DOCUMENTATION FOR THE FINAL 1999 NONPOINT AREA SOURCE NATIONAL EMISSION INVENTORY FOR HAZARDOUS AIR POLLUTANTS (VERSION 3)

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1.0 INTRODUCTION

1.1 What Is the National Emission Inventory?

The National Emission Inventory (NEI) is a comprehensive inventory covering all criteria pollutants and hazardous air pollutants for all areas of the United States. The NEI was created by the Emission Factor and Inventory Group (EFIG) of the U.S. Environmental Protection Agency (EPA) in Research Triangle Park, North Carolina. The NEI is made up of point source facility-specific data, mobile source data, and area (nonpoint) source data. The 1999 base year NEI for hazardous air pollutants (HAPs) will be used to support air quality modeling and other activities. This report presents an overview of how the nonpoint source component of the 1999 NEI for HAPs was compiled.

1.2 Why Did the EPA Create the NEI for Hazardous Air Pollutants?

The Clean Air Act (CAA), as amended in 1990, includes many mandates for the EPA related to HAPs. The CAA presents a list of 188 HAPs (see *http://www.epa.gov/ttn/atw/Orig189polls.html* for a list of pollutants and their chemical abstract service (CAS) numbers), for which EPA is to identify these pollutants' 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 NEI is a tool that EPA can use to meet the CAA mandates.

1.3 How Is the EPA Going to Use This Version of the NEI?

It is anticipated that the nonpoint source portion of the NEI will have multiple end uses. The NEI is a critical component of the EPA's National Toxics Program. The initial objective is to make the data available to EPA modelers for use in the National Air Toxics Assessment (NATA). In addition, the emissions data compiled as part of this inventory effort will be used in

residual risk assessments conducted by EPA, and to prepare the air toxics portion of the annual EPA publication entitled *National Air Pollutant Emission Trend 1900-1998*, which is referred to as the EPA Trends report (U.S. EPA, 2000).

1.4 Report Organization

This report is organized in the following structure:

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

Section 2. Describes in general terms how the nonpoint source NEI was developed. The discussion covers inventory planning, emission estimation, and data management;

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 whose emissions were calculated by the NEI nonpoint source team, and documents how nonpoint emission estimates were developed;

Appendix B. Lists the Maximum Achievable Control Technology (MACT) source categories included in the 1999 nonpoint source inventory, the source of the emissions information, the year of the emissions, and other useful notes;

Appendix C. Describes the approach and data used to spatially apportion the national emission estimates in the nonpoint source NEI to create county emission estimates;

Appendix D. Provides details on the state, local, and tribal agency HAP inventory data provided to EPA for use in this version of the NEI; and

Appendix E. Lists the surrogate and localized county-level data that were used to allocate the national-level calculated emissions.

2.0 DEVELOPMENT OF THE NONPOINT SOURCE NATIONAL EMISSION INVENTORY FOR HAZARDOUS AIR POLLUTANTS

2.1 What Are Area Sources?

There are essentially two definitions that can be used for area sources. First, area sources can be stationary point sources whose facility-specific emissions can be inventoried individually. Based on their HAP emissions, these "area" sources are defined as such because they have emissions below the major source threshold as defined in the CAA. According to the CAA, a major source is:

> Any stationary source . . . that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.

EPA, state- and local agency-supplied facility level data, including area source facilities that emit below the major source threshold, are stored in the point source NEI.

Another area source definition is applied based on how the emission estimates are developed. Emission estimates for nonpoint area sources typically use "top-down" methods to estimate emissions. Top-down methods use national-, regional-, or state-level information to estimate emissions, which are then allocated to the local level. These methods simplify and generalize in order to estimate emissions from nonpoint sources.

The 1999 nonpoint source NEI includes 449 source categories and 160 HAPs, culminating to nearly 2.66 million county-level records. Like other emission inventories, the nonpoint source NEI has limitations based on the availability of data for some HAPs and source categories. These limitations are discussed in Section 3 of this document, and it is important to review them before interpreting the nonpoint source NEI data.

2.2 How Were the Nonpoint Area Source Emissions Estimated?

The development of the 1999 nonpoint source inventory proceeded through these steps:

- Planning;
- Gathering information;
- Estimating emissions;
- Analyzing state, local-, and tribal-submitted and revised data and comments for incorporation;
- Performing quality assurance (QA)/quality control (QC) checks;
- Comparing emissions data for similar source categories that are in the point NEI; and
- Compiling the data into a single final inventory database.

The goal for the nonpoint source NEI was to compile as many HAP emission estimates for as many source categories as possible. The planning phase focused on identifying source categories that could be included and data available for each source category that could be used to estimate emissions. In the planning phase, QA/QC needs were also identified, and decisions were made on the database structure that would be used to compile and store the inventory data.

The data-gathering phase focused on four primary sources:

- Data provided to Emission Factors and Inventory Group (EFIG) by state and local agencies;
- Data provided by the EPA's Emission Standards Division (ESD) for categories with area source emissions that currently are or will be regulated under the EPA's MACT program;

- Emission factors and activity data used by EFIG to calculate emissions; and
- Data retrieved from the 1996 Area Source NEI.

The nonpoint source categories included in the 1996 NEI were used as the starting point to identify source categories to include in the 1999 inventory. Some state and local data were available and used in the draft inventory; these data were used because they provided greater detail than was available from the allocated national- or state-level emissions. In the initial version of the inventory (Version 1), emissions data and source category recommendations from nine state and local air agencies were incorporated. Those air agencies providing nonpoint source data are listed in Table 2-1. For the draft Version 2 of this inventory, emissions data and source category recommendations from an additional twenty-one state and local agencies were incorporated. These are listed in Table 2-2. Additionally, two tribal data sets were submitted: Ute Mountain, CO and Umatilla, OR. In the latest version of this inventory, 12 state and local agencies and 1 tribal data set were submitted for incorporation. These are listed in Table 2-3. Emissions data provided by state and local air agencies superceded any emissions data provided by other information sources. Tribal data were appended into the inventory, but did not supercede any estimates due to the nonconformity of the emissions data level. The tribal land emissions data may cover partial single or multiple counties and states, while the nonpoint inventory is solely at the county-level.

Appendix D is a summary of information received from state, local and tribal agencies. EFIG also compiled emission and activity factors, and calculated national- or state-level estimates for other nonpoint source categories. Data from the 1996 nonpoint NEI were used to fill gaps for estimates not developed for 1999 base year. A baseyear 1999 Puerto Rico and Virgin Islands inventory was not available; therefore, the estimates for the 1996 baseyear were incorporated, but not scaled to 1999 levels.

Table 2-1

States and Localities Providing Initial Nonpoint Source Information for the 1999 NEI (June 2001 Submittals)

State or Local Agency
Alabama Department of Environmental Management
Colorado Department of Public Health and Environment
Maryland Department of Environment
Massachusetts Department of Environmental Protection
Michigan Department of Environment Quality
New Jersey Department of Environmental Protection
South Carolina Department of Health and Environmental Control
Washington--Puget Sound Clean Air Agency
West Virginia Department of Environmental Quality

The source categories for which emissions were calculated are listed in Appendix A. This appendix also provides detailed descriptions of the methods, factors, and information sources used to calculate and allocate national emissions for these source categories.

Appendix B contains a table listing the MACT source categories included in the 1999 nonpoint source NEI. Information is provided that indicates the base year of the estimates and the source of the data. Most of the emissions data, activity level data, and/or emission factors for these source categories were provided by ESD, with the exception of hospital sterilizer and perchloroethylene dry cleaning estimates. Hospital sterilizer usage was provided by the Ethylene Oxide Industrial Council, while perchloroethylene dry cleaning usage was provided by the Halogenated Solvents Industry Alliance.

Table 2-2

States and Localities Providing Nonpoint Source Information for the Draft Version 3 of the 1999 NEI (February and June 2002 submittals)

State or Local Agency
California Air Resource Board
Colorado Department of Public Health
Colorado--Ute Mountain Tribe
Delaware Department of Natural Resources and Environmental Control
Florida--Hillsborough County Environmental Commission
Florida--Pinellas County Environmental Management Department
Idaho Department of Environmental Quality
Maine Department of Environmental Protection
Massachusetts Department of Environmental Protection
Michigan Department of Environmental Quality
Minnesota Pollution Control Agency
New Hampshire Department of Environmental Resources
New Jersey Department of Environmental Protection
New York Department of Environmental Conservation
Oregon--Umatilla Tribe
Rhode Island Department of Environmental Management
South Carolina Department of Health and Environmental Control
Tennessee Davidson County Metro Health Control
Texas Commission on Environmental Quality
Vermont Air Pollution Control
Washington--Puget Sound Clean Air Agency
West Virginia Department of Environmental Quality
Wisconsin Department of Natural Resources

Table 2-3

States and Localities Providing Nonpoint Source Information for the Final Version 3 1999 NEI (March 2003 submittals)

State or Local Agency
California Air Resource Board
California--Bishop Paiute Tribe
Florida--Duval County Regulatory and Environmental Services Department
Florida--Pinellas County Environmental Management Department
Michigan Department of Environmental Quality
Minnesota Pollution Control Agency
North Dakota Department of Health
Oregon Department of Environmental Quality
Ohio--Ohio Regional Air Pollution Control Agency
South Dakota Department of Environment and Natural Resources
Vermont Air Pollution Control
Washington--Olympic Clean Air Agency
Wisconsin Department of Natural Resources

Emission estimates provided by state/locals/tribal agencies were given highest priority; ESD for MACT sources were given the next highest priority. ESD data that had a base year other than 1999 were included in the inventory, but they were compared against other data sources to determine if they were the best data available and if they represented 1999 emission levels regardless of their base year.

2.3 What Adjustments Were Made to These Data?

Two common problems with nonpoint source inventories are: (1) double counting between facility-specific data collected and emission estimates calculated using nonpoint source methods; and (2) overlap between two nonpoint source categories. Resolving these issues required adjustments to the nonpoint source inventory data.

Facilities inventoried in the point source NEI are not just those that have been identified as major sources either by CAA standards (greater than or equal to 10 tons per year [tpy] for one HAP or greater than or equal to 25 tpy for multiple HAPs) or by thresholds set by state regulatory agencies. Facility-specific data provided by ESD and state, local, and tribal agencies were included in the point source NEI. For example, publicly owned treatment works (POTW) emissions were calculated for nonpoint sources for the entire U.S. However, the South Carolina Department of Health and Environment Control included their POTW estimates at the facility-level in the point source NEI. The POTW estimates developed for South Carolina were subsequently removed from the nonpoint source NEI to avoid double-counting of HAP emissions.

Similarly, when the state, local or tribal agency-supplied data were determined to provide better estimates of emissions, these were incorporated into the nonpoint source NEI. In order to avoid double counting, national emissions that were provided by ESD or EFIG and allocated to counties in a top-down approach were removed or adjusted from the counties where the state-supplied data were used.

2.4 How Were Groups of HAPs Handled?

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 source NEI was created so that information on the individual chemicals in these HAP groups could 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 emission to the individual HAP emissions.

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 polycyclic aromatic hydrocarbons (PAHs), and the other consists of 16 PAHs. Individual POM chemicals that are not in either the 7-PAH or 16-PAH groups, or emissions defined simply as POM, are reported as POM in the nonpoint source NTI.

The compounds listed below constitute the 7-PAH (marked with asterisks) and the 16-PAH compounds. The 7-PAH compounds have been determined by the International Agency for Research on Cancer (IARC) 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 16 compounds represents the 16-PAH emission subset used in this inventory.

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

Thus, an estimate of the emissions for all of the POM compounds in the nonpoint source NEI is the sum of the 16-PAH (group or individual), the non-16-PAH individual HAPs, and the unspeciated POM emissions.

For dioxins and furans, emissions are presented as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxic equivalents (TEQs), dibenzofurans, and individual and total dioxin/furan. The dibenzofurans group is included in the CAA HAP list. Total dioxin/furan represents emissions of the remaining dioxins and furans retained in the nonpoint source NEI.

EFIG's goal for this inventory is to have individual congeners and have done that wherever sufficient information exists.

2.5 How Were the Emissions Allocated to the County Level?

Most of the nonpoint source NEI was initially compiled as a national-level inventory. National-level emission estimates were spatially allocated to the county-level using a number of allocation factors, such as population and employment within certain industries. When state-, locality-, or tribal-specific emissions data were available, those data were substituted for data that had been allocated from national emission estimates. A detailed discussion of spatial allocation routines for source categories with national-level emission estimates are described in Appendices C and E.

When ESD provided any emissions data at the facility level, even for sources considered to be "area", those data were assigned to the point source NEI. Any corresponding emissions were removed from the nonpoint source NEI. Nonpoint source categories with their level of detail are noted in the list of MACT categories in Appendix B.

2.6 How Were the Inventory Data Compiled into the NEI Database?

One of the goals of compiling the NEI was to process all of the inventory data into a common structure with consistently defined data fields. A common data structure can help end users of the inventory data define standardized approaches to using the data. The NEI Input Format (NIF) Version 3.0 as designed by EPA allows for a variety of data transfer mechanisms to be used and is flexible enough to be supported by many different database programs. More detailed information about the NIF can be found at http://www.epa.gov/ttn/chief/nif/index.html.

2.7 What Quality Assurance Procedures Were Used?

Quality assurance procedures used for this inventory cover five main preparation steps:

- Methods selection and data gathering;
- Emissions calculation;
- Data handling and transfer;
- Identification and removal of overlaps; and
- Review of state-submitted inventory data.

Methods selection -- Methods were researched and chosen based on previous work, availability of newer EPA and state methodologies, and the availability of emission and activity factors. Options for available data were identified. Decisions were peer reviewed before proceeding.

Emissions calculation **--** All emission calculations were developed using spreadsheets and peer reviewed when complete. Samples of the emission calculations for each source category were verified using manual calculations.

Data handling and transfer **--** Quality control checks were used to catch data handling errors at every major step of the process. Use of spreadsheets and direct links to the database reduced the potential for errors in transfer. Maintenance of referential integrity to the NIF Version 3.0 primary keys and field lengths was an added QC check for the 1999 nonpoint source NEI.

Identification and removal of overlaps **--** This inventory used data from multiple sources (MACT, EFIG, state, etc.), so that the inventory could be as comprehensive as possible. Issues concerning double counting between data sources, between nonpoint source categories, and

between pollutants made up of multiple chemical species or congeners were first addressed as part of the inventory planning and approach. The overall approaches to these issues are discussed in this report in Sections 2.4 and 2.5.

Although some issues, such as multiple definitions of dioxin congeners, could be avoided by making simplifying decisions in the planning stage, other issues required painstaking review of the inventory data. Specifically, some state, local and tribal agencies submitted data records for source categories that were more specific than the estimates developed by EFIG. Conversely, some state, local, and tribal agencies submitted data records for source categories that covered multiple source categories developed by EFIG.

Three types of overlap analysis were performed between the point and nonpoint inventories. They are: 1) direct Source Classification Code (SCC) category match ups at the county-level; 2) direct MACT category match ups at the county-level; and 3) specific overlap analysis of four non-MACT EFIG-calculated categories. The direct SCC analysis identified overlaps for approximately 22,000 records; the direct MACT analysis identified another 24,000 overlaps. Non-state-submitted nonpoint data were either removed from the inventory or adjusted to account for point sources in their respective county. The third type of analysis involved non-ESD source categories which may cover multiple SCC codes. The four categories of interest are: stage II gasoline distribution, graphic arts, autobody refinishing, and industrial surface coating. For example, graphic arts estimates developed by EFIG are coded SCC 2425000000 (graphic arts - all processes). However, state/local agencies may have reported their graphic arts estimates in the point database under SCC 40500511 (printing/publishing - gravure). In this situation, the nonpoint graphic arts estimates were removed for the overlapping counties. All overlapping data for this third phase of the overlap analysis were removed from the nonpoint inventory, which totaled nearly 5,600 records.

Review of state-submitted inventory data -- State, local, and tribal agencies were asked by EFIG to submit their nonpoint source NEI data and revisions at the county-level. As a result, the agencies submitted the following:

- Records designated for deletion;
- Records designated for replacement with agency-provided emission estimates; and
- Records designated for addition in the form of new source categories not included in the draft inventory for a specific county.

The agency-submitted revisions were subjected to a rigorous QA/QC review process in order to ensure the internal consistency of the area source inventory. Specifically, the following steps were performed:

- Review the documentation provided by state/local/tribal agency to ensure that it is consistent with the actual changes to the inventory submitted by the agency;
- Review the format of the submitted data to ensure that the NIF data structure was correct;
- Verify that the additional pollutants were HAPs;
- Verify that the additional pollutants were assigned the correct CAS number;
- Determine if there is source category overlap between the existing draft and submitted state data; and
- Perform reality checks on emission estimates, by source category and HAP, to identify outliers and determine the validity of such estimates.

3.0 INTERPRETATION AND USE OF THE 1999 NONPOINT SOURCE INVENTORY

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

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 factors and activity data for some 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 the 1996 nonpoint source NEI. As the information-gathering phase progressed, some of the categories were dropped. Nonpoint source categories that were dropped are those for which there were no available emission factors or 1999 national-, state-, or regional-level activity factors, and categories that appeared to be very small contributors yet would require significant amounts of data collection to develop emission estimates.

State, local, and tribal agency-supplied data – State, local, and tribal agency-supplied emissions data have been given priority in the nonpoint source NEI. Although these submissions were reviewed by the EFIG for data handling and entry errors, and potential double counting, the estimation methods, reliability of data sources and calculations, and other quality assurance issues were the responsibility of the preparing agency. The most immediate result of using state, local, and tribal agency-supplied data is that emissions from different states for the same source category may have been calculated using different methods. This diminishes the comparability of the data between states. State, local, and tribal agency-supplied data that reported emissions greater than EFIG-generated estimates were flagged for further review; state/local/tribal agency officials were contacted to verify the validity of the data. In some cases, the questionable data were removed.

Non-1999 Data -- For some source categories, the necessary activity or emissions data were not available to compile 1999 estimates at the national level. In these cases, data for other base years were used. For some of these source categories, ESD provided emissions data for a year other than 1999 and noted that the data is 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 were used to best estimate emissions. Table 3-1 provides a list of the nonpoint source categories with data with a base year other than 1999. When state, local, and tribal agency-supplied data was for a year other than 1999, it was noted the NEI.

Emission estimates for Puerto Rico and the Virgin Islands are also included in this inventory; the data were retrieved from the 1996 nonpoint source NEI and were not adjusted for a 1999 base year.

Categories not included -- Some nonpoint source categories may contribute HAPs, but could not be estimated at the national level in the 1999 nonpoint source NEI. One example of an excluded category is metal mining and processing.

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. Notable examples are:

- 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. Many states provided local emissions estimates for this source category during the review phase of the 1996 nonpoint sources NEI, and states were encouraged to do the same for 1999. These revisions should improve overall emission estimates and emissions allocation for this source category.

Table 3-1

1999 NEI Nonpoint Source Categories That Do Not Have a 1999 Base Year

Source Category Group	Year
Asphalt Concrete Manufacturing[a]	1996
Asphalt Roofing and Processing	1996
Flexible Polyurethane Foam Fabrication Operations	1993
Flexible Polyurethane Foam Production	1993
Industrial Boilers: Waste Oil	1996
Institutional/Commercial Heating: POTW Digester Gas	1996
Miscellaneous Organic Chemical Processes (MON)	1995
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

[a] Non-MACT Source Category Groups

- Marine cargo handling, various fuel types – In the previous version of this inventory, marine cargo handling emission estimates of different fuels (e.g. crude oil, kerosene) were developed. However, based on ESD review, the estimates were removed due to the recent population of this category into the point inventory. State and local agencies which submitted estimates for this category were retained in this version of the inventory.

Category double counting **--** If source categories overlap in their coverage of emissions, emissions will be double counted. This can be a particular concern if source categories have been defined in multiple studies, such as MACT source categories or in EPA *Locating and Estimating* documents. Several steps were taken to avoid source category overlaps in the nonpoint source NEI, and these are discussed in Section 2.7 of this document. As MACT data become available for point sources, nonpoint categories currently in this version of the inventory such as steel pickling HCl process and MON may be removed in future versions.

3.2 What Are the Limitations of the Emissions Data?

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.

Facility double counting -- As discussed previously, double counting of emissions can occur when data are compiled from more than one set of data sources. To minimize double counting of emissions, all source categories from the 1996 nonpoint source NEI whose raw facility data were rolled up to the county level were disaggregated back to the facility-level; these disaggregated data were incorporated in the 1999 point source NEI. Table 3-2 lists these categories.

Double counting can also occur when facility-specific data (from the 1999 point source NEI) overlaps with nonpoint source categories that have emissions estimated using top-down methods. Instances of this type of double counting include the nonpoint source NEI source categories of POTWs for SIC codes 4952 and 4953 (Electric, Gas, and Sanitary Services: Sewerage Systems).

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 were available. Detailed discussions of the spatial allocation procedure appears in Appendices C and E. An inventory prepared by a state, local, or tribal agency using county-specific data can include more local detail and assign emissions to the county level more accurately.

Table 3-2

1996 Nonpoint NEI Source Categories Disaggregated to the Facility-Level and Transferred to 1999 Point NEI

Source Category	MACT Code
Acrylic/Modacrylic Fibers Production	1001
Amino/Phenolic Resins Production	1347
Boat Manufacturing	1305
Cellulose Products Manufacturing	1349
Cyanide Chemicals Manufacturing	1405
Friction Materials Manufacturing	1636
Hydrogen Fluoride Production	1409
Industrial Boilers: Coal Combustion	0107
Industrial Boilers: Wood Combustion	0107
Leather Tanning and Finishing Operations	1634
Metal Cans (Surface Coating)	0707
Mineral Wool Manufacturing	0409
Municipal Waste Combustors	1802
Pharmaceuticals Production	1201
Polysulfide Rubber Production	1332
Stationary Reciprocal Internal Combustion Engines - Diesel-Fired	0105
Stationary Reciprocal Internal Combustion Engines - Natural Gas-Fired	0105
Stationary Combustion Turbines	0108

Temporal Allocation – A few states chose to submit emissions data that were not annual, but rather monthly or seasonal. Massachusetts reported Gasoline Distribution Stage II estimates for every month, while Texas reported Gasoline Distribution Stage I and Gasoline Distribution Stage II estimates by season. Alabama reported Structure Fire emissions from June to August (for modeling purposes) in addition to their annual emissions for this category.

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 does not take into account emission reductions due to state and local regulations. For instance, some ozone non-attainment counties are required to install stage II vapor recovery systems in their gasoline service stations. If equipped and annually inspected, an emission reduction between 86% and 95% can be applied. A list of counties with this regulation imposed were identified via a literature search, and is found in Table E-2 of Appendix E.

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

3.3.1 Purpose

The National Emissions Inventory (NEI) is a comprehensive inventory covering all criteria pollutants and hazardous air pollutants (HAPs) for all areas of the United States. The NEI was created by the EPA's Emission Factor and Inventory Group (EFIG) in Research Triangle Park, North Carolina. This version (Version 3) of the 1999 base year NEI for HAPs will be used to support air quality modeling and other activities. To this end, the EPA established a goal to compile a comprehensive, 1999 base year nonpoint area source inventory, in addition to facility-specific point source data, and mobile source data.

3.3.2 Explanation of Potential Uses

The Clean Air Act (CAA) includes many mandates for the EPA related to HAPs. 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 NEI is a tool that EPA can use to meet the CAA mandates.

It is anticipated that the 1999 nonpoint source inventory developed from this effort will have multiple end uses. The NEI is a critical component of the EPA's national Air Toxics

Program. The initial objective is to make the data available to EPA modelers for use in the National Air Toxics Assessment (NATA). In addition, the emissions data compiled as part of this inventory effort will be used in residual risk assessments conducted by EPA, and to prepare the air toxics portion of the annual EPA publication entitled *National Air Pollutant Emission Trends,* which is referred to as the EPA Trends report (U.S. EPA, 2000).

3.3.3 Product Content - Inputs, Methodologies, and Outputs

The scope of the inventory effort was to compile 1999 base year HAP emissions data for nonpoint area sources in the United States and its territories.

There are essentially two definitions that can be used for area sources. First, area sources can be stationary point sources whose facility-specific emissions can be inventoried individually. Based on their HAP emissions, these "area" sources are defined as such because they have emissions below the major source threshold as defined in the CAA. According to the CAA, a major source is:

> Any stationary source . . . that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.

EPA, state- and local agency-supplied facility level data, including area source facilities that emit below the major source threshold, are stored in the point source NEI.

Another area source definition is applied based on how the emission estimates are developed. Emission estimates for nonpoint area sources typically use "top-down" methods to estimate emissions. Top-down methods use national-, regional-, or state-level information to estimate emissions, which are then allocated to the local level. These methods simplify and generalize in order to estimate emissions from nonpoint sources.

