all under-fired charbroilers in the county

(737 under-fired charbroilers x 180.06 lbs/week) / (2000 lbs/ton)
= 66.4 tons of steak per week

Step 5. The mass of meat was then multiplied by the appropriate emission factor to estimate annual emissions.

$$M_{steak,ufc} * EF_{steak,ufc} = \mathrm{EM}_{steak,ufc}$$

where:	$M_{steak,ufc}$	=	Total tons per week of steak cooked on all under-fired charbroilers in the county
	$EF_{steak,ufc}$	=	VOC emission factor for steak cooked on all under-fired charbroilers
	$\mathrm{EM}_{steak,ufc}$	=	Annual VOC emissions from steak cooked on all under-fired charbroilers in the county

*(66.4 tons of steak per week x 0.86 lb/ton) * (52 weeks/year) / (2000 lb/ton)*
= 1.48 tons of VOC emitted per year

References

1. Public Research Institute, *Charbroiling Activity Estimation, Draft Report*, prepared for California Environmental Protection Agency, California Air Resources Board, March 2003.

2. Dun & Bradstreet, *MarketPlace* CD-ROM, Jan-Mar, 2002.

3. U.S. Department of Agriculture, "U.S. Pack of Frozen Potato Products," American Frozen Food Institute, 2001.

4. G. Lucier, U.S. Department of Agriculture, personal communication with P. Hemmer, E.H. Pechan & Associates, Inc., May 2003.

5. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Methods for Developing a National Emission Inventory for Commercial Cooking Processes: Technical Memorandum*, prepared by E.H. Pechan & Associates, Inc., Research Triangle Park, NC. September 2003.

6. South Coast Air Quality Management District (SCAQMD), Perryman, Pamela and Peter Votlucka, "Staff Report for Proposed Rule 1138 - Control of Emissions from Restaurant Operations," October 10, 1997.

CONSTRUCTION - NON-RESIDENTIAL
SCC: 2311020000

Primary PM_{10} and $PM_{2.5}$ emissions were estimated for non-residential construction. Emissions for this source category are all primary; there are no condensible emissions. Emissions from non-residential construction activity are a function of the acreage disturbed for non-residential construction.[1] Non-residential construction activity is developed from data obtained from the U.S. Department of Commerce (DOC)'s Bureau of the Census.[2] Emissions from non-residential construction in Puerto Rico and the U.S. Virgin Islands was not estimated.

The national value of non-residential construction put in place (in millions of dollars) was allocated to counties using county-level non-residential construction (NAICS Code 2362) employment data obtained from the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) program.[3] For many counties, employment data from the BLS was withheld (not reported). In these cases, the BLS county employment data was supplemented with Dun & Bradstreet (D&B) county non-residential construction employment data.[4] State non-residential construction employment totals from the BLS included employment numbers for the counties where county-level employment data was withheld. A ratio of D&B county-to-State employment was applied to the BLS State employment totals to estimate county-level non-residential construction employment for those counties where employment data was withheld. Appendix B contains the non-residential construction employment data by county.

To estimate the number of acres disturbed by non-residential construction, a conversion factor of 1.55 acres/10^6 dollars was applied to the county-level construction valuation data. This conversion factor was developed by adjusting the 1999 value of 2 acres/10^6 dollars to 2002 constant dollars using the Price and Cost Indices for Construction.[5]

Emission Factors

Initial PM_{10} emissions from construction of non-residential buildings are calculated using an emission factor of 0.19 tons/acre/month. The duration of construction activity for non-residential construction is assumed to be 11 months.

Adjustments

Regional variances in construction emissions are corrected using soil moisture level, silt content, and control efficiency. These correction parameters are applied to initial PM_{10} emissions from non-residential construction to develop the final emissions inventory.

To account for the soil moisture level, the PM_{10} emissions are weighted using the precipitation-evaporation (PE) values from Thornthwaite's PE Index. Average precipitation evaporation values for each State were estimated based on PE values for specific climatic divisions within a State. These values range from 7 to 41.

To account for the silt content, thePM_{10} emissions are weighted using average silt content for each county. A data base containing county-level dry silt values was complied. These values were derived by applying a correction factor developed by the California Air Resources Board to convert wet silt values to dry silt values.[6]

The equation for PM_{10} emissions corrected for soil moisture and silt content is:

$$Corrected\ E_{PM10} = Initial\ E_{PM10} \times \frac{24}{PE} \times \frac{S}{9\%}$$

where: Corrected E_{PM10} = PM_{10} emissions corrected for soil moisture and silt content,
PE = precipitation-evaporation value for each State,
S = % dry silt content in soil for area being inventoried.

CONSTRUCTION - NON-RESIDENTIAL (continued)
SCC: 2311020000

Nonattainment areas are assumed to require controls for PM emissions from non-residential construction activity. A control efficiency of 50 percent is assumed for both PM_{10} and $PM_{2.5}$ in nonattainment areas.

Once PM_{10} estimates are developed, $PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.20 to PM_{10} emissions.[1] Note that EPA lowered the PM25-PRI/-FIL particle size multiplier to 0.10 just prior to completing the final 2002 nonpoint NEI. The EPA applied an adjustment factor of 0.67 (an error) to the PM25-PRI/-FIL emissions in the final NEI; the emission factor in this documentation and in Appendix C has been revised to reflect this change. Note EPA will make a further adjustment of 0.75 in version 2 of the 2002 NEI to correct the error. [7]

Table 1 provides a national summary of activity and emissions by pollutant. It is important to note that the values in Table 1 represent total activity and emissions. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI. Point source emissions are classified under SCCs 31100101 through 31100103. Note that the emission factor for PM2.5 was adjusted from 0.038 to 0.026 to account for the correction mentioned in the previous paragraph. The factor should be 0.019 and will be corrected in version 2 of the 02 NEI. See Section 2.8.6 of this report for further discussion of this adjustment.

Table 1. National Emissions Summary for Non-Residential Construction: Not Adjusted for Point Source Activity or Emissions

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Reference	National Activity Level (Reference 2,3)	National Emissions (tons/year)
PM10-PRI / PM10-FIL	0.19	Reference 1	258,980	622,723
PM25-PRI / PM25-FIL	0.026	Reference 1	258,980	83,445

References:

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. “Technical Memorandum: Revised Methodology for Estimating Emissions from Construction.” Prepared by E.H. Pechan & Associates. Research Triangle Park, NC. September 2000.

2. U.S. Department of Commerce, Bureau of the Census. Construction Statistics. *Annual Value of Construction Put in Place in the U.S. 1998-2002*. 2002.

3. U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages Program. *County Employment and Wages, 2002*. 2002.

4. Dun & Bradstreet, *MarketPlace* CD-ROM, Jan-Mar, 2002.

5. U.S. Department of Commerce, Bureau of the Census. Construction Statistics. *Annual Construction Cost Indexes (1964 to 2002)*. 2002.

6. Campbell, 1996: Campbell, S.G., D.R. Shimp, and S.R. Francis. *Spatial Distribution of PM-10 Emissions from Agricultural Tilling in the San Joaquin Valley*, pp. 119-127 in Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association, Reno, NV. 1996.

7. EPA, 2006. Western Governors'Association. 2006. Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. Western Regional Air Partnership (WRAP), 1515 Cleveland Plance, Suite 200, Denver, Colorado 80202 .

CONSTRUCTION - RESIDENTIAL

SCC: 2311010000

Primary PM_{10} and $PM_{2.5}$ emissions were estimated for residential construction. Emissions for this source category are all filterable; there are no condensible emissions. Emissions from residential construction activity are a function of the acreage disturbed and volume of soil excavated for residential construction.[1] Residential construction activity is developed from data obtained from the U.S. Department of Commerce (DOC)'s Bureau of the Census. Emissions from residential construction in Puerto Rico and the U.S. Virgin Islands was not estimated.

Annual regional housing starts data by housing category (1-unit, 2 to 4-units, 5-units or more) are developed from the 2002 New Privately Owned Housing Units Started.[2] Table 1 presents the housing starts data obtained from the DOC. The resulting annual regional housing starts for each housing category are then converted from 'number of units' data into 'number of structures' data. The regional number of structures started in 2002 is then allocated to counties. The Permits by County[3] data for 2002 is used to calculate the ratio of the number of building permits in each county to the total number of building permits in the region. This ratio is then used to estimate the number of structures started in each county. Appendix B contains the permit data by county.

Table 1. New Privately Owned Housing Units Started in 2002 (thousands) [2]

Month	Total	1 unit	2 to 4 units	5 or more units	Northeast Total	Midwest Total	South Total	West Total	Northeast 1 unit	Midwest 1 unit	South 1 unit	West 1 unit
Jan	110.4	84.7	4.7	21.1	8.9	18.1	57.0	26.4	6.4	13.4	44.2	20.6
Feb	120.4	99.1	2.9	18.4	7.8	20.6	61.7	30.2	6.6	17.1	51.2	24.2
Mar	138.2	109.5	3.7	25.0	13.1	25.6	65.0	34.5	10.1	19.9	50.7	28.8
Apr	148.8	122.2	2.3	24.2	11.3	27.4	74.4	35.7	9.1	24.6	58.9	29.6
May	165.5	133.7	3.2	28.5	15.5	36.0	74.8	39.1	12.3	27.6	61.8	32.1
Jun	160.3	130.1	4.0	26.2	17.5	35.4	70.3	37.1	13.6	31.0	54.9	30.5
Jul	155.9	125.2	2.9	27.8	14.9	35.5	68.2	37.2	9.2	28.5	55.6	31.9
Aug	147.0	111.4	2.9	32.6	16.5	31.0	67.3	32.1	12.0	21.4	52.0	26.0
Sep	155.6	124.0	3.2	28.4	15.9	34.5	67.5	37.8	10.8	25.9	55.6	31.7
Oct	146.8	118.8	3.2	24.9	13.4	30.7	60.7	42.0	10.5	23.9	52.4	32.0
Nov	133.0	102.6	2.9	27.5	12.0	30.5	59.5	31.1	9.0	23.8	46.8	23.1
Dec	123.1	97.2	2.6	23.3	11.6	24.4	54.9	32.2	8.1	19.7	44.1	25.3

The percentage of one family houses with basements is obtained from the U.S. Census Bureau in the report *Characteristics of New Houses,* Type of Foundation in New One Family Houses Completed.[4] Table 2 presents the percentage of one-family homes with basements for each region. The percentages are applied to 1-unit structures to obtain the number of structures with basements in each county.

Table 2. Type of Foundation in New One Family Houses Completed in 2002 [4]

Region	Total	Full or Partial Basement	Slab or other Type	Crawl Space	Percent Basements
Northeast	113	100	9	4	0.8850
South	615	90	403	122	0.1463
Midwest	272	205	46	21	0.7537
West	325	60	203	62	0.1846
United States	1,325	455	661	208	0.3434

CONSTRUCTION - RESIDENTIAL (continued)
SCC: 2311010000

The county-level housing starts by structure type is used to estimate the acreage disturbed due to residential construction. The total area disturbed in each county is calculated by assuming an average acreage disturbed for each type of structure as given below:

- 1-Unit - 1/4 acre/structure
- 2-Unit - 1/3 acre/structure
- Apartment - ½ acre/structure

The U.S. Census Bureau no longer reports separate data for 2-unit structures, but groups them into a 2 to 4-units category. However, the Census Bureau was contacted to request the number of 2-unit structure starts and number of 3 to 4-unit structure starts. The available national data are displayed in Table 3. The ratio of number of 2-unit structure starts and number of 3 to-4 unit structure starts to number of 2 to 4-unit structure starts was then computed as shown in Table 3. These ratios were used to allocate the number of 2 to 4-unit starts in each region to 2-unit starts and 3 to 4-unit starts.[5]

Table 3. National Number of Housing Starts for 2-units and 3 to 4-units

	2 units	3-4 units	Total
National Starts (thousands)	14	24	38
Ratios	0.368	0.632	

The cubic yards of dirt excavated for 1-unit structures with basements is also estimated. This estimation assumes all single-family homes are 2,000 square feet in area, have a basement depth of 8 feet, and have additional peripheral dirt removed amounting to 10% of the basement volume. Table 4 summarizes the activity data for residential construction.

Table 4. Summary of National Activity Data for Residential Construction

Type of Structure	Units	Activity
Apartments	acres disturbed	12,828
2-Unit Structures	acres disturbed	2,363
1-Unit Structures w/o Basements	acres disturbed	222,950
1-unit Structures with Basements	acres disturbed	116,676
	cubic yards excavated	304,221,375

Emission Factors

Initial PM_{10} emissions from construction of single family, two family, and apartments structures are calculated using the emission factors given in Table 5. The duration of construction activity for houses is assumed to be 6 months and the duration of construction for apartments is assumed to be 12 months. For single-unit houses with basements, emissions are calculated assuming best available control measures (BACM).[6] The BACM Level 2 emission factor equation is applied to the acreage disturbed and the cubic yards of dirt excavated.

Table 5. Emission Factors for Residential Construction

Type of Structure	Emission Factor	Duration of Construction
Apartments	0.11 tons PM10/acre-month	12 months
2-Unit Structures	0.032 tons PM10/acre-month	6 months
1-Unit Structures w/o Basements	0.032 tons PM10/acre-month	6 months
1-unit Structures with Basements	0.011 tons PM10/acre-month	6 months
	0.059 tons PM10/1000 cubic yards	

Adjustments

Regional variances in construction emissions are corrected using soil moisture level, silt content, and control efficiency. These correction parameters are applied to initial PM_{10} emissions from residential construction to develop the final emissions inventory.

To account for the soil moisture level, the PM_{10} emissions are weighted using the precipitation-evaporation (PE) values from Thornthwaite's PE Index. Average precipitation evaporation values for each State were estimated based on PE values for specific climatic divisions within a State. These values range from 7 to 41.

To account for the silt content, thePM_{10} emissions are weighted using average silt content for each county. A data base containing county-level dry silt values was complied. These values were derived by applying a correction factor developed by the California Air Resources Board to convert wet silt values to dry silt values.[7]

The equation for PM_{10} emissions corrected for soil moisture and silt content is:

$$Corrected\ E_{PM10} = Initial\ E_{PM10} \times \frac{24}{PE} \times \frac{S}{9\%}$$

where:

Corrected E_{PM10}	=	PM_{10} emissions corrected for soil moisture and silt content,
PE	=	precipitation-evaporation value for each State,
S	=	% dry silt content in soil for area being inventoried.

Nonattainment areas are assumed to require controls for PM emissions from residential construction activity. A control efficiency of 50 percent is assumed for both PM_{10} and $PM_{2.5}$ in nonattainment areas.

Once PM_{10} estimates are developed, $PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.20 to PM_{10} emissions.[1] Note that EPA lowered the PM25-PRI/-FIL particle size multiplier to 0.10 just prior to completing the final 2002 nonpoint NEI. The EPA applied an adjustment factor of 0.67 (an error) to the PM25-PRI/-FIL emissions in version 1 of the final NEI; the emission factor in this documentation and in Appendix C has been revised to reflect this change. Note EPA will make a further adjustment of 0.75 in version 2 of the 2002 NEI to correct the error. See Section 2.8.6 of this report for further discussion of this adjustment[8].

Table 6 provides a national summary of activity and emissions by pollutant. It is important to note that the values in Table 6 represent total activity and emissions. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI. Point source emissions are classified under SCCs 31100101 through 31100103.

CONSTRUCTION - RESIDENTIAL (continued)
SCC: 2311010000

Table 6. National Criteria Pollutant Emissions Summary for Residential Construction: Not Adjusted for Point Source Activity or Emissions

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Reference	National Activity Level (Reference 2,3,4)	National Emissions (tons/year)
PM10-PRI / PM10-FIL	See Table 2	Reference 1	See Table 1	100,109
PM25-PRI / PM25-FIL	See Table 2	Reference 1	See Table 1	13,414

References:

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, "Technical Memorandum: Revised Methodology for Estimating Emissions from Construction." Prepared by E.H. Pechan & Associates. Research Triangle Park, NC. September 2000.

2. U.S. Department of Commerce, Bureau of the Census. Construction Statistics. *Housing Starts - New Privately Owned Housing Units Started.* 2002.

3. U.S. Department of Commerce, Bureau of the Census. Construction Statistics. *Annual Characteristics of New Housing - Type of Foundation in New One-Family Houses Completed*, 2002.

4. U.S. Department of Commerce, Bureau of the Census. Construction Statistics. *Annual Housing Units Authorized by Building Permits - Permits by County*. 2002.

5. U.S. Census Bureau, Residential Construction Branch, personal communication with P. Hemmer of E.H. Pechan & Associates, Inc., June 2003.

6. Midwest Research Institute. Improvement of Specific Emission Factors (BACM Project No. 1). Prepared for South Coast Air Quality Management District. March 29, 1996.

7. Campbell, 1996: Campbell, S.G., D.R. Shimp, and S.R. Francis. *Spatial Distribution of PM-10 Emissions from Agricultural Tilling in the San Joaquin Valley*, pp. 119-127 in Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association, Reno, NV. 1996.

8. EPA, 2006. Western Governors'Association. 2006. Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. Western Regional Air Partnership (WRAP), 1515 Cleveland Plance, Suite 200, Denver, Colorado 80202 .

CONSTRUCTION - ROAD
SCC: 2311030000

Primary PM_{10} and $PM_{2.5}$ emissions were estimated for road construction. Emissions for this source category are all primary; there are no condensible emissions. Emissions from road construction activity are a function of the acreage disturbed for road construction.[1] Road construction activity is developed from data obtained from the Federal Highway Administration (FHWA). Emissions from road construction in Puerto Rico and the U.S. Virgin Islands was not estimated.

State-level new miles of road constructed are estimated by first obtaining 2002 FHWA State expenditure for capital outlay data , in thousands of dollars, according to the following six classifications:[2]

1. Interstate, urban
2. Interstate, rural
3. Other arterial, urban
4. Other arterial, rural
5. Collectors, urban
6. Collectors, rural

The State expenditure data are then converted to new miles of road constructed using $/mile conversions obtained from the North Carolina Department of Transportation.[3] A conversion of $4 million/mile is applied to the interstate expenditures. This conversion corresponds to freeways and interstate projected listed for: 1) new location; 2) widen existing 2-land shoulder section; and 30 widen existing 4-lane median. For expenditures on other arterial and collectors, a conversion factor of $1.9 million/mile is applied, which corresponds to all other projects (excluding freeway and interstate projects) listed for: 1) new location; 2) widen existing 2-land shoulder section; and 30 widen existing 4-lane median.

The new miles of road constructed is used to estimate the acreage disturbed due to road construction. The total area disturbed in each State is calculated by converting the new miles of road constructed to acres using an acres disturbed/mile conversion factor for each road type as given below:[1]

1. Interstate, urban and rural; Other arterial, urban - 15.2 acres/mile
2. Other arterial, rural - 12.7 acres/mile
3. Collectors, urban - 9.8 acres/mile
4. Collectors, rural - 7.9 acres/mile

Residential building starts are used to allocate the State-level acres disturbed by road construction to the county. A ratio of the number of building starts in each county to the total number of building starts in each State is applied to the State-level acres disturbed to estimate the total number of acres disturbed by road construction in each county.

Emission Factors

Initial PM_{10} emissions from construction of roads are calculated using an emission factor of 0.42 tons/acre/month. Since most road construction consists of grading and leveling of land, the higher emission factor more accurately reflects the high level of cut and fill activity that occurs at road construction sites. The duration of construction activity for road construction is assumed to be 12 months.

Adjustments

Regional variances in construction emissions are corrected using soil moisture level, silt content, and control efficiency. These correction parameters are applied to initial PM_{10} emissions from road construction to develop the final emissions inventory.

CONSTRUCTION - ROAD (continued)
SCC: 2311030000

To account for the soil moisture level, the PM_{10} emissions are weighted using the precipitation-evaporation (PE) values from Thornthwaite's PE Index. Average precipitation evaporation values for each State were estimated based on PE values for specific climatic divisions within a State. These values range from 7 to 41.

To account for the silt content, thePM_{10} emissions are weighted using average silt content for each county. A data base containing county-level dry silt values was complied. These values were derived by applying a correction factor developed by the California Air Resources Board to convert wet silt values to dry silt values.[4]

The equation for PM_{10} emissions corrected for soil moisture and silt content is:

$$Corrected\ E_{PM10} = Initial\ E_{PM10} \times \frac{24}{PE} \times \frac{S}{9\%}$$

where: Corrected E_{PM10} = PM_{10} emissions corrected for soil moisture and silt content,
PE = precipitation-evaporation value for each State,
S = % dry silt content in soil for area being inventoried.

Nonattainment areas are assumed to require controls for PM emissions from road construction activity. A control efficiency of 50 percent is assumed for both PM_{10} and $PM_{2.5}$ in nonattainment areas.

Once PM_{10} estimates are developed, $PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.20 to PM_{10} emissions.[1] Note that EPA lowered the PM25-PRI/-FIL particle size multiplier to 0.10 just prior to completing the version one of the final 2002 nonpoint NEI. The EPA applied an adjustment factor of 0.67 (an error) to the PM25-PRI/-FIL emissions in the final NEI; the emission factor in this documentation and in Appendix C has been revised to reflect this change. Note EPA will make a further adjustment of 0.75 in version 2 of the 2002 NEI to correct the error. See Section 2.8.6 of this report for further discussion of this adjustment[5].
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Table 1 provides a national summary of activity and emissions by pollutant. It is important to note that the values in Table 1 represent total activity and emissions. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI. Point source emissions are classified under SCCs 31100101 through 31100103.

Table 1. National Criteria Pollutant Emissions Summary for Road Construction: Not Adjusted for Point Source Activity or Emissions

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Reference	National Activity Level (Reference 2,3)	National Emissions (tons/year)
PM10-PRI	0.42	Reference 1	239,682	1,369,212
PM10-FIL	0.42	Reference 1	239,682	1,369,212
PM25-PRI	0.084	Reference 1	239,682	183,474
PM25-FIL	0.084	Reference 1	239,682	183,474

CONSTRUCTION - ROAD (continued)
SCC: 2311030000

References:

1. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. "Technical Memorandum: Revised Methodology for Estimating Emissions from Construction." Prepared by E.H. Pechan & Associates. Research Triangle Park, NC. September 2000.

2. Federal Highway Administration. *Highway Statistics, Section IV - Highway Finance, Table SF-12A, "State Highway Agency Capital Outlay -2002."* 2002.

3. North Carolina Department of Transportation. Facsimile from D. Lane, North Carolina Department of Transportation, to R. Huntley, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Factors and Inventory Group. Research Triangle Park. September 2000.

4. Campbell, 1996: Campbell, S.G., D.R. Shimp, and S.R. Francis. *Spatial Distribution of PM-10 Emissions from Agricultural Tilling in the San Joaquin Valley*, pp. 119-127 in Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association, Reno, NV. 1996.

5. EPA, 2006. Western Governors'Association. 2006. Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. Western Regional Air Partnership (WRAP), 1515 Cleveland Plance, Suite 200, Denver, Colorado 80202 .

COTTON GINNING
SCC: 2801000000

Filterable PM_{10} and $PM_{2.5}$ (PM10-FIL and PM25-FIL) emissions estimates for 2002 were developed for cotton ginning. Emissions from cotton ginning are a function of the number of bales of cotton ginned.[1] Ginning activity occurs in 16 States. The USDA Cotton Ginning reports present the amount of cotton ginned by State, district, and county for each crop year. The following data files were obtained from the USDA National Agricultural Statistics Service [2]:

NASS_01-2002.txt	Activity data for period August/September 2002 through January 25, 2002.
NASS_01-2003.txt	Activity data for period August/September 2002 through March 22, 2002.
NASS_01-2002.txt	Activity data for period August/September 2003 through January 23, 2003.

Appendix B contains a compilation of these data files into a one table in database format.

A crop year begins in August/September 2002 through March 2003, covering parts of two calendar years. Since the activity data are reported as running totals for the growing season, the number of bales ginned for a calendar year needs to be determined using data from two crop years. The amount of cotton ginned from January 1 to the end of the season (March) for calendar year x (crop year x) and the amount of cotton ginned from the beginning of the season (August/September) for calendar year x (crop year y) is summed to get the calendar year x total. To determine the amount ginned from January 1 to the end of the season, the amount ginned before January 1 (in the early January Cotton Ginnings report) was subtracted from the total reported in the end of season (March) Cotton Ginnings report. To determine the amount ginned from the beginning of the season to January 1, the total recorded by January 1 in the early January Cotton Ginnings report was used.

The Cotton Ginnings report may not show detailed data for a county, but may include those data in the district, State, or U.S. totals. Data for a gin may be considered confidential if (1) there are fewer than three gins operating in the county, or (2) more than 60 percent of the cotton ginned in the county is ginned at one mill. The standard Cotton Ginnings report lists the following four codes to its table of running bales ginned:

1/ withheld to avoid disclosing individual gins
2/ withheld to avoid disclosing individual gins, but included in State total
3/ excludes some gins' data to avoid disclosing individual gins, but included in the State total
4/ withheld to avoid disclosing individual gins but included in the U.S. total

The following methodology is used for estimating the number of bales ginned in counties with confidential data.

(1) If all counties in the district show confidentiality, but there is a district total, divide district total by the number of counties to get individual county estimates.

(2) If some (but not all) counties in a district show confidentiality and there is a district total, subtract county totals from district total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

(3) If both county and district totals are considered confidential within a State, divide the State total by the number of counties to get individual county estimates.

(4) If some (but not all) districts show confidentiality, subtract recorded district totals from the State total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

In some cases, data in the March report differed from earlier reports for the crop year in both total number of bales ginned and counties where ginning occurred. The January reports showed higher totals for some counties, and subtracting the January totals from the March totals for these counties yielded a negative number. In these cases, the activity for the county for that time period was considered zero. In instances where counties were recorded in the March final report, but not in earlier reports, the activity was assumed to have occurred sometime before January.

These counties were then added to the January listing as confidential counties, and distribution of ginning activity was then performed.

Kansas has only one small gin operating in the State, and this gin does not operate every year. Since the amount of cotton ginned at this facility is considered insignificant (less than 0.005 percent of the total cotton ginned in the United States in 1995), no emissions for Kansas were calculated.

Once all the cotton ginning activity was distributed using the methodologies above, PM10-FIL and PM25-FIL emissions were calculated. Table 1 presents the emission factors for cotton ginning. There are 2 sets of emission factors, one set for full PM controls (high-efficiency cyclone) and one set for conventional PM controls (screened drums or cages). For each State, a certain percentage of cotton ginning is assumed to apply conventional controls and full controls.[3] Table 2 shows the estimated percentage of crop by emission control method for each State. The equation for calculating emissions is:

$$E = \left[EF_c\left(Pc \times B\right)\right] + \left[EFf\left(Pf \times B\right)\right]$$

where
Pc = percent crop full controls,
Pf = percent crop conventional controls,
B = number of bales ginned,
EFc = full controls emission factor, and
EFf = conventional controls emission factor.

Table 1. Cotton Ginning Emission Factors [1]

Control Type	**PM-FIL (lb/bale)**	**PM10-FIL (lb/bale)**	**PM25-FIL (lb/bale)**
Full controls (high-efficiency cyclone)	2.4	0.82	0.024
Conventional controls (screened drums or cages)	3.1	1.2	0.031

Table 3 provides a national summary of activity and emissions by pollutant for the cotton ginning category. It is important to note that the cotton ginning values in Table 3 represent total activity and emissions. However, point source adjustments were completed on the emissions in the final nonpoint NEI. The final 2002 point source inventory contained State-supplied emissions for cotton ginning reported under point source SCCs 30200401 through 30200499. For the States that did not report nonpoint source emissions for this category and for which EPA's estimates were included in the final 2002 nonpoint NEI, EPA adjusted its nonpoint source emissions by subtracting the uncontrolled point source emissions from the nonpoint emissions. Uncontrolled point source PM10-PRI/-FIL and PM25-PRI/-FIL emissions were back-calculated using the point source control efficiencies that each State provided in the point source inventory. The uncontrolled point source emissions were summed to the county level, and subtracted from the county-level nonpoint PM10-PRI/-FIL and PM25-PRI/-FIL emissions. If the subtraction resulted in a negative or zero number for one or more of the pollutants, the nonpoint emissions for all of the pollutants (i.e., PM10-PRI/-FIL and PM25-PRI/-FIL) were set to zero. Note that EPA did not perform point source adjustments to the nonpoint emissions supplied by State agencies. It was assumed that the agencies completed point source adjustments to the nonpoint emissions they provided EPA.

COTTON GINNING (continued)
SCC: 2801000000

Table 2. Estimated Percentage of Crop By Emission Control Method [3]

State	Percentage of Crop		State	Percentage of Crop	
	Full Controls	Conventional Controls		Full Controls	Conventional Controls
Alabama	20	80	Missouri	20	80
Arizona	50	50	New Mexico	20	80
Arkansas	30	70	North	30	70
California	72	28	Oklahoma	20	80
Florida	20	80	South	20	80
Georgia	30	70	Tennessee	20	80
Louisiana	20	80	Texas	30	70
Mississippi	20	80	Virginia	20	80

Table 3. National Criteria Pollutant Emissions Summary:
Not Adjusted for Point Source Activity or Emissions

Pollutant Description and NIF 3.0 Pollutant Code	Emissions Factors (lb/bale)		Percentage of Crop [a] (National Average)		Emission Factor and Crop Percentage References	National Activity Level (Reference 2) (No. of Bales Ginned)	National Emissions (tons/year)
	Full Controls	Conventional Controls	Full Controls	Conventional Controls			
PM10-PRI / PM10-FIL	0.82	1.2	35	65	Reference 1 Reference 3	16,790,805	9,026
PM25-PRI / PM25-FIL	0.024	0.031	35	65	Reference 1 Reference 3	16,790,805	241

[a] Average is based on the average crop (average total bales ginned per year) from 1991 to 1995 for these States.

References

1. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 9.3.1 Cotton Harvesting." Research Triangle Park, NC. 1995.

2. U.S. Department of Agriculture, National Agricultural Statistics Service. "Reports by Commodity - Cotton Ginnings." 2002. http://www.usda.gov/nass/pubs/estindx1.htm#cotton

3. Johnson, 1996: Memorandum from Fred Johnson, National Cotton Council, Memphis, TN, to Bill Mayfield, U.S. Department of Agriculture, Memphis, TN. "Estimated Percent of Crop by Emission Control Method," July 23, 1996.

DRUM AND BARREL RECLAMATION
SCC: 2461160000

A number of facilities in the United States recondition used industrial packaging, including drums and barrels, for reuse. Approximately 35 million 55-barrel drums are reclaimed annually. As part of the reclamation process, many of these drums and barrels are placed in a furnace to burn off any residue remaining from prior use. This reclamation process results in CAP and HAP emissions. The emissions are assumed to be a function of the number of drums and barrels burned.

The Reusable Industrial Packaging Association (RIPA) was contacted to provide data on the number of drums and barrels reclaimed in furnaces. No calendar year 2002 data were available; the most recent data available were from surveys of reclamation companies for calendar year 2000. However, RIPA estimates that 20 million 55-gallon barrels were reclaimed using furnaces in the United States in 2002.[1]

The 2002 national emission estimates for drum and barrel reclamation were developed by multiplying the appropriate emission factors by the national activity estimate. Emission factors for most of the HAPs are from the U.S. Environmental Protection Agency's *Locating and Estimating Air Emissions From Sources of Polycyclic Organic Matter*.[2] The emission factor for lead is taken from *Locating and Estimating Air Emissions from Sources of Lead and Lead Compounds*.[3] Emission factors for NO_x and PM10-FIL were taken from EPA's Factor Information REtrieval (FIRE) database.[4] Emission factors for PM25-PRI and PM25-FIL are not available. Consequently, in order to include PM25-PRI and PM25-FIL emissions in the NEI, the PM25-PRI emission factor was set equal to the PM10-PRI emission factor, and the PM25-FIL emission factor was set equal to the PM10-FIL emission factor.

Eleven drum reclamation facilities that utilize furnaces were identified during the 112(c)(6) inventory effort.[5] Table 1 lists the nine counties where these facilities are located. Because furnace throughput for each facility is not available, national drum reclamation activity was allocated evenly among the 11 facilities. Table 2 presents the national summary of activity data, emission factors, and emissions for each pollutant. It is important to note that these values represent total emissions.

The nonpoint source emissions for IL and MD are not included in the final nonpoint source NEI because the emissions for the category are included in their point source inventories. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI for the remaining States. Point source emissions are classified under SCC 30902501 (Drum Cleaning/Reclamation, Drum Burning Furnace).

Table 1. Counties with Drum Reclamation Facilities

FIPS Code	State	County	Number of Facilities	National Activity Allocation Ratio
17031	IL	Cook	1	0.09091
19163	IA	Scott	1	0.09091
20015	KS	Butler	1	0.09091
20209	KS	Wyandotte	2	0.18182
24510	MD	Baltimore City	2	0.18182
27053	MN	Hennepin	1	0.09091
42003	PA	Allegheny	1	0.09091
42101	PA	Philadelphia	1	0.09091
45019	SC	Charleston	1	0.09091

DRUM AND BARREL RECLAMATION (continued)
SCC: 2461160000

Table 2. National Criteria and HAP Emissions Summary:
Not Adjusted for Point Source Activity or Emissions

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/10^3 barrels)[1]	Emission Factor Reference	Converted Emission Factor (lb/10^3 barrels)	National Activity (barrels)	National Emissions (tons/yr)
Acenaphthene	83329	2.85E-06	Reference 2		20,000,000	2.85E-05
Acenaphthylene	208968	7.07E-07	Reference 2		20,000,000	7.07E-06
Anthracene	120127	2.63E-06	Reference 2		20,000,000	2.63E-05
Benz[a]anthracene	56553	3.54E-07	Reference 2		20,000,000	3.54E-06
Benzo[b]fluoranthene	205992	1.33E-07	Reference 2		20,000,000	1.33E-06
Chrysene	218019	6.63E-08	Reference 2		20,000,000	6.63E-07
Fluoranthene	206440	5.30E-07	Reference 2		20,000,000	5.30E-06
Fluorene	86737	6.32E-06	Reference 2		20,000,000	6.32E-05
Lead	7439921	3.50E-04	Reference 3	3.50E-01	20,000,000	3.50E+00
Naphthalene	91203	1.67E-05	Reference 2		20,000,000	1.67E-04
Nitrogen Oxides	NO_X	2.30E-03	Reference 5	2.30E+00	20,000,000	2.30E+01
Phenanthrene	85018	4.66E-06	Reference 2		20,000,000	4.66E-05
PM10-PRI	PM10-PRI	2.00E-02	Reference 4	2.00E+01	20,000,000	2.00E+02
PM10-FIL	PM10-FIL	2.00E-02	Reference 4	2.00E+01	20,000,000	2.00E+02
PM25-PRI	PM25-PRI	2.00E-02	Reference 4	2.00E+01	20,000,000	2.00E+02
PM25-FIL	PM25-FIL	2.00E-02	Reference 4	2.00E+01	20,000,000	2.00E+02
Pyrene	129000	6.63E-07	Reference 2		20,000,000	6.63E-06

[1] All emission factors reported in lb/10^3 barrels except lead, NO_X, and PM10-FIL, which are reported in lb/barrel.
[2] Emission factors for PM25-PRI and PM25-FIL are not available. The PM25-PRI emission factor was set equal to the PM10-PRI emission factor, and the PM25-FIL emission factor was set equal to the PM10-FIL emission factor.

Sample Calculation: Acenaphthene

$$Emissions = \frac{Emission\ Factor\ (\frac{lb}{10^3\ barrel}) * 2002\ Activity\ (10^3 barrels)}{2000\ lb/ton}$$

$$Emissions = \frac{2.85E-06 \frac{\text{lb}}{10^3 barrel} \ * \ 20{,}000\ 10^3 barrels}{2000\ lb\ /\ ton} = \ 2.85E-05\ tons$$

DRUM AND BARREL RECLAMATION (continued)
SCC: 2461160000

References

1. C.L. Pettit, Director, Regulatory & Technical Affairs, Reusable Industrial Packaging Association. Personal communication with Holly Lindquist, E.H. Pechan & Associates, Inc. November, 2003.

2. U.S. Environmental Protection Agency. 1998 *Locating and Estimating Air Emissions From Sources of Polycyclic Organic Matter*. Office of Air Quality Planning and Standards. Research Triangle Park, NC. 3.

3. U.S. Environmental Protection Agency. 1998 *Locating and Estimating Air Emissions From Sources of Lead and Lead Compounds*. Office of Air Quality Planning and Standards. Research Triangle Park, NC.

4. U.S. Environmental Protection Agency. Factor Information Retrieval (FIRE) System. Office of Air Quality Planning and Standards. Research Triangle Park, NC, accessed 2002.

5. U.S. Environmental Protection Agency. *1990 Emissions Inventory of Section 112(c)(6) Pollutants: Polycyclic Organic Matter (POM), 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)/2,3,7,8-Tetrachlorodibenzofuran (TCDF), Polychlorinated Biphenyl Compounds (PCBs), Hexachlorobenzene, Mercury, and Alkylated Lead*. Office of Air Quality Planning and Standards. Research Triangle Park, NC. 1998.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL
SCCs: 2103001000 and 2103002000

The mass of coal consumed by commercial/institutional combustion in the U.S. was used to estimate emissions. Coal consumption by energy use sector is presented in State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level total fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

EIA data do not distinguish between anthracite and bituminous/subbituminous coal consumption estimates. The EIA table “Domestic and Foreign Distribution of U.S. Coal by State of Origin, 2001,” provides State-level residential and commercial coal distribution data for 2001 that were used to develop separate estimates of anthracite and bituminous/subbituminous coal consumption.[2] The residential and commercial sectors were combined in the EIA table. The 2001 ratio of anthracite (and bituminous/subbituminous) coal consumption to total coal consumption was used to distribute the EIA’s total commercial/institutional sector coal consumption data by coal type. Table 1 presents the 2001 anthracite and bituminous/subbituminous coal ratios for each State.

Table 1. 2001 Anthracite and Bituminous/Subbituminous Coal Distribution for the Residential and Commercial Sectors

State	Ratio of Bituminous/ Subbituminous	Ratio of Anthracite	State	Ratio of Bituminous/ Subbituminous	Ratio of Anthracite
Alaska	1	0	Montana	1	0
Alabama	1	0	North Carolina	1	0
Arkansas	0	0	North Dakota	1	0
Arizona	1	0	Nebraska	1	0
California	0	0	New Hampshire	0	1
Colorado	0.976	0.024	New Jersey	0	1
Connecticut	0	1	New Mexico	1	0
District of Columbia	1	0	Nevada	1	0
Delaware	0	1	New York	0.667	0.333
Florida	1	0	Ohio	0.978	0.022
Georgia	1	0	Oklahoma	1	0
Hawaii	0	0	Oregon	0	0
Iowa	1	0	Pennsylvania	0.424	0.576
Idaho	1	0	Rhode Island	0	1
Illinois	1	0	South Carolina	0	0
Indiana	0.964	0.036	South Dakota	1	0
Kansas	0	0	Tennessee	1	0
Kentucky	1	0	Texas	1	0
Louisiana	0	0	Utah	1	0
Massachusetts	0.375	0.625	Virginia	1	0
Maryland	0.974	0.026	Vermont	0	1
Maine	0	1	Washington	1	0
Michigan	0.889	0.111	Wisconsin	1	0
Minnesota	1	0	West Virginia	0.979	0.021
Missouri	1	0	Wyoming	1	0
Mississippi	0	0			

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2103001000 and 2103002000

State-level coal consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[3] This allocation specifically used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in each State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

In some cases (see Table 2 below), SO_2, PM_{10}, and $PM_{2.5}$ emission factors required information on the sulfur and/or ash content of the coal burned. State-specific sulfur and ash contents of anthracite and sulfur contents of bituminous/subbituminous coal were obtained from data compiled in preparing 1999 residential coal combustion emissions inventory estimates.[4] This study mostly relied on data obtained from the U.S. Geological Survey's COALQUAL database. States not included in the database but that reported coal usage were assigned values based on their proximity to coal seams or using an average value for Pennsylvania (see 1999 inventory report for details of the analysis). Table 3 presents the bituminous/subbituminous coal sulfur content values used for each State. For anthracite coal, an ash content value of 13.38 and a sulfur content of 0.89 were applied to all States except New Mexico (ash content 16.61%, sulfur content 0.77%), Washington (ash content 12%, sulfur content 0.9%), and Virginia (ash content 13.38%, sulfur content 0.43%).

Table 2. SO_2 and PM Emission Factors for Commercial/Institutional Anthracite and Bituminous/Subbituminous Coal Combustion

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	AP-42 Table
Anthracite Emission Factors (SCC 2103001000)		
PM-CON	0.08	1.2-3
PM10-FIL	1.1 * % Ash	1.2-4
PM25-FIL	0.48 * % Ash	1.2-4
PM10-PRI	1.1 * % Ash + 0.08	1.2-3 and 1.2-4
PM25-PRI	0.48 * % Ash + 0.08	1.2-3 and 1.2-4
SO_2	39 * % Sulfur	1.2-1
Bituminous/Subbituminous Emission Factors (SCC 2103002000)		
PM-CON	1.04	1.1-5
PM10-FIL	12	1.1-9
PM25-FIL	1.4	1.1-9
PM10-PRI	13.04	1.1-5 and 1.1-9
PM25-PRI	2.44	1.1-5 and 1.1-9
SO_2	38 * % Sulfur	1.1-3

Note: PM_{10}, $PM_{2.5}$, and condensible PM emission factors for bituminous/subbituminous coal do not require ash content, nor does the condensible PM emission factor for anthracite coal.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2103001000 and 2103002000

Table 3. State-Specific Sulfur Content for Bituminous/Subbituminous Coal (SCC 2103002000)

State	Percent Sulfur Content	State	Percent Sulfur Content
Alabama	2.08	Montana	0.60
Alaska	0.31	Nebraska	2.43
Arizona	0.47	Nevada	2.30
Arkansas	1.20	New Hampshire	2.42
California	0.47	New Jersey	2.42
Colorado	0.61	New Mexico	0.75
Connecticut	2.42	New York	2.42
Delaware	1.67	North Carolina	1.62
District of Columbia	1.67	North Dakota	0.97
Florida	1.28	Ohio	3.45
Georgia	1.28	Oklahoma	3.08
Hawaii	1.00	Oregon	0.50
Idaho	0.31	Pennsylvania	2.42
Illinois	3.48	Rhode Island	2.42
Indiana	2.49	South Carolina	1.28
Iowa	4.64	South Dakota	0.97
Kansas	5.83	Tennessee	1.62
Kentucky	1.93	Texas	1.14
Louisiana	0.86	Utah	0.80
Maine	2.42	Vermont	2.42
Maryland	1.67	Virginia	1.19
Massachusetts	2.42	Washington	0.50
Michigan	1.20	West Virginia	1.25
Minnesota	0.97	Wisconsin	1.00
Mississippi	1.24	Wyoming	0.87
Missouri	3.39		

PM10-FIL/PRI and PM25-FIL/PRI emission factors for Commercial/Institutional Anthracite Coal are based on boilers controlled by multiple cyclones. Control efficiency table records were added to the NEI using the primary device type code 121 (multiple cyclones). Due to a lack of control efficiency data, the control efficiency fields were left blank in the NEI.

PM10-FIL/PRI and PM25-FIL/PRI emission factors for Commercial/Institutional Bituminous/Subbituminous Coal are based on boilers controlled by multiple cyclone with fly ash reinjection. CE records were added to the NEI using the primary device type code 077 (multiple cyclone with fly ash reinjection). Due to a lack of control efficiency data, the control efficiency fields were left blank in the NEI.

CAP and HAP emissions were calculated by multiplying the total annual coal consumption in each county by an emission factor. All emission factors, except for Ammonia, are from AP-42.[5] Ammonia emission factors are from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[6] Some AP-42 HAP emission factors were updated based on current information supplied by EPA.[7] The HAP's were: Arsenic, Beryllium, Cadmium, Chromium, Formaldehyde, Lead, Manganese, Mercury, and Nickel. The emission factors table in Appendix C contains a field called "EFs Updated Sept05." HAP emission factors that were updated are marked in this field with an "X." Table 4 presents a summary of emission factors, total national commercial/ institutional anthracite coal consumption, and associated national emissions (SCC 2103001000). Table 5 presents a summary of emission factors, total national commercial/institutional bituminous/subbituminous coal consumption, and associated national emissions (SCC 2103002000). For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/institutional coal combustion emissions were estimated, but these emissions are not represented in the Table 4 and 5 totals (see section 2.5 of this report for the methodology used to estimate PR and VI emissions).

