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United States
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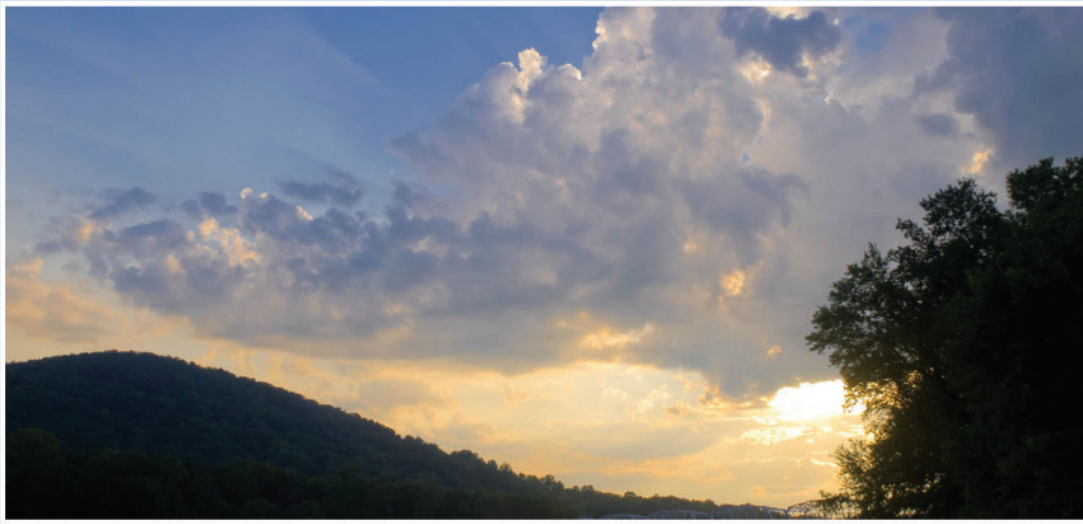
Hierarchical Bayesian Model (HBM)-Derived Estimates of Air Quality for 2007: Annual Report



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Office of Research and Development
National Exposure Research Laboratory

Disclaimer

The information in this document has been funded wholly by the United States Environmental Protection Agency under a 'funds-in' interagency agreement RW75922615-01-3 with the Centers for Disease Control and Prevention (CDC). It has been subjected to the Agency's peer and administrative review and has been approved for publication as an EPA document.

EPA/600/R-12/538 | June 06, 2012 | www.epa.gov/ord

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Developed by the U.S. Environmental Protection Agency
Office of Research and Development (ORD)
National Exposure Research Laboratory (NERL)
And
Office of Air and Radiation (OAR)
Office of Air Quality Planning and Standards (OAQPS)

Office of Research and Development
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Acknowledgements

The following people served as reviewers of this document and provided valuable comments that were included: Alexis Zubrow (EPA/OAR), Richard Mason (EPA/OAR), Norm Possiel (EPA/OAR), Kirk Baker (EPA/OAR), Carey Jang (EPA/OAR), Tyler Fox (EPA/OAR), Rachelle Duvall (EPA/ORD), Melinda Beaver (EPA/ORD), and OAR/OAQPS support contractors from Computer Sciences Corporation (CSC).

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1.0 Introduction

This report describes EPA's Hierarchical Bayesian model-generated (HBM) estimates of ozone (O3) and fine particulate matter (PM2.5, particles with aerodynamic diameter < 2.5 microns) concentrations throughout the continental United States during the 2007 calendar year. HBM estimates provide the spatial and temporal variance of O_3 and $PM_{2.5}$, allowing estimation of their concentration values across the U.S., independent of where air quality monitors are physically located. HBM estimates are generated through the statistical 'fusion' of measured air quality monitor concentration values and air quality model predicted concentration values from EPA's Community Multiscale Air Quality (CMAQ) computer model. Information on EPA's air quality monitors, CMAQ model, and HBM model is included to provide the background and context for understanding the data output presented in this report.

The data contained in this report are an outgrowth of a collaborative research partnership between EPA scientists from the Office of Research and Development's (ORD) National Exposure Research Laboratory (NERL) and personnel from EPA's Office of Air and Radiation's (OAR) Office of Air Quality Planning and Standards (OAQPS). NERL's Human Exposure and Atmospheric Sciences Division (HEASD), Atmospheric Modeling and Analysis Division (AMAD), and Environmental Sciences Division (ESD), in conjunction with OAQPS, work together to provide air quality monitoring data and model estimates to the Centers for Disease Control and Prevention (CDC) for use in their Environmental Public Health Tracking (EPHT) Network.

CDC's EPHT Network supports linkage of air quality data with human health outcome data for use by various public health agencies throughout the U.S. The EPHT Network Program is a multidisciplinary collaboration that involves the ongoing collection, integration, analysis, interpretation, and dissemination of data from: environmental hazard monitoring activities; human exposure assessment information; and surveillance of noninfectious health conditions. As part of the National EPHT Program efforts, the CDC is leading the initiative to build the National EPHT Network (http://www.cdc.gov/nceh/tracking/default.htm). The National EPHT Program, with the EPHT Network as its cornerstone, is the CDC's response to requests calling for improved understanding of how the environment affects human health. The EPHT Network is designed to provide the means to identify, access, and organize hazard, exposure, and health data from a variety of sources and to examine, analyze and interpret those data based on their spatial and temporal characteristics. The EPHT Network is a standards-based, secure information network that was created to be used by many different entities, including epidemiologists, public health practitioners, academic researchers, schools of public health, along with local, state, and federal agencies such as EPA. Levels of access to the data in the EPHT Network will vary among stakeholders based upon their role and their purpose for using the data. Data access will be carefully controlled to ensure compliance with federal and state privacy laws which address the use of health data and other protected personal information. The CDC's National EPHT Program is establishing the EPHT Network by collaborating with a wide range of partners with expertise from federal, state, and local health and environmental agencies; nongovernmental organizations (NGOs); state public health and environmental laboratories; and schools of public health.

Since 2002, EPA has collaborated with the CDC on the development of the EPHT Network. On September 30, 2003, the Secretary of Health and Human Services (HHS) and the Administrator of EPA signed a joint Memorandum of Understanding (MOU) with the objective of advancing efforts to achieve mutual environmental public health goals.[1] HHS, acting through the CDC and the Agency for Toxic Substances and Disease Registry (ATSDR), and EPA agreed to expand their cooperative activities in support of the CDC EPHT Network and EPA's Central Data Exchange Node on the Environmental Information Exchange Network in the following areas:

- Collecting, analyzing and interpreting environmental and health data from both agencies (HHS and EPA).
- Collaborating on emerging information technology practices related to building, supporting, and operating the CDC EPHT Network and the Environmental Information Exchange Network.
- Developing and validating additional environmental public health indicators.
- Sharing reliable environmental and public health data between their respective networks in an efficient and effective manner.
- Consulting and informing each other about dissemination of results obtained through work carried out under the MOU and the associated Interagency Agreement (IAG) between EPA and CDC.

Under the auspices of the HHS/EPA MOU, a research project was implemented between 2004 and 2006 to investigate the utility of EPA-generated air quality estimates as an input to the EPHT Network. The relationship between air pollutants

[1] Available at www.cdc.gov/nceh/tracking/epa_mou.htm

and human health is of interest to both Agencies. EPA develops and funds ambient air quality monitoring networks to monitor air pollution and to provide data that may be used to mitigate its impact on our ecosystems and human health. (Note: AQS and AIRNow are EPA databases containing data collected from EPA's air quality monitoring networks.) Air quality monitoring data has been used by researchers to investigate the linkages between human health outcomes and air quality, and by environmental and public health professionals to develop environmental health indicators which provide measures of potential human health impacts. However, an analysis of the currently available methods for generating and characterizing air quality estimates that could be developed and delivered systematically, and which were also readily available to link with public health surveillance data, had not been previously attempted. EPA collaborated with the CDC and state public health agencies in New York, Maine, and Wisconsin on the Public Health Air Surveillance Evaluation (PHASE) project to address this issue. The project focused on generating concentration surfaces for O_3 and $PM_{2.5}$, which were subsequently linked with asthma and cardiovascular disease data. Results of this research project indicated that using a Hierarchical Bayesian approach to statistically "combine" Community Multiscale Air Quality (CMAQ) model estimates and air quality monitoring data documented in EPA's AQS provided better overall estimates of air quality at locations without monitors than those obtained through other well-known, statistically-based estimating techniques (e.g., kriging).

Ambient air quality monitoring data stored in the Air Quality System (AQS), along with air quality modeling estimates from CMAQ, can be statistically combined, via a Hierarchical Bayesian statistical space-time modeling (HBM) system, to provide air quality estimates (hereafter referred to as Hierarchical Bayesian-derived air quality estimates). These Hierarchical Bayesian-derived air quality estimates serve as well-characterized inputs to the EPHT Network. The air quality monitor data, CMAQ modeling estimates, and the Hierarchical Bayesian-derived air quality estimates can be used to develop meaningful environmental public health indicators and to link ozone and $PM_{2.5}$ concentrations with health outcome data. The Hierarchical Bayesian-derived air quality estimates are based on EPA's current knowledge of predicting spatial and temporal variations in pollutant concentrations derived from multiple sources of information. EPA is continuing its research in this critical science area and is implementing this project to establish procedures for routinely generating the Hierarchical Bayesian-derived air quality estimates developed in the PHASE project. This effort will assist EPA in making both ambient air quality monitoring (raw) data and the Hierarchical Bayesian-derived air quality estimates available to the CDC EPHT Network through EPA's Central Data Exchange (CDX) Node on the Environmental Information Exchange Network.

Because of EPA's expertise related to measurement, analysis, scientific visualization, and reporting of air quality monitoring data, air quality modeling estimates, and Hierarchical Bayesian-derived air quality estimates and associated research, the CDC approached EPA to provide technical support for incorporating air quality data and estimates into its EPHT Network. Because the air quality data generated could be used by EPA to achieve other research goals related to linking air quality data and health effects and performing cumulative risk assessments, EPA proposed an interagency agreement under which each agency would contribute funding and/or in-kind support to efficiently leverage the resources of both agencies. The major objective of this research is to provide data and guidance to CDC to assist them in tracking estimated population exposure to O_3 and $PM_{2.5}$; estimating health impacts to individuals and susceptible subpopulations; guiding public health actions; and conducting analytical studies linking human health outcomes and environmental conditions.

This report is divided into five sections and three appendices. The first section of the report describes the air quality data obtained from EPA's nationwide monitoring network and the importance of the monitoring data in determining potential health risks. The second section of the report details the emissions inventory data, how it is obtained and its role as a key input into air quality computer models. The third section of the report describes the CMAQ computer model and its role in providing estimates of pollutant concentrations across the U.S. based on 12-km grid cells (entire continental U.S.). The fourth section of the report explains the Hierarchical Bayesian statistical modeling system which is used to combine air quality monitoring data and air quality estimates from the CMAQ model into a continuous concentration surface which includes regions without air quality monitors. The fifth section of the report provides guidelines and requisite understanding that users must have when using the Hierarchical Bayesian statistical modeling system. The appendices provide a list of acronyms used in this report, detailed information on emissions inventory data, and detailed information on the Hierarchical bayesian statistical modeling system.

2.0
Air Quality Data

To compare health outcomes with air quality measures, it is important to understand the origins of those measures and the methods for obtaining them. This section provides a brief overview of the origins and process of air quality regulation in this country. It provides a detailed discussion of ozone (O_3) and particulate matter (PM). The PHASE project focused on these two pollutants, since numerous studies found them to be harmful to public health and the environment, and there was more extensive monitoring and modeling data available.

2.1 Introduction to Air Quality Regulation in the United States

2.1.1 The Clean Air Act

In 1970, the Clean Air Act (CAA) was signed into law. Under this law, EPA sets limits on how much of a pollutant can be present in the air anywhere in the United States. This ensures that all Americans have the same basic health and environmental protections. The CAA has been amended several times to keep pace with new scientific information. More information is available on the CAA at: http://www.epa.gov/oar/caa/. Under the CAA, the U.S. EPA has established standards or limits for six common/ubiquitous air pollutants, known as the criteria air pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), and particulate matter (PM). These standards, called the National Ambient Air Quality Standards (NAAQS), are designed to protect public health and the environment. The CAA established two types of air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The law requires EPA to periodically review these standards. More specific information on the NAAQS is available at: http://www.epa.gov/air/criteria.html. General information on the criteria pollutants is available at: http://www.epa.gov/air/urbanair/. When these standards are not met, the area is designated as a nonattainment area. States must develop state implementation plans (SIPs) that explain the regulations and controls it will use to clean up the nonattainment areas. States with an EPA-approved SIP can request that the area be redesignated from nonattainment to attainment by providing three consecutive years of data showing NAAQS compliance. The state must also provide a maintenance plan to demonstrate how it will continue to comply with the NAAQS and demonstrate compliance over a 10-year period, and what corrective actions it will take should a NAAQS violation occur after redesignation. EPA must review and approve the NAAQS compliance data and the maintenance plan before redesignating the area; thus, a person may live in an area designated as non attainment even though no NAAQS violation has been observed for quite some time. More information attainment/non attainment designations is available at: http://www.epa.gov/ozonedesignations/ and http://www.epa.gov/pmdesignations/.

2.1.2 Ozone

Ozone (O_3) is a colorless gas composed of three oxygen atoms. Ground level ozone is formed when pollutants released from cars, power plants, and other sources react in the presence of heat and sunlight. It is the prime ingredient of what is commonly called "smog." When inhaled, ozone can cause acute respiratory problems, aggravate asthma, cause inflammation of lung tissue, and even temporarily decrease the lung capacity of healthy adults. Repeated exposure may permanently scar lung tissue. Toxicological, human exposure, and epidemiological studies were integrated by EPA in "Air Quality Criteria for Ozone and Related Photochemical Oxidants" available at: http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_index.html. The current (as of October 2008) NAAQS for ozone, in place since 1997, is an 8-hour maximum of 0.075 parts per million [ppm] (for details, see http://www.epa.gov/ozonedesignations/). An 8-hour maximum is the maximum of the 24 possible running 8-hour average concentrations for each calendar day. The Clean Air Act requires EPA to review the NAAQS at least every five years and revise them as appropriate in accordance with Section 108 and Section 109 of the Act. The 'allowable' ozone values are shown in the table below:

Parts Per Million: Measurement—(ppm)	1997	2008
1-Hour Standard	0.12	0.12
8-Hour Standard	0.08	0.075

Table 2-1. Ozone Standard

2.1.3 Particulate Matter (PM)

PM air pollution is a complex mixture of small and large particles of varying origin that can contain hundreds of different chemicals, including cancer-causing agents like polycyclic aromatic hydrocarbons (PAH), as well as heavy metals such as arsenic and cadmium. PM air pollution results from direct emissions of particles as well as particles formed through chemical transformations of gaseous air pollutants. The characteristics, sources, and potential health effects of particulate matter depend on its source, the season, and atmospheric conditions.

As practical convention, PM is divided by sizes[2] into classes with differing health concerns and potential sources. Particles less than 10 micrometers in diameter (PM_{10}) pose a health concern because they can be inhaled and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as "fine" particles. Because of their small size, fine particles can lodge deeply into the lungs. Sources of fine particles include all types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Particles with diameters between 2.5 and 10 micrometers ($PM_{10-2.5}$) are referred to as "coarse" or PMc. Sources of PMc include crushing or grinding operations and dust from paved or unpaved roads. The distribution of PM_{10}, $PM_{2.5}$ and PMc varies from the Eastern U.S. to arid western areas.

Epidemiological and toxicological studies have demonstrated associations between fine particles and respiratory and cardiovascular health effects, including irritation of the airways, coughing, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease. These studies are summarized and integrated in "Air Quality Criteria for Particulate Matter" (EPA 2004). This document and other technical documents related to PM standards are available at http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html.

The current (as of March 2012) NAAQS for $PM_{2.5}$ includes both a 24-hour standard to protect against short-term effects, and an annual standard to protect against long-term effects. The annual average $PM_{2.5}$ concentration must not exceed 15 ug/m^3, and the 24-hr average concentration must not exceed 35 micrograms per cubic meter (ug/m^3). The current annual $PM_{2.5}$ NAAQS was set in 1997 and the current 24-hr $PM_{2.5}$ NAAQS was set in 2006 "(for details see http://www.epa.gov/air/criteria.html) and http://www.epa.gov/oar/particlepollution/naaqsrev2006.html). The EPA quality assurance standards for $PM_{2.5}$ monitors specify that the coefficient of variation (CV = standard deviation/mean) of a monitor measurement must be less than 10%. The relative bias (tendency for measured values to be higher or lower than 'true' value) for $PM_{2.5}$ monitor measurements must be between the range of -10% to +10%. The 'allowable' $PM_{2.5}$ values are shown in the table below:

Micrograms Per Cubic Meter: Measurement - (μg/m3)	1997	2006
Annual Average	15	15
24-Hour Average	65	35

Table 2-2. $PM_{2.5}$ Standards

[2] The measure used to classify PM into sizes is the aerodynamic diameter. The measurement instruments used for PM are designed and operated to separate large particles from the smaller particles. For example, the $PM_{2.5}$ instrument only captures and thus measures particles with an aerodynamic diameter less than 2.5 micrometers. The EPA method to measure PMc is designed around taking the mathematical difference between measurements for PM_{10} and $PM_{2.5}$.

2.2 Ambient Air Quality Monitoring in the United States

2.2.1 Monitoring Networks

The Clean Air Act requires every state to establish a network of air monitoring stations for criteria pollutants, following specific guidelines for their location and operation. Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors are used to measure criteria pollutants. The monitoring stations in this network have been called the State and Local Air Monitoring Stations (SLAMS). The SLAMS network consists of approximately 4,000 monitoring sites whose distribution is largely determined by the needs of state and local air pollution control agencies. All ambient monitoring networks selected for use in SLAMS are tested periodically to assess the quality of the SLAMS data being produced. Measurement accuracy and precision are estimated for both automated and manual methods. The individual results of these tests for each method or analyzer are reported to EPA. Then, EPA calculates quarterly integrated estimates of precision and accuracy for the SLAMS data.

The National Air Monitoring Station network (NAMS) is about a 1,000-site subset of the SLAMS network, with emphasis on areas of maximum concentrations and high population density in urban and multi-source areas. The NAMS monitoring sites are designed to obtain more timely and detailed information about air quality in strategic locations and must meet more stringent monitor siting, equipment type, and quality assurance criteria. NAMS monitors also must submit detailed quarterly and annual monitoring results to EPA.

The SLAMS and NAMS networks experienced accelerated growth throughout the 1970s. The networks were further expanded in 1999 following the 1997 revision of the CAA to include separate standards for fine particles ($PM_{2.5}$) based on their link to serious health problems ranging from increased symptoms, hospital admissions, and emergency room visits, to premature death in people with heart or lung disease. While most of the monitors in these networks are located in populated areas of the country, "background" and rural monitors are an important part of these networks. For criteria pollutants other than ozone and $PM_{2.5}$, the number of monitors has declined. More information on SLAMS and NAMS, as well as EPA's other air monitoring networks are available at: http://www.epa.gov/ttn/amtic.

In summary, state and local agencies and tribes implement a quality-assured monitoring network to measure air quality across the United States. EPA provides guidance to ensure a thorough understanding of the quality of the data produced by these networks. These monitoring data have been used to characterize the status of the nation's air quality and the trends across the U.S. (http://www.epa.gov/airtrends).

2.2.2 Air Quality System Database

The Air Quality System (AQS) database contains ambient air pollution data collected by EPA, state, local, and tribal air pollution control agencies from thousands of monitoring stations (SLAMS and NAMS). AQS also contains meteorological data, descriptive information about each monitoring station (including its geographic location and its operator), and data quality assurance and quality control

information. State and local agencies are required to submit their air quality monitoring data into AQS by the end of the quarter following the quarter in which the data were collected. This ensures timely submission of these data for use by state, local, and tribal agencies, EPA, and the public. EPA's Office of Air Quality Planning and Standards and other AQS users rely upon the data in AQS to assess air quality, assist in attainment vs. non-attainment designations, evaluate SIPs, perform modeling for permit review analysis, and perform other air quality management functions.

AQS was converted from a mainframe system to a UNIX-based Oracle system which is easily accessible to users through the Internet. This system became available in January 2002. Today, state, local, and tribal agencies submit their data directly to AQS. Registered users may also retrieve data through the AQS application and through the use of third-party software such as the Discoverer tool from Oracle Corporation. For more detailed information about the AQS database, go to http://www.epa.gov/ttn/airs/airsaqs/index.htm.

2.2.3 Advantages and Limitations of the Air Quality Monitoring and Reporting System

Air quality data is required to assess public health outcomes that are affected by poor air quality. The challenge is to get surrogates for air quality on time and spatial scales that are useful for Environmental Public Health Tracking activities.

The advantage of using ambient data from EPA monitoring networks for comparing with health outcomes is that these measurements of pollution concentrations are the best characterization of the concentration of a given pollutant at a given time and location, and require no further analysis. Furthermore, the data are supported by a comprehensive quality assurance program, ensuring data of known quality. One disadvantage of using the ambient data is that it is usually out of spatial and temporal alignment with health outcomes. This spatial and temporal 'misalignment' between air quality monitoring data and health outcomes is influenced by the following key factors: the living and/or working locations (microenvironments) where a person spends their time not being co-located with an air quality monitor; time(s)/date(s) when a patient experiences a health outcome/symptom (e.g., asthma attack) not coinciding with time(s)/date(s) when an air quality monitor records ambient concentrations of a pollutant high enough to affect the symptom (e.g., asthma attack either during or shortly after a high $PM_{2.5}$ day). To compare/correlate ambient concentrations with acute health effects, daily local air quality data is needed. Spatial gaps exist in the air quality monitoring network, especially in rural areas, since the air quality monitoring network is designed to focus on measurement of pollutant concentrations in high population density areas. Temporal limits also exist. Samples from Federal Reference Method (FRM) $PM_{2.5}$ monitors are generally collected only one day in every three days, due in part to the time and costs involved in collecting and analyzing the samples. However, over the past several years Tapered Element Oscillating Microbalance (TEOM) monitors, which can automatically collect, analyze, and report $PM_{2.5}$ measurements on an hourly basis, have been introduced. These monitors are available in most of the major metropolitan areas and (as of March 2012) are being assessed for their equivalency to the FRM. Ozone is monitored daily, but mostly during the ozone season (the warmer months, approximately April through October). However, year-long data is extremely useful to evaluate whether ozone is a factor in health outcomes during the non-ozone seasons.

2.2.4 Use of Air Quality Monitoring Data for EPHT

Air quality monitoring data has been used to provide the information for the following:

1. Assessing effectiveness of SIPs in addressing NAAQS nonattainment areas
2. Characterizing local, state, and national air quality status and trends
3. Associating health and environmental damage with air quality levels/concentrations

For the EPHT effort, EPA is providing air quality data to support efforts associated with (2), and (3) above. Data supporting (3) is generated by EPA through the use of its air quality data and its Hierarchical Bayesian space-time statistical model (HBM).

Most studies that associate air quality with health outcomes use air monitoring as a surrogate for exposure to the air pollutants being investigated. Many studies have used the monitoring networks operated by state and federal agencies in the implementation of Clean Air Act requirements. Some studies perform special monitoring that can better represent exposure to the air pollutants: community monitoring, near residences, in-house or work place monitoring, and personal monitoring. For the EPHT program, special monitoring is generally not supported, though it could be used on a case-by-case basis.

Many approaches may be used to assign exposure from monitors or estimate concentrations for a new time period or location based on existing data. On the simplest level for example, data from monitoring sites are averaged and applied to the population in an entire county, or the nearest monitor is assigned to a subject's address. At the next level, variogram analysis may be used to describe the spatial correlation of the data and interpolate concentrations across space. Such approaches work well for temporally and spatially robust data, but where data are missing (for example for $PM_{2.5}$ data with samples taken every third day), further assumptions and modeling are needed which add uncertainty into the interpolated concentrations. Finally, air quality monitoring data can be used with air quality modeling estimates (using emissions inventories) and incorporated into a Bayesian model to enhance the prediction of ambient air concentrations in space and time. There are two methods used in EPHT to provide estimates of ambient concentrations of air pollutants: air quality monitoring data and the Hierarchical Bayesian-derived air quality estimate, which is a statistical 'combination' of air quality monitor data and air quality modeling estimates.

Goal	Status
(1) Air data sets and metadata required for air quality indicators are available to EPHT state Grantees.	AQS data is available through state agencies and EPA's AirData and AirExplorer. EPA and CDC developed an interagency agreement, where EPA provides air quality data along with HBM modeling data, associated metadata, and technical reports that are delivered to CDC.
(2) Estimate the linkage or association of $PM_{2.5}$ and ozone on health to: A. Identify populations that may have higher risk of adverse health effects due to $PM_{2.5}$ and ozone, B. Generate hypothesis for further research, and C. Provide information to support prevention and pollution control strategies.	Regular discussions have been held on health-air linked indicators and CDC/HEI/EPA convened a workshop in January 2008. CDC has collaborated on a health impact assessment (HIA) with Emory University, EPA and state grantees that can be used to facilitate greater understanding of these linkages.
(3) Produce and disseminate basic indicators and other findings in electronic and print formats to provide the public, environmental health professionals, and policymakers, with current and easy-to-use information about air pollution and the impact on public health.	Templates and "how to" guides for $PM_{2.5}$ and ozone have been developed for routine indicators. Calculation techniques and presentations for the indicators have been developed.

Table 2-3. Public Health Surveillance Goals and Current Results

Ozone (daily 8-hr period with maximum concentration—ppm—by Federal Reference Method (FRM))
Number of days with maximum ozone concentration over the NAAQS (or other relevant benchmarks (by county and MSA)
Number of person-days with maximum 8-hr average ozone concentration over the NAAQS & other relevant benchmarks (by county and MSA)
$PM_{2.5}$ (daily 24-hr integrated samples by FRM)
Average ambient concentrations of particulate matter (< 2.5 microns in diameter) and compared to annual $PM_{2.5}$ NAAQS (by state).
% population exceeding annual $PM_{2.5}$ NAAQS (by state).
% of days with $PM_{2.5}$ concentration over the daily NAAQS (or other relevant benchmarks (by county and MSA)
Number of person-days with $PM_{2.5}$ concentration over the daily NAAQS & other relevant benchmarks (by county and MSA)

Table 2-4. Basic Air Quality Indicators

2.3 Air Quality Indicators Developed for the EPHT Network

Air quality indicators have been developed for use in the Environmental Public Health Tracking Network (EPHT). The approach divides "indicators" into two categories. First, basic air quality measures were developed to compare air quality levels over space and time within a public health context (e.g., using the NAAQS as a benchmark). Next, indicators were developed that mathematically link air quality data to public health tracking data (e.g., daily $PM_{2.5}$ levels and hospitalization data for acute myocardial infarction). Table 2-3 and Table 2-4 describe the issues impacting calculation of basic air quality indicators.