The goal in developing the nonpoint area source NEI was to obtain/develop as much county-level information such as allocation data, county regulations, throughput, emissions, and process descriptions as possible. It was hoped that the data would be sufficient to support exposure modeling and risk assessment needs. The starting point for obtaining this nonpoint area source data was a combination of EFIG-derived estimates and state/local/tribal air pollution control agencies, who are most likely to have this type of detailed HAP inventory data.

State and local agencies and tribes were asked to supply HAP emission inventory data to the EPA. Inventory data were also requested from the EPA's Emission Standards Division (ESD) for Maximum Achievable Control Technology (MACT) source categories. The information requested from ESD was identical to the information requested from state and local agencies.

As a last step, state/local/tribal agency, ESD, and EFIG-calculated data for 1999 were supplemented with MACT submitted data from the 1996 NEI for HAPs.

As discussed previously, the NEI will be used in the National Air Toxics Assessment. To this end, EFIG strived to identify nonpoint area sources that are, or will be, subject to MACT standards that will result in HAP emission reductions. Source categories are assigned a MACT code if ESD provided the data subject to a MACT standard. The MACT codes can be found in the inventory files in the Emission Process record.

Throughout the development of the 1999 NEI, EFIG requested state, local, and tribal agency, and EPA review of draft versions. To the extent possible, EFIG incorporated all revisions and new data provided. In the inventory files, the Emission record indicates the source of the current reported emissions value. The following data source codes indicate if the data were provided or revised by state, local, or tribal agencies, EPA/ESD, or pulled in from the 1996 NEI:

- E = Emission records calculated by EFIG;
- L = Local agency submittal;
- S = State agency submittal;
- T = Tribal agency submittal;
- N = Data from the 1996 NEI; and
- M = EPA/ESD provided MACT data.

An in-depth QA/QC program was implemented in conjunction with the inventory development process. The NEI QA/QC process was initiated immediately after each phase when state and local agency and EPA files or revisions were provided to EFIG. An automated QA program was developed and used to check each file for format and data field errors. Format checks were based on the minimum data requirements for file acceptance by EFIG. Data field checks were related to the codes and numeric data ranges in the file. The EFIG accepted data with data field errors, as these could be corrected with minimal effort. Duplicate records were then removed, along with records that had null and zero emissions values. Referential integrity violations, invalid codes, and erroneous locational data were then corrected (or added) if possible. Additionally, nonpoint data were checked against the point source NEI to identify possible overlaps between the two inventories. Where overlap existed, the point source data had priority. Thus, the area nonpoint data were either removed or adjusted.

NEI output data are released in a number of formats. EPA's file transfer protocol (ftp) site has separate nonpoint, point, onroad, and nonroad mobile source files for each state, including Washington, DC, Puerto Rico, and the Virgin Islands, containing the 1999 NEI HAP files for the state. The specific data structure used for the 1999 NEI for HAPs is based on NEI Input Format (NIF) Version 3.0. The files posted include an inventory documentation file that describes how the NEI was developed, and a READ ME file describes the different files posted on the site and how to use them.

In addition to the NEI documentation and NIF data files, additional files are provided to facilitate evaluation of the NEI, and to help put the emission estimates presented into perspective by state, county and facility. In each summary file, emissions are presented for each 188 HAP

category, as the sum of the 188 HAPs, and as the sum of the 33 urban HAPs used by EPA in many air toxics programs. Each 33 urban HAP is flagged as such. Each county is flagged with the urban/rural designation developed under EPA/s Integrated Urban Air Toxics Strategy. A county is considered “urban” if either:

1) it includes a metropolitan statistical area with a population greater than 250,000; or
2) the U.S. Census Bureau designates more than fifty percent of the population as "urban."

The county emission summary presents HAP emissions by state, and county for major, area/other, onroad, and nonroad sources. Major and area/other sources are also summarized as MACT vs. non-MACT source categories.

The source category summary presents emissions by state, and county for major, area/other, onroad, and nonroad sources. The area/other sources are delineated as point or nonpoint. Each stationary source category is presented by MACT code, SIC code, or just source category name if there is no applicable MACT or SIC code.

3.3.4 Product Limitations and Caveats

The 1999 NEI was developed initially for use in EPA’s National Air Toxics Assessment (NATA). The goal of the national-scale assessment 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).

The 1999 NEI is a composite of emission estimates generated by state/local/tribal regulatory agencies and 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

pollutants, level of detail and geographic coverage. However, this compilation of emissions estimates represents the best available information to date.

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.

In addition, state/local/tribal agency-supplied emissions data are given priority in the nonpoint area source NEI. These submissions are reviewed by the EFIG for data handling and entry errors, and potential double counting. The estimation methods, reliability of data sources and calculations, and other quality assurance issues are the responsibility of the preparing agency. To the extent possible, state and local agency-supplied data that appear as outliers in the data set are flagged for further review, and state/local/tribal agency officials are contacted to verify the validity of the data. In some cases, the questionable data are removed.

For some source categories, emission estimates were not available for 1999. In these cases, data for other base years were used. For some of these source categories, ESD provided emissions data for a year other than 1999 and noted that the data is the best available to represent 1999. When data are reported for a year other than 1999, it is noted in the NEI.

3.3.5 Contact Information

NEI area nonpoint source questions should be forwarded to:
Ms. Laurel Driver
U.S. Environmental Protection Agency
Emission Factor and Inventory Group
Emissions Monitoring and Analysis Division (D205-01)
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711
driver.laurel@epa.gov
919-541-2859

4.0 REFERENCES

Emission Inventory Improvement Program (EIIP). 1999a. Chapter 1: EIIP Phase I Data Model. In: *EIIP Volume VII: Data Management Procedures.* EPA-454/R-97-004g. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. Available at: *http://www.epa.gov/ttn/chief/eiip/techrep.htm#mobsrc*.

Emission Inventory Improvement Program (EIIP). 1999b. *EIIP Volume III: Area Sources Preferred and Alternative Methods.* EPA-454/R-97-004c. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. Available at: *http://www.epa.gov/ttn/chief/eiip/techrep.htm#areasrc*.

U.S. Environmental Protection Agency. 2001. *Documentation for the 1996 Base Year National Toxics Inventory for Area Sources.* Emission Factor and Inventory Group, Office of Air Quality Planning and Standards. Research Triangle Park, NC.

U.S. Environmental Protection Agency. 2000. National Air Pollutant Emission Trends, 1990-1998. EPA 454/R-00-002. U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, North Carolina.

Appendix A

Emission Estimation Methodology

Index to Appendix A

Index to Appendix A (Continued)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Animal Cremation

SCC: 2810060100

The 1999 national emission estimates for arsenic, beryllium, cadmium, chromium, dibenzofurans, dioxins (total), formaldehyde, hydrogen chloride, lead, nickel, and POM (as 7 and 16 PAH) were developed by multiplying an emission factor by a national activity estimate. All emission factors used for Animal Cremation were first developed for Human Cremation. For these hazardous air pollutants, except cadmium and formaldehyde, factors were taken from the State of California Air Resources Board Test Report No. C-90-004[1]. The emission factor used for formaldehyde was reported in the USEPA FIRE System Database[2] and the emission factors used for cadmium. dibenzofurans, total dioxins, hydrogen chloride, and lead were taken from an EPA test at the Woodlawn Cemetery[3]. An Emission Standards Division (ESD) memorandum[4] states that the Human Cremation emission factors (except in mercury which is used for filling of human teeth) were applicable to Animal Cremation.

ESD also provided 1990 national activity data, which was scaled to 1999 activity level assuming that: 1) animal mortality and cremation rates (cremations/deaths) are constant and 2) the animal population is directly proportional to human population. United States population data was obtained from the U.S. Bureau of Census[5].

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[6] for SIC Code 0750, Animal Services except Veterinary. Refer to Appendices C and E for more details on this allocation.

References:

1. State of California Air Resources Board, Engineering Evaluation Branch, Monitoring and Laboratory Division. "Evaluation Test on Two Propane Fired Crematories at Camellia Lawn Cemetery." Test Report No. C-90-004. October 29, 1992.

2. U.S. Environmental Protection Agency. Factor Information Retrieval (FIRE) System Database, Version 6.23. Research Triangle Park, North Carolina. October 2000.

3. U.S. Environmental Protection Agency, Cremation Association of North America, and Industrial Equipment and Engineering Co. Crematory Testing. The Woodlawn Cemetary, Bronx, NY. June 1999.

4. Crume, Richard, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. EPA/Emissions Monitoring and Analysis Division. Comments on Animal Cremation information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources -- Interim Final Report," September 18, 1998. October 30, 1998.

5. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program*. Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

6. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Animal Cremation

SCC: 2810060100

Pollutant	Emission Factor (lb/ton cremated)	Emission Factor Reference	National Activity Level (Reference 1, 2, 5) (tons cremated/year)	National Emissions (tons/year)
arsenic	4.00E-04	Reference 1	8.75E+04	1.75E-02
beryllium	1.84E-05	Reference 1	8.75E+04	8.05E-04
cadmium	1.46E-03	Reference 3	8.75E+04	6.38E-02
chromium	3.99E-04	Reference 1	8.75E+04	1.74E-02
dibenzofurans	1.43E-07	Reference 3	8.75E+04	6.25E-06
dioxins, total (non-TEQ)	7.74E-08	Reference 3	8.75E+04	3.38E-06
formaldehyde	2.89E-09	Reference 2	8.75E+04	1.27E-07
hydrogen chloride	1.97E+00	Reference 3	8.75E+04	8.61E+01
lead	9.39E-03	Reference 3	8.75E+04	4.11E-01
nickel	5.09E-04	Reference 1	8.75E+04	2.23E-02
POM as 7-PAH	1.03E-09	Reference 1	8.75E+04	4.50E-08
POM as 16-PAH	9.63E-04	Reference 1	8.75E+04	4.21E-02

National Activity Level Calculation:

Assumes that animal mortality and cremation rates (cremations/deaths) are constant and that the animal

Human Population 1999 / Human Population 1990 = Animal Cremations 1999 / Animal Cremations 1990

1990 U.S. Population (July 1) =	249,440,000
1999 U.S. Population (July 1) =	272,691,000
1990 U.S. Animal cremation national activity level, tons/yr =	8.00E+04
1999 U.S. Animal cremation national activity level, tons/yr =	8.75E+04

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Asphalt Paving: Cutback

SCC: 2461021000

Asphalt used for paving is available for three types: hot-mix, cutback, and emulsified[1]. Paving from hot-mix and emulsified asphalt are minor in comparison to cutback asphalt, and some states/localities ban cutback asphalt usage during the ozone season.

Cutback asphalts fall into three subcategories: Rapid Cure (RC), Medium Cure (MC), and Slow Cure (SC)[2]. Cutback asphalt is prepared by "cutting back" asphalt cement with various petroleum distillates such as naphthas, gasoline, and kerosene. The evaporation rate is dependent upon the petroleum distillate. The average diluent for cutback asphalt is 35%. The average amount of VOCs contained in RC, MC, and SC is 95%, 70 %, and 25%, respectively. If data on the cure types is not available, then an average of 70% is recommended[2].

The national consumption for cutback asphalt in 1998 was 2.331 million short tons with a projected consumption of 2.450 million short tons by 2003[4]. Using this information, the 1998 national consumption was forecast to increase by 1.00 percent, thus estimating 1999 asphalt consumption to be at 2.354 million short tons. Estimates are provided for the following HAPs: ethylbenzene, toluene, and xylene. Using equations in AP-42, total VOC estimation emissions can be calculated. Individual HAP emissions are estimated with HAP-speciation profiles[5].

Allocation of emissions from the national level to the state level can be apportioned through individual state spending of federal highway money. State highway agency spending for total capital and total outlay is available through the Bureau of Transportation Statistics[6]. Emissions were allocated to the county-level by the county proportion of the state population[7]. Use of cutback asphalt is primarily in the summer; counties and states which ban the use of cutback asphalt will not have emissions apportioned them.

References

1. U.S. Environmental Protection Agency. "Asphalt Paving, external draft". Emissions Inventory Improvement Program. May 1998.

2. U.S. Environmental Protection Agency. "Compilation of Air Pollution Emission Factors, AP-42". Section 4.5. January 1995.

3. Moulthrop, James, et al. "Emulsion: The Future of Pavement Maintenance". Asphalt Contractor. February 1997. pp 48-56.

4. Freedonia, "Asphalt Paving Products Demand by Type (thousand tons) 1989-2008" Report 1215, Chapter 06, Record 009.

5. California Air Resources Board. "Speciation Manual". Air Resources Board. Sacramento, CA. August 1991.

6. Bureau of Transportation Statistics. "State Highway Agency Capitol Outlay - 1999". October 2000. Information retrieved from the following website: http://www.fhwa.dot.gov/ohim/hs99/hfpage.htm

7. U.S. Census Bureau, Population Division. January 2, 2001. Population Estimates Program. Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Asphalt Paving: Cutback

SCC: 2461021000

1998 National consumption of cutback asphalt in U.S.[4] =	2.33E+06	short tons
Estimated 2003 National consumption of cutback asphalt in U.S.[4] =	2.45E+06	short tons
Shows percentage yearly increase in cutback asphalt consumed =	1.00	%
Percentage of diluent contained in cutback asphalt (same as MC)[2] =	35	%
Density of diluent[2] =	0.8	kg/L
Density of asphalt cement[2] =	1.1	kg/L

Activity level for 1999 national consumption of cutback asphalt = 1998 National U.S. consumption * Growth factor

Activity level for 1999 national consumption of cutback asphalt = 2.33E+06 short tons * 1.01

Activity level for 1999 national consumption of cutback asphalt = **2.35E+06** short tons = **1.94E+09** liter

From AP-42,

Equation 1[2]: Amount of cutback asphalt = ("x" liter, diluent)*(density of diluent) + ("y" liter, asphalt)*(density of asphalt cement)

Equation 2[2]: "x" liter diluent = (% of diluent contained in cutback asphalt)*("x" liter, diluent + "y" liter, asphalt cement)

Equation 1: 1.94E+09 liter = 0.8 "x" liter, diluent + 1.1 "y" liter, asphalt

Equation 2: "x" liter, diluent = 0.35 *("x" liter, diluent + "y" liter, asphalt cement)

"x" liter, diluent = 0.35 "x" liter, diluent + 0.35 "y" liter, asphalt cement

0.65 "x" liter, diluent = 0.35 "y" liter, asphalt cement

Solving for "x" liter, diluent yields:

"x" liter, diluent = 0.5384615 "y" liter, asphalt cement

Substituting Equation 2 into Equation 1 yields:

1.94E+09 liter = (0.8)*("x" liter, diluent + (1.1)*("y" liter, asphalt)

1.94E+09 liter = (0.8)*(0.5385y) + (1.1)*("y" liter, asphalt)

Solving for "y" liter asphalt cement yields:

"y" liter, asphalt cement = 1.27E+09

Entering "y" liter, asphalt cement into Equation 1 yields:

1.94E+09 liter = 0.8 "x" liter, diluent + 1.1 * 1.27E+09

"x" liter, diluent = **6.83E+08** liter = 5.46E+08 kg

Assuming that the amount of VOCs in the diluent is 70%[2], then the amount of VOCs can be calculated as follows:

Amount of VOCs in the diluent = (% of diluent which contains VOCs)*("x" liter, diluent)

Amount of VOCs in the diluent = 70 % * 5.46E+08 kg

Amount of VOCs in the diluent = **3.82E+08** kg

Assume the following speciation profile[5]:

HAP	% wt of VOC
Ethylbenzene	2.3
Toluene	6.4
Xylene (mixed isomers)	12.2
Kerosene (diluent in MC)[2]	79.1

Therefore, the individual HAP estimate = Amount of VOC in diluent * % wt of individual HAP in total VOC

HAP	Estimate (kg)	Estimate (tpy)
Ethylbenzene	**8.80E+06**	**4.40E+03**
Toluene	**2.45E+07**	**1.22E+04**
Xylene (mixed isomers)	**4.67E+07**	**2.33E+04**

Note: References 2-5 can be found on the previous page

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Autobody Refinishing Paint Application

SCC: 2401005000

National estimates of emissions of individual HAPs from autobody refinishing operations were estimated by multiplying HAP speciation data found in EPA's Speciate by a nationwide 1999 VOC estimate[1]. The 1999 VOC estimate was calculated using the 1995 baseline emissions estimated by the EPA[2] and subtracting the expected reduction value from a final rule on VOC emission standards enacted in September 1998[3].

The proposed rule[2] promulgating national VOC emission standards for automobile refinishing operations estimates 1995 baseline VOC emissions of 88,500 Mg/yr (97,550 tons/year). The final rule[3] calls for a reduction of emissions by 28,900 Mg/year (31,900 tons/year). The 1995 baseline estimate minus the rule reduction value gives a 1999 national VOC estimate of 59,600 Mg/year (65,650 tons/year).

HAP Speciation Factors:	Butyl Cellosolve	2.00% by weight
	Cellosolve	0.16% by weight
	Ethylene Glycol	0.16% by weight
	Diethyene Glycol Monoethyl Ether	0.08% by weight
	Diethyene Glycol Monomethyl Ether	0.08% by weight
	Diethyene Glycol Monobutyl Ether	0.37% by weight
	Cellosolve Acetate	0.24% by weight
	Methyl Ethyl Ketone	11.60%, by weight
	Methyl Isobutyl Ketone	3.09%, by weight
	Toluene	12.96%, by weight
	Xylene	25.68%, by weight

Emissions of lead from autobody refinishing in 1999 were estimated by dividing the 1989 national estimate of lead from paint application in large, medium and small shops[4] by 1989 population and then multiplying this by the 1999 population.[5]

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[6] for SIC Code 7532, Top & Body Repair & Paint Shops. Refer to Appendices C and E for more details on this allocation.

References

1. U.S. EPA. Speciate, version 3.1. RTP, NC. Profile Number 2402, Automobile Refinishing

2. 61FR19055. National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings. Proposed Rule and Notice of Public Hearing. April 30, 1996.

3. 63FR48806. National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings. Final Rule. September 11, 1998.

4. Locating & Estimating Air Emissions from Sources of Lead and Lead Compounds, Draft Report. U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. July 1996. p. B-51.

5. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program*. Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

6. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Autobody Refinishing Paint Application

SCC: 2401005000

HAP Calculations from VOC Emissions

HAP Speciation Factors (Ref. 1):

Hazardous Air Pollutant	%, by weight
Butyl Cellosolve	2
Cellosolve	0.16
Ethylene Glycol	0.16
Diethylene Glycol Monoethyl Ether	0.08
Diethylene Glycol Monomethyl Ether	0.08
Diethylene Glycol Monobutyl Ether	0.37
Cellosolve Acetate	0.24
Methyl Ethyl Ketone	11.6
Methyl Isobutyl Ketone	3.09
Toluene	12.96
Xylene	25.68

National 1999 VOC Estimate = 1995 baseline estimate (Ref. 2) - 1998 final rule reduction (Ref. 3)

National 1999 VOC Estimate = 97,550 tons/yr - 31,900 tons/yr = 65,650 tons/yr

Speciated HAPs = (VOC emitted) x (HAP %, by weight / 100)

Butyl Cellosolve = (65,650 tons/year) x 2/100 =	**1,313.00**	tons Butyl Cellosolve /year
Cellosolve = (65,650 tons/year) x 0.16/100 =	**105.04**	tons Cellosolve /year
Ethylene Glycol = (65,650 tons/year) x 0.16/100 =	**105.04**	tons Ethylene Glycol /year
Diethylene Glycol Monoethyl Ether = (65,650 tons/year) x 0.	**52.52**	tons Diethylene Glycol Monoethyl Ether /year
Diethylene Glycol Monomethyl Ether = (65,650 tons/year) x	**52.52**	tons Diethylene Glycol Monomethyl Ether /year
Diethylene Glycol Monobutyl Ether = (65,650 tons/year) x 0.	**242.91**	tons Diethylene Glycol Monobutyl Ether /year
Cellosolve Acetate = (65,650 tons/year) x 0.24/100 =	**157.56**	tons Cellosolve Acetate /year
Methyl Ethyl Ketone = (65,650 tons/year) x 11.6/100 =	**7,615.40**	tons Methyl Ethyl Ketone /year
Methyl Isobutyl Ketone = (65,650 tons/year) x 3.09/100 =	**2,028.59**	tons Methyl Isobutyl Ketone /year
Toluene = (65,650 tons/year) x 12.96/100 =	**8,508.24**	tons Toluene /year
Xylene = (65,650 tons/year) x 25.68/100 =	**16,858.92**	tons Xylene /year

Lead Emissions Calculations

1989 estimates from Lead L & E (Reference 4)

Emissions from small shops = 69,933 lbs Lead / 2000 lbs/ton = 34.967 tons lead from small shops

Emissions from medium shops = 11,666 lbs Lead / 2000 lbs/ton = 5.833 tons lead from medium shops

Emissions from large shops = 8, 166 lbs Lead / 2000 lbs/ton = 4.083 tons lead from large shops

1989 Emissions from all size shops = 44.883 tons lead/year

1999 Emissions from all size shops = (1989 emissions / 1989 population) x 1999 population {Reference 5}

1999 Emissions from all size shops = (44.883 tons/246819230) x 272690813

1999 Emissions from all size shops = 49.6 tons lead/year from autobody refinishing

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Aviation Gasoline Distribution: Stage I

SCC: 2501080050

Aviation Gasoline is the only aviation fuel that contains lead as an anti-knock compound[1]. The fuel is used for reciprocating, piston-engine aircrafts, and is more prevalent in civil aviation, as opposed to commercial and military aviation. There are two emission components of Aviation Gasoline Distribution: 1) from unloading of the fuel at the airport's bulk terminal (stage 1); and 2) from the spillage and displacement of the fuel during the loading of the fuel from the refineries to the refueling via small trucks (stage 2). The following estimates are for **Stage I** only.

In 1999, 325,920,000 gallons of aviation gasoline were used[2]. Available HAP emission factors are few for this source category, with the exception of TetraEthyl Lead (TEL) and ethylene dichloride (EDC). Emission factors for TEL were derived from an EPA report on alkylated lead emissions[1]. The emission factor for EDC is from the Locating and Estimating Series for ethylene dichloride[3]. The remaining HAP emission profiles used for stage I calculations mirror the HAP emission profiles used for Gasoline Distribution - Stage I, with the exception of MTBE which is not used for airplanes[4,5].

HAP emissions were allocated to the county-level by the county-level proportion on the amount of general aviation take-offs in each county[6].

References

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

2. Energy Information Administration, U.S. Department of Energy. *Petroleum Annual Supply, 1999*. (DOE/EIA-0340(99)/1 Washington, D.C. August 2000.

3. U.S. Environmental Protection Agency. Locating and Estimating Air Emissions from Sources of Ethylene Dichloride. (EPA-450/4-84-007d) Research Triangle Park, North Carolina. March 1984.

4. Memorandum from Greg LaFlam and Tracy Johnson, PES to Stephen Shedd EPA/OAQPS, Speciated Hazardous Air Pollutants- Baseline Emissions and Emission Reductions under the Gasoline Distribution NESHAP, 9 August 1996.

5. Personal Communication via e-mail from Steve Shedd, EPA/ESD to Laurel Driver, EPA/EFIG. E-mail dated May 29, 2002.

6. FAA. Air Traffic Activity Data System (ATADS) for General Aviation, Year 1999. Federal Aviation Administration. 2002.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Aviation Gasoline Distribution: Stage I

SCC: 2501080050

Assumptions

Gas Sales (1999)	325,920,000	gal
Number of Bulk Plant Equivalent	2,442	plants
Number of Valves per Bulk Plant	50	valves/plant
Number of Pumps per Plant	4	pumps/plant
Number of Seals per Pump	2	seals/pump
Number of Days per year	300	days
Liters per gallon	3.78	liter/gal
Stage I TEL Emission Factor	9.78E-06	kg TEL/kg VOC
Ethylene Dichloride Emission Factor	2.167E-06	lb EDC/gal

TetraEthyl Lead Estimates

Emission Source Type	Sub-types	Emission Factor	VOC EF Units
Aviation Gas Unloading/Tank Filling	Tank Fill	1081	mg VOC per liter
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	Valves	0.26	kg VOC/valve/day
Aviation Gas - Fugitive	Pumps	2.7	kg VOC/seal/day

Emission Source Type	Sub-types	VOC Emissions (kg)	TEL Emissions (kg)
Aviation Gas Unloading/Tank Filling	Tank Fill	1,331,767.79	13.022
Aviation Gas Unloading/Tank Filling	Storage Tank Working	532,214.32	5.204
Aviation Gas Tank Truck Filling	Composite	1,521,492.34	14.877
Aviation Gas Storage Tank	Breathing Losses	250,091.45	2.445
Aviation Gas - Fugitive	Valves	9,523,800.00	93.123
Aviation Gas - Fugitive	Pumps	15,824,160.00	154.728
	Total VOC Emissions (kg) =		28,983,525.90
	Total TEL Emissions (kg) =		283.400
	Total TEL Emissions (lbs) =		**624.79**
	Total TEL Emissions (tons) =		0.31

Ethylene Dichloride (Stage I)

325,920,000 gal * 2.167E-6 lb EDC/gal = **706.27** lbs EDC

0.35 tons EDC

Other HAPS (stage I)

HAP	HAP% of VOC	kg HAP	lbs HAP	tons HAP
2,2,4-Trimethylpentane	0.8	231,868	**511,182**	255.6
Benzene	0.9	260,852	**575,080**	287.5
Cumene	0.01	2,898	**6,390**	3.2
Ethylbenzene	0.1	28,984	**63,898**	31.9
Hexane	1.6	463,736	**1,022,364**	511.2
Naphthalene	0.05	14,492	**31,949**	16.0
Toluene	1.3	376,786	**830,671**	415.3
Xylene	0.5	144,918	**319,489**	159.7

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Aviation Gasoline Distribution: Stage II

SCC: 2501080100

Aviation Gasoline is the only aviation fuel that contains lead as an anti-knock compound[1]. The fuel is used for reciprocating, piston-engine aircrafts, and is more prevalent in civil aviation, as opposed to commercial and military aviation. There are two emission components of Aviation Gasoline Distribution: 1) from unloading of the fuel at the airport's bulk terminal (stage 1); and 2) from the spillage and displacement of the fuel during the loading of the fuel from the refineries to the refueling via small trucks (stage 2). The following estimates are for **Stage II** only.