Table 4. National Criteria and HAP Emissions Summary for Commercial/Institutional Anthracite Coal Combustion (SCC 2103001000): Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/ton)	Emission Factor Reference	National Throughput (tons)	National Emissions (tons/year)
Ammonia	NH_3	0.030	Reference 6	319,378.88	4.79E+00
Arsenic	7440382	0.00041	Reference 7	319,378.88	6.55E-02
Beryllium	7440417	0.00021	Reference 7	319,378.88	3.35E-03
Biphenyl	92524	0.025	Reference 5 (Table 1.2-5)	319,378.88	3.99E+00
Cadmium	7440439	5.10e-05	Reference 7	319,378.88	8.14E-03
Carbon Monoxide	CO	0.6	Reference 5 (Table 1.2-2)	319,378.88	9.58E+01
Chromium	7440473	0.00026	Reference 7	319,378.88	4.15E-02
Lead	7439921	0.00042	Reference 7	319,378.88	6.71E-02
Manganese	7439965	0.00049	Reference 7	319,378.88	7.82E-02
Mercury	7439976	0.000083	Reference 7	319,378.88	1.33E-02
Naphthalene	91203	0.13	Reference 5 (Table 1.2-5)	319,378.88	2.08E+01
Nickel	7440020	0.00028	Reference 7	319,378.88	4.47E-02
Nitrogen Oxides	NO_X	9	Reference 5 (Table 1.2-1)	319,378.88	1.44E+03
Phenanthrene	85018	0.0068	Reference 5 (Table 1.2-5)	319,378.88	1.09E+00
PM-CON	PM-CON	0.08	Reference 5 (Table 1.2-3)	319,378.88	1.28E+01
PM10-FIL	PM10-FIL	1.1*State-specific % ash content	Reference 5 (Table 1.2-4)	319,378.88	2.35E+03
PM25-FIL	PM25-FIL	0.48*State-specific % ash content	Reference 5 (Table 1.2-4)	319,378.88	1.03E+03
PM10-PRI	PM10-PRI	1.1*State-specific % ash content + 0.08	Reference 5 (Tables 1.2-3 and 1.2-4)	319,378.88	2.36E+03
PM25-PRI	PM25-PRI	0.48*State-specific % ash content + 0.08	Reference 5 (Tables 1.2-3 and 1.2-4)	319,378.88	1.04E+03
Selenium	7782492	0.0013	Reference 5 (Table 1.2-7)	319,378.88	2.08E-01
Sulfur Dioxide	SO_2	39*State-specific % sulfur content	Reference 5 (Table 1.2-1)	319,378.88	5.54E+03
Volatile Organic Compounds	VOC	0.3	Reference 5 (Table 1.2-6)	319,378.88	4.79E+01

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2103001000 and 2103002000

Table 5. National Criteria and HAP Emissions Summary for Commercial/Institutional Bituminous/ Subbituminous Coal Combustion (SCC 2103002000): Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Throughput (tons)	National Emissions (tons/year)
Ammonia	NH_3	0.030	Reference 6	2,128,165.29	3.19E+01
Arsenic	7440382	0.00041	Reference 7	2,128,165.29	4.36E-01
Cadmium	7440439	0.00051	Reference 7	2,128,165.29	5.43E-02
Carbon Monoxide	CO	5	Reference 5 (Table 1.1-3)	2,128,165.29	5.32E+03
Chromium	7440473	0.00026	Reference 7	2,128,165.29	2.77E-01
Formaldehyde	50000	0.00024	Reference 7	2,128,165.29	2.55E-01
Hydrochloric Acid	7647010	1.2	Reference 5 (Table 1.1-15)	2,128,165.29	1.28E+03
Hydrogen Fluoride	7664393	0.15	Reference 5 (Table 1.1-15)	2,128,165.29	1.60E+02
Lead	7439921	0.00042	Reference 7	2,128,165.29	4.47E-01
Nitrogen Oxides	NO_X	11	Reference 5 (Table 1.1-3)	2,128,165.29	1.17E+04
PM-CON	PM-CON	1.04	Reference 5 (Table 1.1-5)	2,128,165.29	1.11E+03
PM10-FIL	PM10-FIL	12	Reference 5 (Table 1.1-9)	2,128,165.29	1.28E+04
PM25-FIL	PM25-FIL	1.4	Reference 5 (Table 1.1-9)	2,128,165.29	1.49E+03
PM10-PRI	PM10-PRI	13.04	Reference 5 (Tables 1.1-5 and 1.1-9)	2,128,165.29	1.39E+04
PM25-PRI	PM25-PRI	2.44	Reference 5 (Tables 1.1-5 and 1.1-9)	2,128,165.29	2.60E+03
Sulfur Dioxide	SO_2	38*State-specific % sulfur content	Reference 5 (Table 1.1-3)	2,128,165.29	6.74E+04
Volatile Organic Compounds	VOC	0.05	Reference 5 (Table 1.1-19)	2,128,165.29	5.32E+01

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2103001000 and 2103002000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{ton\ coal}\right) \times National\ Activity\left(\frac{tons\ coal\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions\ from\ anthracite\ coal\ combusion = \frac{\frac{1.3E-03\ lb}{ton} \times\ 319{,}378.88\ tons}{2000\ \frac{lb}{ton}} = 2.08E-01\ tons$$

References:

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FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: DISTILLATE OIL
SCC: 2103004000

The State-level volume of distillate oil consumed by the commercial/institutional sector was used to estimate emissions. Distillate oil consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Because 2002 consumption data were not yet available when this inventory was prepared in November 2004, year 2001 consumption data were used to estimate 2002 emissions. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with the point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level distillate oil consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[2] This allocation procedure used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for distillate oil were taken from AP-42.[3] For all counties in the United States, the distillate oil consumed by commercial/institutional combustion is assumed to be No. 2 fuel oil with a heating value of 140,000 Btu per gallon and a sulfur content of 0.30%.[4] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[5] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[6]

County-level pollutant emissions were calculated by multiplying nonpoint source distillate oil consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source distillate oil burned, and national nonpoint emissions from commercial/institutional combustion of distillate oil. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/institutional distillate oil combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Emissions Summary for Commercial/Institutional Distillate Oil Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	0.000021	Reference 5	3,162,524.70	3.32E-02
Acenaphthylene	208968	2.52E-07	Reference 5	3,162,524.70	3.98E-04
Acetaldehyde	75070	0.0049	Reference 5	3,162,524.70	7.75E+00
Ammonia	NH_3	0.8	Reference 6	3,162,524.70	1.27E+03
Anthracene	120127	1.218e-06	Reference 5	3,162,524.70	1.93E-03
Arsenic	7440382	0.00056	Reference 5	3,162,524.70	8.86E-01
Benz[a]Anthracene	56553	4.06e-06	Reference 5	3,162,524.70	6.42E-03
Benzene	71432	0.00021	Reference 5	3,162,524.70	3.32E-01
Benzo[b+k]Fluoranthene	102	1.54e-06	Reference 5	3,162,524.70	2.44E-03
Benzo[g,h,i,]Perylene	191242	2.24e-06	Reference 5	3,162,524.70	3.54E-03
Beryllium	7440417	4.20e-04	Reference 5	3,162,524.70	6.64E-01
Cadmium	7440439	4.20e-04	Reference 5	3,162,524.70	6.64E-01
Carbon Monoxide	CO	5	Reference 3 (Table 1.3-1)	3,162,524.70	7.91E+03

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: DISTILLATE OIL (continued)
SCC: 2103004000

Table 1 (continued)

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Chromium	7440473	4.20e-04	Reference 5	3,162,524.70	6.64E-01
Chrysene	218019	2.38e-06	Reference 5	3,162,524.70	3.76E-03
Dibenzo[a,h]Anthracene	53703	1.68e-06	Reference 5	3,162,524.70	2.66E-03
Fluoranthene	206440	4.90e-06	Reference 5	3,162,524.70	7.75E-03
Fluorene	86737	4.48e-06	Reference 5	3,162,524.70	7.08E-03
Formaldehyde	50000	0.0336	Reference 5	3,162,524.70	5.31E+01
Indeno[1,2,3-c,d]Pyrene	193395	2.10e-06	Reference 5	3,162,524.70	3.32E-03
Lead	7439921	0.00126	Reference 5	3,162,524.70	1.99E+00
Manganese	7439965	0.00084	Reference 5	3,162,524.70	1.33E+00
Mercury	7439976	0.00042	Reference 5	3,162,524.70	6.64E-01
Naphthalene	91203	0.001134	Reference 5	3,162,524.70	1.79E+00
Nickel	7440020	0.00042	Reference 5	3,162,524.70	6.64E-01
Nitrogen Oxides	NO_X	20	Reference 3 (Table 1.3-1)	3,162,524.70	3.16E+04
Phenanthrene	85018	1.05e-05	Reference 6	3,162,524.70	1.66E-02
PM-CON	PM-CON	1.3	Reference 3 (Table 1.3-2)	3,162,524.70	2.06E+03
PM10-FIL	PM10-FIL	1.08	Reference 3 (Table 1.3-7)	3,162,524.70	1.71E+03
PM25-FIL	PM25-FIL	0.83	Reference 3 (Table 1.3-7)	3,162,524.70	1.31E+03
PM10-PRI	PM10-PRI	2.38	Reference 3 (Tables 1.3-2 and 1.3-7)	3,162,524.70	3.76E+03
PM25-PRI	PM25-PRI	2.13	Reference 3 (Tables 1.3-2 and 1.3-7)	3,162,524.70	3.37E+03
Pyrene	129000	4.20e-06	Reference 5	3,162,524.70	6.64E-03
Selenium	7782492	0.0021	Reference 5	3,162,524.70	3.32E+00
Sulfur Dioxide	SO_2	142* % sulfur content	Reference 3 (Table 1.3-1)	3,162,524.70	6.74E+04
Volatile Organic Compounds	VOC	0.34	Reference 3 (Table 1.3-3)	3,162,524.70	5.38E+02

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: DISTILLATE OIL (continued)
SCC: 2103004000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) =$$

$$\frac{Emission\ Factor\left(\frac{lb}{MM\ Btu\ Oil}\right)\times\frac{0.14\ MMBtu}{gal}\times\frac{1000\ gallons}{1\ thousand\ gallons}\times National\ Activity\left(\frac{thousands\ of\ gal\ oil\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions =$$

$$\frac{\frac{1.5E-05\ lb}{MMBtu}\times\frac{0.14\ MMBtu}{gallon}\times\frac{1000\ gallons}{1\ thousand\ gallons}\times\ 3{,}162{,}524.70\ thousand\ gal}{2000\ \frac{lb}{ton}} = 3.32E-00\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_df.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_ residfuel_inven_apr2003.zip, accessed November 2004.

5. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: KEROSENE
SCC: 2103011000

The State-level volume of kerosene consumed by the commercial/institutional sector was used to estimate emissions. Kerosene consumption by energy use sector is available from the Energy Information Administration (EIA).[1] Because 2002 consumption was not yet available when this inventory was prepared in November 2004, year 2001 consumption data were used to estimate 2002 emissions. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level kerosene consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[2] This allocation procedure used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Distillate oil emission factors were multiplied by a factor of 135/140 to convert them for use as kerosene emission factors. This factor is based on the ratio of the heat content of kerosene (135,000 Btu/gallon) to the heat content of distillate oil (140,000 Btu/gallon).[3] Distillate oil criteria pollutant emission factors were taken from AP-42.[4] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[5] A distillate oil sulfur content of 0.30% was used for kerosene.[3] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[6]

County-level pollutant emissions were calculated by multiplying nonpoint source kerosene consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source kerosene burned, and national nonpoint emissions from commercial/institutional combustion of kerosene. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/institutional kerosene combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Emissions Summary for Commercial/Institutional Kerosene Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	2.025e-05	Reference 5	230,093.70	2.33E-03
Acenaphthylene	208968	2.43e-07	Reference 5	230,093.70	2.80E-05
Acetaldehyde	75070	0.004725	Reference 5	230,093.70	5.44E-01
Ammonia	NH_3	0.80	Reference 6	230,093.70	8.88E+01
Anthracene	120127	1.1745e-06	Reference 5	230,093.70	1.35E-04
Arsenic	7440382	0.00054	Reference 5	230,093.70	6.21E-02
Benz[a]Anthracene	56553	3.915e-06	Reference 5	230,093.70	4.50E-04
Benzene	71432	0.0002025	Reference 5	230,093.70	2.33E-02
Benzo[b+k]Fluoranthene	102	1.485e-06	Reference 5	230,093.70	1.71E-04
Benzo[g,h,i,]Perylene	191242	2.16e-06	Reference 5	230,093.70	2.49E-04
Beryllium	7440417	0.000405	Reference 5	230,093.70	4.66E-02
Cadmium	7440439	0.000405	Reference 5	230,093.70	4.66E-02
Carbon Monoxide	CO	4.821428571	Reference 4 (Table 1.3-1)	230,093.70	5.55E+02
Chromium	7440473	0.000405	Reference 5	230,093.70	4.66E-02

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: KEROSENE (continued)
SCC: 2103011000

Table 1 (continued)

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Chrysene	218019	2.295e-06	Reference 5	230,093.70	2.64E-04
Dibenzo[a,h]Anthracene	53703	1.62e-06	Reference 5	230,093.70	1.86E-04
Fluoranthene	206440	4.725e-06	Reference 5	230,093.70	5.44E-04
Fluorene	86737	4.32e-06	Reference 5	230,093.70	4.97E-04
Formaldehyde	50000	0.0324	Reference 5	230,093.70	3.73E+00
Indeno[1,2,3-c,d]Pyrene	193395	0.000002025	Reference 5	230,093.70	2.33E-04
Lead	7439921	0.001215	Reference 5	230,093.70	1.40E-01
Manganese	7439965	0.00081	Reference 5	230,093.70	9.32E-02
Mercury	7439976	0.000405	Reference 5	230,093.70	4.66E-02
Naphthalene	91203	0.0010935	Reference 5	230,093.70	1.26E-01
Nickel	7440020	0.000405	Reference 5	230,093.70	4.66E-02
Nitrogen Oxides	NO_X	19.28571429	Reference 4 (Table 1.3-1)	230,093.70	2.22E+03
Phenanthrene	85018	0.000010125	Reference 6	230,093.70	1.16E-03
PM-CON	PM-CON	1.253571429	Reference 4 (Table 1.3-2)	230,093.70	1.44E+02
PM10-FIL	PM10-FIL	1.041428571	Reference 4 (Table 1.3-7)	230,093.70	1.20E+02
PM25-FIL	PM25-FIL	0.800357143	Reference 4 (Table 1.3-7)	230,093.70	9.21E+01
PM10-PRI	PM10-PRI	2.295	Reference 4 (Tables 1.3-2 and 1.3-7)	230,093.70	2.64E+02
PM25-PRI	PM25-PRI	2.053928572	Reference 4 (Tables 1.3-2 and 1.3-7)	230,093.70	2.36E+02
Pyrene	129000	4.05e-06	Reference 5	230,093.70	4.66E-04
Selenium	7782492	0.002025	Reference 5	230,093.70	2.33E-01
Sulfur Dioxide	SO_2	142 * % sulfur content	Reference 4 (Table 1.3-1)	230,093.70	4.73E+03
Volatile Organic Compounds	VOC	0.327857143	Reference 4 (Table 1.3-3)	230,093.70	3.77E+01

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: KEROSENE (continued)
SCC: 2103011000

Example Calculation:

$$National\ Emissions\left(\frac{lbs}{year}\right) = Distillate\ \ Emission\ Factor\left(\frac{lb}{millionBtu}\right) \times \frac{.14\,million\ Btu}{gallon} \times \frac{1000\text{ gallons}}{1\text{ thousand gallons}} \times$$

$$Distillate\,to\,Kerosene\,Conversion\left(\frac{135}{140}\right) \times National\ Activity\left(\frac{1000\ barrels}{year}\right) \times \frac{1\,ton}{2000\,lbs}$$

$$National\ Selenium\ Emissions = \frac{1.5\text{E - }05\ lb}{1\,million\ Btu} \times \frac{0.14\,million\ Btu}{gallon} \times \frac{1000\,gallons}{1\,thousand\ gallons}$$

$$\times \frac{135}{140} \times 230{,}093.70\ thousands\,of\ \ gallons \times \frac{1\,ton}{2000\,lbs} = 2.33E - 01\,tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_ks.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_ inven_apr2003.zip, accessed November 2004.

4. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

5. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants.” Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: LIQUEFIED PETROLEUM GAS
SCC: 2103007000

Commercial/institutional liquefied petroleum gas (LPG) combustion emissions were calculated using the volume of LPG consumed in the United States. State-level LPG consumption by sector is available from the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because these were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level LPG consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[2] This allocation procedure used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Pollutant emission factors for commercial/institutional LPG combustion are based on the commercial/institutional natural gas combustion emission factors.[3,4,5,6] For all counties in the United States, the natural gas consumed by commercial/institutional combustion is assumed to have a heating value of 1,050 Btu per cubic foot and a sulfur content of 2,000 grains per million cubic feet.[3] Natural gas emission factors originally presented in the units "pounds per million cubic feet" were converted to energy-based units using the 1,050 Btu/cubic foot conversion factor. Once all the natural gas emission factors were converted to energy-based units, the natural gas emission factors were converted to LPG emission factors by multiplying by 91,330 Btu/gallon.[7] See Appendix C for each step in the natural gas-to-LPG emission factor conversion process.

County-level criteria pollutant and HAP emissions were calculated by multiplying nonpoint source LPG consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emission factors, volume of nonpoint source LPG burned, and national nonpoint criteria pollutant and HAP emissions from commercial/institutional combustion of LPG. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/institutional LPG combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: LIQUEFIED PETROLEUM GAS (continued)
SCC: 2103007000

Table 1. National Criteria Pollutant and HAP Emissions Summary for Commercial/Institutional LPG Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousands of barrels)	Emission Factor Reference	National Throughput (thousands of barrels)	National Emissions (tons/year)
Acetaldehyde	75070	4.98662e-05	Reference 4	24,772.86	6.18E-04
Ammonia	NH_3	0.49	Reference 6	24,772.86	2.22E+01
Benzene	71432	0.00767172	Reference 3 (Table 1.4-3)	24,772.86	9.50E-02
Carbon Monoxide	CO	306.8688	Reference 3 (Table 1.4-1)	24,772.86	3.80E+03
Fluoranthene	206440	1.15076e-05	Reference 4	24,772.86	1.43E-04
Fluorene	86737	1.07404e-05	Reference 4	24,772.86	1.33E-04
Formaldehyde	50000	0.2876895	Reference 4	24,772.86	3.56E+00
Lead	7439921	0.0018266	Reference 3 (Table 1.4-2)	24,772.86	2.26E-02
Naphthalene	91203	0.002339875	Reference 4	24,772.86	2.90E-02
Nitrogen Oxides	NO_X	365.32	Reference 3 (Table 1.4-1)	24,772.86	4.53E+03
Phenanthrene	85018	6.52096e-05	Reference 4	24,772.86	8.08E-04
PM-CON	PM-CON	20.82324	Reference 3 (Table 1.4-2)	24,772.86	2.58E+02
PM10-FIL	PM10-FIL	6.94108	Reference 3 (Table 1.4-2)	24,772.86	8.60E+01
PM25-FIL	PM25-FIL	6.94108	Reference 3 (Table 1.4-2)	24,772.86	8.60E+01
PM10-PRI	PM10-PRI	27.76432	Reference 3 (Table 1.4-2)	24,772.86	3.44E+02
PM25-PRI	PM25-PRI	27.76432	Reference 3 (Table 1.4-2)	24,772.86	3.44E+02
Pyrene	129000	1.91793e-05	Reference 4	24,772.86	2.38E-04
Sulfur Dioxide	SO_2	2.19192	Reference 3 (Table 1.4-2)	24,772.86	2.72E+01
Volatile Organic Compounds	VOC	20.0926	Reference 3 (Table 1.4-2)	24,772.86	2.49E+02

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: LIQUEFIED PETROLEUM GAS (continued)
SCC: 2103007000

Example Calculation:

$$National\ Emissions = Natural\ Gas\ Emission\ Factor \left(\frac{lb}{million\ Btu}\right) \times \frac{91{,}330\ million\ Btu}{million\ gallons\ (LPG)} \times$$
$$\frac{42\ gallons}{barrel} \times \frac{1\ million barrels}{1000\ thousand barrels} \times National\ Activity \left(\frac{thousand barrels}{year}\right) \times \frac{1\ ton}{2{,}000\ lbs}$$

$$National\ fluorene\ emissions = \frac{2.8E-09\ lb}{million\ Btu} \times \frac{91{,}330\ million\ Btu}{million\ gallons} \times \frac{42\ gallons}{barrel} \times \frac{1\ million barrels}{1000\ thousand barrels} \times$$
$$\frac{24{,}772.86\ million\ cubic\ feet}{year} = 0.266\ lbs \times \frac{1\ ton}{2000\ lbs} = 1.33E-04\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_lg.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

5. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip, accessed November 2004.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

7. U.S. Department of Energy, Energy Information Administration, *2001 Glossary*, available from http://www.eia.doe.gov/emeu/recs/glossary.html, accessed September 2004.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: NATURAL GAS
SCC: 2103006000

The State-level volume of natural gas consumed by the commercial/institutional sector was used to estimate emissions. Natural gas consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the EIA.[1] Year 2001 consumption data were used to estimate 2002 emissions because these data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level natural gas consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[2] This allocation procedure used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for natural gas were taken from AP-42.[3] HAP emission factors are from AP-42 and "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[4] According to AP-42, natural gas has a heat content of 1,050 million Btus per million cubic feet.[3] This value was used to convert emission factors originally specified as "pounds per million Btu" to units of "pounds per million cubic feet." Natural gas is also assumed to have a sulfur content of 2,000 grains per million cubic feet.[5] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Report*.[6]

County-level criteria pollutant and HAP emissions were calculated by multiplying nonpoint source natural gas consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source natural gas burned, and national nonpoint criteria pollutant and HAP emissions from commercial/institutional combustion of natural gas. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/institutional natural gas combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Criteria Pollutant and HAP Emissions Summary for Commercial/Institutional Natural Gas Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/million cubic feet)	Emission Factor Reference	National Throughput (millions of cubic feet)	National Emissions (tons/year)
Acetaldehyde	75070	0.00001365	Reference 4	2,401,728	1.64E-02
Ammonia	NH_3	0.49	Reference 6	2,401,728	5.88E+02
Benzene	71432	0.0021	Reference 3 (Table 1.4-3)	2,401,728	2.52E+00
Carbon Monoxide	CO	84	Reference 3 (Table 1.4-1)	2,401,728	1.01E+05
Fluoranthene	206440	3.15e-06	Reference 4	2,401,728	3.78E-03
Fluorene	86737	2.94e-06	Reference 4	2,401,728	3.53E-03
Formaldehyde	50000	0.07875	Reference 4	2,401,728	9.46E+01
Lead	7439921	0.0005	Reference 3 (Table 1.4-2)	2,401,728	6.00E-01
Naphthalene	91203	0.0006405	Reference 4	2,401,728	7.69E-01
Nitrogen Oxides	NO_X	100	Reference 3 (Table 1.4-1)	2,401,728	1.20E+05
Phenanthrene	85018	0.00001785	Reference 4	2,401,728	2.14E-02
PM-CON	PM-CON	5.7	Reference 3 (Table 1.4-2)	2,401,728	2.28E+03
PM10-FIL	PM10-FIL	1.9	Reference 3 (Table 1.4-2)	2,401,728	9.13E+03
PM25-FIL	PM25-FIL	1.9	Reference 3 (Table 1.4-2)	2,401,728	2.28E+03
PM10-PRI	PM10-PRI	7.6	Reference 3 (Table 1.4-2)	2,401,728	9.13E+03
PM25-PRI	PM25-PRI	7.6	Reference 3 (Table 1.4-2)	2,401,728	6.84E+03
Pyrene	129000	5.25e-06	Reference 4	2,401,728	6.30E-03
Sulfur Dioxide	SO_2	0.6	Reference 3 (Table 1.4-2)	2,401,728	7.21E+02
Volatile Organic Compounds	VOC	5.5	Reference 3 (Table 1.4-2)	2,401,728	6.60E+03

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: NATURAL GAS (continued)
SCC: 2103006000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MMBtu}\right) \times \frac{1050\ MMBtu}{million\ ft^3} \times National\ Activity\left(\frac{million\ ft^3\ nat\ gas}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ fluorene\ emissions = \frac{\frac{2.8E-09\ lb}{MMBtu} \times \frac{1050\ MMBtu}{million\ ft^3} \times 2{,}401{,}728\ million\ ft^3}{2000\ \frac{tons}{yr}} = 3.53E-03\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_ng.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

5. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip, accessed November 2004.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: RESIDUAL OIL
SCC: 2103005000

The volume of residual oil consumed by the commercial/institutional sector in the U.S. was used to estimate emissions. Residual oil consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level residual oil consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 42, 44-45, 51-54, 56, 61-62, 71-72, and 81.[2] This allocation procedure used the ratio of the number of commercial/institutional sector employees in each county to the total number of commercial/institutional sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for residual oil were taken from AP-42.[3] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[4] According to AP-42 (page 1.3-8), #4, #5, and #6 residual oil have a heat content of 150 million Btus per thousand gallons.[3] Emission factors that were originally provided on a Btu basis were converted to physical units using this value. The midpoint of the range of sulfur content values provided in Appendix A of AP-42 (2.25%) was used in the PM and SO_2 emission calculations.[3] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report.*[5]

County-level pollutant emissions were calculated by multiplying nonpoint source residual oil consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source residual oil burned, and national nonpoint emissions from commercial/ institutional combustion of residual oil. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), commercial/ institutional combustion of residual oil emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

SCC: 2103005000

Table 1. National Emissions Summary for Commercial/Institutional Residual Oil Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	2.25e-05	Reference 4	327,738.61	3.69E-03
Acenaphthylene	208968	2.70e-07	Reference 4	327,738.61	4.42E-05
Acetaldehyde	75070	0.00525	Reference 4	327,738.61	8.60E-01
Ammonia	NH_3	0.8	Reference 5	327,738.61	1.31E+02
Anthracene	120127	1.305e-06	Reference 4	327,738.61	2.14E-04
Arsenic	7440382	0.00141	Reference 4	327,738.61	2.31E-01
Benz[a]Anthracene	56553	4.35e-06	Reference 4	327,738.61	7.13E-04
Benzene	71432	0.000225	Reference 4	327,738.61	3.69E-02
Benzo[b+k]Fluoranthene	102	1.65e-06	Reference 4	327,738.61	2.70E-04
Benzo[g,h,i,]Perylene	191242	2.40e-06	Reference 4	327,738.61	3.93E-04
Beryllium	7440417	3.00e-05	Reference 4	327,738.61	4.92E-03
Cadmium	7440439	4.20e-04	Reference 4	327,738.61	6.88E-02
Carbon Monoxide	CO	5	Reference 3 (Table 1.3-1)	327,738.61	8.19E+02
Chromium	7440473	0.0009	Reference 4	327,738.61	1.47E-01
Chrysene	218019	2.55e-06	Reference 4	327,738.61	4.18E-04
Dibenzo[a,h]Anthracene	53703	1.80e-06	Reference 4	327,738.61	2.95E-04
Fluoranthene	206440	5.25e-06	Reference 4	327,738.61	8.60E-04
Fluorene	86737	4.80e-06	Reference 4	327,738.61	7.87E-04
Formaldehyde	50000	0.036	Reference 4	327,738.61	5.90E+00
Indeno[1,2,3-c,d]Pyrene	193395	2.25e-06	Reference 4	327,738.61	3.69E-04
Lead	7439921	0.00165	Reference 4	327,738.61	2.70E-01
Manganese	7439965	0.00315	Reference 4	327,738.61	5.16E-01
Mercury	7439976	0.0001215	Reference 4	327,738.61	1.99E-02
Naphthalene	91203	0.001215	Reference 4	327,738.61	1.99E-01
Nickel	Nickel	0.09	Reference 4	327,738.61	1.47E+01
Nitrogen Oxides	NO_X	55	Reference 4	327,738.61	9.01E+03
Phenanthrene	85018	1.125e-05	Reference 4	327,738.61	1.84E-03
PM-CON	PM-CON	1.5	Reference 3 (Table 1.3-2)	327,738.61	2.46E+02
PM10-FIL	PM10-FIL	5.17 * (1.12 * % sulfur content + 0.37)	Reference 3 (Table 1.3-7)	327,738.61	2.45E+03
PM25-FIL	PM25-FIL	1.92 * (1.12 * % sulfur content + 0.37)	Reference 3 (Table 1.3-7)	327,738.61	9.09E+02
PM10-PRI	PM10-PRI	5.17 * (1.12 * % sulfur content + 0.37) + 1.5	Reference 3 (Tables 1.3-2 and 1.3-7)	327,738.61	2.69E+03
PM25-PRI	PM25-PRI	1.92 * (1.12 * % sulfur content + 0.37) + 1.5	Reference 3 (Tables 1.3-2 and 1.3-7)	327,738.61	1.16E+03
Pyrene	129000	0.0000045	Reference 4	327,738.61	7.37E-04
Selenium	7782492	0.000735	Reference 4	327,738.61	1.20E-01
Sulfur Dioxide	SO_2	157 * % sulfur content	Reference 3 (Table 1.3-1)	327,738.61	5.79E+04
Volatile Organic Compounds	VOC	1.13	Reference 3 (Table 1.3-3)	327,738.61	1.85E+02

FOSSIL FUEL COMBUSTION - COMMERCIAL/INSTITUTIONAL: RESIDUAL OIL (continued)
SCC: 2103005000

Example Calculation:

$$National\ selenium\ emissions = \frac{\frac{4.9\text{E-}06\ lb}{MMBtu} \times \frac{150\ MMBtu}{thousand\ gallons} \times 327{,}738.61\ thousand\ gal}{2000\ \frac{lb}{ton}} = 1.20E-01\ tons$$

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MMBtu}\right) \times \frac{150\ MMBtu}{thousand\ gallons} \times National\ Activity\left(\frac{thousands\ of\ gal\ oil\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_rf.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

5. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL

SCCs: 2102001000 and 2102002000

The mass of coal consumed by industrial combustion sector was used to estimate emissions. Coal consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

It was determined that for a number of States, the 2001 industrial sector coal consumption data also included coke consumption in the State. This coke consumption was subtracted from the 2001 data for these particular States. The EIA only reported 2001 year coke consumption on a national level and for the State of Indiana.[2] After subtracting Indiana's coke consumption from the national total, the remaining coke consumption was allocated to the States based on the proportion of coke distributed to each State in 2001.[3] Table 1 displays the estimated amount of coke consumed in each State in year 2001.

Table 1. Estimated 2001 Coke Consumption By State

State	2001 Coke Consumption (Tons)
Alabama	1,513,047
Illinois	881,059
Indiana	8,100,000
Kentucky	1,101,033
Michigan	1,125,474
New York	736,738
Pennsylvania	8,047,083
Ohio	1,780,740
Utah	592,416
Virginia	1,166,210
West Virginia	1,031,200

EIA data do not distinguish between anthracite and bituminous/subbituminous coal consumption estimates. The EIA table "Domestic and Foreign Distribution of U.S. Coal by State of Origin, 2001," provides State-level industrial coal distribution data for 2001 that was used to estimate the proportion of coal consumption associated with anthracite and bituminous/subbituminous coal.[4] The 2001 ratio of anthracite (and bituminous/subbituminous) coal consumption to total coal consumption was used to distribute the EIA's total industrial sector coal consumption data by coal type. Table 2 presents the 2001 anthracite and bituminous/subbituminous coal ratios for each State.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2102001000 and 2102002000

Table 2. 2001 Anthracite and Bituminous/Subbituminous Coal Distribution for the Industrial Sector

State	Bituminous/ Subbituminous Ratio	Anthracite Ratio	State	Bituminous/ Subbituminous Ratio	Anthracite Ratio
Alaska	1	0	Montana	0.993	0.007
Alabama	0.9997	0.0003	North Carolina	0.993	0.007
Arkansas	0.973	0.027	North Dakota	1	0
Arizona	1	0	Nebraska	1	0
California	1	0	New Hampshire	0	0
Colorado	0.952	0.048	New Jersey	0.741	0.259
Connecticut	0	0	New Mexico	1	0
District of Columbia	0	0	Nevada	1	0
Delaware	0.958	0.042	New York	0.997	0.003
Florida	1	0	Ohio	0.998	0.002
Georgia	1	0	Oklahoma	1	0
Hawaii	1	0	Oregon	0	0
Iowa	0.985	0.015	Pennsylvania	0.944	0.056
Idaho	1	0	Rhode Island	0	0
Illinois	0.9992	0.0008	South Carolina	0.988	0.012
Indiana	1	0	South Dakota	1	0
Kansas	0.991	0.009	Tennessee	0.996	0.004
Kentucky	0.997	0.003	Texas	0.9998	0.0002
Louisiana	1	0	Utah	1	0
Massachusetts	1	0	Virginia	0.9994	0.0006
Maryland	0.913	0.087	Vermont	0	0
Maine	1	0	Washington	1	0
Michigan	0.9992	0.0008	Wisconsin	0.996	0.004
Minnesota	0.998	0.002	West Virginia	0.996	0.004
Missouri	1	0	Wyoming	0.9994	0.0006
Mississippi	1	0			

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2102001000 and 2102002000

State-level coal consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 31-33.[5] This allocation procedure used the ratio of the number of industrial sector employees in each county to the total number of industrial sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

In some cases (see Table 3 below), SO_2 and PM emission factors required information on the sulfur or ash content of the coal burned. Sulfur and ash content values for anthracite and bituminous/subbituminous coal were obtained from data compiled in preparing 1999 residential coal combustion emissions estimates.[6] This study mostly relied on data obtained from U.S. Geological Survey (USGS) COALQUAL database. States not included in the database but that reported coal usage were assigned values based on their proximity to coal seams or the average value for Pennsylvania (see residential coal combustion report for details on these assignments). Table 4 presents the bituminous/subbituminous coal sulfur content values used for each State. For anthracite coal, an ash content value of 13.38 and a sulfur content of 0.89 were applied to all States except New Mexico (ash content 16.61%, sulfur content 0.77%), Washington (ash content 12%, sulfur content 0.9%), and Virginia (sulfur content 0.43%).

Table 3. SO_2 and PM Emission Factors for Industrial Anthracite and Bituminous/Subbituminous Coal Combustion

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	AP-42 Table
Anthracite Emission Factors (SCC 2102001000)		
PM-CON	0.08	1.2-3
PM10-FIL	1.1 * % Ash	1.2-4
PM25-FIL	0.48 * % Ash	1.2-4
PM10-PRI	1.1 * % Ash + 0.08	1.2-3 and 1.2-4
PM25-PRI	0.48 * % Ash + 0.08	1.2-3 and 1.2-4
SO_2	39 * % Sulfur	1.2-1
Bituminous/Subbituminous Emission Factors (SCC 2102002000)		
PM-CON	1.04	1.1-5
PM10-FIL	12	1.1-9
PM25-FIL	1.4	1.1-9
PM10-PRI	13.04	1.1-5 and 1.1-9
PM25-PRI	2.44	1.1-5 and 1.1-9
SO_2	38 * % Sulfur	1.1-3

Note: PM_{10}, $PM_{2.5}$, and condensible PM emission factors for bituminous/subbituminous coal do not require ash content, nor does the condensible PM emission factor for anthracite coal.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2102001000 and 2102002000

Table 4. State-Specific Sulfur Content for Bituminous/Subbituminous Coal (SCC 2102002000)

State	Percent Sulfur Content	State	Percent Sulfur Content
Alabama	2.08	Montana	0.60
Alaska	0.31	Nebraska	2.43
Arizona	0.47	Nevada	2.30
Arkansas	1.20	New Hampshire	2.42
California	0.47	New Jersey	2.42
Colorado	0.61	New Mexico	0.75
Connecticut	2.42	New York	2.42
Delaware	1.67	North Carolina	1.62
District of Columbia	1.67	North Dakota	0.97
Florida	1.28	Ohio	3.45
Georgia	1.28	Oklahoma	3.08
Hawaii	1.00	Oregon	0.50
Idaho	0.31	Pennsylvania	2.42
Illinois	3.48	Rhode Island	2.42
Indiana	2.49	South Carolina	1.28
Iowa	4.64	South Dakota	0.97
Kansas	5.83	Tennessee	1.62
Kentucky	1.93	Texas	1.14
Louisiana	0.86	Utah	0.80
Maine	2.42	Vermont	2.42
Maryland	1.67	Virginia	1.19
Massachusetts	2.42	Washington	0.50
Michigan	1.20	West Virginia	1.25
Minnesota	0.97	Wisconsin	1.00
Mississippi	1.24	Wyoming	0.87
Missouri	3.39		

PM10-FIL/PRI and PM25-FIL/PRI emission factors for Industrial Anthracite Coal are based on boilers controlled by multiple cyclones. CE records were added to the NEI using the primary device type code 121 (multiple cyclones). Due to a lack of control efficiency data, the control efficiency fields were left blank in the NEI.

PM10-FIL/PRI and PM25-FIL/PRI emission factors for Industrial Bituminous/Subbituminous Coal are based on boilers controlled by multiple cyclone with fly ash reinjection. CE records were added to the NEI using the primary device type code 077 (multiple cyclone with fly ash reinjection). Due to a lack of control efficiency data, the control efficiency fields were left blank in the NEI.

The remaining criteria pollutant and HAP emissions were calculated by multiplying the total coal consumed in each county per year by an emission factor. Most emission factors were taken from AP-42.[7] Ammonia emission factors were taken from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[8] Some HAP emission factors were updated based on current information from EPA.[9] The HAP's were: Arsenic, Beryllium, Cadmium, Chromium, Formaldehyde, Lead, Manganese, Mercury, and Nickel. The emission factors table in Appendix C contains a field called "EFs Updated Sept05." HAP emission factors that were updated are marked in this field with an "Sept 2005." Table 5 presents a summary of the emission factors, total nonpoint source industrial coal consumption, and national nonpoint source emissions from industrial anthracite coal combustion (SCC 2103001000). Table 6 presents analogous information for industrial bituminous/subbituminous coal combustion (SCC 2103002000). For Puerto Rico (PR) and the U.S. Virgin Islands (VI), industrial coal combustion emissions were estimated, but these emissions are not included in Tables 5 and 6 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 5. National Criteria and HAP Emissions Summary for Industrial Anthracite Coal Combustion (SCC 2102001000): Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Throughput (tons)	National Emissions (tons/year)
Ammonia	NH_3	0.030	Reference 8	109,699.94	1.65E+00
Arsenic	7440382	0.00041	Reference 9	109,699.94	2.25E-02
Beryllium	7440417	0.00021	Reference 9	109,699.94	1.15E-03
Biphenyl	92524	0.025	Reference 6 (Table 1.2-5)	109,699.94	1.37E+00
Cadmium	7440439	5.10e-05	Reference 9	109,699.94	2.80E-03
Carbon Monoxide	CO	0.6	Reference 6 (Table 1.2-2)	109,699.94	3.29E+01
Chromium	7440473	0.00026	Reference 9	109,699.94	1.43E-02
Lead	7439921	0.00042	Reference 9	109,699.94	2.30E-02
Manganese	7439965	0.00049	Reference 9	109,699.94	2.69E-02
Mercury	7439976	8.30e-05	Reference 9	109,699.94	4.55E-03
Naphthalene	91203	0.13	Reference 6 (Table 1.2-5)	109,699.94	7.13E+00
Nickel	7440020	0.00028	Reference 9	109,699.94	1.54E-02
Nitrogen Oxides	NO_X	9	Reference 6 (Table 1.2-1)	109,699.94	4.94E+02
Phenanthrene	85018	0.0068	Reference 6 (Table 1.2-5)	109,699.94	3.73E-01
PM-CON	PM-CON	0.08	Reference 6 (Table 1.2-3)	109,699.94	4.39E+00
PM10-FIL	PM10-FIL	1.1*State-specific % ash content	Reference 6 (Table 1.2-4)	109,699.94	8.07E+02
PM25-FIL	PM25-FIL	0.48*State-specific % ash content	Reference 6 (Table 1.2-4)	109,699.94	3.52E+02
PM10-PRI	PM10-PRI	1.1*State-specific % ash content + 0.08	Reference 6 (Tables 1.2-3 and 1.2-4)	109,699.94	8.12E+02
PM25-PRI	PM25-PRI	0.48*State-specific % ash content + 0.08	Reference 6 (Tables 1.2-3 and 1.2-4)	109,699.94	3.57E+02
Selenium	7782492	0.0013	Reference 6 (Table 1.2-7)	109,699.94	7.13E-02
Sulfur Dioxide	SO_2	39*State-specific % sulfur content	Reference 6 (Table 1.2-1)	109,699.94	1.90E+03
Volatile Organic Compounds	VOC	0.3	Reference 6 (Table 1.2-6)	109,699.94	1.65E+01

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2102001000 and 2102002000

Table 6. National Criteria and HAP Emissions Summary for Industrial Bituminous/Subbituminous Coal Combustion (SCC 2102002000): Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Throughput (tons)	National Emissions (tons/year)
Ammonia	NH_3	0.030	Reference 7	27,832,191.26	4.17E+02
Arsenic	7440382	0.00041	Reference 9	27,832,191.26	5.71E+00
Cadmium	7440439	0.000051	Reference 9	27,832,191.26	7.10E-01
Carbon Monoxide	CO	5	Reference 6 (Table 1.1-3)	27,832,191.26	6.96E+04
Chromium	7440473	0.00026	Reference 9	27,832,191.26	3.62E+00
Formaldehyde	50000	0.00024	Reference 9	27,832,191.26	3.34E+00
Hydrochloric Acid	7647010	1.2	Reference 6 (Table 1.1-15)	27,832,191.26	1.67E+04
Hydrogen Fluoride	7664393	0.15	Reference 6 (Table 1.1-15)	27,832,191.26	2.09E+03
Lead	7439921	0.00042	Reference 9	27,832,191.26	5.84E+00
Nitrogen Oxides	NO_X	11	Reference 6 (Table 1.1-3)	27,832,191.26	1.53E+05
PM-CON	PM-CON	1.04	Reference 6 (Table 1.1-5)	27,832,191.26	1.45E+04
PM10-FIL	PM10-FIL	12	Reference 6 (Table 1.1-9)	27,832,191.26	1.67E+05
PM25-FIL	PM25-FIL	1.4	Reference 6 (Table 1.1-9)	27,832,191.26	1.95E+04
PM10-PRI	PM10-PRI	13.04	Reference 6 (Tables 1.1-5 and 1.1-9)	27,832,191.26	1.81E+05
PM25-PRI	PM25-PRI	2.44	Reference 6 (Tables 1.1-5 and 1.1-9)	27,832,191.26	3.40E+04
Sulfur Dioxide	SO_2	38*State-specific % sulfur content	Reference 6 (Table 1.1-3)	27,832,191.26	8.76E+05
Volatile Organic Compounds	VOC	0.05	Reference 6 (Table 1.1-19)	27,832,191.26	6.96E+02

FOSSIL FUEL COMBUSTION - INDUSTRIAL: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCCs: 2102001000 and 2102002000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{ton\ coal}\right) \times National\ Activity\left(\frac{tons\ coal\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions\ from\ anthracite\ coal\ combustion = \frac{\frac{1.3E-03\ lb}{ton} \times\ 109{,}699.94\ tons}{2000\ \frac{lb}{ton}} = 7.13E-02\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, DC 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_cl.html, accessed November 2004.

2. U.S. Department of Energy, Energy Information Administration. "Annual Coal Report 2002," DOE/EIA-0584(2002). Washington, DC. Internet Address: http://tonto.eia.doe.gov/FTPROOT/coal/05842002.pdf, accessed August 2005.

3. U.S. Department of Energy, Energy Information Administration. "Domestic Distribution of U.S. Coal by Distribution State, Consumer, Destination and Method of Transportation, 2001." Washington, DC. Internet Address: http://tonto.eia.doe.gov/FTPROOT/coal/coaldistrib/coaldistrib.html, last modified October 12, 2004..

4. U.S. Department of Energy, Energy Information Administration (EIA). "Domestic and Foreign Distribution of U.S. Coal by State of Origin, 2001." Washington, DC. Internet Address: http://tonto.eia.doe.gov/FTPROOT/coal/coaldistrib/distables.pdf, accessed November 2004.

5. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files]. Washington, DC. Issued April 2003.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_ residfuel_inven_apr2003.zip, accessed November 2004.

7. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

8. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

9. Porter, Fred. U.S. Environmental Protection Agency. HAP Emission Factors for Industrial Boilers. Received from ERG via email on September 15, 2005.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: DISTILLATE OIL
SCC: 2102004000

The State-level volume of distillate oil consumed by the industrial sector was used to estimate emissions. Distillate oil consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Because 2002 consumption data were not yet available when this inventory was prepared in November 2004, year 2001 consumption data were used to estimate 2002 emissions. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level distillate oil consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 31-33.[2] This allocation procedure used ratio of the number of industrial sector employees in each county to the total number of industrial sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for distillate oil were taken from AP-42.[3] For all counties in the United States, the distillate oil consumed by industrial combustion is assumed to be No. 2 fuel oil with a heating value of 140,000 Btu per gallon and a sulfur content of 0.30%.[4] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[5] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report.*[6]

County-level pollutant emissions were calculated by multiplying nonpoint source distillate oil consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source distillate oil burned, and national nonpoint emissions from industrial combustion of distillate oil. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), industrial distillate oil combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Emissions Summary for Industrial Distillate Oil Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	2.10e-05	Reference 5	7,337,378.75	7.70E-02
Acenaphthylene	208968	2.52e-07	Reference 5	7,337,378.75	9.25E-04
Acetaldehyde	75070	0.0049	Reference 5	7,337,378.75	1.80E+01
Ammonia	NH_3	0.8	Reference 6	7,337,378.75	2.93E+03
Anthracene	120127	1.218e-06	Reference 5	7,337,378.75	4.47E-03
Arsenic	7440382	5.60e-04	Reference 5	7,337,378.75	2.05E+00
Benz[a]Anthracene	56553	4.06e-06	Reference 5	7,337,378.75	1.49E-02
Benzene	71432	2.10e-04	Reference 5	7,337,378.75	7.70E-01
Benzo[b+k]Fluoranthene	102	1.54e-06	Reference 5	7,337,378.75	5.65E-03
Benzo[g,h,i,]Perylene	191242	2.24e-06	Reference 5	7,337,378.75	8.22E-03
Beryllium	7440417	4.20e-04	Reference 5	7,337,378.75	1.54E+00
Cadmium	7440439	4.20e-04	Reference 5	7,337,378.75	1.54E+00
Carbon Monoxide	CO	5	Reference 3 (Table 1.3-1)	7,337,378.75	1.83E+04
Chromium	7440473	4.20e-04	Reference 5	7,337,378.75	1.54E+00
Chrysene	218019	2.38e-06	Reference 5	7,337,378.75	8.73E-03
Dibenzo[a,h]Anthracene	53703	1.68e-06	Reference 5	7,337,378.75	6.16E-03
Fluoranthene	206440	4.90e-06	Reference 5	7,337,378.75	1.80E-02

FOSSIL FUEL COMBUSTION - INDUSTRIAL: DISTILLATE OIL (continued)
SCC: 2102004000

Table 1 (continued)

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Fluorene	86737	4.48e-06	Reference 5	7,337,378.75	1.64E-02
Formaldehyde	50000	0.0336	Reference 5	7,337,378.75	1.23E+02
Indeno[1,2,3-c,d]Pyrene	193395	2.10e-06	Reference 5	7,337,378.75	7.70E-03
Lead	7439921	1.26e-03	Reference 5	7,337,378.75	4.62E+00
Manganese	7439965	8.40e-04	Reference 5	7,337,378.75	3.08E+00
Mercury	7439976	4.20e-04	Reference 5	7,337,378.75	1.54E+00
Naphthalene	91203	0.001134	Reference 5	7,337,378.75	4.16E+00
Nickel	7440020	0.00042	Reference 5	7,337,378.75	1.54E+00
Nitrogen Oxides	NO_X	20	Reference 3 (Table 1.3-1)	7,337,378.75	7.34E+04
Phenanthrene	85018	1.05e-05	Reference 5	7,337,378.75	3.85E-02
PM-CON	PM-CON	1.3	Reference 3 (Table 1.3-2)	7,337,378.75	4.77E+03
PM10-FIL	PM10-FIL	1	Reference 3 (Table 1.3-6)	7,337,378.75	3.67E+03
PM25-FIL	PM25-FIL	0.25	Reference 3 (Table 1.3-6)	7,337,378.75	9.17E+02
PM10-PRI	PM10-PRI	2.3	Reference 3 (Tables 1.3-2 and 1.3-6)	7,337,378.75	8.44E+03
PM25-PRI	PM25-PRI	1.55	Reference 3 (Tables 1.3-2 and 1.3-6)	7,337,378.75	5.69E+03
Pyrene	129000	4.20e-06	Reference 5	7,337,378.75	1.54E-02
Selenium	7782492	0.0021	Reference 5	7,337,378.75	7.70E+00
Sulfur Dioxide	SO_2	142 * % sulfur content	Reference 3 (Table 1.3-1)	7,337,378.75	1.56E+05
Volatile Organic Compounds	VOC	0.2	Reference 3 (Table 1.3-3)	7,337,378.75	7.34E+02

FOSSIL FUEL COMBUSTION - INDUSTRIAL: DISTILLATE OIL (continued)
SCC: 2102004000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MM\ Btu\ Oil}\right) \times \frac{0.14\ MMBtu}{gal} \times \frac{1000\ gallons}{1\ thousand\ gallons} \times National\ Activity\left(\frac{thousands\ of\ gal\ oil\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions = \frac{\frac{1.5E-05\ lb}{MMBtu} \times \frac{0.14\ MMBtu}{gallon} \times \frac{1000\ gallons}{1\ thousand\ gallons} \times\ 7{,}337{,}378.75\ thousand\ gal}{2000\ \frac{lb}{ton}} = 7.70E+00\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_df.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip, accessed November 2004.

5. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: KEROSENE
SCC: 2102011000

The State-level volume of kerosene consumed by the industrial sector was used to estimate emissions. Kerosene consumption by energy use sector is available from the Energy Information Administration (EIA).[1] Because 2002 consumption data were not yet available when this inventory was prepared in November 2004, year 2001 consumption data were used to estimate 2002 emissions. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level kerosene consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 31-33.[2] This allocation procedure used ratio of the number of industrial sector employees in each county to the total number of industrial sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Distillate oil emission factors were multiplied by a factor of 135/140 to convert them for use as kerosene emission factors. This factor is based on the ratio of the heat content of kerosene (135,000 Btu/gallon) to the heat content of distillate oil (140,000 Btu/gallon).[3] Distillate oil criteria pollutant emission factors were taken from AP-42.[4] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[5] A distillate oil sulfur content of 0.30% was used for kerosene.[3] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources*, *Draft Final Report*.[6]

County-level pollutant emissions were calculated by multiplying nonpoint source kerosene consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source kerosene burned, and national nonpoint emissions from industrial combustion of kerosene. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), industrial kerosene combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Emissions Summary for Industrial Kerosene Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	2.025e-05	Reference 5	137,062.92	1.39E-03
Acenaphthylene	208968	2.43e-07	Reference 5	137,062.92	1.67E-05
Acetaldehyde	75070	0.004725	Reference 5	137,062.92	3.24E-01
Ammonia	NH3	0.80	Reference 6	137,062.92	5.29E+01
Anthracene	120127	1.1745e-06	Reference 5	137,062.92	8.05E-05
Arsenic	7440382	0.00054	Reference 5	137,062.92	3.70E-02
Benz[a]Anthracene	56553	3.915e-06	Reference 5	137,062.92	2.68E-04
Benzene	71432	0.0002025	Reference 5	137,062.92	1.39E-02
Benzo[b+k]Fluoranthene	102	1.49e-06	Reference 5	137,062.92	1.02E-04
Benzo[g,h,i,]Perylene	191242	2.16e-06	Reference 5	137,062.92	1.48E-04
Beryllium	7440417	0.000405	Reference 5	137,062.92	2.78E-02
Cadmium	7440439	0.000405	Reference 5	137,062.92	2.78E-02
Carbon Monoxide	CO	4.821428571	Reference 4 (Table 1.3-1)	137,062.92	3.30E+02
Chromium	7440473	0.000405	Reference 5	137,062.92	2.78E-02
Chrysene	218019	2.30e-06	Reference 5	137,062.92	1.57E-04

FOSSIL FUEL COMBUSTION - INDUSTRIAL: KEROSENE (continued)
SCC: 2102011000

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Dibenzo[a,h]Anthracene	53703	1.62e-06	Reference 5	137,062.92	1.11E-04
Fluoranthene	206440	4.725e-06	Reference 5	137,062.92	3.24E-04
Fluorene	86737	4.32e-06	Reference 5	137,062.92	2.96E-04
Formaldehyde	50000	0.0324	Reference 5	137,062.92	2.22E+00
Indeno[1,2,3-c,d]Pyrene	193395	2.025e-06	Reference 5	137,062.92	1.39E-04
Lead	7439921	0.001215	Reference 5	137,062.92	8.33E-02
Manganese	7439965	0.00081	Reference 5	137,062.92	5.55E-02
Mercury	7439976	0.000405	Reference 5	137,062.92	2.78E-02
Naphthalene	91203	0.0010935	Reference 5	137,062.92	7.49E-02
Nickel	7440020	0.000405	Reference 5	137,062.92	2.78E-02
Nitrogen Oxides	NO_X	19.28571429	Reference 4 (Table 1.3-1)	137,062.92	1.32E+03
Phenanthrene	85018	0.000010125	Reference 5	137,062.92	6.94E-04
PM-CON	PM-CON	1.253571429	Reference 4 (Table 1.3-2)	137,062.92	8.59E+01
PM10-FIL	PM10-FIL	0.964285714	Reference 4 (Table 1.3-6)	137,062.92	6.61E+01
PM25-FIL	PM25-FIL	0.241071429	Reference 4 (Table 1.3-6)	137,062.92	1.65E+01
PM10-PRI	PM10-PRI	2.217857143	Reference 4 (Tables 1.3-2 and 1.3-6)	137,062.92	1.52E+02
PM25-PRI	PM25-PRI	1.494642858	Reference 4 (Tables 1.3-2 and 1.3-6)	137,062.92	1.02E+02
Pyrene	129000	4.05e-06	Reference 5	137,062.92	2.78E-04
Selenium	7782492	0.002025	Reference 5	137,062.92	1.39E-01
Sulfur Dioxide	SO_2	142 * % sulfur content	Reference 4 (Table 1.3-1)	137,062.92	2.82E+03
Volatile Organic Compounds	VOC	0.192857143	Reference 4 (Table 1.3-3)	137,062.92	1.32E+01

Example Calculation:

$$National\ Emissions\left(\frac{lbs}{year}\right) = Distillate\ Emission\ Factor\left(\frac{\text{lb}}{\text{million Btu}}\right) \times \frac{.14\ million\ Btu}{gallon} \times \frac{1000\ \text{gallons}}{1\ \text{thousand gallons}} \times$$

$$Distillate\ to\ Kerosene\ Conversion\left(\frac{135}{140}\right) \times National\ Activity\left(\frac{1000\ barrels}{year}\right) \times \frac{1\ ton}{2000\ lbs}$$

References:

$$National\ Selenium\ Emissions = \frac{1.5\text{E}-05\ lb}{1\ million\ Btu} \times \frac{0.14\ million\ Btu}{gallon} \times \frac{1000\ gallons}{1\ thousand\ gallons}$$

$$\times \frac{135}{140} \times 137{,}062.92\ thousands\ of\ gallons \times \frac{1\ ton}{2000\ lbs} = 1.39E-01\ tons$$

FOSSIL FUEL COMBUSTION - INDUSTRIAL: KEROSENE (continued)
SCC: 2102011000

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_ks.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_ residfuel_inven_apr2003.zip, accessed November 2004.

4. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

5. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants.” Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: NATURAL GAS
SCC: 2102006000

The State-level volume of natural gas consumed by the industrial sector was used to estimate emissions. Natural gas consumption by energy use sector is available from State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because these data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level natural gas consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 31-33.[2] This allocation procedure used ratio of the number of industrial sector employees in each county to the total number of industrial sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for natural gas were taken from AP-42.[3] HAP emission factors are from AP-42 and "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[4] According to AP-42, natural gas has a heat content of 1,050 million Btus per million cubic feet.[3] This value was used to convert emission factors originally specified as "pounds per million Btu" to units of "pounds per million cubic feet." Natural gas is also assumed to have a sulfur content of 2,000 grains per million cubic feet.[5] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[6]

County-level criteria pollutant and HAP emissions were calculated by multiplying nonpoint source natural gas consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that displays the emissions factors, volume of nonpoint source natural gas burned, and national nonpoint criteria pollutant and HAP emissions from industrial combustion of natural gas. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), industrial natural gas combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Criteria Pollutant and HAP Emissions Summary for Industrial Natural Gas Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/million cubic feet)	Emission Factor Reference	National Throughput (millions of cubic feet)	National Emissions (tons/year)
Acetaldehyde	75070	0.00001365	Reference 4	4,776,591	3.26E-02
Ammonia	NH_3	3.2	Reference 6	4,776,591	7.64E+03
Benzene	71432	0.0021	Reference 3 (Table 1.4-3)	4,776,591	5.02E+00
Carbon Monoxide	CO	84	Reference 3 (Table 1.4-1)	4,776,591	2.01E+05
Fluoranthene	206440	3.15e-06	Reference 4	4,776,591	7.52E-03
Fluorene	86737	2.94e-06	Reference 4	4,776,591	7.02E-03
Formaldehyde	50000	0.07875	Reference 4	4,776,591	1.88E+02
Lead	7439921	0.0005	Reference 3 (Table 1.4-2)	4,776,591	1.19E+00
Naphthalene	91203	0.0006405	Reference 4	4,776,591	1.53E+00
Nitrogen Oxides	NO_X	100	Reference 3 (Table 1.4-1)	4,776,591	2.39E+05
Phenanthrene	85018	0.00001785	Reference 4	4,776,591	4.26E-02

FOSSIL FUEL COMBUSTION - INDUSTRIAL: NATURAL GAS (continued)
SCC: 2102006000

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/million cubic feet)	Emission Factor Reference	National Throughput (millions of cubic feet)	National Emissions (tons/year)
PM-CON	PM-CON	5.7	Reference 3 (Table 1.4-2)	4,776,591	1.36E+04
PM10-FIL	PM10-FIL	1.9	Reference 3 (Table 1.4-2)	4,776,591	4.54E+03
PM25-FIL	PM25-FIL	1.9	Reference 3 (Table 1.4-2)	4,776,591	4.54E+03
PM10-PRI	PM10-PRI	7.6	Reference 3 (Table 1.4-2)	4,776,591	1.82E+04
PM25-PRI	PM25-PRI	7.6	Reference 3 (Table 1.4-2)	4,776,591	1.82E+04
Pyrene	129000	5.25e-06	Reference 4	4,776,591	1.25E-02
Sulfur Dioxide	SO_2	0.6	Reference 3 (Table 1.4-2)	4,776,591	1.43E+03
Volatile Organic Compounds	VOC	5.5	Reference 3 (Table 1.4-2)	4,776,591	1.31E+04

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MMBtu}\right) \times \frac{1{,}050\ MMBtu}{million\ ft^3} \times National\ Activity\left(\frac{million\ ft^3\ nat\ gas}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ fluorene\ emissions = \frac{\frac{2.8E-09\ lb}{MMBtu} \times \frac{1{,}050\ MMBtu}{million\ ft^3} \times 4{,}776{,}591\ million\ ft^3}{2000\ \frac{tons}{yr}} = 7.52E-03\ tons$$

References:

FOSSIL FUEL COMBUSTION - INDUSTRIAL: NATURAL GAS (continued)
SCC: 2102006000

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_use_ng.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

5. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip, accessed November 2004.

6. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FOSSIL FUEL COMBUSTION - INDUSTRIAL: RESIDUAL OIL
SCC: 2102005000

The volume of residual oil consumed by the industrial sector was used to estimate emissions. Residual oil consumption by energy use sector is presented in State Energy Data 2001 consumption tables published by the Energy Information Administration (EIA).[1] Year 2001 consumption data were used to estimate 2002 emissions because these data were the latest data available when this inventory was prepared in November 2004. Due to the potential inclusion of point source fuel consumption in the activity, final 2002 NEI point source CO emissions data were used to back-calculate throughput associated with point sources. State-level point source throughput was then subtracted from the 2001 EIA State-level fuel consumption data. This adjustment ensures that any point source activity is not being included in the nonpoint source consumption data. Section 2.8.4 describes the point source throughput estimation methods used in this point source subtraction procedure.

State-level residual oil consumption was allocated to each county using 2001 *County Business Patterns* employment data for NAICS codes 31-33.[2] The allocation procedure used the ratio of the number of industrial sector employees in each county to the total number of industrial sector employees in the State. Year 2001 employment data were used to estimate 2002 emissions because year 2001 data were the latest data available when this inventory was prepared in November 2004. Refer to Appendices B and C for more details on the allocation.

Criteria pollutant emission factors for residual oil were taken from AP-42.[3] HAP emission factors are from "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants."[4] According to AP-42 (page 1.3-8), #4, #5, and #6 residual oil have a heat content of 150 million Btus per thousand gallons value.[3] Emission factors that were originally provided on a Btu basis were converted to physical units using this value. The midpoint of the range of sulfur content values provided in Appendix A of AP-42, (2.25%) was used in the PM and SO_2 emission calculations.[3] The ammonia emission factor is from EPA's *Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report*.[5]

County-level pollutant emissions were calculated by multiplying nonpoint source residual oil consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that contains the emissions factors, volume of nonpoint source residual oil burned, and national nonpoint emissions from industrial combustion of residual oil. For Puerto Rico (PR) and the U.S. Virgin Islands (VI), industrial residual oil combustion emissions were estimated, but the emissions are not included in Table 1 (see section 3.5 of the report for the draft 2002 NEI for the methodology used to estimate PR and VI emissions).

Table 1. National Emissions Summary for Industrial Residual Oil Combustion: Adjusted for Point Source Fuel Consumption

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Acenaphthene	83329	2.25e-05	Reference 4	334,903.40	3.77E-03
Acenaphthylene	208968	2.70e-07	Reference 4	334,903.40	4.52E-05
Acetaldehyde	75070	0.00525	Reference 4	334,903.40	8.79E-01
Ammonia	NH_3	0.8	Reference 5	334,903.40	1.34E+02
Anthracene	120127	1.305e-06	Reference 4	334,903.40	2.19E-04
Arsenic	7440382	0.00141	Reference 4	334,903.40	2.36E-01
Benz[a]Anthracene	56553	4.35e-06	Reference 4	334,903.40	7.28E-04
Benzene	71432	0.000225	Reference 4	334,903.40	3.77E-02
Benzo[b+k]Fluoranthene	102	1.65e-06	Reference 4	334,903.40	2.76E-04
Benzo[g,h,i,]Perylene	191242	2.40e-06	Reference 4	334,903.40	4.02E-04
Beryllium	7440417	3.00e-05	Reference 4	334,903.40	5.02E-03
Cadmium	7440439	4.20e-04	Reference 4	334,903.40	7.03E-02
Carbon Monoxide	CO	5	Reference 3 (Table 1.3-1)	334,903.40	8.37E+02
Chromium	7440473	9.00e-04	Reference 4	334,903.40	1.51E-01
Chrysene	218019	2.55e-06	Reference 4	334,903.40	4.27E-04

FOSSIL FUEL COMBUSTION - INDUSTRIAL: RESIDUAL OIL (continued)
SCC: 2102005000

Table 1 (continued)

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/thousand gallons)	Emission Factor Reference	National Throughput (thousands of gallons)	National Emissions (tons/year)
Dibenzo[a,h]Anthracene	53703	1.80e-06	Reference 4	334,903.40	3.01E-04
Fluoranthene	206440	5.25e-06	Reference 4	334,903.40	8.79E-04
Fluorene	86737	4.80e-06	Reference 4	334,903.40	8.04E-04
Formaldehyde	50000	3.60e-02	Reference 4	334,903.40	6.03E+00
Indeno[1,2,3-c,d]Pyrene	193395	2.25e-06	Reference 4	334,903.40	3.77E-04
Lead	7439921	1.65e-03	Reference 4	334,903.40	2.76E-01
Manganese	7439965	3.15e-03	Reference 4	334,903.40	5.27E-01
Mercury	7439976	0.0001215	Reference 4	334,903.40	2.03E-02
Naphthalene	91203	0.001215	Reference 4	334,903.40	2.03E-01
Nickel	7440020	0.09	Reference 4	334,903.40	1.51E+01
Nitrogen Oxides	NO_X	55	Reference 3 (Table 1.3-1)	334,903.40	9.21E+03
Phenanthrene	85018	1.125e-05	Reference 4	334,903.40	1.88E-03
PM-CON	PM-CON	1.5	Reference 3 (Table 1.3-2)	334,903.40	2.51E+02
PM10-FIL	PM10-FIL	7.17*(1.12 * % sulfur content + 0.37)	Reference 3 (Table 1.3-5)	334,903.40	3.47E+03
PM25-FIL	PM25-FIL	4.67*(1.12 * % sulfur content + 0.37)	Reference 3 (Table 1.3-5)	334,903.40	2.26E+03
PM10-PRI	PM10-PRI	7.17*(1.12 * % sulfur content + 0.37) + 1.5	Reference 3 (Tables 1.3-2 and 1.3-5)	334,903.40	3.72E+03
PM25-PRI	PM25-PRI	4.67*(1.12 * % sulfur content + 0.37) + 1.5	Reference 3 (Tables 1.3-2 and 1.3-5)	334,903.40	2.51E+03
Pyrene	129000	0.0000045	Reference 4	334,903.40	7.54E-04
Selenium	7782492	0.000735	Reference 4	334,903.40	1.23E-01
Sulfur Dioxide	SO_2	157 * % sulfur content	Reference 3 (Table 1.3-1)	334,903.40	5.92E+04
Volatile Organic Compounds	VOC	0.28	Reference 3 (Table 1.3-3)	334,903.40	4.69E+01

FOSSIL FUEL COMBUSTION - INDUSTRIAL: RESIDUAL OIL (continued)
SCC: 2102005000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MMBtu}\right)\times\frac{150\ MMBtu}{thousand\ gallons}\times National\ Activity\left(\frac{thousands\ of\ gal\ oil\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions = \frac{\frac{0.0000049\ lb}{MMBtu}\times\frac{150\ MMBtu}{thousand\ gallons}\times\ 334{,}903.40\ thousand\ gal}{2000\ \frac{lb}{ton}} = 1.23E-01\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2001 Consumption. Washington, D.C. 2004. Internet Address: http://www.eia.doe.gov/emeu/states/sep_fuel/html/fuel_rf.html, accessed November 2004.

2. U.S. Department of Commerce, Bureau of the Census, 2001 *County Business Patterns*, C1-E01-CBPX-01-US1 [Electronic files], Washington, DC. Issued April 2003.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants." Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

5. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Estimating Ammonia Emissions from Anthropogenic Sources, Draft Final Report. Prepared by E.H. Pechan & Associates, Inc. Durham, NC. April 2004.

FUGITIVE DUST FROM PAVED ROADS
SCC: 2294000000

Fugitive dust emissions from paved road traffic were estimated for PM10-PRI, PM10-FIL, PM25-PRI, and PM25-FIL. Since there are no PM-CON emissions for this category, PM10-PRI emissions are equal to PM10-FIL emissions and PM25-PRI emissions are equal to PM25-FIL. Table 1 provides a national summary of the 2002 annual vehicle miles traveled (VMT) activity and emissions by pollutant.

Table 1. 2002 National Criteria Air Pollutant Emissions Summary for Fugitive Dust from Paved Roads

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor	National Activity (Million Miles)	National Emissions
PM10-FIL	Reference 1	2,762,373	2,073,974
PM10-PRI	Reference 1	2,762,373	2,073,974
PM25-FIL	Reference 1	2,762,373	203,442
PM25-PRI	Reference 1	2,762,373	203,442

Uncontrolled paved road emissions were calculated at the State level by roadway class and month. This was done by multiplying the State/roadway class VMT by the appropriate monthly temporal allocation factor and by the paved road emission factor. After the paved road dust emissions were calculated at the State/road class/monthly level of detail, the uncontrolled emissions were then allocated to the county level using total VMT as a surrogate. Next, control factors were applied to the paved road emissions in PM_{10} nonattainment area counties. Emissions and VMT by roadway class were then totaled to the county level for reporting in the NEI. The following provides further details on the emission factor equation, temporal and spatial allocation procedures, and controls.

Emission Factor Equation

Reentrained road dust emissions for paved roads were estimated using paved road VMT and the emission factor equation from AP-42:[1]

$$E = [\ k * (sL/2)^{0.65} * (W/3)^{1.5} - C\ ] * [1 - P/(4*N)]$$

where:
- E = paved road dust emission factor (gram [g]/VMT)
- k = particle size multiplier (7.3 g/VMT for PM10-PRI/-FIL and 1.1 g/VMT for PM25-PRI/-FIL)
- sL = road surface silt loading (g/square meter [m^2])
- W = average weight (tons) of all vehicles traveling the road
- C = emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear
- N = number of days in the month
- P = number of days in the month with at least 0.01 inches of precipitation

The uncontrolled PM10-PRI/-FIL and PM25-PRI/-FIL emission factors are provided in Appendix C by State, roadway class, and month. Note that the EPA lowered the PM25-PRI/-FIL particle size multiplier just prior to completing the final 2002 nonpoint NEI to about 1.1 g/VMT. The EPA applied an adjustment factor of 0.6 to the PM25-PRI/-FIL emissions in the final NEI. Appendix C was not revised to reflect this change. See Section 2.8.6 of this report for further discussion of this adjustment.

Paved road silt loadings were assigned to each of the twelve functional roadway classes (six urban and six rural) based on the average annual traffic volume of each functional system by State.[2] The resulting paved road silt loadings calculated from the average annual traffic volume data are shown in Table 2.

The AP-42 equation listed above includes a correction factor to adjust for the number of days with measurable precipitation in each month. The factor of "4" in the precipitation adjustment accounts for the fact that paved roads dry more quickly than unpaved roads and that precipitation may not occur over the entire 24-hour day period. The number of days with at least 0.01 inches of precipitation in each month by State was obtained from the National

FUGITIVE DUST FROM PAVED ROADS (continued)
SCC: 2294000000

Climatic Data Center.[3] Data were collected from a meteorological station selected to be representative of urban areas within each State. The precipitation data are presented in Appendix C by State and month. There are cases where the emission factor calculated using the equation above ends up negative due to the subtraction of the C term that accounts for vehicle exhaust, brake wear, and tire wear. In these cases, the emission factor was reset to 0, under the assumption that the emissions have been accounted for in the onroad emission inventory.

Activity

Total annual VMT estimates by State and roadway class were obtained from the Federal Highway Administration's (FHWA) annual Highway Statistics report.[2] Paved road VMT was calculated by subtracting the State/roadway class unpaved road VMT from total State/roadway class VMT.

Allocation

The paved road VMT estimates by State/roadway class were first temporally allocated by season using the National Acid Precipitation Assessment Program (NAPAP) Inventory seasonal temporal allocations factors for VMT.[4] These factors are included in Appendix B. The seasonal VMT values were then multiplied by the ratio of the number of days in a month to the number of days in a season to adjust to monthly VMT. The emission factors were then applied to estimate emissions by month.

The paved road activity and emissions were spatially allocated to counties according to the fraction of total VMT in each county for the specific roadway class as shown by the following equation:

$$EMIS_{x,y} = EMIS_{ST,y} * VMT_{x,y} / VMT_{ST,y}$$

where:
$EMIS_{x,y}$ = paved road emissions (tons) for county x and roadway class y
$EMIS_{ST,y}$ = paved road emissions (tons) for the entire State for roadway class y
$VMT_{x,y}$ = total VMT (million miles) in county x and roadway class y
$VMT_{ST,y}$ = total VMT (million miles) in entire State for roadway class y

The county-level VMT by roadway class developed to calculate onroad mobile source emissions was used in this equation.[5] The county-level allocation factors are provided in Appendix B. Note that because of differences in the methodologies for calculating total and unpaved road VMT, there are rural counties where unpaved road VMT was higher than total VMT. For these counties, unpaved VMT was reduced to total VMT and paved road VMT was assigned a value of zero.

Controls

Paved road dust controls were applied by county to urban and rural roads in serious PM_{10} nonattainment areas and to urban roads in moderate PM_{10} nonattainment areas. The assumed control measure is vacuum sweeping of paved roads twice per month. A control efficiency of 79 percent was assumed for this control measure.[6] The assumed rule penetration varies by roadway class and PM_{10} nonattainment area classification (serious or moderate).[6] The rule penetration rates are shown in Table 3. Rule effectiveness was assumed to be 100% for all counties where this control was applied.

Note that the controls were applied at the county/roadway class level, and the controls differ by roadway class. In the NIF 3.0 emissions table, the emissions for all roadway classes were summed to the county level. Therefore, the emissions at the county level can represent several different control, rule effectiveness, and rule penetration levels. As a result, the control efficiency, rule effectiveness, and rule penetration values were reported in the control equipment table as a composite, overall control level for each county; the rule effectiveness and rule penetration values were not reported separately in the emission table.

Table 2. 2002 Silt Loadings by State and Roadway Class Modeled in Paved Road Emission Factor Calculations (g/m^2)

	Rural Roadway Classes						Urban Roadway Classes					
State	Inter-state	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local	Inter-state	Freeways & Express-ways	Other Principal Arterial	Minor Arterial	Collector	Local
Alabama	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Alaska	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.03	0.2	0.2
Arizona	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Arkansas	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.6
California	0.015	0.03	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.2	0.2
Colorado	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Connecticut	0.015	0.03	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Delaware	0.015	0.03	0.03	0.2	0.2	0.2	0.015	0.015	0.03	0.03	0.06	0.2
Dist. of Columbia	0.015	0.6	0.6	0.6	0.6	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Florida	0.015	0.03	0.06	0.2	0.2	0.2	0.015	0.015	0.03	0.03	0.06	0.2
Georgia	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Hawaii	0.015	0.03	0.06	0.2	0.2	0.2	0.015	0.015	0.03	0.03	0.06	0.2
Idaho	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Illinois	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Indiana	0.015	0.06	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Iowa	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Kansas	0.015	0.2	0.2	0.6	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Kentucky	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.2	0.2
Louisiana	0.015	0.06	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.6
Maine	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Maryland	0.015	0.03	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Massachusetts	0.015	0.03	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Michigan	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.2	0.2
Minnesota	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Mississippi	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Missouri	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Montana	0.015	0.2	0.2	0.6	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Nebraska	0.015	0.2	0.2	0.6	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Nevada	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.03	0.06	0.2
New Hampshire	0.015	0.03	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
New Jersey	0.015	0.03	0.06	0.2	0.2	0.2	0.015	0.015	0.03	0.06	0.2	0.2
New Mexico	0.015	0.2	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
New York	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.06	0.2
North Carolina	0.015	0.03	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
North Dakota	0.015	0.2	0.2	0.6	0.6	0.6	0.015	0.015	0.03	0.2	0.2	0.2
Ohio	0.015	0.03	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Oklahoma	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Oregon	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Pennsylvania	0.015	0.03	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Rhode Island	0.015	0.03	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.6
South Carolina	0.015	0.06	0.06	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.2	0.6
South Dakota	0.015	0.2	0.2	0.6	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.6
Tennessee	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Texas	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.6
Utah	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.03	0.06	0.2
Vermont	0.015	0.06	0.2	0.2	0.2	0.2	0.015	0.015	0.03	0.06	0.2	0.2
Virginia	0.015	0.03	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.03	0.2	0.2
Washington	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
West Virginia	0.015	0.06	0.2	0.2	0.2	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Wisconsin	0.015	0.06	0.2	0.2	0.6	0.6	0.015	0.015	0.03	0.06	0.2	0.2
Wyoming	0.015	0.2	0.2	0.2	0.6	0.6	0.015	0.015	0.06	0.2	0.2	0.2

FUGITIVE DUST FROM PAVED ROADS (continued)
SCC: 2294000000

Table 3. Penetration Rate of Paved Road Vacuum Sweeping

PM_{10} Nonattainment Status	Roadway Class	Vacuum Sweeping Penetration Rate
Moderate	Urban Interstate	0.42
Moderate	Urban Freeway & Expressway	0.67
Moderate	Urban Other Principal Arterial	0.90
Moderate	Urban Minor Arterial	0.67
Moderate	Urban Collector	0.64
Moderate	Urban Local	0.88
Serious	Rural Interstate	0.55
Serious	Rural Other Principal Arterial	0.37
Serious	Rural Minor Arterial	0.71
Serious	Rural Major Collector	0.83
Serious	Rural Minor Collector	0.59
Serious	Rural Local	0.35
Serious	Urban Interstate	0.42
Serious	Urban Freeway & Expressway	0.67
Serious	Urban Other Principal Arterial	0.90
Serious	Urban Minor Arterial	0.67
Serious	Urban Collector	0.64
Serious	Urban Local	0.88

References

1. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.2.1, Paved Roads." Research Triangle Park, NC. 2003.

2. U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 2001.* Office of Highway Policy Information. Washington, DC. 2002. Available at http://www.fhwa.dot.gov/ohim/hs01/index.htm.

3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Summary of the Day Element TD-3200, 2002 data provided on CD. National Climatic Data Center. 2003.

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FUGITIVE DUST FROM UNPAVED ROADS
SCC: 2296000000

Fugitive dust emissions from unpaved road traffic were estimated for PM10-PRI, PM10-FIL, PM25-PRI, and PM25-FIL. Since there are no PM-CON emissions for this category, PM10-PRI emissions are equal to PM10-FIL emissions and PM25-PRI emissions are equal to PM25-FIL. Table 1 provides a national summary of the 2002 annual VMT activity and emissions by pollutant.

Table 1. 2002 National Criteria Air Pollutant Emissions Summary for Fugitive Dust from Unpaved Roads

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor Reference	National Activity (Million Miles)	National Emissions
PM10-FIL	Reference 1	41,041	8,585,509
PM10-PRI	Reference 1	41,041	8,585,509
PM25-FIL	Reference 1	41,041	842,402
PM25-PRI	Reference 1	41,041	842,402

Uncontrolled unpaved road emissions were calculated at the State level by roadway class and month. This was done by multiplying the State/roadway class unpaved roadway VMT by the appropriate monthly temporal allocation factor and by the monthly unpaved road emission factor. After the unpaved road dust emissions were calculated at the State/roadway class/monthly level of detail, the uncontrolled emissions were then allocated to the county level using 1990 rural population data as a surrogate. Next, control factors were applied to the unpaved road emissions in PM_{10} nonattainment area counties. Emissions and VMT by roadway class were then totaled to the county level for reporting in the NEI. The following provides further details on the emission factor equation, temporal and spatial allocation procedures, and controls.

Emission Factor Equation

Reentrained road dust emissions for unpaved roads were estimated using unpaved road VMT and the emission factor equation from AP-42:[1]

$$E = [\, k * (s/12)^{a} * (SPD/30)^{b}] \,/\, (M/0.5)^{c} - C$$

where k, a, b, and c are empirical constants given in Table 2, and

E = size specific emission factor (lb/VMT)
s = surface material silt content (%)
SPD = mean vehicle speed (mph)
M = surface material moisture content (%)
C = emission factor for 1980's vehicle fleet exhaust, brake wear, and tire wear (lb/VMT)

The uncontrolled emission factors are provided in Appendix C by State, roadway class, and month.

Average State-level unpaved road silt content values, developed as part of the 1985 NAPAP Inventory, were obtained from the Illinois State Water Survey.[2] Silt contents of over 200 unpaved roads from over 30 States were obtained. Average silt contents of unpaved roads were calculated for each sate that had three or more samples for that State. For States that did not have three or more samples, the average for all samples from all States was used as a default value. Appendix C provides a table of the silt content values by State, and identifies if the values were based on a sample average or default value.

FUGITIVE DUST FROM UNPAVED ROADS (continued)
SCC: 2296000000

Table 2. Constants for Unpaved Roads Reentrained Dust Emission Factor Equation[1]

Constant	PM25-PRI/ PM25-FIL	PM10-PRI/ PM10-FIL
k (lb/VMT)	0.18	1.8
a	1	1
b	0.5	0.5
c	0.2	0.2
C	0.00036	0.00047

Note that table 2 reflects the change in the PM25 factor from 0.27 to 0.18 effective with version 1 of the 02 NEI[8]. Table 3 lists the speeds modeled on the unpaved roads by roadway class. These speeds were determined based on the average speeds modeled for onroad emission calculations and weighted to determine a single average speed for each of the roadway classes. The value of 0.5 percent for M was chosen as the national default as sufficient resources were not available at the time the emissions were calculated to determine more locally-specific values for this variable.

Table 3. Speeds Modeled by Roadway Type on Unpaved Roads

Unpaved Roadway Type	Speed (mph)
Rural Minor Arterial	39
Rural Major Collector	34
Rural Minor Collector	30
Rural Local	30
Urban Other Principal Arterial	20
Urban Minor Arterial	20
Urban Collector	20
Urban Local	20

Correction factors were applied to the emission factors to account for the number of days with a sufficient amount of precipitation to prevent road dust resuspension. Monthly corrected emission factors by State and roadway classification were calculated using the following equation:

$$E_{corr} = E * [(D-p)/D]$$

where:
E_{corr} = unpaved road dust emission factor corrected for precipitation effects
E = uncorrected emission factor
D = number of days in the month
p = number of days in the month with at least 0.01 inches of precipitation

FUGITIVE DUST FROM UNPAVED ROADS (continued)
SCC: 2296000000

The number of days with at least 0.01 inches of precipitation in each month was obtained from the National Climatic Data Center.[3] Data were collected from a meteorological station selected to be representative of rural areas within the State. The monthly precipitation data used by State for 2002 are included in Appendix C.

Note that the EPA lowered the PM25-PRI/-FIL particle size multiplier just prior to completing the final 2002 nonpoint NEI. The EPA applied an adjustment factor of 0.67 to the PM25-PRI/-FIL emissions in the final NEI; however, the emission factor in this documentation and in Appendix C was not revised due to resource constraints. Section 2.8.6 of this report for further discussion of this adjustment.

Activity

Unpaved roadway mileage estimates were obtained from the FHWA's annual Highway Statistics report.[4] Unpaved mileage data for 2001 were used, as data for 2002 were not yet available. Separate calculations of VMT were performed for county- and noncounty- (State or federally) maintained roadways. State-level, county-maintained roadway mileage was organized by surface type (rural and urban) and the average daily traffic volume (ADTV) groups shown in Table 4. From these data, State-level unpaved roadway mileage estimates were made. The following equation was then used to calculate State-level unpaved road VMT estimates.

$$VMTUP = ADTV * FSRM * 365 \text{ days/year}$$

where: VMTUP = VMT on unpaved roads (miles/year)
ADTV = average daily traffic volume (vehicles/day/mile)
FSRM = functional system roadway mileage (miles)

State and federally maintained roadway mileage was categorized by arterial classification, not roadway traffic volume; therefore, the VMT was calculated differently than for county-maintained roadways. The ADTV was assumed to not vary by roadway maintenance responsibility, so the ADTV calculated from county-maintained VMT and mileage (ADTV = VMT / Mileage) was used with noncounty-maintained roadway mileage to calculate VMT in the above equation.

Table 4. Assumed Values for Average Daily Traffic Volume (ADTV) by Volume Group

Rural Roads				
Volume Category (vehicles per day per mile)	< 50	50-199	200-499	> 500
Assumed ADTV	5*	125**	350**	550***
Urban Roads				
Volume Category (vehicles per day per mile)	< 200	200-499	500-1999	> 2000
Assumed ADTV	20*	350**	1250**	2200***

Notes: *10% of volume group's maximum range endpoint.
** Average of volume group's range endpoints.
*** 110% of volume group's minimum range endpoint.

Allocation

The unpaved road VMT estimates by State/roadway class were first temporally allocated by season using the NAPAP Inventory seasonal temporal allocations factors for VMT.[5] These factors are included in Appendix B. The seasonal VMT values were then multiplied by the ratio of the number of days in a month to the number of days in a season to adjust to monthly VMT. The emission factors were then applied to estimate emissions by month.

The State/roadway class unpaved road emissions were then spatially allocated to each county using estimates of the ratio of 1990 county rural population to the State rural population from the U.S. Census Bureau[6] as shown by the following equation:

$$EMIS_{x,y} = (CL_x / SL) * EMIS_{,y}$$

where: $EMIS_{x,y}$ = unpaved road emissions (tons) for county x and roadway class y
CL_x = rural population in county x
SL = rural population in the State
$EMIS_{,y}$ = unpaved road emissions in entire State for roadway class y

The county-level allocation factors are provided in Appendix B.

Controls

The controls assumed for unpaved roads varied by PM_{10} nonattainment area classification and by urban and rural areas. On urban unpaved roads in moderate PM_{10} nonattainment areas, paving of the unpaved road was assumed, and a control efficiency of 96 percent and a rule penetration of 50 percent were applied. Chemical stabilization, with a control efficiency or 75 percent and a rule penetration of 50 percent, was assumed for rural areas in serious PM_{10} nonattainment areas. A combination of paving and chemical stabilization, with a control efficiency of 90 percent and a rule penetration of 75 percent, was assumed for urban unpaved roads in serious PM_{10} nonattainment areas.[7]

Note that the controls were applied at the county/roadway class level, and the controls differ by roadway class. In the NIF 3.0 emissions table, the emissions for all roadway classes were summed to the county level. Therefore, the emissions at the county level can represent several different control, rule effectiveness, and rule penetration levels. As a result, the control efficiency, rule effectiveness, and rule penetration values were reported in the control equipment table as a composite, overall control level for each county; the rule effectiveness and rule penetration values were not reported separately in the emissions table.

FUGITIVE DUST FROM UNPAVED ROADS (continued)
SCC: 2296000000

References

1. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. “Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.2.2, Unpaved Roads.” Research Triangle Park, NC. 2003.

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3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Summary of the Day Element TD-3200, 2002 data provided on CD. National Climatic Data Center. 2003.

4. U.S. Department of Transportation, Federal Highway Administration. *Highway Statistics 2001*. Office of Highway Policy Information. Washington, DC. 2002. Available at http://www.fhwa.dot.gov/ohim/hs01/index.htm.

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6. U.S. Department of Commerce. “1990 Census of Population , Volume I Characteristics of Population,” Bureau of the Census. Washington, DC. July 1992.

7. E.H. Pechan & Associates, Inc. “Phase II Regional Particulate Strategies; Task 4: Particulate Control Technology Characterization,” draft report prepared for U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. Washington, DC. June 1995.

8. EPA, 2006. Western Governors'Association. 2006. Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. Western Regional Air Partnership (WRAP), 1515 Cleveland Plance, Suite 200, Denver, Colorado 80202 .

GASOLINE DISTRIBUTION: STAGE I

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

Stage I gasoline distribution includes the following gasoline emission points: 1) bulk terminals; 2) pipeline facilities; 3) bulk plants; 4) tank trucks; and 5) service stations. Emissions from Stage I gasoline distribution occur as gasoline vapors are released into the atmosphere. The EPA considers these processes as comprising the Stage I gasoline distribution maximum available control technology (MACT) category.[1]

Emissions from gasoline distribution at bulk terminals and bulk plants take place when gasoline is loaded into a storage tank or tank truck, from working losses (for fixed roof tanks), and from working losses and roof seals (for floating roof tanks). Working losses consist of both breathing and emptying losses. Breathing losses are the expulsion of vapor from a tank vapor space that has expanded or contracted because of daily changes in temperature and barometric pressure; these emissions occur in the absence of any liquid level change in the tank. Emptying losses occur when the air that is drawn into the tank during liquid removal saturates with hydrocarbon vapor and expands, thus exceeding the fixed capacity of the vapor space and overflowing through the pressure vacuum valve.[2]

Emissions from tank trucks in transit occur when gasoline vapor evaporates from (1) loaded tank trucks during transportation of gasoline from bulk terminals/plants to service stations, and (2) empty tank trucks returning from service stations to bulk terminals/plants.[3] Pipeline emissions result from the valves and pumps found at pipeline pumping stations and from the valves, pumps, and storage tanks at pipeline breakout stations. Stage I gasoline distribution emissions also occur when gasoline vapors are displaced from storage tanks during unloading of gasoline from tank trucks at service stations (Gasoline Service Station Unloading) and from gasoline vapors evaporating from service station storage tanks and from the lines going to the pumps (Underground Storage Tank Breathing and Emptying).

Bulk Terminals and Pipelines

There are no generally accepted activity-based VOC emission factors for the pipelines and bulk terminals sectors because they are generally treated as point sources whose emissions are estimated using site-specific information. For example, emission estimates for bulk terminal storage tanks are typically derived from tank specific parameters that are input into the TANKS program.[4] Therefore, for bulk terminals and pipelines, EPA estimated 2002 national VOC emissions by multiplying 1998 national estimates developed in support of the Gasoline Distribution MACT standard[5] by the 2002 to 1998 ratio of the national volume of wholesale gasoline supplied (see Table 1). The gasoline supply information was obtained from Table S4 in of Volume I of Petroleum Supply Annual 2003.[6]

Table 1. Estimation of Total 2002 VOC Emissions for Pipelines and Bulk Terminals

Category	1998 Post-MACT Control Emissions (Mg)	Mg to Ton Conversion Factor	1998 Emissions (tons)	Ratio of 2002 to 1998 Gasoline Supplied	2002 Emissions (tons)
Pipelines	79,830	1.1023	87,997	(8,848 thousand barrels per day / 8,253 thousand barrels per day) = 1.072	94,341
Bulk Terminals	137,555	1.1023	151,627		162,558

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To estimate HAP emissions, EPA applied national average speciation profiles to these VOC emission estimates.[7] Table 2 presents these speciation profiles and total national bulk terminal and pipeline HAP emission estimates (note that unless otherwise noted, all emission values reported in this section exclude estimates for Puerto Rico and the U.S. Virgin Islands). As noted below, EPA used the total VOC emission estimates as the first step in calculating nonpoint source VOC and HAP emissions. The following describes how these total national VOC estimates were allocated to counties, and how nonpoint source VOC and HAP emissions were calculated for each county.