2.3.1 Rationale for the Air Quality Indicators

The CDC EPHT Network is initially focusing on ozone and $PM_{2.5}$. These air quality indicators are based mainly around the NAAQS health findings and program-based measures (measurement, data and analysis methodologies). The indicators will allow comparisons across space and time for EPHT actions. They are in the context of health-based benchmarks. By bringing population into the measures, they roughly distinguish between potential exposures (at broad scale).

2.3.2 Air Quality Data Sources

The air quality data will be available based on the state/federal air program's data collection and processing. Air quality data management (EPA's Air Quality System—AQS) and delivery systems (AirData and Air Explorer) were used in the PHASE project as the pilot test for air quality indicators. The AirExplorer functionality is now fully integrated into the AirData system, and AirExplorer is no longer a stand-alone system/application.

2.3.3 Use of Air Quality Indicators for Public Health Practice

The basic indicators will be used to inform policymakers and the public regarding the degree of hazard within a state and across states (national). For example, the number of days per year that ozone is above the NAAQS can be used to communicate to sensitive populations (such as asthmatics) the number of days that they may be exposed to unhealthy levels of ozone. This is the same level used in the Air Quality Alerts that inform these sensitive populations when and how to reduce their exposure. These indicators, however, are not a surrogate measure of exposure and therefore will not be linked with health data.

3.0 Emissions Data

3.1 Introduction to the 2007 Emissions Data Development

The U.S. EPA has developed a 2005-based air quality modeling platform for emissions data. Version 4 of the 2005 platform (i.e., 2005v4) was used to develop the year 2007 emission data for this project, where there was not 2007-specific data available. This section is a summary of the emissions inventory and emissions modeling for Criteria Air Pollutants (CAPs), and describes the approach and data used to produce emissions inputs to the air quality model. The air quality modeling, meteorological inputs and boundary conditions are described in a separate section. A complete description of the 2005v4 Platform is available in "Technical Support Document: Preparation of Emissions Inventories for the Version 4, 2005-based Platform, U.S. EPA, Research Triangle Park, NC 27711, July 2010" (available from http://www.epa.gov/ttn/chief/emch/index.html#2005).

The Community Multiscale Air Quality (CMAQ) model (http://www.epa.gov/AMD/CMAQ/) is one of the air quality models supported by the 2005v4 platform for the purposes of modeling ozone (O_3) and particulate matter (PM). The version of CMAQ used for this study requires hourly and gridded emissions of species from the following inventory pollutants: carbon monoxide (CO),nitrogen oxides (NO_X), volatile organic compounds (VOC), sulfur dioxide (SO_2), ammonia (NH_3), particulate matter less than or equal to 10 microns (PM_{10}), and individual component species for particulate matter less than or equal to 2.5 microns ($PM_{2.5}$). In addition, the CMAQ CB05 with chlorine chemistry, which is part of the "base" version of CMAQ, allows explicit treatment of the following substances, Benzene, Acetaldehyde, Formaldehyde, and Methanol (BAFM), and includes anthropogenic Hazardous Air Pollutant (HAP) emissions ofHCl and Cl. Readers may note that the version of CMAQ targeted by the 2005v4 platform does not support Hg, but other versions of the modeling platform do support Hg.

The effort to create the 2007 emission inputs for this study included development of emission inventories for a 2007 model evaluation case and application of the emissions modeling tools to convert the inventories into the format and resolution needed by CMAQ. The 2007 evaluation case uses 2007-specific fire emissions and 2007-specific continuous emission monitoring (CEM) data for electric generating units (EGUs).

The primary emissions modeling tool used to create the CMAQ model-ready emissions was the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system. SMOKE version 2.6 was used to create emissions files for a 12-km national grid. Electronic copies of some of the data used with SMOKE for the criteria air pollutants (CAP) 2005v4 Platform are available at the emissions modeling clearinghouse, http://www.epa.gov/ttn/chief/emch/, under the section entitled "CAP BAFM 2005-Based Platform, Version 4."

This summary contains two additional sections. Section 3.2 describes the inventories input to SMOKE and the ancillary files used along with the emission inventories. Section 3.3 describes the emissions modeling performed to convert the inventories into the format and resolution needed by CMAQ.

3.2 2007 Emission Inventories and Approaches

This section describes the emissions inventories created for input to SMOKE. The primary basis for the emission inputs for the 2005v4 Platform is the 2005 National Emission Inventory (NEI), Version 2. The 2005 NEI v2 includes emissions of CO, NO_x, VOC, SO_2, NH_3, PM_{10}, and $PM_{2.5}$ and hazardous air pollutants (HAPs). The 2005 platform utilizes select HAPs: the base version includes chlorine, HCl, benzene, acetaldehyde, formaldehyde, and methanol. Documentation for the 2005 NEI can be found at: http://www.epa.gov/ttn/chief/net/2005inventory.html#documentation. For inventories outside of the United States, including Canada, Mexico and offshore emissions, the latest available base year inventories were used.

The 2005 NEI includes five source sectors: a) nonpoint (formerly called "stationary area") sources; b) point sources; c) nonroad mobile sources; d) onroad mobile sources; and e) fires. The fires portion of the inventory includes emissions from wildfires and prescribed burning computed as hour-specific point sources. For purposes of preparing the CMAQ-ready emissions, the NEI is split into several additional "platform" sectors for use in emissions modeling; biogenic emissions are added along with emissions from other sources and other NEI such as the Canadian, Mexican, and offshore inventories. The significance of an emissions sector for the platform is that it is run through all of the SMOKE programs, except the final merge, independently from the other sectors. The final merge program (i.e., Mrggrid) combines the sector-specific gridded, speciated and temporalized emissions to create the CMAQ emission inputs.

Table 3-1 presents the sectors in the 2005v4 platform used to develop 2007 emissions for this project. The sector abbreviations are provided in italics; these abbreviations are used in the SMOKE modeling scripts and inventory file names and throughout the remainder of this section. Annual 2007 emission summaries for the U.S. anthropogenic sectors are shown in Table 3-2 (i.e., excluding biogenic emissions). Table 3-3 provides a summary of emissions for the anthropogenic sectors containing Canadian, Mexican and offshore sources.

2005v4 Platform Sector	2005 NEI Sector	Description and resolution of the data input to SMOKE
IPM sector: *ptipm*	Point	2005v2 NEI point source EGUs mapped to the Integrated Planning Model (IPM) model using year 2007 continuous emission monitoring (CEM) NOX and SO_2 emissions from the National Electric Energy Database System (NEEDS, 2006 version 3.02) database. Hourly files for CEM sources are included for the 2007 evaluation case used for this project. Day-specific emissions for non-CEM sources are year 2005 NEI-based estimates and were created for input into SMOKE.
Non-IPM sector: *ptnonipm*	Point	Year 2005 emissions for all 2005v2 NEI point source records not matched to the ptipm sector, annual resolution. Includes all aircraft emissions.
Point source fire sector: *ptfire*	Fires	Point source day-specific wildfires and prescribed fires for 2007.
Agricultural sector: ag	Nonpoint	Primarily 2002 NEI nonpoint NH_3 emissions from livestock and fertilizer application, county and annual resolution.
Area fugitive dust sector: *afdust*	Nonpoint	Primarily 2002 NEI nonpoint PM_{10} and $PM_{2.5}$ from fugitive dust sources (e.g., building construction, road construction, paved roads, unpaved roads, agricultural dust), county/annual resolution.
Remaining nonpoint sector: *nonpt*	Nonpoint	Primarily 2002 NEI nonpoint sources not otherwise included in other SMOKE sectors, county and annual resolution. Also includes updated Residential Wood Combustion emissions and year 2005 non-California Western Regional Air Partnership (WRAP) oil and gas "Phase II" inventory.
Nonroad sector: *nonroad*	Mobile: Nonroad	Year 2007 monthly nonroad emissions from the National Mobile Inventory Model (NMIM) using NONROAD2005 version nr05c-BondBase for all states except California. Monthly emissions for California created from annual emissions submitted by the California Air Resources Board (CARB) for the 2005v2 NEI linearly-interpolated with year 2009 emissions to create year 2007.
locomotive, and non-C3 commercial marine: *alm_no_c3*	Mobile: Nonroad	Year 2002 non-rail maintenance locomotives, and category 1 and category 2 commercial marine vessel (CMV) emissions sources, county and annual resolution. Unlike prior platforms, aircraft emissions are now included in the ptnonipm sector and category 3 CMV emissions are now contained in the seca_c3 sector
C3 commercial marine: *seca_c3*	Mobile : Nonroad	Annual point source formatted year 2007 category 3 (C3) CMV emissions, developed for the EPA rule called "Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder", usually described as the Area (ECA) study, originally called SO2 ("S") ECA.
Onroad California, NMIM-based, and MOVES sources not subject to temperature adjustments: *on_noadj*	Mobile: onroad	Year 2007 emissions consisting of two, monthly, county-level components: 1. MOVES2010-based (December 2009) except for California and gasoline exhaust PM. 2. California onroad, created using annual EMFAC-based emissions submitted by CARB for the 2005v2 NEI, linearly-interpolated with year 2009 EMFAC-based submissions.
Onroad cold-start gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_startpm*	Mobile: onroad	Year 2007 monthly, county-level MOVES2010-based onroad gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species. California emissions not included. This sector is limited to cold start mode emissions that contain different temperature adjustment curves from running exhaust (see on_moves_runpm sector).
Onroad running gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_runpm*	Mobile: onroad	Year 2007 monthly, county-level MOVES2010-based onroad gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species. California emissions not included. This sector is limited to running mode emissions that contain different temperature adjustment curves from cold start exhaust (see on_moves_startpm sector).
Biogenic: *beis*	N/A	Hour-specific, grid cell-specific emissions generated from the BEIS3.14 model -includes emissions in Canada and Mexico.
Other point sources not from the NEI: *othpt*	N/A	Point sources from Canada's 2006 inventory and Mexico's Phase III 1999 inventory, annual resolution. Also includes annual U.S. offshore oil 2005v2 NEI point source emissions.

2005v4 Platform Sector	2005 NEI Sector	Description and resolution of the data input to SMOKE
Other nonpoint and nonroad not from the NEI: *othar*	N/A	Annual year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) nonpoint and nonroad mobile inventories, annual resolution.
Other onroad sources not from the NEI: *othon*	N/A	Year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) onroad mobile inventories, annual resolution.

Table 3-1. Platform Sectors Used in the Emission

Sector	CO	NH_3	NOX	PM_{10}	PM_{25}	SO_2	VOC
afdust				8,858,992	1,030,391		
Ag		3,251,990					
alm_no_c3	270,007	773	1,924,925	59,366	56,687	154,016	67,690
nonpt	7,376,314	134,080	1,683,490	1,349,685	1,076,954	1,252,645	7,474,512
nonroad	17,902,244	2,042	2,010,786	192,016	182,151	103,787	2,514,819
onroad	37,903,749	163,735	8,001,667	179,470	102,494	66,370	3,147,282
ptfire	33,600,784	550,283	397,094	3,363,355	2,850,301	233,739	7,910,324
ptipm	578,111	20,997	3,360,926	612,992	507,501	9,083,244	40,075
ptnonipm	3,222,221	159,003	2,247,228	653,957	442,656	2,117,649	1,310,085
seca_c3	58,225		688,087	58,042	53,398	452,318	24,233
Con.US Total	**100,911,655**	**4,282,903**	**20,314,203**	**15,327,874**	**6,302,535**	**13,463,767**	**22,489,021**

Table 3-2. 2007 Continental United States Emissions by Sector (tons/yr in 48 states + D.C.)

Country & Sector	CO	NH3	NOX	PM_{10}	$PM_{2.5}$	SO_2	VOC*
Canada othar	3,747,987	537,835	718,996	1,421,910	393,852	97,652	1,332,559
Canada othon	4,514,002	21,810	537,665	15,002	10,632	5,430	308,318
Canada othpt	1,147,801	21,138	861,223	117,254	68,114	1,762,340	448,629
Canada Subtotal	9,409,790	580,784	2,117,883	1,554,167	472,598	1,865,422	2,089,507
Mexico othar	350,557	254,600	171,099	75,556	49,023	82,643	429,264
Mexico othon	1,066,589	1,898	110,203	5,151	4,720	6,124	152,265
Mexico othpt	68,422	0	224,202	97,146	72,264	649,810	65,273
Mexico Subtotal	1,485,567	256,498	505,505	177,854	126,007	738,578	646,802
Offshore othpt	89,800	0	82,571	839	837	1,961	53,399
Offshore seca_c3	40,377	0	490,149	40,483	37,240	300,320	17,176
2007 TOTAL	**11,025,535**	**837,282**	**3,196,108**	**1,773,342**	**636,682**	**2,906,280**	**2,806,884**

* VOC is approximated from a sum of speciated VOC within the modeling domain

Table 3-3. 2007 Non-US Emissions by Sector (tons/yr for Canada, Mexico, Offshore)

3.2.1 Point Sources (ptipm and ptnonipm)

Point sources are sources of emissions for which specific geographic coordinates (e.g., latitude/longitude) are specified, as in the case of an individual facility. A facility may have multiple emission points, which may be characterized as units such as boilers, reactors, spray booths, kilns, etc. A unit may have multiple processes (e.g., a boiler that sometimes burns residual oil and sometimes burns natural gas). Note that this section describes only contiguous U.S. NEI point sources. The offshore oil platform (othpt sector) and category 3 CMV emissions (seca_c3 sector) are point source formatted inventories, but they are discussed later in this section.

After removing offshore oil platforms into the othpt sector, two platform sectors were created from the remaining 2005 point source NEI, v2 for input into SMOKE: the Integrated Planning Model (IPM) sector (ptipm) and the non-IPM sector (ptnonipm). This split facilitates the use of different SMOKE temporal processing and future year projection techniques for these sectors. The inventory pollutants processed through SMOKE for both ptipm and ptnonipm sectors were: CO, NO_X, VOC, SO_2, NH_3, PM_{10}, $PM_{2.5}$ and the following HAPs: HCl and Cl. BAFM from these sectors was not used and instead the VOC was speciated without any integration of VOC HAP (integration is discussed in detail in Section 3.3.4).

The ptnonipm emissions were provided to SMOKE as annual emissions. In the 2007 model evaluation case used in this study, for ptipm sector sources with CEM data that could be matched to the NEI, 2007 hourly SO_2 and NO_X emissions were used alongside annual emissions of all other pollutants. The hourly data also contained heat input, which was used to allocate the annual emissions to hourly values. For the non-CEM sources, daily emissions were created, and state-specific diurnal profiles were applied to create hourly emissions.

Full documentation for the development of the 2005 point source NEI, v2, is at:

http://www.epa.gov/ttn/chief/net/2005inventory.html#documentation. A summary of this documentation follows:

1. Electric generating unit (EGU) emissions are obtained from emissions and heat input from EPA'S Acid Rain Program. The following approach applied to units in the 2002 NEI that matched to 2005 CEMS units. For pollutants covered by the CEMS, the 2007 CEMS data were used. For CEMS units with pollutants not covered by CEMS (e.g., VOC, $PM_{2.5}$, HCl) unit specific ratios of 2007 to 2005 heat input were applied to 2005 NEI v2 emissions to obtain 2007 estimates.

2. Non-EGU Stationary Source enhancements focused on improving the following sectors:

   a. HAP data received from States and industry to support the MACT program, including the recent Risk and Technology Review rulemaking

   b. 2005 State, local, and tribal data submitted to EPA under the Consolidated Emissions Reporting Rule (CERR)

   c. HAP data from Toxic Release Inventory (TRI) for missing facilities and pollutants

   d. Off-shore platform data from Mineral Management Services (MMS)

The changes made to the 2005 NEI point sources prior to modeling are as follows:

- The tribal data, which do not use state/county Federal Information Processing Standards (FIPS) codes in the NEI, but rather use the tribal code, were assigned a state/county FIPS code of 88XXX, where XXX is the 3-digit tribal code in the NEI. This change was made because SMOKE requires the state/county FIPS code.
- Stack parameters for some point sources were defaulted when modeling in SMOKE. SMOKE uses an ancillary file, called the PSTK file, which provides default stack parameters by Source Classification Code (SCC) to either 'gap fill' stack parameters if they are missing in the NEI or to correct stack parameters if they are outside the ranges specified in SMOKE for acceptable values. The SMOKE PSTK file is contained in the ancillary file directory of the 2005v4 website.
- A transport fraction was applied to all SCCs that were identified as PM fugitive dust, to prevent the overestimation of fugitive dust impacts in the grid modeling.

3.2.1.1 IPM Sector (ptipm)

The ptipm sector contains emissions from EGUs in the 2005 NEI version 2 point inventory that could be matched to the units found in the 2006 NEEDS database, version 3.02 (http://www.epa.gov/airmarkets/progsregs/epa-ipm/index.html), which is used by the IPM, version 3.02. The IPM model provides future year emission inventories for the universe of EGUs contained in the NEEDS database. As described below, this matching was done in order to (1) provide consistency between the 2005 EGU sources and future year EGU emissions for sources which are forecasted by IPM and (2) avoid double counting in projecting point source emissions.

The 2005 NEI point source inventory contains emissions estimates for both EGU and non-EGU sources. The IPM is used to predict the future year emissions for the EGU sources. The remaining non-EGU point sources are projected by applying projection and control factors to the base year emissions. It was therefore necessary to identify and separate into two sectors: (1) all sources that are projected via the IPM and (2) those that are not. This procedure prevents double-counting or dropping significant emissions when creating the future-year emissions. The matching process relies on imperfect data; consequently, a small degree of dropped and/or double-counted emissions occurred for sources that we could not match. We believe that the unmatched units are small emissions sources because we have reviewed both the NEI and the NEEDS database to ensure that all significant EGUs have been captured in the matching process.

The methodology that follows describes how the point inventory was split into the ptipm and ptnonipm sectors. The

approach started with the splits identified for the 2002 NEI (step 1) and then included additional steps to apply these to the 2005 NEI.

The methodology used to split the EGU emission sources from the non-EGU emission sources was implemented as follows:

Step 1: Obtain facilities and units identified as EGUs from the 2002 NEI

2005 NEI units were identified as IPM units using the 2006 NEEDS 3.0 database. This methodology is described in the 200 Platform documentation previously referenced. Since some source identifiers are held constant between the 2002 and 2005 NEI, particularly "NEI Unique ID", it was easier to compare the two inventories to ensure that improvements were made in the 2005 matching rather than having inadvertent omissions.

Step 2: Create the 2005 NEI v2 point modeling inventory from the 2005v2 NEI and impacts on EGU matching

The published 2005 NEI v2 point inventory was enhanced to improve the ptipm and ptnonipm splits and make other updates. What follows are the issues and their resolution. These changes represent differences between the published 2005 v2 NEI and what was used for modeling.

1. Facilities with added HAP emissions records that were clearly EGUs, but had not been flagged as "IPM" sources were identified. These facilities had facility identifiers (i.e., plant IDs) beginning with "EGU". It was further confirmed that these records were EGU emissions; and therefore, these units were moved to the ptipm sector.
2. One additional unit with HAP emissions records not flagged as an EGU was found, after confirming that representing emissions were from a facility for which CAP records were identified as ptipm sector records. This unit (South Mississippi Electric Power, plantid = 2807300021, unitid = 012, NEI_UNIQUE_ID=NEI409) was moved into the ptipm inventory.
3. Several facilities and units closed between 2002 and 2005 and had not initially been removed in the development of the 2005v2 NEI; these were removed based on a list from the NEI developers.
4. Inspection of CEM and 2005 NEI v2 point inventory revealed some duplication of sources with state and non-state reported data. This can occur because EPA created the EGU records in the 2005 NEI, but the states sometimes still submitted these emissions records. These duplicates were removed.
5. ORIS facility and boiler codes (used to match to the CEM hourly data) were unintentionally dropped between a preliminary and final 2005 NEI v2 point dataset. These ORIS facility and boiler codes were repopulated based on available data.

Another reason the ptipm sources were separated from the other sources was due to the difference in the temporal resolution of the data input to SMOKE. The ptipm sector uses the available hourly CEM data via a method first implemented in the 2002 platform that was also used for the 2005 platform. For sources with CEMs, the actual year 2007 hourly CEM data were used. The hourly CEM data were obtained from the CAMD Data and Maps website[3]. The SMOKE modeling system matches the ORIS Facility and Boiler IDs in the NEI SMOKE-ready file to the same fields in the CEM data. This allowed us to use the hourly SO_2 and NO_X CEM emissions directly from the CEM data file. The heat input from the hourly CEM data was used to allocate the NEI annual values for all other pollutants from CEM sources, because hourly data for these other pollutants are not available with the hourly CEM data.

For sources not matching the CEM data ("non-CEM" sources), daily emissions were computed from the NEI annual emissions using a structured query language (SQL) program and state-average CEM data. To allocate annual emissions to each month, state-specific, three-year averages of 2006-2008 CEM data were created. These average annual-to-month factors were assigned to non-CEM sources by state. To allocate the monthly emissions to each day, the 2007 CEM data were used to compute state-specific month-to-day factors, which were then averaged across all units in each state. The resulting daily emissions were input into SMOKE. The daily-to-hourly allocation was performed in SMOKE using diurnal profiles. The development of these diurnal ptipm-specific profiles, considered ancillary data for SMOKE, is described in a later section.

3.2.1.2 Non-IPM Sector (ptnonipm)

The non-IPM (ptnonipm) sector contains all 2005 NEI v2 point sources not included in the IPM (ptipm) sector[4]. The ptnonipm sector contains fugitive dust PM emissions from vehicular traffic on paved or unpaved roads at industrial facilities or coal handling at coal mines. Prior to input to SMOKE, the fugitive dust PM emissions were reduced to estimate the emissions that remain aloft by applying county-specific fugitive dust transportable fraction factors. This is discussed further in Section 3.2.2.1.

For some geographic areas, some of the sources in the ptnonipm sector belong to source categories that are contained in other sectors. This occurs in the inventory when states, tribes or local programs report certain inventory emissions as point sources because they have specific geographic coordinates for these sources. They may use point source SCCs (8-digit) or non-point, onroad or nonroad (10-digit) SCCs. In the 2005 NEI, examples of these types of sources include: aircraft emissions in all states, waste disposal emissions in several states, firefighting training in New Mexico, several industrial processes and solvent utilization sources in North Carolina and Tennessee, livestock (i.e., animal husbandry) in primarily Kansas and Minnesota,

[3] http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard

[4] Except for the offshore oil and day-specific point source fire emissions data which are included in separate sectors, as discussed in sections 2.6 and 2.3.1, respectively.

and petroleum product working losses.

The most significant changes made to the ptnonipm emissions involved moving some HAP records that should have been flagged as IPM into the ptipm sector. The other modifications are listed here and represent differences between the published 2005 NEI v2 and the 2005 inventory used for modeling:

1. Removed duplicate annual records (not sub-annual, non-repeating records).
2. Removed a source with a state/county FIPS code of 30777; the "777" county FIPS represents portable facilities that move across counties, but is not currently a valid state/county FIPS code in the SMOKE ancillary file "COSTCY". This Montana FIPS code was located in northern Wyoming and contained very small emissions.
3. Dropped sources with coordinates located well into the oceans or lakes.
4. Fixed the coordinates for several larger sources that had a state/county FIPS code mismatch with their inventory coordinates greater than 10 km and emissions greater than 10 tons per year of either NO_X, VOC, SO_2, or 5 tons/yr of $PM_{2.5}$. These corrections were limited to a small number of plants in Arizona, Indiana, Kentucky, Ohio, and Virginia.

3.2.2 Nonpoint Sources (afdust, ag, nonpt)

The nonpoint portion of the 2005 NEI v2 generally did not include updated emissions from the values used in the 2002 NEI, and this modeling platform took a similar approach. Consequently, several sectors were created from the 2002 nonpoint NEI prior to modeling. The nonpoint tribal-submitted emissions were removed to prevent possible double counting with the county-level emissions. Because the tribal nonpoint emissions are small, these omissions should not impact results at the 12-km scale used for modeling. This omission also eliminated the need to develop costly spatial surrogate data to allocate tribal data to grid cells during the SMOKE processing. The documentation for the nonpoint sector of the 2005 NEI is available at: http://www.epa.gov/ttn/chief/net/2005inventory.html

In the rest of this section, each of the platform sectors into which the 2005 nonpoint NEI was divided is described, as are the changes made to these data. See the 2002 platform documentation for sectors that did not change

3.2.2.1 Area Fugitive Dust Sector (afdust)

The area-source fugitive dust (afdust) sector contains PM_{10} and $PM_{2.5}$ emission estimates for 2002 NEI nonpoint SCCs identified by EPA staff as dust sources. This sector is separated from other nonpoint sectors to make it easier to apply a "transport fraction," that reduces emissions to reflect observed diminished transport from these sources at the scale of our modeling. Application of the transport fraction prevents the overestimation of fugitive dust impacts in the grid modeling as compared to ambient samples. Categories included in this sector are paved roads, unpaved roads and airstrips, construction (residential, industrial, road and total), agriculture production and all of the mining 10-digit SCCs beginning with the digits "2325." It does not include fugitive dust from grain elevators because these are elevated point sources.

The afdust sector was created from the 2002 NEI based on SCCs and pollutant codes (i.e., PM_{10} and $PM_{2.5}$) that are considered "fugitive". A complete list of all possible fugitive dust SCCs (including both 8-digit point source SCCs and 10-digit nonpoint SCCs) is provided at: http://www.epa.gov/ttn/chief/emch/dustfractions/tf_scc_list2002nei_v2.xls. However, not all of the SCCs in this file are present in the 2002 NEI.