In 1999, 325,920,000 gallons of aviation gasoline were used[2]. Available HAP emission factors are few for this source category, with the exception of TetraEthyl Lead (TEL) and ethylene dichloride (EDC). Emission factors for TEL were derived from an EPA report on alkylated lead emissions[1]. The emission factors for EDC (displacement and spillage) are from the Locating and Estimating Series for ethylene dichloride[3]. The remaining HAP emission profiles used for stage II calculations mirror the HAP emission profiles used for Gasoline Distribution - Stage II, with the exception of MTBE which is not used for airplanes[4,5].

HAP emissions were allocated to the county-level by the amount of general aviation take-offs in each county[6].

References

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

2. Energy Information Administration, U.S. Department of Energy. *Petroleum Annual Supply, 1999*. (DOE/EIA-0340(99)/1 Washington, D.C. August 2000.

3. U.S. Environmental Protection Agency. Locating and Estimating Air Emissions from Sources of Ethylene Dichloride. (EPA-450/4-84-007d) Research Triangle Park, North Carolina. March 1984.

4. Memorandum from Greg LaFlam and Tracy Johnson, PES to Stephen Shedd EPA/OAQPS, Speciated Hazardous Air Pollutants- Baseline Emissions and Emission Reductions under the Gasoline Distribution NESHAP, 9 August 1996.

5. Personal Communication via e-mail from Steve Shedd, EPA/ESD to Laurel Driver, EPA/EFIG. E-mail dated May 29, 2002.

6. FAA. Air Traffic Activity Data System (ATADS) for General Aviation, Year 1999. Federal Aviation Administration. 2002.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Aviation Gasoline Distribution: Stage II

SCC: 2501080100

Assumptions		
Gas Sales (1999)	325,920,000	gal
Liters per gallon	3.78	liter/gal
Stage II TEL Emission Factor	1.59E-02	mg TEL/liter
Ethylene Dichloride Emission Factor	1.883E-06	lb EDC/gal
VOC Emission Factor	1.360E-02	lb VOC/gal

TetraEthyl Lead Estimates

325,920,000 gal*(1.59e-2 mg TEL/liter)*(3.78 liter/gal)*(1g/1000mg)*(1lb/453.5924 g) =
43.19 lbs TEL

Ethylene Dichloride (Stage II)

325,920,000 gal * 1.883E-6 lb EDC/gal = **613.71** lbs EDC

Other HAPS (stage II)

VOC estimate = 325,920,000 gal * 1.36E-2 lb VOC/gal
VOC estimate = 4,432,512 lbs VOC

HAP	HAP% of VOC	lb HAP	ton HAP
2,2,4-Trimethylpentane	0.8	**35,460**	17.73
Benzene	0.9	**39,893**	19.95
Cumene	0.01	**443**	0.22
Ethylbenzene	0.1	**4,433**	2.22
Hexane	1.6	**70,920**	35.46
Naphthalene	0.05	**2,216**	1.11
Toluene	1.3	**57,623**	28.81
Xylene	0.5	**22,163**	11.08

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Chromic Acid Anodizing

SCC: 2309100050

The chromium emission estimates from Chromic Acid Anodizing for 1993 were 3.90 tons[1], and the activity level has been assumed to be steady. The Federal Register indicates that these emissions are solely from large plants (≥ 60 million ampere-hours). The 1999 emission estimates are subject to the MACT standards which were presumed to be in compliance and impose a 99% reduction using control technology[2] for major and area sources. The area emission estimates is 95% of the total emission estimates.

Chromic Acid Anodizing = (Small Plant Emissions + Large Plant Emissions)* (100% - 99% reduction)*(95% area)
= (0.00 tons/yr +3.90 tons/yr) *(0.01)*(0.95)
= 0.03705 tons/yr

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for SIC Code 3471, Plating and Polishing. Refer to Appendices C and E for more details on this allocation.

References

1. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks. Federal Register 58. Page 65768 and 65786. December 16, 1993.

2. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks; Final Rule. Federal Register 60. Page 4955-56. January 25, 1995.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Adhesives and Sealants

SCC: 2460600000

The 1999 emission estimates for "Consumer Products Usage: Adhesives and Sealants Products" were calculated for twenty hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Adhesives and Sealants Products is one of seven group categories of Consumer Products Usage.

Emission factors used for the 1999 inventory effort for this group category were adjusted due to the promulgation of a national VOC rule[2] in 1998. The rule calls for a 20% reduction in VOC emissions for certain specific consumer products listed in this group category. For each of these specific categories, the VOC emissions were reduced by the mandated 20%.

As a result, a new group category VOC estimate was developed due to the reduction mandated by the VOC rule. HAP emission factors were adjusted in the same proportion as the change in VOC emissions.

Total pre-rule Adhesives and Sealants VOC emissions were 63,399.36 tons; this group category encompasses 21 specific categories. VOC reductions of 20% were made for two specific categories listed in the rule. The total listed VOC emission before the rule for these two specific categories was 26,324.65 tons VOC.

A 20% reduction for these two specific categories will result in new VOC emissions of 21,059.72 tons VOC. The new total Adhesives and Sealants VOC emissions reduces to 58,134.43 tons VOC, or an 8.30% reduction for this group category. All HAP emission factors will be reduced by 8.30%.

The adjusted emission factors were multiplied by the 1999 U.S. national population of 272,690,813 as provided by the Census Bureau[3]. Emissions were allocated to the county-level by the county proportion of the national population.

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Adhesives and Sealants

SCC: 2460600000

Pollutant	Per Capita Emission Factor (lb/year/person) for Adhesive and Sealants Products	% Reduction due to VOC Rule	Adjusted Emission Factor	1999 Population	1999 Emissions (tons) [a]
Acrylic acid	3.94E-09	8.30%	3.61E-09	2.727E+08	4.93E-04
Dibenzofurans	8.07E-06	8.30%	7.40E-06	2.727E+08	1.01E+00
N,N-Dimethylformamide	2.29E-07	8.30%	2.10E-07	2.727E+08	2.86E-02
1,4-Dioxane	1.09E-05	8.30%	1.00E-05	2.727E+08	1.36E+00
Ethyl benzene	1.36E-05	8.30%	1.25E-05	2.727E+08	1.70E+00
Formaldehyde	2.51E-05	8.30%	2.30E-05	2.727E+08	3.14E+00
Glycol ethers	1.28E-04	8.30%	1.17E-04	2.727E+08	1.60E+01
Hexane	7.83E-02	8.30%	7.18E-02	2.727E+08	9.79E+03
Methanol	6.82E-04	8.30%	6.25E-04	2.727E+08	8.53E+01
Methyl ethyl ketone	3.91E-02	8.30%	3.59E-02	2.727E+08	4.89E+03
Methyl isobutyl ketone	1.24E-03	8.30%	1.14E-03	2.727E+08	1.55E+02
Methylene chloride	8.78E-03	8.30%	8.05E-03	2.727E+08	1.10E+03
Naphthalene	1.07E-04	8.30%	9.81E-05	2.727E+08	1.34E+01
2-Nitropropane	2.12E-06	8.30%	1.94E-06	2.727E+08	2.65E-01
Tetrachloroethylene	6.75E-04	8.30%	6.19E-04	2.727E+08	8.44E+01
Toluene	8.43E-02	8.30%	7.73E-02	2.727E+08	1.05E+04
Methyl Chloroform	2.14E-01	8.30%	1.96E-01	2.727E+08	2.68E+04
Trichloroethylene	3.88E-05	8.30%	3.56E-05	2.727E+08	4.85E+00
Vinyl acetate	4.94E-08	8.30%	4.53E-08	2.727E+08	6.18E-03
Xylenes	9.76E-03	8.30%	8.95E-03	2.727E+08	1.22E+03

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: Acrylic Acid

Emissions = ((Per Capita Emission Factor) * (1 - (%reduction/100))*(1999 Population))/2000

Emissions = ((3.94E-09) * (1 - (8.30/100)) * (272,690,813))/2000 = **4.93E-04** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Automotive Aftermarket Products

SCC: 2460400000

The 1999 emission estimates for "Consumer Products Usage: Automotive Aftermarket Products" were calculated for eighteen hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Automotive Aftermarket Products is one of seven group categories of Consumer Products Usage.

Emission factors used for the 1999 inventory effort for this group category were adjusted due to the promulgation of a national VOC rule[2] in 1998. The rule calls for a 20% reduction in VOC emissions for certain specific consumer products listed in this group category. For each of these specific categories, the VOC emissions were reduced by the mandated 20%.

As a result, a new group category VOC estimate was developed due to the reduction mandated by the VOC rule. HAP emission factors were adjusted in the same proportion as the change in VOC emissions.

Total pre-rule Automotive Aftermarket Products VOC emissions were 144,655.21 tons; this group category encompasses 23 specific categories. VOC reductions of 20% were made for four specific categories listed in the rule. The total listed VOC emission before the rule for these four specific categories was 64,917.12 tons VOC.

A 20% reduction for these four specific categories will result in new VOC emissions of 51,933.70 tons VOC. The new total Automotive Aftermarket Product VOC emissions reduces to 131,681.79 tons VOC, or an 8.97% reduction for this group category. All HAP emission factors will be reduced by 8.97%.

The adjusted emission factors were multiplied by the 1999 U.S. national population of 272,690,813 as provided by the Census Bureau[3]. Emissions were allocated to the county-level by the county proportion of the national population.

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Automotive Aftermarket Products

SCC: 2460400000

Pollutant	Per Capita Emission Factor (lb/year/person) for Automotive Aftermarket Products	% Reduction due to VOC Rule	Adjusted Emission Factor	1999 Population	1999 Emissions (tons) [a]
Benzene	4.72E-06	8.97%	4.30E-06	2.727E+08	5.86E-01
Chloroform	3.60E-05	8.97%	3.28E-05	2.727E+08	4.47E+00
N,N-Dimethylformamide	2.78E-08	8.97%	2.53E-08	2.727E+08	3.45E-03
Ethyl benzene	7.51E-05	8.97%	6.84E-05	2.727E+08	9.32E+00
Glycol ethers	2.69E-02	8.97%	2.45E-02	2.727E+08	3.34E+03
Hexane	3.53E-03	8.97%	3.21E-03	2.727E+08	4.38E+02
Hydrogen fluoride	1.41E-05	8.97%	1.28E-05	2.727E+08	1.75E+00
Methanol	6.61E-01	8.97%	6.02E-01	2.727E+08	8.20E+04
Methyl ethyl ketone	3.04E-03	8.97%	2.77E-03	2.727E+08	3.77E+02
Methyl isobutyl ketone	8.73E-04	8.97%	7.95E-04	2.727E+08	1.08E+02
Methyl-tert-butyl ether	2.36E-05	8.97%	2.15E-05	2.727E+08	2.93E+00
Methylene chloride	4.83E-03	8.97%	4.40E-03	2.727E+08	5.99E+02
Naphthalene	2.26E-06	8.97%	2.06E-06	2.727E+08	2.81E-01
Tetrachloroethylene	2.35E-02	8.97%	2.14E-02	2.727E+08	2.92E+03
Toluene	2.49E-02	8.97%	2.27E-02	2.727E+08	3.09E+03
Methyl Chloroform	7.63E-02	8.97%	6.95E-02	2.727E+08	9.47E+03
Trichloroethylene	2.67E-04	8.97%	2.43E-04	2.727E+08	3.31E+01
Xylenes	1.20E-02	8.97%	1.09E-02	2.727E+08	1.49E+03

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: Benzene

Emissions = ((Per Capita Emission Factor) * (1 - (%reduction/100))*(1999 Population))/2000

Emissions = ((4.72E-06) * (1 - (8.97/100)) * (272,690,813))/2000 = **5.86E-01** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Coating and Related Products

SCC: 2460500000

The 1999 emission estimates for "Consumer Products Usage: Coatings and Related Products" were calculated for nineteen hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Coatings and Related Products is one of seven group categories of Consumer Products Usage.

The VOC Rule[2] did not list any specific categories targeted for a 20% reduction in Coatings and Related Products group category. Therefore, none of the emission factors were adjusted.

Emissions were allocated to the county-level by the county proportion of the national population[3].

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

Pollutant	Per Capita Emission Factor (lb/year/person) for Coating and Related Products	1999 Population	1999 Emissions (tons) [a]
Acetophenone	8.53E-06	2.727E+08	1.16E+00
Carbon tetrachloride	4.10E-10	2.727E+08	5.59E-05
Chlorobenzene	1.51E-05	2.727E+08	2.06E+00
Chloroform	9.55E-04	2.727E+08	1.30E+02
Ethyl benzene	6.86E-04	2.727E+08	9.35E+01
Formaldehyde	8.55E-04	2.727E+08	1.17E+02
Glycol ethers	2.24E-03	2.727E+08	3.05E+02
Hexane	2.39E-03	2.727E+08	3.26E+02
Methanol	1.60E-02	2.727E+08	2.18E+03
Methyl ethyl ketone	7.94E-03	2.727E+08	1.08E+03
Methyl isobutyl ketone	5.26E-03	2.727E+08	7.17E+02
Methylene chloride	1.97E-02	2.727E+08	2.69E+03
Naphthalene	5.75E-06	2.727E+08	7.84E-01
Tetrachloroethylene	1.48E-04	2.727E+08	2.02E+01
Toluene	3.16E-01	2.727E+08	4.31E+04
Methyl Chloroform	7.69E-03	2.727E+08	1.05E+03
Trichloroethylene	1.37E-04	2.727E+08	1.87E+01
Triethylamine	5.26E-04	2.727E+08	7.17E+01
Xylenes	4.05E-02	2.727E+08	5.52E+03

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: Acetophenone

Emissions = ((Per Capita Emission Factor) *(1999 Population))/2000

Emissions = ((8.53E-06) * (272,690,813))/2000 = **1.16E+00** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - FIFRA-Regulated Products

SCC: 2460800000

The 1999 emission estimates for "Consumer Products Usage: FIFRA-Regulated Products" were calculated for eighteen hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. FIFRA-Regulated Products is one of seven group categories of Consumer Products Usage.

Although a national VOC rule for Consumer Products Usage was promulgated in 1998, emission factors used for the 1999 inventory effort for this group category were not adjusted due to the one-year delay for FIFRA-regulated products[2]. Consequently, HAP emission factors were not adjusted.

Ethylene oxide was excluded from this source category due to the potential overlap of ethylene oxide emissions from commercial sterilization facilities.

Emissions were allocated to the county-level by the county proportion of the national population[3].

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

Pollutant	Per Capita Emission Factor (lb/year/person) for FIFRA-Regulated Products	1999 Population	1999 Emissions (tons) [a]
Chlorobenzene	7.16E-02	2.727E+08	9.76E+03
1,4-Dichlorobenzene	3.52E-02	2.727E+08	4.80E+03
1,3-Dichloropropene	1.60E-01	2.727E+08	2.18E+04
Ethyl benzene	1.30E-03	2.727E+08	1.77E+02
Formaldehyde	3.81E-04	2.727E+08	5.19E+01
Glycol ethers	5.65E-03	2.727E+08	7.70E+02
Isophorone	9.47E-04	2.727E+08	1.29E+02
Methanol	9.48E-04	2.727E+08	1.29E+02
Methyl bromide	2.22E-01	2.727E+08	3.03E+04
Methyl ethyl ketone	2.01E-05	2.727E+08	2.74E+00
Methyl isobutyl ketone	9.01E-05	2.727E+08	1.23E+01
Methylene chloride	6.81E-04	2.727E+08	9.29E+01
Naphthalene	4.60E-02	2.727E+08	6.27E+03
Tetrachloroethylene	1.92E-04	2.727E+08	2.62E+01
Methyl Chloroform	5.99E-02	2.727E+08	8.17E+03
Triethylamine	3.13E-04	2.727E+08	4.27E+01
Xylenes	1.37E-01	2.727E+08	1.87E+04

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: Chlorobenzene

Emissions = ((Per Capita Emission Factor) *(1999 Population))/2000

Emissions = ((7.16E-02) * (272,690,813))/2000 = **9.76E+03** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Household Products

SCC: 2460200000

The 1999 emission estimates for "Consumer Products Usage: Household Products" were calculated for eighteen hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Household Products is one of seven group categories of Consumer Products Usage.

Emission factors used for the 1999 inventory effort for this group category were adjusted due to the promulgation of a national VOC rule[2] in 1998. The rule calls for a 20% reduction in VOC emissions for certain specific consumer products listed in this group category. For each of these specific categories, the VOC emissions were reduced by the mandated 20%.

As a result, a new group category VOC estimate was developed due to the reduction mandated by the VOC rule. HAP emission factors were adjusted in the same proportion as the change in VOC emissions.

Total pre-rule Household Products VOC emissions were 242,077.80 tons; this group category encompasses 53 specific categories. VOC reductions of 20% were made for eighteen specific categories listed in the rule. The total listed VOC emission before the rule for these eighteen specific categories was 132,467.34 tons VOC.

A 20% reduction for these eighteen specific categories will result in new VOC emissions of 105,973.87 tons VOC. The new total Household Product VOC emissions reduces to 215,584.33 tons VOC, or a 10.94% reduction for this group category. All HAP emission factors will be reduced by 10.94%.

The adjusted emission factors were multiplied by the 1999 U.S. national population of 272,690,813 as provided by the Census Bureau[3]. Emissions were allocated to the county-level by the county proportion of the national population.

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Household Products

SCC: 2460200000

Pollutant	Per Capita Emission Factor (lb/year/person) for Household Products	% Reduction due to VOC Rule	Adjusted Emission Factor	1999 Population	1999 Emissions (tons) [a]
1,4-Dichlorobenzene	4.79E-02	10.94%	4.27E-02	2.727E+08	5.82E+03
1,2-Dichloroethane	3.52E-08	10.94%	3.13E-08	2.727E+08	4.27E-03
Ethyl benzene	2.56E-06	10.94%	2.28E-06	2.727E+08	3.11E-01
Formaldehyde	6.74E-06	10.94%	6.00E-06	2.727E+08	8.18E-01
Glycol ethers	5.31E-03	10.94%	4.73E-03	2.727E+08	6.45E+02
Hexane	2.09E-03	10.94%	1.86E-03	2.727E+08	2.54E+02
Hydrochloric Acid	1.75E-06	10.94%	1.56E-06	2.727E+08	2.13E-01
Hydrogen fluoride	8.75E-08	10.94%	7.79E-08	2.727E+08	1.06E-02
Methanol	6.66E-04	10.94%	5.93E-04	2.727E+08	8.09E+01
Methyl ethyl ketone	4.49E-04	10.94%	4.00E-04	2.727E+08	5.45E+01
Methyl isobutyl ketone	1.08E-04	10.94%	9.62E-05	2.727E+08	1.31E+01
Methylene chloride	2.39E-03	10.94%	2.13E-03	2.727E+08	2.90E+02
Naphthalene	5.52E-07	10.94%	4.92E-07	2.727E+08	6.70E-02
Tetrachloroethylene	2.96E-03	10.94%	2.64E-03	2.727E+08	3.59E+02
Toluene	5.82E-04	10.94%	5.18E-04	2.727E+08	7.07E+01
Methyl Chloroform	2.85E-02	10.94%	2.54E-02	2.727E+08	3.46E+03
Trichloroethylene	4.34E-05	10.94%	3.87E-05	2.727E+08	5.27E+00
Xylenes	3.28E-03	10.94%	2.92E-03	2.727E+08	3.98E+02

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: 1,4-Dichlorobenzene

Emissions = ((Per Capita Emission Factor) * (1 - (%reduction/100))*(1999 Population))/2000

Emissions = ((4.79E-02) * (1 - (10.94/100)) * (272,690,813))/2000 = **5.82E+03** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Miscellaneous

SCC: 2460900000

The 1999 emission estimates for "Consumer Products Usage: Miscellaneous" were calculated for nine hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Miscellaneous Products is one of seven group categories of Consumer Products Usage.

The VOC Rule[2] did not list any specific categories targeted for a 20% reduction in Miscellaneous Products group category. Therefore, none of the emission factors were adjusted.

Emissions were allocated to the county-level by the county proportion of the national population[3].

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Miscellaneous

SCC: 2460900000

Pollutant	Per Capita Emission Factor (lb/year/person) for Miscellaneous Products	1999 Population	1999 Emissions (tons) [a]
N,N-Dimethylformamide	7.43E-06	2.727E+08	1.01E+00
Glycol ethers	2.42E-04	2.727E+08	3.30E+01
Methanol	1.84E-02	2.727E+08	2.51E+03
Methyl ethyl ketone	1.01E-05	2.727E+08	1.38E+00
Methylene chloride	2.38E-05	2.727E+08	3.25E+00
Tetrachloroethylene	7.53E-04	2.727E+08	1.03E+02
Toluene	2.46E-06	2.727E+08	3.35E-01
Methyl Chloroform	2.46E-04	2.727E+08	3.35E+01
Xylenes	4.31E-04	2.727E+08	5.88E+01

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: N,N-Dimethylformamide

Emissions = ((Per Capita Emission Factor) *(1999 Population))/2000

Emissions = ((7.43E-06) * (272,690,813))/2000 = **1.01E+00** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Personal Care Products

SCC: 2460100000

The 1999 emission estimates for "Consumer Products Usage: Personal Care Products" were calculated for eight hazardous air pollutants (HAP) by multiplying a per capita emission factor[1] by the U.S. population. Personal Care Products is one of seven group categories of Consumer Products Usage.

Emission factors used for the 1999 inventory effort for this group category were adjusted due to the promulgation of a national VOC rule[2] in 1998. The rule calls for a 20% reduction in VOC emissions for certain specific consumer products listed in this group category. For each of these specific categories, the VOC emissions were reduced by the mandated 20%.

As a result, a new group category VOC estimate was developed due to the reduction mandated by the VOC rule. HAP emission factors were adjusted in the same proportion as the change in VOC emissions.

Total pre-rule Personal Care Product VOC emissions were 319,185.47 tons; this group category encompasses 83 specific categories. VOC reductions of 20% were made for eight specific categories listed in the rule. The total listed VOC emission before the rule for these eight specific categories was 193,223.61 tons VOC.

A 20% reduction for these eight specific categories will result in new VOC emissions of 154,578.89 tons VOC. The new total Personal Care Product VOC emissions reduces to 280,540.75 tons VOC, or a 12.11% reduction for this group category. All HAP emission factors will be reduced by 12.11%.

The adjusted emission factors were multiplied by the 1999 U.S. national population of 272,690,813 as provided by the Census Bureau[3]. Emissions were allocated to the county-level by the county proportion of the national population.

References:

1. U.S. Environmental Protection Agency. August 1996. *Emission Inventory Improvement Program: Preferred and Alternative Methods for Estimating Air Emissions.* Volume III, Chapter 5. Research Triangle Park, North Carolina.

2. 63FR48819. National Volatile Organic Compound Emission Standards for Consumer Products. Final Rule. September 11, 1998.

3. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program.* Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Commercial and Consumer Products Usage - Personal Care Products

SCC: 2460100000

Pollutant	Per Capita Emission Factor (lb/year/person) for Personal Care Products	% Reduction due to VOC Rule	Adjusted Emission Factor	1999 Population	1999 Emissions (tons) [a]
Acetamide	1.38E-07	12.11%	1.21E-07	2.727E+08	1.65E-02
Ethylene Dichloride	4.62E-06	12.11%	4.06E-06	2.727E+08	5.54E-01
N,N-Dimethylformamide	2.71E-05	12.11%	2.38E-05	2.727E+08	3.25E+00
Glycol ethers	1.52E-05	12.11%	1.34E-05	2.727E+08	1.82E+00
Methanol	5.67E-07	12.11%	4.98E-07	2.727E+08	6.79E-02
Methyl ethyl ketone	1.75E-05	12.11%	1.54E-05	2.727E+08	2.10E+00
Toluene	3.41E-03	12.11%	3.00E-03	2.727E+08	4.09E+02
Methyl Chloroform	7.45E-04	12.11%	6.55E-04	2.727E+08	8.93E+01

[a] Emissions are based on a 1999 population of 272,690,813 (Source: Population Estimates Program, Population Division, U.S. Bureau of the Census, Washington, DC 20233.).

Example Calculation: Acetamide

Emissions = ((Per Capita Emission Factor) * (1 - (%reduction/100))*(1999 Population))/2000

Emissions = ((1.38E-07) * (1 - (12.11/100)) * (272,690,813))/2000 = **1.65E-02** tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Decorative Chromium Electroplating

SCC: 2309100030

The chromium emission estimates from Decorative Chromium Electroplating for 1993 were 11.50 tons[1], and the activity level has been assumed to be steady. The Federal Register indicates that these emissions are solely from large plants (≥ 60 million ampere-hours). The 1999 emission estimates are subject to the MACT standards which were presumed to be in compliance and impose a 99% reduction using control technology[2] for major and area sources. The area emission estimates is 95% of the total emission estimates.

Decorative Chromium Electroplating = (Small Plant Emissions + Large Plant Emissions)* (100% - 99% reduction)*(95% area)
= (0.00 tons/yr +11.50 tons/yr) *(0.01)*(0.95)
= 0.10925 tons/yr

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for SIC Code 3471, Plating and Polishing. Refer to Appendices C and E for more details on this allocation.

References

1. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks. Federal Register 58. Page 65768 and 65786. December 16, 1993.

2. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks; Final Rule. Federal Register 60. Page 4955-56. January 25, 1995.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Dental Preparation and Use

SCC: 31502500

National level mercury estimates from dental use and preparation were determined by multiplying the total amount of mercury used in the dental industry by an emissions factor. In 1995, 32 Mg (35 tons) of mercury were used in the dental industry[1]. This number is estimated to have remained constant through 1999[3]. EPA estimates that 2.0% of the mercury used in dental applications is emitted to the atmosphere[3].

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[4] for SIC Code 8072, Dental Laboratories. Refer to Appendices C and E for more details on this allocation.

Emissions Estimate:

Mercury release due to dental use and preparation = total mercury consumed by the dental industry x 2.0%

Mercury release due to dental use and preparation = 35 tons mercury consumed x 0.02

Mercury release due to dental use and preparation = 1400 lb = 0.70 tons mercury released

References

1. Plachy, J. 1996. Mercury. Minerals Yearbook, Volume I -- Metals and Minerals, U.S. Geological Survey, U.S. Dept. of Interior.

2. Reese, R. 1999. Mercury. Minerals Yearbook, Volume I -- Metals and Minerals, U.S. Geological Survey, U.S. Dept. of Interior.

3. U.S. Environmental Protection Agency, "Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds." December 1997.

4. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Drum and Barrel Reclamation

SCC: 2461160000

The 1999 national emission estimates for benz[a]anthracene, benzo[b]fluoranthene, chrysene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene were developed by multiplying an emission factor by a national activity estimate. Emission factors for these hazardous air pollutants were taken from the U.S. Environmental Protection Agency *Locating and Estimating Air Emissions From Sources of Polycyclic Organic Matter*[1]. The emission factor for lead is taken from *Locating and Estimating Air Emissions from Sources of Lead and Lead Compounds*[2]. The emission factors for the dioxin and furan compounds are taken from *Locating and Estimating Air Emissions from Sources of Dioxins and Furans*[3].

Information reported by the Reusable Industrial Packaging Association indicated that there were approximately 35 million 55-gallon barrels reclaimed in the United States in 1997[4]. The number of barrels reclaimed in 1997 was assumed to be constant through 1999.

Emissions were allocated to the county-level using county-level proportions developed from a list of facilities gathered during the 112(c)(6) inventory effort[5].

References:

1. 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

2. 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

3. U.S. Environmental Protection Agency. 1997 *Locating and Estimating Air Emissions From Sources of Dioxins and Furans*. Office of Air Quality Planning and Standards. Research Triangle Park, NC

4. Reusable Industrial Packaging Association. 1997 Statistics as found on the Reusable Industrial Packaging Association webpage (Internet Address: http://www.reusablepackaging.org/Stats.html)

5. U.S. Environmental Protection Agency. 1998. *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

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Drum and Barrel Reclamation

SCC: 2461160000

Pollutant	Emission Factor (lb/1000 barrels)	National Activity Level (1000 barrels reclaimed/year)	National Emissions (tons/year)
Lead	3.50E-01	35,000	6.13E+00
2,3,7,8-TCDD	4.61E-09	35,000	8.07E-08
2,3,7,8-TCDF	8.05E-08	35,000	1.41E-06
2,3,7,8-TCDD TEQ	1.09E-07	35,000	1.91E-06
Benz[a]Anthracene	3.54E-07	35,000	6.20E-06
Benzo[b]Fluoranthene	1.33E-07	35,000	2.33E-06
Chrysene	6.63E-08	35,000	1.16E-06
Acenaphthene	2.85E-06	35,000	4.99E-05
Acenaphthylene	7.07E-07	35,000	1.24E-05
Anthracene	2.63E-06	35,000	4.60E-05
Fluoranthene	5.30E-07	35,000	9.28E-06
Fluorene	6.32E-06	35,000	1.11E-04
Naphthalene	1.67E-05	35,000	2.92E-04
Phenanthrene	4.66E-06	35,000	8.16E-05
Pyrene	6.63E-07	35,000	1.16E-05

National Activity Level

1997 55-gallon barrels reclaimed in the U.S. =	35,000,000
1997 thousand 55-gallon barrels reclaimed in the	35,000

Example Calculation for Benz[a]Anthracene:

1999 Emission, tons/yr=	1997 thousand 55-gallon barrels reclaimed in the U.S. x Ave. Emission Factor (lb/1000 barrel) / 2000 (lb/ton)
1999 Emission, tons/yr=	(35,000 x 3.54E-07) / 2000 = 6.20E-06

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Fluorescent Lamp Recycling

SCC: 31301200

National level mercury estimates for 1999 from fluorescent lamp recycling were determined by multiplying the number of lamps recycled by an emission factor.

In 1999, 620 million lamps were discarded in the U.S, 15% of these were recycled[1]. EPA estimates that from the recycling process, 0.00088 mg Hg/lamp are released[2].

Emissions estimate:

Total 1999 fluorescent lamps recycled = # of lamps discarded x 0.15
Total 1999 fluorescent lamps recycled = 620,000,000 x 0.15 = 93,000,000 lamps recycled
Total 1999 Hg emissions from recycled lamps = # lamps recycled x mg Hg released/lamp recycled
Total 1999 Hg emissions from recycled lamps = 93,000,000 lamps x 0.00088 mg Hg/lamp = 81,840 mg Hg released
Total 1999 Hg emissions from recycled lamps = 0.00009 tons mercury

Emissions were allocated to the county-level by the county proportion of the national population[3]. Refer to Appendices C and E for more details on this allocation.

References:

1. National Electrical Manufacturer's Association, "Environmental Impact Analysis: Spent Mercury-Containing Lamps." January 2000.

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, Population Division. January 2, 2001. *Population Estimates Program* . Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Gasoline Distribution Stage I

SCC: 2501050120 & 2501060053

The following HAP emission estimates from "Stage I Gasoline Distribution" have been derived from an EPA Memorandum[1]. The estimates were for a base year of 1998[2]. To calculate the 1999 estimates, a ratio between the 1999 and 1998 through-put was multiplied to the 1998 emission estimates. The 1998 through-put was estimated to be 446.3 billion liters and the 1999 through-put was estimated to be 448.5 billion liter based on a 0.5% annual increase (As noted in the EPA's background information document for Gasoline Distribution Industry (stage I)[3].

Seven types of fuel are used for these estimates: 1) conventional gasoline; 2) reformulated w/ MTBE; 3) reformulated w/o MTBE; 4) oxygenated w/ MTBE; 5) oxygenated w/o MTBE; 6) reformulated/oxygenated w/MTBE; and 7) reformulated/oxygenated w/o MTBE.

Stage I Gasoline Distribution activity includes the following processes/emission points: 1) bulk terminals; 2) pipeline facilities; 3) bulk plants; and 4) service stations with storage tanks. Stage I activity associated with aviation gasoline at the bulk plants were removed from these estimates, and are calculated separately under "Aviation Gasoline Distribution: Stage I" which is found earlier in this appendix.

The "Aviation Gasoline Distribution: Stage I" bulk plants VOC estimate of 28,983 Mg was subtracted from the total VOC estimates of 220,770 Mg for bulk plants under "Stage I Gasoline Distribution". HAP speciation profiles were available for the following HAPs: hexane; benzene; toluene; 2,2,4-trimethylpentane; xylenes; ethylbenzene; cumene; naphthalene; and MTBE[1].

Area sources are estimated to be 95% of the total emissions[1]. There is no area source emission control reduction for this category, as only the major sources are applicable to the MACT regulation[1]. Emissions for bulk terminals, pipeline facilities, and bulk plants (SCC 2501050120) were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[5] SIC Code 5171, Petroleum Bulk Stations and Terminals. Emissions for service stations (SCC 2501060053) were allocated to the county-level by the county proportion of the national Vehicle Miles Traveled[6]. Refer to Appendices C and E for more details on this allocation.

References

1. Memorandum from Greg Nizich to Barbara Driscoll, Comments on MACT Inventory, November 3, 1998

2. Memorandum from Greg LaFlam and Tracy Johnson, PES to Stephen Shedd EPA/OAQPS, Speciated Hazardous Air Pollutants- Baseline Emissions and Emission Reductions under the Gasoline Distribution NESHAP, August 9, 1996.

3. U.S. EPA, Gasoline Distribution Industry (Stage I)- Background Information for Proposed Standards (EPA-453/R94-002a), Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, January 1994.

4. U.S. Environmental Protection Agency. 40 CFR part 9 and 63 National Emission Standards for Hazardous Air Pollutants for Source Categories: Gasoline Distribution (Stage I) November 21,1994.

5. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

6. U.S. EPA. Documentation for the Draft 1999 Base Year Onroad National Emissions Inventory for Hazardous Air Pollutants. RTP, NC. September 28, 2001

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Gasoline Distribution Stage I

SCC: 2501050120 & 2501060053

Emission Points	SCC	VOC - all stage I bulk plants (1998)	1999/1998 Ratio	VOC - all stage I bulk plants (1999)	Aviation Gasoline Distribution Bulk Plants	Adjusted VOC - stage I w/o aviation gas (1999)
Bulk Terminals (Mg)	2501050120	167,370	1.005	168,207		168,207
Pipeline Facilities (Mg)		85,740	1.005	86,169		86,169
Bulk Plants (Mg)		220,770	1.005	221,874	28,983	192,891
Service Stations storage tanks (Mg)	2501060053	213,970	1.005	215,040		215,040

Part 1 - Bulk Terminals, Pipeline Facilities, and Bulk Plants (SCC 2501050120)

Total VOC Emissions = 447,266 Mg

Chemical	1998 HAP Weighted Percentage	1999 Estimate (Mg/yr)	Mg to ton Conversion Factor	1999 Total Estimate (Tons/yr)	1999 Area Estimate (95% of total)
Benzene	0.73%	3252	1.1023113	3,584.54	3,405.31
Naphthalene	0.05%	222	1.1023113	245.13	232.88
Hexane	1.52%	6809	1.1023113	7,505.25	7,129.98
Toluene	1.22%	5475	1.1023113	6,035.16	5,733.40
2,2,4 Trimethylpentane	0.76%	3405	1.1023113	3,752.98	3,565.33
Xylene	0.46%	2070	1.1023113	2,282.18	2,168.07
Ethylbenzene	0.10%	445	1.1023113	490.27	465.75
Cumene	0.01%	44	1.1023113	48.74	46.30
MTBE	1.34%	5978	1.1023113	6,589.94	6,260.44

Part 2 - Service Stations (SCC 2501060053)

Total VOC Emissions = 215,040 Mg

Chemical	1998 HAP Weighted Percentage	1999 Estimate (Mg/yr)	Mg to ton Conversion Factor	1999 Total Estimate (Tons/yr)	1999 Area Estimate (95% of total)
Benzene	0.73%	1563	1.1023113	1,723.40	1,637.23
Naphthalene	0.05%	107	1.1023113	117.86	111.96
Hexane	1.52%	3274	1.1023113	3,608.42	3,428.00
Toluene	1.22%	2632	1.1023113	2,901.63	2,756.55
2,2,4 Trimethylpentane	0.76%	1637	1.1023113	1,804.38	1,714.17
Xylene	0.46%	995	1.1023113	1,097.24	1,042.38
Ethylbenzene	0.10%	214	1.1023113	235.71	223.93
Cumene	0.01%	21	1.1023113	23.43	22.26
MTBE	1.34%	2874	1.1023113	3,168.36	3,009.94

Example county-level calculation: Johnson County, KS Benzene emissions for Stage I Gasoline Distribution

Part 1 - SCC 2501050120 Emissions - Allocated by SIC Code employment

Benzene emissions = National benzene emissions * (Number of employees in Johnson County, KS for SIC Code = 5171) / (total number of U.S. employees for SIC Code = 5171)

Benzene emissions = 3,405.31 tpy Benzene * 22 Johnson County, KS employees / (59,137 U.S. Employees)

Part 1 Benzene emissions = **1.27** tons Benzene

Part 2 - SCC 2501060053 Emissions - Allocated by Vehicle Miles Traveled

Benzene emissions = National benzene emissions * (Number Vehicle Miles Traveled in Johnson County, KS) / (total U.S. Vehicle Miles Traveled)

Benzene emissions = 1,637.23 tpy Benzene * 152,631 million miles / 93,427,668 million miles

Part 2 Benzene emissions = **2.67** tons Benzene

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Gasoline Distribution Stage II

SCC: 2501060100

1999 fuel sales for conventional, reformulated, and winter-oxygenated gasolines were obtained from the Energy Information Administration[1]. Reformulated gasoline was further divided into reformulated gasoline with methyl tertiary butyl ether (MTBE) and reformulated gasoline with ethanol, by market share (81% and 19%, respectively)[2].

Likewise, 18% of winter-oxygenated gasoline sales were apportioned as winter-oxygenated with MTBE and 82% with ethanol. These sale figures were multiplied by a VOC emission factor of 11.7 lb/1000 gallons of gasoline[3], yielding annual VOC emission estimates for each gasoline type. The emission factor includes emissions from uncontrolled displacement losses and spillage. Emission reduction percentages were applied to counties in which stage II vapor recovery systems were in place. This reduction percentage ranged from 86%-95%, depending upon state requirements. EPA's default is 86% for service stations which are annually inspected[4]. Refer to Appendix E-2 for counties identified as having stage II vapor recovery systems.

The VOC estimates were then speciated by hazardous air pollutant (HAP), based on the following source fingerprints:

	Gasoline Type					
		Reformulated		Winter-Oxygenated		Weighted
Pollutant	Conventional	w/ MTBE	w/ Ethanol	w/ MTBE	w/ Ethanol	Average
2,2,4-Trimethylpentane	0.8	0.7	0.7	0.7	0.7	0.76
Benzene	0.9	0.4	0.4	0.7	0.7	0.71
Cumene	0.01	0.01	0.01	0.01	0.01	0.01
Ethyl benzene	0.1	0.1	0.1	0.1	0.1	0.10
Hexane	1.6	1.4	1.4	1.4	1.4	1.52
MTBE	0	8.7	0	11.9	0	2.59
Naphthalene	0.05	0.05	0.05	0.05	0.05	0.05
Toluene	1.3	1.1	1.1	1.1	1.1	1.22
Xylene	0.5	0.4	0.4	0.4	0.4	0.46

Note: Emission factors, except for cumene, are as reported in Background Information document for the gasoline distribution industry[5]. The cumene emission factor was provided by ESD[6].

Emissions were allocated to the county-level by the county proportion of the national vehicle miles travelled[7].

References:

1. Energy Information Administration, U.S. Department of Energy. *Petroleum Marketing Annual, 1999*. (DOE/EIA-0487(99)) Washington, D.C. August 2000.

2. Memorandum from Rich Cook, U.S. EPA/OMS, to Laurel Driver and Anne Pope, U.S. EPA/OAQPS. "Guidance on Mobile Source Emission Estimates in the 1996 National Toxics Inventory." June 9, 1998.

3. U.S. EPA. Compilation of Air Pollutant Emission Factors, 5th Edition, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1995.

4. U.S. EPA, Technical Guidance- Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities Volume 1: Chapters (EPA-450/3-91-022a),Office of Air Quality Planning and Standards, November 1991.

5. U.S. EPA. Gasoline Distribution Industry (Stage 1) - Background Information for Proposed Standards (EPA-453/R-94-002a). Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina. January 1994.

6. Personal Communication via e-mail from Steve Shedd, EPA/ESD to Laurel Driver, EPA/EFIG. Dated May 29, 2002.

7. U.S. EPA. Documentation for the Draft 1999 Base Year Onroad National Emissions Inventory for Hazardous Air Pollutants. RTP, NC. September 28, 2001

Activity	Conventional Gasoline	Reformulated Gasoline (81%)	Winter Oxygenated Gasoline (19%)
1999 Gasoline Sales (thousands of gallons/day)	37,248.20	21,956.00	2751.9

		Reformulated Gasoline		Winter Oxygenated Gasoline		
Activity	Conventional Gasoline	w/MTBE	w/o MTBE	w/MTBE	w/o MTBE	Total
1999 Gasoline Sales (millions of gallons per year)	13,596	6,491	1,523	181	824	22,614
1999 VOC Emissions (tons)	79,534	37,974	8,907	1,058	4,818	132,292

1999 HAP Emissions (tons)

		Reformulated Gasoline		Winter Oxygenated Gasoline		
HAP	Conventional Gasoline	w/MTBE	w/o MTBE	w/MTBE	w/o MTBE	Total (tons)
2,2,4-Trimethylpentane	636.27	265.82	62.35	7.40	33.73	1005.58
Benzene	715.81	151.90	35.63	7.40	33.73	944.47
Cumene	7.95	3.80	0.89	0.11	0.48	13.23
Ethyl benzene	79.53	37.97	8.91	1.06	4.82	132.29
Hexane	1272.55	531.64	124.70	14.81	67.46	2011.15
MTBE	0.00	3303.74	0.00	125.86	0.00	3429.61
Naphthalene	39.77	18.99	4.45	0.53	2.41	66.15
Toluene	1033.94	417.71	97.98	11.63	53.00	1614.28
Xylene	397.67	151.90	35.63	4.23	19.27	608.70

Sample Calcuations:

Reformulated Gasoline = RFG
RFG w/MTBE = RFG sales * 1000 gallons * 365 days *fraction of MTBE
RFG w/MTBE = 21956.0 * 1000 gallons * 365 days *0.81 = 6491 millions of gallons

Tons VOC from RFG w/MTBE = (RFG w/MTBE) *(11.7 lb VOC/1000gal)* (1000)/(2000lb/ton)
Tons VOC from RFG w/MTBE = (6491 * 11.7 * 1000)/(2000)
Tons VOC from RFG w/MTBE = 37,974 tons

2,2,4-Trimethylpentane emissions from RFG w/MTBE= Tons VOC from RFG w/MTBE *EF
2,2,4-Trimethylpentane emissions from RFG w/MTBE= Tons VOC from RFG w/MTBE *Percent VOC
2,2,4-Trimethylpentane emissions from RFG w/MTBE= 37,974 tons * 0.7/100
2,2,4-Trimethylpentane emissions from RFG w/MTBE =265.82 tons

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - General Laboratory Activities

SCC: 31503001

National mercury emissions from general laboratory activities were calculated by multiplying the tons of mercury consumed by laboratories by an emission factor. In 1999, laboratories consumed 20 Mg of mercury[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 x Emission Factor

Total mercury emitted from laboratories = 20 Mg total mercury * 40 kg mercury released/Mg total mercury

Total mercury emitted from laboratories = 800 kg mercury released = 0.9 tons mercury released

Emissions were allocated to the county-level by the county proportion of the national population[3].

References:

1. U.S. Geological Survey, "The Materials Flow of Mercury in the Economies of the United States and the World." June 2000. U.S. Geological Survey Circular 1197, U.S. Dept. of Interior.

2. U.S. Enironmental 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, Population Division. January 2, 2001. Population Estimates Program. Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Grain Elevators: Terminal

SCC: 30200512

Fumigants are sprayed on crops stored in grain elevators. State-level activity data for several crops for the 1999 base year were retrieved at the U.S. Department of Agricultural (USDA) agricultural chemical usage website[1]. A total of 8 crop fumigant summaries (crops listed on next page) were examined for the following HAP active ingredients:

- Captan;
- Lindane; and,
- Methyl Bromide

Volatilization rates for the above chemicals were not available for grain elevators. Thus, volatilization rates were estimated using the chemical vapor pressures used for pesticide application found in AP-42 and the ARS Pesticide Database[2,3]. Using the methodology in AP-42, methyl bromide was given a volatilization rate of 58% based on its high vapor pressure, while the remaining HAPs were given a default volatilization rate of 35%.

Phosphine is contained in aluminum phosphide, which is an active ingredient. Using stoichiometric balance, 0.60 pounds of phosphine are created for every pound of aluminum phosphide and water sprayed. It was assumed that 100% of the phosphine produced is volatilized[4].

Emissions were first allocated to the individual states by their reported chemical usage; state-level emissions were then allocated to the county level by the proportion emission based on county vs. state farm acres obtained from the 1997 Census of Agriculture[5].

References

1. U.S. Department of Agriculture (USDA). Agricultural Chemical Usage reports. Postharvest Applications. Internet address: usda.mannlib.cornell.edu/reports/nassr/other/pcu-bb/

2. U.S. Environmental Protection Agency. Compilation of Air Pollution Factors, AP-42. Section 9.2.2. January 1995.

3. U.S. Department of Agriculture (USDA). ARS Pesticide Properties Database. Internet address: http://wizard.arsusda.gov/acsl/listall.html

4. Air Toxics Emission Estimates Methods Evaluation. Washington State Department of Ecology. Air Quality Program. May 1996. Pub. No. 96-204.

5. USDA. 1997 Census of Agriculture Farm Numbers, Land in Farms, and Average Size of Farms. Internet address: http://www.nass.usda.gov/census/census97/county/farms/index.html

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Grain Elevators: Terminal

SCC: 30200512

Table 1 - Crop Reports Reviewed

Crops	Year of Report
Corn	1997
Oats	1998
Peanuts	1999
Processed Rice	1999
Rough Rice	1999
Sorghum	1999
Soybeans	1998
Wheat	1997

Table 2 - National Emissions

Fumigant Active Ingredient	HAP	%HAP in Chemical	Volatilization Rate (%)	Amount Sprayed (1000 lbs)	Emitted (lbs)	# of States
Aluminum Phosphide	Phosphine	60.00%	100	143.83	86,300	1
Captan	Captan	100.00%	35	79.43	27,800	29
Lindane	Lindane	100.00%	35	25.14	8,799	3
Methyl Bromide	Methyl Bromide	100.00%	58	64.47	37,394	18

$$\text{County Emissions} = \frac{\text{Amount Chemical Sprayed} * \%\text{ HAP in Chemical} * \%\text{ Volatilization} * \text{County Farm Acres}}{\text{State Farm Acres}}$$

Example Calculation:

In 1999, fumigants containining aluminum phosphide was applied to peanuts in North Carolina (NC).
The total aluminum phosphide applied in NC was 260.43 lbs.

Wake County, NC contains 113,201 acres of farm; North Carolina contains 9,122,379 acres of farm

$$\text{Wake County, NC Phosphine Emissions} = \frac{\text{Aluminum Phosphide Sprayed in NC (lbs)} * \%\text{ HAP} * \text{Vol. Rate (\%)} * \text{Wake County Farm Acres}}{\text{NC Acres Farm}}$$

$$\text{Wake County, NC Phosphine Emissions} = \frac{260.43 \text{ lbs sprayed} * 60\% \text{ Phosphine} * 100\% \text{ vol. rate.} * 113{,}201 \text{ farm acres in Wake County}}{9{,}122{,}379 \text{ farm acres in NC}}$$

Wake County, NC Phosphine Emissions = 1.939 lbs Phosphine

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Graphic Arts

SCC: 2425000000

The national emissions estimates for hazardous air pollutants from the graphic arts industry were developed by a per capita emission methodology using national population[1,2] to obtain VOC emissions. HAP speciation factors and emission factor data[3,4,5] were applied to the VOC emissions.