Table 2. Bulk Terminal and Pipeline HAP Speciation Profiles and Total Emission Estimates

Pollutant Description	NIF 3.0 Pollutant Code	Percentage of VOC Emissions	Reference	National Emissions (tpy)	
				Bulk Terminals	Pipelines
Benzene	71432	0.7	7	1.14E+03	6.60E+02
Methyl Tertiary-Butyl Ether (MTBE)	1634044	2.4	7	3.90E+03	2.26E+03
2,2,4-Trimethylpentane	540841	0.827	7	1.34E+03	7.80E+02
Cumene	98828	0.01	7	1.63E+01	9.43E+00
Ethyl Benzene	100414	0.138	7	2.24E+02	1.30E+02
Hexane	110543	1.589	7	2.58E+03	1.50E+03
Naphthalene	91203	0.046	7	7.48E+01	4.34E+01
Toluene	108883	1.290	7	2.10E+03	1.22E+03
Xylenes	1330207	0.530	7	8.62E+02	5.00E+02

For both categories, EPA allocated national total VOC emissions to counties in a two-step manner. First, EPA allocated VOC emissions based on 2002 gasoline supply data reported by the U.S. Department of Energy (DOE). Next, EPA allocated emissions based on employment data reported in the 2001 County Business Patterns.[8]

For pipelines, EPA allocated VOC emissions to Petroleum Administration District (PAD)s based on the total amount of finished motor gasoline moved by pipeline in each PAD in year 2002. There are five PADs across the United States: PAD 1 comprises seventeen States plus the District of Columbia along the Atlantic Coast; PAD 2 comprises fifteen States in the Midwest; PAD 3 comprises six States in South Central U.S.; PAD 4 comprises five States in the Rocky Mountains; and PAD 5 comprises seven States along the West Coast. These data, which are displayed below in Table 3, are reported in Table 33 of Volume 1 of Petroleum Supply Annual 2002.[9] Next, EPA allocated pipeline VOC emissions in each PAD to counties based on County Business Patterns employment data. Because employment data for NAICS code 48691 (Pipeline Transportation of Refined Petroleum Products) are often withheld due to confidentiality reasons, EPA used the number of employees in NAICS code 42271 (Petroleum Bulk Stations and Terminals) for this allocation. To better account for the location of refined petroleum pipelines,

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however, EPA did not allocate any activity to States which had employees in this NAICS code, but did not have employees in NAICS code 48691 (i.e., Connecticut, District of Columbia, Hawaii, Idaho, Maine, Massachusetts, New Hampshire, Vermont, and West Virginia).

Table 3. Movement of Finished Motor Gasoline by Pipeline Between PAD Districts, 2002

	From I	From II	From III	From IV	From V
To I	n/a	1,140	486,453	0	0
To II	73,668	n/a	119,254	6,890	0
To III	0	11,347	n/a	0	0
To IV	0	8,798	10,114	n/a	0
To V	0	0	21,414	9,045	n/a

For bulk terminals, EPA first allocated total national VOC emissions to States based on the 2002 refinery, bulk terminal, and natural gas plant stocks of motor gasoline reported for each State in Table 31 of Volume 1 of DOE's Petroleum Supply Annual 2002 (see Table 4).[9] Next, EPA allocated total VOC emissions in each State to counties based on the number of NAICS code 42271 (Petroleum Bulk Stations and Terminals) employees reported in the 2001 County Business Patterns.[8] When the DOE publication reported totals for multiple States, EPA aggregated the employment data for these States to develop the necessary county allocation ratios. Appendix B contains the NAICS code 42271 County Business Patterns employment data in database format.

For Puerto Rico (PR) and the U.S. Virgin Islands (VI), EPA estimated VOC emissions for bulk terminals because DOE information indicates that each territory has at least one bulk terminal. Bulk terminal total VOC emissions were estimated based on per capita emission factors calculated from the total VOC emissions and population data for Monroe County, Florida (for PR) and Broward County, Florida (for VI). These per capita factors were multiplied by 2002 county populations in PR and VI to estimate total VOC emissions. Pipeline emissions were not estimated for the VI based on information indicating that only PR has a refined petroleum product pipeline.[10] To calculate total pipeline VOC emissions for PR, EPA used a per capita emission estimation approach analogous to that used for bulk terminals.

It is important to reiterate that the above discussion addresses the calculation of total VOC emissions. The 2002 point source NEI reports VOC emissions related to bulk terminal and pipeline processes. For pipelines, EPA estimated nonpoint source VOC emissions by subtracting 2002 point source VOC emission estimates from total pipeline VOC emissions. The following pipeline SCCs had VOC emissions reported in the 2002 point source NEI: 40600501 (Pipeline Petroleum Transport - General - All Products; Pipeline Leaks); 40600502 (Pipeline Petroleum Transport - General - All Products; Pipeline Venting); 40600503 (Pipeline Petroleum Transport - General - All Products; Pump Station); and 40600504 (Pipeline Petroleum Transport - General - All Products; Pump Station Leaks). For bulk terminals, EPA estimated nonpoint source VOC emissions by subtracting 2002 point source VOC emission estimates from total bulk terminal VOC emissions for the point SCCs displayed in Table 5. The EPA estimated nonpoint source HAP bulk terminal and pipeline emissions in each county by multiplying HAP speciation profiles from Table 2 by each county's nonpoint source bulk terminal and pipeline VOC emissions.

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Table 4. Refinery, Bulk Terminal, and Natural Gas Plant Stocks of Motor Gasoline, 2002

State	**Motor Gasoline (Thousand Barrels)**	**State**	**Motor Gasoline (Thousand Barrels)**
Alabama	1,106	Missouri	812
Alaska	515	Montana	1,068
Arizona	394	Nevada	180
Arkansas	704	New Jersey	9,276
California	10,698	New Mexico	378
Colorado	994	New York	2,778
Connecticut	949	North Carolina	2,255
Delaware, D.C., Maryland	1,909	N. Dakota, S. Dakota	423
Florida	4,915	Ohio	3,107
Georgia	2,018	Oklahoma	1,490
Hawaii	602	Oregon	1,235
Idaho	334	Pennsylvania	5,342
Illinois	2,658	Rhode Island	565
Indiana	2,608	South Carolina	1,222
Iowa	1,317	Tennessee	1,597
Kansas, Nebraska	2,440	Texas	17,800
Kentucky	804	Utah	504
Louisiana	6,319	Virginia	2,424
Maine, New Hampshire, Vermont	1,070	Washington	3,385
Massachusetts	1,631	West Virginia	144
Michigan	2,889	Wisconsin	1,971
Minnesota	1,501	Wyoming	875
Mississippi	2,477		

<u>Bulk Plants</u>

Because bulk plants are generally inventoried as point sources using site-specific information, there is no acknowledged nonpoint source VOC emission estimation methodology for this category. Therefore, EPA calculated total VOC emissions from bulk plants by developing an average emission factor from the bulk plant motor gasoline VOC emissions and throughput data developed in support of the Gasoline Distribution MACT standards.[2,5] To estimate 2002 national total VOC emissions, the VOC emission factor (8.62 pounds of VOC per 1,000 gallons) was applied to the estimated national volume of gasoline passing through bulk plants in 2002. The volume of bulk plant gasoline throughput was assumed to be 9 percent of total gasoline consumption.[11] Total gasoline consumption estimates were calculated as the sum of the 2002 onroad and nonroad gasoline consumption estimates developed from National Mobile Inventory Model (NMIM) and NONROAD2004 model runs, respectively. Onroad gasoline consumption (in gallons) was calculated for each county based on a conversion factor that was applied to the CO2 emissions estimated for each county from the NMIM 2002 NEI.[12] This factor (102.2982 gallons per ton of CO2) was applied to the NMIM 2002 results for the gasoline fueled vehicle classes. Because PR and VI are not included in NONROAD2004, the total national gasoline consumption value used in this procedure excluded gasoline consumption estimates for these territories. The resulting national total VOC emission estimate was then allocated to counties based on employment data for NAICS code 42271 (Petroleum Bulk Stations and Terminals).

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Table 5. Bulk Terminal SCCs with VOC Emissions in 2002 Point Source NEI

SCC	SCC Description
40400103	Bulk Terminals, Gasoline Reid vapor pressure (RVP) 7: Breathing Loss (67000 Bbl. Capacity) - Fixed Roof Tank
40400104	Bulk Terminals, Gasoline RVP 13: Breathing Loss (250000 Bbl Capacity)-Fixed Roof Tank
40400105	Bulk Terminals, Gasoline RVP 10: Breathing Loss (250000 Bbl Capacity)-Fixed Roof Tank
40400106	Bulk Terminals, Gasoline RVP 7: Breathing Loss (250000 Bbl Capacity) - Fixed Roof Tank
40400107	Bulk Terminals, Gasoline RVP 13: Working Loss (Diam. Independent) - Fixed Roof Tank
40400108	Bulk Terminals, Gasoline RVP 10: Working Loss (Diam. Independent) - Fixed Roof Tank
40400109	Bulk Terminals, Gasoline RVP 7: Working Loss (Diam. Independent) - Fixed Roof Tank
40400110	Bulk Terminals, Gasoline RVP 13: Standing Loss (67000 Bbl Capacity)-Float. Roof Tank
40400111	Bulk Terminals, Gasoline RVP 10: Standing Loss (67000 Bbl Capacity)-Float. Roof Tank
40400112	Bulk Terminals, Gasoline RVP 7: Standing Loss (67000 Bbl Capacity)- Floating Roof Tank
40400113	Bulk Terminals, Gasoline RVP 13: Standing Loss (250000 Bbl Capacity) - Floating Roof Tank
40400114	Bulk Terminals, Gasoline RVP 10: Standing Loss (250000 Bbl Capacity) - Floating Roof Tank
40400115	Bulk Terminals, Gasoline RVP 7: Standing Loss (250000 Bbl Capacity) - Floating Roof Tank
40400116	Bulk Terminals, Gasoline RVP 13/10/7: Withdrawal Loss (67000 Bbl Capacity) - Floating Roof Tank
40400117	Bulk Terminals, Gasoline RVP 13/10/7: Withdrawal Loss (250000 Bbl Capacity) - Floating Roof Tank
40400118	Bulk Terminals, Gasoline RVP 13: Filling Loss (10500 Bbl Capacity) - Variable Vapor Space
40400119	Bulk Terminals, Gasoline RVP 10: Filling Loss (10500 Bbl Capacity) - Variable Vapor Space
40400120	Bulk Terminals, Gasoline RVP 7: Filling Loss (10500 Bbl Capacity) - Variable Vapor Space
40400131	Bulk Terminals, Gasoline RVP 13: Standing Loss - External Floating Roof w/ Primary Seal
40400132	Bulk Terminals, Gasoline RVP 10: Standing Loss - External Floating Roof w/ Primary Seal
40400133	Bulk Terminals, Gasoline RVP 7: Standing Loss - External Floating Roof w/ Primary Seal
40400141	Bulk Terminals, Gasoline RVP 13: Standing Loss - External Floating Roof w/ Secondary Seal
40400142	Bulk Terminals, Gasoline RVP 10: Standing Loss - External Floating Roof w/ Secondary Seal
40400143	Bulk Terminals, Gasoline RVP 7: Standing Loss - External Floating Roof w/ Secondary Seal
40400148	Bulk Terminals, Gasoline RVP 13/10/7: Withdrawal Loss - External Floating Roof (Primary/Secondary Seal)
40400150	Bulk Terminals, Miscellaneous Losses/Leaks: Loading Racks
40400151	Bulk Terminals, Valves, Flanges, and Pumps
40400152	Bulk Terminals, Vapor Collection Losses
40400153	Bulk Terminals, Vapor Control Unit Losses
40400161	Bulk Terminals, Gasoline RVP 13: Standing Loss - Internal Floating Roof w/ Primary Seal
40400162	Bulk Terminals, Gasoline RVP 10: Standing Loss - Internal Floating Roof w/ Primary Seal
40400163	Bulk Terminals, Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Primary Seal
40400171	Bulk Terminals, Gasoline RVP 13: Standing Loss - Internal Floating Roof w/ Secondary Seal
40400172	Bulk Terminals, Gasoline RVP 10: Standing Loss - Internal Floating Roof w/ Secondary Seal
40400173	Bulk Terminals, Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Secondary Seal
40400178	Bulk Terminals, Gasoline RVP 13/10/7: Withdrawal Loss - Internal Float Roof (Primary/Secondary Seal)

Total VOC emissions for PR and VI were estimated using per capita emission factors calculated from the VOC emissions and population data for Monroe County, Florida (for PR) and Broward County, Florida (VI). These per capita factors were multiplied by 2002 county populations to estimate total VOC emissions. Table 6 presents the HAP speciation profiles and total VOC and HAP emissions estimates for bulk plants (note that these estimates do not include PR and VI emissions).

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

Table 6. Bulk Plant HAP Speciation Profiles and Total Emission Estimates

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Reference	National Emissions (tpy)
VOC	VOC	8.62 lb/1,000 gallons	2 and 5	5.25E+04
2,2,4-Trimethylpentane	540841	0.827% of VOC	7	4.34E+02
Cumene	98828	0.01% of VOC	7	5.25E+00
Ethyl Benzene	100414	0.138% of VOC	7	7.24E+01
Hexane	110543	1.589% of VOC	7	8.34E+02
Naphthalene	91203	0.046% of VOC	7	2.41E+01
Toluene	108883	1.290% of VOC	7	6.77E+02
Xylenes	1330207	0.530% of VOC	7	2.78E+02
Benzene	71432	county-specific % of VOC	13	3.76E+02
MTBE	1634044	county-specific % of VOC	13	1.80E+03

It is important to note that the above discussion pertains to total bulk plant emission. There are numerous point SCCs associated with gasoline distribution at bulk plants. EPA developed a list of potential bulk plant point SCCs and reviewed the 2002 point source NEI for the presence of VOC emission estimates. Point source VOC emission estimates were identified in the 2002 point source NEI for the SCCs displayed in Table 7. EPA calculated nonpoint source bulk plant VOC emissions in each county by subtracting 2002 point source NEI VOC emissions in each county from total VOC emissions. To estimate benzene and MTBE emissions from bulk plants, EPA multiplied the nonpoint source VOC emission estimates by county-level speciation profiles calculated from the annual onroad refueling (Stage 2) emissions from the 2002 NEI NMIM results.[13] All other HAP emissions were estimated by multiplying VOC emissions by the national average speciation profiles displayed in Table 6.

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

Table 7. Bulk Plant SCCs with VOC Emissions in 2002 Point Source NEI

SCC	SCC Description
40400201	Bulk Plants, Gasoline RVP 13: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank
40400202	Bulk Plants, Gasoline RVP 10: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank
40400203	Bulk Plants, Gasoline RVP 7: Breathing Loss (67000 Bbl. Capacity) - Fixed Roof Tank
40400204	Bulk Plants, Gasoline RVP 13: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank
40400205	Bulk Plants, Gasoline RVP 10: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank
40400206	Bulk Plants, Gasoline RVP 7: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank
40400207	Bulk Plants, Gasoline RVP 13: Standing Loss (67000 Bbl Cap.) - Floating Roof Tank
40400208	Bulk Plants, Gasoline RVP 10: Standing Loss (67000 Bbl Cap.) - Floating Roof Tank
40400209	Bulk Plants, Gasoline RVP 7: Standing Loss (67000 Bbl Cap.) - Floating Roof Tank
40400210	Bulk Plants, Gasoline RVP 13/10/7: Withdrawal Loss (67000 Bbl Cap.) - Floating Roof Tank
40400211	Bulk Plants, Gasoline RVP 13: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space
40400212	Bulk Plants, Gasoline RVP 10: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space
40400213	Bulk Plants, Gasoline RVP 7: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space
40400231	Bulk Plants, Gasoline RVP 13: Standing Loss - External Floating Roof w/ Primary Seal
40400232	Bulk Plants, Gasoline RVP 10: Standing Loss - External Floating Roof w/ Primary Seal
40400233	Bulk Plants, Gasoline RVP 7: Standing Loss - External Floating Roof w/ Primary Seal
40400241	Bulk Plants, Gasoline RVP 13: Standing Loss - External Floating Roof w/ Secondary Seal
40400242	Bulk Plants, Gasoline RVP 10: Standing Loss - External Floating Roof w/ Secondary Seal
40400243	Bulk Plants, Gasoline RVP 7: Standing Loss - External Floating Roof w/ Secondary Seal
40400248	Bulk Plants, Gasoline RVP 10/13/7: Withdrawal Loss - External Floating Roof (Primary/Secondary Seal)
40400250	Bulk Plants, Loading Racks
40400251	Bulk Plants, Valves, Flanges, and Pumps
40400252	Bulk Plants, Miscellaneous Losses/Leaks: Vapor Collection Losses
40400253	Bulk Plants, Miscellaneous Losses/Leaks: Vapor Control Unit Losses
40400261	Bulk Plants, Gasoline RVP 13: Standing Loss - Internal Floating Roof w/ Primary Seal
40400262	Bulk Plants, Gasoline RVP 10: Standing Loss - Internal Floating Roof w/ Primary Seal
40400263	Bulk Plants, Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Primary Seal
40400271	Bulk Plants, Gasoline RVP 13: Standing Loss - Internal Floating Roof w/ Secondary Seal
40400272	Bulk Plants, Gasoline RVP 10: Standing Loss -Internal Floating Roof w/ Secondary Seal
40400273	Bulk Plants, Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Secondary Seal
40400278	Bulk Plants, Gasoline RVP 10/13/7: Withdrawal Loss - Internal Floating Roof (Primary/Secondary Seal)
40400401	Underground Tanks, Gasoline RVP 13: Breathing Loss
40400402	Underground Tanks, Gasoline RVP 13: Working Loss
40400403	Underground Tanks, Gasoline RVP 10: Breathing Loss
40400404	Underground Tanks, Gasoline RVP 10: Working Loss
40400405	Underground Tanks, Gasoline RVP 7: Breathing Loss
40400406	Underground Tanks, Gasoline RVP 7: Working Loss
40600101	Tank Cars/Trucks, Gasoline: Splash Loading
40600126	Tank Cars/Trucks, Gasoline: Submerged Loading
40600131	Tank Cars/Trucks, Gasoline: Submerged Loading (Normal Service)
40600136	Tank Cars/Trucks, Gasoline: Splash Loading (Normal Service)
40600141	Tank Cars/Trucks, Gasoline: Submerged Loading (Balanced Service)
40600144	Tank Cars/Trucks, Gasoline: Splash Loading (Balanced Service)
40600147	Tank Cars/Trucks, Gasoline: Submerged Loading (Clean Tanks)

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

Tank Trucks in Transit

The EPA calculated total VOC emissions from tank trucks in transit by multiplying county-level tank truck gasoline throughput by a 0.06 lb of VOC per 1,000 gallon emission factor. As noted in Table 8, this emission factor is the sum of the individual emission factors reported in the Gasoline Distribution EIIP guidance document for gasoline-filled trucks (traveling to service station/bulk plant for delivery) and vapor-filled trucks (traveling to bulk terminal/plant for reloading).[3] Gasoline throughput for tank trucks was computed by multiplying the sum of the NMIM and NONROAD2004 consumption estimates by a factor of 1.09 to account for gasoline that is transported more than once in a given area (i.e., transported from bulk terminal to bulk plant and then from bulk plant to service station).[11] Tank trucks in transit total VOC emissions for PR and VI were calculated in an analogous manner. Because onroad gasoline consumption estimates were available from NMIM, but nonroad estimates were not available from NONROAD2004, it was necessary to develop these estimates from gasoline consumption/VOC emission ratios. These ratios were calculated from the nonroad total VOC emission and gasoline consumption estimates for two surrogate Florida counties (Monroe County, Florida for PR and Broward County, Florida for VI). These ratios were then applied to the nonroad VOC emission estimates for PR and VI to estimate gasoline consumption in each territory. Table 9 presents HAP speciation profiles and total VOC and HAP emission estimates for tank trucks in transit (these estimates do not include PR and VI).

Table 8. Tank Trucks in Transit VOC Emission Factors

	VOC Emission Factor
Vapor-Filled Trucks	0.055 lb/1,000 gallons
Gasoline Filled Trucks	0.005 lb/1,000 gallons
Total	**0.06 lb/1,000 gallons**

Table 9. Tank Trucks in Transit HAP Speciation Profiles and Total Emission Estimates

Pollutant Description	**NIF 3.0 Pollutant Code**	**Emission Factor**	**Reference**	**National Emissions (tpy)**
VOC	VOC	0.06 lb/1,000 gallons	3	4.42E+03
2,2,4-Trimethylpentane	540841	0.827% of VOC	7	3.66E+01
Cumene	98828	0.01% of VOC	7	4.42E-01
Ethyl Benzene	100414	0.138% of VOC	7	6.10E+00
Hexane	110543	1.589% of VOC	7	7.03E+01
Naphthalene	91203	0.046% of VOC	7	2.03E+00
Toluene	108883	1.290% of VOC	7	5.71E+01
Xylenes	1330207	0.530% of VOC	7	2.34E+01
Benzene	71432	county-specific % of VOC	13	2.91E+01
MTBE	1634044	county-specific % of VOC	13	1.81E+02

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

It is important to note that the above tank trucks in transit emission values represent total emissions. The EPA identified a list of point SCCs associated with gasoline tank trucks in transit emissions and reviewed the 2002 point source NEI for the presence of VOC emissions in each SCC. Point source VOC emissions were identified in the following SCCs: 40400154 (Bulk Terminals, Tank Truck Vapor Leaks); 40400254 (Bulk Plants, Tank Truck Vapor Losses); 40600162 (Tank Cars and Trucks, Gasoline: Loaded with Fuel [Transit Losses]); and 40600163 (Tank Cars and Trucks, Gasoline: Return with Vapor [Transit Losses]). Point source VOC emissions were subtracted from total VOC emissions to yield the nonpoint source VOC emission estimates for this category. The EPA then estimated nonpoint source HAP emissions in each county by applying the HAP speciation profiles from Table 9 to each county's nonpoint source VOC emissions.

Underground Storage Tank (UST) Breathing and Emptying

The EPA calculated total VOC emissions from UST breathing and emptying by multiplying total gasoline consumption, calculated as described above in the Bulk Plants section, by the 1 lb/1,000 gallons emission factor recommended by the Gasoline Distribution EIIP guidance document.[3] UST breathing and emptying VOC emissions for PR and VI were calculated in an analogous manner using the total gasoline consumption estimates described above in the tank trucks in transit section. Table 10 displays the HAP speciation profiles and national total emission estimates for this source category (note that these estimates exclude PR and VI).

Table 10. Underground Storage Tank Breathing and Emptying HAP Speciation Profiles and Total Emissions

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Reference	National Emissions (tpy)
VOC	VOC	1 lb/1,000 gallons	3	6.76E+04
2,2,4-Trimethylpentane	540841	0.827% of VOC	7	5.59E+02
Cumene	98828	0.01% of VOC	7	6.76E+00
Ethyl Benzene	100414	0.138% of VOC	7	9.33E+01
Hexane	110543	1.589% of VOC	7	1.07E+03
Naphthalene	91203	0.046% of VOC	7	3.11E+01
Toluene	108883	1.290% of VOC	7	8.72E+02
Xylenes	1330207	0.530% of VOC	7	3.58E+02
Benzene	71432	county-specific % of VOC	13	4.45E+02
MTBE	1634044	county-specific % of VOC	13	2.76E+03

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

The EPA reviewed the 2002 point source NEI for the presence of VOC emissions in SCCs associated with UST breathing and emptying. The 2002 point source NEI included point source VOC emissions for the following point source UST breathing and emptying SCCs: 40600307 (Gasoline Retail Operations - Stage I, Underground Tank Breathing and Emptying) and 40600707 (Consumer [Corporate] Fleet Refueling - Stage I, Underground Tank Breathing and Emptying). County-level point source VOC emissions for these SCCs were subtracted from total county-level VOC emissions to yield the nonpoint source VOC emission estimates for this category. With the exception of benzene and MTBE, HAP emissions were estimated by multiplying VOC emissions by the national HAP speciation profiles listed in Table 10. To estimate benzene and MTBE emissions, EPA multiplied VOC emissions by county-level speciation profiles from NMIM.

<u>Gasoline Service Station Unloading</u>

The EPA estimated uncontrolled total VOC emissions from unloading of gasoline into service station tanks from county-level total gasoline consumption estimates[12] and the following AP-42 equation:

$$L = (12.46 \times S \times P \times M)/T$$

where:

L	=	uncontrolled loading loss of liquid loaded (in lb/1,000 gallons)
S	=	saturation factor;
P	=	true vapor pressure of liquid loaded (pounds per square inch absolute);
M	=	molecular weight of vapors (lbs per lb/mole); and
T	=	temperature of liquid loaded (rankine).[14]

This equation requires geographic-specific information. This information includes the saturation factor, which differs by method of loading (e.g., submerged filling), Reid vapor pressure (RVP), temperature, and true vapor pressure of gasoline.

Gasoline RVP values were obtained from the NMIM 2002 database.[15] Because NMIM is a county-level database that reports RVP values by month, EPA developed county-level monthly gasoline consumption estimates by multiplying annual county gasoline consumption by monthly allocation factors. State-level monthly allocation factors were developed from monthly gasoline sales data reported in the Federal Highway Administration's Highway Statistics 2002.[16] Geographic-specific information on the temperature of gasoline and the method of loading were obtained from a recent Stage I and II gasoline distribution emission inventory study prepared for the EIIP.[17] In lieu of available information, for PR and VI, EPA used the monthly allocation factors and gasoline temperature data for Florida and assumed that all gasoline was splash loaded.

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

The true vapor pressure of gasoline was estimated for each county/month using the following equation:

$$P = \exp\left\{ \begin{aligned} &\left[0.7553 - \left(\frac{413.0}{T + 459.6}\right)\right] S^{0.5} \log_{10}(RVP) - \left[1.854 - \left(\frac{1{,}042}{T + 459.6}\right)\right] S^{0.5} \\ &+ \left[\left(\frac{2{,}416}{T + 459.6}\right) - 2.013\right] \log_{10}(RVP) - \left(\frac{8{,}742}{T + 459.6}\right) + 15.64 \end{aligned} \right\}$$

where:

P	=	Stock true vapor pressure, in pounds per square inch absolute.
T	=	Stock temperature, in degrees Fahrenheit.
RVP	=	Reid vapor pressure, in pounds per square inch.
S	=	Slope of the ASTM distillation curve at 10 percent evaporated, in degrees Fahrenheit per percent (assumed that S = 3.0 for gasoline per Figure 7.1-14a of AP-42).[18]

This equation was used to calculate monthly county-level true vapor pressure estimates. In cases where more than one filling method was assumed to apply in a county (e.g., due to vapor balancing requirement applying to a portion of a county's total gasoline throughput due to a throughput exemption), EPA developed two sets of calculations for each month, one for each filling method.

The EIIP study regional stock temperature information was used to estimate the temperature of gasoline in each county in each month (see Table 11).[17]

The EPA incorporated the effect of Stage I Gasoline Service Station vapor balancing controls based on the county-level control efficiency values (either 90 or 95 percent) that were compiled for the EIIP study.[17] As noted earlier, EPA assumed splash filling (i.e., no Stage I Service Station controls) in PR and VI counties. Table 12 presents the HAP speciation profiles and total VOC and HAP emission estimates calculated using these procedures (note that the estimates for PR and VI are not included in these totals).

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

Table 11. Temperature Data Used in Estimating True Vapor Pressure (ºF)

Region	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1 (Northeast)	46	44	44	48	57	64	70	73	70	64	60	51
2 (Southeast)	66	67	69	74	78	81	80	81	80	77	69	60
3 (Southwest)	60	61	62	66	73	78	81	84	82	78	71	62
4 (Midwest)	33	35	40	47	55	62	71	73	68	65	64	63
5 (West)	50	52	62	66	73	76	80	83	86	84	73	60
6 (Northwest)	49	50	50	52	57	62	67	72	68	60	49	42

Region 1: Alaska, Connecticut, Delaware, DC, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin
Region 2: Alabama, Arkansas, Florida, Georgia, Hawaii, Louisiana, Mississippi, N. Carolina, S. Carolina, Tennessee
Region 3: Arizona, New Mexico, Oklahoma, Texas
Region 4: Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, N. Dakota, S. Dakota, Wyoming
Region 5: California, Nevada, Utah
Region 6: Idaho, Oregon, Washington

Table 12. Stage I Service Station Unloading HAP Speciation Profiles and Total Emission Estimates

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Reference	National Emissions (tpy)
VOC	VOC	Equation 1[1]	14	3.53E+05
2,2,4-Trimethylpentane	540841	0.827% of VOC	7	2.92E+03
Cumene	98828	0.01% of VOC	7	3.53E+01
Ethyl Benzene	100414	0.138% of VOC	7	4.87E+02
Hexane	110543	1.589% of VOC	7	5.61E+03
Naphthalene	91203	0.046% of VOC	7	1.62E+02
Toluene	108883	1.290% of VOC	7	4.55E+03
Xylenes	1330207	0.530% of VOC	7	1.87E+03
Benzene	71432	county-specific % of VOC	13	2.70E+03
MTBE	1634044	county-specific % of VOC	13	7.50E+03

[1]Note that Appendix C does not list an emission factor for VOC because the emission factor is an equation that is difficult to express via the Appendix C database structure

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

The above procedures were used to calculate total stage I service station unloading VOC emissions. The EPA identified point SCCs associated with this process and reviewed the 2002 point source NEI for the presence of VOC emissions. Point source VOC emissions were generally categorized into the three different stage I filling methods: submerged filling, splash filing, and balanced submerged filling. The following point source submerged filling SCCs were identified as having VOC emissions in the 2002 point source NEI: 40600302 (Gasoline Retail Operations - Stage I, Submerged Filling w/o Controls) and 40600702 (Consumer [Corporate] Fleet Refueling - Stage I, Submerged Filling w/o Controls). The following point source splash fill SCCs were determined to have VOC emissions in the 2002 point source NEI: 40600301 (Gasoline Retail Operations - Stage I, Splash Filling) and 40600701 (Consumer [Corporate] Fleet Refueling - Stage I, Splash Filling). The point source balanced submerged SCCs with VOC emissions in the 2002 point source NEI were identified as: 40600305 (Gasoline Retail Operations - Stage I, Unloading); 40600306 (Gasoline Retail Operations - Stage I, Balanced Submerged Filling); and 40600706 (Petroleum Products, Consumer [Corporate] Fleet Refueling - Stage I, Balanced Submerged Filling). Point source VOC emissions were also reported in SCC 40600399 (Gasoline Retail Operations - Stage I, Not Classified). To facilitate the point source subtractions, EPA allocated these point source VOC emissions to splash filling and balanced submerged filling based on the proportion of total VOC emissions calculated by EPA in each category in the applicable county.

Next, EPA estimated nonpoint source HAP emissions in each county by multiplying the nonpoint source VOC emission estimates by HAP speciation profiles. Benzene and MTBE emissions were calculated by multiplying the VOC emission estimates by county-level speciation profiles from NMIM. All other HAPs were estimated in a similar manner using the national average HAP speciation profiles displayed in Table 12. Nonpoint source emissions are reported by SCC based on the filling methods used in each county as determined from the EIIP study: SCC 2501060051 (Submerged Filling); SCC 2501060052 (Splash Filling); and SCC 2501060053 (Balanced Submerged Filling).

GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

<u>Example Total Emission Calculations</u>

Bulk Terminals

2002 national benzene emissions = VOC emissions x HAP speciation factor
1.63E+05 tons x 0.007
1.14E+03 tons

Pipelines

2002 national MTBE emissions = VOC emissions x HAP speciation factor
9.43E+04 tons x 0.024
2.26E+03 tons

Bulk Plants

2002 national VOC emissions
= national gasoline consumption x proportion passing through bulk plants x VOC emission factor
= 135,253,077.45 thousand gallons x 0.09 x 8.62 lbs VOC/thousand gallons
= 1.05E+08 lbs / 2000 lbs
= 5.25E+04 tons

Tank Trucks in Transit

2002 Alamance County, North Carolina VOC emissions
= total county gasoline consumption x (1+proportion of gasoline transported twice) x VOC emission factor
= 61,985.91 thousand gallons x (1+0.09) x 0.06 lbs VOC/thousand gallons
= 4.05E+03 lbs / 2000 lbs
= 2.03E+00 tons

UST Breathing and Emptying

2002 Alamance County, North Carolina VOC emissions
= total county gasoline consumption x VOC emission factor
= 61,985.91 thousand gallons x 1 lb VOC/thousand gallons
= 6.20E+04 lbs / 2000 lbs
= 30.99E+00 tons

Stage I Gasoline Service Station Unloading July VOC uncontrolled emissions for Alamance County, NC
= annual county consumption x proportion of annual gasoline sold in July x VOC emission factor
= 61,985.91 thousand gallons x 0.08835 x VOC emission factor
= 5,476.182 thousand gallons x ((12.46 x saturation factor x true vapor pressure x vapor molecular weight) / temperature))
= 5,476.182 thousand gallons x ((12.46 x 1.0 x 5.471 x 67.733) / 540)
= 46,827.53 lbs

Incorporate effect of control (vapor balancing requirement)
= Uncontrolled emissions x ((100-CE)/100)
= 46,827.53 lbs x ((100-90)/100)
= 4,682.75 lbs / 2,000 lbs
= 2.34E+00 tons.

GASOLINE DISTRIBUTION: STAGE I (continued)
SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

References

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5. Hester, Charles, MACTEC, Inc., Memorandum from Charles Hester, MACTEC, Inc., to Stephen Shedd, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Standards Division, "Review of the Gasoline Distribution Emission Estimation Methods and Emission Estimates Presented in Laurel Driver's Memorandum 'Request for Review/Comment on EPA Plans for FINAL 2002 NEI'," June 17, 2005.

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GASOLINE DISTRIBUTION: STAGE I (continued)

SCCs: 2501050120 (Bulk Terminals)
2501055120 (Bulk Plants)
2505030120 (Tank Trucks in Transit)
2505040120 (Pipelines)
2501060051 (Gasoline Service Station Unloading: Submerged Fill)
2501060052 (Gasoline Service Station Unloading: Splash Fill)
2501060053 (Gasoline Service Station Unloading: Balanced Submerged Fill)
2501060201 (Gasoline Service Stations, Underground Tank: Breathing and Emptying)

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GASOLINE DISTRIBUTION: STAGE II
SCC: 2501060100 (Gasoline Service Stations, Stage 2: Total)

This SCC is used in the NEI to report emissions for onroad gasoline vehicle refueling. These estimates were generated via the MOBILE6 model, using the county-specific fuel parameters, temperature, humidity, Reid vapor pressure, and other relevant model inputs for each county. (Estimates for Stage II nonroad equipment gasoline refueling are included in the nonroad source emissions inventory.) The documentation for the final 2002 mobile source NEI describes the methods for calculating total onroad and nonroad gasoline vehicle refueling VOC emission estimates.

Stage II gasoline distribution nonpoint source VOC emission estimates were calculated by subtracting point source VOC emission estimates from total onroad source VOC emissions. The EPA identified the following SCCs with VOC emission estimates in the 2002 point source NEI: 40600401 (Filling Vehicle Gas Tanks - Stage II, Vapor Loss w/o Controls); 40600402 (Filling Vehicle Gas Tanks - Stage II, Liquid Spill Loss w/o Controls); 40600403 (Filling Vehicle Gas Tanks - Stage II, Vapor Loss w/o Controls); 40600499 (Filling Vehicle Gas Tanks - Stage II, Not Classified **); 40600601 (Consumer (Corporate) Fleet Refueling - Stage II, Vapor Loss w/o Controls); 40600602 (Consumer (Corporate) Fleet Refueling - Stage II, Liquid Spill Loss w/o Controls); and 40600603 (Consumer (Corporate) Fleet Refueling - Stage II, Vapor Loss w/controls).

The EPA calculated nonpoint source HAP emission estimates by applying HAP speciation profiles to the resulting nonpoint source VOC emissions. For this step, EPA used the same HAP speciation profiles as indicated in Table 12 of the Stage I Service Station Unloading source category discussion presented earlier.

GENERAL LABORATORY ACTIVITIES
SCC: 2851001000

Note: The emissions for this category were previously reported under the point SCC 31503001 in the draft and preliminary 2002 NEI and in the 1999 NEI. For the final 2002 NEI, the point SCC was changed to the new nonpoint SCC 2851001000 (Miscellaneous Area Sources : Laboratories : Bench Scale Reagents : (probably "Total")).

National mercury emissions from general laboratory activities are calculated by multiplying the tons of mercury consumed by laboratories by an emission factor. According to the U.S. Geological Survey, (USGS) laboratories in the United States consumed 8 Mg of mercury during the year 2002.[1] EPA estimates that for every Mg of mercury used in laboratories, 40 kg of mercury are emitted.[2]

Emissions estimate:

Total mercury emitted from laboratories = total mercury consumed by laboratories × Emission Factor

Total mercury emitted from laboratories = 8 Mg total mercury × 40 kg mercury released/Mg total mercury

Total mercury emitted from laboratories = 320 kg mercury released = 0.3527 tons mercury released

Emissions were allocated to the county-level by the county proportion of the national population.[3] Appendix B contains population data in database format.

The estimate of mercury consumed in the United States does not include the amount of mercury consumed in Puerto Rico or the U.S. Virgin Islands. Emissions for Puerto Rico and the U.S. Virgin Islands were estimated using the approach outlined in the report text. Broward County in Florida is assumed to be the surrogate county for Puerto Rico. Monroe County in Florida is assumed to be the surrogate for the U.S. Virgin Islands. Emissions for mercury in the surrogate counties were divided by the population of the surrogate counties obtained from the U.S. Census Bureau to estimate emissions on a per capita basis.[3] The per capita emissions were then multiplied by the population in each county of Puerto Rico and the U.S. Virgin Islands to estimate emissions. Using this methodology, EPA estimated 0.00485 tons of mercury was emitted in Puerto Rico and the U.S. Virgin Islands during 2002 from general laboratory activities. Table 1 provides a national summary of activity and emissions.

Table 1. National HAP Pollutant Emissions Summary for General Laboratory Activities

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (Kg of Hg per Mg of Hg consumed)	Emission Factor Reference	2002 National Activity Level (Mg of Hg consumed)	2002 National Emissions [a] (tons/year)
Mercury	7439976	40	Reference 2	8	0.3576

[a] Includes Puerto Rico and the U.S. Virgin Islands

References:

1. Goonan, 2003. Thomas Goonan from the U.S. Geological Survey, U.S. Dept. of Interior, personal communication to Paula Hemmer, E.H. Pechan & Associates, Inc., July 10, 2003.

2. U.S. Environmental Protection Agency, “Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States. December 1997. EPA-452/R-97-004.

3. U.S. Census Bureau. *7/1/2002 County Population Estimates File and Components of Change*, [Data file], April 17, 2003. Available from Population Estimates Branch Web site http://eire.census.gov/popest/estimates_dataset.php

LAMP BREAKAGE
SCC: 2861000000

According to National Electrical Manufacturers Association (NEMA), 660 million lamps containing 9 tons of mercury were either discarded into landfills or recycled in the year 2002.[1] NEMA estimated that approximately 142 million broken lamps were recycled and 518 million were sent to landfills. EPA estimates that of all lamps sent to landfills, only 6.6% of the mercury contained in the lamps is released into the atmosphere.[2]

Emissions estimate:

Percentage of lamps sent to landfills = 518 million/660 million × 100% = 78.5%

Amount of Hg sent to landfills = 9 tons Hg × 78.5% = 7.0636 tons Hg discarded to landfills

National Emissions = 7.0636 tons Hg sent to landfills × 6.6% Hg released
= 0.4662 tons Hg released

Mercury emissions are not subject to the proposed Municipal Solid Waste Landfills MACT[3], and any control devices required by the MACT do not effectively control mercury emissions.[4] Therefore, mercury emissions from landfills are not assumed to have any controls.

Mercury emissions are allocated to the county-level by the county proportion of the national population.[5] Appendix B contains population data in database format.

The estimate of mercury consumed in the United States does not include the amount of mercury consumed in Puerto Rico or the U.S. Virgin Islands. Emissions were not estimated for Puerto Rico because this category did not appear in the 1996 HAP inventory for this territory. Emissions for the U.S. Virgin Islands were estimated using the approach outlined in the report text. Monroe County in Florida is assumed to be the surrogate for the U.S. Virgin Islands. Emissions for mercury in Monroe County were divided by the population obtained from the U.S. Census Bureau to estimate emissions on a per capita basis.[5] The per capita emissions estimate was then multiplied by the population in each county of the U.S. Virgin Islands to estimate emissions. Using this methodology, EPA estimated 0.0001759 tons of mercury was emitted in the U.S. Virgin Islands during 2002 from lamp breakage. Table 1 provides a national summary of activity and emissions.

Table 1. National HAP Pollutant Emissions Summary for Lamp Breakage

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (% of Hg in lamps)	Emission Factor Reference	2002 National Activity Level (tons of Hg in lamps)	2002 National Emissions [a] (tons/yr)
Mercury	7439976	6.6	Reference 2	7.065	0.4664

[a] Includes the U.S. Virgin Islands

LAMP BREAKAGE
SCC: 2861000000

References:

1. Erdheim, 2003. National Electrical Manufacturers Association (NEMA), Government Affairs, personal communication with Paula Hemmer, E.H. Pechan & Associates, Inc., August, 2003.

2. U.S. Environmental Protection Agency, “Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States. December 1997. EPA-452/R-97-004.

3. National Emission Standards for Hazardous Air Pollutants: Proposed Standards for Municipal Solid Waste Landfills. Federal Register 58. Pages 66672-66685.

4. U.S. Environmental Protection Agency. Section 2.4 of Compilation of Air Pollutant Emissions Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

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LAMP (FLUORESCENT) RECYCLING
SCC: 2861000010

Note: The emissions for this category were previously reported under the point SCC 31301200 in the draft and preliminary 2002 NEI and in the 1999 NEI. For the final 2002 NEI, the point SCC was changed to the new nonpoint SCC 2861000010 (Miscellaneous Area Sources : Fluorescent Lamp Breakage : Recycling Related Emissions : Total).

National level mercury (Hg) estimates for 2002 from fluorescent lamp recycling were determined by multiplying the number of lamps recycled by an emission factor. The National Electrical Manufacturers Association (NEMA) reported that 660 million lamps were discarded in the United States during 2002.[1] According to NEMA, 142 million of the discarded lamps were recycled. EPA estimates that 0.00088 mg of mercury are released from the recycling process per lamp recycled.[2]

Emissions estimate:

Total 2002 fluorescent lamps recycled = 142,000,000

Total 2002 Hg emissions from recycled lamps = No. of lamps recycled × mg Hg released/lamp recycled
= 142,000,000 lamps × 0.00088 mg Hg/lamp
= 124,960 mg Hg
= 0.000137 tons Hg

Emissions were allocated to the county-level by the county proportion of the national population.[3] Mercury emissions from general laboratory activity in Puerto Rico and the U.S. Virgin Islands was not estimated. Table 1 provides a national summary of activity and emissions.

Table 1. National HAP Pollutant Emissions Summary for Fluorescent Lamp Recycling

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (mg Hg/ lamp recycled)	Emission Factor Reference	National Activity Level (lamps)	National Emissions (tons/yr)
Mercury	7439976	0.00088	Reference 2	142,000,000	1.3774E-04

References:

1. Erdheim, 2003. National Electrical Manufacturers Association (NEMA), Government Affairs, personal communication with Paula Hemmer, E.H. Pechan & Associates, Inc., August, 2003.

2. U.S. Environmental Protection Agency, “Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds.” December 1997.

3. U.S. Census Bureau. *7/1/2002 County Population Estimates File and Components of Change*, [Data file], April 17, 2003. Available from Population Estimates Branch Web site http://eire.census.gov/popest/estimates_dataset.php

OPEN BURNING - LAND CLEARING DEBRIS
SCC: 2610000500

Criteria pollutant and HAP emission estimates for land clearing debris burning are a function of the amount of material or fuel subject to burning per year. The amount of material burned was estimated using the county-level total number of acres disturbed by residential, non-residential, and road construction. County-level weighted loading factors were applied to the total number of construction acres to convert acres to tons of available fuel.

Version 2 of the Biogenic Emissions Land cover Database (BELD2) within EPA's Biogenic Emission Inventory System (BEIS) was used to identify the acres of hardwoods, softwoods, and grasses in each county. Table 1 presents the average fuel loading factors by vegetation type. The average loading factors for slash hardwood and slash softwood were adjusted by a factor of 1.5 to account for the mass of tree that is below the soil surface that would be subject to burning once the land is cleared.[1] Weighted average county-level loading factors were calculated by multiplying the average loading factors by the percent contribution of each type of vegetation class to the total land area for each county.