Our approach was to apply the transportable fractions by county such that all afdust SCCs in the same county receive the same factor. The approach used to calculate the county-specific transportable fractions is based on land use data and is described by: http://www.epa.gov/ttn/chief/emch/dustfractions/transportable_fraction_080305_rev.pdf

As the paper describing the approach mentions, a limitation of the transportable fraction approach is the lack of monthly variability, which would be expected due to seasonal changes in vegetative cover. Further, the variability due to soil moisture, precipitation, and wind speeds is not accounted for by the methodology. An electronic version of the county-level transport fractions can be found at: http://www.epa.gov/ttn/chief/emch/dustfractions/transportfractions052506rev.xls

3.2.2.2 Agricultural Ammonia Sector (ag)

The agricultural NH_3 "ag" sector comprises livestock and agricultural fertilizer application emissions from the nonpoint sector of the 2002 NEI. This sector is unchanged in the 2005 platform. In building this sector, livestock and fertilizer emissions were extracted based on the SCC. The "ag" sector includes all of the NH_3 emissions from fertilizer from the NEI. However, the "ag" sector does include all of the livestock ammonia emissions, as there are also significant NH_3 emissions from livestock in the point source inventory. Most of the point source livestock NH_3 emissions were reported by the states of Kansas and Minnesota. For these two states, farms with animal operations were provided as point sources.[5]

The "ag" sector includes all of the NH_3 emissions from fertilizer from the NEI. However, the "ag" sector does not include all of the livestock ammonia emissions, as there are also significant NH_3 emissions from livestock in the point source inventory retained from the 2002 NEI. Note that in these cases, emissions were not also in the nonpoint inventory for counties for which they were in the point source inventory; therefore no double counting occurred. Most of the point source livestock NH_3 emissions were reported by the states of Kansas and Minnesota. For these two states, farms with animal operations were provided as point sources using the following SCCs[6]:

[5] These point source emissions are also identified by the segment ID, which is one of the following: "SWINE," "CATTLE," "DAIRY," or "PLTRY."

[6] These point source emissions are also identified by the segment ID, which is one of the following: "SWINE", "CATTLE", "DAIRY", or "PLTRY".

- 30202001: Industrial Processes; Food and Agriculture; Beef Cattle Feedlots; Feedlots General
- 30202101: Industrial Processes; Food and Agriculture; Eggs and Poultry Production; Manure Handling: Dry
- 30203099: Industrial Processes; Food and Agriculture; Dairy Products; Other Not Classified

There are also livestock NH_3 emissions in the point source inventory with SCCs of 39999999 (Industrial Processes; Miscellaneous Manufacturing Industries; Miscellaneous Industrial Processes; Other Not Classified) and 30288801 (Industrial Processes; Food and Agriculture; Fugitive Emissions; Specify in Comments Field). These sources were identified as livestock NH_3 point sources based on their facility name. The reason the livestock NH_3 emissions in the ptnonipm sector had to be identified was to properly implement the emission projection techniques for livestock sources in future years. The projection techniques cover all livestock sources, including those in the ag and ptnonipm sectors.

3.2.2.3 Other Nonpoint Sources (nonpt)

Nonpoint sources that were not subdivided into the afdust, ag or nonpt sectors were assigned to the "nonpt" sector. In preparing the nonpt sector, catastrophic releases were excluded since these emissions were dominated by tire burning, which is an episodic, location-specific emissions category. Tire burning accounts for significant emissions of particulate matter in some parts of the country. Because such sources are reported by a very small number of states, and are inventoried as county annual totals without the information in the NEI to temporally and spatially allocate the emissions to the time and location where the event occurred, catastrophic releases were excluded.

The nonpt sector includes emission estimates for Portable Fuel Containers (PFCs), also known as "gas cans." Inventories for PFCs were recently developed for EPA's Mobile Source Air Toxics (MSAT) rule and were incorporated into the 2002 NEI v3. The PFC inventory consists of five distinct sources of PFC emissions, further distinguished by residential or commercial use. The five sources are: (1) displacement of the vapor within the can; (2) spillage of gasoline while filling the can; (3) spillage of gasoline during transport; (4) emissions due to evaporation (i.e., diurnal emissions); and (5) emissions due to permeation. Note that spillage and vapor displacement associated with using PFCs to refuel nonroad equipment are included in the nonroad inventory.

Statewide total annual VOC inventories were allocated to counties using county-level fuel consumption ratios from the NONROAD model. Of note from this documentation, the developers derived the 2002 PFC inventory by linearly interpolating inventories developed for 1999 and 2010.

3.2.4 Day-Specific Point Source Fires (ptfire)

Wildfire and prescribed burning emissions are contained in the ptfire sector. The ptfire sector has emissions provided at geographic coordinates (point locations) and has daily emissions values.

For the 2005 Platform, the following SCCs from the 2005 NEI are considered "fires" (note that the actual SCC description includes "Miscellaneous Area Sources" as the first tier level description):

- 2810001000: Miscellaneous Area Sources; Other Combustion; Forest Wildfires; Total
- 2810015000: Miscellaneous Area Sources; Other Combustion; Prescribed Burning for Forest Management; Total
- 2810005000: Miscellaneous Area Sources; Managed Burning, Slash (Logging Debris); Total

The ptfire sector for the 2005 Platform excludes agricultural burning and other open burning sources, which are included in the nonpt sector. The agricultural burning and other open burning sources are in the nonpt sector because these categories were not factored into the development of the ptfire sector. Additionally, their year-to-year impacts are not as variable as wildfires and non-agricultural prescribed/managed burns.

The ptfire sector includes wildfire and prescribed[7] burning emissions occurring in 2007, which were used for the 2007 model evaluation case. This sector includes emissions for all 2007 wildfires and many prescribed burns with daily estimates of each fire's emissions. It includes a satellite derived latitude/longitude of the fire's origin and other parameters associated with the emissions such as acres burned and fuel load, which allow estimation of plume rise. Note that Agricultural Burning is not included in the ptfire sector as it is included in the nonpt sector.

The SCCs in the ptfire sector are the following:

- 2810001000: Miscellaneous Area Sources; Other Combustion; Forest Wildfires; Total
- 2810005000: Miscellaneous Area Sources; Other Combustion; Managed Burning, Slash (Logging Debris);Total

The point source day-specific emission estimates for 2007 fires rely on Sonoma Technology, Inc.'s Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) system (Sullivan, et al., 2008). Figure 3-1 shows a functional diagram of the SMARTFIRE process. SMARTFIRE involves the use the National Oceanic and Atmospheric Administration's (NOAA's) Hazard Mapping System (HMS) fire location information as input combined with CONSUMEv3.0, a computer program designed to predict emissions, fuel consumption, and heat release from naturally burning fuels such as wood (Joint Fire Science Program, 2009), and the Fuel Characteristic Classification System (FCCS) fuel-loading database to estimate fire emissions from wildfires and prescribed burns on a daily basis.

The method involves the reconciliation of ICS-209 reports (Incident Status Summary Reports) with satellite-based fire detections to determine spatial and temporal information about the fires. The ICS-209 reports for each large wildfire

[7] For purposes of this document prescribed burning also includes managed burning, i.e., "Other Combustion; Managed Burning, Slash (Logging Debris)"

are created daily to enable fire incident commanders to track the status and resources assigned to each large fire (100 acre timber fire or 300 acre rangeland fire). The SMARTFIRE system of reconciliation with ICS-209 reports is described in an Air and Waste Management Association report (Raffuse, et al., 2007). Once the fire reconciliation process is completed, the emissions are calculated using the U.S. Forest Service's CONSUMEv3.0 fuel consumption model and the FCCS fuel-loading database in the Bluesky Framework (Ottmar, et al., 2007).

The detection of fires with this method is satellite-based. Note that the distinction between wildfire and prescribed burn is not as precise as with ground-based methods. The fire size was based on the number of satellite pixels and a nominal fire size of 100 acres/pixel was assumed for a significant number of fire detections when the first detections were not matched to ICS 209 reports, so the fire size information is not as precise as ground-based methods. Because the HMS satellite product from NOAA is based on daily detections, the emission inventory represents a time-integrated emission estimate. For example, a large smoldering fire will show up

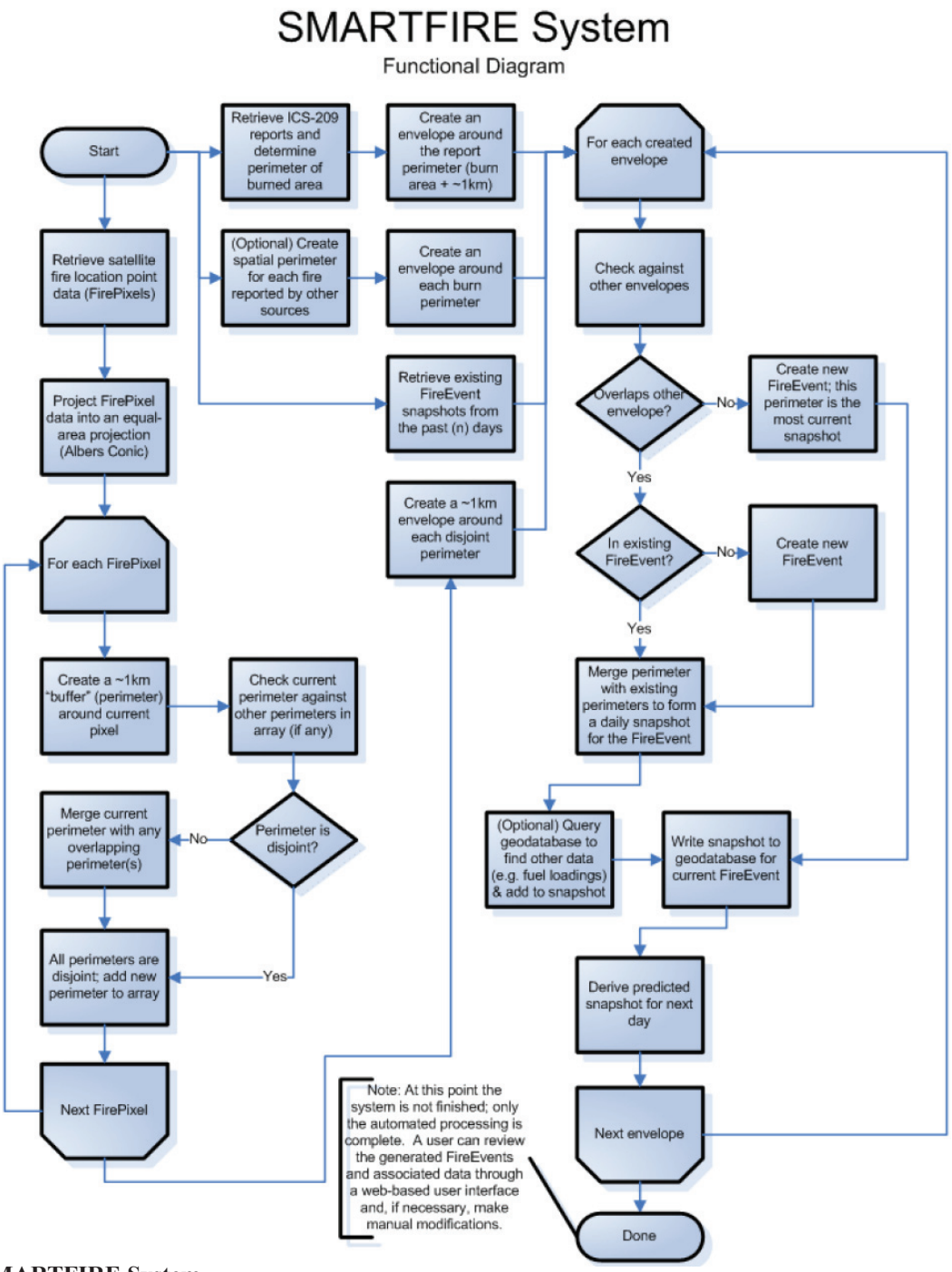


Figure 3-1. SMARTFIRE System

on satellite for many days and would count as acres burned on a daily basis whereas a ground-based method would count the area burned only once even it burns over many days. Additional references for this method are provided in McKenzie, et al., 2007; Ottmar et al., 2003; Ottmar et al., 2006; and Anderson et al., 2004.

The SMOKE-ready "ORL" inventory files created from the raw daily fires contain both CAPs and HAPs. The HAPs were generated using the same emission factors as were used in the 2002 Platform and described in Section 2.3 of the CAP and HAP 2002-Based Platform, Version 3 (ftp://ftp.epa.gov/EmisInventory/2002v3CAPHAP/documentation). The BAFM HAP emissions from the inventory were obtained using VOC speciation profiles (i.e., a "no-integrate noHAP" use case).

3.2.5 Biogenic Sources (beis)

For CMAQ, biogenic emissions were computed based on 2005 meteorology data using the BEIS3.14 model from SMOKE. The 2002 platform used the BEIS3.13 model; otherwise, all underlying land use data and parameters are unchanged for the 2005 platform.

The BEIS3.14 model creates gridded, hourly, model-species emissions from vegetation and soils. It estimates CO, VOC, and NO_X emissions for the U.S., Mexico, and Canada. The BEIS3.14 model is described further in: http://www.cmascenter.org/conference/2008/slides/pouliot_tale_two_cmas08.ppt.

The inputs to BEIS include:

- Temperature data at 2 meters which were obtained from the CMAQ meteorological input files,
- Land-use data from the Biogenic Emissions Landuse Database, version 3 (BELD3). BELD3 data provides data on the 230 vegetation classes at 1-km resolution over most of North America, which is the same land-use data were used for the 2002 platform.

3.2.6 2005 Mobile Sources (on_noadj, on_moves_runpm, on_moves_startpm, nonroad, alm_no_c3, seca_c3)

The 2005v4 platform onroad emissions are broken out into three sectors: (1) "on_moves_startpm"; (2) "on_moves_runpm"; and (3) "on_noadj". The aircraft, locomotive, and commercial marine emissions are divided into two nonroad sectors: "alm_no_c3" and "seca_c3", and as previously mentioned, the aircraft emissions are now in the nonEGU point inventory.

While the previous EPA platforms used NMIM for the onroad and nonroad sectors[8], some of the onroad emissions in the 2005 platform were based on an initial version[9] of the MOVES2010 model run for the year 2007. This MOVES2010 model was used to make sure to include the exhaust mode $PM_{2.5}$ emissions from onroad gasoline vehicles, including temperature effects that are much larger than were found in previous versions of onroad $PM_{2.5}$. The onroad gasoline emissions are based on MOVES2010 for the pollutants listed in Table 3-4. MOVES2010 was used to create 2007 emissions by state and month and these emissions were then allocated to counties based on 2005 NMIM-based county-level data. The reason for the state resolution was due to (a) run time issues that made a county run done for the nation infeasible in the timeframe required and (b) uncompleted efforts to create a national database of county-specific inputs to MOVES2010. The emissions that did not come from the MOVES2010 model were obtained from the 2005 NMIM runs, which are consistent with the 2005 NEI v2

Included in the 2005 CAP-BAFM Platform
$PM_{2.5}$; exhaust, partially speciated[2]
PM_{10}; total exhaust
$PM_{2.5}$ and PM_{10} brake and tire wear, not speciated
VOC; except refueling
CO
NO_X
SO_2
Benzene; except refueling
Formaldehyde
Acetaldehyde

Table 3-4. Pollutants covered by the MOVES2010 model in the 2005 Platform[1]

[1] MOVES2010 data were used only for onroad gasoline vehicles with the exception of motorcycles. MOVES2010 data were not used for any California onroad emissions

[2] Exhaust mode $PM_{2.5}$ species from MOVES consist of: PEC, PSO_4 and the difference between $PM_{2.5}$ and PEC (named as "PM25OC"). Brake wear and tire wear $PM_{2.5}$ emissions were not available from draft MOVES.

For onroad mobile emissions in California, year 2007 emissions were generated by linearly interpolating year 2005 and year 2009 EMFAC-based emissions. For nonroad mobile emissions in California, year 2007 emissions were generated by linearly interpolating year 2005 and year 2009 OFFROAD model-based emissions. The 2005 v2 NEI contains onroad and nonroad mobile emissions generated using NMIM (EPA, 2005b) for all of the U.S. except for California.[10] NMIM data was used for some of the nonroad mobile sources. NMIM relies on calculations from the MOBILE6 and NONROAD2005 models as described below, and in the NEI documentation. Inputs to NMIM are posted with the 2005 Emission Inventory. The direct link is: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/ncd/ncd20080522.zip.

NMIM creates the onroad and nonroad emissions on a month-specific basis that accounts for temperature, fuel types, and other variables that vary by month. Inventory

[8] Other than California which were provided by CARB and were based on the mobile models used by California, EMFAC and OFFROAD, for onroad and nonroad emissions, respectively.

[9] The version of MOVES is "MOVES2010" released in December 2009, this initial version was replaced by the publicly released MOVES2010a version in August 2010 and is available at www.epa.gov/otaq/models/moves/

[10] Although OTAQ generated emissions using NMIM for California, these were not used in the 2005 NEI version 2, but rather were replaced by state-submitted emissions.

documentation for the 2005 NEI v2 onroad and nonroad sectors is also posted with other 2005 NEI documentation; the direct link is: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile/2005_mobile_nei_version_2_report.pdf. The year 2007 NMIM nonroad emissions were generated using updated activity (fuels, vehicle population, etc) data, but are otherwise similar in methodology to those generated for the 2005 NEI.

The residual fuel commercial marine vessel (CMV), also referred to as Category 3 (C3) consists of a set of approximately 4-km resolution point source format emissions; these are now modeled separately as point sources in the "seca_c3" sector for the 2005 platform, and were projected to year 2007 using OTAQ-supplied growth factors.

The nonroad sector is the only 2002 mobile sector with U.S. emissions that was left intact in the 2005v4 platform and is still based on NMIM. For this study, NMIM was run for 2007.

With the exception of the seca_c3 point source-formatted sector, the mobile sectors are at county and SCC resolution. Tribal data from the alm_no_c3 sector have been dropped because spatial surrogate data is not available, and the emissions are small. Thus, these data were removed from the SMOKE input inventories for 2005.

All mobile sectors that have benzene, acetaldehyde, formaldehyde or methanol present in the inventory data, use these HAPs via "integration" for input into the air quality model. A few categories of nonroad sources (CNG and LPG-fueled equipment) do not have BAFM and therefore utilize the "no-integrate", "no-hap-use" case which means VOC from these sources is speciated to provide BAFM.

3.2.7 Adjustments to Onroad Mobile Source PM Emissions (on_moves_runpm, on_moves_startpm)

The on_moves_rupm and on_moves_startpm sectors contain MOVES2010 emissions for PM for non-California onroad gasoline cold-start exhaust except for motorcycles. These emissions (and the on_moves_runpm sector discussed in the next section) are processed separately from the remainder of the onroad mobile emissions because they are subject to hourly temperature adjustments, and these temperature adjustments are different for cold-start and running exhaust modes.

Temperature adjustments were applied to account for the strong sensitivity of PM exhaust emissions to temperatures below 72 ºF. Because it was not feasible to run MOVES directly for all of the gridded, hourly temperatures needed for modeling, emissions of PM exhaust at 72 ºF were created and temperature adjustments applied after the emissions were spatially and temporally allocated. The $PM_{2.5}$ adjustments were different for starting and running exhaust and applied to SMOKE gridded, hourly intermediate files using the gridded hourly temperature data also input to the CMAQ model. One result of this approach is that inventory summaries based on the raw SMOKE inputs for the on_moves_startpm and on_moves_runpm sectors will not be consistent with the final modeled emissions because they will not include the temperature adjustments. As a result, the post-processing for temperature adjustments included computing the emissions totals at state, county, and month resolution to use for summaries.

Figure 3-2 shows how PM emissions increase with colder temperatures and how start exhaust emissions increase more than running exhaust emissions.

A number of features of the MOVES output required additional processing to develop county-level monthly ORL files for SMOKE. As stated earlier, the spatial resolution of the MOVES data was at the state level and these data were allocated to county level prior to input into SMOKE. In addition, the exhaust $PM_{2.5}$ emissions from MOVES were partially speciated. To retain the speciated elemental carbon and sulfate emissions from MOVES, the speciation step that is usually done in SMOKE was performed prior to SMOKE, and it was modified to allow the temperature adjustments to be done only on the species affected by temperature. Finally, because the start emissions were broken out separately from running exhaust emissions, they were assigned to new SCCs (urban and rural parking areas) that allowed for the appropriate spatial and temporal profiles to be applied in SMOKE.

A list of the procedures performed to prepare the MOVES data for input into SMOKE is provided below.

i. State-level emissions were allocated to counties using state-county emission ratios by SCC, pollutant, and emissions mode (e.g., evaporative, exhaust) for each month. The ratios were computed using NMIM 2007 data.

ii. Start and run emissions were assigned to urban and rural SCCs based on the county-level ratio of emissions from urban versus rural local roads from the NMIM onroad gasoline data. For example, the LDGV start emissions in the state-total MOVES data (assigned SCC 2201001000) were split into urban (2201001370) and rural (2201001350) based on the ratio of LDGV urban (2201001330) and rural (2201001210) local roads.

iii. MOVES-based $PM_{2.5}$ species at 72 ºF were converted to SMOKE-ready PM species. The SMOKE-ready species are listed below and the speciation technique used to obtain the SMOKE-ready species is further discussed in Appendix B of the 2005v4 emissions modeling platform documentation.

- PEC_72: unchanged from MOVES-based PM25EC, subject to temperature adjustment below 72 ºF.

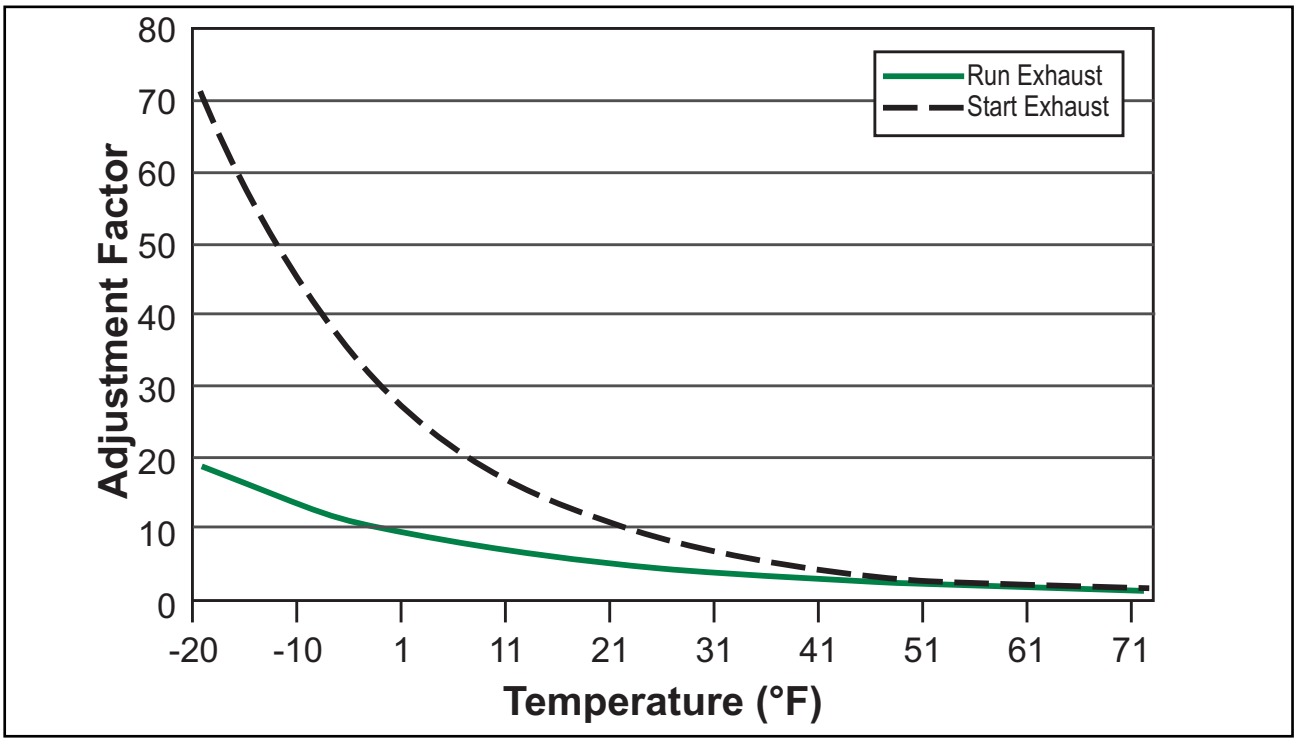


Figure 3-2. MOVES exhaust temperature adjustment functions.

- POC_72: modified MOVES-based PM25OC to remove metals, PNO3 (computed from MOVES-based PM25EC), NH_4 (computed from MOVES-based PM25SO4 and PNO3), and MOVES-based PM25SO4. Subject to temperature adjustment below 72 ºF.
- PSO_4: unchanged from MOVES-based PM25SO4, not subject to temperature adjustment.
- PNO_3: computed from MOVES-based PM25EC, not subject to temperature adjustment.
- OTHER: sum of computed metals (fraction of MOVES-based PM25EC) and NH_4 (computed from PNO3 and PSO4), not subject to temperature adjustment.
- PMFINE_72: Computed from OTHER and fraction of POC_72. Subject to temperature adjustment below 72 ºF.
- PMC_72: Computed as fraction of sum of PMFINE_72, PEC_72, POC_72, PSO4, and PNO3. Subject to temperature adjustment below 72 ºF.

The result of these preprocessing steps is that SMOKE-ready PM emissions that do not exactly match what MOVES provides. The emissions are conserved during allocation from the state to county and from the generic total "start" SCCs to the two new parking SCCs that end in "350" and "370". Primary particulate elemental carbon (PEC) and primary particulate sulfur (PSO_4) components of $PM_{2.5}$ emissions are also conserved as they are simply renamed from the MOVES specie "PM25EC". However, as seen above, POC, PNO_3, and PMFINE components involve multiplying the MOVES PM species by components of an onroad gasoline exhaust speciation profile described in Appendix B of the 2005v4 platform documentation.

3.2.8 Onroad Mobile Sources without Adjustments (on_noadj)

The on_noadj sector consists of the remaining onroad mobile emissions not covered by the on_moves_startpm and on_moves_runpm sectors. These emissions did not receive any temperature adjustments in our processing. There are four sources of data that are pre-processed to create two sets of monthly inventories for this sector.