The following chemicals were included for this source category: toluene, toluene diisoyanate, dibutyl phthalate, diethylene glycol monomethyl ether, methyl ethyl ketone, and methyl isobutyl ketone.

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[6] for SIC Code 2754, Commercial Printing: Gravure. Refer to Appendices C and E for more details on this allocation.

References

1. U.S. Environmental Protection Agency. EIIP Volume III, Chapter 7 *Graphic Arts*. 1996.

2. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program*. Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

3. U.S. Environmental Protection Agency. Speciate 3.1. Profile 1086. July 11, 2001.

4. Great Lakes Commission. *1997 Inventory of Toxic Air Emissions: Point, Area, and Mobile, Appendix Q - Graphic Arts*. GLC. April 2001. (Internet address: http://www.glc.org)

5. U.S. Environmental Protection Agency. Speciate 3.1. Profile 1191. Species profiles developed by Radian Coorporation. September 1987.

6. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Graphic Arts

SCC: 2425000000

National emissions estimates for 1999 were obtained by multiplying national population (Ref. 2) by a VOC emission factor.(Ref. 1)

272,690,813 people * 0.00065 tons VOC per capita = 177,249.03 tons VOC

HAP speciation data was used to allocate VOC emissions.

HAP	Speciation %	Tons VOC	tons emitted	Reference
Toluene	6.48%	177,249.03	11485.74	4
Dibuthyl Phthalate	10.00%	177,249.03	17723.13	4
Toluene Diisoyanate	0.03%	177,249.03	53.17	4
Methyl Carbitol	0.04%	177,249.03	70.90	5
Methyl Ethyl Ketone	54.27%	177,249.03	96193.05	3
Methyl Isobutyl Ketone	14.78%	177,249.03	26197.41	3

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Halogenated Solvent Cleaners

SCC: 2415000000

The 1999 national Halogenated Solvents Cleaners emissions were estimated by taking the 1990 baseline emissions[1] and accounting for the expected MACT reductions[2]. Total baseline emissions for methylene chloride, tetrachloroethylene, methyl chloroform, and trichloroethylene were 141,735 tons per year, and the expected reduction for major and area sources for the four HAPs are 85,300 tons per year. The use and demand of halogenated solvent cleaners have leveled out in the late 1990s[3]. The area emissions were estimated by multiplying total emissions by 30%[4].

Area emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[5] for numerous SIC codes related to commercial and industrial sources. Refer to Appendices C and E for more details on this allocation.

References

1. U.S. EPA National Emission Standards for Hazardous Air Pollutants: Halogenated Solvent Cleaning- Background Information Document. EPA-453/R-93-054. Office of Air Quality Planning and Standards. November 1993.

2. Fact Sheet Halogenated Solvent Cleaning Machine NESHAP, http://www.epa.gov/ttnatw01/hscfacts.hmtl Accessed June 29, 2001.

3. Methylene Chloride, Perchloroethylene, 1,1,1-Trichloroethane, and Trichloroethylene Reporting from Mannsville Chemcial Products Copr. Adams, NY Supplied by Halogenated Solvents Industry Alliance, Inc. 1999.

4. U.S. EPA. Documentation for the 1996 Base Year National Toxics Inventory for Area Sources. US Environmental Protection Agency. Research Triangle Park, NC. 2001

5. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Halogenated Solvent Cleaners

SCC: 2415000000

Hazardous Air Pollutant	Total Baseline Emissions Mg/yr [1]	Total Baseline Emissions Tons/yr	% Pollutant of Total Emissions	1999 Total Emissions Tons/yr	1999 Area Emissions Tons/yr
Methylene Chloride	8,700.00	9,590.11	6.77	3,818.51	1,145.55
Perchloroethylene (Tetrachloroethylene)	10,770.00	11,871.89	8.38	4,727.06	1,418.12
1,1,1-Trichloroethane (Methyl Chloroform)	72,180.00	79,564.83	56.14	31,680.50	9,504.15
Trichloroethylene	36,930.00	40,708.36	28.72	16,208.93	4,862.68
Total	128,580	141,735	100.00	56,435	16,930.50

Sample Calculations for Methylene Chloride:

Total Baseline Emission (Tons/yr) = Total Baseline Emission (Mg/yr) * 1.102311311 (Tons/Mg)
= 8,700 (Mg/yr) * 1.102311311 (Tons/Mg)
= 9,590 (Tons/yr)

Total 1999 Emissions = Total Baseline Emissions - Reduction [2]
= 141,735 tons/yr - 85,300 tons/yr
= 56,435 tons/yr

Methylene Chloride = % Pollutant of Total Emissions * Total 1999 Emissions
= 6.77% * 56,435
= 3,818.51 tons per year

Area Emissions = 30% * Total Methylene Chloride Emissions
= 1145.554 tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Hard Chromium Electroplating

SCC: 2309100010

The chromium emission estimates from Hard Chromium Electroplating for 1993 were 159.6 tons[1], and the activity level has been assumed to be steady. The Federal Register indicates that these emissions are from small (< 60 million ampere-hours) and large plants (≥ 60 million ampere-hours). The 1999 emission estimates are subject to the MACT standards were presumed to be in compliance and impose a 99% reduction using control technology[2] on major and area sources. The area emission estimates is 95% of the total emission estimates.

Hard Chromium Electroplating = (Small Plant Emissions + Large Plant Emissions)* (100% - 99% reduction)*(95% area)
= (20.30 tons/yr +139.30 tons/yr) *(0.01)*(0.95)
= 1.5162 tons/yr

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for SIC Code 3471, Plating and Polishing. Refer to Appendices C and E for more details on this allocation.

References

1. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks. Federal Register 58. Page 65768 and 65786. December 16, 1993.

2. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks; Final Rule. Federal Register 60. Page 4955-56. January 25, 1995.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Hospital Sterilization

SCC: 2850000010

National estimates of emissions of ethylene oxide from hospital sterilization were provided by the Ethylene Oxide Industry Council[1]. In 1999, 215 tons of ethylene oxide were sold to hospitals by approved technical registrants. Only technical registrants may sell ethylene oxide to hospitals for sterilization use. It is assumed that all the ethylene oxide used is released into the atmosphere.

Emissions were allocated to the county-level by estimating the number of hospital beds in each county. This was done by taking the number of hospital beds by state, and apportioning these numbers by hospital employment, as reported to the 1999 County Business Patterns[3] for SIC Code 8060, Hospitals. Refer to Appendices C and E for more details on this allocation.

References

1. Conviser, Steve. Response to request for information regarding the amount of ethylene oxide sold to hospitals by technical registrants. Ethylene Oxide Industry Council. June 2001.

2. AHA. Advancing Health in America. Information provided via facsimile to ERG on June 5, 2001.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Human Cremation

SCC: 2810060200

The 1999 national emission estimates for "Human Cremation" were developed by multiplying an emission factor by a national activity estimate. Emission factors for arsenic, beryllium, chromium, formaldehyde, nickel, and POM (as 7 and 16 PAH) were taken from the State of California Air Resources Board Test Report No. C-90-004 for an average body weight of 150 pounds[1]. The emission factor used for formaldehyde was reported in the USEPA FIRE System Database[2]. Emission factors used for mercury, cadmium, hydrogen chloride, lead, total dioxins, and dibenzofurans were taken from a nine-run test conducted at the Woodlawn Cemetery for an average body weight of 168 pounds[3].

National activity was provided by the Emission Standards Division[4]. According to the Cremation Association of North America 25.39 percent of the 2,345,702 deaths in the United States in 1999 were cremated[5]. Emissions were allocated to the state-level by the number of cremations by state[5], and then to the county-level by the county proportion of the state population[6].

References:

1. State of California Air Resources Board, Engineering Evaluation Branch, Monitoring and Laboratory Division. "Evaluation Test on Two Propane Fired Crematories at Camellia Lawn Cemetery." Test Report No. C-90-004. October 29, 1992.

2. U.S. Environmental Protection Agency. Factor Information Retrieval (FIRE) System Database, Version 6.23. Research Triangle Park, North Carolina. October 2000.

3. U.S. Environmental Protection Agency. Emission Test Evaluation of a Crematory at Woodlawn Cemetery in the Bonx, NY. Final Test Report, Vol. 1. Office of Air Quality Planning and Standard Emission Measurement Center. Research Triangle Park, NC. September 1999.

4. Crume, Richard, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. EPA/Emissions Monitoring and Analysis Division. Comments on Human and Animal Cremation information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources – Interim Final Report," September 18, 1998. October 30, 1998.

5. Cremation Association of North America. 1999 Statistics as found on the Cremation Association of North America webpage: http://www.cremationassociation.org/html/statistics.html

6. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program*. Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Human Cremation

SCC: 2810060200

Pollutant	Emission Factor (lb/ton cremated)	Emission Factor Reference	National Activity Level (Reference 1, 2, 5) (tons cremated/year)	National Emissions (tons/year)
arsenic	4.00E-04	Reference 1	4.47E+04	8.93E-03
beryllium	1.84E-05	Reference 1	4.47E+04	4.11E-04
cadmium	1.46E-03	Reference 3	4.47E+04	3.27E-02
chromium	3.99E-04	Reference 1	4.47E+04	8.90E-03
Dioxins, total (non-TEQ)	7.74E-08	Reference 3	4.47E+04	1.73E-06
formaldehyde	2.89E-09	Reference 2	4.47E+04	6.46E-08
furans, (Dibenzofurans)	1.43E-07	Reference 3	4.47E+04	3.20E-06
hydrogen chloride	1.97E+00	Reference 3	4.47E+04	4.40E+01
lead	9.39E-03	Reference 3	4.47E+04	2.10E-01
mercury	5.32E-03	Reference 3	4.47E+04	1.19E-01
nickel	5.09E-04	Reference 1	4.47E+04	1.14E-02
POM as 7-PAH	1.03E-09	Reference 1	4.47E+04	2.30E-08
POM as 16-PAH	9.63E-04	Reference 1	4.47E+04	2.15E-02

Activity Level Calculation:
Assume each body weighs 150 lbs.
1999 Deaths in the U.S. = 2,345,702
1999 percentage of bodies cremated in the U.S. = 25.39

1999 Activity, tons/yr= 1999 deaths x fraction cremated x body weight x ton/lb
1999 Activity, tons/yr= 4.47E+04

Sample Calculation

Los Angelos County, CA Formaldehyde Emissions = National Formaldehyde Emissions * $\frac{\text{(number of cremations in Los Angelos County)}}{\text{(total number of U.S. cremations)}}$

Los Angelos County, CA Formaldehyde Emissions = 6.46E-08 tons per year * $\frac{29{,}255 \text{ cremations}}{595{,}611 \text{ cremations}}$

Los Angelos County, CA Formaldehyde Emissions = 3.173 E-09 tons per year

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Institutional/Commercial Heating: Distillate Oil

SCC: 2103004000

The activity data used for calculating the HAP estimates for institutional/commercial sources heating distillate oil were taken from the Energy Information Administration[1]. In 1999, 417 million MMBTUs of distillate oil were consumed for institutional/commercial heating.

The Emission Standards Division[2] supplied emission factors for acetaldehyde, arsenic, benzene, beryllium, cadmium, chromium, formaldehyde, lead, manganese, mercury, nickel, selenium, and individual PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b,k) fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene).

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for numerous SIC codes relating to institutional/commercial sources. Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001.
   Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

2. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. EPA/Emissions Monitoring and Analysis Division. Comments on Commercial/Institutional Heating information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources -- Interim Final Report," September 18, 1998. November 13, 1998.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Institutional/Commercial Heating: Distillate Oil

SCC: 2103004000

Pollutant	Emission Factor (lb/MM Btu Oil)	Emission Factor Reference	National Activity Level (Reference 1) (MM Btu oil burned/year)	National Emissions (tons/year)
acenaphthene	1.5E-07	Reference 2, 3	4.17E+08	3.14E-02
acenaphtylene	1.8E-09	Reference 2, 3	4.17E+08	3.76E-04
acetaldehyde	3.5E-05	Reference 2	4.17E+08	7.29E+00
anthracene	8.7E-09	Reference 2, 3	4.17E+08	1.82E-03
arsenic	4.0E-06	Reference 2, 3	4.17E+08	8.33E-01
benz(a)anthracene	2.9E-08	Reference 2, 3	4.17E+08	5.97E-03
benzene	1.5E-06	Reference 2, 3	4.17E+08	3.12E-01
benzo(b,k)fluoranthene	1.1E-08	Reference 2, 3	4.17E+08	2.20E-03
benzo(g,h,i)perylene	1.6E-08	Reference 2, 3	4.17E+08	3.36E-03
beryllium	3.0E-06	Reference 2, 3	4.17E+08	6.25E-01
cadmium	3.0E-06	Reference 2, 3	4.17E+08	6.25E-01
chromium	3.0E-06	Reference 2, 3	4.17E+08	6.25E-01
chrysene	1.7E-08	Reference 2, 3	4.17E+08	3.54E-03
dibenzo(a,h)anthracene	1.2E-08	Reference 2, 3	4.17E+08	2.48E-03
fluoranthene	3.5E-08	Reference 2, 3	4.17E+08	7.20E-03
fluorene	3.2E-08	Reference 2, 3	4.17E+08	6.65E-03
formaldehyde	2.4E-04	Reference 2, 3	4.17E+08	5.00E+01
indeno(1,2,3-cd)pyrene	1.5E-08	Reference 2, 3	4.17E+08	3.18E-03
lead	9.0E-06	Reference 2, 3	4.17E+08	1.87E+00
manganese	6.0E-06	Reference 2, 3	4.17E+08	1.25E+00
mercury	3.0E-06	Reference 2, 3	4.17E+08	6.25E-01
naphthalene	8.1E-06	Reference 2, 3	4.17E+08	1.68E+00
nickel	3.0E-06	Reference 2, 3	4.17E+08	6.25E-01
phenanthrene	7.5E-08	Reference 2, 3	4.17E+08	1.56E-02
pyrene	3.0E-08	Reference 2, 3	4.17E+08	6.32E-03
selenium	1.5E-05	Reference 2, 3	4.17E+08	3.12E+00

Example Calculation

National Emissions (tons/year) = [Emission Factor (lb/MM Btu Oil)*National Activity Level (MM Btu oil burned/year)] / 2000 (lb/ton)

National pyrene emissions = (0.00000003*417000000)/2000 = .0063

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Institutional/Commercial Heating: Natural Gas

SCC: 2103006000

The activity level for institutional/commercial sources heating natural gas comes from the Energy Information Administration[1]. In 1999, 3.14 billion MMBTUs of natural gas were consumed for institutional/commercial heating.

The Emission Standards Division[2] provided emission factors for acetaldehyde, benzene, formaldehyde, and individual PAHs (fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene).

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for numerous SIC codes relating to institutional/commercial sources. Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001.
   Internet Address:http://www.eia.doe.gov/emeu/sedr/contents.html

2. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. EPA/Emissions Monitoring and Analysis Division. Comments on Commercial/Institutional Heating information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources -- Interim Final Report," September 18, 1998. November 13, 1998.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

Pollutant	Emission Factor (lb/MM Btu NG)	Emission Factor Reference	National Activity Level (Reference 1) (MM Btu NG burned/year)	National Emissions (tons/year)
acetaldehyde	1.3E-08	Reference 2	3.14E+09	2.04E-02
benzene	2.1E-06	Reference 2, 3	3.14E+09	3.29E+00
formaldehyde	7.5E-05	Reference 2, 3	3.14E+09	1.18E+02
fluoranthene	3.0E-09	Reference 2, 3	3.14E+09	4.70E-03
fluorene	2.8E-09	Reference 2, 3	3.14E+09	4.39E-03
naphthalene	6.1E-07	Reference 2, 3	3.14E+09	9.56E-01
phenanthrene	1.7E-08	Reference 2, 3	3.14E+09	2.67E-02
pyrene	5.00E-09	Reference 2, 3	3.14E+09	7.84E-03

Example Calculation

National Emissions (tons/year) = [Emission Factor (lb/MM NG burned)*National Activity Level (MM NG burned/year)] / 2000 (lb/ton)

National pyrene emissions = (0.000000005*3140000000)/2000 = .00784

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Institutional/Commercial Heating: Residual Oil

SCC: 2103005000

The activity data used to estimate the HAP emissions from institutional/commercial sources heating residual oil were provided from the Energy Information Administration[1]. In 1999, 88 million MMBTUs of residual oil were consumed from institutional/commercial heating.

The Emission Standards Division[2] supplied emission factors for acetaldehyde, arsenic, benzene, beryllium, cadmium, chromium, formaldehyde, lead, manganese, mercury, nickel, selenium, and individual PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b,k) fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene).

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for numerous SIC codes relating to institutional/commercial sources. Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001.
   Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

2. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S. EPA/Emissions Monitoring and Analysis Division. Comments on Commercial/Institutional Heating information in the "Baseline Emission Inventory of HAP Emissions from MACT Sources -- Interim Final Report," September 18, 1998. November 13, 1998.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Institutional/Commercial Heating: Residual Oil

SCC: 2103005000

Pollutant	Emission Factor (lb/MM Btu Oil)	Emission Factor Reference	National Activity Level (Reference 1) (MM Btu oil burned/year)	National Emissions (tons/year)
acenaphthene	1.5E-07	Reference 2, 3	8.80E+07	6.63E-03
acenaphthylene	1.8E-09	Reference 2, 3	8.80E+07	7.95E-05
acetaldehyde	3.5E-05	Reference 2	8.80E+07	1.54E+00
anthracene	8.7E-09	Reference 2, 3	8.80E+07	3.83E-04
arsenic	9.4E-06	Reference 2, 3	8.80E+07	4.14E-01
benz(a)anthracene	2.9E-08	Reference 2, 3	8.80E+07	1.26E-03
benzene	1.5E-06	Reference 2, 3	8.80E+07	6.60E-02
benzo(b,k)fluoranthene	1.1E-08	Reference 2, 3	8.80E+07	4.65E-04
benzo(g,h,i)perylene	1.6E-08	Reference 2, 3	8.80E+07	7.10E-04
beryllium	2.0E-07	Reference 2, 3	8.80E+07	8.80E-03
cadmium	2.8E-06	Reference 2, 3	8.80E+07	1.23E-01
chromium	6.0E-06	Reference 2, 3	8.80E+07	2.64E-01
chrysene	1.7E-08	Reference 2, 3	8.80E+07	7.48E-04
dibenzo(a,h)anthracene	1.2E-08	Reference 2, 3	8.80E+07	5.25E-04
fluoranthene	3.5E-08	Reference 2, 3	8.80E+07	1.52E-03
fluorene	3.2E-08	Reference 2, 3	8.80E+07	1.40E-03
formaldehyde	2.4E-04	Reference 2, 3	8.80E+07	1.06E+01
indeno(1,2,3-cd)pyrene	1.5E-08	Reference 2, 3	8.80E+07	6.73E-04
lead	1.1E-05	Reference 2, 3	8.80E+07	4.84E-01
manganese	2.1E-05	Reference 2, 3	8.80E+07	9.24E-01
mercury	8.1E-07	Reference 2, 3	8.80E+07	3.56E-02
naphthalene	8.1E-06	Reference 2, 3	8.80E+07	3.55E-01
nickel	6.0E-04	Reference 2, 3	8.80E+07	2.64E+01
phenanthrene	7.5E-08	Reference 2, 3	8.80E+07	3.30E-03
pyrene	3.0E-08	Reference 2, 3	8.80E+07	1.34E-03
selenium	4.9E-06	Reference 2, 3	8.80E+07	2.16E-01

Example Calculation

National Emissions (tons/year) = [Emission Factor (lb/MM oil burned)*National Activity Level (MM oil burned/year)] / 2000 (lb/ton)

National pyrene emissions = (0.00000003*88000000)/2000 = 0.00134

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Lamp Breakage

SCC: 2861000000

In 1999, 620 million lamps containing 17 tons of mercury were either discarded into landfills or recycled[1]. It is estimated that 85% of broken lamps were sent to landfills, and 15% were recycled[1]. Mercury emissions are not subject to the proposed Municipal Solid Waste Landfills MACT[2], and any control devices required by the MACT do not effectively control mercury emissions[3].

EPA estimates that of all lamps sent to landfills, only 6.6% of the mercury contained in the lamps is released into the atmosphere[4].

Emissions estimate:

17 tons Hg x 0.85 = 14.45 tons Hg discarded to landfills

14.45 tons Hg discarded x 0.066 = 0.95 tons released from discarded lamps

Mercury emissions are allocated to the county-level by county proportion of the national population[5] for counties that are reporting landfill emissions in the 1999 point NEI for HAPs[6].

References:

1. National Electrical Manufacturer's Association, "Environmental Impact Analysis: Spent Mercury-Containing Lamps." January 2000.

2. National Emission Standards for Hazardous Air Pollutants: Proposed Standards for Municipal Solid Waste Landfills. Federal Register 58. Pages 66672-66685.

3. 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

4. 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.

5. U.S. Census Bureau, Population Division. January 2, 2001. Population Estimates Program. Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Forest and Wildfires

SCC: 2810001000

Acres burned data were obtained at the State-level from the following sources: a) U.S. Department of Interior (DOI) Bureau of Land Management (BLM); b) the National Parks Service (NPS); c) the Fish and Wildlife Service (FWS); d) U.S. Forest Service (USFS); and e) State/private lands (from USFS). DOI's Bureau of Indian Affairs (BIA) provided activity at the regional-level.

The state-level activity data was then allocated to the county-level. This was done using Version 2 of the Biogenic Emissions Land cover Database (BELD2) within EPA's Biogenic Emission Inventory System (BEIS). {BELD2 land cover type acreage for rural and urban forest categories + the acreage for brush and grass in the miscellaneous category}.

BIA regional data was first used to proportion emissions to the State-level using the number of acres of tribal land in each State. Activity from all the above agencies was then totaled by State and allocated to the county-level with the BELD2 factors. Exception: BELD2 does not contain land cover data for AK and HI, so State to county factors were derived from data contained in the allocation factor file used for the 1996 NTI for these two States.

Emission factors from a Ward and Peterson study[1] and an EPA report[2] and state-specific fuel consumption factors (i.e, the amount actually consumed in the fire) in a report prepared for EPA[3] were used to estimate county-level emissions for 30 HAPs from the allocated activity. State-level fuel consumption factors used were (ton/acre):

Alabama	10.1	Kentucky	3.3	North Dakota	0.5
Alaska	16	Louisiana	9.1	Ohio	3
Arizona	17.7	Maine	27.8	Oklahoma	2.7
Arkansas	10.1	Maryland	5.4	Oregon	12.5
California	15.5	Massachusetts	24	Pennsylvania	3.2
Colorado	12.6	Michigan	10.1	Rhode Island	3.1
Connecticut	3.1	Minnesota	13.6	South Carolina	9.6
Delaware	7.7	Mississippi	9.7	South Dakota	1.3
District of Columbia	3.1	Missouri	2.7	Tennessee	4.3
Florida	19.7	Montana	4.7	Texas	3.5
Georgia	13.2	Nebraska	1.1	Utah	9.6
Hawaii	15.5	Nevada	3	Vermont	51.3
Idaho	8.1	New Hampshire	33.4	Virginia	7.7
Illinois	3.1	New Jersey	11.6	Washington	2.6
Indiana	2.4	New Mexico	14.1	West Virginia	4.8
Iowa	2.8	New York	20.3	Wisconsin	7.4
Kansas	1	North Carolina	9.6	Wyoming	5

Total activity of wildfires burned in the U.S. = 119,750,070 tons.

It was assumed that 75% of the combustion phase is under flaming conditions, while 25% is under smoldering conditions[2].

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Forest and Wildfires

SCC: 2810001000

Pollutant	Flaming Emission Factor (lb/ton)	Smoldering Emission Factor (lb/ton)	Emissions (lbs)
1,3-butadiene	0.24	0.9	48,498,778
2,3,7,8-TCDD TEQ	0.000000002	0.000000002	0.240
acetaldehyde	0.473	0.214	48,887,966
acrolein	0.468	0.292	50,774,030
anthracene	0.005	0.005	598,750
benz(a)anthracene	0.0062	0.0062	742,450
benzene	0.66	2.52	134,718,829
benzo(a)fluoranthene	0.0026	0.0026	311,350
benzo(a)pyrene	0.00148	0.00148	177,230
benzo(c)phenanthrene	0.0039	0.0039	467,025
benzo(e)pyrene	0.00266	0.00266	318,535
benzo(ghi)perylene	0.00508	0.00508	608,330
benzo(k)fluoranthene	0.0026	0.0026	311,350
benzofluoranthenes	0.00514	0.00514	615,515
carbonyl sulfide	0.000534	0.000534	63,947
chrysene	0.0062	0.0062	742,450
fluoranthene	0.00673	0.00673	805,918
formaldehyde	1.5	5.8	308,356,430
indeno(1,2,3-cd)pyrene	0.00341	0.00341	408,348
methyl chloride	0.0101	0.483	15,366,928
methylanthracene	0.00823	0.00823	985,543
methylbenzopyrenes	0.00296	0.00296	354,460
methylchrysene	0.0079	0.0079	946,026
methylpyrene, -fluoranthene	0.00905	0.00905	1,083,738
n-hexane	0.0189	0.00891	1,964,201
o,m,p-xylene	0.279	0.131	28,979,517
perylene	0.000856	0.000856	102,506
phenanthrene	0.005	0.005	598,750
pyrene	0.00929	0.00929	1,112,478
toluene	0.655	0.308	68.047,977

(Overall emission factors populated in the data files were weighted 75% for flaming and 25% for smoldering.)