Table 1. Fuel Loading Factors by Vegetation Type

Vegetation Type	Unadjusted Average Fuel Loading Factor (Ton/acre)	Adjusted Average Fuel Loading Factor (Ton/acre)
Hardwood	66	99
Softwood	38	57
Grass	4.5	Not Applicable

Controls for land clearing debris burning are generally in the form of a ban on open burning of waste in a given municipality or county. Counties that were more than 80% urban were assumed not to practice any open burning. Appendix B contains the counties with a population more than 80% urban. Therefore, criteria pollutant and HAP emissions from yard waste burning are zero in these counties. In addition, the State of Colorado implemented a State-wide ban on open burning. Emissions from open burning of land clearing debris in all Colorado counties were assumed to be zero.

County-level criteria pollutant and HAP emissions (in lb/year) were calculated by multiplying the total mass of land clearing debris burned per year by an emission factor.[1,2,3] Emissions were then converted to ton/year by dividing the emissions by 1 ton/2000 lb. Table 2 contains the emissions factors, total mass of land clearing debris burned, and national criteria and HAP emissions from open burning of land clearing debris. It is important to note that the values in Table 2 represent total emissions. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI. Industrial point source emissions are classified under SCCs 50200201 and 50200202, and commercial/institutional point source emissions are classified under SCCs 50300201 and 50300202).

OPEN BURNING - LAND CLEARING DEBRIS (continued)
SCC: 2610000500

Table 2. National Emissions Summary for Open Burning of Land Clearing Debris (SCC 2610000500): Not Adjusted for Point Source Activity or Emissions

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	2002 National Activity Level (tons burned/year)	2002 National Emissions (tons/year)
VOC	VOC	1.16E+01	Reference 1	1.35E+07	7.81E+04
NO_X	NO_X	5.00E+00	Reference 2	1.35E+07	3.37E+04
CO	CO	1.69E+02	Reference 1	1.35E+07	1.14E+06
PM10-FIL	PM10-FIL	1.70E+01	Reference 1	1.35E+07	1.14E+05
PM25-FIL	PM25-FIL	1.70E+01	Reference 1	1.35E+07	1.14E+05
PM10-PRI	PM10-PRI	1.70E+01	Reference 1	1.35E+07	1.14E+05
PM25-PRI	PM25-PRI	1.70E+01	Reference 1	1.35E+07	1.14E+05
Cumene	98828	1.33E-02	Reference 3	1.35E+07	8.92E+01
Ethyl Benzene	100414	4.80E-02	Reference 3	1.35E+07	3.23E+02
Methyl Ethyl Ketone	78933	6.70E-02	Reference 3	1.35E+07	4.51E+02
Phenol	108952	1.15E-01	Reference 3	1.35E+07	7.75E+02
Styrene	100425	1.02E-01	Reference 3	1.35E+07	6.84E+02

References

1. Ward, D.E., C.C. Hardy, D.V. Sandberg, and T.E. Reinhardt. "Mitigation of Prescribed Fire Atmospheric Pollution Through Increased Utilization of Hardwoods, Piled Residues, and Long-Needled Conifers." Final Report. USDA Forest Service, Pacific Northwest Research Station, Fire and Air Resource Management. 1989.

2. U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 13.1 Prescribed Burning,, Table 13.1.3 October 1992.

3. U.S. Environmental Protection Agency, *Evaluation of Emissions from the Open Burning of Household Waste in Barrels*, EPA-600/R-97-134a, Control Technology Center. November 1997.

OPEN BURNING - RESIDENTIAL HOUSEHOLD WASTE
SCC: 2610030000

Criteria pollutant and HAP emission estimates for residential municipal solid waste burning are a function of the amount of household waste burned per year. The amount of household waste burned was estimated using data from EPA's report *Municipal Solid Waste in the United States.*[1] The report presents the total mass of waste generated in the United States by type of waste for the calendar year 2000. This information was used to calculate a daily estimate of the per capita household waste subject to burning, 3.37 lbs/person/day. Non-combustibles waste, such as glass and metals was not considered to be waste subject to burning. Burning of yard waste is included in SCC 2610000100 and SCC 2610000400, therefore, it is not part of residential household waste. Approximately 25 to 32 percent of all waste that is subject to open burning is actually burned.[2] A median value of 28 percent is assumed to burned in all counties in the United States.

The per capita estimate was then multiplied by the 2002 population in each county that is expected to burn waste. Since open burning is generally not practiced in urban areas, only the rural population of each county was assumed to practice open burning. The ratio of urban to rural population was obtained from 2000 U.S. Census data.[3] This ratio was then multiplied by the 2002 U.S. Census Bureau estimate of the population in each county to obtain the county-level rural population for 2002.[4] Appendix B contains the urban and rural population data in database format.

Controls for residential municipal solid waste burning are generally in the form of a ban on open burning of waste in a given municipality or county. Counties that were more than 80% urban were assumed not to practice any open burning. Therefore, criteria pollutant and HAP emissions from residential municipal solid waste burning are zero in these counties. In addition, the State of Colorado implemented a State-wide bun on open burning. Emissions from open burning of residential waste in all Colorado counties were assumed to be zero. Emissions that were set to zero due to burning bans excluded from the NEI. Table 1 contains the national emissions summary for both HAP and criteria pollutants.

County-level criteria pollutant and HAP emissions were calculated by multiplying the total amount of residential municipal solid waste burned per year by an emission factor.[5,6] Residential municipal solid waste (MSW) open burning emissions factors for VOC, NO_x, CO, and SO_2 were obtained from AP-42 (Table 2.5-1 (Municipal Refuse).[5] Residential MSW open burning emission factors for PM_{10} and $PM_{2.5}$ were obtained from Table 3-11 in the report "Evaluation of Emissions from the Open Burning of Household Waste in Barrels."[6] The emission factors were calculated by taking the average of test numbers 4 and 5 (non-recycler) PM_{10} and $PM_{2.5}$ emissions. Tables 1 contains the emissions factors, total mass of yard waste burned and national criteria pollutants and HAP emissions from residential municipal solid waste.

Emission from residential municipal solid waste burning in Puerto Rico and the U.S. Virgin Islands were estimated according to the methodology outlined in the report text. The surrogate counties for Puerto Rico and the U.S. Virgin Islands, Broward County, and Monroe County in Florida, are more than 80% urban, therefore, the emissions are zero. The emissions from residential municipal solid waste burning in Puerto Rico and the U.S. Virgin Islands were assumed to be zero as well.

OPEN BURNING - RESIDENTIAL HOUSEHOLD WASTE (continued)
SCC: 2610030000

Table 1. National Emissions Summary

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Activity Level (Reference 4) (tons of waste burned/yr)	National Emissions (tons/year)
CO	CO	8.50E+01	Reference 3	8.73E+06	3.68E+05
NO_X	NO_X	6.00E+00	Reference 3	8.73E+06	2.60E+04
PM10-FIL	PM10-FIL	3.80E+01	Reference 4	8.73E+06	1.64E+05
PM10-PRI	PM10-PRI	3.80E+01	Reference 4	8.73E+06	1.64E+05
PM25-FIL	PM25-FIL	3.48E+01	Reference 4	8.73E+06	1.51E+05
PM25-PRI	PM25-PRI	3.48E+01	Reference 4	8.73E+06	1.51E+05
SO_2	SO_2	1.00E+00	Reference 3	8.73E+06	4.33E+03
VOC	VOC	3.00E+01	Reference 3	8.73E+06	1.30E+05
1,2,4-trichlorobenzene	120821	2.20E-04	Reference 4	8.73E+06	9.52E-01
1,4-dichlorobenzene	106467	3.20E-04	Reference 4	8.73E+06	1.38E+00
Acenaphthene	83329	1.54E-03	Reference 4	8.73E+06	6.64E+00
Acenaphthylene	208968	2.26E-02	Reference 4	8.73E+06	9.78E+01
Anthracene	120127	3.66E-03	Reference 4	8.73E+06	1.58E+01
Benz[a]anthracene	56553	4.48E-03	Reference 4	8.73E+06	1.94E+01
Benzene	71432	2.48E+00	Reference 4	8.73E+06	1.07E+04
Benzo[a]pyrene	50328	4.24E-03	Reference 4	8.73E+06	1.84E+01
Benzo[b]fluoranthene	205992	5.26E-03	Reference 4	8.73E+06	2.28E+01
Benzo[g,h,i,]Perylene	191242	3.95E-03	Reference 4	8.73E+06	1.71E+01
Benzo[k]fluoranthene	207089	2.05E-03	Reference 4	8.73E+06	8.87E+00
Chlorobenzene	108907	8.48E-04	Reference 4	8.73E+06	3.67E+00
Chrysene	218019	5.07E-03	Reference 4	8.73E+06	2.19E+01
Dibenzo[a,h]anthracene	53703	6.46E-04	Reference 4	8.73E+06	2.79E+00
Fluoranthene	206440	8.14E-03	Reference 4	8.73E+06	3.52E+01
Fluorene	86737	7.31E-03	Reference 4	8.73E+06	3.16E+01
Hexachlorobenzene	118741	4.40E-05	Reference 4	8.73E+06	1.90E-01
Hydrochloric Acid	7647010	5.68E-01	Reference 4	8.73E+06	2.46E+03
Hydrogen Cyanide	74908	9.36E-01	Reference 4	8.73E+06	4.05E+03
Indeno[1,2,3-c,d]pyrene	193395	3.75E-03	Reference 4	8.73E+06	1.62E+01
Naphthalene	91203	3.51E-02	Reference 4	8.73E+06	1.52E+02
Pentachlorophenol	87865	1.06E-04	Reference 4	8.73E+06	4.59E-01
Phenanthrene	85018	1.46E-02	Reference 4	8.73E+06	6.34E+01
Phenol	108952	2.80E-01	Reference 4	8.73E+06	1.21E+03
Polychlorinated Biphenyls	1336363	5.72E-03	Reference 4	8.73E+06	2.47E+01
Pyrene	129000	9.66E-03	Reference 4	8.73E+06	4.18E+01
Styrene	100425	1.48E+00	Reference 4	8.73E+06	6.40E+03

<u>References</u>

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2. U.S. Environmental Protection Agency, Region V. "Emission Characteristics of Burn Barrels." Prepared by Two Rivers Regional Council of Public Officials and Patrick Engineering, Inc. June 1994.

3. U.S. Census Bureau, Decennial Censuses, 2000 Census: SF1, Table P2

4. U.S. Census Bureau. *7/1/2002 County Population Estimates File and Components of Change*, [Data file], April 17, 2003. Available from Population Estimates Branch Web site http://eire.census.gov/popest/estimates_dataset.php

5. United States Environmental Protection Agency, Office of Air Quality Planning and Standards. *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Section 2.5 Open Burning*. Research Triangle Park, NC. October 1992.

6. U.S. Environmental Protection Agency, Control Technology Center. "Evaluation of Emissions from the Open Burning of Household Waste in Barrels." EPA-600/R-97-134a. November 1997.

OPEN BURNING - SCRAP TIRES
SCC: 2830000000

The 2002 National Emissions for "Open Burning: Scrap Tires" are based on EPA-approved emission factors[1,2] multiplied by the number of tires burned. The national number of tires was found by summing up the number of tires burned by county which were based on a literature search for incidences of tire fires in 2002. Table 1 provides a summary of tire fires found, which also includes the date and number of tires burned. Emissions were allocated to each of these counties by the number of tires burned.

Table 1 - Summary of 2002 Tire Fires Found

County Location	State	Date of Fire	Number of Tires Burned	Reference
Saratoga County	NY	March 28, 2002	700,000	3
Roanoke City	VA	March 23, 2002	3,000,000[a]	4
Otoe County	NE	January 23, 2002	50,000	5
Keokuk County	IA	November 25, 2002	50,000	6
St. Lucie County	FL	October 13, 2002	1,800,000[b]	7
St. Mary	MD	June 12, 2002	5,000[c]	8
Luzerne County	PA	August 26, 2002	175,000[d]	9
Bernalillo County	NM	January 22, 2002	100	10
El Paso	CO	January 3, 2002	30,000	11
Androscoggin County	ME	June 30, 2002	2,250	12
Suffolk	VA	June 22, 2002	35,000	13
Etowah	AL	May 25, 2002	1,250	14
2002 National Number of Tires Burned			**5,848,600**	

a Estimates ranged from 2 to 4 million tires. An average of 3,000,000 was assumed.
b Number of tires burned not available. However, an estimate on the number of tires was generated using information on the volume of the pile of tire chips: 1.5 million cubic ft. (Reference 7), average loose density of tire shreds, 24 lb/cubic ft (Reference 15), and assumed weight of a tire (20 pounds/tire).
c Assumed 5,000. Report stated "several thousand tires were on fire."
d Estimates ranged from 150,000 to 200,000 tires. An average of 175,000 was assumed.

Calculations

It was assumed that each tire burned weighed approximately 20 pounds. Thus,

Amount of tires burned = Number of tires * assumed weight of tire = (5,848,600 tires) * (20 pounds/tire)

Amount of tires burned = 116,960,000 pounds = 58,480 tons = 58.480 thousand tons (10E3)

For comparison, in 1999, 16,179,540 tires burned in twelve counties.[16]

OPEN BURNING - SCRAP TIRES (continued)
SCC: 2830000000

Tables 2 and 3 list the EPA-approved emission factors from AP-42 and the ORD report for HAPs and criteria pollutants. Two types of emission factors are reported: chunk and shredded. An average emission factor was calculated and applied to the national number of tires burned. Emission factors for PM25-PRI and PM25-FIL are not available. Consequently, in order to include PM25-PRI and PM25-FIL emissions in the NEI, the PM25-PRI emission factor was set equal to the PM10-PRI emission factor, and the PM25-FIL emission factor was set equal to the PM10-FIL emission factor.

Table 2 - Emission Factors and National-Level Emissions for Criteria (PM, VOCs) Pollutants

Pollutant Description and NIF 3.0 Pollutant Code	Reference	Chunk (lb/1000 tons)	Shredded (lb/1000 tons)	Average (lb/1000 tons)	Emissions (tpy)
PM10-PRI	1	227,000	298,000	262,500	7,676.288
PM10-FIL	1	227,000	298,000	262,500	7,676.288
PM25-PRI	1	227,000	298,000	262,500	7,676.288
PM25-FIL	1	227,000	298,000	262,500	7,676.288
VOC	2	22,364	26,136	24,250	709.143

[1] Emission factors for PM25-PRI and PM25-FIL are not available. The PM25-PRI emission factor was set equal to the PM10-PRI emission factor, and the PM25-FIL emission factor was set equal to the PM10-FIL emission factor.

Table 3- Emission Factors and National-Level Emissions for HAPs (Metals, PAH, Others)

Pollutant Description		NIF 3.0 Pollutant Code	Reference	Chunk (lb/1000 tons)	Shredded (lb/1000 tons)	Average (lb/1000 tons)	Emissions (tpy)
Metals	Antimony	7440360	1	5.88	4.73	5.31	0.155
	Arsenic	7440382	1	0.10	0.40	0.25	0.007
	Chromium	7440473	1	3.94	3.43	3.69	0.108
	Lead	7439921	1	0.67	0.20	0.44	0.013
	Nickel	7440020	1	4.74	2.15	3.45	0.101
	Selenium	7782492	1	0.13	0.40	0.27	0.008
PAHs	Acenaphthene	83329	2	580.60	4891.40	2736.00	80.009
	Acenaphthylene	208968	2	1494.50	1093.00	1293.75	37.833
	Anthracene	120127	2	113.00	99.00	106.00	3.100
	Benzo(a)pyrene	50328	2	170.00	227.80	198.90	5.816
	Benzon(b)fluoranthene	205992	2	139.00	177.00	158.00	4.620
	Benzo(g,h,i)perylene	191242	2	132.00	318.80	225.40	6.591
	Benzo(k)fluoranthene	207089	2	149.00	199.00	174.00	5.088
	Benz(a)anthracene	56553	2	164.00	204.80	184.40	5.392
	Chrysene	218019	2	142.00	183.00	162.50	4.752
	Dibenz(a,h)anthracene	53703	2	2.20	0.00	1.10	0.032
	Fluoranthene	206440	2	677.40	916.00	796.70	23.298
	Fluorene	86737	2	521.00	373.60	447.30	13.080
	Indeno(1,2,3-cd)pyrene	193395	2	103.00	171.00	137.00	4.006
	Naphthalene	91203	2	1632.00	972.00	1302.00	38.074
	Phenanthrene	85018	2	475.00	505.00	490.00	14.329
	Pyrene	129000	2	67.60	303.40	185.50	5.425
Other	Benzene	71432	2	4312.60	4410	4361.30	127.537
	Biphenyl	92524	2	419.00	660.20	539.60	15.778
	1,3-Butadiene	106990	2	616.80	320.00	468.40	13.697
	Ethylbenzene	100414	2	921.60	590.20	755.90	22.105
	Phenol	108952	2	1.00	29.00	15.00	0.439
	Styrene	100425	2	1320.00	1291.00	1305.50	38.177

OPEN BURNING - SCRAP TIRES (continued)
SCC: 2830000000

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OPEN BURNING - YARD WASTE - LEAF AND BRUSH SPECIES
SCC: 2610000100 & 2610000400

Criteria pollutant and HAP emission estimates for leaf and brush waste burning are a function of the amount of waste burned per year. The amount of leaf and brush waste burned was estimated using data from EPA's report *Municipal Solid Waste in the United States.*[1] The report presents the total mass of waste generated in the United States by type of waste, including yard waste, for the calendar year 2000. This information was used to calculate a daily estimate of the per capita yard waste, 0.54 lbs/person/day. Of the total amount of yard waste generated, the yard waste composition was assumed to be 25 percent leaves, 25 percent brush, and 50 percent grass by weight.[2]

Open burning of grass clippings is not typically practiced by homeowners, and as such only estimates for leaf burning and brush burning were developed. Approximately 25 to 32 percent of all waste is actually burned.[2] It was assumed that 28 percent of the leaf and brush yard waste generated is burned.

The per capita estimate was then multiplied by the 2002 population in each county that is expected to burn waste. Since open burning is generally not practiced in urban areas, only the rural population of each county was assumed to practice open burning. The ratio of urban to rural population was obtained from 2000 U.S. Census data[3]. This ratio was then multiplied by the 2002 U.S. Census Bureau estimate of the population in each county to obtain the county-level rural population for 2002[4]. Appendix B contains both the total population and urban and rural population data in database format.

The percentage of forested acres from Version 2 of BELD2 within BEIS was used to adjust for variations in vegetation. The percentage of forested acres per county (including rural forest and urban forest) was then determined. To better account for the native vegetation that would likely be occurring in the residential yards of farming States, agricultural land acreage was subtracted before calculating the percentage of forested acres. Table 1 presents the ranges that were used to make adjustments to the amount of yard waste that is assumed to be generated per county.

Table 1. Adjustment for Percentage of Forested Acres

Percent Forested Acres per County	Adjustment for Yard Waste Generated
< 10%	0% generated
>= 10%, and < 50%	50% generated
>= 50%	100% generated

Controls for yard waste burning are generally in the form of a ban on open burning of waste in a given municipality or county. Counties that were more than 80% urban were assumed not to practice any open burning. Therefore, criteria pollutant and HAP emissions from residential municipal solid waste burning are zero in these counties. In addition, the State of Colorado implemented a State-wide ban on open burning. Emissions from open burning of residential waste in all Colorado counties were assumed to be zero. Emissions that were set to zero due to burning bans excluded from the NEI.

County-level criteria pollutant and HAP emissions were calculated by multiplying the total amount of yard waste (leaf and brush) burned per year by an emission factor.[5,6] Emissions for leaves and residential brush were calculated separately, since emission factors vary by yard waste type. Tables 2 and 3 contain the emissions factors, total mass of yard waste burned and national criteria pollutants and HAP emissions from burning of leaves and brush, respectively.

OPEN BURNING - YARD WASTE - LEAF AND BRUSH SPECIES (continued)
SCC: 2610000100 & 2610000400

Example Calculations:

2000 Leaf Burning activity, ton/year = 2.84E+05

2000 Leaf Burning Styrene, ton/year = 2.84E+05* 1.02E-01 * (1/2000) = 1.44E+01

Table 2. National Emissions Summary for Leaf Species (SCC 2610000100)

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/ton)	Emission Factor Reference	2002 National Activity Level (tons burned/year)	2002 National Emissions (tons/year)
CO	CO	1.12E+02	Reference 3	2.84E+05	1.59E+04
PM10-FIL	PM10-FIL	3.80E+01	Reference 3	2.84E+05	5.41E+03
PM10-PRI	PM10-PRI	3.80E+01	Reference 3	2.84E+05	5.41E+03
PM25-FIL	PM25-FIL	3.80E+01	Reference 3	2.84E+05	5.41E+03
PM25-PRI	PM25-PRI	3.80E+01	Reference 3	2.84E+05	5.41E+03
VOC	VOC	2.80E+01	Reference 3	2.84E+05	3.99E+03
Ethyl Benzene	100414	4.80E-02	Reference 4	2.84E+05	6.83E+00
Styrene	100425	1.02E-01	Reference 4	2.84E+05	1.44E+01
Phenol	108952	1.15E-01	Reference 4	2.84E+05	1.64E+01
Methyl Ethyl Ketone	78933	6.70E-02	Reference 4	2.84E+05	9.54E+00
Cumene	98828	1.33E-02	Reference 4	2.84E+05	1.89E+00

OPEN BURNING - YARD WASTE - LEAF AND BRUSH SPECIES (continued)
SCC: 2610000100 & 2610000400

Table 3. National Emissions Summary for Brush Species (SCC 2610000400)

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	2002 National Activity Level (tons burned/year)	2002 National Emissions (tons/year)
CO	CO	1.40E+02	Reference 3	2.84E+05	1.99E+04
PM10-PRI	PM10-PRI	1.70E+01	Reference 3	2.84E+05	2.42E+03
PM10-FIL	PM10-FIL	1.70E+01	Reference 3	2.84E+05	2.42E+03
PM25-PRI	PM25-PRI	1.70E+01	Reference 3	2.84E+05	2.42E+03
PM25-FIL	PM25-FIL	1.70E+01	Reference 3	2.84E+05	2.42E+03
VOC	VOC	1.90E+01	Reference 3	2.84E+05	2.70E+03
Cumene	98828	1.33E-02	Reference 4	2.84E+05	1.89E+00
Ethyl Benzene	100414	4.80E-02	Reference 4	2.84E+05	6.83E+00
Methyl Ethyl Ketone	78933	6.70E-02	Reference 4	2.84E+05	9.54E+00
Phenol	108952	1.15E-01	Reference 4	2.84E+05	1.64E+01
Styrene	100425	1.02E-01	Reference 4	2.84E+05	1.44E+01

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PUBLICLY OWNED TREATMENT WORKS (POTW)
SCC: 2630020000

Publicly owned treatment works (POTW) facilities are owned by a municipality, State, an intermunicipality or interstate agency, and departments/agencies of the federal government. The definition of a POTW facility includes intercepting sewers, outfall sewers, sewage collection systems, pumping, power, and other equipment. The wastewater treated by these POTWs is generated by industrial, commercial, and domestic sources.[1] The national emission estimates for POTW facilities were calculated using an interpolated nationwide flow rate for base year 2002, and then applying emission factors for VOCs, ammonia, and 53 HAPs. Nationwide projected flow rates for 2000 and 2005 were available from an EPA report[2], and are summarized in Table 1. In 2000, flow rate was estimated to be 34,710 million gallons per day (MMGD); in 2005, flow rate was estimated to be 37,085 MMGD. The interpolated 2002 nationwide flow rate (using a linear regression) was calculated at 35,660 MMGD, or 13,015,900 million gallons annually.

The ammonia emission factor was obtained from a report to EPA[3], while the VOC emission factor was retrieved from FIRE program.[4] Emission factors for the 53 HAPs were derived using 1996 nonpoint source emissions estimates that were provided by ESD[5] and the 1996 nationwide flow rate.[6] Table 2 lists the 53 HAPs, the 1996 nonpoint source emissions, and the derived emission factor in pounds per million gallons treated. It was assumed that the emission factors derived from the 1996 information are applicable for the year 2002. Emissions were allocated to the county-level by the county proportion of the U.S. population.[7] Appendix B contains the total population data in database format.

Table 2 provides a national summary of emissions by pollutant. It is important to note that the values in Table 2 represent total emissions. Due to time and resource constraints for completing the final 2002 nonpoint NEI, an evaluation was not performed to determine if there was double counting of point source emissions in the nonpoint source NEI. Point source emissions are classified under SCCs 50100781 and 50100791 through 50182599.

The national POTW flow rate estimate does not include Puerto Rico or the U.S. Virgin Islands. Emissions for Puerto Rico and the U.S. Virgin Islands were estimated using the approach outlined in the report text. Broward County in Florida is assumed to be the surrogate county for Puerto Rico. Monroe County in Florida is assumed to be the surrogate for the U.S. Virgin Islands. POTW emissions in the surrogate counties were divided by the population of the surrogate counties obtained from the U.S. Census Bureau to estimate emissions on a per capita basis.[7] The per capita emissions were then multiplied by the population in each county of Puerto Rico and the U.S. Virgin Islands to estimate emissions. The emissions data reported in Table 2 include the emission estimates for Puerto Rico and the U.S. Virgin Islands.

<u>Example Calculations</u>:

The 1996 flow rate per day was 32,175 MMGD. (1996 was a leap year.) Annually, this computes to:

32,175 MMGD treated * 366 days = 11,776,050 million gallons treated

Benzene emissions in 1996 for nonpoint source POTWs were estimated to be 461.44 tons per year. The derived benzene emission factor is calculated as follows:

Benzene emission factor = (461.44 tons * 2000 lb/ton)/(11,776,050 million gallons treated)

Benzene emission factor = 0.078369 lb/million gallons treated

Benzene estimates for 2002 for nonpoint source POTWs (excluding Puerto Rico and U.S. Virgin Islands) are calculated as follows:

2002 Benzene emissions = (35,660 MMGD * 365 days) * (0.078369 lb/million gallons treated)

2002 Benzene emissions = 1,020,043 pounds = 510.02 tons/year

PUBLICLY OWNED TREATMENT WORKS (POTW) (continued)
SCC: 2630020000

Data Parameters

Table 1 - National Flow Rates, 1996-2005

Year	Flow rate (MMGD)	Reference
1996	32,175	6
2000	34,710	2
2002	35,660	interpolated by linear regression
2005	37,085	2

Table 2 - Criteria and HAP Emission Factors and National-Level Estimates: Not Adjusted for Point Source Emissions

Pollutant Description	NIF 3.0 Pollutant Codes	1996 Emissions (tpy)	Derived Emission Factor (lb/MMGAL)	2002 Emissions (tpy) [1]
1,1,2,2-Tetrachloroethane	79345	0.12	2.0380E-05	0.1335
1,1,2-Trichloroethane	79005	0.08	1.3587E-05	0.0890
1,2,4-Trichlorobenzene	120821	5.92	1.0054E-03	6.5839
1,3-Butadiene	106990	1.72	2.9212E-04	1.9129
1,4-Dichlorobenzene	106467	14.76	2.5068E-03	16.4152
1-Chloro-2,3-Epoxypropane	106898	0.31	5.2649E-05	0.3448
2,4-Dinitrotoluene	121142	3.3	5.6046E-04	3.6701
2-Nitropropane	79469	0.02	3.3967E-06	0.0222
Acetaldehyde	75070	21.27	3.6124E-03	23.6552
Acetonitrile	75058	23.67	4.0200E-03	26.3244
Acrolein	107028	26.3	4.4667E-03	29.2493
Acrylonitrile	107131	26.47	4.4956E-03	29.4384
Allyl Chloride	107051	1.33	2.2588E-04	1.4791
Ammonia	NH_3	NA	0.169 [2]	1,070
Benzene	71432	461.44	7.8369E-02	513.1862
Benzyl Chloride	100447	0.56	9.5108E-05	0.6228
Biphenyl	92524	5.16	8.7636E-04	5.7386
Carbon Disulfide	75150	296.41	5.0341E-02	329.65496
Carbon Tetrachloride	56235	77.35	1.3137E-02	86.0241
Chlorobenzene	108907	33.13	5.6267E-03	36.8452
Chloroform	67663	441.89	7.5049E-02	491.4438
Chloroprene	126998	1.63	2.7683E-04	1.8128
Cresols (includes o,m,p)	331	0.11	1.8682E-05	0.1223
Dimethyl Sulfate	77781	0.09	1.5285E-05	0.1001
Ethyl Acrylate	140885	0.12	2.0380E-05	0.1335

PUBLICLY OWNED TREATMENT WORKS (POTW) (continued)
SCC: 2630020000

Table 2 (continued)

Pollutant Description	NIF 3.0 Pollutant Codes	1996 Emissions (tpy)	Derived Emission Factor (lb/MMGAL)	2002 Emissions (tpy) [1]
Ethyl benzene	100414	525.48	8.9246E-02	584.4077
Ethylene Oxide	75218	15.22	2.5849E-03	16.9268
Formaldehyde	50000	1.35	2.2928E-04	1.5014
Glycol Ethers	171	788.86	1.3398E-01	877.3233
Hexachlorobutadiene	87683	0.05	8.4918E-06	0.0556
Hexachlorocyclopentadiene	77474	0.04	6.7935E-06	0.0445
Methanol	67561	782.48	1.3289E-01	870.2278
Methyl Chloroform (1,1,1-Trichloroethane)	71556	38.62	6.5591E-03	42.9509
Methyl Ethyl Ketone (2-Butanone)	78933	195.16	3.3145E-02	217.0454
Methyl Isobutyl Ketone (Hexone)	108101	184.45	3.1326E-02	205.1343
Methyl Methacrylate	80626	21.31	3.6192E-03	23.6997
MTBE	1634044	4.37	7.4218E-04	4.8601
Methylene Chloride	75092	625.92	1.0630E-01	696.1111
N,N-Dimethylaniline	121697	22.10	3.7534E-03	24.5783
Naphthalene	91203	90.00	1.5285E-02	100.0927
Nitrobenzene	98953	0.45	7.6426E-05	0.5005
o-Toluidine	95534	0.12	2.0380E-05	0.1335
P-Dioxane	123911	1.23	2.0890E-04	1.3679
Propionaldehyde	123386	0.24	4.0761E-05	0.2669
Propylene Dichloride	78875	0.79	1.3417E-04	0.8786
Propylene Oxide	75569	50.21	8.5275E-03	55.8406
Styrene	100425	187.35	3.1819E-02	208.3596
Tetrachloroethylene	127184	292.47	4.9672E-02	325.2678
Toluene	108883	839.51	1.4258E-01	933.6532
Trichloroethylene	79016	20.98	3.5632E-03	23.3327
Vinyl Acetate	108054	5.25	8.9164E-04	5.8387
Vinyl Chloride	75014	0.46	7.8125E-05	0.5116
Vinylidene Chloride	75354	29.01	4.9269E-03	32.2632
VOC	VOC	NA	9.90E+00 [2]	64,828.2886
Xylenes (includes o, m, and p)	1330207	4100.05	6.9634E-01	4,559.8322

[1] Includes estimates for Puerto Rico and the U.S. Virgin Islands.
[2] Actual emission factor, not derived.

PUBLICLY OWNED TREATMENT WORKS (POTW) (continued)
SCC: 2630020000

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RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL
SCC: 2104001000 and 2104002000

The mass of coal consumed for residential heating in the U.S. is used to estimate emissions. Coal consumption by energy use sector is presented in the State Energy Data 2000 Consumption published by the Energy Information Administration (EIA).[1] Year 2000 consumption data (452 thousand tons) were used to estimate 2002 consumption because year 2000 data were the latest data available.

The State Energy Data Report does not distinguish between anthracite and bituminous/subbituminous coal consumption estimates. EPA's report "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion," uses State-level anthracite and bituminous/subbituminous coal consumption estimates for 1999 that were obtained directly from EIA.[2] The 1999 ratio of anthracite and bituminous/subbituminous coal consumption to total coal consumption is used to distribute the 2000 coal consumption data by coal type. Table 1 presents the 1999 ratio between anthracite and bituminous/subbituminous coal consumption in each State.

Table 1. 1999 State Distribution of Anthracite and Bituminous/Subbituminous Coal Consumed for Residential Heating

State	Ratio of Bituminous/ Subbituminous	Ratio of Anthracite	State	Ratio of Bituminous/ Subbituminous	Ratio of Anthracite
Alabama	1.00000	0.00000	Montana	1.00000	0.00000
Alaska	1.00000	0.00000	Nebraska	0.00000	0.00000
Arizona	0.00000	0.00000	Nevada	0.00000	0.00000
Arkansas	0.00000	0.00000	New Hampshire	0.00000	1.00000
California	1.00000	0.00000	New Jersey	0.00000	1.00000
Colorado	1.00000	0.00000	New Mexico	1.00000	0.00000
Connecticut	0.00000	1.00000	New York	0.63636	0.36364
Delaware	0.00000	1.00000	North Carolina	1.00000	0.00000
District of Columbia	1.00000	0.00000	North Dakota	1.00000	0.00000
Florida	1.00000	0.00000	Ohio	0.98430	0.01570
Georgia	1.00000	0.00000	Oklahoma	1.00000	0.00000
Hawaii	0.00000	0.00000	Oregon	0.00000	0.00000
Idaho	1.00000	0.00000	Pennsylvania	0.19450	0.80550
Illinois	1.00000	0.00000	Rhode Island	0.00000	1.00000
Indiana	0.97527	0.02473	South Carolina	1.00000	0.00000
Iowa	1.00000	0.00000	South Dakota	1.00000	0.00000
Kansas	1.00000	0.00000	Tennessee	1.00000	0.00000
Kentucky	1.00000	0.00000	Texas	1.00000	0.00000
Louisiana	1.00000	0.00000	Utah	1.00000	0.00000
Maine	0.00000	1.00000	Vermont	0.00000	1.00000
Maryland	0.92771	0.07229	Virginia	0.98625	0.01375
Massachusetts	0.61165	0.38835	Washington	1.00000	0.00000
Michigan	0.91724	0.08276	West Virginia	1.00000	0.00000
Minnesota	1.00000	0.00000	Wisconsin	1.00000	0.00000
Mississippi	0.00000	0.00000	Wyoming	1.00000	0.00000
Missouri	0.97746	0.02254			

RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCC: 2104001000 and 2104002000

State-level coal consumption was allocated to each county using the U.S. Census Bureau's 2000 Census Detailed Housing Information.[3] These data include the number of housing units using a specific type of fuel for residential heating. Appendix B provides these data in database format. State coal consumption was allocated to each county using the ratio of the number of houses burning coal in each county to the total number of houses burning coal in the State. Refer to Appendices B and C for more details on this allocation.

Calculation of SO_2 and PM emissions requires sulfur content and ash content of the coal burned. Table 2 presents SO_2 and sulfur content of PM emission factors for anthracite and bituminous/subbituminous coal. State -specific sulfur and ash content of anthracite and bituminous/subbituminous coal is obtained from EPA's report "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion"[2] This report presents an analysis of the sulfur content and ash content in each State with a coal seam based on data obtained from USGS COALQUAL database. States that are not included in the database but reported coal usage are assigned values based on their proximity to coal seams or using an average value for Pennsylvania (see report for details of the analysis). Table 3 presents the sulfur and ash content by coal type for each State.

Table 2. Emission Factors for Residential Anthracite and Bituminous/Subbituminous Coal Combustion

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	AP-42 Table
Anthracite Emission Factors		
SO_2	39 x % Sulfur	1.2-1
PM10-FIL	10.0	1.2-3
PM25-FIL	0.6 x % Ash	1.2-4
PM-CON	0.08 x % Ash	1.2-3
Bituminous/Subbituminous Emission Factors		
SO_2	31 x % Sulfur	1.1-3
PM10-FIL	6.2	1.1-4
PM25-FIL	3.8	1.1-10
PM-CON	0.04	1.1-5

Note: PM_{10}, $PM_{2.5}$, and condensible PM emission factors for bituminous/ subbituminous coal do not require ash content.

Table 3. State-Specific Sulfur and Ash Content for Anthracite and Bituminous/Subbituminous Coal

Anthracite			Bituminous/Subbituminous			
State	**Percent Ash Content**	**Percent Sulfur Content**	**State**	**Percent Sulfur Content**	**State**	**Percent Sulfur Content**
Connecticut	13.38	0.89	Alabama	2.08	Montana	0.6
Delaware	13.38	0.89	Alaska	0.31	New Mexico	0.75
Indiana	13.38	0.89	California	0.47	New York	2.42
Maine	13.38	0.89	Colorado	0.61	North Carolina	1.62
Maryland	13.38	0.89	Dist. Columbia	1.67	North Dakota	0.97
Massachusetts	13.38	0.89	Florida	1.28	Ohio	3.45
Michigan	13.38	0.89	Georgia	1.28	Oklahoma	3.08
Missouri	13.38	0.89	Idaho	0.31	Pennsylvania	2.42
New Hampshire	13.38	0.89	Illinois	3.48	South Carolina	1.28
New Jersey	13.38	0.89	Indiana	2.49	South Dakota	0.97
New York	13.38	0.89	Iowa	4.64	Tennessee	1.62
Ohio	13.38	0.89	Kansas	5.83	Texas	1.14
Pennsylvania	13.38	0.89	Kentucky	1.93	Utah	0.8
Rhode Island	13.38	0.89	Maryland	1.67	Virginia	1.19
Vermont	13.38	0.89	Massachusetts	2.42	Washington	0.5
Virginia	27.6	0.43	Michigan	1.2	West Virginia	1.25
			Minnesota	0.97	Wisconsin	1
			Missouri	3.39	Wyoming	0.87

The remaining criteria pollutant and HAP emissions were calculated by multiplying the total coal consumed in each county per year by an emission factor. Emissions for anthracite and bituminous/subbituminous coal were calculated separately, since emission factors vary by coal type. Table 4 presents a summary of the CAP emissions factors, total mass of coal burned and the national CAP emissions. Table 5 presents HAP emissions factors, total mass of coal burned and the national HAP emissions. Emissions from residential heating by coal in the Puerto Rico and the U.S. Virgin Islands were not estimated for the 2002 NEI.

RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCC: 2104001000 and 2104002000

Table 4. National Criteria Pollutant Emissions Summary for Residential Heating with Anthracite and Bituminous/Subbituminous Coal

Pollutant Description and NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Activity Level (thousand short tons)	National Emissions (tons/yr)
Anthracite				
CO	275	Reference 2	74.45	10,237
NOX	3	Reference 2	74.45	112
PM10-FIL	See Table 2	Reference 2	74.45	4,989
PM-CON	See Table 2	Reference 2	74.45	39.9
PM25-FIL	See Table 2	Reference 2	74.45	299
SO2	See Table 2	Reference 2	74.45	1,291
VOC	10	Reference 2	74.45	372
Bituminous/Subbituminous				
CO	275	Reference 2	377.55	51,913
NOX	9.1	Reference 2	377.55	1,718
PM10-FIL	6.2	Reference 2	377.55	1,170
PM25-FIL	3.8	Reference 2	377.55	717
PM-CON	0.04	Reference 2	377.55	7.6
SO2	See Table 2	Reference 2	377.55	11,388
VOC	10	Reference 2	377.55	1,888

RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCC: 2104001000 and 2104002000

**Table 5. National HAP Emissions Summary
for Residential Heating with Anthracite and Bituminous/Subbituminous Coal**

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Activity Level (thousand short tons)	National Emissions (tons/yr)
Anthracite					
Acenaphthene	83329	5.10e-07	Reference 5	74.45	1.90e-05
Acenaphthylene	208968	2.50e-07	Reference 5	74.45	9.31e-06
Acetaldehyde	75070	5.70e-04	Reference 4,5	74.45	2.12e-02
Acetophenone	98862	1.50e-05	Reference 4,5	74.45	5.58e-04
Acrolein	107028	2.90e-04	Reference 4,5	74.45	1.08e-02
Anthracene	120127	2.10e-07	Reference 5	74.45	7.82e-06
Antimony	7440360	1.80e-05	Reference 4,5	74.45	6.70e-04
Arsenic	7440382	4.10e-04	Reference 4,5	74.45	1.53e-02
Benz[a]Anthracene	56553	8.00e-08	Reference 5	74.45	2.98e-06
Benzene	71432	1.30e-03	Reference 4,5	74.45	4.84e-02
Benzo[a]Pyrene	50328	3.80e-08	Reference 5	74.45	1.41e-06
Benzo[g,h,i,]Perylene	191242	2.70e-08	Reference 5	74.45	1.01e-06
Benzofluoranthenes	56832736	1.10e-07	Reference 5	74.45	4.09e-06
Beryllium	7440417	2.10e-05	Reference 4,5	74.45	7.82e-04
Bis(2-Ethylhexyl)Phthalate	117817	7.30e-05	Reference 4,5	74.45	2.72e-03
Cadmium	7440439	5.10e-05	Reference 4,5	74.45	1.90e-03
Carbon Disulfide	75150	1.30e-04	Reference 4,5	74.45	4.84e-03
Chlorobenzene	108907	2.20e-05	Reference 4,5	74.45	8.19e-04
Chromium	7440473	2.64e-04	Reference 4,5	74.45	9.83e-03
Chrysene	218019	1.00e-07	Reference 5	74.45	3.72e-06
Cobalt	7440484	1.00e-04	Reference 4,5	74.45	3.72e-03
Ethyl Benzene	100414	9.40e-05	Reference 4,5	74.45	3.50e-03
Ethylene Dichloride	107062	4.00e-05	Reference 4,5	74.45	1.49e-03
Fluoranthene	206440	7.10e-07	Reference 5	74.45	2.64e-05
Fluorene	86737	9.10e-07	Reference 5	74.45	3.39e-05
Formaldehyde	50000	2.40e-04	Reference 4,5	74.45	8.93e-03
Hexane	110543	6.70e-05	Reference 4,5	74.45	2.49e-03
Hydrochloric Acid	7647010	1.20e+00	Reference 4,5	74.45	4.47e+01
Hydrogen Fluoride	7664393	1.50e-01	Reference 5	74.45	5.58e+00
Indeno[1,2,3-c,d]Pyrene	193395	6.10e-08	Reference 5	74.45	2.27e-06
Isophorone	78591	5.80e-04	Reference 4,5	74.45	2.16e-02
Lead	7439921	4.20e-04	Reference 4,5	74.45	1.56e-02
Manganese	7439965	4.90e-04	Reference 4,5	74.45	1.82e-02
Mercury	7439976	8.30e-05	Reference 4,5	74.45	3.09e-03
Methyl Bromide	74839	1.60e-04	Reference 4,5	74.45	5.96e-03
Methyl Chloride	74873	5.30e-04	Reference 4,5	74.45	1.97e-02
Methyl Ethyl Ketone	78933	3.90e-04	Reference 4,5	74.45	1.45e-02
Methylene Chloride	75092	2.90e-04	Reference 4,5	74.45	1.08e-02
Naphthalene	91203	1.30e-05	Reference 5	74.45	4.84e-04
Nickel	7440020	2.80e-04	Reference 4,5	74.45	1.04e-02
Phenanthrene	85018	2.70e-06	Reference 5	74.45	1.01e-04
Phenol	108952	1.60e-05	Reference 5	74.45	5.96e-04
Propionaldehyde	123386	3.80e-04	Reference 4,5	74.45	1.41e-02
Pyrene	129000	3.30e-07	Reference 5	74.45	1.23e-05
Selenium	7782492	1.30e-03	Reference 4,5	74.45	4.84e-02
Styrene	100425	2.50e-05	Reference 4,5	74.45	9.31e-04
Tetrachloroethylene	127184	4.30e-05	Reference 4,5	74.45	1.60e-03
Toluene	108883	2.40e-04	Reference 4,5	74.45	8.93e-03

RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS COAL (continued)
SCC: 2104001000 and 2104002000

Table 5 (continued)

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/ton)	Emission Factor Reference	National Activity Level (thousand short tons)	National Emissions (tons/yr)
Bituminous/Subbituminous					
Acetaldehyde	75070	5.70e-04	Reference 4,5	377.55	1.08e-01
Acetophenone	98862	1.50e-05	Reference 4,5	377.55	2.83e-03
Acrolein	107028	2.90e-04	Reference 4,5	377.55	5.47e-02
Antimony	7440360	1.80e-05	Reference 4,5	377.55	3.40e-03
Arsenic	7440382	4.10e-04	Reference 4,5	377.55	7.74e-02
Benz[a]Anthracene	56553	8.00e-08	Reference 5	377.55	1.51e-05
Benzene	71432	1.30e-03	Reference 4,5	377.55	2.45e-01
Benzo[b]Fluoranthene	205992	1.10e-07	Reference 5	377.55	2.08e-05
Benzo[g,h,i,]Perylene	191242	2.70e-08	Reference 5	377.55	5.10e-06
Beryllium	7440417	2.10e-05	Reference 4,5	377.55	3.96e-03
Bis(2-Ethylhexyl)Phthalate	117817	7.30e-05	Reference 4,5	377.55	1.38e-02
Cadmium	7440439	5.10e-05	Reference 4,5	377.55	9.63e-03
Carbon Disulfide	75150	1.30e-04	Reference 4,5	377.55	2.45e-02
Chlorobenzene	108907	2.20e-05	Reference 4,5	377.55	4.15e-03
Chromium	7440473	2.60e-04	Reference 4,5	377.55	4.91e-02
Chrysene	218019	1.00e-07	Reference 4	377.55	1.89e-05
Cobalt	7440484	1.00e-04	Reference 4,5	377.55	1.89e-02
Ethyl Benzene	100414	9.40e-05	Reference 4,5	377.55	1.77e-02
Ethylene Dichloride	107062	4.00e-05	Reference 4,5	377.55	7.55e-03
Formaldehyde	50000	2.40e-04	Reference 4,5	377.55	4.53e-02
Hexane	110543	6.70e-05	Reference 4,5	377.55	1.27e-02
Indeno[1,2,3-c,d]Pyrene	193395	6.10e-08	Reference 5	377.55	1.15e-05
Isophorone	78591	5.80e-04	Reference 4,5	377.55	1.09e-01
Lead	7439921	4.20e-04	Reference 4,5	377.55	7.93e-02
Manganese	7439965	4.90e-04	Reference 4,5	377.55	9.25e-02
Mercury	7439976	8.30e-05	Reference 4,5	377.55	1.57e-02
Methyl Bromide	74839	1.60e-04	Reference 4,5	377.55	3.02e-02
Methyl Chloride	74873	5.30e-04	Reference 4,5	377.55	1.00e-01
Methyl Ethyl Ketone	78933	3.90e-04	Reference 4,5	377.55	7.36e-02
Methylene Chloride	75092	2.90e-04	Reference 4,5	377.55	5.47e-02
Nickel	7440020	2.80e-04	Reference 4,5	377.55	5.29e-02
Phenol	108952	1.60e-05	Reference 5	377.55	3.02e-03
Propionaldehyde	123386	3.80e-04	Reference 4,5	377.55	7.17e-02
Pyrene	129000	3.30e-07	Reference 5	377.55	6.23e-05
Selenium	7782492	1.30e-03	Reference 4,5	377.55	2.45e-01
Styrene	100425	2.50e-05	Reference 4,5	377.55	4.72e-03
Tetrachloroethylene	127184	4.30e-05	Reference 4,5	377.55	8.12e-03
Toluene	108883	2.40e-04	Reference 4,5	377.55	4.53e-02

RESIDENTIAL HEATING: ANTHRACITE AND BITUMINOUS/SUBBITUMINOUS COAL (continued)
SCC: 2104001000 and 2104002000

Example Calculations

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{ton\ coal}\right) \times National\ Activity\left(\frac{tons\ coal\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ selenium\ emissions\ \text{from bituminous coal combustion} = \frac{\frac{1.3 \times 10^{-3}\ lb}{ton} \times\ 377.55 \times 10^{3}\ ton}{2000\ \frac{lb}{ton}} = .024541\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2000 Consumption. Washington, D.C. 2003. Internet Address: http://www.eia.doe.gov/emeu/states/_use_multistate.htm

2. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. “Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion.” Research Triangle Park, NC. September 2002. http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip

3. U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.

4. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. Environmental Protection Agency/Emissions Monitoring and Analysis Division. Comments on Industrial Boiler information in the “Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report,” September 18, 1998. November 13, 1998.

5. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

RESIDENTIAL HEATING: DISTILLATE OIL
SCC: 2104004000

The State-level volume of distillate oil consumed for residential heating in the U.S. is used to estimate emissions. Distillate Oil consumption by energy use sector is presented in the State Energy Data 2000 Consumption published by the Energy Information Administration (EIA).[1] Because 2002 consumption data were not yet available, year 2000 consumption data (6,175,092 thousand gallons) were used to estimate 2002 consumption.

State-level distillate oil consumption was allocated to each county using the U.S. Census Bureau's 2000 Census Detailed Housing Information.[2] These data include the number of housing units using a specific type of fuel for residential heating. Appendix B provides these data in database format. State distillate oil consumption was allocated to each county using ratio of number of houses burning distillate oil in each county to the total number of houses burning distillate oil in the State.

Criteria pollutant emission factors for distillate oil are from "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion."[3] For all counties in the U.S., the distillate oil consumed for residential heating is assumed to be No. 2 fuel oil with a heating value of 140,000 Btu per gallon and a sulfur content of 0.30%.[3]

County-level criteria pollutant and HAP emissions were calculated by multiplying the total distillate oil consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that contains the emissions factors, total volume of distillate oil burned, and national criteria pollutant and HAP emissions from residential heating with distillate oil. Emissions from residential heating by distillate oil in the Puerto Rico and the U.S. Virgin Islands were not estimated for the 2002 NEI.

RESIDENTIAL HEATING: DISTILLATE OIL (continued)
SCC: 2104004000

Table 1. National Criteria Pollutant and HAP Emissions Summary for Residential Heating with Distillate Oil

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/1,000 gal)	Emission Factor Reference	National Activity Level Distillate Oil Consumption (thousand gallons)	National Emissions (lb/yr)
Acenaphthene	83329	2.11e-05	Reference 5	6,175,092	6.51E-02
Acenaphthylene	208968	2.53e-07	Reference 5	6,175,092	7.81E-04
Acetaldehyde	75070	4.92e-03	Reference 5	6,175,092	1.52E+01
Anthracene	120127	1.22e-06	Reference 5	6,175,092	3.77E-03
Arsenic	7440382	5.62e-04	Reference 4, 5	6,175,092	1.73E+00
Benz[a]Anthracene	56553	4.07e-06	Reference 5	6,175,092	1.26E-02
Benzene	71432	2.11e-04	Reference 4, 5	6,175,092	6.51E-01
Benzo[b+k]Fluoranthene	102	1.55e-06	Reference 5	6,175,092	4.77E-03
Benzo[g,h,i,]Perylene	191242	2.25e-06	Reference 5	6,175,092	6.94E-03
Beryllium	7440417	4.21e-04	Reference 4, 5	6,175,092	1.30E+00
Cadmium	7440439	4.21e-04	Reference 4, 5	6,175,092	1.30E+00
Chromium	7440473	4.21e-04	Reference 4, 5	6,175,092	1.30E+00
Chrysene	218019	2.39e-06	Reference 5	6,175,092	7.37E-03
Dibenzo[a,h]Anthracene	53703	1.69e-06	Reference 5	6,175,092	5.20E-03
Fluoranthene	206440	4.92e-06	Reference 5	6,175,092	1.52E-02
Fluorene	86737	4.50e-06	Reference 5	6,175,092	1.39E-02
Formaldehyde	50000	3.37e-02	Reference 4, 5	6,175,092	1.04E+02
Indeno[1,2,3-c,d]Pyrene	193395	2.11e-06	Reference 5	6,175,092	6.51E-03
Lead	7439921	1.26e-03	Reference 4, 5	6,175,092	3.90E+00
Manganese	7439965	8.43e-04	Reference 4, 5	6,175,092	2.60E+00
Mercury	7439976	4.21e-04	Reference 4, 5	6,175,092	1.30E+00
Naphthalene	91203	1.14e-03	Reference 5	6,175,092	3.51E+00
Nickel	7440020	4.21e-04	Reference 4, 5	6,175,092	1.30E+00
Phenanthrene	85018	1.05e-05	Reference 5	6,175,092	3.25E-02
Pyrene	129000	4.21e-06	Reference 5	6,175,092	1.30E-02
Selenium	7782492	2.11e-03	Reference 4, 5	6,175,092	6.51E+00
CO	CO	5.00e-00	Reference 3	6,175,092	1.54E+04
NO_X	NO_X	1.80e+01	Reference 3	6,175,092	5.56E+04
PM10-FIL	PM10-FIL	1.08e+00	Reference 3	6,175,092	3.33E+03
PM25-FIL	PM25-FIL	8.30e-01	Reference 3	6,175,092	2.56E+03
PM-CON	PM-CON	1.30e+00	Reference 3	6,175,092	4.01E+03
SO_2	SO_2	4.26e+01	Reference 3	6,175,092	1.32E+05
VOC	VOC	7.00e-01	Reference 3	6,175,092	2.16E+03

RESIDENTIAL HEATING: DISTILLATE OIL (continued)
SCC: 2104004000

Example Calculation

$$\text{National Emissions}\left(\frac{tons}{year}\right) = \frac{\text{Emission Factor}\left(\frac{lb}{MM\ Btu\ Oil}\right)\times\frac{0.14\ MMBtu}{gal}\times\text{National Activity}\left(\frac{gal\ oil\ burned}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$\text{National selenium emissions} = \frac{\frac{1.5\times10^{-5}\ lb}{MMBtu}\times\frac{0.14\ MMBtu}{gal}\times\ 6{,}175.092\times10^{6}\ gal}{2000\ \frac{lb}{ton}} = 6.51\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2000 Consumption. Washington, D.C. 2003. Internet Address: http://www.eia.doe.gov/emeu/states/_use_multistate.html

2. U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.

3. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion." September 2002. http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip

4. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. Environmental Protection Agency/Emissions Monitoring and Analysis Division. Comments on Industrial Boiler information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report," September 18, 1998. November 13, 1998.

5. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

RESIDENTIAL HEATING: KEROSENE
SCC: 2104011000

The State-level volume of kerosene consumed for residential heating in the United States is used to estimate emissions. Kerosene consumption by energy use sector is available from the Energy Information Administration (EIA).[1] Because 2002 consumption data were not yet available, year 2000 consumption data were used to estimate 2002 consumption.

State-level kerosene consumption was allocated to each county using the U.S. Census Bureau's 2000 Census detailed housing data.[2] These data provide the number of housing units using fuel oil/kerosene for residential heating. Appendix B provides these data in database format. Kerosene consumption ratios were calculated using the ratio of the number of houses burning kerosene in each county to the total number of houses burning kerosene in the State. These consumption ratios were used to calculate county-level kerosene consumption.

Pollutant emission factors for residential kerosene combustion are based on the emission factors for residential distillate oil combustion.[3,4,5,] Because the heating value of kerosene is approximately 135,000 Btu/gallon and the heating value of distillate fuel oil is approximately 140,000 Btu/gallon, the kerosene emission factors were estimated by multiplying the distillate fuel oil emission factors by 135/140.[6]

County-level criteria pollutant and HAP emissions were calculated by multiplying the total annual amount of kerosene consumed in each county by an emission factor. Table 1 is a national summary of the emissions data that displays the emission factors, total volume of kerosene burned, and national criteria pollutant and HAP emissions from residential heating with kerosene. Emissions from residential heating by kerosene in Puerto Rico and the U.S. Virgin Islands were not estimated for the 2002 NEI.

RESIDENTIAL HEATING: KEROSENE (continued)
SCC: 2104011000

Table 1. National Criteria Pollutant and HAP Emissions Summary for Residential Heating with Kerosene

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/1,000 barrels)	Emission Factor Reference	National Activity Level Kerosene Consumption (thousand barrels)	National Emissions (tons/yr)
Acenaphthene	83329	8.53E-04	Reference 5,6	16,679	7.12E-03
Acenaphthylene	208968	1.02E-05	Reference 5,6	16,679	8.54E-05
Acetaldehyde	75070	1.99E-01	Reference 5,6	16,679	1.66E+00
Anthracene	120127	4.95E-05	Reference 5,6	16,679	4.13E-04
Arsenic	7440382	2.28E-02	Reference 4,5,6	16,679	1.90E-01
Benz[a]Anthracene	56553	1.65E-04	Reference 5,6	16,679	1.38E-03
Benzene	71432	8.53E-03	Reference 4,5,6	16,679	7.12E-02
Benzo[b+k]Fluoranthene	102	6.26E-05	Reference 5,6	16,679	5.22E-04
Benzo[g,h,i,]Perylene	191242	9.10E-05	Reference 5,6	16,679	7.59E-04
Beryllium	7440417	1.71E-02	Reference 4,5,6	16,679	1.42E-01
Cadmium	7440439	1.71E-02	Reference 4,5,6	16,679	1.42E-01
Chromium	7440473	1.71E-02	Reference 4,5,6	16,679	1.42E-01
Chrysene	218019	9.67E-05	Reference 5,6	16,679	8.07E-04
Dibenzo[a,h]Anthracene	53703	6.83E-05	Reference 5,6	16,679	5.69E-04
Fluoranthene	206440	1.99E-04	Reference 5,6	16,679	1.66E-03
Fluorene	86737	1.82E-04	Reference 5,6	16,679	1.52E-03
Formaldehyde	50000	1.37E+00	Reference 4,5,6	16,679	1.14E+01
Indeno[1,2,3-c,d]Pyrene	193395	8.53E-05	Reference 5,6	16,679	7.12E-04
Lead	7439921	5.12E-02	Reference 4,5,6	16,679	4.27E-01
Manganese	7439965	3.41E-02	Reference 4,5,6	16,679	2.85E-01
Mercury	7439976	1.71E-02	Reference 4,5,6	16,679	1.42E-01
Naphthalene	91203	4.61E-02	Reference 5,6	16,679	3.84E-01
Nickel	7440020	1.71E-02	Reference 4,5,6	16,679	1.42E-01
Phenanthrene	85018	4.27E-04	Reference 5,6	16,679	3.56E-03
Pyrene	129000	1.71E-04	Reference 5,6	16,679	1.42E-03
Selenium	7782492	8.53E-02	Reference 4,5,6	16,679	7.12E-01
CO	CO	2.03E+02	Reference 3,6	16,679	1,688.78
NO_X	NO_X	7.29E+02	Reference 3,6	16,679	6,079.62
PM10-FIL	PM10-FIL	4.37E+01	Reference 3,6	16,679	364.78
PM25-FIL	PM25-FIL	3.36E+01	Reference 3,6	16,679	280.34
PM-CON	PM-CON	5.27E+01	Reference 3,6	16,679	439.08
SO_2	SO_2	1.73E+03	Reference 3,6	16,679	14,388.42
VOC	VOC	2.84E+01	Reference 3,6	16,679	236.43

RESIDENTIAL HEATING: KEROSENE (continued)
SCC: 2104011000

Example Calculation

$$National\ Emissions\left(\frac{lbs}{year}\right) = Distillate\ Emission\ Factor\left(\frac{\text{lb}}{\text{1000 gallons}}\right) \times \frac{135}{140} \times \frac{\text{42 gallons}}{\text{barrel}} \times National\ Activity\left(\frac{1000\ barrels}{year}\right) \times \frac{1\,ton}{2000\,lbs}$$

$$National\ Selenium\ Emissions = \frac{0.002107\ lb}{1000\,gallons} \times \frac{135}{140} \times \frac{42}{1} \times 16{,}679.33\ thousand\ barrels \times \frac{1\,ton}{2000\,lbs}$$

$$= 0.712\,tons\,/\,year$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2000 Consumption. Washington, D.C. 2003. Internet Address: http://www.eia.doe.gov/emeu/states/_use_multistate.html

2. U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.

3. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion." September 2002. http://www.epa.gov/ttn/chief/eiip/techreport/volume03/drat1999_residfuel_inven_apr2003.zip

4. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. Environmental Protection Agency/Emissions Monitoring and Analysis Division. Comments on Industrial Boiler information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report," September 18, 1998. November 13, 1998.

5. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

6. U.S. Department of Energy, Energy Information Administration, *Commercial Buildings Glossary*, available from http://www.eia.doe.gov/emeu/cbecs/gloss.html, accessed September 2004.

RESIDENTIAL HEATING: LIQUEFIED PETROLEUM GAS
SCC: 2104007000

Residential liquefied petroleum gas (LPG) combustion emissions were calculated using the volume of LPG consumed in the United States. State-level LPG consumption by sector is available from the Energy Information Administration (EIA).[1] Year 2000 consumption data were used to estimate 2002 consumption because these data were the latest data available.

State-level LPG consumption was allocated to each county using the U.S. Census Bureau's 2000 Census detailed housing data.[2] These data report the number of housing units using "bottled, tank, or LP gas" for residential heating. Appendix B provides these data in database format. State LPG consumption was allocated to each county using the ratio of number of houses burning LPG in each county to the total number of houses burning LPG in the State.

Pollutant emission factors for residential LPG are based on the residential natural gas emission factors.[3,4,5] For all counties in the United States, the natural gas consumed for residential heating is assumed to have a heating value of 1,050 Btu per cubic foot and a sulfur content of 2,000 grains per million cubic feet.[3] The natural gas emission factors (in lb/million Btu) were converted to LPG emission factors (in lb/million gallons) by multiplying by 91,330 Btu/gallon.[6]

County-level criteria pollutant and HAP emissions were calculated by multiplying the total annual amount of LPG consumed in each county by an emission factor. Table 1 is a national summary of the emissions data that displays the emission factors, total volume of LPG burned, and national criteria pollutant and HAP emissions from residential heating with LPG. Emissions from residential heating by LPG in Puerto Rico and the U.S. Virgin Islands were not estimated for the 2002 NEI.

Table 1. National Criteria Pollutant and HAP Emissions Summary for Residential Heating with LPG

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor (lb/thousand barrels)	Emission Factor Reference	National Activity LPG (Thousand barrels)	National Emissions (tons/yr)
Formaldehyde	50000	2.88E-01	Reference 4,6	156,280	2.25E+01
Benzene	71432	8.07E-03	Reference 4,6	156,280	6.31E-01
Acetaldehyde	75070	5.00E-05	Reference 4,6	156,280	3.91E-03
Pyrene	129000	1.92E-05	Reference 5,6	156,280	1.50E-03
Phenanthrene	85018	6.54E-05	Reference 5,6	156,280	5.11E-03
Fluoranthene	206440	1.15E-05	Reference 5,6	156,280	8.99E-04
Fluorene	86737	1.07E-05	Reference 5,6	156,280	8.39E-04
Naphthalene	91203	2.34E-03	Reference 5,6	156,280	1.83E-01
CO	CO	1.46E+02	Reference 3,6	156,280	1.14E+04
NOX	NOX	3.43E+02	Reference 3,6	156,280	2.68E+04
PM10-FIL	PM10-FIL	6.94E+00	Reference 3,6	156,280	5.42E+02
PM25-FIL	PM25-FIL	6.94E+00	Reference 3,6	156,280	5.42E+02
PM-CON	PM-CON	2.08E+01	Reference 3,6	156,280	1.63E+03
SO_2	SO_2	2.19E+00	Reference 3,6	156,280	1.71E+02
VOC	VOC	2.01E+01	Reference 3,6	156,280	1.57E+03

RESIDENTIAL HEATING: LIQUEFIED PETROLEUM GAS (continued)
SCC: 2104007000

Example Calculation:

$$National\ Emissions = Natural\ Gas\ Emission\ Factor\left(\frac{lb}{million\ cubic\ ft}\right) \times \frac{1\ million\ cubic\ ft\ (Natural\ Gas)}{1{,}050\ million\ Btu} \times \frac{91{,}330\ Btu}{gallon\ (LPG)} \times \frac{42\ gallons}{barrel} \times \frac{1\ million\ barrels}{1000\ thousand\ barrels} \times National\ Activity\left(\frac{thousand\ barrels}{year}\right) \times \frac{1\ ton}{2000\ lbs}$$

$$National\ fluorene\ emissions = \frac{2.94\ E\text{-}06\ lb}{million\ cubic\ feet} \times \frac{1\ million\ cubic\ feet}{1{,}050\ million\ Btu} \times \frac{91{,}330\ Btu}{gallon} \times \frac{42\ gallons}{barrel} \times \frac{1\ million\ barrels}{1000\ thousand\ barrels} \times \frac{156{,}280.15003\ thousand\ barrels}{year} \times \frac{1\ ton}{2000\ lbs}$$

$$8.39 \times 10^{-4}\ \ tons/year$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2000 Consumption. Washington, D.C. 2003. Internet Address: http://www.eia.doe.gov/emeu/states/_use_multistate.html

2. U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.

3. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/drat1999_residfuel_inven_apr2003.zip

4. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. Environmental Protection Agency/Emissions Monitoring and Analysis Division. Comments on Industrial Boiler information in the “Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report,” September 18, 1998. November 13, 1998.

5. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

6. U.S. Department of Energy, Energy Information Administration, *2001 Glossary*, available from http://www.eia.doe.gov/emeu/recs/glossary.html, accessed September 2004.

RESIDENTIAL HEATING: NATURAL GAS
SCC: 2104006000

The State-level volume of natural gas consumed for residential heating in the United States is used to estimate emissions. Natural gas consumption by energy use sector is presented in the State Energy Data 2000 Consumption published by the EIA.[1] Year 2000 consumption data (4,991,678 million cubic feet) were used to estimate 2002 consumption because these data were the latest data available.

State-level natural gas consumption was allocated to each county using the U.S. Census Bureau's 2000 Census Detailed Housing Information.[2] These data include the number of housing units using a specific type of fuel for residential heating. Appendix B contains the fuel type data in database format. State distillate oil consumption was allocated to each county using ratio of number of houses burning distillate oil in each county to the total number of houses burning distillate oil in the State.

Criteria pollutant emission factors for natural gas are from "Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion."[3] For all counties in the United States, the natural gas consumed for residential heating is assumed to have a heating value of 1,050 Btu per cubic foot and a sulfur content of 2,000 grains per million cubic feet.[3]

County-level criteria pollutant and HAP emissions were calculated by multiplying the total natural gas consumed in each county per year by an emission factor. Table 1 is a national summary of the emissions data that contains the emissions factors, total volume of natural gas burned, and national criteria pollutant and HAP emissions from residential heating with natural gas. Emissions from residential heating by natural gas in the Puerto Rico and the U.S. Virgin Islands were not estimated for the 2002 NEI.

Table 1. National Criteria Pollutant and HAP Emissions Summary for Residential Heating with Natural Gas

Pollutant Description	NIF 3.0 Pollutant Codes	Emission Factor (lb/million cubic ft)	Emission Factor Reference	National Activity Natural Gas (million cubic feet)	National Emissions (tons/yr)
Formaldehyde	50000	7.88e-02	Reference 4	4,991,678	1.97e+02
Benzene	71432	2.21e-03	Reference 4	4,991,678	5.51e+00
Acetaldehyde	75070	1.37e-05	Reference 4	4,991,678	3.41e-02
Pyrene	129000	5.25e-06	Reference 5	4,991,678	1.31e-02
Phenanthrene	85018	1.79e-05	Reference 5	4,991,678	4.46e-02
Fluoranthene	206440	3.15e-06	Reference 5	4,991,678	7.86e-03
Fluorene	86737	2.94e-06	Reference 5	4,991,678	7.34e-03
Naphthalene	91203	6.41e-04	Reference 5	4,991,678	1.60e+00
CO	CO	4.00E+01	Reference 3	4,991,678	9.98E+04
NO_X	NO_X	9.40E+01	Reference 3	4,991,678	2.35E+05
PM10-FIL	PM10-FIL	1.90E+00	Reference 3	4,991,678	4.74E+03
PM25-FIL	PM25-FIL	1.90E+00	Reference 3	4,991,678	4.74E+03
PM-CON	PM-CON	5.70E+00	Reference 3	4,991,678	1.42E+04
SO_2	SO2	6.00E-01	Reference 3	4,991,678	1.50E+03
VOC	VOC	5.50E+00	Reference 3	4,991,678	1.37E+04

RESIDENTIAL HEATING: NATURAL GAS (continued)
SCC: 2104006000

Example Calculation:

$$National\ Emissions\left(\frac{tons}{year}\right) = \frac{Emission\ Factor\left(\frac{lb}{MMBtu}\right)\times\frac{1050\,MMBtu}{million\ ft^3}\times National\ Activity\left(\frac{million\ ft^3\ nat\ gas}{year}\right)}{2000\ \frac{lb}{ton}}$$

$$National\ fluorene\ emissions = \frac{\frac{2.8\times10^{-9}\ lb}{MMBtu}\times\frac{1050\,MMBtu}{million\ ft^3}\times\ 4{,}991{,}678\ million\ ft^3}{2000\ \frac{tons}{yr}} = 7.34e-03\ tons$$

References:

1. U.S. Department of Energy, Energy Information Administration (EIA). State Energy Data 2000 Consumption. Washington, D.C. 2003. Internet Address: http://www.eia.doe.gov/emeu/states/_use_multistate.html

2. U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.

3. U.S. Environmental Protection Agency. Emission Factors and Inventory Group. Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion. September 2002. Internet address: http://www.epa.gov/ttn/chief/eiip/techreport/volume03/draft1999_residfuel_inven_apr2003.zip

4. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. Environmental Protection Agency/Emissions Monitoring and Analysis Division. Comments on Industrial Boiler information in the “Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report,” September 18, 1998. November 13, 1998.

5. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

The emission estimation methodology for this source category was taken directly from the results of a study by EIAG.[1] Emissions associated with residential heating with wood are estimated for seven types of equipment and reported under the following SCCs:

Fireplaces: Without Inserts (SCC = 2104008001);
Fireplaces: Inserts - Catalytic, non-EPA-certified (SCC = 2104008002);
Fireplaces: Inserts - Non-catalytic, EPA-certified (SCC = 2104008003);
Fireplaces: Inserts - Catalytic, EPA-certified (SCC = 2104008004);
Woodstoves - Conventional (SCC = 2104008010);
Woodstoves - Catalytic (SCC = 2104008030); and,
Woodstoves - Non-catalytic (SCC = 2104008050)

The following is a summary of the study's methods.

Activity Data

Appendix C contains the final activity data, wood consumption by type of combustion device, that was developed for residential heating using wood. The following steps were taken to estimate the national and county-level activity data for this category:

1. ***Use the 2001 national activity data to extrapolate national activity data for 2002***. The activity data for residential wood combustion (RWC) were estimated based on the type of combustion unit. Table 1 identifies the steps followed to estimate the national number of fireplaces without inserts, and the national amount of cordwood burned in the fireplaces. Table 2 shows the steps followed to estimate the national number of woodstoves and fireplaces with inserts, and the national amount of cordwood burned in these combustion units. The national number of fireplaces without inserts, fireplaces with inserts, and woodstoves was taken from the 2001 *American Housing Survey for the United States* (AHS)[2], which is released every two years. The national numbers were adjusted to account for the number of usable fireplaces and woodstoves that are used to burn wood (see Tables 1 and 2). Cordwood consumption was then estimated for each of these three types of equipment. The 2001 national cordwood consumption was then adjusted to 2002 national cordwood consumption using a ratio of national heating demand for both years (see Tables 1 and 2).[3]

2. ***Group all counties into one of five climate zones to address wood consumption differences due to temperature***. The extent of wood consumption in residential combustion units is directly related to temperature – in colder climates more wood is consumed. The second step in the method was to use historical climate data to assign each county in the country to one of five climate zones. The climate zones are defined by the National Climatic Data Center and are based on heating degree day (HDD) and cooling degree day (CDD) data. The database used for climate zone assignments was revised in May 2004. Each climate zone was then assigned a percentage of total national wood consumption based on information contained in the Energy Information Administration's Residential Energy Consumption database.[4] The following shows the percentage of national wood consumption allocated to each climate zone:

Climate Zone	Percent of Wood Consumed
1 (>7000 HDD)	36
2 (5500-7000 HDD)	19
3 (4000-5499 HDD)	21
4 (<4000 HDD and <2000 CDD)	15
5 (<4000 HDD and >2000 CDD)	9

Table 1. Methods for Estimating National Wood Consumption for Fireplaces Without Inserts

Step	Description	Calculation Step	Reference	Total
1	Number of homes with usable fireplaces (inserts and no inserts)		2001 American Housing Survey (Table 2-25; Selected Amenities, Usable Fireplaces) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab225.html)	35,097,000
2	Number of usable fireplaces (inserts and no inserts)	Multiply Step 1 by factor (1.17) for more than 1 unit per home	US Consumer Product Safety Commission, March 1989	41,063,490
3	Number of usable fireplaces burning wood (as opposed to gas)	Multiply Step 2 by factor (0.74) to estimate number of units burning wood	Houck, Based on industry sales data from Hearth Products, Vista Marketing, and Industry reps.	30,386,983
4	Number of wood burning, usable fireplaces actually in use	Multiply Step 3 by factor (0.58) to estimate the number of fireplaces in use	Houck, Based on five local surveys, Vista Marketing Research survey, US Consumer Product Safety report and on a 3/97 Housing economics article.	17,624,450
5	Number of homes with fireplaces with inserts, used for main heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	145,000
6	Number of homes with fireplaces with inserts, used for other heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	4,937,000
7	Total number of homes with fireplaces with inserts, used for heating	Sum of Steps 5 and 6		5,082,000
8	Total number of fireplaces with inserts, used for heating	Multiply Step 7 by factor (1.10) for more than 1 unit per home	US Consumer Product Safety Commission, March 1989	5,590,200
9	Total fireplaces without inserts burning wood	Step 4 minus Step 8		12,034,250
10	Number of homes with fireplaces (no inserts) used for main heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	64,000
11	Number of homes with fireplaces (no inserts) used for other heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	4,055,000
12	Total number of homes with fireplaces (no inserts) used for heating	Sum of Steps 10 and 11		4,119,000
13	Total number of fireplaces (no inserts) used for heating	Multiply Step 12 by factor (1.17) for more than 1 unit per home	US Consumer Product Safety Commission, March 1989	4,819,230
14	Number of fireplaces used for aesthetics and pleasure	Step 9 minus Step 13		7,215,020

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES) (continued)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

Table 1 (continued)

Step	Description	Calculation Step	Reference	Total
15	Cords consumed in fireplaces without inserts used for heating	Step 13 times 0.656 cords/unit/yr (wood consumption rate for fireplaces w/o inserts used for heating)		3,161,415
16	Cords consumed in fireplaces without inserts used for aesthetics and pleasure	Step 14 times 0.069 cords/unit/yr (wood consumption rate for fireplaces w/o inserts used for aesthetics and pleasure)		497,836
17	Total cords consumed in fireplaces without inserts	Sum of Steps 15 and 16		3,659,251
18	Dry weight wax/sawdust fireplace logs (tons)	Calculating the 2 year percentage increase from 1997 to 1999 then applying that increase to estimate 2001.	Houck 2001b. *Recommended Procedure for Compiling Emission Inventory Data For Manufactured Wax/Sawdust Fireplace Logs.*	263,695
19	Approximate cordwood equivalent value for wax/sawdust fireplace logs used in 2001 (dry tons)	Multiply Step 18 by 4.49	Houck 2001b. *Recommended Procedure for Compiling Emission Inventory Data For Manufactured Wax/Sawdust Fireplace Logs.*	1,183,991
20	Cordwood value adjusted for wax/sawdust fireplace log use 2001	Subtract Step 19 from 17		2,475,261
21	Cordwood value adjusted for wax/sawdust fireplace log use 2002	Multiply Step 20 times amount of cordwood used in 2002/2001 (350/407 Trillion BTU)	EIA. Estimated Renewable Energy Consumption: Residential and Commercial Sectors. Table 10.2a. Monthly Energy Review. August, 2003. This table has both the 2001 and 2002 fuel consumption from residential wood (in trillion BTU)	2,128,603

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES) (continued)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

Table 2. Methods for Estimating National Wood Consumption for Fireplaces with Inserts and Woodstoves

Step	Description	Calculation Step	Reference	Total
1	Number of homes with woodstoves used for main heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	1,137,000
2	Number of homes with woodstoves used for other heating		2001 American Housing Survey (Table 2-4) (http://www.census.gov/hhes/www/housing/ahs/ahs01/tab24.html)	4,834,000
3	Total number of homes with woodstoves used for heating	Sum of Steps 1 and 2		5,971,000
4	Total number of woodstoves used for heating	Multiply Step 3 by factor (1.09) for more than 1 unit per home	US Consumer Product Safety Commission, March 1989	6,508,390
5	Number of homes with fireplaces with inserts, used for main heating		From Table 1, Step 5	145,000
6	Number of homes with fireplaces with inserts, used for other heating		From Table 1, Step 6	4,937,000
7	Total number of homes with fireplaces with inserts	Sum of Steps 5 and 6	From Table 1, Step 7	5,082,000
8	Total number fireplaces with inserts	Multiply Step 7 by factor (1.10) for more than 1 unit per home	US Consumer Product Safety Commission, March 1989	5,590,200
9	Total number of fireplaces with inserts and woodstoves	Sum of Steps 4 plus 8		12,098,590
10	Total cords of wood consumed by residential sector (doesn't include consumption for aesthetics or pleasure)	Multiply 1997 data (21,700,000 cords) by 2001/1997 ratio of residential wood Btus (407 trillion Btus/433 trillion Btus)	1997 cords of wood data from EIA Renewable Energy Annual (Dec. 1998). 2001 Btu data from Table 7 of Renewable Energy Annual 2002 (Nov. 2003); 1997 Btu data from Table 7 of Renewable Energy Annual 2001 (Nov. 2002).	20,396,998
11	Cords consumed in fireplaces without inserts used for heating		From Table 1, Step 15	3,161,415
12	Total cords of wood consumed by residential sector in woodstoves/fireplaces with inserts	Step 10 minus Step 11		17,235,583
13	Cords consumed per woodstove/insert unit per year	Step 12 divided by Step 9		1.425
14	Cords consumed in fireplaces with inserts in 2001	Step 13 times Step 8		7,963,767
15	Cords consumed in woodstoves in 2001	Step 13 times Step 4		9,271,816
16	Cords consumed in fireplaces with inserts in 2002	Multiply Step 14 times amount of cordwood used in 2002/2001 (350/407 Trillion BTU)	EIA. Estimated Renewable Energy Consumption: Residential and Commercial Sectors. Table 10.2a. Monthly Energy Review. August, 2003. This table has both the 2001 and 2002 fuel consumption from residential wood (in trillion BTU)	6,848,449

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES) (continued)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

Step	Description	Calculation Step	Reference	Total
17	Cords consumed in woodstoves in 2002	Multiply Step 15 times amount of cordwood used in 2002/2001 (350/407 Trillion BTU)	EIA. Estimated Renewable Energy Consumption: Residential and Commercial Sectors. Table 10.2a. Monthly Energy Review. August, 2003. This table has both the 2001 and 2002 fuel consumption from residential wood (in trillion BTU)	7,973,306

3. ***Allocate the consumption level in each zone to individual counties in that zone***. The next step in the procedure was to allocate the wood consumption in each climate zone to individual counties in that zone. This was accomplished using the relative percent of detached single-family homes in each county compared to the number of detached single-family homes in the entire climate zone. The number of detached single-family homes by county was obtained from year 2000 Census data.[5] The county-level housing data are presented in Appendix B by State and county FIPS and climate zone.

4. ***Designate each county as urban or rural***. Each county was then designated as urban or rural in order to reflect equipment usage patterns. The U.S. Bureau of Census classifies a county as rural if less than 50% of its population is located in cities and towns, and urban if more than 50% of its population is located in cities and towns. Estimated 2002 urban/rural population data were used for this classification. These data were developed by multiplying the year 2000 ratios of U.S. Census Bureau urban and rural population to total population by the year 2002 U.S. Census Bureau total population in each county.[6]

5. ***Adjust urban and rural wood consumption to match AHS data***. In each zone, the total urban and rural county wood consumption was summed. If the urban and rural totals did not match the expected percent split for that combustion unit as described in the AHS data, then an adjustment was made within the zone for each county's consumption. The 2001 AHS shows that each type of combustion unit occurs preferentially in urban and rural areas.[2] The percent of combustion units found in urban and rural areas was used as a surrogate for wood consumption. AHS estimated that 73% of fireplaces without inserts are found in urban areas compared to 27% in rural areas. For woodstoves, AHS estimated that 65% of the woodstoves are found in rural areas compared to 35% in urban areas. For fireplaces with inserts, AHS estimated that 57% of the inserts are found in urban areas compared to 43% in rural areas. The following Table 3 shows how the percentages were derived from the 2001 AHS data:

Table 3. Calculation of Urban Versus Rural Distribution of Fireplaces Without Inserts, Fireplaces With Inserts, and Woodstoves

Type of Heating/ Geographic Location		2001 National Number of Occupied Housing Units (1,000)		
		Fireplaces Without Inserts	Fireplaces With Inserts	Woodstoves
Main	Urban	33	61	192
	Rural	31	84	939
Other Heating	Urban	2,985	2,840	1,910
	Rural	1,071	2,097	2,924
Total Heating	Urban	3,018	2,901	2,102
	Rural	1,102	2,181	3,863
	% Urban	73%	57%	35%
	% Rural	27%	43%	65%

From second page of Table 2-4 (Selected Equipment and Plumbing Occupied Units) of 2001 *American Housing Survey for the United States* (pdf file).

6. ***Allocate wood consumption to equipment types designated by SCC.*** Wood consumption in fireplaces without inserts was placed on SCC 2104008001. Total wood consumption for woodstoves and fireplaces with inserts were apportioned as follows:

Type of Device	SCCs for Fireplaces with Inserts	SCCs for Woodstoves	Percent of Total Wood Consumption
Non-certified	2104008002	2104008010	92
Certified non-catalytic	2104008003	2104008050	5.7
Certified catalytic	2104008004	2104008030	2.3

The steps described above resulted in final cordwood consumption by county. Cordwood was converted to tons of wood before estimating emissions using a conversion factor of one cord of wood equaling 1.163 tons.[7] The wood consumption estimates for stoves and inserts were further divided to account for the different designs of units that exist in the marketplace. The different designs of stoves/inserts have been found to have different levels of emissions. Based on data received from the Hearth Products Association,[8] three primary types of units are in use: non-certified, which constitute 92% of the stoves manufactured; certified, non-catalytic (5.7%); and catalytic (2.3%). These splits were applied to the national, State, and county cordwood consumption estimates prior to the application of emission factors. National-level usage by SCC was computed as follows:

SCC 2104008001 = 2,475,565 tons;
SCC 2104008002 = 7,327,566 tons;
SCC 2104008003 = 453,991 tons;
SCC 2104008004 = 183,189 tons;
SCC 2104008010 = 8,531,118 tons;
SCC 2104008030 = 213,278 tons; and
SCC 2104008050 = 528,558 tons.

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES) (continued)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

Emission Factors

The majority of the emission factors used to determine national emission estimates for RWC were obtained from EPA's AP-42 document (Tables 1.9-1, 1.10-3, and 1.10-4).[9] Some of the stove and insert factors were adjusted based on new data developed in the reference *Review of Wood Heater and Fireplace Emission Factors*.[10] The emission factors generated by Houck, et. al.[10] for 7-PAH and 16-PAH were lower than the associated AP-42 emission factors. Therefore, the AP-42 PAH emission factors were adjusted downward by 62% for conventional woodstoves, 51% for catalytic woodstoves, and 40% for non-catalytic woodstoves. Tables 4-10 summarize the emission factors and emissions used for the HAP and criteria pollutants.

Seasonal Throughput Data

Default seasonal throughput values prepared during development of the RWC methodology are listed as follows by National Climate Data Center climate zone:

Climate Zone	Winter	Spring	Summer	Fall
5	100	0	0	0
4	70	15	0	15
3	50	25	0	25
2	40	30	0	30
1	33.33	33.33	0	33.33

These seasonal throughput percentage values were included in the Emission Process table of the inventory. The climate zone to which each State and county was assigned is available in the Appendix B table containing the year 2000 detached single-family housing data.