1. MOVES-based onroad excluding gasoline exhaust PM: These are the monthly MOVES-based emissions from three MOVES inventories:

   a. Diesel Exhaust: VOC, NO_X, SO_2, $PM_{2.5}$, PM_{10}, NH_3, CO, 1,3-butadiene (106990), acetaldehyde (75070), acrolein (107028), benzene (71432), and formaldehyde (50000)

   b. Gasoline Exhaust: VOC, NO_X, SO_2, NH_3, CO, 1,3-butadiene (106990), acetaldehyde (75070), acrolein (107028), benzene (71432), and formaldehyde (50000)

   c. Evaporative: Non-refueling VOC and benzene

   d. Brake and tire wear: Total (not speciated) $PM_{2.5}$ and PM_{10} from gasoline and diesel vehicles

e. For these pollutants listed, these non-California MOVES emissions do not require the same intermediate temperature adjustments and can therefore be processed with the remaining "no adjust" onroad mobile emissions. These emissions contain both running and parking sources and are pre-processed from state-level to county-level much like the on_moves_startpm and on_moves_runpm sectors already discussed. The preprocessing for these emissions did not require species calculations because the raw MOVES emissions translated directly to SMOKE inventory species.

2. California onroad inventory: California year 2007 complete CAP/HAP onroad inventory. California monthly onroad emissions are year 2007 and are based on September 2007 California Air Resources Board (CARB) submitted 2005 and 2009 data which has been interpolated to provide 2007 values. NH_3 emissions are from NMIM runs for California. Only those HAPs that are also estimated by NMIM for nonroad mobile sources were retained; all other HAPs provided by California were dropped. The California onroad inventory does not use the SCCs for Heavy Duty Diesel Vehicles (HDDV) class 6 & 7 (2230073XXX) emissions. California does not specify road types, so NMIM California ratios were used to break out vehicle emissions to the match the more detailed NMIM level.

The remainder of this section discusses the pre-processing required to create monthly ORL files for the remainder of the on_noadj sector (#3 above).

EPA/OTAQ created the NMIM 2005v2 onroad mobile CAP/HAP emissions for all states and sources using the MOBILE6 model version M6023ChcOxFixNMIM. The CO_2 emissions were removed, along with emissions of dioxins and furans and emissions that were replaced by MOVES and California-submitted data. The onroad refueling emissions were also removed since the NEI treats onroad refueling as a stationary source that is included in the nonpt sector (gasoline distribution, Stage II, SCC=2501060100), and can be found in the point sector in a handful of states (gasoline distribution Stage II; vapor loss or unclassified, SCC=40600401, 40600402, 40600403, and 40600499 in California, Colorado, Kentucky, and North Carolina).

Emissions were converted from monthly totals to monthly average-day based the on number of days in each month. Furthermore, this sector includes exhaust, evaporative, brake wear and tire wear emissions from onroad sources, which allowed us to use speciation profiles that are specific to each of these processes. The 2007 VMT database was based on 2002 VMT grown to 2007 based on Federal Highway Administration (FWHA) data, unless state-provided VMT was available.

3.2.9 Nonroad Mobile Sources—NMIM-Based Nonroad (nonroad)

The nonroad sector includes monthly exhaust, evaporative and refueling emissions from nonroad engines (not including commercial marine, aircraft, and locomotives) derived from NMIM for all states except California. The NMIM configuration relied on the version of the NONROAD2005 model (NR05c-BondBase) used for the marine spark ignited (SI) and small SI engine proposed rule, published May 18, 2007 (EPA, 2007c). For 2007, the NONROAD2005 model (NR05c-BondBase) is equivalent to NONROAD2008a, since it incorporated Bond rule revisions to some of the base case inputs and the Bond rule controls did not take effect until future years. As with the onroad emissions, NMIM provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, refueling emissions for nonroad sources are not dropped from processing for this sector.

EPA/OTAQ ran NMIM to create county-SCC emissions for the 2007 nonroad mobile CAP/HAP inventory. In a similar process as for the on_noadj sector, California NMIM emissions were removed and replaced with emissions submitted by California, but scaled to 2007 using linear interpolation of year 2005 and 2009 inventories. Emissions were converted from monthly totals to monthly average-day based the on number of days in each month. Similar to onroad NMIM emissions, EPA default inputs were replaced by state inputs where provided. The NMIM inventory documentation describes this and all other details of the NMIM nonroad emissions development for the 2005v4 platform:

ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile/2005_mobile_nei_version_2_report.pdf

California monthly nonroad emissions are year 2007 and are based on linearly-interpolated September 2007 California Air Resources Board (CARB) submitted inventories for the years 2005 and 2009. NH_3 emissions are from NMIM runs for California because these were not included in the California NEI submittal. HAP emissions were estimated by applying HAP-to-CAP ratios computed from California data in the NEI 2005 v2 submittal. Only those HAPs that are also estimated by NMIM for nonroad mobile sources were retained; all other HAPs were dropped.

The CARB-based nonroad data did not have mode-specific data for VOC (exhaust, evaporative, and refueling). The annual total California data was split into monthly, mode-specific nonroad emissions for California using the NMIM results. Details on this process are documented separately (Strum, 2007). Nonroad refueling emissions for California were computed as Gasoline Transport (SCC=2505000120) emissions multiplied by a factor of 0.46 (to avoid double counting with portable fuel container (PFC) emissions in the nonpt sector) and were allocated to the gasoline equipment types based on ratios of evaporative-mode VOC. The factor of 0.46 was computed by dividing the NMIM-derived California refueling for 2005 by the sum of portable fuel container emissions and NMIM-derived refueling for 2005.

3.2.10 Nonroad Mobile Sources: Aircraft, Locomotive and Commercial Marine (alm_no_c3)

The alm_no_c3 sector contains CAP and HAP emissions from locomotive and commercial marine sources, except for category 3/residual-fuel (C3) commercial marine vessels. In previous modeling platforms, this sector also contained aircraft emissions, but here aircraft emissions have been removed from the sector because point-source airports were provided in the 2005 NEI v2 point source inventory and are included as part of the ptnonipm sector. Note that the C3 commercial marine vessel emissions are in the seca_c3 sector. Note that the "a" in the "alm_no_c3" sector name is now misleading because aircraft are no longer in this sector.

The remaining emissions in the alm_no_c3 sector are year 2002 emissions unchanged from the 2002 platform. The 2005v4 platform documentation has a complete list of SCCs found in the alm_no_c3 sector. The documentation of the 2002 NEI for the alm sector is available at: http://www.epa.gov/ttn/chief/net/2002inventory.html#documentation.

For modeling purposes, the following additional changes were made to the data in this sector for the 2005v4 platform:

- Removed C3 CMV SCCs (residual fuel) and aircraft SCCs.
- Removed railway maintenance emissions (SCCs 2285002015, 2285004015, and 2285006015) because these are included in the nonroad NMIM monthly inventories. This change was made for the 2002 platform and is retained here in the 2005 platform.
- For the purpose of CAP-HAP VOC integration, removed benzene, formaldehyde, and acetaldehyde for all sources for which these HAPs were not integrated with VOC. These sources are considered no-integrate when the source of data between VOC and VOC HAPs is inconsistent or VOC analysis of VOC and VOC HAPs indicates the source is not integrated. Although the CAP-HAP integration approach also required the removal of methanol for no-integrate sources, the only sources in this sector that included methanol were in California, where the integrate approach was used for all sources and therefore did not need to remove it.

The 2002 platform documentation goes into greater detail on the locomotives and C1/C2 CMV emissions.

3.2.11 Nonroad mobile sources: C3 commercial marine (seca_c3)

The raw seca_c3 sector emissions data were developed in an ASCII raster format used since the Emissions Control Area-International Marine Organization (ECA-IMO) project began in 2005, then known as the Sulfur Emissions Control Area (SECA). These emissions consist of large marine diesel engines (at or above 30 liters/cylinder) that until very recently, were allowed to meet relatively modest emission requirements, often burning residual fuel. The emissions in this sector are comprised of primarily foreign-flagged ocean-going vessels, referred to as Category 3 (C3) ships. The seca_c3 (ECA) inventory includes these ships in ports and underway mode and includes near-port auxiliary engines. An overview of the ECA-IMO project and future year goals for reduction of NO_X, SO_2, and PM C_3 emissions can be found at:

http://www.epa.gov/oms/regs/nonroad/marine/ci/420f09015.htm

The base year ECA inventory is 2002 and consists of these CAPs: PM_{10}, CO, CO_2, NH_3, NO_X, SO_X (assumed to be SO_2), and Hydrocarbons (assumed to be VOC). EPA developed regional growth (activity-based) factors that were applied to create a 2007 inventory from the 2002 data. These growth factors are provided in Table 3-5 and are mapped and documented in the following report:

http://www.epa.gov/oms/regs/nonroad/marine/ci/420r09007-chap2.pdf

These growth factors are the same for all pollutants except NO_X which includes a Tier 1 Standard.

Region	NOx	All_other pollutants
Alaska	1.114	1.179
East Coast	1.182	1.251
Gulf Coast	1.092	1.156
Hawaii	1.212	1.282
North Pacific (Washington)	1.114	1.179
South Pacific (Oregon and California)	1.212	1.282
Great Lakes	1.082	1.089

Table 3-5. Regional growth factors used to project 2002 C3 emissions to 2007

The raw ECA inventory started as a set of ASCII raster (pixel image) dataset emissions at approximately 4-km resolution that was converted to SMOKE point-source ORL input format as described in this conference paper:

http://www.epa.gov/ttn/chief/conference/ei17/session6/mason.pdf

This paper describes how the ASCII raster dataset was converted to latitude-longitude, mapped to state/county FIPS codes that extend up to 200 nautical miles (nm) from the coast, assigned stack parameters, and how the monthly ASCII raster dataset emissions were used to create monthly temporal profiles. Counties were assigned as extending up to 200nm from the coast because of this was the distance through the Exclusive Economic Zone (EEZ), a distance that would be used to define the outer limits of the Emissions Control Area-International Marine Organization (ECA-IMO) controls for these vessels.

The 2007 ECA-based C_3 inventory does not delineate between ports and underway (or other C_3 modes such as hoteling, maneuvering, reduced-speed zone, and idling) emissions. Therefore, these emissions were assigned to the broad ("total") SCC for C_3 CMV (2280003000). This has no effect on temporal allocation or speciation compared to existing profiles for underway and port C_3 emissions (2280003100 and 2280003200).

Factors were applied to compute HAP emissions (based on emissions ratios) to VOC to obtain HAP emissions values. Table 3-6 shows these factors. Because HAPs were computed

directly from the CAP inventory and the calculations are therefore consistent, the entire seca_c3 sector utilizes CAP-HAP VOC integration to use the VOC HAP species directly, rather than VOC speciation profiles.

Pollutant	Apply to	Pollutant Code	Factor
Acetaldehyde	VOC	75070	0.0002286
Benzene	VOC	71432	9.795E-06
Formaldehyde	VOC	50000	0.0015672

Table 3-6. HAP emission ratios for generation of HAP emissions from criteria emissions for C3 commercial marine vessels

The emissions were converted to SMOKE point source ORL format, allowing for the emissions to be allocated to modeling layers above the surface layer. All non-US emissions (i.e., in waters considered outside of the 200nm EEZ, and hence out of the U.S. territory) are assigned a dummy state/county FIPS code=98001. The SMOKE-ready data have also been cropped from the original ECA-IMO data to cover only the 36-km CMAQ domain, which is the largest domain used for this effort, and larger than the 12km domain used in this project.

3.2.12 Emissions from Canada, Mexico and Offshore Drilling Platforms (othpt, othar, othon)

The emissions from Canada, Mexico, and Offshore Drilling Platforms are included as part of three sectors: othpt, othar, and othon. The "oth" refers to the fact that these emissions are "other" than those in the 2005 NEI, and the third and fourth characters provide the SMOKE source types: "pt" for point, "ar" for "area and nonroad mobile", and "on" for onroad mobile. Mexico's emissions are unchanged from the 2002 Platform with one exception –one stack diameter was updated (recomputed from stack velocity and flowrate) in the Mexico border states point inventory.

For Canada, year 2006 emissions were used, with several modifications:

i. Wildfires and prescribed burning emissions were not included because Canada does not include these inventory data in their modeling.

ii. In-flight aircraft emissions were not included because these are also not included for the U.S. modeling.

iii. A 75% reduction ("transport fraction") to PM for the road dust, agricultural, and construction emissions in the Canadian "afdust" inventory. This approach is more simplistic than the county-specific approach used for the U.S., but a comparable approach was not available for Canada.

iv. Speciated VOC emissions from the ADOM chemical mechanism were not included.

v. Residual fuel CMV (C3) SCCs (22800030X0) were removed because these emissions are included in the seca_c3 sector, which covers not only emissions close to Canada but also emissions far at sea. Canada was involved in the inventory development of the seca_c3 sector emissions.

vi. Wind erosion (SCC=2730100000) and cigarette smoke (SCC=2810060000) emissions were removed from the nonpoint (nonpt) inventory; these emissions are also absent from the U.S. inventory.

vii. Quebec $PM_{2.5}$ emissions (2,000 tons/yr) were removed for one SCC (2305070000) for Industrial Processes, Mineral Processes, Gypsum, Plaster Products due to corrupt fields after conversion to SMOKE input format. This error should be corrected in a future inventory.

viii. Excessively high CO emissions were removed from Babine Forest Products Ltd (British Columbia plantid='5188') in the point inventory. This change was made because the value of the emissions was impossibly large.

ix. The county part of the state/count FIPS code field in the SMOKE inputs were modified in the point inventory from "000" to "001" to enable matching to existing temporal profiles.

For Mexico emissions for 1999 (Eastern Research Group Inc., 2006) were used as these were developed as part of a partnership between Mexico's Secretariat of the Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales-SEMARNAT) and National Institute of Ecology (Instituto Nacional de Ecología-INE), the U.S. EPA, the Western Governors' Association (WGA), and the North American Commission for Environmental Cooperation (CEC). This inventory includes emissions from all states in Mexico.

The offshore emissions include point source offshore oil and gas drilling platforms. Updated offshore emissions from the 2005 NEI v2 point source inventory were used. The offshore sources were provided by the Mineral Management Services (MMS).

3.2.13 SMOKE-ready non-anthropogenic chlorine inventory

For the ocean chlorine, the same data as in the CAP and HAP 2002-based Platform was used. See ftp://ftp.epa.gov/EmisInventory/2002v3CAPHAP/documentation for details.

3.3 Emissions Modeling Summary

The CMAQ model requires hourly emissions of specific gas and particle species for the horizontal and vertical grid cells contained within the modeled region (i.e., modeling domain). To provide emissions in the form and format required by CMAQ, it is necessary to "pre-process" the "raw" emissions (i.e., emissions input to SMOKE) for the sectors described above. In brief, this processing step transforms these emissions from their original temporal resolution, pollutant resolution, and spatial resolution into the data required by CMAQ. The temporal resolution of the emissions input to

SMOKE for the 2005 Platform varies across sectors, and may be hourly, monthly, or annual total emissions. The spatial resolution, which also can be different for different sectors, may be individual point sources or county totals (province totals for Canada, municipio totals for Mexico).

The pollutants for all sectors except for biogenics and ocean chlorine are those inventoried for the NEI. The pre-processing steps involving temporal allocation, spatial allocation, pollutant speciation, and vertical allocation of point sources are referred to as emissions modeling. This section provides some basic information about the tools and data files other than inventories used for emissions modeling as part of the 2005 Platform.

3.3.1 The SMOKE Modeling System

SMOKE version 2.6 was used to pre-process the raw emissions to create the emissions inputs for CMAQ. SMOKE executables and source code are available from the Community Multiscale Analysis System (CMAS) Center at http://www.cmascenter.org.

3.3.2 Key Emissions Modeling Settings

Emissions inventories for each sector are processed separately through SMOKE to create gridded, hourly, speciated emissions. The final merge program (Mrggrid) is then run to combine the model-ready, sector-specific emissions across sectors. The SMOKE settings in the "run scripts" and the data in the SMOKE ancillary files control the approaches used by the individual SMOKE programs for each sector. Table 3-7 summarizes the major processing steps of each platform sector. The "Spatial" column shows the spatial approach: "point" indicates that SMOKE maps the source from a point (i.e., latitude and longitude) location to a grid cell, "surrogates" indicates that some or all of the sources use spatial surrogates to allocate county emissions to grid cells, and "area-to-point" indicates that some of the sources use the SMOKE area-to-point feature to grid the emissions. The "Speciation" column indicates that all sectors use the SMOKE speciation step, though speciation of biogenic emissions is done within BEIS3 and not as a separate SMOKE step. The "Inventory resolution" column shows the inventory temporal resolution from which SMOKE needs to calculate hourly emissions.

Finally, the "plume rise" column indicates the sectors for which the in-line approach is used. These sectors are the only ones which will have emissions in aloft layers, based on plume rise. For the 2005 Platform, SMOKE was not used to compute vertical plume rise; this was done in CMAQ using stack data in SMOKE output files for each model-ready sector. The one sector with "in-line" only, seca_c3, was processed so that the entire emissions would be in aloft layers. Thus, there were no seca_c3 emissions in the 2-dimensional, layer-1 files created by SMOKE. Rather the speciated and temporalized source-based CMAQ inputs for seca_c3 were used for the vertical allocation.

Platform sector	Spatial	Speciation	Inventory resolution	Plume rise
ptipm	point	Yes	daily & hourly	in-line
ptnonipm	point	Yes	annual	in-line
othpt	point	Yes	annual	in-line
nonroad	surrogates & area-to-point	Yes	monthly	
othar	surrogates	Yes	annual	
seca_c3	point	Yes	annual	in-line
alm_no_c3	surrogates & area-to-point	Yes	annual	
on_noadj	surrogates	Yes	monthly	
on_moves_ startpm	surrogates	Yes	monthly	
on_moves_ runpm	surrogates	Yes	monthly	
othon	surrogates	Yes	annual	
nonpt	surrogates & area-to-point	Yes	annual	
ag	surrogates	Yes	annual	
afdust	surrogates	Yes	annual	
beis	pre-gridded landuse	in BEIS	hourly	
ptfire	point	Yes	daily	in-line

Table 3-7. Key emissions modeling steps by sector

One of the issues found was that when using in-line processing, the PELVCONFIG file cannot allow grouping, otherwise the "inline" versus "offline" (i.e., processing whereby SMOKE creates 3-dimensional files) will not give identical results. Since a PELVCONFIG file with grouping was used, the in-line approach should be used to exactly replicate our results.

3.3.3 Spatial Configuration

For this project, we ran SMOKE and CMAQ were run for a 12-km modeling domain as shown in Figure 3-3. The grid used a Lambert-Conformal projection, with Alpha = 33, Beta = 45 and Gamma = -97, with a center of X = -97 and Y = 40. Later sections provide details on the spatial surrogates and area-to-point data used to accomplish spatial allocation with SMOKE.

3.3.4 Chemical Speciation Configuration

The emissions modeling step for chemical speciation creates "model species" needed by the air quality model for a specific chemical mechanism. These model species are either individual chemical compounds or groups of species, called "model species." The chemical mechanism used for the 2005 Platform is the Carbon Bond 05 (CB05) mechanism (Yarwood, 2005) with secondary organic aerosol (SOA) and

Figure 3-3. CMAQ Modeling Domain

HONO enhancements as described in

http://www.cmascenter.org/help/model_docs/cmaq/4.7/RELEASE_NOTES.txt.

From the perspective of emissions preparation, it is the same mechanism used in the 2002 Platform except that additional input model species are needed to support the nitrous acid (HONO) chemistry enhancements and additional input model species are needed to support SOA. Table 3-8 lists the model species produced by SMOKE for use in CMAQ. The only three input species that were not in the CAP 2002-Based Platform described in 2002 "CAP-only" Platform (http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol1_02-28-08.pdf) are nitrous acid (HONO), BENZENE and sesquiterpenes (SESQ). It should be noted that the BENZENE model species is not part of CB05 in that the concentrations of BENZENE do not provide any feedback into the chemical reactions (i.e., it is not "inside" the chemical mechanism). Rather, benzene is used as a reactive tracer and as such is impacted by the CB05 chemistry. BENZENE, along with several reactive CBO5 species (such as TOL and XYL) plays a role in SOA formation in CMAQ4.7.

The approach for speciating $PM_{2.5}$ emissions is the same as that described for the 2002 platform except that two of the onroad sectors, and Canadian emissions contained pre-speciated PM emissions which were not further speciated in SMOKE . The approach for speciating VOC emissions from non-biogenic sources is different in two major ways: 1) for some sources, HAP emissions are used in the speciation process to allow integration of VOC and HAP emissions in the NEI. This has the result of modifying the speciation profiles based on the HAP emission estimates which are presumed to be more accurate than the speciated VOC results for the HAPs; and, 2) for some mobile sources, "combination" profiles are specified by county and month and emission mode (e.g., exhaust, evaporative). SMOKE computes the resultant profile on the fly given the fraction of each specific profile to use for the county, month and emission mode. A new feature and new profile file in SMOKE (the GSPRO_COMBO file) allowed the use of this approach for the 2005 Platform.

Inventory Pollutant	Model Species	Model species description
CO	CO	Carbon monoxide
NO_X	NO	Nitrogen oxide
	NO2	Nitrogen dioxide
	HONO	Nitrous acid
SO_2	SO2	Sulfur dioxide
	SULF	Sulfuric acid vapor
NH_3	NH3	Ammonia
VOC	ALD2	Acetaldehyde
	ALDX	Propionaldehyde and higher aldehydes
	BENZENE	Benzene (not part of CB05)
	ETH	Ethene
	ETHA	Ethane
	ETOH	Ethanol
	FORM	Formaldehyde
	IOLE	Internal olefin carbon bond (R-C=C-R)
	ISOP	Isoprene
	MEOH	Methanol
	OLE	Terminal olefin carbon bond (R-C=C)
	PAR	Paraffin carbon bond
	TOL	Toluene and other monoalkyl aromatics
	XYL	Xylene and other polyalkyl aromatics
Various additional VOC species from the biogenics model which do not map to the above model species	SESQ	Sesquiterpenes
	TERP	Terpenes
PM_{10}	PMC	Coarse PM > 2.5 microns and ≤ 10 microns
$PM_{2.5}$	PEC	Particulate elemental carbon ≤ 2.5 microns
	PNO3	Particulate nitrate ≤ 2.5 microns
	POC	Particulate organic carbon (carbon only) ≤ 2.5 microns
	PSO4	Particulate Sulfate ≤ 2.5 microns
	PMFINE	Other particulate matter ≤ 2.5 microns

Table 3-8. Model Species produced by SMOKE for CB05 with SOA for CMAQ 4.7

The VOC speciation approach for the 2005 Platform differed from the 2002 Platform in that, for some of the U.S. platform sectors, HAP emissions from the NEI were included in the speciation process. That is, instead of speciating VOC to generate all of the species listed in Table 3-8 as was done for the 2002 platform, emissions of the 4 HAPs, benzene, acetaldehyde, formaldehyde and methanol (BAFM) from the NEI were integrated with the NEI VOC. The integration process (described in more detail below) combines the BAFM HAPs with the VOC in a way that does not double count emissions and uses the BAFM directly in the speciation process. Generally, the HAP emissions from the NEI are believed to be more representative of emissions of these compounds than their generation via VOC speciation.

The BAFM HAPs were chosen because, with the exception of BENZENE, they are the only explicit VOC HAPs in the base version of CMAQ 4.7 (CAPs only with chlorine chemistry) model. By "explicit VOC HAPs," we mean model species that participate in the modeled chemistry using the CB05 chemical mechanism. The use of these HAP emission estimates along with VOC is called "HAP-CAP integration". BENZENE was chosen because it was added as a model species in the base version of CMAQ 4.7, and there was a desire to keep its emissions consistent between multi-pollutant and base versions of CMAQ.

The integration of HAP VOC with VOC is a feature available in SMOKE for all inventory formats other than PTDAY (the format used for the ptfire sector). SMOKE allows the user to specify the particular HAPs to integrate and the particular sources to integrate. The particular HAPs to integrate are specified in the INVTABLE file, and the particular sources to integrate are based on the NHAPEXCLUDE file (which actually provides the sources that are *excluded* from integration[11]). For the "integrate" sources, SMOKE subtracts the "integrate" HAPs from the VOC (at the source level) to compute emissions for the new pollutant "NONHAPVOC." The user provides NONHAPVOC-to-NONHAPTOG factors and NONHAPTOG speciation profiles. SMOKE computes NONHAPTOG and then applies the speciation profiles to allocate the NONHAPTOG to the other CMAQ VOC species not including the integrated HAPs. This process is illustrated in Figure 3-4. Note that BAFM emissions do not need to be removed from no-integrate sources in a sector where all sources are no-integrate because this is accomplished by through use of a SMOKE ancillary "INVTABLE" which essentially drops all the BAFM in that sector. CAP-HAP integration was considered for all sectors and developed "integration criteria" for some of those. Table 3-9 summarizes the integration approach for each platform sector used in Step 1 of Figure 3-4.

[11] In SMOKE version 2.6 the options to specify sources for integration are expanded so that a user can specify the particular sources to include or exclude from integration, and there are settings to include or exclude all sources within a sector.