Example calculation for national-level 1,3-butadiene emissions:

Emissions = (119,750,070 tons wildfire burned) *[(0.24 lb 1,3-butadiene emitted during flaming conditions/ton burned)*(75% flaming conditions) + (0.9 lb 1,3-butadiene emitted during smoldering conditions/ton burned)*(25% smoldering conditions)

Emissions = (119,750,070)*(0.18 + 0.225) = **48,498,778** lb 1,3-butadiene

References

1. Ward, D., Peterson, J., and Hao, W. An Inventory of Particulate Matter and Air Toxic Emissions from Prescribed Fires in the U.S. For 1989. U.S. Forest Service. Missoula, MT , and the Wood Chemistry Laboratory, School of Forestry, University of Montana, Missoula, MT

2. U.S. EPA. National Urban Area Source Emissions of Benzene, 1,3-Butadiene, Formaldehyde, Trichloroethylene, Perchloroethylene, Methylene Chloride, and Carbon Tetrachloride. Final Report. RTP, NC March 1996.

3. EC/R. Data Needs and Availability for Wildland Fire Emission Inventories - Short-term Improvements to the Wildland Fire Component of the National Emissions Inventory. Prepared for T. Pace, EPA/EFIG. June 5, 2003.

The number of acres disturbed by residential, non-residential and roadway construction are estimated and then these values are added together to obtain a county-level estimate of total acres disturbed by land-clearing. County-level emissions from land clearing debris are then calculated by multiplying the total acres disturbed by construction by a weighted consumption factor and emission factor.

The BELD2 data base in BEIS was used to determine the number of acres of hardwoods, softwoods, and grasses in each county. Average consumption factors were weighted according to the percent contribution of each type of vegetation class to the total land area for each county. The consumption factors for slash hardwood and slash softwood were further adjusted by a factor of 1.5 to account for the mass of tree that is below the soil surface that would also be subject to burning once the land is cleared. Average consumption factors are as follows:

Fuel type	Fuel consumption factor (tons/acre)
Hardwood	99
Softwood	57
Grass	4.5

Emission Factors

HAP emission factors were obtained from an EIIP document (*Emission Inventory Improvement Program, Volume III: Chapter 16: Open Burning*, 2001). Table 1 presents the HAP emissions factor values used.

Total Activity Land Clearing = 17,740.36254 tons

Pollutant	CAS#	Emission Factor (lb/ton)	Emissions (lb)
2-butanone (methyl ethyl ketone)	78933	0.067	1,189
Cumene	98828	0.01325	235
Dibenzofuran	132649	0.00675	120
Ethyl benzene	100414	0.048	852
Phenol	108952	0.115	2,040
Styrene	100425	0.1015	1,801

Adjustments

It was assumed that little or no land-clearing activity occurs in highly urbanized counties due to local burning bans. Therefore, emissions allocated to counties with at least 80% of their population living in cities and towns (according to the 2000 census) were removed from the inventory.

Acres burned data were obtained at the State-level from the following sources: a) U.S. Department of Interior (DOI) Bureau of Land Management (BLM); b) the National Parks Service (NPS); c) the Fish and Wildlife Service (FWS); d) U.S. Forest Service (USFS); and e) State/private lands (from USFS). DOI's Bureau of Indian Affairs (BIA) provided activity at the regional-level.

The state-level activity data was then allocated to the county-level. This was done using Version 2 of the Biogenic Emissions Land cover Database (BELD2) within EPA's Biogenic Emission Inventory System (BEIS). {BELD2 land cover type acreage for rural and urban forest categories + the acreage for brush and grass in the miscellaneous category}.

BIA regional data was first used to proportion emissions to the State-level using the number of acres of tribal land in each State. Activity from all the above agencies was then totaled by State and allocated to the county-level with the BELD2 factors. Exception: BELD2 does not contain land cover data for AK and HI, so State to county factors were derived from data contained in the allocation factor file used for the 1996 NTI for these two States.

Emission factors from a Ward and Peterson study[1] and an EPA report[2] and state-level fuel consumption factors (i.e., the amount actually consumed in the fire) in a report prepared for EPA[3] were used to estimate county-level emissions for 30 HAPs from the allocated activity. State-level fuel consumption factors used were (ton/acre):

Alabama	7.5	Kentucky	3	North Dakota	2.8
Alaska	12.6	Louisiana	6.6	Ohio	2.9
Arizona	8.7	Maine	11	Oklahoma	2.3
Arkansas	6.8	Maryland	4.4	Oregon	8.6
California	6.3	Massachusetts	9.8	Pennsylvania	3.1
Colorado	6.9	Michigan	5.2	Rhode Island	3.1
Connecticut	3.1	Minnesota	6.3	South Carolina	6.7
Delaware	7.5	Mississippi	7.1	South Dakota	3.5
District of Columbia	3.1	Missouri	2.6	Tennessee	3.5
Florida	17.2	Montana	9.3	Texas	2.9
Georgia	9.9	Nebraska	1.1	Utah	3
Hawaii	6.3	Nevada	5.7	Vermont	18.5
Idaho	12.3	New Hampshire	12.8	Virginia	5.6
Illinois	3	New Jersey	11.3	Washington	4.5
Indiana	2.4	New Mexico	6.4	West Virginia	4
Iowa	2.8	New York	8.6	Wisconsin	4.3
Kansas	1	North Carolina	6.7	Wyoming	4.5

Total activity of Prescribed Burning in the U.S. = 33,382,406 tons.

It was assumed that 75% of the combustion phase is under flaming conditions, while 25% is under smoldering conditions[2].

SCC: 2810015000

Pollutant	Flaming Emission Factor (lb/ton)	Smoldering Emission Factor (lb/ton)	Emissions (lbs)
1,3-butadiene	0.24	0.9	13,519,874
2,3,7,8-TCDD TEQ	0.000000002	0.000000002	0.0668
acetaldehyde	0.473	0.214	13,628,367
acrolein	0.468	0.292	14,154,140
anthracene	0.005	0.005	166,912
benz(a)anthracene	0.0062	0.0062	206,971
benzene	0.66	2.52	37,555,207
benzo(a)fluoranthene	0.0026	0.0026	86,794
benzo(a)pyrene	0.00148	0.00148	49,406
benzo(c)phenanthrene	0.0039	0.0039	130,191
benzo(e)pyrene	0.00266	0.00266	88,797
benzo(ghi)perylene	0.00508	0.00508	169,583
benzo(k)fluoranthene	0.0026	0.0026	86,794
benzofluoranthenes	0.00514	0.00514	171,586
carbonyl sulfide	0.000534	0.000534	17,826
chrysene	0.0062	0.0062	206,971
fluoranthene	0.00673	0.00673	224,664
formaldehyde	1.5	5.8	85,959,695
indeno(1,2,3-cd)pyrene	0.00341	0.00341	113,834
methyl chloride	0.0101	0.483	4,283,797
methylanthracene	0.00823	0.00823	274,737
methylbenzopyrenes	0.00296	0.00296	98,812
methylchrysene	0.0079	0.0079	263,721
methylpyrene, -fluoranthene	0.00905	0.00905	302,111
n-hexane	0.0189	0.00891	547,555
o,m,p-xylene	0.279	0.131	8,078,542
perylene	0.000856	0.000856	28,575
phenanthrene	0.005	0.005	166,912
pyrene	0.00929	0.00929	310,123
toluene	0.655	0.308	18,969,552

(Overall emission factors populated in the data files were weighted 75% for flaming and 25% for smoldering.)

Example calculation for national-level 1,3-butadiene emissions:

Emissions = (33,382,406 tons burned) *[(0.24 lb 1,3-butadiene emitted during flaming conditions/ton burned)*(75% flaming conditions) + (0.9 lb 1,3-butadiene emitted during smoldering conditions/ton burned)*(25% smoldering conditions)

Emissions = (33,382,406)*(0.18 + 0.225) = **13,519,874** lb 1,3-butadiene

References

1. Ward, D., Peterson, J., and Hao, W. An Inventory of Particulate Matter and Air Toxic Emissions from Prescribed Fires in the U.S. For 1989. U.S. Forest Service. Missoula, MT , and the Wood Chemistry Laboratory, School of Forestry, University of Montana, Missoula, MT

2. U.S. EPA. National Urban Area Source Emissions of Benzene, 1,3-Butadiene, Formaldehyde, Trichloroethylene, Perchloroethylene, Methylene Chloride, and Carbon Tetrachloride. Final Report. RTP, NC March 1996.

3. EC/R. Data Needs and Availability for Wildland Fire Emission Inventories - Short-term Improvements to the Wildland Fire Component of the National Emissions Inventory. Prepared for T. Pace, EPA/EFIG. June 5, 2003.

1999 emission estimates for residential MSW burning were developed by first estimating the amount of waste generated for each county in the United States. The amount of waste generated was estimated using a national average per capita waste generation factor, which is 3.31 lbs/person/day[1]. To better reflect the actual amount of household residential waste subject to being burned, non-combustibles (glass and metals) and yard waste generation were subtracted out. This factor was then applied to the portion of the county's total population that is considered rural based on 1990 Census data on rural and urban population, since open burning is generally not practiced in urban areas.

For rural populations, it is estimated that 25 to 32 percent of the municipal waste generated is burned[2]. A median value of 28 percent was assumed for the nation, and this correction factor was applied to the total amount of waste generated.

Controls (or burning bans) were accounted for by assuming that no burning takes place in counties where the urban population exceeds 80 percent of the total population (i.e., urban plus rural). Zero open burning emissions were attributed to these counties.

County-level HAP emissions were calculated by multiplying the total amount of residential municipal solid waste burned per year by an emission factor. Emissions were developed for 32 hazardous air pollutants (HAPs)[3].

References

1. EPA, 2000. Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 1998. EPA530-F-00-024. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. April 2000.

2. TRRCPO, 1994. Emission Characteristics of Burn Barrels. Prepared by Two Rivers Regional Council of Public Officials and Patrick Engineering, Inc. for the U.S. Environmental Protection Agency, Region V. June 1994.

3. EPA, 1997. *Evaluation of Emissions from the Open Burning of Household Waste in Barrels.* EPA-600/R-97-134a. U.S. Environmental Protection Agency, Control Technology Center. November 1997.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Residential, Household Waste

SCC: 2610030000

Total Activity Burned = 9,974,879.839 tons

Pollutant	CAS#	Emission Factor (lb/ton)	Emissions (lbs)
Benzene	71432	2.48	24,737,702
Chlorobenzenes	108907	0.0008484	8,463
Dichlorobenzenes	106467	0.00032	3,192
HCl	7647010	0.568	5,665,732
HCN	74908	0.936	9,336,488
Hexachlorobenzene	118741	0.000044	439
Pentachlorobenzene	87865	0.000106	1057
Phenol	108952	0.28	2,792,966
Styrene	100425	1.48	14,762,822
Polychlorinated biphenyls	1336363	0.00572	57,056
Total OCDD	3268879	0.000076	758
Trichlorobenzenes	120821	0.00022	2,194
Total TCDF	30402143	0.0000045	45
Total PECDF	30402154	0.0000025	25
Total HXCDF	55684941	0.0000016	16
Total HPCDF	38998753	0.0000036	36
Acenapthene	83329	0.0015358	15,319
Acenaphthylene	208968	0.0226001	225,433
Anthracene	120127	0.0036634	36,542
Benzo(a)anthracene	56553	0.0044789	44,676
Benzo(a)pyrene	50328	0.0042442	42,335
Benzo(b)fluoranthene	205992	0.0052601	52,469
Benzo(ghi)perylene	191242	0.0039488	39,389
Benzo(k)fluoranthene	207089	0.0020509	20,457
Chrysene	218019	0.0050724	50,597
Dibenzo(ah)anthracene	53703	0.0006456	6,440
Fluoranthene	206440	0.0081353	81,149
Fluorene	86737	0.0073116	72,932
Indeno(123cd)pyrene	193395	0.0037544	37,450
Napthalene	91203	0.035063	349,749
Phenanthrene	85018	0.0146492	146,124
Pyrene	129000	0.0096576	96,333

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Scrap Tires

SCC: 2830000000

The 1999 National Emissions for "Open Burning: Scrap Tires" are based on the emission factors 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 1999. The following table lists the tire fires found, which also included the number of tires burned.

County Location	State	Number of Tires Burned	Percent of Total Tires	Reference
Starke County	IN	20,000	0.124	1
Stearns County	MN	100,000	0.618	2
Wyandot County	OH	4,000,000	24.7	3
York County	ME	4,000	0.0247	4
Lehigh County	PA	1,000	0.00618	5
Albany County	NY	50,000	0.309	6
Crawford County	PA	2,000	0.0124	7
Wayne County	WV	1,000	0.00618	8
Benton County	AR	1,500	0.00927	9
San Joaquin County	CA	7,000,000	43.3	10
Tarrant County	TX	40	0.000247	11
Stanislaus County	CA	5,000,000	30.9	12
	Total Tires Burned:	16,179,540		

Emissions were allocated to each of these counties by their percent total of tires that were burned. Refer to Appendices C and E for more details on this allocation

References:

(1) South Bend Tribune, December 28, 1999, p. D3

(2) Associated Press State & Local Wire, September 28. 1999

(3) The Columbus Dispatch, September 17, 1999, p. 3B

(4) Portland Press Herald, November 3, 1999, p. 2B

(5) The Morning Call, April 9, 1999, p.B7

(6) The Times Union, February 15, 1999, Three Star Edition, p. B1

(7) Associated Press State & Local Wire, February 2, 1999

(8) The Charleston Gazette, April 7, 1999, p. 3A

(9) Associated Prss State & Local Wire, February 6, 1999

(10) Los Angeles Times, April 23, 1999, Home Edition, p. A3

(11) The Fort Worth Star-Telegram, February 4, 1999, Arlington AM Edition, p. Metro 2

(12)Westly Tire Fire Filbin Tire yard, Message Fourm Ed Filbin profile, http://www.netfeed.com/~jhill/westley.htm Accessed June 21, 2001

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Scrap Tires

SCC: 2830000000

Methodology: National Activity X Emission Factor

Activity: (16,179,540 tires burned annually) X (20 lb/tire) = 161,795 tons tires burned / year

Emission Estimate:

	Pollutant	Emission Factor (lb/1000 tons burned)				Activity (1000s of tons)	National Estimate (lbs)	National Estimate (tons)
		Reference	Chunk	Shredded	Average			
METALS	Antimony	1	5.88	4.73	5.31	161.795	858.32	0.43
	Arsenic	1	0.10	0.40	0.25	161.795	40.45	0.02
	Chromium	1	3.94	3.43	3.69	161.795	596.22	0.30
	Lead	1	0.67	0.20	0.44	161.795	70.38	0.04
	Nickel	1	4.74	2.15	3.45	161.795	557.39	0.28
	Selenium	1	0.13	0.40	0.27	161.795	42.88	0.02
PAH	Acenaphthene	2	580.60	4891.40	2736.00	161.795	442,672.21	221.34
	Acenaphthylene	2	1494.50	1093.00	1293.75	161.795	209,322.80	104.66
	Anthracene	2	113.00	99.00	106.00	161.795	17,150.31	8.58
	Benzo(a)pyrene	2	170.00	227.80	198.90	161.795	32,181.11	16.09
	Benzo(b)fluoranthene	2	139.00	177.00	158.00	161.795	25,563.67	12.78
	Benzo(g,h,i)perylene	2	132.00	318.80	225.40	161.795	36,468.68	18.23
	Benzo(k)fluoranthene	2	149.00	199.00	174.00	161.795	28,152.40	14.08
	Benz(a)anthracene	2	164.00	204.80	184.40	161.795	29,835.07	14.92
	Chrysene	2	142.00	183.00	162.50	161.795	26,291.75	13.15
	Dibenzo(a,h)anthracene	2	2.20	0.00	1.10	161.795	177.97	0.09
	Fluoranthene	2	677.40	916.00	796.70	161.795	128,902.40	64.45
	Fluorene	2	521.00	373.60	447.30	161.795	72,371.08	36.19
	Indeno(1,2,3-cd)pyrene	2	103.00	171.00	137.00	161.795	22,165.97	11.08
	Naphthalene	2	1632.00	972.00	1302.00	161.795	210,657.61	105.33
	Phenanthrene	2	475.00	505.00	490.00	161.795	79,279.75	39.64
	Pyrene	2	67.60	303.40	185.50	161.795	30,013.05	15.01
OTHER HAPS	Benzene	2	4312.60	4410.00	4361.30	161.795	705,638.28	352.82
	Biphenyl	2	419.00	660.20	539.60	161.795	87,304.80	43.65
	1,3-Butadiene	2	616.80	320.00	468.40	161.795	75,784.97	37.89
	Ethyl Benzene	2	921.60	590.20	755.90	161.795	122,301.14	61.15
	Phenol	2	1.00	29.00	15.00	161.795	2,426.93	1.21
	Styrene	2	1320.00	1291.00	1305.50	161.795	211,223.89	105.61

Sample Calculation*: Antimony

(5.31 lb)		(161,795 tons of tire burned)	= 858.32 lbs of Antimony / year
(1000 tons of tire burned)		(year)	= 0.43 tons of Antimony / year

* due to rounding the estimate may not equal the exact product of the average emission factor and the activity.

(1) 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. 1995

(2) U.S. Environmental Protection Agency. *Air Emissions from Scrap Tire Combustion*. (EPA-600/R-97-115) Research Triangle Park, North Carolina. 1997

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Open Burning - Yard Waste - Leaf and Brush Species

SCC: 2610000100 & 2610000400

A national per capita waste generation average daily value of 0.56 lbs yard waste/person/day was used as the basis for yard waste open burning emissions for 1999[1]. 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. Emissions for leaves and residential brush were calculated separately, since emission factors vary by yard waste type. It was assumed that 28 percent of the total yard waste generated is burned and that burning occurs primarily in rural areas[3].

To adjust for variations in vegetation, obtained data on the percentage of forested acres from Version 2 of the Biogenic Emissions Land cover Database (BELD2) within EPA's Biogenic Emission Inventory System (BEIS). Determined the percentage of forested acres per county (including rural forest and urban forest). To better account for the native vegetation that would likely be occurring in the residential yards of farming States, we subtracted out the agricultural lands before calculating the percentage of forested acres. We then used the following ranges to make adjustments to the amount of yard waste that is assumed to be generated per county:

Percent forested acres per county	Adjustment for yard waste generated
< 10%	Zero out
>=10%, and <50%	Multiply by 50%
>=50%	Assume 100%

Controls (or burning bans) were accounted for by assuming that no burning takes place in counties where the urban population exceeds 80 percent of the total population (i.e., urban plus rural). Zero open burning emissions were attributed to these counties.

County-level HAP emissions were calculated by multiplying the total amount of residential yard waste (leaf and brush) burned per year by an emission factor. Emissions were developed for 6 hazardous air pollutants (HAPs)[2].

References

1. EPA, 2000. Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 1998. EPA530-F-00-024. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. April 2000.

2. EPA, 2001. Emission Inventory Improvement Program, Volume III: Chapter 16: Open Burning, U.S. Environmental Protection Agency. January 2001.

3. TRRCPO, 1994. Emission Characteristics of Burn Barrels. Prepared by Two Rivers Regional Council of Public Officials and Patrick Engineering, Inc. for the U.S. Environmental Protection Agency, Region V. June 1994.

Total Activity Leaf Burned = 350,548.9797 tons
Total Activity Brush Burned = 350,548.9797 tons

Emission Factors (lb/ton)

Pollutant	CAS#	Leaf Burning	Brush Burning
2-butanone (methyl ethyl ketone)	78933	0.067	0.067
Cumene	98828	0.01325	0.01325
Dibenzofuran	132649	0.00675	0.00675
Ethyl benzene	100414	0.048	0.048
Phenol	108952	0.115	0.115
Styrene	100425	0.1015	0.1015

Emissions (lb)

Pollutant	CAS#	Leaf Burning	Brush Burning
2-butanone (methyl ethyl ketone)	78933	23,487	23,487
Cumene	98828	4,645	4,645
Dibenzofuran	132649	2,366	2,366
Ethyl benzene	100414	16,826	16,826
Phenol	108952	40,313	40,313
Styrene	100425	33,581	33,581

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Perchloroethylene Dry Cleaning

SCC: 2420000055

National emissions of perchloroethylene (PCE) from dry cleaning facilities were estimated by using the total PCE consumption for 1999[1] and assuming that all the PCE consumed was emitted into the atmosphere. Emissions were then adjusted by subtracting the percent reduction value given in the EPA Final Ruling in Sept. 1993[2] for major and area sources.

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[3] for numerous SIC codes relating to the dry cleaning industry. Refer to Appendices C and E for more details on this allocation.

Emissions Estimate:

(PCE consumed in 1999) - [(44% reduction due to controls)x(PCE consumed in 1999)] = (PCE released)
31,500 tons - [44% x 31,500 tons] = 17,640 tons PCE released in 1999.

References

1. Steve Risotto. Halogenated Solvents Industry Alliance. June 6, 2001. Response to request for information regarding the consumption of PCE by the dry cleaning industry in 1999.

2. 58FR49354. National Emission Standards for Hazardous Air Pollutants for Source Categories: Perchloroethylene Dry Cleaning Facilities. Final Rule. September 22, 1993.

3. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Pesticide Application

SCC: 2461850000

The amount of pesticide applied to a crop for individual state for 1999 were obtained at the U.S. Department of Agricultural (USDA) agricultural chemical usage website[1]. A total of 64 crop application summaries (crops listed on next page) were examined for the following pesticide active ingredients, which are HAPs:

- 2,4-D;
- Captan;
- Carbaryl;
- 1,3-Dichloropropene;
- Methyl Bromide; and,
- Trifluralin.

The volatilization rates for the above active ingredients were estimated from AP-42 data disaggregated by active ingredient vapor pressures[2,3]. Chemicals with high vapor pressures (i.e., methyl bromide and 1,3-dichloropropene) were given a default volatilization rate of 58%, as derived from AP-42 emission factors. The remaining active ingredients (i.e., 2,4-D, captan, carbaryl, and trifluralin) were given a default volatilization rate of 35%, also derived from AP-42 emission factor data.

Additionally, chemicals which contain HAPs were also retrieved. For example, hexachlorobenzene (HCB) is found in the following pesticides:

- Atrazine;
- Chlorothalinol;
- DCPA;
- PCNB; and,
- Simazine

HCB content was received from the manufacturer's of these chemicals[4,5]. Based on these data, it was estimated that the HCB volatilization rate was 8.4% for all these pesticides[6].

Phosphine is contained in two pesticide active ingredients: aluminum phosphide and zinc phosphide. Using stoichiometric balance, 0.60 pounds of phosphine are created for every pound of aluminum phosphide with water sprayed; 0.53 pounds of phosphine are produced for every pound of zinc phosphide with water sprayed. It was assumed that 100% of the phosphine produced is volatilized.

Emissions were first allocated to the individual states by their reported chemical usage; state-level emissions were then allocated to the county level by the proportion emission based on county vs. state farm acres obtained from the 1997 Census of Agriculture[7].

References

1. U.S. Department of Agriculture (USDA). Agricultural Chemical Usage reports. Postharvest Applications. Internet address: usda.mannlib.cornell.edu/reports/nassr/other/pcu-bb/

2. U.S. Environmental Protection Agency. Compilation of Air Pollution Factors, AP-42. Section 9.2.2. January 1995.

3. U.S. Department of Agriculture (USDA). ARS Pesticide Properties Database. Internet address: http://wizard.arsusda.gov/acsl/listall.html

4. Memorandum from Thomas Beidler (Syngenta) to Laurel Driver (EPA), November 5, 2001. "Updated Information on HCB Contaminants in Atrazine, Simazine, and Chlorothalonil Technical Active Ingredients."

5. Personal Conversation between John Wood (AMVAC) and Regi Oommen (ERG), June 28, 2002 concerning DCPA and PCNB usage.

6. Response from Steve McMaster (Dow Elanco) to Laurel Driver (EPA), November 27, 1996. "EPA's Draft Emissions Inventory Report for Clean Air Act Section 112(c)(6) Pollutants and Source Categories."