Table 4 - Emission Factors and National-Level Emissions for SCC 2104008001

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
Carbon Monoxide	CO	1.28E+02	lb/ton	10	1.59E+05
Nitrogen Oxides	NO_X	2.60E+00	lb/ton	9	3.22E+03
Primary PM_{10},total	PM10-PRI	2.36E+01	lb/ton	10	2.92E+04
Primary $PM_{2.5}$, total	PM25-PRI	2.36E+01	lb/ton	10	2.92E+04
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	4.95E+02
Volatile Organic Compounds	VOC	2.29E+02	lb/ton	9	2.83E+05

RESIDENTIAL HEATING USING WOOD (FIREPLACES, INSERTS, AND WOODSTOVES) (continued)
SCCs: 2104008001, 2104008002, 2104008003, 2104008004, 2104008010, 2104008030, and 2104008050

Table 5 - Emission Factors and National-Level Emissions for SCC 2104008002

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
Acenaphthene	83329	6.21E-03	lb/ton	9,10	2.28E+01
Acenaphthylene	208968	1.32E-01	lb/ton	9,10	4.84E+02
Anthracene	120127	8.69E-03	lb/ton	9,10	3.18E+01
Benz(a)anthracene	56553	1.24E-02	lb/ton	9,10	4.54E+01
Benzene	71432	1.94E+00	lb/ton	9	7.10E+03
Benzo(a)pyrene	50328	2.48E-03	lb/ton	9,10	9.09E+00
Benzo(b)fluoranthene	205992	3.73E-03	lb/ton	9,10	1.37E+01
Benzo(e)pyrene	192972	7.45E-03	lb/ton	9,10	2.73E+01
Benzo(g,h,i)perylene	191242	2.48E-03	lb/ton	9,10	9.09E+00
Benzo(k)fluoranthene	207089	1.24E-03	lb/ton	9,10	4.54E+00
Cadmium	7440439	2.20E-05	lb/ton	9	8.06E-02
Carbon Monoxide	CO	2.31E+02	lb/ton	9	8.46E+05
Chrysene	218019	7.45E-03	lb/ton	9,10	2.73E+01
Fluoranthene	206440	1.24E-02	lb/ton	9,10	4.54E+01
Fluorene	86737	1.49E-02	lb/ton	9,10	5.46E+01
Manganese	7439965	1.70E-04	lb/ton	9	6.23E-01
Methyl Ethyl Ketone	78933	2.90E-01	lb/ton	9	1.06E+03
Naphthalene	91203	1.79E-01	lb/ton	9,10	6.56E+02
Nickel	7440020	1.40E-05	lb/ton	9	5.13E-02
Nitrogen Oxides	NO_X	2.80E+00	lb/ton	9	1.03E+04
O-xylene	95476	2.02E-01	lb/ton	9	7.40E+02
Phenanthrene	85018	4.84E-02	lb/ton	9,10	1.77E+02
Primary PM_{10},total	PM10-PRI	3.06E+01	lb/ton	9	1.12E+05
Primary $PM_{2.5}$, total	PM25-PRI	3.06E+01	lb/ton	9	1.12E+05
Pyrene	129000	1.49E-02	lb/ton	9,10	5.46E+01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	1.47E+03
Toluene	108883	7.30E-01	lb/ton	9	2.67E+03
Volatile Organic Compounds	VOC	5.30E+01	lb/ton	9	1.94E+05

Table 6 - Emission Factors and National-Level Emissions for SCC 2104008003

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
7,12-Dimethyl/benz(a)anthracene	57976	1.62E-03	lb/ton	9,10	3.68E-01
Acenaphthene	83329	4.04E-03	lb/ton	9,10	9.17E-01
Acenaphthylene	208968	1.29E-02	lb/ton	9,10	2.93E+00
Anthracene	120127	3.64E-03	lb/ton	9,10	8.26E-01
Benzo(a)pyrene	50328	2.42E-03	lb/ton	9,10	5.49E-01
Benzo(b)fluoranthene	205992	1.62E-03	lb/ton	9,10	3.68E-01
Benzo(e)pyrene	192972	8.08E-04	lb/ton	9,10	1.83E-01
Benzo(g,h,i)Fluoranthene	203123	1.13E-02	lb/ton	9,10	2.57E+00
Benzo(g,h,i)perylene	191242	8.08E-03	lb/ton	9,10	1.83E+00
Biphenyl	92524	8.89E-03	lb/ton	9,10	2.02E+00
Cadmium	7440439	2.00E-05	lb/ton	9	4.54E-03
Carbon Monoxide	CO	1.41E+02	lb/ton	9	3.20E+04
Chrysene	218019	4.04E-03	lb/ton	9,10	9.17E-01
Dibenzo(a,h)anthracene	53703	1.62E-03	lb/ton	9,10	3.68E-01
Fluoranthene	206440	3.23E-03	lb/ton	9,10	7.33E-01
Fluorene	86737	5.66E-03	lb/ton	9,10	1.28E+00
Indeno(1,2,3-cd)pyrene	193395	8.08E-03	lb/ton	9,10	1.83E+00
Manganese	7439965	1.40E-04	lb/ton	9	3.18E-02
Naphthalene	91203	5.82E-02	lb/ton	9,10	1.32E+01
Nickel	7440020	2.00E-05	lb/ton	9	4.54E-03
Perylene	198550	8.08E-04	lb/ton	9,10	1.83E-01
Phenanthrene	85018	4.77E-02	lb/ton	9,10	1.08E+01
PRIMARY PM_{10}, total	PM10-PRI	1.96E+01	lb/ton	9	4.45E+03
PRIMARY $PM_{2.5}$, total	PM25-PRI	1.96E+01	lb/ton	9	4.45E+03
Pyrene	129000	3.23E-03	lb/ton	9,10	7.33E-01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	9.08E+01
Volatile Organic Compounds	VOC	1.20E+01	lb/ton	9	2.72E+03

Table 7 - Emission Factors and National-Level Emissions for SCC 2104008004

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
Acenaphthene	83329	3.08E-03	lb/ton	9,10	2.82E-01
Acenaphthylene	208968	3.49E-02	lb/ton	9,10	3.20E+00
Anthracene	120127	4.10E-03	lb/ton	9,10	3.76E-01
Benz(a)anthracene	56553	1.23E-02	lb/ton	9,10	1.13E+00
Benzene	71432	1.46E+00	lb/ton	9	1.34E+02
Benzo(a)pyrene	50328	2.05E-03	lb/ton	9,10	1.88E-01
Benzo(b)fluoranthene	205992	2.05E-03	lb/ton	9,10	1.88E-01
Benzo(e)pyrene	192972	2.05E-03	lb/ton	9,10	1.88E-01
Benzo(g,h,i)Fluoranthene	203123	3.08E-03	lb/ton	9,10	2.82E-01
Benzo(g,h,i)perylene	191242	1.03E-03	lb/ton	9,10	9.43E-02
Benzo(k)fluoranthene	207089	1.03E-03	lb/ton	9,10	9.43E-02
Carbon Monoxide	CO	1.04E+02	lb/ton	9	9.56E+03
Chrysene	218019	5.13E-03	lb/ton	9,10	4.70E-01
Dibenzo(a,h)anthracene	53703	1.03E-03	lb/ton	9,10	9.43E-02
Fluoranthene	206440	6.16E-03	lb/ton	9,10	5.64E-01
Fluorene	86737	7.18E-03	lb/ton	9,10	6.58E-01
Indeno(1,2,3-cd)pyrene	193395	2.05E-03	lb/ton	9,10	1.88E-01
Methyl Ethyl Ketone	78933	6.20E-02	lb/ton	9	5.68E+00
Naphthalene	91203	9.54E-02	lb/ton	9,10	8.74E+00
Nitrogen Oxides	NO_X	2.00E+00	lb/ton	9	1.83E+02
O-xylene	95476	1.86E-01	lb/ton	9	1.70E+01
Phenanthrene	85018	2.46E-02	lb/ton	9,10	2.25E+00
PRIMARY PM_{10}, total	PM10-PRI	2.04E+01	lb/ton	9	1.87E+03
PRIMARY $PM_{2.5}$, total	PM25-PRI	2.04E+01	lb/ton	9	1.87E+03
Pyrene	129000	5.13E-03	lb/ton	9,10	4.70E-01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	3.66E+01
Toluene	108883	5.20E-01	lb/ton	9	4.76E+01
Volatile Organic Compounds	VOC	1.50E+01	lb/ton	9	1.37E+03

Table 8 - Emission Factors and National-Level Emissions for SCC 2104008010

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
Acenaphthene	83329	6.21E-03	lb/ton	9,10	2.65E+01
Acenaphthylene	208968	1.32E-01	lb/ton	9,10	5.63E+02
Anthracene	120127	8.69E-03	lb/ton	9,10	3.71E+01
Benz(a)anthracene	56553	1.24E-02	lb/ton	9,10	5.29E+01
Benzene	71432	1.94E+00	lb/ton	9	8.27E+03
Benzo(a)pyrene	50328	2.48E-03	lb/ton	9,10	1.06E+01
Benzo(b)fluoranthene	205992	3.73E-03	lb/ton	9,10	1.59E+01
Benzo(e)pyrene	192972	7.45E-03	lb/ton	9,10	3.18E+01
Benzo(g,h,i)perylene	191242	2.48E-03	lb/ton	9,10	1.06E+01
Benzo(k)fluoranthene	207089	1.24E-03	lb/ton	9,10	5.29E+00
Cadmium	7440439	2.20E-05	lb/ton	9	9.38E-02
Carbon Monoxide	CO	2.31E+02	lb/ton	9	9.84E+05
Chrysene	218019	7.45E-03	lb/ton	9,10	3.18E+01
Fluoranthene	206440	1.24E-02	lb/ton	9,10	5.29E+01
Fluorene	86737	1.49E-02	lb/ton	9,10	6.36E+01
Manganese	7439965	1.70E-04	lb/ton	9	7.25E-01
Methyl Ethyl Ketone	78933	2.90E-01	lb/ton	9	1.24E+03
Naphthalene	91203	1.79E-01	lb/ton	9,10	7.64E+02
Nickel	7440020	1.40E-05	lb/ton	9	5.97E-02
Nitrogen Oxides	NO_X	2.80E+00	lb/ton	9	1.19E+04
O-xylene	95476	2.02E-01	lb/ton	9	8.62E+02
Phenanthrene	85018	4.84E-02	lb/ton	9,10	2.06E+02
PRIMARY PM_{10}, Total	PM10-PRI	3.06E+01	lb/ton	9	1.31E+05
PRIMARY $PM_{2.5}$, Total	PM25-PRI	3.06E+01	lb/ton	9	1.31E+05
Pyrene	129000	1.49E-02	lb/ton	9,10	6.36E+01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	1.71E+03
Toluene	108883	7.30E-01	lb/ton	9	3.11E+03
Volatile Organic Compounds	VOC	5.30E+01	lb/ton	9	2.26E+05

Table 9 - Emission Factors and National-Level Emissions for SCC 2104008030

Pollutant	NIF 3.0 Pollutant Codes	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
Acenaphthene	83329	3.08E-03	lb/ton	9,10	3.28E-01
Acenaphthylene	208968	3.49E-02	lb/ton	9,10	3.72E+00
Anthracene	120127	4.10E-03	lb/ton	9,10	4.37E-01
Benz(a)anthracene	56553	1.23E-02	lb/ton	9,10	1.31E+00
Benzene	71432	1.46E+00	lb/ton	9	1.56E+02
Benzo(a)pyrene	50328	2.05E-03	lb/ton	9,10	2.19E-01
Benzo(b)fluoranthene	205992	2.05E-03	lb/ton	9,10	2.19E-01
Benzo(e)pyrene	192972	2.05E-03	lb/ton	9,10	2.19E-01
Benzo(g,h,i)Fluoranthene	203123	3.08E-03	lb/ton	9,10	3.28E-01
Benzo(g,h,i)perylene	191242	1.03E-03	lb/ton	9,10	1.10E-01
Benzo(k)fluoranthene	207089	1.03E-03	lb/ton	9,10	1.10E-01
Carbon Monoxide	CO	1.04E+02	lb/ton	9	1.11E+04
Chrysene	218019	5.13E-03	lb/ton	9,10	5.47E-01
Dibenzo(a,h)anthracene	53703	1.03E-03	lb/ton	9,10	1.10E-01
Fluoranthene	206440	6.16E-03	lb/ton	9,10	6.57E-01
Fluorene	86737	7.18E-03	lb/ton	9,10	7.66E-01
Indeno(1,2,3-cd)pyrene	193395	2.05E-03	lb/ton	9,10	2.19E-01
Methyl Ethyl Ketone	78933	6.20E-02	lb/ton	9	6.61E+00
Naphthalene	91203	9.54E-02	lb/ton	9,10	1.02E+01
Nitrogen Oxides	NO_X	2.00E+00	lb/ton	9	2.13E+02
O-xylene	95476	1.86E-01	lb/ton	9	1.98E+01
Phenanthrene	85018	2.46E-02	lb/ton	9,10	2.62E+00
PRIMARY PM_{10}, Total	PM10-PRI	2.04E+01	lb/ton	9	2.18E+03
PRIMARY $PM_{2.5}$, Total	PM25-PRI	2.04E+01	lb/ton	9	2.18E+03
Pyrene	129000	5.13E-03	lb/ton	9,10	5.47E-01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	4.27E+01
Toluene	108883	5.20E-01	lb/ton	9	5.55E+01
Volatile Organic Compounds	VOC	1.50E+01	lb/ton	9	1.60E+03

Table 10 - Emission Factors and National-Level Emissions for SCC 2104008050

Pollutant Description	NIF 3.0 Pollutant Code	Emission Factor	Emission Factor Units	Emission Factor Reference	Emissions (tons/year)
7,12-Dimethyl/benz(a)anthracene	57976	1.62E-03	lb/ton	9,10	4.28E-01
Acenaphthene	83329	4.04E-03	lb/ton	9,10	1.07E+00
Acenaphthylene	208968	1.29E-02	lb/ton	9,10	3.41E+00
Anthracene	120127	3.64E-03	lb/ton	9,10	9.62E-01
Benzo(a)pyrene	50328	2.42E-03	lb/ton	9,10	6.40E-01
Benzo(b)fluoranthene	205992	1.62E-03	lb/ton	9,10	4.28E-01
Benzo(e)pyrene	192972	8.08E-04	lb/ton	9,10	2.14E-01
Benzo(g,h,i)Fluoranthene	203123	1.13E-02	lb/ton	9,10	2.99E+00
Benzo(g,h,i)perylene	191242	8.08E-03	lb/ton	9,10	2.14E+00
Biphenyl	92524	8.89E-03	lb/ton	9,10	2.35E+00
Cadmium	7440439	2.00E-05	lb/ton	9	5.29E-03
Carbon Monoxide	CO	1.41E+02	lb/ton	9	3.72E+04
Chrysene	218019	4.04E-03	lb/ton	9,10	1.07E+00
Dibenzo(a,h)anthracene	53703	1.62E-03	lb/ton	9,10	4.28E-01
Fluoranthene	206440	3.23E-03	lb/ton	9,10	8.54E-01
Fluorene	86737	5.66E-03	lb/ton	9,10	1.50E+00
Indeno(1,2,3-cd)pyrene	193395	8.08E-03	lb/ton	9,10	2.14E+00
Manganese	7439965	1.40E-04	lb/ton	9	3.70E-02
Naphthalene	91203	5.82E-02	lb/ton	9,10	1.54E+01
Nickel	7440020	2.00E-05	lb/ton	9	5.29E-03
Perylene	198550	8.08E-04	lb/ton	9,10	2.14E-01
Phenanthrene	85018	4.77E-02	lb/ton	9,10	1.26E+01
PRIMARY PM_{10}, Total	PM10-PRI	1.96E+01	lb/ton	9	5.18E+03
PRIMARY $PM_{2.5}$, Total	PM25-PRI	1.96E+01	lb/ton	9	5.18E+03
Pyrene	129000	3.23E-03	lb/ton	9,10	8.54E-01
Sulfur Dioxide	SO_2	4.00E-01	lb/ton	9	1.06E+02
Volatile Organic Compounds	VOC	1.20E+01	lb/ton	9	3.17E+03

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SOLVENT UTILIZATION - SURFACE COATING - ARCHITECTURAL
SCC: 2401001000

Emissions from Architectural Surface Coating are those emitted from the application of paints and other coatings that contain solvent. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to EPA by state, local and tribal agencies. Because only the solvent was used to estimate emissions, information about the specific coatings used, for example, the coating density and water content, was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research report[1] in units of million pounds of solvent in the Paint and Coating (P&C) source category. The fraction of the total P&C solvent consumed by Architectural Surface Coating was estimated from an earlier Freedonia report that included a separate estimate for solvent use in Architectural Surface Coating and also total P&C.[2] To estimate solvent use for Architectural Surface Coating in 2002, the solvent fraction for Architectural Surface Coating from the earlier Freedonia report was multiplied by the most recent Freedonia estimate for total P&C solvent. All solvent used in Architectural Surface Coating was assumed to be VOC based on previous Freedonia solvent reports.[3] Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Architectural Surface Coating.

Item	Data
Data Year	2002
National Consumption Freedonia Market	Architectural Coating, Paint and Coatings
Market Solvent National Consumption (10^6 lbs)	2,570
Fraction of Total Paint and Coating Solvent	0.33
References	
National Consumption	Freedonia, 2004[1]
Solvent Fraction	Freedonia 2003[2]
Source Category National Solvent Emissions (10^6 tons)	0.42

The national solvent utilization data were allocated to the states and counties using (1) business activity data by North American Industrial Classification System (NAICS) code and (2) population. 60 percent of the solvent use was apportioned by employment in NAICS 23521 (Painting and Wall Covering Contractors) and 40 percent by population.

It was not necessary to subtract out the point source component from the total national solvent consumption since there are no point source emissions for this source category in the NEI. Table 2 shows the national nonpoint VOC emissions estimate for Architectural Surface Coating.

Table 2. National VOC Emissions Summary for Architectural Surface Coating.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.42
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.00
National Nonpoint VOC Emissions (10^6 tons)	0.42

[a] Derived from national sales and other national market data (see Table 1).
[b] 2002 NEI Point Sources Sector File.

The HAP emissions from architectural surface coatings were estimated by developing chemical profiles for the organic solvents used. These profiles, expressed as fractions of the total VOC solvent, were multiplied by the total VOC estimated to obtain tons per year (tpy) estimates of speciated solvent emissions from architectural surface coatings. The individual species were identified as HAP and then summed to obtain the total HAP emissions for architectural surface coatings. The procedure used to develop the speciation profiles is described below. References to spreadsheet tables are shown in parentheses which are posted in a separate file.

The speciated profile for emissions from architectural surface coatings was a composite of three profiles taken from two surveys performed for the California Air Resources Board (CARB). Profiles for solvent (ASC-1) and water-based (ASC-2) paints were taken from a 1998 CARB architectural coatings survey.[4] A profile for thinners (ASC-2) was taken from a 1996 CARB report.[5] These three profiles were combined to make a composite profile, weighted according to national architectural paint and coatings industry sales data (ASC-4) from the 2002 U.S. Census of Manufacturers.[6]

Annual architectural surface coating paint sales volumes for 2002 and 2001 were averaged to produce the following estimated sales volumes in units of 1,000 gallons: 114,115 solvent-based; 569,958 water-based; and 18,971 thinners. To estimate solvent use from the sales data, the annual sales volumes were adjusted (ASC-5) to remove the volume of the coatings attributed to solids (resins and pigments) and water, based on the composition of a typical latex interior paint.[7] The solvent proportions in the architectural surface coatings were then calculated as 8 percent solvent in water-based paints and 63 percent solvent in solvent-based paints. Thinners were assumed to be completely volatile. Multiplying the percent solvent by the paint sales volumes (1,000 gallons) produced the following solvent quantities, in 1,000 gallons: 71,322 (0.63 x 114,115) solvent from solvent-based architectural surface coating paint; 42,747 (569,958 x 0.08) solvent from water-based architectural surface coating paint; and 18,971 from thinner (1.0 x 18,971). The fractions then for solvent-based, water-based, and thinners, respectively, of the total architectural surface coating solvent purchased based on sales data were 0.54, 0.32, and 0.14. The speciated profile fractions for solvent-based paint, water-based paint, and thinners were then multiplied by their respective weighting fractions and combined (ASC-6) into a industry composite speciated profile.

In addition, the chemical species contained in “naphtha” or “mineral spirits” (CAS# 8704) were replaced by a more detailed speciation profile (ASC-7) taken from a representative MSDS.[8] The seven naphtha species and percent of total naphtha were: pentane (77.3); 2-methylpentane (3.3); 3-methyl pentane (8.3); cyclopentane (2.8); 2,2-dimethly butane (2.8); 2,3-dimethyl butane (2..8); and 2-methylbutane (2.8).

An example follows for toluene. The toluene fraction in solvent-based paint was 0.0318, and was weighted by 0.54, the industry solvent sales fraction for solvent-based coatings; the water-based paint fraction for toluene of 0.00106 was weighted by 0.32, the water-based solvent industry fraction; and the thinner fraction for toluene of 0.0415 was weighted by 0.14, the thinner fraction of the industry sales, to produce a composite fraction for toluene of 0.0233 (2.3 percent).

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles, shown in Table 3, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates developing using Freedonia data. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Architectural Coating.

Table 3. HAP Speciation Profiles and Emissions for Architectural Surface Coating

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
123911	1,4-Dioxane (1,4-Diethyleneoxide)	0.002	
584849	2,4-Toluene diisocyanate	0.002	
101688	4,4'-Methylenediphenyl diisocyanate (MDI)	0.014	
75070	Acetaldehyde	0.010	
117817	Bis(2-ethylhexyl)phthalate (DEHP)	0.003	
98828	Cumene	0.038	
84742	Dibutyl phthalate	0.002	
131113	Dimethyl phthalate	0.001	
100414	Ethylbenzene	0.248	
107211	Ethylene glycol	5.049	
50000	Formaldehyde	0.002	
171	Glycol Ethers	2.065	
110543	Hexane	0.015	
67561	Methanol	1.008	
80626	Methyl methacrylate	0.012	
71556	Methyl chloroform (1,1,1-Trichloroethane)	0.933	
108101	Methyl isobutyl ketone(Hexone)	0.301	
78933	Methyl ethyl ketone (2-Butanone)	1.349	
75092	Methylene chloride(Dichloromethane)	0.597	
91203	Naphthalene	0.046	
100425	Styrene	0.102	
127184	Tetrachloroethylene (Perchloroethylene)	0.006	
108883	Toluene	2.332	
121448	Triethylamine	0.006	
108054	Vinyl acetate	0.012	
1330207	Xylenes (mixed isomers)	2.851	
	Total	**17.01**	

List of Glycol Ethers Used in Glycol Ether Group

CAS #	Glycol Ether
112345	2-(2-Butoxyethoxy)ethanol {Butyl Carbitol}
111773	Methyl Carbitol {2-(2-ethoxyethoxy)ethanol} {DEGME}
8701	Misc. Glycols, Glycol Ethers, and Acetates
2807309	Ethylene Glycol Propyl Ether {2-Propoxyethanol}
124174	Diethylene Glycol Butyl Ether Acetate {2-2-(Butoxyethoxy)Ethyl Acetate
111900	Carbitol {DEGEE} {2-(2-Ethoxyethoxy)Ethanol}
111159	2-Ethoxyethyl Acetate {Cellosolve Acetate}
110496	Ethylene Glycol Methyl Ether Acetate {Methyl Cellosolve Acetate}

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[1] Personal email communication. Neumore, Jennifer, The Freedonia Group, Cleveland, OH, with Donna Lee Jones, EC/R, Inc., Chapel Hill, NC. ARevised Table X-X: Paints & Coatings Market for Solvents.@ August 18, 2004.

[2] The Freedonia Group. ASolvents: Green & Conventional to 2007. Study 1663.@ Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

[3] The Freedonia Group. ASolvents to 2003. Study 1115.@ Cleveland, Ohio. 2000.

[4] “1998 Architectural Coatings Survey Results.” Final Report. California Air Resources Board, Sacramento, CA. September 1999.

[5] “Improvement of Speciation Profiles for Architectural and Industrial Maintenance Coating Operations (CARB Report 93-319). Prepared by A. Censullo, D. Jones, and M. Wills for the California Air Resources Board. California Air Resources Board, Sacramento, CA June 30, 1996.

[6] Current Industrial Reports: Paint and Allied Products - 2002 (MA325F(02)-1). U.S. Census Bureau, Washington, DC. July 2003.

[7] U.S. Paint Industry Database. SRI International, Menlo Park, CA. 1990.

[8] MSDS for Product ID: Petroleum Spirits, Petroleum Naphtha, Benzine CAS# 8032-32-4 EM Science Division of EM Industries. 02/11/1988. Obtained from Vermont SIRI MSDS Database.

SOLVENT UTILIZATION - AUTOMOBILE REFINISHING
SCC: 2401005000

Emissions from Automobile Refinishing are those emitted from the application of paints and other coatings that contain solvent. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to EPA by state, local and tribal agencies. Because only the solvent was used to estimate emissions, information about the specific coatings used, for example, the coating density and water content, was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research report[1] in units of million pounds of solvent in the Paint and Coating (P&C) source category. The fraction of the total P&C solvent consumed by Automobile Refinishing was estimated from a National Paint and Coating Association (NPCA) report[2] on solvent use. To estimate solvent use for Automobile Refinishing, the solvent fraction for Automobile Refinishing (0.030) from the NPCA report[2] was multiplied by the total Freedonia P&C solvent consumption to obtain an estimate of solvent consumption for the source category. All solvent used in Automobile Refinishing was assumed to be VOC based on previous Freedonia solvent reports.[3] Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Automobile Refinishing.

Item	Data
Data Year	2002
National Consumption Freedonia Market	Paint and Coating
Market Solvent National Consumption (10^6 lbs)	80
Fraction of Total Paint and Coating Solvent	0.03
References	
National Consumption	Freedonia, 2003[1]
Solvent Fraction	NPCA[2]
Source Category National Solvent Emissions (10^6 tons)	0.04

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Automobile Refinishing source category were Couriers and Messengers (NAICS 492); Auto Equipment Rental and Leasing (NAICS 5321); and Auto Repair and Maintenance (NAICS 8111). It was not necessary to subtract out the point source component from the total national solvent consumption since there are no point source emissions for this source category in the NEI. Table 2 shows the national nonpoint VOC emissions estimates for Automobile Refinishing.

Table 2. National VOC Emissions Summary for Automobile Refinishing.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.04
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.00

National Nonpoint VOC Emissions (10^6 tons)	0.04
[a] Derived from national sales and other national market data (see Table 1). [b] From the 2002 NEI point sources sector file.	

National solvent HAP emission estimates for Automobile Refinishing were developed through use of an adjusted speciated chemical profile. The profile, expressed as a fraction of the total VOC solvent, was multiplied by the total VOC to obtain estimates of speciated solvent emissions. Individual species were identified as HAP and then summed to obtain the total HAP emissions for Automobile Refinishing. A more detailed explanation of the procedure used to develop the speciation profile and HAP estimates is presented below. References to tables are shown in parentheses.

HAP emissions from the Automobile Refinishing category were estimated using speciation profiles from EPA's SPECIATE database,[4] which are based on 1990 solvent data. The SPECIATE profile was updated with current industry information that included individual solvent consumption data for 1998 obtained by The Freedonia Group[5] from market sales data and a 1995 National Paint and Coatings Association (NPCA)[6] projection breakdown of solvent use by surface coating source category. The industry data were used to adjust the EPA SPECIATE profiles to reflect recent changes in solvent composition due to market changes and regulatory issues.

In the first step, the 1990 SPECIATE profiles for eight surface coating source categories (SURF-1), by pollutant and by source category, were used to develop a "1990 Composite Paints and Coatings SPECIATE Profile" (by pollutant) using weighting factors for each surface coating source category developed from the 1995 NPCA report (SURF-2). The weighting factors were developed from the volume of coating consumed by each surface coating source category based on 1994 data projected to 2000. Using this procedure a"1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 1) was developed that consisted of a breakdown of "Paints and Coatings" consumption, by pollutant, in units of percent of total coating.

In the second step, the "1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 3) was compared to 1998 Freedonia data (by pollutant) for the "Paint and Coating" source category as a whole, that was similarly expressed in terms of the percent that each individual solvent species comprised of the total (SURF-4 and, also, SURF-3 column 4). This comparison showed that there was a significant difference between 1990 coatings and 1998 coatings which was due to substitution of aliphatic hydrocarbons and alcohols (ethyl alcohol, isopropyl alcohol, acetone, and mineral spirits) for more hazardous solvents (toluene and xylene). Adjustment factors were then calculated (SURF-3, column 5) for the six species that showed significant change using the ratio of the 1998 Freedonia data to the "1990 Composite." Also, species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.

The adjustment factors were multiplied by the "1990 Composite" speciation percentages for each of the six affected species, and then all "1990 Composite" species, as adjusted and amended as above, were normalized to 100 percent VOC to produce an "Updated Speciated Profile-- Adjusted and Normalized," by pollutant and source category in terms of percent of total VOC (SURF-5). The pollutants that are HAP then were identified to develop HAP profiles, as a percent of total VOC, for Automobile Refinishing (SURF-6).

Acetone, which is not a VOC, was estimated separately for Automobile Refinishing using Freedonia[5] data for total acetone consumption for the "Paint and Coating" source category. Acetone consumption for 2002 for "Paint and Coating" was estimated to be 0.14 million tons based on 1998 market data and projected consumption for 2003 from the Freedonia report. Using the same apportionment of total paint and coating for the three surface coating source categories developed from the NPCA report,[6] as above, the consumption of acetone for 2002 in the Automobile Refinishing surface coating category was estimated (see SURF-6).

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles developed from Freedonia compound data and shown in Table 3, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates developed using Freedonia data. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Automobile Refinishing.

Table 3. HAP Speciation Profiles and Emissions for and Emissions for Automobile Refinishing

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
107211	Ethylene glycol	0.16	
171	Glycol Ethers	0.95	
78933	Methyl ethyl ketone (2-Butanone)	11.9	
108101	Methyl isobutyl ketone (Hexone)	3.2	
108883	Toluene	1.8	
1330207	Xylenes (mixed isomers)	2.0	
	Total	**20.0**	

Glycol Ethers Used in Glycol Ether Group

CAS #	Glycol Ether
112345	Butyl Carbitol
111159	Cellosolve Acetate
110805	Cellosolve
111900	Carbitol
111773	Methyl Carbitol

References:

1. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

2. Paint and Coatings '2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

3. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

4. EPA SPECIATE Database 2002. Profile Numbers 2402 for Auto Refinishing, 2403 for Traffic Markings, and 2418 for Industrial Maintenance Coatings (Data Quality Rating B). "Industrial Solvents - Winter 1989." Frost & Sullivan, Inc., New York, New York; and "National Paint Industry Data Base." National Paint and Coatings Association, Washington, D.C. 1990. Profiles prepared by EC/R Incorporated, Durham, NC, for the U.S. EPA, Research Triangle Park, NC. September 30, 1994.

5 The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

6. Paint and Coatings ‘2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

SOLVENT UTILIZATION - CONSUMER AND COMMERCIAL PRODUCTS USAGE
2460200000, 2460000000, 2460100000, 2460400000

SCC	SCC_L1	SCC_L2	SCC_L3	SCC_L4
2460000000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Processes	Total: All Solvent Types
2460100000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Personal Care Products	Total: All Solvent Types
2460200000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Household Products	Total: All Solvent Types
2460400000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Automotive Aftermarket Products	Total: All Solvent Types

Emissions from Consumer and Commercial Products are those emitted from the use of products that contain solvent. The solvent emissions were estimated using a material mass balance approach based upon national solvent production and consumption estimates derived from national sales and other national market data. Because only the solvent was used to estimate emissions, information about the specific products used, for example, the density and water content, was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation, as needed. Solvent consumption data by individual solvent chemical in 1998 were available in a 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from 2002 from a Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Consumer and Commercial Products.

Item	Data
Data Year	1998
National Consumption Freedonia Markets	Consumer Products, Detergents & Cleaners, Household Products, Household Cleaning, Household Cleaning & Other, Household Cleaners and Consumer, and Toiletries & Cosmetics
Market Solvent National Consumption (10^6 lbs)	1,960
Annual Growth (percent)	-0.61
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Other)
Source Category National Solvent Emissions (10^6 tons)	1.0

In the Consumer and Commercial Products nonpoint source solvent category the only antifreeze and deicer solvent data used from Freedonia was for methanol, since the other solvent compounds were assumed to be recycled and/or to not volatilize.

The procedure used to "grow" the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

$$\textit{Source Category Consumption in 2002 (tons)} = \textit{Consumption in 1998(tons)} \times \frac{\textit{Consumption in 2002}}{\textit{Consumption in 1998}}$$

The national solvent VOC consumption estimates for Consumer and Commercial Products were obtained by identifying the reported individual solvent chemicals for 1998 as VOC and then projecting the individual solvent chemical consumption to 2002, as in the equation above. Solvent consumption was then assumed to be equal to VOC emissions.

The national solvent utilization data were allocated to the states and counties using population data as a spatial surrogate. Because information was otherwise not available, solvent consumption was divided equally among the SCCs for the source category. It was not necessary to subtract out the point source component from the total national solvent consumption since there are no point source emissions for this source category. Table 2 shows the national solvent VOC consumption and nonpoint VOC emissions estimates for Consumer and Commercial Products.

Table 2. National VOC Emissions Summary for Consumer and Commercial Products.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.98
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.00
National Nonpoint VOC Emissions (10^6 tons)	0.98

[a] Derived from national sales and other national market data (see Table 1)
[b] From the 2002 NEI point sources sector file

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles developed from Freedonia compound data and shown in Table 3, to estimate HAP emissions. If neither VOC or HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates. National nonpoint pesticide HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Consumer and Commercial Products.

Table 3. HAP Speciation Profiles and Emissions for Consumer and Commercial Products.

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
107211	Ethylene Glycol	29.18	
67561	Methyl Alcohol	13.44	
108883	Toluene	0.27	
	Total	**42.89**	

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - DRY CLEANING
SCC: 2420020000

Dry Cleaning emissions are generated by the use of solvent in the cleaning process. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to EPA by state, local and tribal agencies. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data was taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation. Solvent consumption data by individual solvent chemical in 1998 were available in the 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from a 2002 Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Dry Cleaning.

Item	Data
Data Year	1998
National Consumption Freedonia Markets	Dry Cleaning
Market Solvent National Consumption (10^6 lbs)	40
Annual Growth (percent)	-0.61
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Other)
Source Category National Solvent Emissions (10^6 tons)	0.02

The procedure used to "grow" the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

$$\textit{Solvent Chemical Consumption in 2002 (tons)} = \textit{Solvent Chemical Consumption in 1998 (tons)} \times \frac{\textit{Source Category Consumption in 2002}}{\textit{Source Category Consumption in 1998}}$$

The national solvent VOC consumption estimates for Dry Cleaning were obtained by identifying the reported individual solvent chemicals for 1998 as VOC and then projecting the individual solvent chemical consumption to 2002, as in the equation above. Solvent consumption was then assumed to be equal to VOC emissions.

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Dry Cleaning source category were: Dry Cleaners: Coin-op (NAICS 81231), Services (NAICS 81232), and Linen and Uniform (NAICS 81233). It was not necessary to subtract out the point source component from the total national solvent consumption since there are no point source emissions for this source category in the NEI. Table 2 shows the national nonpoint VOC emissions estimate for Dry Cleaning.

Table 2. National VOC Emissions Summary for Dry Cleaning.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.02
Estimated Point Source VOC Emissions (10^6 tons)	0.00
National Nonpoint VOC Emissions (10^6 tons)	0.02
[a] Derived from national sales and other national market data (see Table 1).	

No HAP emission estimates were generated using the VOC estimates for coin operated and petroleum solvent drycleaners shown in Table 2. However, where HAP emission estimates were submitted to EPA by state, local or tribal agencies for these sources , they were included in the NEI.

Perchloroethylene emissions (a HAP, but not a VOC) from drycleaners were based upon estimates from EPA's Emission Standards Division and were developed for the drycleaning MACT standard. These estimates were used in the 1999 NEI and "carried forward" to the 2002 NEI. No adjustments were attempted for the effects of growth and control between 1999 and 2002.

Table 3. National Percholoethylene Emissions Summary for Dry Cleaning.

Pollutant	Emissions (10^6 tons/year)
Perchloroethylene	
[a] From Drycleaning MACT standard	

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - GRAPHIC ARTS
SCC: 2425000000

Emissions from Graphic Arts are those emitted from the application of inks that contain solvent. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to the EPA by state, local and tribal agencies. Because only the solvent was used to estimate emissions, information about the properties of the specific inks used (e.g., density) was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data for 2002 was taken from The Freedonia Group, Inc., solvent market research report[1] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation. All solvent used in Graphic Arts was assumed to be VOC based on previous Freedonia solvent reports.[2] Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Graphic Arts.

Item	Data
Data Year	2002
National Consumption Freedonia Market	Printing Inks
Market Solvent National Consumption (10^6 lbs)	1,040
Reference for Solvent Consumption	Freedonia, 2003[1]
Source Category National Solvent Emissions (10^6 tons)	0.52

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Graphic Arts source category were Paperboard Container (NAICS 3222) and Printing (NAICS 32311).

It was necessary to subtract out the point source component from the total national solvent consumption to obtain the nonpoint solvent emissions, since the national solvent utilization corresponds to both point and nonpoint solvent emissions sources. The NEI was used as a reference to estimate the point source component of the solvent emissions. Because point source control efficiencies for a process may vary on the county level, the spatial allocation procedure was performed before the point source component was subtracted.

The point and nonpoint source emissions in the NEI are identified by source classification codes (SCCs). Point SCCs were matched with the appropriate nonpoint SCCs for the same solvent process and subtracted from the county level allocations to prevent "double counting" of emissions. The point-to-nonpoint SCC correlations in this step can be found in the report titled *Top Down Approach for Estimating VOC Emissions From Eleven Area Source Solvent Source Categories* located at: http://www.epa.gov/ttn/chief/net/2002inventory.html#nonpoint.

Some of the point source emissions data in the NEI are controlled emissions. Therefore, it was necessary to "back out" uncontrolled point source emissions, which are equal to solvent consumption. If the point source solvent control devices were not destructive, the solvent removed was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the reported controlled solvent emissions were assumed to be equal to uncontrolled solvent emissions, as were the solvent emissions from solvent sources without control devices.

Control device control efficiency (CE) was used to "back out" uncontrolled emissions. The CE used was either the reported CE, the EPA default CE for the control device, or a default CE of 70 percent for all control devices, depending on the availability of control information in the NEI.

The following equation was used to develop a control efficiency factor (CEF) for point source solvent control devices that were destructive, for each point source, *p* (CEF_i):

$$CEF_p = 1/(1 - (eff/100)$$

where,

CEF_p	=	Control efficiency factor for each point source, *p*
eff	=	Control efficiency (percent)

Uncontrolled point source solvent emissions for each point source (*p*) were obtained by multiplying the point source controlled solvent emissions by the CEF_p, as follows:

$$\text{Uncontrolled Point Source } (p) \text{ Solvent (tons)} = \text{Controlled Point Source } (p) \text{ Solvent (tons)} \times CEF_p$$

The total county uncontrolled point source solvent emissions for all point sources/stacks in the county with the same SCCs were then obtained by summing the uncontrolled individual point source solvent emissions, for all point sources in the county with the same SCC. The total county point source solvent consumption by SCC was then subtracted from the total county solvent consumption by SCC to produce the total county nonpoint solvent emissions by SCC, as follows:

$$\text{Nonpoint Solvent Emissions by SCC (tons)} = \text{Total Solvent Consumption by SCC (tons)} - \text{Point Source Solvent Consumption by SCC (tons)}$$

In this last step, if the results were negative a zero was assigned to that nonpoint SCC in the county.

Table 2. National VOC Emissions Summary for Graphic Arts.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.52
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.09
National Nonpoint VOC Emissions (10^6 tons)	0.43

[a] Derived from national sales and other national market data (see Table 1).
[b] From the 2002 NEI point sources sector file

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles, shown in Table 3, to estimate HAP emissions. If neither VOC or HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Graphic Arts.

Table 3. HAP Speciation Profiles and Emissions for Graphic Arts.

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
107211	Ethylene Glycol	0.37	
67561	Methyl Alcohol	3.71	
78933	Methyl Ethyl Ketone	0.89	
108101	Methyl Isobutyl Ketone	0.22	
108883	Toluene	3.79	
1330207	Xylene	0.97	
	Total	**9.95**	

References:

1. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

2. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

SOLVENT UTILIZATION - INDUSTRIAL ADHESIVES AND SEALANTS
SCC: 2440020000

Industrial Adhesive and Sealant emissions are from the evaporation of solvents during the adhesive and sealant drying or curing process. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to the EPA by state, local and tribal agencies. Because only the solvent was used to estimate emissions, information about the properties (e.g., density) of the specific adhesive or sealant was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation, as needed. Solvent consumption data by individual solvent chemical in 1998 were available in a 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from 2002 from a Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Industrial Adhesive and Sealants.

Item	Data
Data Year	1998
National Consumption Freedonia Market	Other
Market Solvent National Consumption (10^6 lbs)	440
Annual Growth (percent)	-0.61
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Other)
Source Category National Solvent Emissions (10^6 tons)	0.22

The procedure used to "grow" the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

$$\textit{Solvent Chemical Consumption in 2002 (tons)} = \textit{Solvent Chemical Consumption in 1998 (tons)} \times \frac{\textit{Source Category Consumption in 2002}}{\textit{Source Category Consumption in 1998}}$$

The national solvent VOC consumption estimates for Industrial Adhesive and Sealants were obtained by identifying the reported individual solvent chemicals for 1998 as VOC and then projecting the individual solvent chemical consumption to 2002, as in the equation above. Solvent consumption was then assumed to be equal to VOC emissions.

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Industrial Adhesive and Sealants source category were Wood Products (NAICS 3212); Paperboard (NAICS 32221); Paper Bag, Treated Paper (NAICS 32222); Sanitary Paper

(NAICS 322291); Printing (NAICS 32311); Plastics and Rubber (NAICS 326); Motor Vehicle Body (NAICS 336211); Building Materials/Supplies (NAICS 4441); and Auto Repair and Maintenance (NAICS 8111). It was necessary to subtract out the point source component from the total national solvent consumption to obtain the nonpoint solvent emissions, since the national solvent utilization corresponds to both point and nonpoint solvent emissions sources. The NEI was used as a reference to estimate the point source component of the solvent emissions. Because point source control efficiencies for a process may vary on the county level, the spatial allocation procedure was performed before the point source component was subtracted.

The point and nonpoint source emissions in the NEI are identified by source classification codes (SCCs). Point SCCs were matched with the appropriate nonpoint SCCs for the same solvent process and subtracted from the county level allocations to prevent "double counting" of emissions. The point-to-nonpoint SCC correlations in this step are shown in the full documentation report that is located at: http://www.epa.gov/ttn/chief/net/2002inventory.html#nonpoint.

Some of the point source emissions data in the NEI are controlled emissions. Therefore, it was necessary to "back out" uncontrolled point source emissions, which are equal to solvent consumption. If the point source solvent control devices were not destructive, the solvent removed was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the reported controlled solvent emissions were assumed to be equal to uncontrolled solvent emissions, as were the solvent emissions from solvent sources without control devices.

Control device control efficiency (CE) was used to "back out" uncontrolled emissions. The CE used was either the reported CE, the EPA default CE for the control device, or a default CE of 70 percent for all control devices, depending on the availability of control information in the NEI. The following equation was used to develop a control efficiency factor (CEF) for point source solvent control devices that were destructive, for each point source, *p* (CEF_i):

$$CEF_p = 1/(1 - (eff/100)$$

where,

CEF_p	=	Control efficiency factor for each point source, *p*
eff	=	Control efficiency (percent)

Uncontrolled point source solvent emissions for each point source (*p*) were obtained by multiplying the point source controlled solvent emissions by the CEF_p, as follows:

Uncontrolled Point Source (*p*) Solvent (tons)	=	Controlled Point Source (*p*) Solvent (tons)	x	CEF_p

The total county uncontrolled point source solvent emissions for all point sources/stacks in the county with the same SCCs were then obtained by summing the uncontrolled individual point source solvent emissions, for all point sources in the county with the same SCC. The total county point source solvent consumption by SCC was then subtracted from the total county solvent consumption by SCC to produce the total county nonpoint solvent emissions by SCC, as follows:

Nonpoint Solvent Emissions by SCC (tons)	=	Total Solvent Consumption by SCC (tons)	-	Point Source Solvent Consumption by SCC (tons)

In this last step, if the results were negative, a zero was assigned to that nonpoint SCC in the county. The county-level nonpoint VOC emissions for Industrial Adhesive and Sealants for the county were obtained by summing the county-level nonpoint source VOC emissions for all SCCs in the county. National nonpoint VOC emissions were then obtained by summing the county nonpoint solvent emissions for all counties. Table 2 shows the national solvent VOC consumption, and point and nonpoint VOC emissions estimates for Industrial Adhesive and Sealants.

Table 2. National VOC Emissions Summary for Industrial Adhesive and Sealants.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.20
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.02
National Nonpoint VOC Emissions (10^6 tons)	0.19

[a] Derived from national sales and other national market data (see Table 1).
[b] Obtained from point source data submitted to EPA for the 2002 NEI.

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles, developed from compound data in the 2000 Freedonia report shown in Table 3, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying HAP speciation profiles developed from the 2000 Freedonia report to the county-level nonpoint VOC consumption estimates. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Industrial Adhesives and Sealants.

Table 3. HAP Speciation Profiles and Emissions for Industrial Adhesive and Sealants.

CAS #	HAP Name	Percent of Total Solvent VOC[a]	Emissions (tons/year)
67561	Methyl Alcohol	12.45	
78933	Methyl Ethyl Ketone	11.16	
108101	Methyl Isobutyl Ketone	0.43	
108883	Toluene	8.37	
1330207	Xylene	2.36	
	Total	**34.77**	

[a] Derived from the ratio of the individual HAP solvent compound consumption to the total VOC solvent consumption from the 2000 Freedonia report.[1]

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - INDUSTRIAL COATING
SCC: 2401010000, 2401015000, 2401020000, 2401025000, 2401030000, 2401040000, 2401050000, 2401055000, 2401060000, 2401065000, 2401070000, 2401080000, 2401090000, 2401100000, 2401200000, 2401990000

SCC	SCC_L1	SCC_L2	SCC_L3	SCC_L4
2401010000	Solvent Utilization	Surface Coating	Textile Products: SIC 22	Total: All Solvent Types
2401015000	Solvent Utilization	Surface Coating	Factory Finished Wood: SIC 2426 thru 242	Total: All Solvent Types
2401020000	Solvent Utilization	Surface Coating	Wood Furniture: SIC 25	Total: All Solvent Types
2401025000	Solvent Utilization	Surface Coating	Metal Furniture: SIC 25	Total: All Solvent Types
2401030000	Solvent Utilization	Surface Coating	Paper: SIC 26	Total: All Solvent Types
2401040000	Solvent Utilization	Surface Coating	Metal Cans: SIC 341	Total: All Solvent Types
2401050000	Solvent Utilization	Surface Coating	Miscellaneous Finished Metals: SIC 34 - (341 + 3498)	Total: All Solvent Types
2401055000	Solvent Utilization	Surface Coating	Machinery and Equipment: SIC 35	Total: All Solvent Types
2401060000	Solvent Utilization	Surface Coating	Large Appliances: SIC 363	Total: All Solvent Types
2401065000	Solvent Utilization	Surface Coating	Electronic and Other Electrical: SIC 36 - 363	Total: All Solvent Types
2401070000	Solvent Utilization	Surface Coating	Motor Vehicles: SIC 371	Total: All Solvent Types
2401080000	Solvent Utilization	Surface Coating	Marine: SIC 373	Total: All Solvent Types
2401090000	Solvent Utilization	Surface Coating	Miscellaneous Manufacturing	Total: All Solvent Types
2401100000	Solvent Utilization	Surface Coating	Industrial Maintenance Coatings	Total: All Solvent Types
2401200000	Solvent Utilization	Surface Coating	Other Special Purpose Coatings	Total: All Solvent Types
2401990000	Solvent Utilization	Surface Coating	All Surface Coating Categories	Total: All Solvent Types

Emissions from Industrial Coating are from the application of paints and other coatings that contain solvent. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to EPA by state, local and tribal agencies. Because only the solvent was used to estimate emissions, information about the specific coatings used, for example, the coating density and water content, was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research reports[1] in units of million pounds of solvent in the Paint and Coating (P&C) source category. The fraction of the total P&C solvent consumed by Industrial Coating was estimated from a National Paint and Coating Association (NPCA) report[2] on paint and coating use. To estimate solvent use for Industrial Coating, the fraction of paint and coatings for Industrial Coating (0.29) from the NPCA report was multiplied by the total Freedonia P&C solvent consumption to obtain an estimate of solvent consumption for the source category. All solvent used in Industrial Coating was assumed to be VOC based on previous Freedonia solvent reports.[3] Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Industrial Coating.

Item	Data
Data Year	2002
National Consumption Freedonia Market	Paint and Coating
Market Solvent National Consumption (10^6 lbs)	780
Fraction of Total Paint and Coating Solvent	0.29
References	
National Consumption	Freedonia, 2003[1]
Solvent Fraction	NPCA[2]
Source Category National Solvent Emissions (10^6 tons)	0.39

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Industrial Coating source category were: Logging (NAICS 1133); Wood Mfg (NAICS 321xx); Pulp&Paper (NAICS 322x); Chemical Mfg (NAICS 325); Plastics and Rubber (NAICS 326); Pottery, Plumbing Mfg (NAICS 32711); Glass (NAICS 327212); Concrete (NAICS 32739); Metal (NAICS 332xx); Computer&Electron. Mfg (NAICS 334xx); Electr. Equip. Mfg (NAICS 335xx); Transp. Equip. Mfg (NAICS 336xx); Furniture Mfg (NAICS 337xx), Misc Mfg (NAICS 339xx); Couriers (NAICS 492); Cables (NAICS 5132); Telecomm. (NAICS 5133); Auto Rental (NAICS 5321); Auto Repair (NAICS 8111); and Electronic Repair (NAICS 811x). Because information was otherwise not available, solvent consumption was divided equally among the SCCs for the source category.

It was necessary to subtract out the point source component from the total national solvent consumption to obtain the nonpoint solvent emissions, since the national solvent utilization corresponds to both point and nonpoint solvent emissions sources. The NEI was used as a reference to estimate the point source component of the solvent emissions. Because point source control efficiencies for a process may vary on the county level, the spatial allocation procedure was performed before the point source component was subtracted.

The point and nonpoint source emissions in the NEI are identified by source classification codes (SCCs). Point SCCs were matched with the appropriate nonpoint SCCs for the same solvent process and subtracted from the county level allocations to prevent "double counting" of emissions. The point-to-nonpoint SCC correlations in this step are shown in the full documentation report that is located at: http://www.epa.gov/ttn/chief/net/2002inventory.html#nonpoint.