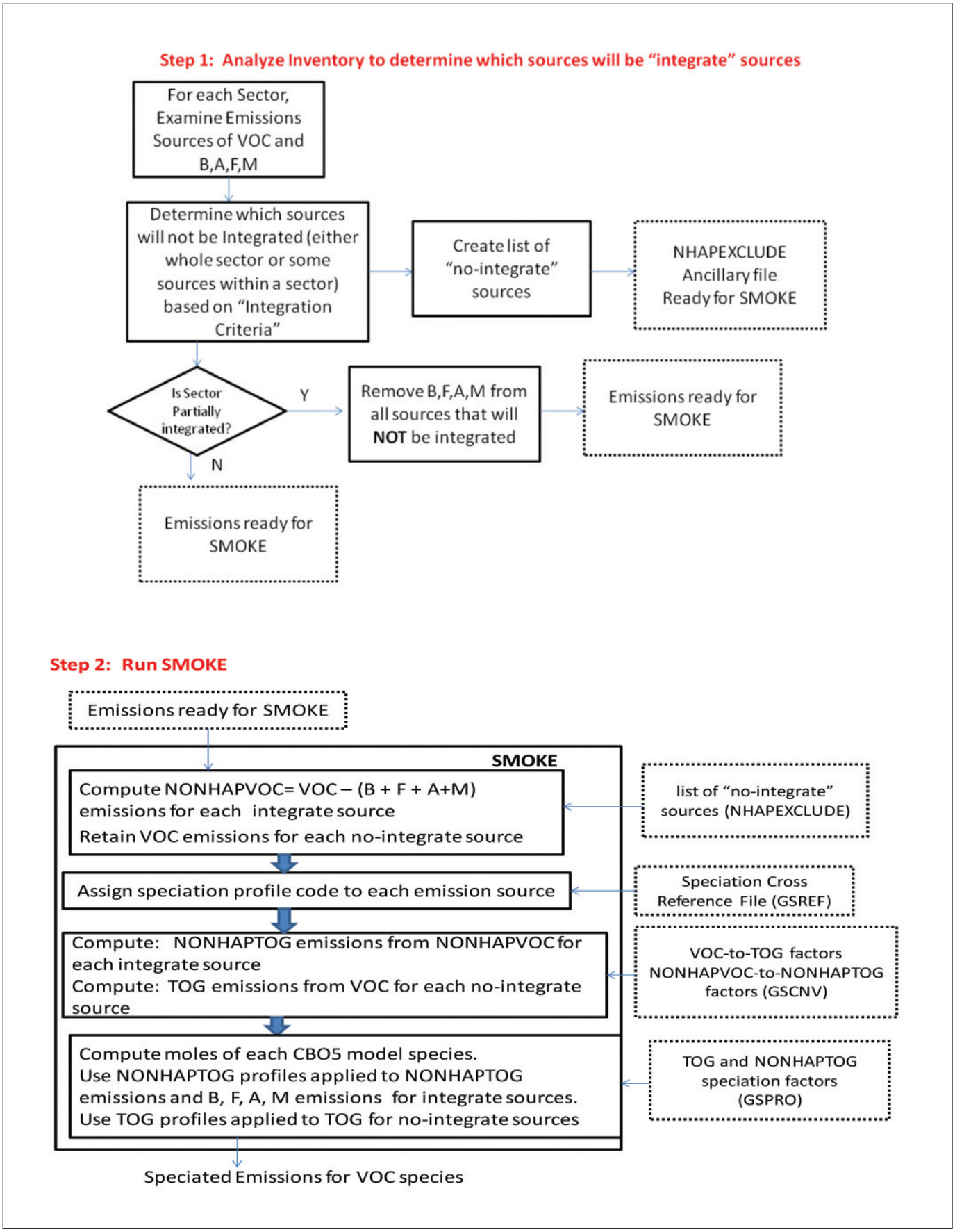


Figure 3-4. Process of integrating BAFM with VOC for use in VOC Speciation

PLATFORM SECTOR	Approach for Integrating NEI emissions of Benzene (B), Acetaldehyde (A), Formaldehyde (F) and Methanol (M)
ptipm	No integration because emissions of BAFM are relatively small for this sector
ptnonipm	No integration because emissions of BAFM are relatively small for this sector and it is not expected that criteria for integration would be met by a significant number of sources
ptfire	Full integration (However, NONHAPVOC computed outside of SMOKE since SMOKE cannot do this calculation for the day-specific fire formatted files)
ag	N/A—sector contains no VOC
afdust	N/A—sector contains no VOC
nonpt	Partial integration; details provided below table
nonroad	For other than California: Partial integration—did not integrate CNG or LPG sources (SCC beginning with 2268 or 2267) because NMIM computed only VOC and not any HAPs for these SCCs. For California: Full integration
alm_no_c3	Partial integration; details provided below table
seca_c3	Full integration
onroad	Full integration
biog	N/A—sector contains no inventory pollutant "VOC"; but rather specific VOC species
othpt	No integration—not the NEI
othar	No integration—not the NEI
othon	No integration—not the NEI

Table 3-9. Integration status of benzene, acetaldehyde, formaldehyde and methanol (BAFM) for each platform sector

For the nonpt sector, the following integration criteria were used to determine the sources to integrate (Step 1):

1. Any source for which B, A, F or M emissions were from the 1996 NEI were not integrated (data source code contains a "96"),
2. Any source for which the sum of B, A, F, or M is greater than the VOC was not integrated, since this clearly identifies sources for which there is an inconsistency between VOC and VOC HAPs. This includes some cases in which VOC for a source is zero.
3. For certain source categories (those that comprised 80% of the VOC emissions), sources were selected for integration in the category per the criteria specified in the first column in Table 3-5. For most of these source categories, sources are allowed to be integrated if they had the minimum combination of B,A,F and M specified in the first column. For a few source categories, all sources were designated as "no-integrate".
4. For source categories not covered in Table 3-5 (i.e., that do not comprise the top 80%of VOC emissions), then as long as the source has emissions of one of the B, F, A or M pollutants, then it can be integrated.

For the alm_no_c3 sector, the integration criteria were (1) that the source had to have at least one of the 4 HAPs and (2) that the sum of BAFM could not exceed the VOC emissions. The criteria for this sector were less complex than the nonpt sector because it has much fewer source categories.

The SMOKE feature to compute speciation profiles from mixtures of other profiles in user-specified proportions was used in this project. The combinations are specified in the GSPRO_COMBO ancillary file by pollutant (including pollutant mode, e.g., EXH__VOC), state and county (i.e., state/county FIPS code) and time period (i.e., month). This feature was used for onroad and nonroad mobile and gasoline-related related stationary sources. These emission sources use fuels with varying ethanol content, and therefore the speciation profiles require different combinations of gasoline, E10 an E85 profiles. Since the ethanol content varies spatially (e.g., by state or county), temporally (e.g., by month) and by modeling year (future years have more ethanol) the combo feature allows combinations to be specified at various levels for different years.

3.3.5 Temporal Processing Configuration

Table 3-10 summarizes the temporal aspect of the emissions processing configuration. It compares the key approaches used for temporal processing across the sectors. The temporal aspect of SMOKE processing is controlled through (a) the scripts T_TYPE (Temporal type) and M_TYPE (Merge type) settings and (b) ancillary data files. In addition to the resolution, temporal processing includes a ramp-up period for several days prior to January 1, 2007, intended to mitigate the effects of initial condition concentrations. The ramp up period for the national 12km grid was 10 days. For most sectors, the emissions from late December of 2007 were used to provide emissions for the end of December, 2006.

3.3.6 Vertical Allocation of Emissions

Table 3-7 specifies the sectors for which plume rise is calculated. If there is no plume rise for a sector, the emissions are placed into layer 1 of the air quality model. Vertical plume rise was performed in-line within CMAQ for this

Platform sector	Inventory resolution	Monthly profiles used?	Daily temporal approach 1,2	Merge processing approach 1,3	Process Holidays as separate days?
ptipm	daily & hourly		all	all	yes
ptnonipm	annual	yes	mwdss	all	yes
othpt	annual	yes	mwdss	all	
nonroad	monthly		mwdss	mwdss	yes
othar	annual	yes	mwdss	mwdss	
alm_no_c3	annual	yes	mwdss	mwdss	
seca_c3	annual	yes	mwdss	mwdss	
on_noadj	monthly		week	week	yes
on_moves_startpm	monthly		week	week	yes
on_moves_runpm	monthly		week	week	yes
othon	annual	yes	week	week	
nonpt	annual	yes	mwdss	mwdss	yes
ag	annual	yes	aveday	aveday	
afdust	annual	yes	aveday	aveday	
beis	hourly		n/a	n/a	
ptfire	daily		all	all	

[1] **Definitions for processing resolution:**

all = hourly emissions computed for every day of the year, inventory is already daily

week = hourly emissions computed for all days in one "representative" week, representing all weeks for each month, which means emissions have day-of-week variation, but not week-to-week variation within the month

mwdss= hourly emissions for one representative Monday, representative weekday, representative Saturday and representative Sunday for each month, which means emissions have variation between Mondays, other weekdays, Saturdays and Sundays within the month, but not week-to-week variation within the month. Also Tuesdays, Wednesdays and Thursdays are treated the same.

aveday = hourly emissions computed for one representative day of each month, which means emissions for all days of each month are the same.

[2] **Daily temporal approach** refers to the temporal approach for getting daily emissions from the inventory using the Temporal program. The values given are the values of the L_TYPE setting.

[3] **Merge processing approach** refers to the days used to represent other days in the month for the merge step. If not "all", then the SMOKE merge step just run for representative days, which could include holidays as indicated by the rightmost column. The values given are the values of the M_TYPE setting.

Table 3-10. Temporal Settings Used for the Platform Sectors in SMOKE

study for all of the SMOKE point-source sectors (ptipm, ptnonipm, othpt, and seca_c3). The in-line plume rise computed within CMAQ is nearly identical to the plume rise that would be calculated within SMOKE using the Laypoint program. See http://www.smoke-model.org/version2.6/html/ch06s07.html for full documentation of Laypoint. The selection of point sources for plume rise is pre-determined in SMOKE using the Elevpoint program (http://www.smoke-model.org/version2.6/html/ch06s03.html). The calculation is done in conjunction with the CMAQ model time steps with interpolated meteorological data and is therefore more temporally resolved than it is when done in SMOKE. Also, the calculation of the location of the point source is slightly different than the one used in SMOKE and this can result in slightly different placement of point sources near grid cell boundaries.

For point sources, the stack parameters are used as inputs to the Briggs algorithm, but point fires do not have stack parameters. However, the ptfire inventory does contain data on the acres burned (acres per day) and fuel consumption (tons fuel per acre) for each day. CMAQ uses these additional parameters to estimate the plume rise of emissions into layers above the surface model layer. Specifically, these data are used to calculate heat flux, which is then used to estimate plume rise. In addition to the acres burned and fuel consumption, heat content of the fuel is needed to compute heat flux. The heat content was assumed to be 8000 Btu/lb of fuel for all fires because specific data on the fuels were unavailable in the inventory.

The plume rise algorithm applied to the fires is a modification of the Briggs algorithm with a stack height of zero and a heat release estimated from the fuel loading and fire size. CMAQ uses the Briggs algorithm to determine the plume top and bottom, and then computes the plumes' distributions into the vertical layers that the plumes intersect. The pressure difference across each layer divided by the pressure

Code	Surrogate Description	Code	Surrogate Description
N/A	Area-to-point approach (see 3.3.1.2)	515	Commercial plus Institutional Land
100	Population	520	Commercial plus Industrial plus Institutional
110	Housing	525	Golf Courses + Institutional +Industrial + Commercial
120	Urban Population	527	Single Family Residential
130	Rural Population	530	Residential - High Density
137	Housing Change	535	Residential + Commercial + Industrial + Institutional + Government
140	Housing Change and Population	540	Retail Trade
150	Residential Heating - Natural Gas	545	Personal Repair
160	Residential Heating - Wood	550	Retail Trade plus Personal Repair
165	0.5 Residential Heating - Wood plus 0.5 Low Intensity Residential	555	Professional/Technical plus General Government
170	Residential Heating - Distillate Oil	560	Hospital
180	Residential Heating - Coal	565	Medical Office/Clinic
190	Residential Heating - LP Gas	570	Heavy and High Tech Industrial
200	Urban Primary Road Miles	575	Light and High Tech Industrial
210	Rural Primary Road Miles	580	Food, Drug, Chemical Industrial
220	Urban Secondary Road Miles	585	Metals and Minerals Industrial
230	Rural Secondary Road Miles	590	Heavy Industrial
240	Total Road Miles	595	Light Industrial
250	Urban Primary plus Rural Primary	596	Industrial plus Institutional plus Hospitals
255	0.75 Total Roadway Miles plus 0.25 Population	600	Gas Stations
260	Total Railroad Miles	650	Refineries and Tank Farms
270	Class 1 Railroad Miles	675	Refineries and Tank Farms and Gas Stations
280	Class 2 and 3 Railroad Miles	700	Airport Areas
300	Low Intensity Residential	710	Airport Points
310	Total Agriculture	720	Military Airports
312	Orchards/Vineyards	800	Marine Ports
320	Forest Land	807	Navigable Waterway Miles
330	Strip Mines/Quarries	810	Navigable Waterway Activity
340	Land	850	Golf Courses
350	Water	860	Mines
400	Rural Land Area	870	Wastewater Treatment Facilities
500	Commercial Land	880	Drycleaners
505	Industrial Land	890	Commercial Timber
510	Commercial plus Industrial		

Table 3-11. U.S. Surrogates Available for the 2002 and 2005 Platforms

difference across the entire plume is used as a weighting factor to assign the emissions to layers. This approach gives plume fractions by layer and source.

3.3.7 Emissions Modeling Ancillary Files

In this section the ancillary data that SMOKE used to perform spatial allocation, chemical speciation, and temporal allocation for the 2005 Platform is summarized. The ancillary data files, particularly the cross-reference files, provide the specific inventory resolution at which spatial, speciation, and temporal factors are applied. For the 2005 Platform, spatial factors were generally applied by country/SCC, speciation factors by pollutant/SCC or (for combination profiles) state/county FIPS code and month, and temporal factors by some combination of country, state, county, SCC, and pollutant.

3.3.7.1 Spatial Allocation Ancillary Files

Spatial allocation was performed for a national 12-km domain. To do this, SMOKE used national 12-km spatial surrogates and a SMOKE area-to-point data file. For the U.S. and Mexico, the same spatial surrogates were used as were used for the 2002 Platform. For Canada, a new set of Canadian surrogates provided by Environment Canada was used as they were provided along with their 2006 emissions data.

3.3.7.2 Surrogates for U.S. Emissions

There are 66 spatial surrogates available for spatially allocating U.S. county-level emissions to the CMAQ 36-km and 12-km grid cells; they are the same as for the 2002 Platform. An area-to-point approach overrides the use of surrogates for some sources. The Surrogate Tool was used to generate all of the surrogates. The shapefiles input to the Surrogate Tool are provided and documented at http://www.epa.gov/ttn/chief/emch/spatial/spatialsurrogate.html. The document ftp://ftp.epa.gov/EmisInventory/emiss_shp2006/us/list_of_shapefiles.pdf provides a list and summary of these shapefiles. The detailed steps in developing the county boundaries for the surrogates are documented at ftp://ftp.epa.gov/EmisInventory/emiss_shp2006/us/metadata_for_2002_county_boundary_shapefiles_rev.pdf. Table 3-11 lists the codes and descriptions of the surrogates.

The onroad off-network (parking area) emissions from the MOVES model, new to the 2005 platform, were spatially allocated as shown in Table 3-12.

SCC & Description	Surrogate
2201001350 Light Duty Gas Vehicles- parking areas rural 2201002350 Light Duty Gas Trucks 1&2- parking areas rural 2201004350 Light Duty Gas Trucks 3&4- parking areas rural	Rural population (same as rural local roads), code= 130
2201001370 Light Duty Gas Vehicles- parking areas urban 2201002370 Light Duty Gas Trucks 1&2- parking areas urban 2201004370 Light Duty Gas Trucks 3&4- parking areas urban	Urban population (same as urban local roads), code =120
2201070350 Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)- parking areas rural 2201070370 Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)- parking areas urban	Commercial plus Industrial plus Institutional, code = 520

Table 3-12. Surrogate assignments to new mobile categories in the 2005 Platform

3.3.7.3 Allocation Method for Airport-Related Sources in the U.S.

There are numerous airport-related emission sources in the 2005 NEI, such as aircraft, airport ground support equipment, and jet refueling. Unlike the 2002 platform in which most of these emissions were contained in sectors with county-level resolution—alm (aircraft), nonroad (airport ground support) and nonpt (jet refueling), the 2005 platform includes the aircraft emissions as point sources. Aircraft emissions are part of the ptnonipm sector, since the 2005v2 inventory included them as point sources.

Thus, for the 2005 platform, the SMOKE "area-to-point" approach was used for only airport ground support equipment (nonroad sector), and jet refueling (nonpt sector). The approach is described in detail in the 2002 Platform documentation: http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol1_02-28-08.pdf.

Nearly the same ARTOPNT file was used to implement the area-to-point approach as was done for the CAP and HAP-2002-Based Platform. This was slightly updated from the CAP-only 2002 Platform by further allocating the Detroit-area airports into multiple sets of geographic coordinates to support finer scale modeling that was done under a different project. The updated file was retained for the 2005 Platform.

3.3.7.4 Surrogates for Canada and Mexico Emission Inventories

The Mexican emissions and single surrogate (population) were the same as were used in the 2002 Platform. For Canada, an updated set of surrogates was used to spatially allocate the 2006 Canadian emissions for the 2005 Platform. The updated set completely replaced the 2002 Platform surrogates for allocating the 2006 province-level Canadian emissions.

The updated surrogate data provided in the 2005v4 zip files and described in Table 3-13 came from Environment Canada. They provided both the surrogates and cross references; the surrogates were outputs from the Surrogate Tool (previously

referenced). Per Environment Canada, the surrogates are based on 2001 Canadian census data. The cross-references that Canada originally provided were updated as follows: all assignments to surrogate '978' (manufacturing industries) were changed to '906' (manufacturing services), and all assignments to '985' (construction and mining) and '984' (construction industries) were changed to '907' (construction services) because the surrogate fractions in 984, 978 and 985 did not sum to 1. Codes for surrogates other than population that did not begin with the digit "9" were also changed.

3.3.7.5 Chemical Speciation Ancillary Files

The following data file, provided at the 2005v4 website, contains the SMOKE inputs used for chemical speciation of the inventory species to the CMAQ model species. SMOKE environmental variable names, used in the file names, are shown using capital letters in parentheses:

- **ancillary_2005v4_smokeformat.zip:** inventory table

Surrogate description	Filename of 2005 Platform Surrogate	Surrogate description	Filename of 2005 Platform Surrogate
Population	CA_100_NOFILL.txt	asphalt	CA_951_NOFILL.txt
Total dwelling	CA_901_NOFILL.txt	cement	CA_952_NOFILL.txt
Agriculture and Forestry and Fishing	CA_902_NOFILL.txt	chemical	CA_953_NOFILL.txt
Waste Management Service	CA_903_NOFILL.txt	commfuelcomb	CA_954_NOFILL.txt
Upstream Oil and Gas (UOG)	CA_904_NOFILL.txt	downstream_petroleum	CA_955_NOFILL.txt
Mining and Oil and Gas services	CA_905_NOFILL.txt	egu	CA_956_NOFILL.txt
Manufacturing services	CA_906_NOFILL.txt	grain	CA_957_NOFILL.txt
Construction services	CA_907_NOFILL.txt	manufacturing	CA_958_NOFILL.txt
Transportation of Passengers and goods	CA_908_NOFILL.txt	mining	CA_959_NOFILL.txt
Electric and Gas and Water utilities	CA_909_NOFILL.txt	oilgas_distibution	CA_960_NOFILL.txt
Wholesaling Merchandise services	CA_910_NOFILL.txt	smelting	CA_961_NOFILL.txt
Retailing Merchandise services	CA_911_NOFILL.txt	waste	CA_962_NOFILL.txt
Government Services	CA_915_NOFILL.txt	wood	CA_963_NOFILL.txt
All Sales	CA_920_NOFILL.txt	asphalt industries	CA_971_NOFILL.txt
Intersection of AGRFORFISH and MANUFACT	CA_921_NOFILL.txt	cement industries	CA_972_FILL.txt
Intersection of Forest and Housing	CA_922_NOFILL.txt	chemical industries	CA_973_FILL.txt
Intersection of MININGOILG and MANUFACT	CA_923_NOFILL.txt	commercial fuel combustion	CA_974_FILL.txt
Intersection of UTILITIES and DWELLING	CA_924_NOFILL.txt	downstream petroleum industries	CA_975_FILL.txt
Intersection of CONSTRUCTION and DWELLING	CA_925_NOFILL.txt	Electric utilities	CA_976_FILL.txt
Intersection of PUBADMIN and DWELLING	CA_926_NOFILL.txt	grain industries	CA_977_FILL.txt
Commercial Marine Vessels	CA_928_NOFILL.txt	manufacturing industries1	CA_978_FILL.txt
HIGHJET	CA_929_NOFILL.txt	mining industries	CA_979_FILL.txt
LOWMEDJET	CA_930_NOFILL.txt	smelting industries	CA_981_FILL.txt
OTHERJET	CA_931_NOFILL.txt	waste management	CA_982_NOFILL.txt
CANRAIL	CA_932_NOFILL.txt	construction industries1	CA_984_NOFILL.txt
LDGV	CA_934_NOFILL.txt	construction and mining1	CA_985_NOFILL.txt
PAVED ROADS	CA_941_NOFILL.txt	TOTALBEEF2	CA_986_NOFILL.txt 2
UNPAVED ROADS	CA_942_NOFILL.txt	TOTALPOUL2	CA_987_NOFILL.txt2
Oil Sands	CA_950_NOFILL.txt	TOTALSWIN2	CA_988_NOFILL.txt2
		TOTALFERT2	CA_989_NOFILL.txt2

1: Not used because fractions did not sum to 1;

2: Surrogates 986, 987, 988 and 989 were originally numbered by Canada as 611, 615, 620 and 65, respectively. We changed the numbers so that all Canadian surrogates would begin with "9".

Table 3-13. Canadian Spatial Surrogates for 2005-based platform Canadian Emission

(INVTABLE), NONHAPVOC emissions calculation exclusions file (NHAPEXCLUDE), speciation cross references (GSREF), speciation VOC-to-TOG conversion factors (GSCNV) , speciation profiles (GSPRO), and combined, monthly speciation profiles (GSPRO_COMBO).

For VOC speciation, SMOKE-ready profiles for the CB05 chemical mechanism were generated using the Speciation Tool (Eyth, 2006):

- TOG-to-model species (used only for no-integrate sources)
- NONHAPTOG-to-model species (used only for the integrate sources)
- TOG-to-BENZENE (used only for no-integrate sources)

Speciation profile entries were added that map NEI emissions of benzene, acetaldehyde, formaldehyde and methanol to the model species BENZENE, ALD2, FORM and METHANOL, respectively. These profiles were used only for the integrate sources. Note that the integrate and no-integrate sources were processed using the same GSREF and GSPRO files. Thus, to avoid double counting of these HAP species, B, A, F and M emissions were removed for all no-integrate sources in the inventory. If the entire sector was no-integrate, then these could be removed in SMOKE (by using "N" in the INVTABLE); but if a sector was partially integrated, these HAPS had to be removed from the actual inventory input to SMOKE, but only for the no HAP use, no-integrate sources.

In addition to the speciation profiles, the Speciation Tool generates the SMOKE-ready speciation conversion files (GSCNV). Two of these were generated: one containing profile-specific VOC-to-TOG conversion factors and the other containing profile-specific NONHAPVOC-to-NONHAPTOG conversion factors.

The TOG and $PM_{2.5}$ speciation factors that are the basis of the chemical speciation approach were developed from the SPECIATE 4.2 database (http://www.epa.gov/ttn/chief/software/speciate/index.html) which is EPA's repository of TOG and PM speciation profiles of air pollution sources. The 2002-based platform utilized an earlier version, SPECIATE 4.0. Note that this update did not impact the $PM_{2.5}$ profiles we used with the 2005-based platform; they were the same as those used for the 2002-based platform.

As with SPECIATE 4.0, SPECIATE 4.2 development was a collaboration involving EPA's ORD and EPA's Office of Air Quality Planning and Standards (OAQPS) at Research Triangle Park, NC, and Environment Canada (EPA, 2006c). The SPECIATE database contains speciation profiles for TOG, speciated into individual chemical compounds, VOC-to-TOG conversion factors associated with the TOG profiles, and speciation profiles for $PM_{2.5}$. The database also contains the $PM_{2.5}$ speciated into both individual chemical compounds (e.g., zinc, potassium, manganese, lead), and into the "simplified" $PM_{2.5}$ components used in the air quality model. These simplified components are:

- PSO4 : primary particulate sulfate
- PNO3: primary particulate nitrate
- PEC: primary particulate elemental carbon
- POC: primary particulate organic carbon
- PMFINE: other primary particulate, less that 2.5 microns in diameter

One minor issue found with the $PM_{2.5}$ speciation which was similarly an issue with the 2002-based platform is that a bituminous coal combustion profile (92095) that is applicable to numerous inventory sources was used, but only for a single nonpoint SCC (2101002000). For the other SCCs pertaining to bituminous coal combustion we used the sub-bituminous coal combustion profile (92084). Table 3-14 shows the differences are shown below, though these are quite small and represent only a minor change to the SMOKE results:

Another issue was that profile 92095 was inadvertently left out of SPECIATE4.2 (and 4.0). It was obtained from EPA ORD staff using it in their modeling applications.

Key changes to the TOG profiles from the 2002 Platform are as follows:

- Updated the profile for aircraft from 1098 (Aircraft Landing/Takeoff (LTO)—Commercial) which is from SPECIATE3.2 and has a profile date of 1989, to 5565 (Aircraft Exhaust), which has a profile date of 8/2008 and is based on testing conducted in 2005).
- Updated the profile for forest fires from 0307 (Miscellaneous Burning - Forest Fires) which was from SPECIATE3.2 and has a profile date of 1989) to 5560 (Biomass Burning - Extratropical Forest, dated 2/2008 and was based on testing conducted in 2001)
- Changed the assignment of residential wood combustion (including woodstove and fireplace emissions) and other profiles that formerly used 4641 (Fireplace wood combustion-oak wood) to 4642 (Fireplace wood combustion-pine wood) because of all three woods tested in the study (oak, pine and eucalyptus), the most complete testing was done for the pine wood (for example, benzene was only measured for pine)
- Updated the profiles for mobile onroad and nonroad sources to use more up-to-date test data. The updated profiles are:
  - 8750: Gasoline Exhaust—Reformulated gasoline
  - 8751: Gasoline Exhaust—E10 ethanol gasoline
  - 8752[12]: Gasoline Exhaust—E85 ethanol gasoline
  - 8753: Gasoline Vehicle - Evaporative emission - Reformulated gasoline

[12] Profile not used in 2005, but used in future years built off of the 2005 base year.

pollutant	species	split factors sub-bituminous 92084	split factors bituminous 92095
PM2_5	PEC	0.0188	0.01696
PM2_5	PMFINE	0.8266	0.827928
PM2_5	PNO3	0.0016	0.00208
PM2_5	POC	0.0263	0.026307
PM2_5	PSO4	0.1267	0.126725

Table 3-14. Differences between two profiles used for coal combustion

- 8754: Gasoline Vehicle - Evaporative emission - E10 ethanol gasoline
- 8755[9]: Gasoline Vehicle - Evaporative emission - E85 ethanol gasoline
- 8756[9,13]: Composite Profile for Tier 2 vehicles E0, exhaust
- 8757[9,10]: Composite Profile for Tier 2 vehicles E10, exhaust

- Utilized combination profiles comprised of the above updated exhaust and evaporative profiles to match the average ethanol content of fuels used by different counties and for different months of the year. Combinations were created based on the fuel properties data in the NMIM county database.