7. USDA. 1997 Census of Agriculture Farm Numbers, Land in Farms, and Average Size of Farms. Internet address: http://www.nass.usda.gov/census/census97/county/farms/index.html

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Pesticide Application

SCC: 2461850000

Table 1

Crop Report Summaries Reviewed			
Almond	Celery	Hazelnuts	Plums
Apples	Cherries, Sweet	Lemons	Prunes
Apricots	Cherries, Tart	Limes	Pumkins
Asparagus	Collards	Melons, Cantaloupe	Raspberries
Beans, Lima, Fresh	Corn	Melons, Honeydew	Soybeans
Beans, Snap, Fresh	Corn, Sweet, Fresh	Melons, Watermelon	Squash
Beans, Snap, Processing	Corn, Sweet, Processing	Nectarines	Strawberries
Blackberries	Cucumbers, Fresh	Okra	Sunflower, All
Blueberries	Cucumbers, Pickles	Olives	Tangelo
Broccoli	Eggplant	Onions, Dry	Tangerines
Brussels Sprouts	Fall Potatoes	Oranges, excluding Temple	Temples
Cabbage, Fresh	Grapes, all	Peaches	Tomatoes, Fresh
Cabbage, Kraut	Grapes, raisin	Peanuts	Tomatoes, Processing
Carrots, Fresh	Grapes, Table	Pears	Upland Cotton
Carrots, Processing	Greens, Mustard	Peas, Green Processing	Walnuts
Cauliflower	Greens, Turnips	Peppers, Bell	Winter Wheat

Table 2

Pesticide Chemical	HAP	%HAP in Chemical	Volatilization Rate (%)	Amount Applied (1000 lbs)	Emitted (lbs)	# of States
Dichloropropene	1,3-Dichloropropene	100.00%	58	11,578.70	6,715,646	3
2,4-D	2,4-D	100.00%	35	4,150.26	1,452,591	24
Captan	Captan	100.00%	35	2,570.95	899,832	14
Carbaryl	Carbaryl	100.00%	35	835.49	292,420	19
Atrazine	Hexachlorobenzene	0.0003%	8.4	55,103.58	13.89	22
Chlorothalonil	Hexachlorobenzene	0.005%	8.4	7,571.09	31.80	23
DCPA	Hexachlorobenzene	0.10%	8.4	93.75	7.87	2
PCNB	Hexachlorobenzene	0.05%	8.4	3,975.03	166.95	9
Simazine	Hexachlorobenzene	0.0003%	8.4	3,194.53	0.81	16
Methyl Bromide	Methyl Bromide	100.00%	58	17,575.60	10,193,848	6
Aluminum Phosphide	Phosphine	60.00%	100	6.70	4,020	1
Zinc Phosphide	Phosphine	53.00%	100	1.20	636	2
Trifluralin	Trifluralin	100.00%	35	10,559.51	3,695,828	27

$$\text{County Emissions} = \frac{\text{State Amount Chemical Applied} * \%\text{ HAP in Chemical} * \%\text{ Volatilization} * \text{County Farm Acres}}{\text{State Farm Acres}}$$

Example Calculation:

In 1999, pesticides containining captan was applied to apples, blackberries, peaches, and strawberries in North Carolina (NC). The total captan applied in NC was 115,400 lbs.

Wake County, NC contains 113,201 acres of farm; North Carolina contains 9,122,379 acres of farm

$$\text{Wake County, NC Captan Emissions} = \frac{115{,}400 \text{ lbs Captan applied} * 100\%\text{ HAP} * 35\%\text{ Vol. Rate} * 113{,}201 \text{ farm acres in Wake County}}{9{,}122{,}379 \text{ farm acres in NC}}$$

Wake County Captan Emissions = 501.21 lbs Captan

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Publicly Owned Treatment Works (POTWs)

SCC: 2630020000

The 1999 emission estimates for "Publicly Owned Treatment Works" were calculated for hazardous air pollutants (HAPs) by adjusting the 1996 area portion of the total emissions using a 1999 flowrate.

Emission estimates used for the 1999 inventory effort for this category were calculated using 1996 area estimates[1], 1996 flow rates, and then an average of projected 1998 and 2000 flow rates[2]. Flow rates are recorded in million gallons per day.

Total 1996 Publicly Owned Treatment Works emissions were reported as 32,175 million gallons per day[2]. Total 1999 Publicly Owned Treatment Works emissions are grown to reflect the 1999 flow rate of 33,905 million gallons per day, which is an average of the estimated 1998 and 2000 flow rates.

Emissions were allocated to the county-level by the county proportion of the national population[3].

References:

1. US EPA. May 2001. Memorandum from Calvin Overcash, EC/R to Bob Lucas, EPA/WCPG. "Estimation of National Area Source Emissions from POTWs." August 20, 1998.

2. US EPA 2001. US Environmental Protection Agency, Office of Wastewater Management - Facilities Database (Needs Survey). June 28, 2001. Research Triangle Park, NC (Internet Address: http://www.epa.gov/owm/faqwfd.htm).

3. U.S. Census Bureau, Population Division. January 2, 2001. Population Estimates Program. Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Publicly Owned Treatment Works (POTWs)

SCC: 2630020000

1996 Flowrate (in million gallons per day) =	32,175
1998 Flowrate (in million gallons per day) =	33,100
2000 Flowrate (in million gallons per day) =	34,710

1999 Flowrate = Average of 1998 and 2000 Flowrates
1999 Flowrate = (33,100+34,710)/2 = 33,905 million gallon per day
1999 Flowrate is used to adjust 1996 emissions. The adjustment factor is 33,905/32,175 = 1.053768

Pollutant	1996 emissions (tpy)	Adjust. Factor	1999 emissions (tpy)
1,1,2,2-Tetrachloroethane	0.12	1.053768	0.13
1,1,2-Trichloroethane	0.08	1.053768	0.08
1,2,4-Trichlorobenzene	5.92	1.053768	6.24
1,2-Dichloropropane	0.79	1.053768	0.83
1,3-Butadiene	1.72	1.053768	1.81
1,4-Dichlorobenzene	14.76	1.053768	15.55
1,4-Dioxane (1,4-Diethyleneoxide)	1.23	1.053768	1.30
2,4-Dinitrotoluene	3.3	1.053768	3.48
2-Nitropropane	0.02	1.053768	0.02
Acetaldehyde	21.27	1.053768	22.41
Acetonitrile	23.67	1.053768	24.94
Acrolein	26.3	1.053768	27.71
Acrylonitrile	26.47	1.053768	27.89
Allyl Chloride	1.33	1.053768	1.40
Benzene	461.44	1.053768	486.25
Benzyl Chloride	0.56	1.053768	0.59
Biphenyl	5.16	1.053768	5.44
Carbon Disulfide	296.41	1.053768	312.35
Carbon Tetrachloride	77.35	1.053768	81.51
Chlorobenzene	33.13	1.053768	34.91
Chloroform	441.89	1.053768	465.65
Chloroprene	1.63	1.053768	1.72
Cresols (includes o,m,p)	0.11	1.053768	0.12
Dimethyl Sulfate	0.09	1.053768	0.09
Epichlorohydrin (l-Chloro-2,3-epoxypropane)	0.31	1.053768	0.33
Ethyl Acrylate	0.12	1.053768	0.13
Ethylbenzene	525.48	1.053768	553.73
Ethylene Oxide	15.22	1.053768	16.04
Formaldehyde	1.35	1.053768	1.42
Glycol Ethers	788.86	1.053768	831.28
Hexachlorobutadiene	0.05	1.053768	0.05
Hexachlorocyclopentadiene	0.04	1.053768	0.04
Methanol	782.48	1.053768	824.55
Methyl Chloroform (1,1,1-Trichloroethane)	38.62	1.053768	40.70
Methyl Ethyl Ketone (2-Butanone)	195.16	1.053768	205.65
Methyl Isobutyl Ketone (Hexone)	184.45	1.053768	194.37
Methyl Methacrylate	21.31	1.053768	22.46
Methyl tert-Butyl Ether	4.37	1.053768	4.60
Methylene Chloride	625.92	1.053768	659.57
N,N-Dimethylaniline	22.1	1.053768	23.29
Naphthalene	90	1.053768	94.84
Nitrobenzene	0.45	1.053768	0.47
o-Toluidine	0.12	1.053768	0.13
Propionaldehyde	0.24	1.053768	0.25
Propylene Oxide	50.21	1.053768	52.91
Styrene	187.35	1.053768	197.42
Tetrachloroethylene	292.47	1.053768	308.20
Toluene	839.51	1.053768	884.65
Trichloroethylene	20.98	1.053768	22.11
Vinyl Acetate	5.25	1.053768	5.53
Vinyl Chloride	0.46	1.053768	0.48
Vinylidene Chloride	29.01	1.053768	30.57
Xylenes (includes o, m, and p)	4100.05	1.053768	4320.50

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Anthracite Coal

SCC: 2104001000

The activity level for residential coal combustion is from the State Energy Data Report[1]. Using information derived from the 112(c)(6) report, bituminous and lignite coal comprises approximately 73.5% of the total coal consumed[2]. In 1999, 1.852 million tons of coal were consumed for residential heating, of which 0.509 million tons was anthracite coal.

The Emission Standards Division[3] supplied emission factors for the following HAPs:

Acetaldehyde	Cobalt	Methyl Bromide
Acetophenone	Dioxin/Furan as 2,3,7,8-TCDD TEQ	Methyl Chloride
Acrolein	Ethylbenzene	Methyl Ethyl Ketone
Antimony	Ethylene Dichloride	Methylene Chloride
Arsenic	Formaldehyde	Nickel
Benzene	Hexane	Phenol
Beryllium	Hydrogen chloride	Propionaldehyde
Bis(2-ethylhexyl) Phthalate	Hydrogen fluoride	Selenium
Cadmium	Isophorone	Styrene
Carbon Disulfide	Lead	Tetrachloroethylene
Chlorobenzene	Manganese	Toluene
Chromium	Mercury	

Individual PAHs were calculated using the emission factors for benz[a]anthracene, benzo[b,j]fluoranthene, benzo[g,h,i]perylene, benzo[a]pyrene, chrysene, and indeno[1,2,3-c,d]pyrene, and pyrene provided in AP-42[4].

Emissions were allocated to the county-level by the county proportion of state consumption of anthracite coal for residential heating[1,5]. County-level allocation factors were calculated from census housing information compiled by EFIG.[3] Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001. Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

2. 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, Final Report. Research Triangle Park, North Carolina. 1998.

3. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S.EPA/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.

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. EFIG. 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

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Anthracite Coal

SCC: 2104001000

Pollutant	Emission Factor (lb/ton coal)	Emission Factor Reference	National Activity Level (Reference 1,2) (tons coal burned/year)	National Emissions (tons/year)
acenaphthene	5.10E-07	Reference 3	5.09E+05	1.30E-04
acenaphthylene	2.5E-07	Reference 3	5.09E+05	6.37E-05
acetaldehyde	5.7E-04	Reference 2, 3	5.09E+05	1.45E-01
acetophenone	1.5E-05	Reference 2, 3	5.09E+05	3.82E-03
acrolein	2.9E-04	Reference 2, 3	5.09E+05	7.39E-02
anthracene	2.1E-07	Reference 3	5.09E+05	5.35E-05
antimony	1.8E-05	Reference 2, 3	5.09E+05	4.58E-03
arsenic	4.1E-04	Reference 2, 3	5.09E+05	1.04E-01
benzene	1.3E-03	Reference 2, 3	5.09E+05	3.31E-01
benzo(a)anthracene	8.0E-08	Reference 3	5.09E+05	2.04E-05
benzo(a)pyrene	3.8E-08	Reference 3	5.09E+05	9.68E-06
benzo(b,j,k)fluoranthene	1.1E-07	Reference 3	5.09E+05	2.80E-05
benzo(g,h,i)perylene	2.7E-08	Reference 3	5.09E+05	6.88E-06
beryllium	2.1E-05	Reference 2, 3	5.09E+05	5.35E-03
bis(2-ethylhexyl)phthalate	7.3E-05	Reference 2, 3	5.09E+05	1.86E-02
cadmium	5.1E-05	Reference 2, 3	5.09E+05	1.30E-02
carbon disulfide	1.3E-04	Reference 2, 3	5.09E+05	3.31E-02
chlorobenzene	2.2E-05	Reference 2, 3	5.09E+05	5.60E-03
chromium	2.6E-04	Reference 2, 3	5.09E+05	6.62E-02
chrysene	1.0E-07	Reference 3	5.09E+05	2.55E-05
cobalt	1.0E-04	Reference 2, 3	5.09E+05	2.55E-02
dioxins/furans (TEQ units)	3.5E-12	Reference 2	5.09E+05	8.92E-10
ethylene dichloride	4.0E-05	Reference 2, 3	5.09E+05	1.02E-02
ethylbenzene	9.4E-05	Reference 2, 3	5.09E+05	2.39E-02
fluoranthene	7.1E-07	Reference 3	5.09E+05	1.81E-04
fluorene	9.1E-07	Reference 3	5.09E+05	2.32E-04
formaldehyde	2.4E-04	Reference 2, 3	5.09E+05	6.11E-02
hexane	6.7E-05	Reference 2, 3	5.09E+05	1.71E-02
hydrogen chloride	1.2E+00	Reference 2, 3	5.09E+05	3.06E+02
hydrogen fluoride	1.5E-01	Reference 2, 3	5.09E+05	3.82E+01
indeno(1,2,3-cd)pyrene	6.1E-08	Reference 3	5.09E+05	1.55E-05
isophorone	5.8E-04	Reference 2, 3	5.09E+05	1.48E-01
lead	4.2E-04	Reference 2, 3	5.09E+05	1.07E-01
manganese	4.9E-04	Reference 2, 3	5.09E+05	1.25E-01
mercury	8.3E-05	Reference 2, 3	5.09E+05	2.11E-02
methyl bromide	1.6E-04	Reference 2, 3	5.09E+05	4.08E-02
methyl chloride	5.3E-04	Reference 2, 3	5.09E+05	1.35E-01
methylene chloride	2.9E-04	Reference 2, 3	5.09E+05	7.39E-02
methyl ethyl ketone	3.9E-04	Reference 2, 3	5.09E+05	9.93E-02
naphthalene	1.3E-05	Reference 3	5.09E+05	3.31E-03
nickel	2.8E-04	Reference 2, 3	5.09E+05	7.13E-02
phenanthrene	2.7E-06	Reference 3	5.09E+05	6.88E-04
phenol	1.6E-05	Reference 3	5.09E+05	4.08E-03
propionaldehyde	3.8E-04	Reference 2, 3	5.09E+05	9.68E-02
pyrene	3.3E-07	Reference 3	5.09E+05	8.41E-05
selenium	1.3E-03	Reference 2, 3	5.09E+05	3.31E-01
styrene	2.5E-05	Reference 2, 3	5.09E+05	6.37E-03
tetrachloroethylene	4.3E-05	Reference 2, 3	5.09E+05	1.10E-02
toluene	2.4E-04	Reference 2, 3	5.09E+05	6.11E-02

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Bituminous and Lignite Coal

SCC: 2104002000

The activity level for residential coal combustion is from the State Energy Data Report[1]. Using information derived from the 112(c)(6) report, bituminous and lignite coal comprises approximately 73.5% of the total coal consumed[2]. In 1999, 1.852 million tons of coal were consumed for residential heating, of which 1.343 million tons was bituminous and lignite coal.

The Emission Standards Division[3] supplied emission factors for the following HAPs:

Acetaldehyde	Cobalt	Methyl Bromide
Acetophenone	Dioxin/Furan as 2,3,7,8-TCDD TEQ	Methyl Chloride
Acrolein	Ethylbenzene	Methyl Ethyl Ketone
Antimony	Ethylene Dichloride	Methylene Chloride
Arsenic	Formaldehyde	Nickel
Benzene	Hexane	Phenol
Beryllium	Hydrogen chloride	Propionaldehyde
Bis(2-ethylhexyl) Phthalate	Hydrogen fluoride	Selenium
Cadmium	Isophorone	Styrene
Carbon Disulfide	Lead	Tetrachloroethylene
Chlorobenzene	Manganese	Toluene
Chromium	Mercury	

Individual PAHs were calculated using the emission factors for benz[a]anthracene, benzo[b,j]fluoranthene, benzo[g,h,i]perylene, benzo[a]pyrene, chrysene, and indeno[1,2,3-c,d]pyrene, and pyrene provided in AP-42[4].

Emissions were allocated to the county-level by the county proportion of state consumption of bituminous and lignite coal for residential heating[1,5]. County-level allocation factors were calculated from census housing information compiled by EFIG.[5] Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001. Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

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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. EFIG. 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

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Bituminous and Lignite Coal

SCC: 2104002000

Pollutant	Emission Factor (lb/ton coal)	Emission Factor Reference	National Activity Level (Reference 1, 2) (tons coal burned/year)	National Emissions (tons/year)
acetaldehyde	5.7E-04	Reference 2, 3	1.34E+06	3.83E-01
acetophenone	1.5E-05	Reference 2, 3	1.34E+06	1.01E-02
acrolein	2.9E-04	Reference 2, 3	1.34E+06	1.95E-01
antimony	1.8E-05	Reference 2, 3	1.34E+06	1.21E-02
arsenic	4.1E-04	Reference 2, 3	1.34E+06	2.75E-01
benz[a]anthracene	8.0E-08	Reference 2, 3	1.34E+06	5.37E-05
benzene	1.3E-03	Reference 2, 3	1.34E+06	8.73E-01
benzo[e]pyrene	3.8E-08	Reference 2, 3	1.34E+06	2.55E-05
benzo[b]fluoranthene	1.1E-07	Reference 2, 3	1.34E+06	7.39E-05
benzo[g,h,i]perylene	2.7E-08	Reference 2, 3	1.34E+06	1.81E-05
beryllium	2.1E-05	Reference 2, 3	1.34E+06	1.41E-02
bis(2-ethylhexyl)phthalate	7.3E-05	Reference 2, 3	1.34E+06	4.90E-02
cadmium	5.1E-05	Reference 2, 3	1.34E+06	3.42E-02
carbon disulfide	1.3E-04	Reference 2, 3	1.34E+06	8.73E-02
chlorobenzene	2.2E-05	Reference 2, 3	1.34E+06	1.48E-02
chromium	2.6E-04	Reference 2, 3	1.34E+06	1.75E-01
chrysene	1.0E-07	Reference 2, 3	1.34E+06	6.72E-05
cobalt	1.0E-04	Reference 2, 3	1.34E+06	6.72E-02
dioxins/furans (TEQ units)	3.5E-12	Reference 2	1.34E+06	2.35E-09
ethylbenzene	9.4E-05	Reference 2, 3	1.34E+06	6.31E-02
ethylene dichloride	4.0E-05	Reference 2, 3	1.34E+06	2.69E-02
formaldehyde	2.4E-04	Reference 2, 3	1.34E+06	1.61E-01
hexane	6.7E-05	Reference 2, 3	1.34E+06	4.50E-02
indeno[1,2,3-c,d]pyrene	6.1E-08	Reference 2, 3	1.34E+06	4.10E-05
isophorone	5.8E-04	Reference 2, 3	1.34E+06	3.89E-01
lead	4.2E-04	Reference 2, 3	1.34E+06	2.82E-01
manganese	4.9E-04	Reference 2, 3	1.34E+06	3.29E-01
mercury	8.3E-05	Reference 2, 3	1.34E+06	5.57E-02
methyl bromide	1.6E-04	Reference 2, 3	1.34E+06	1.07E-01
methyl chloride	5.3E-04	Reference 2, 3	1.34E+06	3.56E-01
methyl ethyl ketone	3.9E-04	Reference 2, 3	1.34E+06	2.62E-01
methylene chloride	2.9E-04	Reference 2, 3	1.34E+06	1.95E-01
nickel	2.8E-04	Reference 2, 3	1.34E+06	1.88E-01
phenol	1.6E-05	Reference 2, 3	1.34E+06	1.07E-02
propionaldehyde	3.8E-04	Reference 2, 3	1.34E+06	2.55E-01
pyrene	3.3E-07	Reference 2, 3	1.34E+06	2.22E-04
selenium	1.3E-03	Reference 2, 3	1.34E+06	8.73E-01
styrene	2.5E-05	Reference 2, 3	1.34E+06	1.68E-02
tetrachloroethylene	4.3E-05	Reference 2, 3	1.34E+06	2.89E-02
toluene	2.4E-04	Reference 2, 3	1.34E+06	1.61E-01

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Distillate Oil

SCC: 2104004000

The activity comes from the State Energy Data Report[1]. In 1999, 811 million MMBTUs of distillate oil was consumed.

The Emission Standards Division[2] supplied emission factors for the following HAPS: acetaldehyde, arsenic, benzene, beryllium, cadmium, chromium, formaldehyde, lead, manganese, mercury, nickel, selenium and individual PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b,k) fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene).

Emissions were allocated to the county-level by the county proportion of state consumption of distillate oil for residential heating[1,3]. County-level allocation factors were calculated from census housing information compiled by EFIG[3]. Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001.
   Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

2. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S.EPA/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.

3. U.S. Environmental Protection Agency. EFIG. 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

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Distillate Oil

SCC: 2104004000

Pollutant	Emission Factor (lb/MM Btu Oil)	Emission Factor Reference	National Activity Level (Reference 1) (MM Btu oil burned/year)	National Emissions (tons/year)
Acenaphthene	1.5E-07	Reference 3	8.11E+08	6.11E-02
Acenapthylene	1.8E-09	Reference 3	8.11E+08	7.33E-04
acetaldehyde	3.5E-05	Reference 2	8.11E+08	1.42E+01
Anthracene	8.7E-09	Reference 3	8.11E+08	3.53E-03
arsenic	4.0E-06	Reference 2, 3	8.11E+08	1.62E+00
Benz(a)anthracene	2.9E-08	Reference 3	8.11E+08	1.16E-02
benzene	1.5E-06	Reference 2, 3	8.11E+08	6.08E-01
Benzo(b,k)fluoranthene	1.1E-08	Reference 3	8.11E+08	4.29E-03
Benzo(g,h,i)perylene	1.6E-08	Reference 3	8.11E+08	6.55E-03
beryllium	3.0E-06	Reference 2, 3	8.11E+08	1.22E+00
cadmium	3.0E-06	Reference 2, 3	8.11E+08	1.22E+00
chromium	3.0E-06	Reference 2, 3	8.11E+08	1.22E+00
Chrysene	1.7E-08	Reference 3	8.11E+08	6.89E-03
Dibenzo(a,h)anthracene	1.2E-08	Reference 3	8.11E+08	4.84E-03
Fluoranthene	3.5E-08	Reference 3	8.11E+08	1.40E-02
Fluorene	3.2E-08	Reference 3	8.11E+08	1.29E-02
formaldehyde	2.4E-04	Reference 2, 3	8.11E+08	9.73E+01
Indeno(1,2,3-c,d)pyrene	1.5E-08	Reference 3	8.11E+08	6.20E-03
lead	9.0E-06	Reference 2, 3	8.11E+08	3.65E+00
manganese	6.0E-06	Reference 2, 3	8.11E+08	2.43E+00
mercury	3.0E-06	Reference 2, 3	8.11E+08	1.22E+00
Naphthalene	8.1E-06	Reference 3	8.11E+08	3.27E+00
nickel	3.0E-06	Reference 2, 3	8.11E+08	1.22E+00
Phenanthrene	7.5E-08	Reference 3	8.11E+08	3.04E-02
Pyrene	3.0E-08	Reference 3	8.11E+08	1.23E-02
selenium	1.5E-05	Reference 2, 3	8.11E+08	6.08E+00

Example Calculation

National Emissions (tons/year) = [Emission Factor (lb/MM Btu Oil)*National Activity Level (MM Btu oil burne

National selenium emissions = (0.000015*811000000)/2000 = 6.08

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Natural Gas

SCC: 2104006000

National activity level estimates were provided by the U.S. Department of Energy[1]. In 1999, 4.86 billion MMBTUs of natural gas was consumed for residential heating

The Emission Standards Division[2] supplied emission factors for the following HAPS: acetaldehyde, benzene, formaldehyde, and individual PAHs, (fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene). Data are for all natural gas combustion sources.

Emissions were allocated to the county-level by the county proportion of state consumption of natural gas for residential heating[1,3]. County-level allocation factors were calculated from census housing informations compiled by EFIG.[3] Refer to Appendices C and E for more details on this allocation.

References:

1. Energy Information Administration (EIA). State Energy Data Report, 1999 Summaries. Consumption Estimates. U.S. Department of Energy, Washington, D.C., May, 2001.
   Internet Address: http://www.eia.doe.gov/emeu/sedr/contents.html

2. Porter, Fred, U.S. Environmental Protection Agency, Emission Standards Division. Note to Anne Pope, U.S.EPA/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.