Some of the point source emissions data in the NEI are controlled. Therefore, it was necessary to "back out" uncontrolled point source emissions, which are equal to solvent consumption. If the point source solvent control devices were not destructive, the solvent removed was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the reported controlled solvent emissions were assumed to be equal to uncontrolled solvent emissions, as were the solvent emissions from sources without control devices.

Control device control efficiency (CE) was used to "back out" uncontrolled emissions. The CE used was either the reported CE, the EPA default CE for the control device, or a default CE of 70 percent for all control devices, depending on the availability of control information in the NEI. The following equation was used to develop a control efficiency factor (CEF) for point source solvent control devices that were destructive, for each point source, p (CEF_i):

$$CEF_p = 1/(1 - (eff/100)$$

where,

CEF_p	=	Control efficiency factor for each point source, p
eff	=	Control efficiency (percent)

Uncontrolled point source solvent emissions for each point source (p) were obtained by multiplying the point source controlled solvent emissions by the CEF_p, as follows:

$$\text{Uncontrolled Point Source } (p) \text{ Solvent (tons)} = \text{Controlled Point Source } (p) \text{ Solvent (tons)} \times CEF_p$$

The total county uncontrolled point source solvent emissions for all point sources/stacks in the county with the same SCCs were then obtained by summing the uncontrolled individual point source solvent emissions, for all point sources in the county with the same SCC. The total county point source solvent consumption by SCC was then subtracted from the total county solvent consumption by SCC to produce the total county nonpoint solvent emissions by SCC, as follows:

Nonpoint Solvent Emissions by SCC (tons)	=	Total Solvent Consumption by SCC (tons)	-	Point Source Solvent Consumption by SCC (tons)

(The point source SCC to nonpoint SCC crosswalk is available in Appendix C) In this last step, if the results were negative, a zero was assigned to that nonpoint SCC in the county.

The county-level nonpoint VOC emissions for Industrial Coating were obtained by summing the county-level nonpoint source VOC emissions for all SCCs in the county. National nonpoint VOC emissions were then obtained by summing the county nonpoint solvent emissions for all counties. Table 2 shows the national solvent VOC consumption, and point and nonpoint VOC emissions estimates for Industrial Coating.

Table 2. National VOC Emissions Summary for Industrial Coating.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.39
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.12
National Nonpoint VOC Emissions (10^6 tons)	0.28

a Derived from national sales and other national market data (see Table 1).
b Obtained from point source data submitted to EPA for the 2002 NEI.

The national solvent HAP consumption estimates for Industrial Coating were estimated by developing speciated chemical profiles for the organic solvents used. The profiles, expressed as fractions of the total VOC solvent, were multiplied by total VOC to obtain estimates of speciated solvent emissions from the source categories. Individual species were identified as HAP and then summed to obtain the total HAP emissions for the surface coatings categories. The procedures used to develop the speciation profiles and other HAP estimates are described below. References to tables are shown in parentheses.

Speciated emissions from the surface coating categories were estimated using speciation profiles from EPA's SPECIATE database,[4] which are based on 1990 solvent data. For the purpose of the 2002 NEI estimate, the SPECIATE profiles were updated with current industry information that included individual solvent consumption data for 1998 obtained by The Freedonia Group[5] from market sales data and a 1995 National Paint and Coatings Association (NPCA)[6] projection breakdown of solvent use by surface coating source category. The industry data were used to adjust the EPA SPECIATE profiles to reflect recent changes in solvent composition due to market changes and regulatory issues.

In the first step, the 1990 SPECIATE profiles for eight surface coating source categories (SURF-1), by pollutant and by source category, were used to develop a "1990 Composite Paints and Coatings SPECIATE

Profile" (by pollutant) using weighting factors for each surface coating source category developed from the 1995 NPCA report (SURF-2). The weighting factors were developed from the volume of coating consumed by each surface coating source category based on 1994 data projected to 2000. Using this procedure a"1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 1) was developed that consisted of a breakdown of "Paints and Coatings" consumption, by pollutant, in units of percent of total coating.

In the second step, the "1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 3) was compared to 1998 Freedonia data (by pollutant) for the "Paint and Coating" source category as a whole, that was similarly expressed in terms of the percent that each individual solvent species comprised of the total (SURF-4 and, also, SURF-3 column 4). This comparison showed that there was a significant difference between 1990 coatings and 1998 coatings which was due to substitution of aliphatic hydrocarbons and alcohols (ethyl alcohol, isopropyl alcohol, acetone, and mineral spirits) for more hazardous solvents (toluene and xylene). Adjustment factors were then calculated (SURF-3, column 5) for the six species that showed significant change using the ratio of the 1998 Freedonia data to the "1990 Composite." Also, species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[7] For the Industrial Coating surface coating category, the SPECIATE profiles of Industrial Maintenance (#2418) and Miscellaneous Manufacturing (#2417) were combined and averaged to produce a new "Industrial Coating" profile.

The adjustment factors were multiplied by the "1990 Composite" speciation percentages for each of the six affected species, and then all "1990 Composite" species, as adjusted and amended as above, were normalized to 100 percent VOC to produce an "Updated Speciated Profile -- Adjusted and Normalized," by pollutant and source category in terms of percent of total VOC (SURF-5). The pollutants that are HAP then were identified to develop HAP profiles, as a percent of total VOC, for the three surface coating categories (SURF-6).

Acetone, which is not a VOC, was estimated separately for the surface coating source categories using Freedonia[5] data for total acetone consumption for the "Paint and Coating" source category. Acetone consumption for 2002 for "Paint and Coating" was estimated to be 0.14 million tons based on 1998 Freedonia market data and projected consumption for 2003 from the Freedonia report. Using the same apportionment of total paint and coating for the three surface coating source categories developed from the NPCA report,[6] as above, the consumption of acetone for 2002 in the three individual surface coating categories also was estimated (see SURF-6).

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles developed from Freedonia compound data and shown in Table 3, to estimate HAP emissions. Table 3 lists the individual Glycol Ethers included in the Glycol Ether Group. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates developed using Freedonia data. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 4 shows the national HAP emissions estimate for Industrial Coating.

Table 3. HAP Speciation Profiles and Emissions for Industrial Coating.

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
107211	Ethylene glycol	0.45	
171	Glycol Ethers	1.4	
78933	Methyl ethyl ketone (2-Butanone)	3.6	
108101	Methyl isobutyl ketone(Hexone)	8.3	
71556	Methyl chloroform (1,1,1-Trichloroethane)	0.8	
108883	Toluene	2.6	
1330207	Xylenes (mixed isomers)	2.2	
	Total	**19.4**	

Table 4. Glycol Ethers in the Glycol Ether Group

CAS #	Glycol Ether
112345	Butyl Carbitol
111159	Cellosolve Acetate
110805	Cellosolve
111900	Carbitol
111773	Methyl Carbitol

References:

1. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

2. Paint and Coatings '2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

3. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

4. EPA SPECIATE Database 2002. Profile Numbers 2402 for Auto Refinishing, 2403 for Traffic Markings, and 2418 for Industrial Maintenance Coatings (Data Quality Rating B). "Industrial Solvents - Winter 1989." Frost & Sullivan, Inc., New York, New York; and "National Paint Industry Data Base." National Paint and Coatings Association, Washington, D.C. 1990. Profiles prepared by EC/R Incorporated, Durham, NC, for the U.S. EPA, Research Triangle Park, NC. September 30, 1994.

5. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

6. Paint and Coatings ‘2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

7. MSDS for Product ID: Petroleum Spirits, Petroleum Naphtha, Benzine CAS# 8032-32-4 EM Science Division of EM Industries. 02/11/1988. Obtained from Vermont SIRI MSDS Database.

SOLVENT UTILIZATION -PROCESS SOLVENTS
SCC: 2301030000, 2430000000, 2440000000

SCC	SCC_L1	SCC_L2	SCC_L3	SCC_L4
2301030000	Industrial Processes	Chemical Manufacturing: SIC 28	Process Emissions from Pharmaceutical Manuf (NAPAP cat. 106)	Total
2430000000	Solvent Utilization	Rubber/Plastics	All Processes	Total: All Solvent Types
2440000000	Solvent Utilization	Miscellaneous Industrial	All Processes	Total: All Solvent Types

Process solvent emissions are from the use of solvents in industrial processes including pharmaceutical and chemical production. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to the EPA for the point source sector of the NEI. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation, as needed. Solvent consumption data by individual solvent chemical in 1998 were available in a 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from 2002 from a Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Process Solvents.

Item	Data
Data Year	1998
Solvent Source Category	Process Solvents
National Consumption Freedonia Market	Extractive Solvents, Paint Strippers, Lubricants, Other Pharmaceutical Chemicals, and Other Markets (See Table 2)
Market Solvent National Consumption (10^6 lbs)	1,480
Annual Growth (percent)	-0.61
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Other)
Source Category National Solvent Emissions (10^6 tons)	0.74

Table 2 shows which chemical data in Freedonia's "Other Markets" solvent market category were allocated to the Process Solvents source category.

The procedure used to “grow” the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

$$\textit{Solvent Chemical Consumption in 2002 (tons)} = \textit{Solvent Chemical Consumption in 1998 (tons)} \times \frac{\textit{Source Category Consumption in 2002}}{\textit{Source Category Consumption in 1998}}$$

Table 2. Freedonia “Other Markets” Chemical Data Included in the “Process Solvents” Source Category.

“Other Market” Solvents
Acetone
Benzene
Benzene Derivatives
Butyl Acetate
E-Series Ether Solvents
Ester Solvents
Ethyl Acetate
Ether Solvents
Ethyl Alcohol
Ethylene Glycol
Furfural solvents
Hydrocarbon Solvents
Isopropyl Alcohol
Methyl Alcohol
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Methylene Chloride
Other Alcohol Solvents
Other Chlorinated Solvents
Other Ethylene Oxide Solvents
Other Ketone Solvents
Other Propylene Oxide-Derived Solvents
Other Solvents
Perchloroethylene
Pinene Solvents
Propyl Acetate
Propylene Glycol Solvents
Special Naphthas
Tetrahydrofuran Solvents
Toluene
Trichloroethane
Trichloroehylene
Xylene

The national solvent VOC consumption estimates for Process Solvents were obtained by identifying the reported individual solvent chemicals for 1998 as VOC and then projecting the individual solvent chemical consumption to 2002, as in the equation above.

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Process Solvents source category were Chemical Manufacturing (NAICS 325) and Computer & Electronic Manufacturing (NAICS 334). Because information was otherwise not available, solvent consumption was divided equally between these two SCCs for the source category.

It was necessary to subtract out the point source component from the total national solvent consumption to obtain the nonpoint solvent emissions, since the national solvent utilization corresponds to both point and nonpoint solvent emissions sources. The NEI was used as a reference to estimate the point source component of the solvent emissions. Because point source control efficiencies for a process may vary on the county level, the spatial allocation procedure was performed before the point source component was subtracted.

The point and nonpoint source emissions in the NEI are identified by source classification codes (SCCs). Point SCCs were matched with the appropriate nonpoint SCCs for the same solvent process and subtracted from the county level allocations to prevent "double counting" of emissions. The point-to-nonpoint SCC correlations in this step are listed in Table 10 of the Report titled *"Solvent Mass Balance" Approach for Estimating VOC Emissions From 11 Nonpoint Solvent Source Categories* located at:
http://www.epa.gov/ttn/chief/net/2002inventory.html#nonpoint

Some of the point source emissions data in the NEI are controlled. Therefore, it was necessary to "back out" uncontrolled point source emissions, which are equal to solvent consumption. If the point source solvent control devices were not destructive, the solvent removed was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the reported controlled solvent emissions were assumed to be equal to uncontrolled solvent emissions, as were the solvent emissions from solvent sources without control devices.

Control device control efficiency (CE) was used to "back out" uncontrolled emissions. The CE used was either the reported CE, the EPA default CE for the control device, or a default CE of 70 percent for all control devices, depending on the availability of control information in the NEI. The following equation was used to develop a control efficiency factor (CEF) for point source solvent control devices that were destructive, for each point source, p (CEF_i):

$$CEF_p = 1/(1 - (eff/100\ )$$

where,

CEF_p	=	Control efficiency factor for each point source, p
eff	=	Control efficiency (percent)

Uncontrolled point source solvent emissions for each point source (p) were obtained by multiplying the point source controlled solvent emissions by the CEF_p, as follows:

$$\text{Uncontrolled Point Source } (p) \text{ Solvent (tons)} = \text{Controlled Point Source } (p) \text{ Solvent (tons)} \times CEF_p$$

The total county uncontrolled point source solvent emissions for all point sources/stacks in the county with the same SCCs were then obtained by summing the uncontrolled individual point source solvent emissions, for all point sources in the county with the same SCC. The total county point source solvent consumption by SCC was then subtracted from the total county solvent consumption by SCC to produce the total county nonpoint solvent emissions by SCC, as follows:

$$\text{Nonpoint Solvent Emissions by SCC (tons)} = \text{Total Solvent Consumption by SCC (tons)} - \text{Point Source Solvent Consumption by SCC (tons)}$$

In this last step, if the results were negative a zero was assigned to that nonpoint SCC in the county.

The county-level nonpoint VOC emissions for Process Solvents for the county were obtained by summing the county-level nonpoint source VOC emissions for all SCCs in the county. National nonpoint VOC emissions were then obtained by summing the county nonpoint solvent emissions for all counties. Table 3 shows the national solvent VOC consumption, and point and nonpoint VOC emissions estimates for Process Solvents.

Table 3. National VOC Emissions Summary for Process Solvents.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.72
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.02
National Nonpoint VOC Emissions (10^6 tons)	0.70

[a] Derived from national sales and other national market data (see Table 1).
[b] Obtained from point source data submitted to EPA for the 2002 NEI.

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles, shown in Table 4, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying HAP speciation profiles developed from the 2000 Freedonia Report to the county-level nonpoint VOC consumption estimates. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 4 shows the national HAP emissions estimates for Process Solvents.

Table 4. HAP Speciation Profiles and Emissions for Process Solvents.

CAS #	HAP Name	Percent of Total Solvent VOC[a]	Emissions (tons/year)
71432	Benzene	1.56	
107211	Ethylene Glycol	7.00	
67561	Methyl Alcohol	4.67	
78933	Methyl Ethyl Ketone	5.32	
108101	Methyl Isobutyl Ketone	0.78	
108883	Toluene	1.10	
79016	Trichloroethylene	0.58	
1330207	Xylene	0.78	
	Total	**21.79**	

[a] Derived from the ratio of the individual HAP solvent compound consumption to the total VOC solvent consumption from the 2000 Freedonia report.[1]

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - PESTICIDE APPLICATION
SCC: 2461850000, 2465800000

SCC	SCC_L1	SCC_L2	SCC_L3	SCC_L4
2461850000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: Agricultural	All Processes
2465800000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application	Total: All Solvent Types

Emissions from Pesticide Application are from the use of pesticides that contain organic solvents. The solvent emissions were estimated using a material mass balance approach based upon national solvent production and consumption estimates derived from national sales and other national market data. Because only the solvent was used to estimate emissions, information about the specific properties of the pesticides used (e.g., the density and water content) were not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data was taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation, as needed. Solvent consumption data by individual solvent chemical in 1998 were available in a 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from 2002 from a Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Pesticide Application.

Item	**Data**
Data Year	1998
National Consumption Freedonia Market	Carrier Solvents, Other Markets (See Table 2)
Market Solvent National Consumption (10^6 lbs)	260
Annual Growth (percent)	-0.61
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Other)
Source Category National Solvent Emissions (10^6 tons)	0.13

Table 2 shows which chemical data in Freedonia's "Other Markets" solvent market category were allocated to the Pesticide Application source category.

The procedure used to "grow" the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

$$\text{Solvent Chemical Consumption in 2002 (tons)} = \text{Solvent Chemical Consumption in 1998 (tons)} \times \frac{\text{Source Category Consumption in 2002}}{\text{Source Category Consumption in 1998}}$$

Table 2. Freedonia "Other Markets" Chemical Data Included in the "Pesticides" Source Category.

"Other Market" Solvents
Benzene
Benzene Derivatives
Ethyl Acetate
Hydrocarbon Solvents
Other Solvents
Special Naphthas

The national solvent VOC consumption estimates for Pesticide Application were obtained by identifying the reported individual solvent chemicals for 1998 and then projecting the individual solvent chemical consumption to 2002, as in the equation above. Solvent consumption was then assumed to be equal to VOC emissions.

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes and population. For the Pesticide Application source category, one-half of the solvent use was allocated using employment data in Crop Production (NAICS 111) and one-half by population. Because information was otherwise not available, solvent consumption was divided equally among the SCCs for the source category. It was not necessary to subtract out the point source component from the total national solvent consumption since there are no point source emissions for this source category. Table 3 shows the national solvent VOC consumption and nonpoint VOC emissions estimates for Pesticide Application.

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profile developed from Freedonia compound data and shown in Table 4, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP pesticide emissions were estimated by applying the HAP speciation profile developed from compound data in the 2002 Freedonia report to the county-level nonpoint VOC consumption estimates. National nonpoint pesticide HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 4 shows the national HAP emissions estimate for Pesticide Application.

Table 3. National VOC Emissions Summary for Pesticide Application.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.12
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.00
National Nonpoint VOC Emissions (10^6 tons)	0.12

[a] Derived from national sales and other national market data (see Table 1)
[b] From the 2002 NEI point sources sector file

Table 4. HAP Speciation Profile and Emissions for Pesticide Application.

CAS #	HAP Name	Percent of Total Solvent VOC[a]	Emissions (tons/year)
71432	Benzene	26.15	
	Total	**26.15**	

[a] Derived from the ratio of the individual HAP solvent compound consumption to the total VOC solvent consumption from the 2000 Freedonia report.[1]

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - SURFACE CLEANING - DEGREASING
SCC: 2415100000, 2415125000, 2415300000, 2415130000

SCC	SCC_L1	SCC_L2	SCC_L3	SCC_L4
2415100000	Solvent Utilization	Degreasing	All Industries: Open Top Degreasing	Total: All Solvent Types
2415125000	Solvent Utilization	Degreasing	'Industrial Machinery and Equipment (SIC 35): Open Top Degreasing	Total: All Solvent Types
2415130000	Solvent Utilization	Degreasing	'Electronic and Other Elec. (SIC 36): Open Top Degreasing	Total: All Solvent Types
2415300000	Solvent Utilization	Degreasing	All Industries: Cold Cleaning	Total: All Solvent Types

Surface Cleaning emissions are from organic solvents used in cold cleaning and vapor degreasing operations. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data, and accounted for point source contributions using facility estimates submitted to the EPA by state, local and tribal agencies. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data was taken from The Freedonia Group, Inc., solvent market research reports[1,2] in units of million pounds of solvent. The Freedonia solvent market data were matched to individual nonpoint source categories according to the solvent usage descriptions in the Freedonia background documentation, as needed. Solvent consumption data by individual solvent chemical in 1998 were available in a 2000 Freedonia report. National solvent consumption data for the individual solvent chemicals from 1998 were projected to 2002 using growth factors also developed using solvent data from 2002 from a Freedonia report for the source category as a whole. Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Surface Cleaning.

Item	**Data**
Data Year	1998
National Consumption Freedonia Market	Cold Cleaning, Vapor Degreasing
Market Solvent National Consumption (10^6 lbs)	300
Annual Growth (percent)	-0.71
References	
National Consumption	Freedonia, 2000[1]
Annual Growth (market type)	Freedonia, 2003[2] (Cleaning Products)
Source Category National Solvent Emissions (10^6 tons)	0.15

The procedure used to "grow" the 1998 solvent consumption data utilized the ratio of the total solvent consumption for the source category in 2002 to that reported for 1998, as follows:

Solvent Chemical *Solvent Chemical* *Source Category*

Consumption in 2002 (tons)	=	*Consumption in 1998 (tons)*	*x*	*Consumption in 2002* / *Source Category Consumption in 1998*

The national solvent VOC consumption estimates for Surface Cleaning were obtained by identifying the reported individual solvent chemicals for 1998 as VOC and then projecting the individual solvent chemical consumption to 2002, as in the equation above. Solvent consumption was then assumed to be equal to VOC emissions. The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogates used to apportion the national solvent consumption data for the Surface Cleaning source category were: Metal (NAICS 331,332); Machinery (NAICS 333); Computers (NAICS 334); Electrical (NAICS 335); Transportation (NAICS 336); Furniture (NAICS 337); Misc Mft (NAICS 339); Auto Parts (NAICS 441); Transp. (NAICS 483, 484, 485, 488); Auto Repair (NAICS 8111); Electronic Repair (NAICS 8112}. Because information was otherwise not available, solvent consumption was divided equally among the SCCs for the source category.

It was necessary to subtract out the point source component from the total national solvent consumption to obtain the nonpoint solvent emissions, since the national solvent utilization corresponds to both point and nonpoint solvent emissions sources. The NEI was used as a reference to estimate the point source component of the solvent emissions. Because point source control efficiencies for a process may vary on the county level, the spatial allocation procedure was performed before the point source component was subtracted.

The point and nonpoint source emissions estimates in the NEI are organized using source classification codes (SCCs). Point source SCCs were matched to nonpoint source SCCs. These SCC matches were used to subtract point source solvent consumption from the total solvent allocated to each county. The point-to-nonpoint SCC correlations used in this step are in the report titled *Top Down Approach for Estimating VOC Emissions From Eleven Area Source Solvent Categories* located at: http://www.epa.gov/ttn/chief/net/2002inventory.html#nonpoint.

Some of the point source emissions data in the NEI are controlled. Therefore, it was necessary to "back out" uncontrolled point source emissions, which are equal to solvent consumption. If the point source solvent control devices were not destructive, the solvent removed was assumed to be used at some other point in the process, contributing to the overall solvent consumption at the source. In this case, the reported controlled solvent emissions were assumed to be equal to uncontrolled solvent emissions, as were the solvent emissions from solvent sources without control devices.

Control device control efficiency (CE) was used to "back out" uncontrolled emissions. The CE used was either the reported CE or a default CE of 70 percent for all control devices, depending on the availability of control information in the NEI. The following equation was used to develop a control efficiency factor (CEF) for point source solvent control devices that were destructive, for each point source, *p* (CEF_i):

$$CEF_p = 1/(1 - (eff/100)$$

where,

CEF_p	=	Control efficiency factor for each point source, *p*
eff	=	Control efficiency (percent)

Uncontrolled point source solvent emissions for each point source (*p*) were obtained by multiplying the point source controlled solvent emissions by the CEF_p, as follows:

Uncontrolled Point Source (p) Solvent (tons)	=	Controlled Point Source (p) Solvent (tons)	x	CEF_p

The total county uncontrolled point source solvent emissions for all point sources/stacks in the county with the same SCCs were then obtained by summing the uncontrolled individual point source solvent emissions, for all point sources in the county with the same SCC. The total county point source solvent consumption by SCC was then subtracted from the total county solvent consumption by SCC to produce the total county nonpoint solvent emissions by SCC, as follows:

Nonpoint Solvent Emissions by SCC (tons)	=	Total Solvent Consumption by SCC (tons)	-	Point Source Solvent Consumption by SCC (tons)

In this last step, if the results were negative a zero was assigned to that nonpoint SCC in the county.

The county-level nonpoint VOC emissions for Surface Cleaning for the county were obtained by summing the county-level nonpoint source VOC emissions for all SCCs in the county. National nonpoint VOC emissions were then obtained by summing the county nonpoint solvent emissions for all counties. Table 2 shows the national solvent VOC consumption, and point and nonpoint VOC emissions estimates for Surface Cleaning.

Table 2. National VOC Emissions Summary for Surface Cleaning.

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.14
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.01
National Nonpoint VOC Emissions (10^6 tons)	0.13

[a] Derived from national sales and other national market data (see Table 1).
[b] Obtained from point source data submitted to EPA for the 2002 NEI.

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profile developed from Freedonia compound data and shown in Table 3, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying a HAP speciation profile developed from the 2002 Freedonia report to the county-level nonpoint VOC consumption estimates. National nonpoint pesticide HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimate for Surface Cleaning.

Table 3. HAP Speciation Profile and Emissions for Surface Cleaning.

CAS #	HAP Name	Percent of Total Solvent VOC[a]	Emissions (tons/year)
79016	Trichloroethylene	0.68	
	Total	**0.68**	

[a] Derived from the ratio of the individual HAP solvent compound consumption to the total VOC solvent consumption from the 2000 Freedonia report.[1]

References:

1. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

2. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

SOLVENT UTILIZATION - TRAFFIC PAINTS
SCC: 2401008000

Emissions from Traffic Paints are from the application of paints that contain solvent. The solvent emissions were estimated using a material mass balance approach that began with national solvent production and consumption estimates derived from national sales and other national market data. Because only the solvent was used to estimate emissions, information about the specific coatings used, for example, the coating density and water content, was not necessary. Solvent utilization was assumed to be equal to solvent emissions.

National solvent utilization data were taken from The Freedonia Group, Inc., solvent market research reports[1] in units of million pounds of solvent in the Paint and Coating (P&C) source category. The fraction of the total P&C solvent consumed by Traffic Paints was estimated from a National Paint and Coatings Association (NPCA) report[2] on paint and coating use. To estimate solvent use for Traffic Paints, the fraction of total coating use for Traffic Paints (0.022) from the NPCA report[2] was multiplied by the total Freedonia P&C solvent consumption to obtain an estimate of solvent consumption for the source category. All solvent used in Traffic Paints was assumed to be VOC based on previous Freedonia solvent reports.[3] Table 1 shows the Freedonia solvent market data used to estimate national solvent emissions for the source category for 2002.

Table 1. National Solvent Consumption Data for Traffic Paints.

Item	Data
Data Year	2002
National Consumption Freedonia Market	Paint and Coating
Market Solvent National Consumption (10^6 lbs)	60
Fraction of Total Paint and Coatings	0.02
References	
National Consumption	Freedonia, 2003[1]
Paint and Coatings Fraction	NPCA[2]
Source Category National Solvent Emissions (10^6 tons)	0.03

The national solvent utilization data were allocated to the states and counties using business activity data, by North American Industrial Classification System (NAICS) codes. The spatial surrogate used to apportion the national solvent consumption data for the Traffic Paints source category was Highway and Street Construction (NAICS 23411). Table 2 shows the national solvent VOC consumption and nonpoint VOC emissions estimates for Traffic Paints.

Table 2. National VOC Emissions Summary for Traffic Paints

Item	Data
Pollutant	VOC
Source Category National Solvent Emissions (10^6 tons)[a]	0.03
Estimated Point Source VOC Emissions (10^6 tons)[b]	0.00
National Nonpoint VOC Emissions (10^6 tons)	0.03

[a] Derived from national sales and other national market data (see Table 1).
[b] From the 2002 NEI point sources sector file

National solvent HAP consumption estimates for Traffic Paints were obtained by applying speciation profiles developed from compound data in the Freedonia Reports and are shown in Table 3. The profiles, expressed as fractions of the total VOC solvent, were multiplied by total VOC to obtain estimates of speciated solvent emissions from the source categories. Individual species were identified as HAP and then summed to obtain the total HAP emissions for the surface coatings categories. The procedure used to develop the speciation profiles and other HAP estimates are described below. References to tables are shown in parentheses below.

Speciated emissions from the surface coating categories were estimated using speciation profiles from EPA's SPECIATE database,[4] which are based on 1990 solvent data. For the purpose of the 2002 NEI estimate, the SPECIATE profiles were updated with current industry information that included individual solvent consumption data for 1998 obtained by The Freedonia Group[5] from market sales data and a 1995 National Paint and Coatings Association (NP&CA)[6] projection breakdown of solvent use by surface coating source category. The industry data were used to adjust the EPA SPECIATE profiles to reflect recent changes in solvent composition due to market changes and regulatory issues.

In the first step, the 1990 SPECIATE profiles for eight surface coating source categories (SURF-1), by pollutant and by source category, were used to develop a "1990 Composite Paints and Coatings SPECIATE Profile" (by pollutant) using weighting factors for each surface coating source category developed from the 1995 NPCA report (SURF-2). The weighting factors were developed from the volume of coating consumed by each surface coating source category based on 1994 data projected to 2000. Using this procedure a"1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 1) was developed that consisted of a breakdown of "Paints and Coatings" consumption, by pollutant, in units of percent of total coating.

In the second step, the "1990 Composite Paint and Coating SPECIATE Profile" (SURF-3, column 3) was compared to 1998 Freedonia data (by pollutant) for the "Paint and Coating" source category as a whole, that was similarly expressed in terms of the percent that each individual solvent species comprised of the total (SURF-4 and, also, SURF-3 column 4). This comparison showed that there was a significant difference between 1990 coatings and 1998 coatings which was due to substitution of aliphatic hydrocarbons and alcohols (ethyl alcohol, isopropyl alcohol, acetone, and mineral spirits) for more hazardous solvents (toluene and xylene). Adjustment factors were then calculated (SURF-3, column 5) for the six species that showed significant change using the ratio of the 1998 Freedonia data to the "1990 Composite." Also, species described as "naptha" or "mineral spirits" were replaced with a more detailed speciation profile taken from a representative MSDS.[7]

The adjustment factors were multiplied by the "1990 Composite" speciation percentages for each of the six affected species, and then all "1990 Composite" species, as adjusted and amended as above, were normalized to 100 percent VOC to produce an "Updated Speciated Profile -- Adjusted and Normalized," by pollutant and source category in terms of percent of total VOC (SURF-5). The pollutants that are HAP then were identified to develop HAP profiles, as a percent of total VOC, for the three surface coating categories (SURF-6).

Acetone, which is not a VOC, was estimated separately for the surface coating source categories using Freedonia[5] data for total acetone consumption for the "Paint and Coating" source category. Acetone consumption for 2002 for "Paint and Coating" was estimated to be 0.14 million tons based on 1998 Freedonia market data and projected consumption for 2003 from the Freedonia report. Using the same apportionment of total paint and coating for the three surface coating source categories developed from the NPCA report,[6] as above, the consumption of acetone for 2002 in the three individual surface coating categories also was estimated (see SURF-6).

If HAP emission estimates were submitted to EPA by state, local or tribal agencies, these numbers were used in the NEI. Where only VOC estimates were submitted, they were used with the HAP speciation profiles, shown in Table 3, to estimate HAP emissions. If neither VOC nor HAP emissions were submitted to EPA, county-level nonpoint HAP emissions were estimated by applying the HAP speciation profiles to the county-level nonpoint VOC consumption estimates developed using Freedonia data. National nonpoint HAP emissions were then obtained by summing the county-level nonpoint HAP emissions. Table 3 shows the national HAP emissions estimates for Traffic Paints.

Table 3. HAP Speciation Profiles and Emissions for Traffic Paints.

CAS #	HAP Name	Percent of Total Solvent VOC	Emissions (tons/year)
71556	Methyl Chloroform (1,1,1-Trichloroethane)	10.5	
78933	Methyl ethyl ketone (2-Butanone)	6.4	
108101	Toluene	7.3	
108883	Xylenes (mixed isomers)	0.9	
	Total	**25.1**	

References:

1. The Freedonia Group. "Solvents: Green & Conventional to 2007. Study 1663." Chapter 2: Solvents Demand (million pounds) 1997 - 2012; Chapter 5: Paints and Coatings Market for Solvents (million pounds) 1992-2012. Cleveland, Ohio. April 2003.

2. Paint and Coatings '2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

3. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

4. EPA SPECIATE Database 2002. Profile Numbers 2402 for Auto Refinishing, 2403 for Traffic Markings, and 2418 for Industrial Maintenance Coatings (Data Quality Rating B). "Industrial Solvents - Winter 1989." Frost & Sullivan, Inc., New York, New York; and "National Paint Industry Data Base." National Paint and Coatings Association, Washington, D.C. 1990. Profiles prepared by EC/R Incorporated, Durham, NC, for the U.S. EPA, Research Triangle Park, NC. September 30, 1994.

5. The Freedonia Group. "Solvents to 2003. Study 1115." Cleveland, Ohio. 2000.

6. Paint and Coatings '2000': Review and Forecast. Prepared by Kline and Company, Inc., for the National Paint and Coating Association, Washington, DC. 1995.

7. MSDS for Product ID: Petroleum Spirits, Petroleum Naphtha, Benzine CAS# 8032-32-4 EM Science Division of EM Industries. 02/11/1988. Obtained from Vermont SIRI MSDS Database.

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Appendix B

Electronic Appendix Containing Data Sets Used to Spatially Allocate National Activity Data and Emissions to Counties

The data sets used to allocate 2002 activity data to counties for the nonpoint source NEI are included in an Access 2000 database named "Appendix B_Final02NPNEI_Jan06.mdb." The database is located at the following link on the web: http://www.epa.gov/ttn/chief/net/2002inventory.html under Inventory Documentation in the NONPOINT folder.

This database contains the following tables:

Table Name	Description
T01 - 2002 Landings and Takeoffs	General Aviation LTO data for 2002 computed from FAA's ATADS for Instrument Operations
T02- 2002 Bales of Cotton Ginned	U.S. Department of Agriculture, National Agricultural Statistics Service. "Reports by Commodity - Cotton Ginnings." 2002. http://www.usda.gov/nass/pubs/estindx1.htm#cotton
T03 - 2002 Number of Building Permits	U.S. Department of Commerce, Bureau of the Census. Construction Statistics. Annual Housing Units Authorized by Building Permits - Permits by County. 2002.
T04 - 2000 Number of Houses Heating By Fuel Type	U.S. Census Bureau. "Table H40. House Heating Fuel Type", Census 2000: Summary File 3, [Data file], March, 2003.
T05 - 2002 Population	U.S. Census Bureau. 7/1/2002 County Population Estimates File and Components of Change. April 17, 2003.
T06 - 2002 Urban/Rural Population	Memorandum from Regi Oommen, ERG, to Andy Bollman and Randy Strait, E.H. Pechan & Associates, Inc., "Determination of 2002 County U1/U2/R Classifications for the United States," January 7, 2004.
T07 - 2002 Number of Restaurants	Dun & Bradstreet, MarketPlace CD-ROM, Jan-Mar, 2002. (Restaurants associated with commercial cooking)
T08 - Detached Single-Family Housing Data	U.S. Census Bureau. 2003. American FactFinder, Data Sets, Census 2000 Summary File 3, Quick Tables. Internet address: http://factfinder.census.gov. Data Retrieved for each U.S. County on June 30, 2003.
T09 - PavedRoad_02_emis_alloc_fac	2002 Paved Road Fugitive Dust County/Road Type-level Emission Allocation Factors
T10 - UnpavedRoad_02_emis_alloc_fac	2002 Unpaved Road Fugitive Dust County-level Emission Allocation Factors
T11 - Paved_UnpavedRoad_VMTtempfactors	Paved and Unpaved Road VMT Seasonal Temporal Allocation Factors from NAPAP
T12 - 2002 Non-ResConstruction Employment Data	U.S. Bureau of Labor Statistics. Annual Average Employment for NAICS 2362. Withheld BLS Data supplemented with Non-ResConstruction employment data from Dun & Bradstreet, MarketPlace CD-ROM, Jan-Mar, 2002.

Table Name	Description
T13 - 2001 Comm/Inst County Business Patterns Employment Data	From County Business Patterns 2001
T14 - 2001 Industrial County Business Patterns Employment Data	From County Business Patterns 2001
T15 - 2001 NAICS Code 42271 County Business Patterns Employment Data	From County Business Patterns 2001

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Appendix C

Emission Factors and County-Level Activity Data Used to Calculate 2002 Emissions by Category

The activity data sets and emission factors used to calculate county-level 2002 emissions for the nonpoint source NEI are included in an Access 2000 database named "Appendix C_Final02NPNEI_Jan06.mdb." This database is located at the following link on the web: http://www.epa.gov/ttn/chief/net/2002inventory.html under Inventory Documentation in the NONPOINT folder.

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Table Name	Description
AvGasStageI_Activity Data	2002 Activity Data for Aviation Gasoline Distribution: Stage I Source Category
AvGasStageI_Emiss Fact Composite	2002 Composite Emission Factors for Aviation Gasoline Distribution: Stage I Source Category
AvGasStageI_Emiss Fact Original	2002 Original Emission Factors for Aviation Gasoline Distribution: Stage I Source Category
AvGasStageII_Activity Data	2002 Activity Data for Aviation Gasoline Distribution: Stage II Source Category
AvGasStageII_Emiss Factors	2002 Emission Factors for Aviation Gasoline Distribution: Stage II Source Category
BulkPlant_Activity Data	2002 Activity Data for Bulk Plants
BulkPlant Emission Factors _county_level	2002 Emissions Factors, County Level MTBE and Benzene, for Bulk Plants
BulkPlant Emission Factors _national_level	2002 Emission Factors, National Level, for Bulk Plants
BulkTerminals_Activity Data	2002 Activity Data for Bulk Terminals
BulkTerminals_Emission Factors	2002 Emissions Factors for Bulk Terminals
ComCook_Activity Data Composite	2002 Composite Activity Data for Commercial Charbroiling Source Categories (sum of original activity to the SCC-level)
ComCook_Activity Data Original	2002 Original Activity Data for Commercial Cooking Source Categories (in tons/week)
ComCook_Emission Factors	2002 Emission Factors for Commercial Cooking Source Categories
ConsumerProducts_Activity Data	2002 Activity Data for Commercial & Consumer Products Usage Source Categories
ConsumerProducts_Emission Factors	2002 Emission Factors for Commercial & Consumer Products Usage Source Categories
CottonGin_Activity Data	2002 Activity Data for Cotton Ginning Source Category
CottonGin_Emission Factors	2002 Emission Factors for Cotton Ginning Source Category

Table Name	Description
DrumReclam_Activity Data	2002 Activity Data for Drum and Barrel Reclamation Source Category
DrumReclam_Emission Factors	2002 Emission Factors for Drum and Barrel Reclamation Source Category
FuelCombustion_Activity Data	2001 County-Level Activity Data for Commercial/Institutional and Industrial Fuel Combustion Categories
FuelCombustion_NP Emission Factors	2002 State-Level Nonpoint Emission Factors for Commercial/Institutional and Industrial Fuel Combustion Categories
FuelCombustion_PT to NP Xwalk_ PT CO EFs	Used for point source backouts; contains point source uncontrolled CO emission factors and mapping of point to nonpoint SCCs for back-calculating point source throughput to subtract from total State Energy Data fuel consumption
Hg Categories_Activity Data	2002 Activity Data for Lamp Breakage, Fluorescent Lamp Recycling, and General Laboratory Activities Source Categories
Hg Categories_Emission Factors	2002 Emission Factors for Lamp Breakage, Fluorescent Lamp Recycling, and General Laboratory Activities Source Categories
HwyConstruction_Activity Data	2002 Activity Data for Highway Construction Source Category
HwyConstruction_Emission Factors	2002 Emission Factors for Highway Construction Source Category
Non-ResConstruction_Activity Data	2002 Activity Data for Non-Residential Construction Source Category
Non-ResConstruction_Emission Factors	2002 Emission Factors for Non-Residential Construction Source Category
OpenBurnLandClearing_Activity Data	2002 Activity Data for Open Burning of Land Clearing Debris Source Category
OpenBurnLandClearing_Emission Factors	2002 Emission Factors for Open Burning of Land Clearing Debris Source Category
OpenBurnMSW_Activity Data	2002 Activity Data for Open Burning of Residential Municipal Solid Waste Source Category
OpenBurnMSW_Emission Factors	2002 Emission Factors for Open Burning of Residential Municipal Solid Waste Source Category
OpenBurnTires_Activity Data	2002 Activity Data for Open Burning of Scrap Tires Source Category
OpenBurnTires_Emission Factors	2002 Emission Factors for Open Burning of Scrap Tires Source Category
OpenBurnYW_Activty Data	2002 Activity Data for Open Burning of Yard Waste Source Categories, Leaves & Brush
OpenBurnYW_Emission Factors	2002 Emission Factors for Open Burning of Yard Waste Source Categories, Leaves & Brush
Paved_UnpavedRoad_Control_Factors	Paved and Unpaved Road Fugitive Dust Control Factors

Table Name	Description
PavedRoad_Precipitation_02_Data	Number of days with at least 0.01 inches of precipitation by month in 2002 for paved roads
PavedRoad_Uncontrolled_PM10_EFs	2002 Paved Road Fugitive Dust Uncontrolled PM10-PRI/-FIL Emission Factors by State, Road Class, and Month
PavedRoad_Uncontrolled_PM25_EFs	2002 Paved Road Fugitive Dust Uncontrolled PM25-PRI/-FIL Emission Factors by State, Road Class, and Month
Pipelines_Activity Data	2002 Activity Data for Pipelines
Pipelines_Emission Factors	2002 Emission Factors for Pipelines
POTW_Activity Data	2002 Activity Data for Publicly Owned Treatment Works Source Category
POTW_Emission Factors	2002 Emission Factors for Publicly Owned Treatment Works Source Category
ResConstruction_Activity Data	2002 Activity Data for Residential Construction Source Category
ResConstruction_Emission Factors	2002 Emission Factors for Residential Construction Source Category
ResHeatCoal_Activity Data	2002 Activity Data for Residential Heating: Anthracite and Bituminous/ Subbituminous & Lignite Source Categories
ResHeatCoal_Emission Factors	2002 Emission Factors for Residential Heating: Anthracite and Bituminous/Subbituminous & Lignite Source Categories
ResHeatDistill_Activity Data	2002 Activity Data for Residential Heating: Distillate Oil Source Category
ResHeatDistill_Emission Factors	2002 Emission Factors for Residential Heating: Distillate Oil Source Category
ResHeatNatGas_Activity Data	2002 Activity Data for Residential Heating: Natural Gas Source Category
ResHeatNatGas_Emission Factors	2002 Activity Data for Residential Heating: Natural Gas Source Category
ResKerosene_Activity Data	2000 county-level residential kerosene consumption in thousands of barrels
ResKerosene_Activity Data_State_level	2000 state-level residential kerosene consumption in thousands of barrels
ResKerosene_Emission Factors	Residential kerosene emission factors in pounds per thousand barrels
ResLPG_Activity Data	2000 county-level residential LPG consumption in thousands of barrels
ResLPG_Activity Data_State_level	2000 state-level residential LPG consumption in thousands of barrels
ResLPG_Emission Factors	Residential LPG emission factors in pounds per thousand barrels

Table Name	Description
ResWoodComb_Activity Data	2002 Activity Data for Residential Wood Combustion Source Categories
ResWoodComb_Emission Factors	2002 Emission Factors for Residential Wood Combustion Source Categories
Solvent Nonpoint to Point SCC Crosswalk	Solvent Utilization: Nonpoint to Point SCC Crosswalk for Point Source Backouts
StageIServiceStation_Activity Data	2002 Activity data for Stage I Service Stations: Stage I Source Category
StageIServiceStation_Emission Factors_county_level	2002 Emissions Factors, County Level MTBE and Benzene, for Stage I Service Stations: Stage I Source Category
StageIServiceStations_Emission Factors_national_level	2002 Emissions Factors, National Level, for Stage I Service Stations: Stage I Source Category
TankTruck_Activity Data	2002 Activity Data for Tank Trucks in Transit
TankTruck_Emission Factors _county_level	2002 Emissions Factors, County Level MTBE and Benzene, for Tank Trucks in Transit
TankTruck_Emission Factors _national_level	2002 Emission Factors, National Level, for Tank Trucks in Transit
UnpavedRoad_Precipitation_02_Data	Number of days with at least 0.01 inches of precipitation by month in 2002 for unpaved roads
UnpavedRoad_Silt_Content_by_State	Silt Content Values Used in Unpaved Road Fugitive Dust Emission Calculations
UnpavedRoad_Uncontrolled_PM10_EFs	2002 Unpaved Road Fugitive Dust Uncontrolled PM10-PRI/-FIL Emission Factors by State, Road Class, and Month
UnpavedRoad_Uncontrolled_PM25_EFs	2002 Unpaved Road Fugitive Dust Uncontrolled PM25-PRI/-FIL Emission Factors by State, Road Class, and Month
USTEmptying&Breathing_Activity Data	2002 Activity Data for Underground Storage Tank Emptying and Breathing
USTEmptying&Breathing Emission Factors _county_level	2002 Emissions Factors, County Level MTBE and Benzene, for Underground Storage Tanks Emptying and Breathing
USTEmptying&Breathing_Emission Factors_national_level	2002 Emission Factors, National Level, for Underground Storage Tanks Emptying and Breathing

Appendix D

Electronic Appendix Summary of Changes Made to State, Local, and Tribal (S/L/T) Inventory Data to Prepare the Draft 2002 and the Final Nonpoint Source NEI

The Electronic Appendix Summary of Changes Made to State, Local, and Tribal (S/L/T) Inventory Data to Prepare the Draft 2002 and the Final Nonpoint Source NEI is in an MS Excel Spreadsheet named “Appendix D_Nonpoint Doc Feb 02 version of 2002 NEI.xls.” The spreadsheet is located at the following link on the web: http://www.epa.gov/ttn/chief/net/2002inventory.html under Inventory Documentation in the NONPOINT folder.

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