Speciation profiles for use with BEIS are not included in SPECIATE. The 2005 Platform uses BEIS 3.14 and includes a new species (SESQ) that was not in BEIS 3.13 (the version used for the 2002 Platform). This species was therefore added (it is mapped to the CMAQ species SESQT) to the set of profiles that had been used in the 2002 Platform. The profile code associated with BEIS3.14 profiles for use with CB05 uses the same as in the 2002 Platform: "B10C5."

The INVTABLE and NHAPEXCLUDE SMOKE input files have a critical function in the VOC speciation process for emissions modeling cases utilizing HAP-CAP integration, as is done for the 2005 Platform.

Two different INVTABLE files were prepared to use with different sectors of the platform. For sectors in which we chose no integration across the entire sector, a "no HAP use" INVTABLE that set the "KEEP" flag to "N" for BAFM was created. Thus, any BAFM in the inventory input into SMOKE would be dropped. This approach both avoids double-counting of these species and assumes that the VOC speciation is the best available approach for these species for the sectors using the approach. The second INVTABLE, used for sectors in which one or more sources are integrated, causes SMOKE to keep the BAFM pollutants and indicates that they are to be integrated with VOC (by setting the "VOC or TOG component" field to "V" for all four HAP pollutants.

Sector-specific NHAPEXCLUDE files were developed that provide the specific sources that are excluded from integration.

3.3.7.6 Temporal Allocation Ancillary Files

The emissions modeling step for temporal allocation creates the 2005 hourly emission inputs for CMAQ by adjusting the emissions from the inventory resolution (annual, monthly, daily or hourly) that are input into SMOKE. The temporal resolution of each of the platform sectors prior to their input into SMOKE is included in the sector descriptions from Table 3-1 and were repeated in the discussion of temporal settings.

The starting point for the temporal profiles was the 2002 Platform. The monthly, weekly, and diurnal temporal profiles and associated cross references used to create the 2005 hourly emissions inputs for CMAQ were generally based on the temporal allocation data used for the 2002 Platform. New profile assignments were added for SCCs in the 2005 inventory that were not in the 2002 inventory, and the profiles used for ptipm sources without CEM data were updated to represent the year 2007. Temporal profiles were assigned for the new parking area SCCs provided by the draft version of MOVES and are shown in Figure 3-5. The remainder of this section discusses the development of the new temporal profiles or profile assignments used in the 2005 Platform.

The next development for the 2005 Platform included the addition of diurnal profiles for electric generating units (ptipm). The state-specific and pollutant-specific diurnal profiles for use in allocating the day-specific emissions for non-CEM sources in the ptipm sector were updated. The 2007 CEM data was used to create state-specific, day-to-hour factors, averaged over the whole year and all units in each state. Diurnal factors were calculated using CEM SO_2 and NO_X emissions and heat input. SO_2 and NO_X-specific factors were computed from the CEM data for these pollutants. All other pollutants used factors created from the hourly heat input data. The resulting profiles were assigned by state and pollutant.

[13] Profile not included in SPECIATE4.2 (Nov. 2008), per OTAQ documentation, profiles were created October 2008, by OTAQ with EPAct Phase 1 data, 22 out of 22 valid test cycles. Three vehicles tested: Honda Civic, Toyota Sienna, Chevy Silverado. Composite emission factors calculated using straight weighting for an LA92 drive cycle (1.19 miles, 8.63 miles, 1.19 miles for Bags 1,2 and 3, respectively).

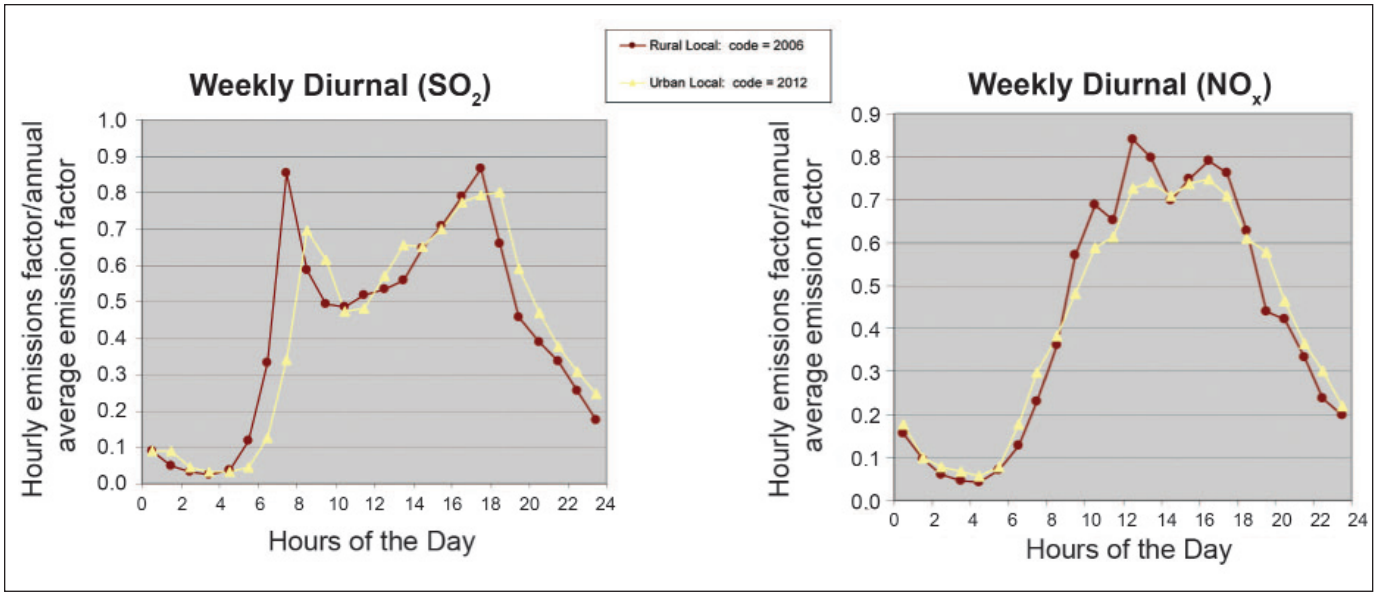


Figure 3-5. Diurnal Profiles for Parking Areas (Pollutants: SO_2 and NOx)

Canadian emission inventories were also included in the 2005 Platform. The temporal profile assignments for the Canadian 2006 inventory were provided by Environment Canada along with the inventory. They provided profile assignments that rely on the existing set of temporal profiles in the 2002 Platform. For point sources, they provided profile assignments by PLANTID.

Finally, WRAP oil and gas inventory profiles were included in the 2005 Platform. The WRAP 2005 oil and gas inventory SCCs[14] utilized uniform monthly and day of week profiles (codes 262 and 7, respectively) and an hourly profile (code 26) that put emissions in every hour, but weighted towards the day light hours.

[14] See Table 2-9: 2310000220, 2310000330, 2310000440, 2310010100, 2310010200, 2310010300, 2310010700, 2310010800, 2310020600, 2310020700, 2310020800, 2310021100, 2310021300, 2310021400, 2310021500, 2310021600, 2310023000, 2310030210, 2310030220

4.0
CMAQ Air Quality Model Estimates

4.1 Introduction to the CMAQ Modeling Platform

The Clean Air Act (CAA) provides a mandate to assess and manage air pollution levels to protect human health and the environment. EPA has established National Ambient Air Quality Standards (NAAQS), requiring the development of effective emissions control strategies for such pollutants as ozone and particulate matter. Air quality models are used to develop these emission control strategies to achieve the objectives of the CAA.

Historically, air quality models have addressed individual pollutant issues separately. However, many of the same precursor chemicals are involved in both ozone and aerosol (particulate matter) chemistry; therefore, the chemical transformation pathways are dependent. Thus, modeled abatement strategies of pollutant precursors, such as volatile organic compounds (VOC) and NOx to reduce ozone levels, may exacerbate other air pollutants such as particulate matter.

To meet the need to address the complex relationships between pollutants, EPA developed the Community Multiscale Air Quality (CMAQ) modeling system. The primary goals for CMAQ are to:

- Improve the environmental management community's ability to evaluate the impact of air quality management practices for multiple pollutants at multiple scales.
- Improve the scientist's ability to better probe, understand, and simulate chemical and physical interactions in the atmosphere.

The CMAQ modeling system brings together key physical and chemical functions associated with the dispersion and transformations of air pollution at various scales. It was designed to approach air quality as a whole by including state-of-the-science capabilities for modeling multiple air quality issues, including tropospheric ozone, fine particles, toxics, acid deposition, and visibility degradation. CMAQ relies on emission estimates from various sources, including the U.S. EPA Office of Air Quality Planning and Standards' current emission inventories, observed emission from major utility stacks, and model estimates of natural emissions from biogenic and agricultural sources. CMAQ also relies on meteorological predictions that include assimilation of meteorological observations as constraints. Emissions and meteorology data are fed into CMAQ and run through various algorithms that simulate the physical and chemical processes in the atmosphere to provide estimated concentrations of the pollutants. Traditionally, the model has been used to predict air quality across a regional or national domain and then to simulate the effects of various changes in emission levels for policymaking purposes. For health studies, the model can also be used to provide supplemental information about air quality in areas where no monitors exist.

CMAQ was also designed to have multi-scale capabilities so that separate models were not needed for urban and regional scale air quality modeling. The grid spatial resolutions in past annual CMAQ runs have been 36 km x 36 km per grid for the "parent" domain, and nested within that domain are 12 km x 12 km grid resolution domains. The parent domain typically covered the continental United States, and the nested 12 km x 12 km domain covered the Eastern or Western United States. The CMAQ simulation performed for this 2007 assessment used a single domain that covers the entire continental U.S. (CONUS) and large portions of Canada and Mexico using 12 km by 12 km horizontal grid spacing. For urban applications, CMAQ has also been applied with a 4-km x 4-km grid resolution for urban core areas; however, the uncertainties in emissions and meteorology information can actually increase at this high of a resolution. Currently, 12 km x 12 km resolution is recommended for most applications as the highest resolution. With the temporal flexibility of the model, simulations can be performed to evaluate longer term (annual to multi-year) pollutant climatologies as well as short-term (weeks to months) transport from localized sources. By making CMAQ a modeling system that addresses multiple pollutants and different temporal and spatial scales, CMAQ has a "one atmosphere" perspective that combines the efforts of the scientific community. Improvements will be made to the CMAQ modeling system as the scientific community further develops the state-of-the-science.

For more information on CMAQ, go to http://www.epa.gov/asmdnerl/CMAQ or http://www.cmascenter.org.

4.1.1 Advantages and Limitations of the CMAQ Air Quality Model

An advantage of using the CMAQ model output for comparing with health outcomes is that it has the potential to provide complete spatial and temporal coverage. Additionally, meteorological predictions, which are also needed when comparing health outcomes, are available for every grid cell along with the air quality predictions.

A disadvantage of using CMAQ is that, as a deterministic model, it has none of the statistical qualities of interpolation techniques that fit the observed data to one degree or another. Furthermore, the emissions and meteorological data used in CMAQ each have large uncertainties, in particular for unusual emission or meteorological events. There are also uncertainties associated with the chemical transformation and fate process algorithms used in air quality models.

Thus, emissions and meteorological data plus modeling uncertainties cause CMAQ to predict best on longer time scale bases (e.g., synoptic, monthly, and annual scales) and be most error prone at high time and space resolutions compared to direct measures.

One practical disadvantage of using CMAQ model output for health outcome research is that the regularly spaced grid cells do not line up directly with counties or ZIP codes which are the geographical units over which health outcomes are likely to be aggregated. But it is possible to overlay grid cells with county or ZIP code boundaries and devise means of assigning an exposure level that nonetheless provides more complete coverage than that available from ambient data alone. Another practical disadvantage is that CMAQ requires significant data and computing resources to obtain results for daily environmental health surveillance.

This section describes the air quality modeling platform used for the 2007 CMAQ simulation. A modeling platform is a structured system of connected modeling-related tools and data that provide a consistent and transparent basis for assessing the air quality response to changes in emissions and/or meteorology. A platform typically consists of a specific air quality model, emissions estimates, a set of meteorological inputs, and estimates of "boundary conditions" representing pollutant transport from source areas outside the region modeled. We used the CMAQ[15] model as part of the 2007 Platform to provide a national scale air quality modeling analysis. The CMAQ model simulates the multiple physical and chemical processes involved in the formation, transport, and destruction of ozone and fine particulate matter ($PM_{2.5}$).

This section provides a description of each of the main components of the 2007 CMAQ simulation along with the results of a model performance evaluation in which the 2007 model predictions are compared to corresponding measured concentrations.

4.2 CMAQ Model Version, Inputs and Configuration

4.2.1 Model Version

CMAQ is a non-proprietary computer model that simulates the formation and fate of photochemical oxidants, including $PM_{2.5}$ and ozone, for given input sets of meteorological conditions and emissions. The CMAQ model version 4.7 was most recently peer-reviewed in February of 2009 for the U.S. EPA.[16] As mentioned previously, CMAQ includes numerous science modules that simulate the emission, production, decay, deposition and transport of organic and inorganic gas-phase and particle-phase pollutants in the atmosphere. This analysis employed a version of CMAQ based on the latest publicly released version of CMAQ (i.e., version 4.7.1[17]) at the time of the 2007 air quality modeling. CMAQ version 4.7.1 reflects updates to version 4.7 to improve the underlying science which include aqueous chemistry mass conservation improvements and improved vertical convective mixing. The model enhancements in version 4.7.1 also include:

1. Aqueous chemistry
   - Mass conservation improvements
     + Imposed 1 second minimum timestep for remainder of the cloud lifetime

       after 100 "iterations" in the solver
     + Force mass balance for the last timestep in the cloud by limiting oxidized amount to mass available
   - Implemented steady state assumption for OH
   - Only allow sulfur oxidation to control the aqueous chemistry solver timestep (previously, reactions of OH, GLY, MGLY, and Hg for multipollutant model also controlled the timestep)
2. Advection
   - Added additional divergence-based constraint on advection timestep
   - Vertical advection in the Yamo module is now represented with the PPM scheme to limit numerical diffusion
3. Model time step determination
   - Fixed a potential advection time step error
     + The sum of the advection steps for a given layer time step might not equal the output time step duration in some extreme cases
     + Ensured that the advection steps sum up to the synchronization step
4. Horizontal diffusion
   - Fixed a potential error
     + Concentration data may not be correctly initialized if multiple sub-cycle time steps are required
     + Fix to initialize concentrations with values calculated in the previous sub-time step
5. Emissions
   - Bug fix in EMIS_DEFN.F to include point source layer 1 NH3 emissions
   - Bug fix to calculate soil NO "pulse" emissions in BEIS

[15] Byun, D.W., and K. L. Schere, 2006: Review of the Governing Equations, Computational Algorithms, and Other Components of the Models-3 Community Multiscale Air Quality (CMAQ) Modeling System. Applied Mechanics Reviews, Volume 59, Number 2 (March 2006), pp. 51-77.

[16] Allen, D., Burns, D., Chock, D., Kumar, N., Lamb, B., Moran, M. (February 2009 Draft Version). Report on the Peer Review of the Atmospheric Modeling and Analysis Division, NERL/ORD/EPA. U.S. EPA, Research Triangle Park, NC. CMAQ version 4.7 was released on December, 2008. It is available from the Community Modeling and Analysis System (CMAS) as well as previous peer-review reports at: http://www.cmascenter.org.

[17] CMAQ version 4.7.1 model code is available from the Community Modeling and Analysis System (CMAS) at: http://www.cmascenter.org.

- Remove excessive logging of cases where ambient air temperature exceeds 315.0 Kelvin. When this occurs, the values are just slightly over 315
- Bug fix for parallel decomposition errors in plume rise emissions

6. Photolysis
   - JPROC/phot_table and phot_sat options
     + Expanded lookup tables to facilitate applications across the globe and vertical extent to 20km
     + Updated temperature adjustments for absorption cross sections and quantum yields
     + Revised algorithm that processes TOMS datasets for OMI data format
   - In-line option
     + Asymmetry factor calculation updated using values from Mie theory integrated over log normal particle distribution; added special treatment for large particles in asymmetry factor algorithm to avoid numerical instabilities

	National 12 km CMAQ Modeling Configuration
Map Projection	Lambert Conformal Projection
Grid Resolution	12 km
Coordinate Center	97 W, 40 N
True Latitudes	33 and 45 N
Dimensions	459 x 299 x 24
Vertical extent	24 Layers: Surface to 50 mb level (see Table 4-2)

Table 4-1. Geographic Information for 12 km Modeling Domain

4.2.2 Model Domain and Grid Resolution

The CMAQ modeling analyses were performed for a domain covering the continental United States, as shown in Figure 4-1. This single domain covers the entire continental U.S. (CONUS) and large portions of Canada and Mexico using 12 km by 12 km horizontal grid spacing. The model extends vertically from the surface to 50 millibars (approximately 19 km) using a sigma-pressure coordinate system. Air quality conditions at the outer boundary of the 12 km domain were taken from a global model. Table 4-1 provides some basic geographic information regarding the 12 km CMAQ domain.

Figure 4-1. Map of the CMAQ Modeling Domain. The blue box denotes the 12 km national modeling domain (Same as Figure 3-3.)

4.2.3 Modeling Period / Ozone Episodes

The 12 km CMAQ modeling domain was modeled for the entire year of 2007. The 2007 annual simulation was performed in two half-year segments (i.e., January through June, and July through December) for each emissions scenario. With this approach to segmenting an annual simulation we were able to reduce the overall throughput time for an annual simulation. The annual simulation included a "ramp-up" period, comprised of 10 days before the beginning of each half-year segment, to mitigate the effects of initial concentrations. All 365 model days were used in the annual average levels of $PM_{2.5}$. For the 8-hour ozone, we used modeling results from the period between May 1 and September 30. This 153-day period generally conforms to the ozone season across most parts of the U.S. and contains the majority of days that observed high ozone concentrations.

4.2.4 Model Inputs: Emissions, Meteorology and Boundary Conditions

2007 Emissions: The emissions inventories used in the 2007 air quality modeling are described in Section 3, above.

Meteorological Input Data: The gridded meteorological data for the entire year of 2007 at the 12 km continental United States scale domain was derived from version 3.1 of the Weather Research and Forecasting Model (WRF), Advanced Research WRF (ARW) core.[18] Previous CMAQ annual simulations have typically utilized meteorology provided by the 5th Generation Mesoscale Model (MM5).[19] The WRF Model is a next-generation mesoscale numerical weather prediction system developed for both operational forecasting and atmospheric research applications (http://wrf-model.org). The 2007 WRF simulation included the physics options of the Pleim-Xiu land surface model (LSM), Asymmetric Convective Model version 2 planetary boundary layer (PBL) scheme, Morrison double moment microphysics, Kain-Fritsch cumulus parameterization scheme and the RRTMG long-wave radiation (LWR) scheme.[20]

The WRF meteorological outputs were processed to create model-ready inputs for CMAQ using the Meteorology-Chemistry Interface Processor (MCIP) package[21], version 3.6, to derive the specific inputs to CMAQ: horizontal wind components (i.e., speed and direction), temperature, moisture, vertical diffusion rates, and rainfall rates for each grid cell in each vertical layer. The WRF simulation used the same CMAQ map projection, a Lambert Conformal projection centered at (-97, 40) with true latitudes at 33 and 45 degrees north. The 12 km WRF domain consisted of 459 by 299 grid cells. The WRF simulation utilized 34 vertical layers with a surface layer of approximately 38 meters. Table 4-2 shows the vertical layer structure used in WRF and the layer collapsing approach to generate the CMAQ meteorological inputs. CMAQ resolved the vertical atmosphere with 24 layers, preserving greater resolution in the PBL.

In terms of the 2007 WRF meteorological model performance evaluation, an approach which included a combination of qualitative and quantitative analyses was used to assess the adequacy of the WRF simulated fields.[22] The qualitative aspects involved comparisons of the model-estimated synoptic patterns against observed patterns from historical weather chart archives. Additionally, the evaluations compared spatial patterns of monthly average rainfall and monthly maximum planetary boundary layer (PBL) heights. The statistical portion of the evaluation examined the model bias and error for temperature, water vapor mixing ratio, solar radiation, and wind fields. These statistical values were calculated on a monthly basis.

Initial and Boundary Conditions: The lateral boundary and initial species concentrations are provided by a three-dimensional global atmospheric chemistry model, the GEOS-CHEM[23] model version 8-02-03. The global GEOS-CHEM model simulates atmospheric chemical and physical processes driven by assimilated meteorological observations from the NASA's Goddard Earth Observing System (GEOS). This model was run for 2007 with a grid resolution of 2.0 degrees x 2.5 degrees (latitude-longitude) and 47 vertical layers. The predictions were used to provide one-way dynamic boundary conditions at three-hour intervals and an initial concentration field for the CMAQ simulations. A GEOS-Chem evaluation was conducted for the purpose of validating the 2007 GEOS-Chem simulation for selected measurements relevant to their use as boundary conditions for CMAQ and reproducing GEOS-Chem evaluation plots reported in the literature for previous versions of the model.[24] More information is available about the GEOS-CHEM model and other applications using this tool at: http://www-as.harvard.edu/chemistry/trop/geos.

4.3 CMAQ Model Performance Evaluation

An operational model performance evaluation for ozone and $PM_{2.5}$ and its related speciated components was conducted for the 2007 simulation using state/local monitoring sites data in order to estimate the ability of the CMAQ modeling system to replicate the 2007 base year concentrations for the 12 km continental U.S. domain.

There are various statistical metrics available and used by the science community for model performance evaluation. For a robust evaluation, the principal evaluation statistics used to evaluate CMAQ performance were two bias metrics, normalized mean bias and fractional bias; and two

[18] Skamarock, W.C., Klemp, J.B., Dudhia, J., Gill, D.O., Barker, D.M., Duda, M.G., Huang, X., Wang, W., Powers, J.G., 2008. A Description of the Advanced Research WRF Version 3.

[19] Grell, G. A., Dudhia, A. J., and Stauffer, D. R., 1994. A description of the Fifth-Generation PennState/NCAR Mesoscale Model (MM5). NCAR Technical Note NCAR/TN-398+STR. Available at http://www.mmm.ucar.edu/mm5/doc1.html.

[20] Gilliam, R.C., Pleim, J.E., 2010. Performance Assessment of New Land Surface and Planetary Boundary Layer Physics in the WRF-ARW. Journal of Applied Meteorology and Climatology 49, 760-774.

[21] Otte T.L., Pleim, J.E., 2010. The Meteorology-Chemistry Interface Processor (MCIP) for the CMAQ modeling system: updates through v3.4.1. Geoscientific Model Development 3, 243-256.

[22] U.S. Environmental Protection Agency, 2011. Meteorological Model Performance for Annual 2007 Simulations, Office of Air Quality Planning and Standards, Research Triangle Park, NC., 27711, EPA-454/R-11-007.

[23] Yantosca, B., 2004. GEOS-CHEMv7-01-02 User's Guide, Atmospheric Chemistry Modeling Group, Harvard University, Cambridge, MA, October 15, 2004.

[24] Lam, Y-F., Fu, J.S., Jacob, D.J., Jang, C., Dolwick, P., 2010. 2006-2008 GEOS-Chem for CMAQ Initial and Boundary Conditions. 9th Annual CMAS Conference, October 11-13, 2010, Chapel Hill, NC.

Height (m)	Pressure (mb)	WRF	Depth (m)	CMAQ	Depth (m)
17,145	50	34	2,655	24	4,552
14,490	95	33	1,896		
12,593	140	32	1,499	23	2,749
11,094	185	31	1,250		
9,844	230	30	1,078	22	2,029
8,766	275	29	951		
7,815	320	28	853	21	1,627
6,962	365	27	775		
6,188	410	26	711	20	1,368
5,477	455	25	657		
4,820	500	24	612	19	1,185
4,208	545	23	573		
3,635	590	22	539	18	539
3,095	635	21	509	17	509
2,586	680	20	388	16	388
2,198	716	19	281	15	281
1,917	743	18	273	14	273
1,644	770	17	178	13	178
1,466	788	16	174	12	174
1,292	806	15	171	11	171
1,121	824	14	168	10	168
952	842	13	165	9	165
787	860	12	82	8	163
705	869	11	81		
624	878	10	80	7	160
544	887	9	80		
465	896	8	79	6	157
386	905	7	78		
307	914	6	78	5	78
230	923	5	77	4	77
153	932	4	38	3	76
114	937	3	38		
76	941	2	38	2	38
38	946	1	38	1	38

Table 4-2. Vertical layer structure for 2007 WRF and CMAQ simulations (heights are layer top).

error metrics, normalized mean error and fractional error. Normalized mean bias (NMB) is used as a normalization to facilitate a range of concentration magnitudes. This statistic averages the difference (model - observed) over the sum of observed values. NMB is a useful model performance indicator because it avoids overinflating the observed range of values, especially at low concentrations. Normalized mean bias is defined as:

$$\text{NMB} = \frac{\sum_{1}^{n}(P\text{-}O)}{\sum_{1}^{n}(O)} *100, \text{ where P = predicted concentrations and O = observed}$$

Normalized mean error (NME) is also similar to NMB, where the performance statistic is used as a normalization of the mean error. NME calculates the absolute value of the difference (model - observed) over the sum of observed values. Normalized mean error is defined as:

$$\text{NME} = \frac{\sum_{1}^{n}|P\text{-}O|}{\sum_{1}^{n}(O)} *100, \text{ where P = predicted concentrations and O = observed}$$

Fractional Bias (FB) is defined as:

$$\text{FB} = \frac{1}{n}\left(\frac{\sum_{1}^{n}(P\text{-}O)}{\sum_{1}^{n}\left(\frac{(P+O)}{2}\right)}\right) *100, \text{ where P = predicted concentrations and O = observed}$$

FB is a useful model performance indicator because it has the advantage of equally weighting positive and negative bias estimates. The single largest disadvantage in this estimate of model performance is that the estimated concentration (i.e., prediction, P) is found in both the numerator and denominator.