3. U.S. Environmental Protection Agency. EFIG. 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

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Natural Gas

SCC: 2104006000

Pollutant	Emission Factor (lb/MM Btu NG)	National Activity Level (Reference 1) (MM Btu NG burned/year)	National Emissions (tons/year)
acetaldehyde	1.3E-08	4.86E+09	3.16E-02
benzene	2.1E-06	4.86E+09	5.10E+00
formaldehyde	7.5E-05	4.86E+09	1.82E+02
Fluoranthene	3.0E-09	4.86E+09	7.28E-03
Fluorene	2.8E-09	4.86E+09	6.80E-03
Naphthalene	6.1E-07	4.86E+09	1.48E+00
Phenanthrene	1.7E-08	4.86E+09	4.13E-02
Pyrene	5.0E-09	4.86E+09	1.21E-02

The emission estimates for this source category were taken directly from the results of a study by the U.S. Environmental Protection Agency's Emission Factor and Inventory Group[1]. The following is a summary of the study's methods.

Activity Data

The following steps were taken to estimate the national and county-level activity data for residential wood combustion (RWC).

1) Use the 1997 national activity data to extrapolate national activity data for 1999.
2) Group all counties into one of five climate zones to address wood consumption differences due to temperature.
3) Allocate the consumption level in each zone to individual counties in that zone.
4) Designate each county as urban or rural.
5) Adjust urban and rural wood consumption to match American Housing Survey (AHS) data.

Step 1.
The activity data for residential wood combustion were estimated based on the type of combustion unit. Activity data for woodstoves and fireplaces with inserts ("inserts") were estimated based on the total amount of wood consumed in a year. To extrapolate activity data from 1997 to 1999, a growth rate was developed based on wood energy consumption data from the Energy Information Administration[2]. Activity data for fireplaces were estimated based on the number of homes in the U.S. with usable fireplaces[3,4].

Step 2.
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 is 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 and cooling degree day data. 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[5].

Step 3.
The next step in the activity data procedure was to allocate the 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.

Step 4.
Each county was then designated as urban or rural in order to reflect unit location preferences reported in the 1999 AHS. The 1999 AHS shows that each type of combustion unit occurs preferentially in urban and rural areas. The percent of combustion units found in urban and rural areas was used as a surrogate for wood consumption. AHS estimated that 68% of fireplaces are found in urban areas compared to 32 percent in rural areas. For woodstoves, AHS estimated that 69% of the woodstoves are found in rural areas compared to 31% in urban areas. For inserts, AHS reported a roughly even split between urban and rural areas.

Step 5.

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 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. 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, 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.

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)[6]. 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,"[7]. The emission factors generated by Houck, et. al. for 7-PAH and 16-PAH were approximately 62% lower than associated AP-42 emission factors. All of the AP-42 PAH emission factors were thus adjusted downward by 62%.

References

1. U.S. Environmental Protection Agency. "Documentation Report for National and County-level Emission Estimates for Residential Wood Combustion". Prepared for EFIG by Eastern Research Group, Inc. July 3, 2001.

2. Energy Information Administration (EIA). 2001. *Monthly Energy Review April 2001*, (http://www.eia.gov).

3. U.S. Census Bureau. 1997. *U.S. Census Data*, Database 48 1995 Revised, Table 2-4. Report No. H-150/95RV. July 1997.

4. U.S. Census Bureau. 2000. *U.S. Census Data, American Housing Survey for the United States: 1999*, Table 2-4. Report No. H-150-99. October 2000.

5. Energy Information Administration (EIA). 1999. *A Look at Residential Energy Consumption in 1997*. U.S. Department of Energy, Washington, D.C. November, 1999.

6. U.S. Environmental Protection Agency. 1996. *AP-42, Fifth Edition, Chapter 1 External Combustion Sources, Section 1.9 Residential Fireplaces, 1.10 Residential Wood Stove, Supplement B*, www.epa.gov/ttn/chief/ap42/ch01/final.

7. Houck, J.E., J. Crouch, and R.H. Huntley. 2001. *Review of Wood Heater and Fireplace Emission Factors*. Technical presentation at the International Emission Inventory Conference "One Atmosphere, One Inventory, Many Challenges," Denver, CO, April 30 - May 3, 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Residential Heating: Wood/Wood Residue

SCC: 2104008001; 2104008002; 2104008003; 2104008004; 2104008010; 2104008030; & 2104008050

HAP Emission Factors

Pollutant Name	Fireplaces (2104008001)	Fireplaces: Inserts; catalytic, EPA certified (2104008004)	Fireplaces: Inserts; non catalytic, EPA certified (2104008003)	Fireplaces: Inserts; non-EPA certified (2104008002)	Residential Heating: Non-catalytic Woodstoves - General (2104008050)	Residential Heating: Catalytic Woodstoves - General (2104008030)	Residential Heating: Woodstoves - conventional (2104008010)
	lb/ton	lb/ton	lb/ton	lb/ton	lb/ton	lb/ton	lb/ton
2,3,7,8-TCDD TEQ	2.000E-09	2.000E-09	2.000E-09	2.000E-09	2.000E-09	2.000E-09	2.000E-09
7,12-Dimethylbenz[a] Anthracene			1.620E-03		1.620E-03		
Acenaphthene		3.080E-03	4.040E-03	6.210E-03	4.040E-03	3.080E-03	6.210E-03
Acenaphthylene		3.490E-02	1.290E-02	1.320E-01	1.290E-02	3.490E-02	1.320E-01
Anthracene		4.100E-03	3.640E-03	8.690E-03	3.640E-03	4.100E-03	8.690E-03
Benz[a]Anthracene		1.230E-02		1.240E-02		1.230E-02	1.240E-02
Benzene		1.464E+00		1.938E+00		1.464E+00	1.938E+00
Benzo(g,h,i)Fluoranthene		3.080E-03	1.130E-02		1.130E-02	3.080E-03	
Benzo[a]Pyrene		2.050E-03	2.420E-03	2.480E-03	2.420E-03	2.050E-03	2.480E-03
Benzo[b]Fluoranthene		2.050E-03	1.620E-03	3.730E-03	1.620E-03	2.050E-03	3.730E-03
Benzo[e]Pyrene		2.050E-03	8.080E-04	7.450E-03	8.080E-04	2.050E-03	7.450E-03
Benzo[g,h,i,]Perylene		1.030E-03	8.080E-03	2.480E-03	8.080E-03	1.030E-03	2.480E-03
Benzo[k]Fluoranthene		1.030E-03		1.240E-03		1.030E-03	1.240E-03
Biphenyl			8.890E-03		8.890E-03		
Cadmium & Compounds			2.000E-05	2.200E-05	2.000E-05		2.200E-05
Chrysene		5.130E-03	4.040E-03	7.450E-03	4.040E-03	5.130E-03	7.450E-03
Dibenzo[a,h]Anthracene		1.030E-03	1.620E-03		1.620E-03	1.030E-03	
Fluoranthene		6.160E-03	3.230E-03	1.240E-02	3.230E-03	6.160E-03	1.240E-02
Fluorene		7.180E-03	5.660E-03	1.490E-02	5.660E-03	7.180E-03	1.490E-02
Indeno[1,2,3-c,d]Pyrene		2.050E-03	8.080E-03		8.080E-03	2.050E-03	
Manganese & Compounds			1.400E-04	1.700E-04	1.400E-04		1.700E-04
Methyl Ethyl Ketone		6.200E-02		2.900E-01		6.200E-02	2.900E-01
Naphthalene		9.540E-02	5.820E-02	1.790E-01	5.820E-02	9.540E-02	1.790E-01
Nickel & Compounds			2.000E-05	1.400E-05	2.000E-05		1.400E-05
o-Xylene		1.860E-01		2.020E-01		1.860E-01	2.020E-01
Perylene			8.080E-04		8.080E-04		
Phenanthrene		2.460E-02	4.770E-02	4.840E-02	4.770E-02	2.460E-02	4.840E-02
Pyrene		5.130E-03	3.230E-03	1.490E-02	3.230E-03	5.130E-03	1.490E-02
Toluene		5.200E-01		7.300E-01		5.200E-01	7.300E-01

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Structure Fires

SCC: 2810030000

The methodology for estimating 1999 emissions for structure fires was revised to follow the methodology used for the 1996 NTI. Calculated 1999 national hazardous air pollutant (HAP) emissions by obtaining the total number of residential and non-residential fires from the U.S. Fire Administration National Fire Data Center (NFDC) and applying a fuel loading factor of 1.15 tons/fire and emission factors.

Total Activity for Structure Fires = 581,080 tons burned

Emission Factors

Emissions factors for Acrolein, Hydrogen cyanide, Hydrogen chloride, and Formaldehyde were obtained from "Documentation for the 1996 Base Year National Toxics Inventory for Area Sources"[1].

Acrolein : 4.414 lb / ton burned
Hydrogen cyanide : 35.486 lb / ton burned
Hydrogen chloride : 15.112 lb / ton burned
Formaldehyde : 1.023 lb / ton burned

Emissions

Pollutant	Emissions (lbs)
Acrolein	2,564,887
Hydrogen Cyanide	20,620,205
Hydrogen Chloride	8,781,281
Formaldehyde	594,445

References

1. *Documentation for the 1996 Base Year National Toxics Inventory for Area Sources*. Prepared by Eastern Research Group, Inc. for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Emission Factor and Inventory Group, Research Triangle Park, NC. June, 2000.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Architectural

SCC: 2401001000

Emissions from "Surface Coatings: Architectural" are those emitted from the application of coating such as paint, primer, varnish or laquer to architectural surfaces, and the use of solvents as thinners and for cleanup[1].

1999 emissions were estimated for twelve pollutants using per capita usage factors estimated from the quantity of architectural coatings shipped in 1999 for solvent and water based coatings[2]; the amount shipped was multiplied by paint content speciation factors[3].

Emissions from solvent based coatings and water based coatings were estimated separately, but were added together for total emissions from the use of solvent and water based architectural surface coatings.

Manufacturers and importers of architectural surface coatings will be required to limit the VOC content of each individual type of architectural surface coating material manufactured for use in the United States after September 13, 1999[4].

Emissions were allocated to the county-level by the county proportion of the national population[2].

References

1. The Current Industrial Report for Paint and Allied Products (MA28F) - 1999. United States Department of Commerce. Bureau of the Census. Issued, 2000. http://www.census.gov/industry/ma28f99.wks

2. U.S. Census Bureau, Population Division. January, 2, 2001. *Population Estimates Program*. Washington, DC 20233. (Internet Address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

3. Introduction to Area Source Emission Inventory Development. Volume III: Chapter 3, Architectural Surface Coating. Prepared by Eastern Research Group for the Emission Inventory Improvement Program Area Source Committee. November 1995.

4. 63FR48848. National Volatile Organic Compound Emission Standards for Architectural Coatings. Final Rule. September 11, 1998.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Architectural

SCC: 2401001000

Activity (Reference 1)	**Solvent Based (SB) Coatings**		**Water Based (WB) Coatings**		
Exterior Coatings	86,279,000	gal/yr	Exterior Coatings	180,302,000	gal/yr
Interior Coatings	52,091,000	gal/yr	Interior Coatings	349,853,000	gal/yr
Total Solvent-Based =	138,370,000	gal/yr	Total Water-Based =	530,155,000	gal/yr

1999 U.S. Population = 272,690,813 people (Reference 2)

Usage Factor: Usage Factor = National Volume of Solvent, by type / U.S. Population

Solvent-Based Coatings:	0.507	gal/person/year
Water-Based Coatings:	1.944	gal/person/year

VOC Emission Factors (Ref. 3)

Solvent-based coatings:	3.87	lb/gal VOC
Water-based coatings:	0.74	lb/gal VOC

Emission Factor:

Emission Factor = VOC content * HAP Weight Fraction

Example Calculation for Ethylene Glycol

Solvent Based Coatings:

Speciated VOC Emission Factors = (3.87 lb VOC/ gal SB Coatings) x (Weight Fraction VOC, SB coatings)

= (3.87 lb VOC / gal SB Coatings) x (.006) = 0.02322 lb ethylene glycol / gal. SB coatings

(272,690,813 people) x (0.507 gal SB/person/yr) x (.0232 lb / gal. SB coatings) = 3,212,951.40 lb ethylene glycol, SB coatings

Water Based Coatings:

Speciated VOC Emission Factors = (0.74 lb VOC/ gal WB Coatings) x (Weight Fraction VOC, WB coatings)

= (0.74 lb VOC / gal WB Coatings) x (.005) = 0.0037 lb ethylene glycol / gal. WB coatings

(272,690,813 people) x (1.944 gal WB/person/yr) x (.0037 lb / gal. WB coatings) = 1,961,573.50 lb ethylene glycol, WB coatings

Total Emissions = ethylene glycol from SB coatings (lb/year) + ethylene glycol from WB coatings (lb/yr) / 2000 lb/ton

(3,212,951.40 lb + 1,961,573.5 lb) / 2000 lb/ton = 2587.26245 tons ethylene glycol, from SB and WB architectural surface coatings

VOC Speciation Factors (Ref. 3)

HAPS - SB Coatings	Weight Fraction SB Coatings	SB Coatings EF (lb/gal)	HAPS WB Coatings	Weight Fraction WB Coatings	WB Coatings EF (lb/gal)
N,N-Dimethylformamide	0.005	0.01935	Benzene	0.003	0.00222
Ethylbenzene	0.043	0.16641	Methylene Chloride	0.055	0.0407
Ethylene Glycol	0.006	0.02322	Ethyl Chloride	0.006	0.00444
n-Hexane	0.207	0.80109	Ethylene Glycol	0.005	0.0037
Isomers of Xylene	0.026	0.10062	Methyl Chloride	0.005	0.0037
Methyl Ethyl Ketone	0.056	0.21672			
Methyl Isobutyl Ketone	0.006	0.02322			
Toluene	0.052	0.20124			

Calculation of Emission Estimates

HAP	Solvent-Based Emissions (lb/yr)	Water-Based Emissions (lb/yr)	Total Emissions (lb/yr)	Total Emissions (ton/yr)
Benzene	0.0	1,176,944.1	1,176,944.1	588.5
Methylene Chloride	0.0	21,577,308.5	21,577,308.5	10,788.7
N,N-Dimethylformamide	2,677,459.5	0.0	2,677,459.5	1,338.7
Ethyl Chloride	0.0	2,353,888.2	2,353,888.2	1,176.9
Ethylbenzene	23,026,151.7	0.0	23,026,151.7	11,513.1
Ethylene Glycol	3,212,951.4	1,961,573.5	5,174,524.9	2,587.3
n-Hexane	110,846,823.3	0.0	110,846,823.3	55,423.4
Isomers of Xylene	13,922,789.4	0.0	13,922,789.4	6,961.4
Methyl Chloride	0.0	1,961,573.5	1,961,573.5	980.8
Methyl Ethly Ketone	29,987,546.4	0.0	29,987,546.4	14,993.8
Methyl Isobutyl Ketone	3,212,951.4	0.0	3,212,951.4	1,606.5
Toluene	27,845,578.8	0.0	27,845,578.8	13,922.8

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Industrial Maintenance

SCC: 2401100000

Industrial maintenance coatings are high performance architectural coatings, including primers, sealers, undercoaters, intermediate coats, and topcoats formulated and recommended for application to substrates exposed to extreme environmental conditions in industrial, commercial, or institutional settings.

1999 emissions from the use of industrial maintenance coatings were estimated for thirteen pollutants by multiplying emission factors developed from 1996 and 1998 data provided by CARB[1,2] and 1999 coating sales data[3].

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[4] for numerous SIC codes related to industrial sources. Refer to Appendices C and E for more details on this allocation.

References

1. CARB. "1998 Architectural Coatings Survey Results". Final Report. California Environmental Protection Agency. Air Resources Board. September 1999. Pp. 86, 97&98.

2. CARB. "Improvement of Speciation Profiles for Architectural and Industrial Maintenance Operations". Final Report. California Environmental Protection Agency. Air Resources Board Research Division. June 1996. Pp. 90, 138 - 140.

3. U.S Census Bureau. "The Current Indsutrial Report for Paint and Allied Products (MA28F) - 1999". United States Department of Commerce. Bureau of the Census. Issued, 2000. www.census.gov/industry/ma28f99.wks

4. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Industrial Maintenance

SCC: 2401100000

Estimated emission factors (lb VOC/gallon) for Water-based Coatings (WBC) and Solvent-based Coatings (SBC) using data from the 1998 CARB solvent use survey report (Ref. 1). EF = 1996 emissions / 1996 coating sales

= 1996 emissions (tpy) x (2000 lb/ton) / (1000 gal coatings) = lb VOC /gal

Coating Category	1996 Coating Sales in CA (Ref. 1)		% Sold, By Type Coating		1996 VOC Emissions in CA (Ref. 1)		New VOC Emission Factors	
	WBC (1000 gal)	SBC (1000 gal)	WBC	SBC	WBC (tons/year)	SBC (tons/year)	WBC (lb/gal)	SBC (lb/gal)
Industrial Maintenance Coatings	379	3902	9.0	91.0	132	5070	0.70	2.60

1999 activity is the amount of industrial new construction and maintenance paints shipped within the US in 1999. (Ref. 2).

Interior = 15,686,000 gallons

Exterior = 31,779,000 gallons

47,465,000 gallons

Multiply emission factors by the amount of both WBC and SBC shipped in 1999.

WBC: (0.70 lb VOC/gal WBC) x 47,465,000 gallons x 0.090 (% WBC) = 2,990,295 lb VOC/year from WBC

= 1495.15 tpy VOC from WBC

SBC: (2.60 lb VOC/gal SBC) x 47,465,000 gallons x 0.910 (% SBC) = 112,302,190 lb VOC/year from SBC

= 56,151.10 tpy VOC from SBC

Multiply the WBC and SBC emissions of VOC by the percent contibution of each HAP identified in the 1996 CARB speciation report. (Ref. 2).

Example calculation using ethylene glycol

(2,990,295 lb VOC/year, WBC) x 0.1271 = 380,066 lb Ethylene Glycol / year from Water-borne Coatings

= 190.03 tons per year Ethylene Glycol from Water-borne Coatings

(112,302,190 lb VOC/year, SBC) x 0.0048 = 539,050 lb Ethylene Glycol / year from Solvent-borne Coatings

= 269.53 tons per year Ethylene Glycol from Water-borne Coatings

HAP (POLLNAME)	Water-borne Coatings Average VOC Weight Fraction (Ref 3,pg. 90)	Solvent-borne Coatings VOC Weight Fraction (Ref. 3, pg. 138-140)	Emissions from WBC tons/year	Emissions from SBC tons/year	Total Emissions tons/year
Acetophenone	not identified	0.0006		33.691	33.69
Cumene	not identified	0.0012		67.381	67.38
Dibutyl Phthalate	0.0031	not identified	4.635		4.63
Ethyl Benzene	not identified	0.0062		348.137	348.14
Ethylene Glycol	0.1271	0.0048	190.033	269.525	459.56
Glycol Ethers	0.1434	0.0334	214.404	1875.447	2089.85
Isophorone	not identified	0.0053		297.601	297.60
Methanol	0.0429	0.0151	64.142	847.882	912.02
Methyl Ethyl Ketone	not identified	0.0065		364.982	364.98
Methyl Isobutyl Ketone	not identified	0.0162		909.648	909.65
Naphthalene	not identified	0.0022		123.532	123.53
Toluene	not identified	0.0118		662.583	662.58
Xylenes -o,-m,-p	not identified	0.0348		1954.058	1954.06

Add emissions from Water-based and Solvent-based Coatings by Pollutant

269.53 tpy ethylene glycol, WBC + 190.03 tpy ethylene glycol, SBC = 459.56 tpy ethylene glycol from IMC

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Traffic Markings

SCC: 2401008000

HAP emissions were estimated for thirteen pollutants by multiplying HAP emission factors with the national traffic paint usage in 1999[1]. Individual HAP emission factors were developed from data provided by the EPA in the Emission Inventory Improvement Program Guidance for estimating emissions from Traffic Markings[2].

Allocation of emissions from the national level to the state level can be apportioned through individual state spending of federal highway money. State highway agency spending for total capital and total outlay is available through the Bureau of Transportation Statistics[3]. Emissions were allocated to the county-level by the county proportion of the state population[4].

References

1. The Current Industrial Report for Paint and Allied Products (MA28F) - 1999. United States Department of Commerce. Bureau of the Census. Issued, 2000. www.census.gov/industry/ma28f99.wks

2. EIIP. Introduction to Area Source Emission Inventory Development. Volume III: Chapter 14, Traffic Markings. Final Draft. Prepared by Eastern Research Group for the Emission Inventory Improvement Program Area Source Committee. May 1997. Pp. 4-4 and 4-12.

3. Bureau of Transportation Statistics. "State Highway Agency Capitol Outlay - 1999". October 2000. Information retrieved from the following website: http://www.fhwa.dot.gov/ohim/hs99/hfpage.htm

4. U.S. Census Bureau, Population Division. January 2, 2001. Population Estimates Program. Washington, DC 20233. (Internet address: http://blue.census.gov/population/estimates/nation/intfile1-1.txt)

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Surface Coatings: Traffic Markings

SCC: 2401008000

Activity:

National Traffic Paint Usage for 1999 = 35,309,000 gal/yr (Ref. 1)

Example Calculation:

Emissions = (35,309,000 gal paint, 1999) x (0.00002 gal Cumene/gal paint) x (7.19 lb Cumene/gal Cumene)
= (5077.43 lbs Cumene) x (1 ton / 2000 lb) = 2.54 tons Cumene

Calculation of Emission Estimates

HAP	Volume % (Ref. 2)	HAP Density (Ref. 2)	Total Emissions (lb/yr)	Total Emissions (ton/yr)
Carbon tetrachloride	0.009	12.19	38,737.50	19.37
Cumene	0.002	7.19	5,077.43	2.54
Ethylbenzene	0.009	7.24	23,007.34	11.50
Ethylene glycol	0.086	9.31	282,705.04	141.35
Glycol ethers	0.04	7.01	99,006.44	49.50
Methyl ethyl ketone	1.514	6.89	3,683,244.21	1,841.62
Methyl isobutyl ketone	0.002	6.71	4,738.47	2.37
Methyl methacrylate	0.044	7.84	121,801.93	60.90
Napthalene	0.002	9.55	6,744.02	3.37
Propylene oxide	0.115	6.93	281,395.08	140.70
Styrene	0.277	7.55	738,434.77	369.22
Toluene	6.914	7.23	17,650,340.60	8,825.17
Xylenes (mixed isomers)	0.499	7.18	1,265,057.91	632.53

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Swimming Pools

SCC: 2862000000

The 1999 national emission estimates for "Swimming Pools" were developed by multiplying an emission factor by a national activity estimate. Emission factors for chloroform were taken from the Arizona Department of Environmental Quality Final Report No. 0493-013-900[1]. In 1999, there were an estimate of 7.26 million residential pools in use[2] and an estimate of 700,000 public pools[3] in use.

A usage of 525,600 minutes/year is assumed for each outdoor residential and public pools[1]. Usage assumes that pools are uncovered.

Emissions were allocated to the county-level by the county proportion of national employment as reported to the 1999 County Business Patterns[4] for the multiple SIC codes related to swimming pool maintenance and outdoor recreation clubs with facilities. Refer to Appendices C and E for more details on this allocation.

References:

1. Arizona Department of Environmental Quality, 1995. Draft, Arizona Hazardous Air Pollution Research Program Final Report, Volume 1: Approach. August, 1995. Document No. 0493-013-900.

2. Hulbert, Patty. National Spa and Pool Institute. 2111 Eisenhower Ave. Alexandria, VA 22314. Document 801 (Internet address: www.nspi.org)

3. Kolwalski, Les. National Swimming Pool Foundation. PO Box 495. Merrick, NY 11566. 516-623-3447. (Internet address: www.nspf.com). Personal communication with Robin Barrows, Eastern Research Group. Morrisville, NC 27560. 11 July 2001.

4. County Business Patterns 1999. United States Department of Commerce, Bureau of the Census. CBP-99-1. June 2001.

APPENDIX A: NEI NONPOINT HAP SOURCE ESTIMATES - Swimming Pools

SCC: 2862000000

Estimated Pool Usage in a year=	525,600	min/yr (Reference 1)
Ave. Surface Area, residential pool=	47.56	m^2 (Reference 1)
Ave. Surface Area, public pool=	200	m^2 (Reference 1)
Chloroform Emission Flux =	2.23E-05	$g/m^2/min$ (Reference 1)
	2.23E-08	$kg/m^2/min$ (Reference 1)
Number of Residential Pools, 1999 =	7,258,000	(Reference 2)
Number of Public Pools, 1999 =	700,000	(Reference 3)

Pool Area = Number of pools X Ave. Area/pool, m^2

Residential = 7,258,000 pools *(47.56 m^2 /pool) = 345,190,480 m^2

Public = 700,000 pools *(200 m^2 /pool) = 140,000,000 m^2

Emissions:

Pool Type	Area (m^2)	Emission Factor $ug/m^2/min$	Usage (min/yr)	Emissions (lb/yr)	Chloroform Emissions (ton/yr)
Residential	345,190,480	2.23E-08	525,600	8,919,670.93	4459.84
Public	140,000,000	2.23E-08	525,600	3,617,579.29	1808.79
Total					**6268.63**