Fractional error (FE) is similar to fractional bias except the absolute value of the difference is used so that the error is always positive. Fractional error is defined as:

$$\text{FE} = \frac{1}{n}\left(\frac{\sum_{1}^{n}|P\text{-}O|}{\sum_{1}^{n}\left(\frac{(P+O)}{2}\right)}\right) *100, \text{ where P = predicted concentrations and O = observed}$$

In addition to the performance statistics, regional maps which show the normalized mean bias and error were prepared for the ozone season, May through September, at individual monitoring sites as well as on an annual basis for PM2.5 and its component species.

Evaluation for 8-hour Daily Maximum Ozone: The operational model performance evaluation for hourly and eight-hour daily maximum ozone was conducted using the statistics defined above. Ozone measurements from 1176 sites for 2007 in the continental U.S. were included in the evaluation and were taken from the 2007 State/local monitoring site data in the Air Quality System (AQS) Aerometric Information Retrieval System (AIRS). The performance statistics were calculated using predicted and observed data that were paired in time and space on an hourly and/or 8-hour basis. Statistics were generated for the following geographic groupings: domain wide and four large sub-regions[25]: Midwest, Northeast, Southeast, Central, and Western U.S.

[25] The subregions are defined by States where: Midwest is IL, IN, MI, OH, and WI; Northeast is CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, and VT; Southeast is AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV; Central is AR, IA, KS, LA, MN, MO, NE, OK, and TX; West is AK, CA, OR, WA, AZ, NM, CO, UT, WY, SD, ND, MT, ID, and NV.

The 8-hour ozone model performance bias and error statistics for each subregion and each season are provided in Table 4-4. Seasons were defined as: winter (December-January-February), spring (March-April-May), summer (June, July, August), and fall (September-October-November). Spatial plots of the normalized mean bias and error for individual monitors are shown in Figures 4-2 through 4-3. The statistics shown in these two figures were calculated over the ozone season using data pairs on days with observed 8-hour ozone of ≥ 60 ppb.

In general, the model performance statistics indicate that the 8-hour daily maximum ozone concentrations predicted by the 2007 CMAQ simulation closely reflect the corresponding 8-hour observed ozone concentrations in space and time in each subregion of the 12 km modeling domain. As indicated by the statistics in Table 4-4, bias and error for 8-hour daily maximum ozone are relatively low in each subregion, not only in the summer when concentrations are highest, but also during other times of the year. Specifically, 8-hour ozone in the summer is slightly over predicted with the greatest over prediction in the Central States (NMB is 19.6 percent). In the spring, ozone is slightly under predicted in all the subregions except in the Central states where NMB is near negligible (NMB is 0.2 percent). In the winter, when concentrations are generally low, the model under predicts 8-hour ozone with the exception of the West (NMB is 3.0). In the fall, when concentrations are also relatively low, ozone is slightly over predicted; with NMBs less than 12 percent in each subregion.

Subregion		No. of Obs	NMB (%)	NME (%)	FB (%)	FE (%)
Central States	Winter	11,223	-8.68	20.2	-10.3	24.7
	Spring	15,214	0.2	14.0	1.1	15.1
	Summer	16,619	19.6	25.8	19.7	26.4
	Fall	14,568	6.4	18.8	6.8	20.4
Midwest	Winter	2,824	-22.1	26.1	-28.1	33.1
	Spring	11,850	-1.8	12.2	-1.4	13.5
	Summer	16,592	9.6	16.6	9.6	16.7
	Fall	9,589	4.9	16.0	5.9	17.7
Southeast	Winter	6,431	-1.1	15.6	-1.1	16.8
	Spring	18,516	-0.5	10.3	-0.2	11.0
	Summer	20,465	14.3	18.6	15.8	19.5
	Fall	15,848	12.0	17.9	12.9	18.8
Northeast	Winter	5,085	-23.5	25.9	-30.0	34.4
	Spring	12,276	-3.9	13.3	-4.3	14.8
	Summer	15,973	11.3	17.7	10.8	17.7
	Fall	11,066	6.7	17.6	6.3	19.1
West	Winter	23,908	3.0	18.4	3.4	20.9
	Spring	27,771	-1.4	12.3	-1.4	13.1
	Summer	30,806	11.0	18.7	10.6	18.7
	Fall	27,746	6.4	18.6	6.2	20.0

Table 4-4. Summary of CMAQ 2007 8-Hour Daily Maximum O3 Model Performance Statistics by Subregion, by Season.

Model bias at individual sites during the ozone season is similar to that seen on a subregional basis for the summer. The information in Figure 4-2 indicates that the bias for days with observed 8-hour daily maximum ozone greater than 60 ppb is within ± 20 percent at the vast majority of monitoring sites across the U.S. domain. The exceptions are sites in and/or near Minneapolis, Duluth, District of Columbia, New York City, New Orleans, and San Antonio, as well as a few areas along the California coast. At these sites observed concentrations greater than 60 ppb are generally predicted in the range of ±20 to 40 percent. Looking at the map of bias, Figure 4-2 indicates that the low bias at these sites is not evident at other sites in these same areas. This suggests that the under prediction at these sites is likely due to very local features (e.g., meteorology and/or emissions) and not indicative of a systematic problem in the modeling platform. Model error, as seen from Figure 4-3, is 14 percent or less at most of the sites across the U.S. modeling domain. Somewhat greater error is evident at sites in several areas most notably along portions of the Northeast Corridor and in portions of Michigan, Minnesota, Louisiana, Texas, and the western most part of the modeling domain, (e.g., New Mexico, California, and Washington).

$PM_{2.5}$: The $PM_{2.5}$ evaluation focuses on $PM_{2.5}$ total mass and its components, including sulfate (SO_4), nitrate (NO_3), total nitrate ($TNO_3 = NO_3 + HNO_3$), ammonium (NH_4), elemental carbon (EC), and organic carbon (OC). The $PM_{2.5}$ bias and error performance statistics were calculated on an annual basis for each subregion (Table 4-5). $PM_{2.5}$ ambient measurements for 2007 were obtained from the following networks for model evaluation: Chemical Speciation Network (CSN—total of 211 sites, 24 hour average), Interagency Monitoring of PROtected Visual Environments (IMPROVE—total of 163 sites, 24 hour average), and Clean Air Status and Trends Network (CASTNet—total of 86, weekly average). For $PM_{2.5}$ species that are measured by more than one network, we calculated separate sets of statistics for each network by subregion. For brevity, Table 4-5 provides annual model performance statistics for $PM_{2.5}$ and its component species for the 12 km continental U.S. domain and the five sub-regions defined above (Northeast,

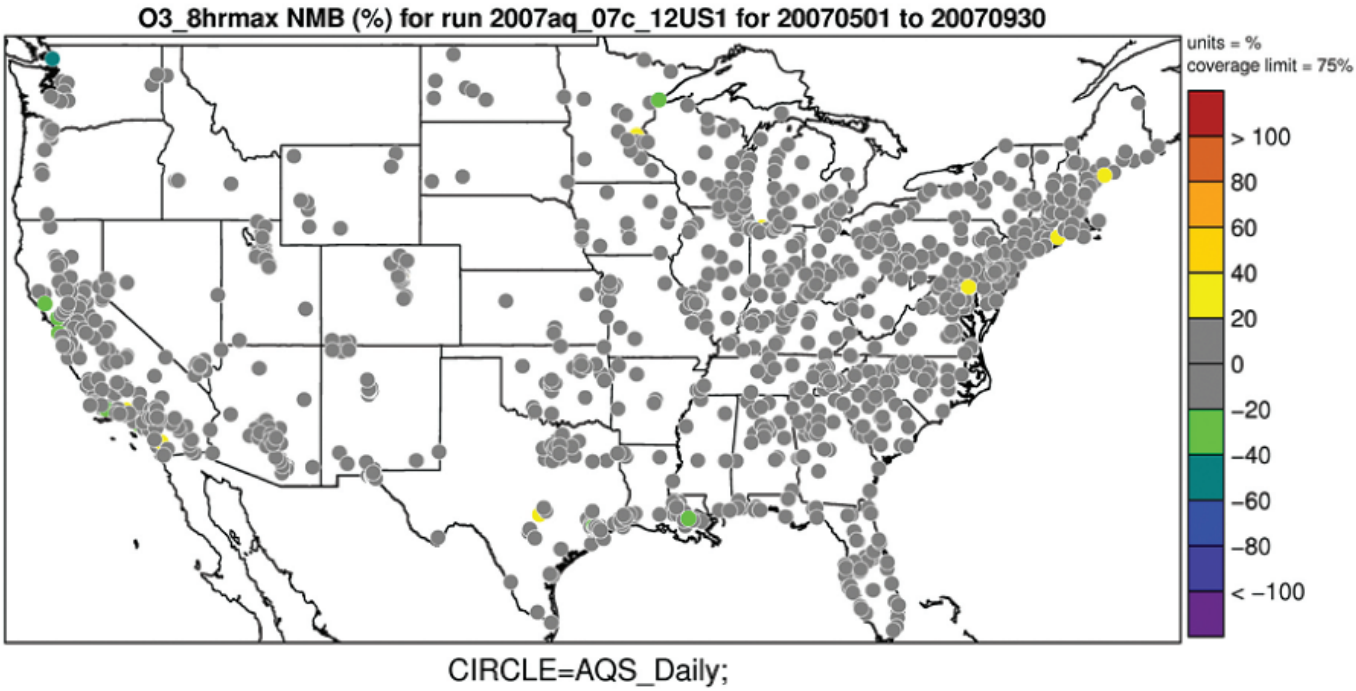


Figure 4-2. Normalized Mean Bias (%) of 8-hour daily maximum ozone greater than 60 ppb over the period May-September 2007 at monitoring sites in the continental U.S. modeling domain.

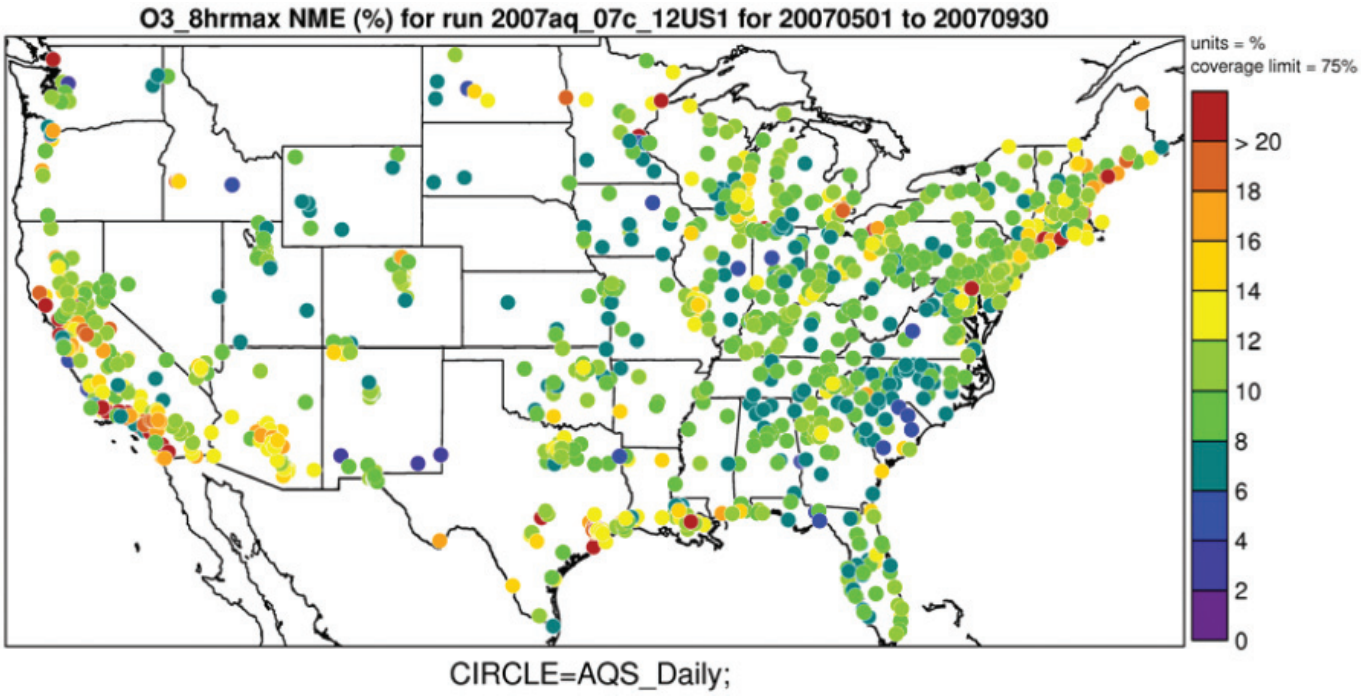


Figure 4-3. Normalized Mean Error (%) of 8-hour daily maximum ozone greater than 60 ppb over the period May-September 2007 at monitoring sites in the continental U.S. modeling domain.

Midwest, Southeast, Central, and West). In addition to the tabular summaries of bias and error statistics, annual spatial maps which show the normalized mean bias and error by site for each $PM_{2.5}$ species are provided in Figures 4-4 through 4-17.

As indicated by the statistics in Table 4-5, annual CMAQ $PM_{2.}5$ for 2007 shows a slight under prediction at rural IMPROVE monitoring sites in each subregion except the Northeast which shows an over prediction in NMB of 18.1 percent. Annual $PM_{2.5}$ at urban CSN monitoring sites show slight over predictions in the Midwest, Central and West whereas annual $PM_{2.5}$ is under predicted in the Southeast (NMB is -2.1 percent) and Northeast (NMB is -42.3).

Although not shown here, the mean observed concentrations of $PM_{2.5}$ are more than twice as high at the CSN sites (~16µg m^{-3}) as the IMPROVE sites (~ 6µg m^{-3}), thus illustrating the statistical differences between the urban CSN and rural IMPROVE networks.

Annual average sulfate is consistently under-predicted at CSN, IMPROVE, and CASTNet monitoring sites across the modeling domain, with NMB values ranging from -8 percent to -34 percent. Overall, sulfate bias performance is slightly better at urban CSN sites than at rural IMPROVE and/or suburban CASTNet sites. Sulfate performance shows moderate error, ranging from 22 to 45 percent. Annual model bias and error at individual sites, as displayed in Figures 4-6

CMAQ 2007 Annual			No. of Obs.	NMB (%)	NME (%)	FB (%)	FE (%)
$PM_{2.5}$	CSN	Northeast	3,279	-42.3	70.2	11.8	40.9
		Midwest	2,348	6.1	32.3	5.4	32.2
		Southeast	2,304	-2.1	36.8	-3.7	36.5
		Central	2,122	18.1	51.3	7.8	45.5
		West	3,239	3.0	54.2	-4.5	51.4
	IMPROVE	Northeast	2,335	18.1	50.2	9.3	45.4
		Midwest	581	-0.4	34.5	-6.0	38.2
		Southeast	1,916	-7.0	43.4	-12.9	46.4
		Central	2,524	-0.1	44.8	-9.0	47.9
		West	9,952	-15.7	61.4	-32.4	61.9
Sulfate	CSN	Northeast	3,473	-10.9	28.6	-6.4	29.9
		Midwest	2,421	-10.4	29.5	-9.5	31.8
		Southeast	2,952	-16.9	30.7	-15.5	33.2
		Central	2,518	-11.2	37.1	-11.8	39.0
		West	3,583	-14.7	43.9	-5.6	42.8
	IMPROVE	Northeast	2,327	-8.8	30.5	-3.9	32.0
		Midwest	588	-16.3	29.7	-13.9	32.3
		Southeast	1,830	-16.9	32.4	-14.0	35.5
		Central	2,490	-25.4	35.1	-22.4	39.2
		West	10,015	-12.8	43.4	0.0	45.2
	CASTNet	Northeast	755	-18.9	22.4	-20.8	25.6
		Midwest	631	-20.8	24.4	-23.6	27.9
		Southeast	1,105	-26.0	27.0	-29.7	31.2
		Central	370	-34.5	35.1	-40.2	41.1
		West	1,139	-26.7	36.3	-20.5	38.3
Nitrate	CSN	Northeast	3,620	32.6	68.0	9.6	70.8
		Midwest	2,421	23.8	62.9	14.0	63.8
		Southeast	2,952	38.6	99.0	-36.5	97.3
		Central	1,906	34.5	70.8	11.9	73.5
		West	3,583	-32.4	61.4	-57.9	90.7
	IMPROVE	Northeast	2,327	93.8	128.0	12.3	95.1
		Midwest	588	46.8	86.3	-10.7	92.0
		Southeast	1,830	58.8	128.0	-43.0	114.0
		Central	2,490	47.2	83.0	-6.4	90.1
		West	10,007	-23.2	85.0	-78.0	122.0

CMAQ 2007 Annual			No. of Obs.	NMB (%)	NME (%)	FB (%)	FE (%)
Total Nitrate (NO_3 + HNO_3)	CASTNet	Northeast	755	69.5	72.8	46.6	53.9
		Midwest	630	43.6	48.5	36.7	40.3
		Southeast	1,105	45.0	54.9	32.2	45.4
		Central	370	35.2	46.6	24.1	37.4
		West	1,139	12.8	41.6	20.4	44.1
Ammonium	CSN	Northeast	3,171	6.9	38.1	17.8	39.8
		Midwest	2,421	5.3	35.8	14.0	36.7
		Southeast	2,831	-0.4	38.1	3.8	39.2
		Central	2,305	13.4	47.2	12.1	46.7
		West	3,224	-10.4	57.3	10.4	55.2
	CASTNet	Northeast	755	9.4	33.6	10.3	34.3
		Midwest	631	18.4	31.7	18.1	29.0
		Southeast	1,105	-4.8	32.4	-3.9	33.0
		Central	370	14.6	39.1	8.3	37.3
		West	1,139	-9.1	40.2	-3.8	41.2
Elemental Carbon	CSN	Northeast	4,589	3.2	60.5	0.7	56.9
		Midwest	2,997	-18.5	54.4	-9.8	53.3
		Southeast	4,040	-11.7	49.8	-11.1	53.1
		Central	4,427	-14.7	95.2	-6.8	79.5
		West	12,119	-10.1	88.0	-30.2	81.2
	IMPROVE	Northeast	2,393	15.0	53.0	-3.4	50.5
		Midwest	662	-22.3	40.1	26.5	48.8
		Southeast	1,963	-22.7	46.6	-28.4	52.2
		Central	2,520	4.6	52.3	-7.0	48.4
		West	9,779	35.6	90.0	-8.7	63.9
Organic Carbon	CSN	Northeast	3,003	5.6	60.0	11.0	63.0
		Midwest	2,304	-22.2	49.5	-12.1	56.2
		Southeast	2,767	-21.0	48.4	-18.5	55.7
		Central	2,259	0.0	59.2	-5.6	57.3
		West	2,653	0.7	68.1	-4.0	64.0
	IMPROVE	Northeast	2,391	14.4	62.8	-1.0	55.6
		Midwest	662	-25.5	46.8	-33.6	56.1
		Southeast	1,968	-17.1	54.1	-30.8	57.4
		Central	2,520	-10.6	57.9	-32.6	60.4
		West	9,761	5.4	79.9	-37.9	73.9

Table 4-5. Summary of CMAQ 2007 Annual $PM_{2.5}$ Species Model Performance Statistic

and 4-7, suggest spatial patterns vary by region. The model bias for most of the Southeast, Central and Southwest states are within -20 to -40 percent. The model bias appears to be much less (±20 percent) in the Northeast, Midwest, and Northwest states. A few sites in the Northwest have biases much greater than 20 percent. Model error also shows a spatial trend by region, where much of the Eastern states are 20 to 30 percent, the Central U.S. states are 30 to 40 percent, and the Western states are greater than 40 percent.

Annual average nitrate is over predicted at the urban and rural monitoring sites in most of the subregions in the12 km modeling domain (NMB in the range of 24% to 93%), while nitrate is under predicted in the West (NMB in the range of -23% to -32%). The bias statistics indicate that the model performance for nitrate is generally best at the urban CSN monitoring sites. Model performance of total nitrate at suburban CASTNet monitoring sites shows an

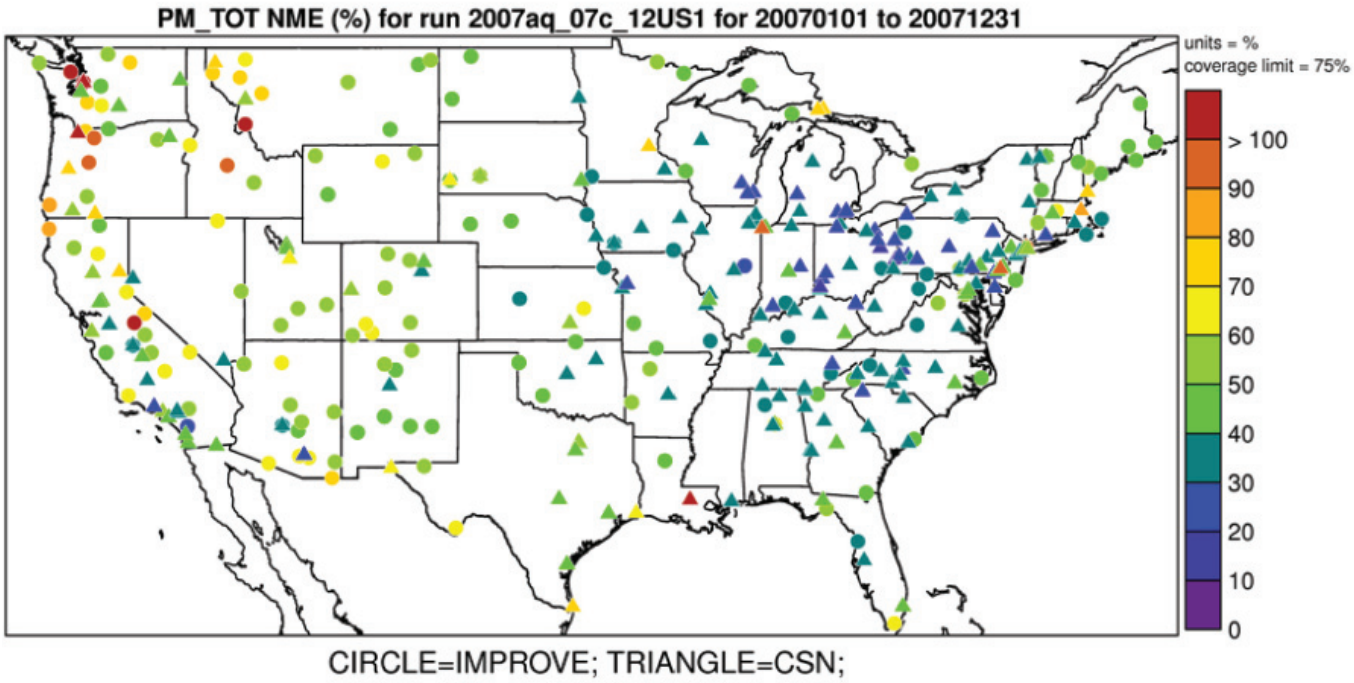


Figure 4-4. Normalized Mean Bias (%) of annual PM2.5 mass at monitoring sites in the continental U.S. modeling domain.

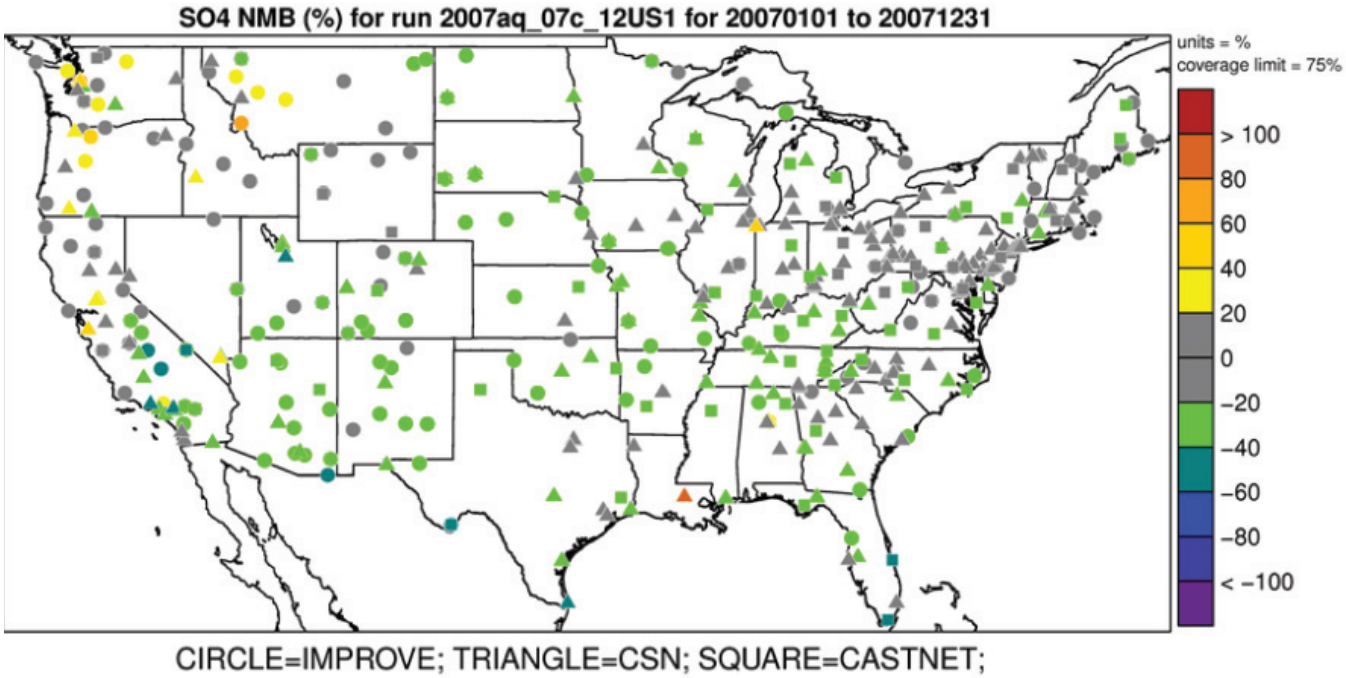


Figure 4-5. Normalized Mean Error (%) of annual PM2.5 mass at monitoring sites in the continental U.S. modeling domain.

over prediction across all subregions. Model error for nitrate is somewhat greater for each subregion as compared to sulfate. Model bias at individual sites indicates mainly over prediction of greater than 20 percent at most monitoring sites in the Eastern half of the U.S. as well and in the extreme Northwest, as indicated in Figure 4-8. The exception to this is in the Southwest of the modeling domain where there appears to be a greater number of sites with under prediction of nitrate of 20 to 80 percent. Model error for annual nitrate, as shown in Figure 4-9, is least at sites in portions of the Midwest and extending eastward to the Northeast corridor. Nitrate concentrations are typically higher in these areas than in other portions of the modeling domain.

Annual average ammonium model performance as indicated in Table 4-5 has a tendency for the model to slightly over predict in the Northeast, Midwest, and Central U.S. states across the CSN and CASTNet monitoring sites (NMB

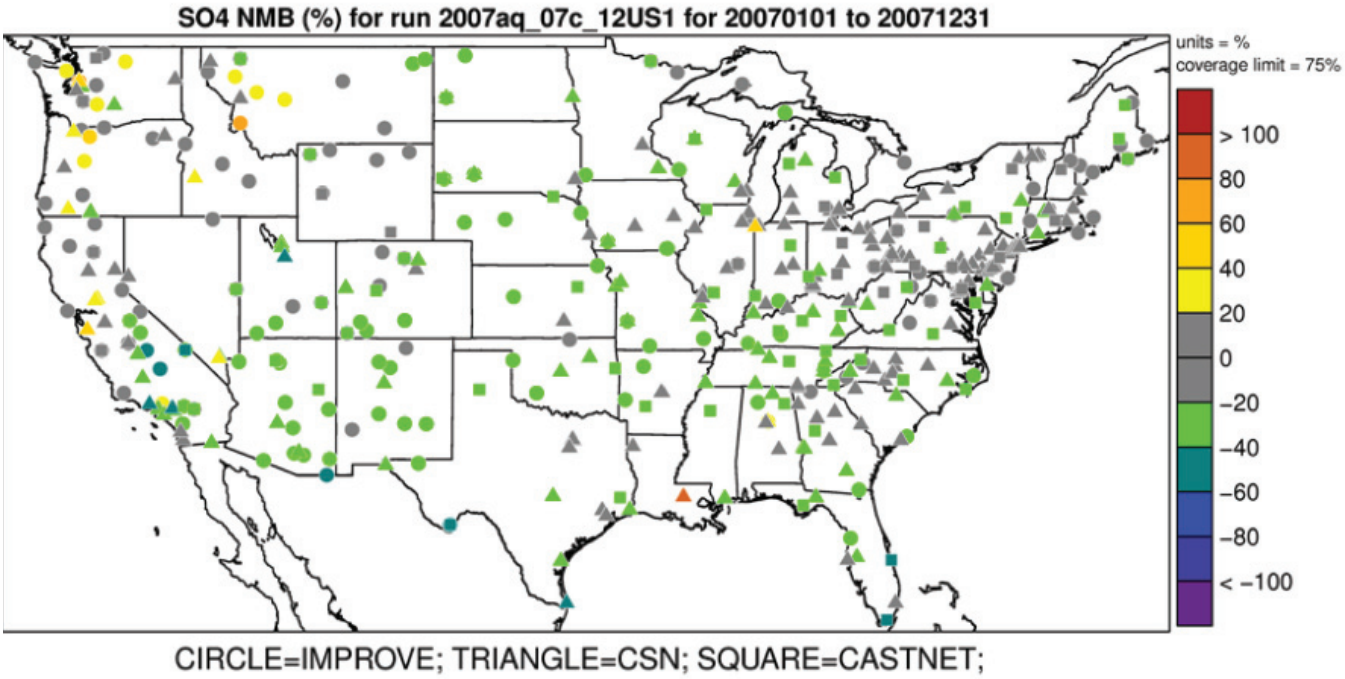


Figure 4-6. Normalized Mean Bias (%) of annual Sulfate at monitoring sites in the continental U.S. modeling domain.

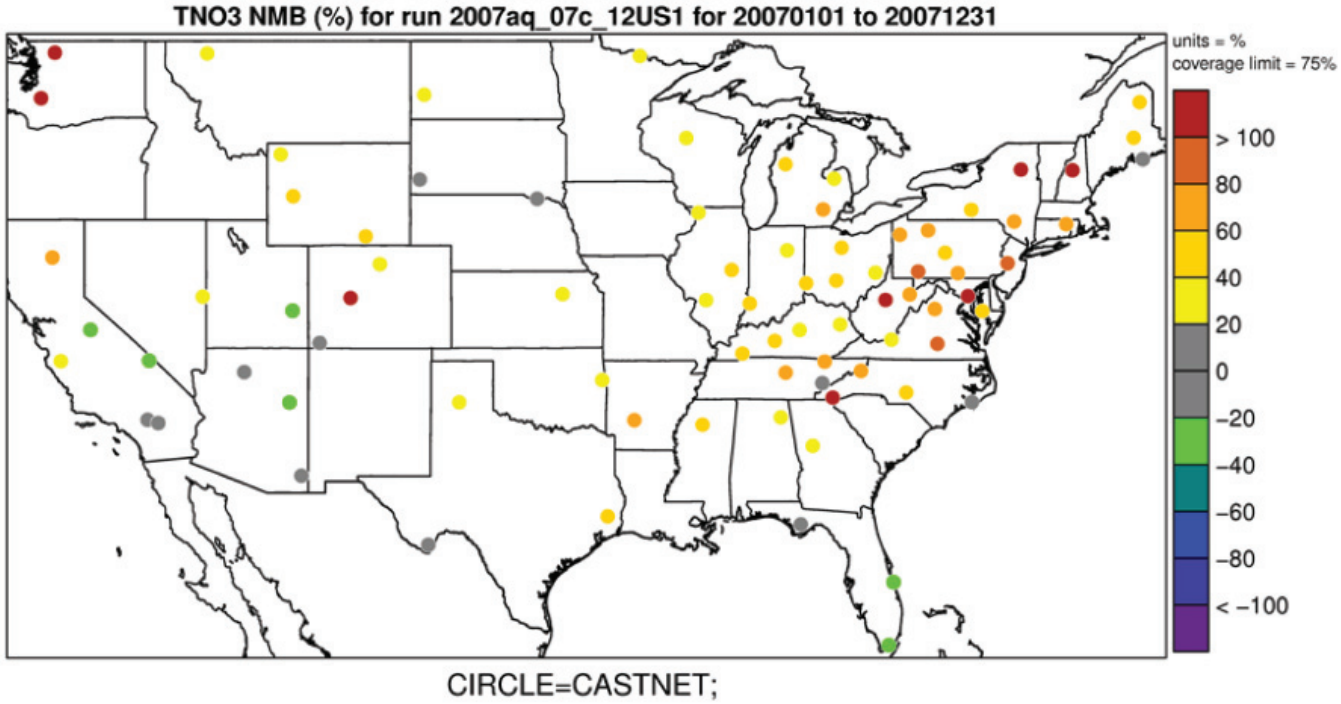


Figure 4-7. Normalized Mean Error (%) of annual Sulfate at monitoring sites in the continental U.S. modeling domain.

ranging from -0.4 to -10 percent). In contrast, the model tends to slightly under predict in the Southeast and Western states at CSN and CASTNet sites (NMB ranging from 5 to 18 percent). There is not a large variation from subregion to subregion or at urban versus rural sites in the error statistics for ammonium.

Annual average elemental carbon is under predicted in all subregions at urban sites with the exception of the slight over prediction in the Northeast. At rural sites, elemental carbon is over predicted in the Northeast, Central and West, although elemental carbon is under predicted in the Midwest and Southeast. Similar to ammonium error model performance, there is not a large variation from subregion to subregion or at urban versus rural sites.

Annual average organic carbon is under predicted in the Midwest, Southeast and Central states at the urban and rural monitoring sites. In contrast, organic carbon model bias tends to show a slight over prediction in the Northeast and West. Similar to ammonium and elemental carbon, error model performance does not show a large variation from subregion to subregion or at urban versus rural sites.

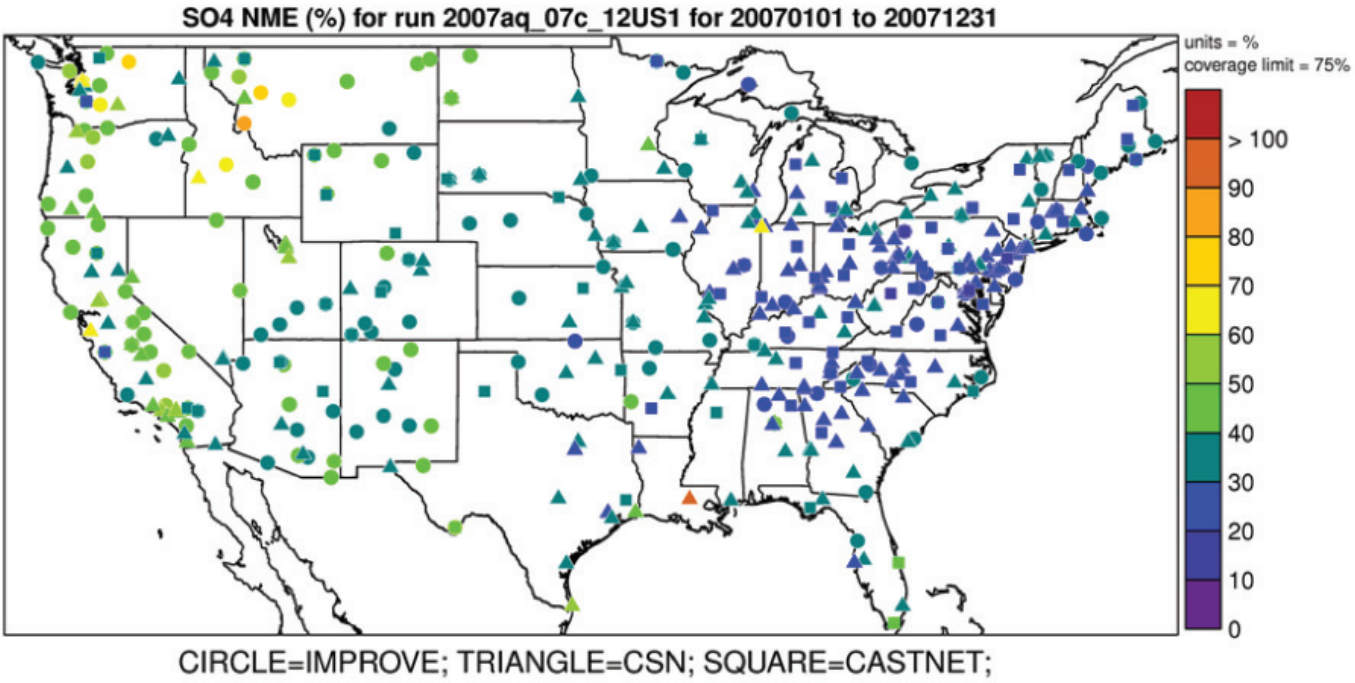


Figure 4-8. Normalized Mean Bias (%) of annual Nitrate at monitoring sites in the continental U.S. modeling domain.

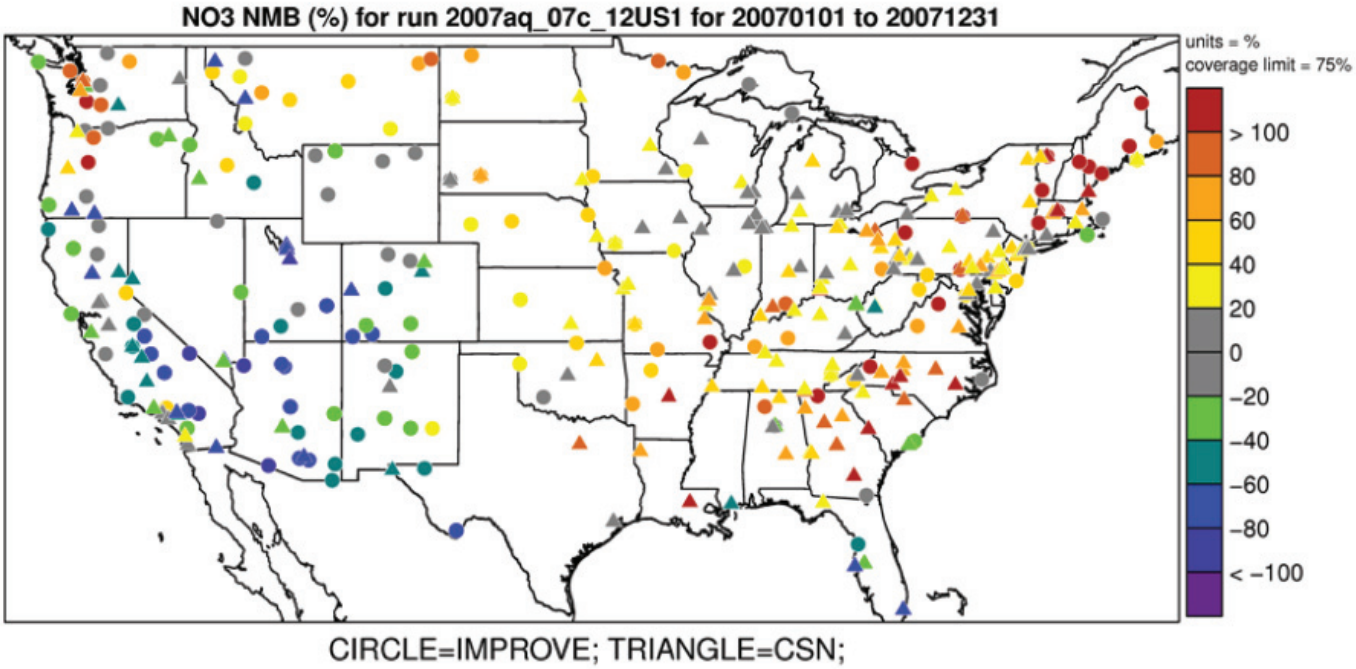


Figure 4-9. Normalized Mean Error (%) of annual Nitrate at monitoring sites in the continental U.S. modeling domain.

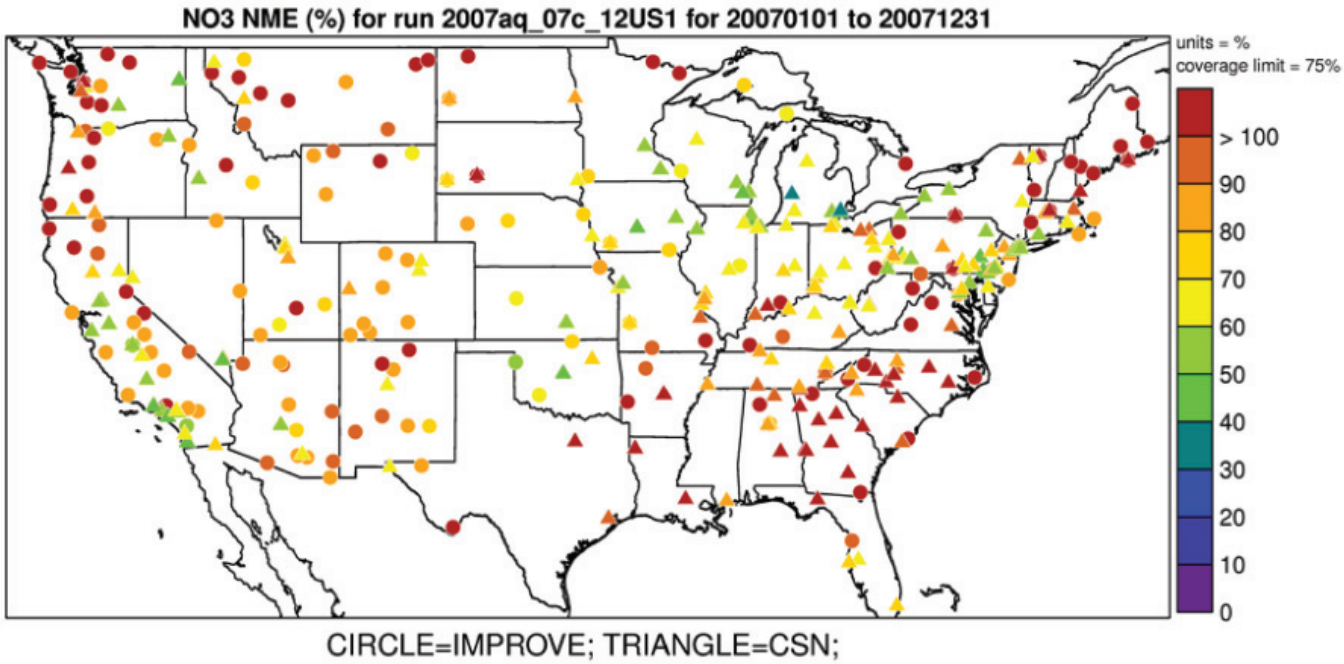


Figure 4-10. Normalized Mean Bias (%) of annual Total Nitrate at monitoring sites in the continental U.S. modeling domain.

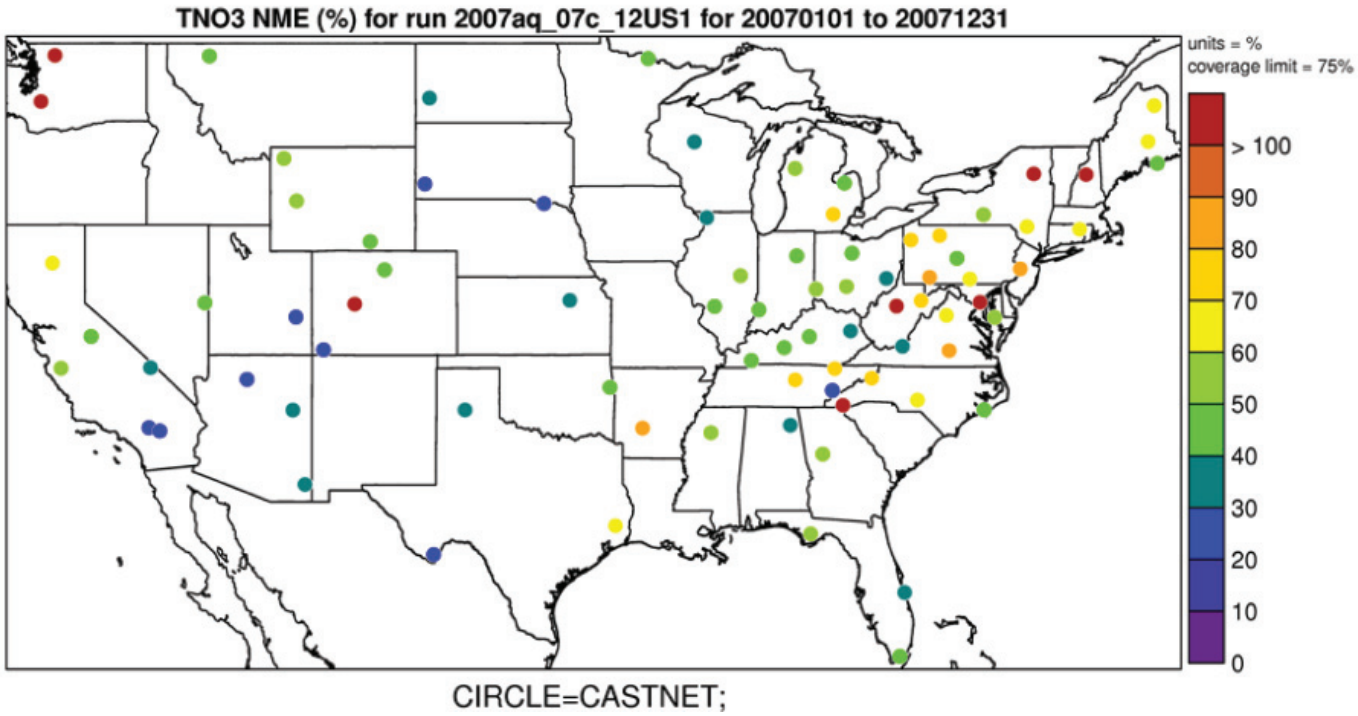


Figure 4-11. Normalized Mean Error (%) of annual Total Nitrate at monitoring sites in the continental U.S. modeling domain.

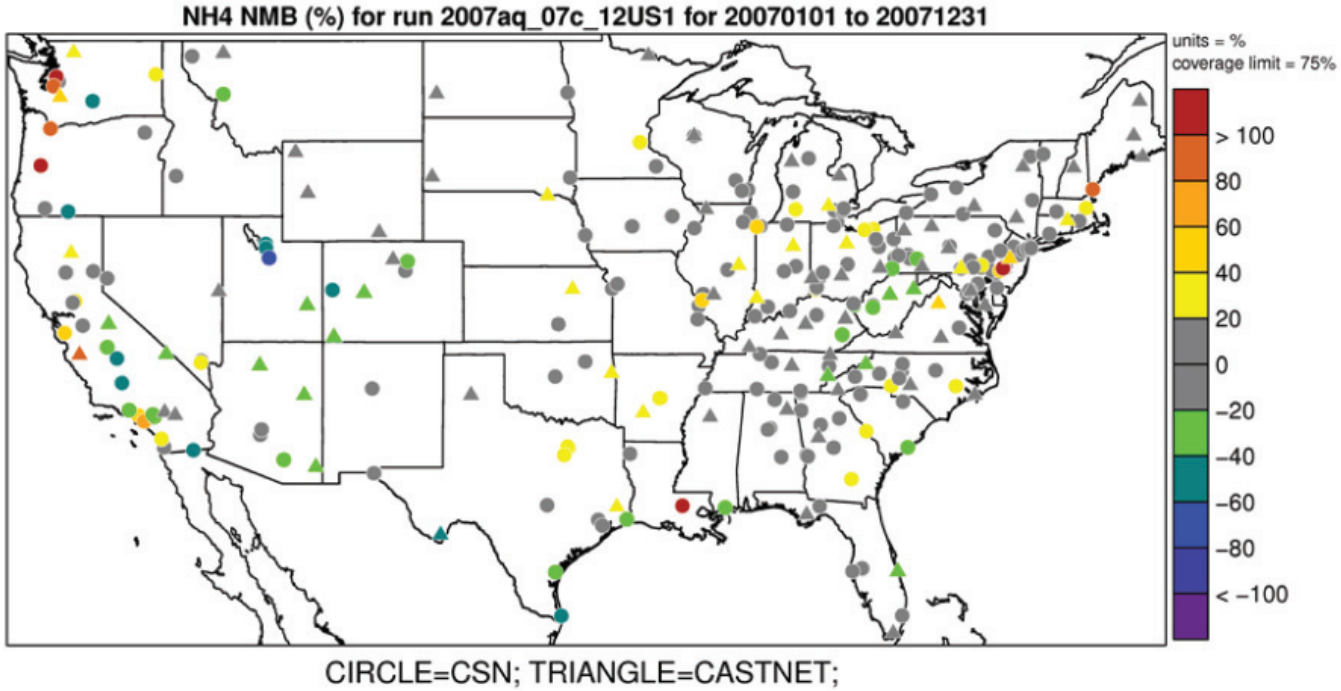


Figure 4-11. Normalized Mean Error (%) of annual Total Nitrate at monitoring sites in the continental U.S. modeling domain.

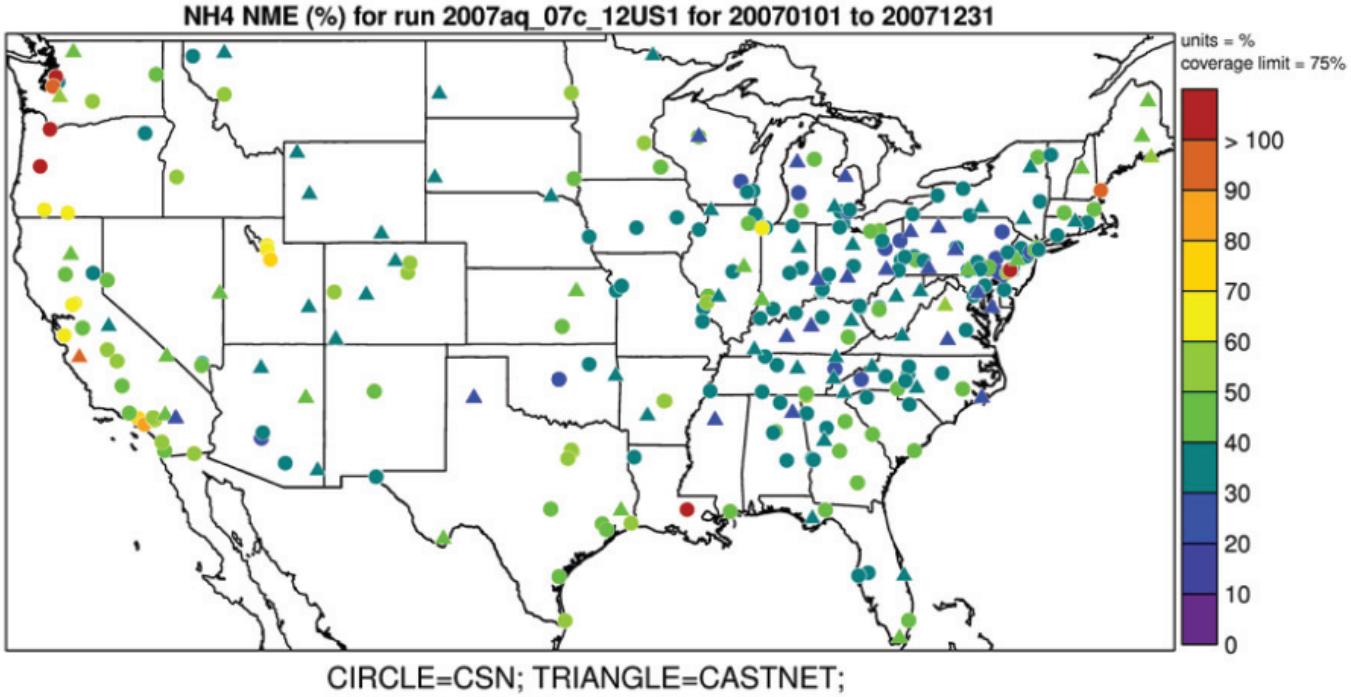


Figure 4-13. Normalized Mean Error (%) of annual Ammonium at monitoring sites in the continental U.S. modeling domain.

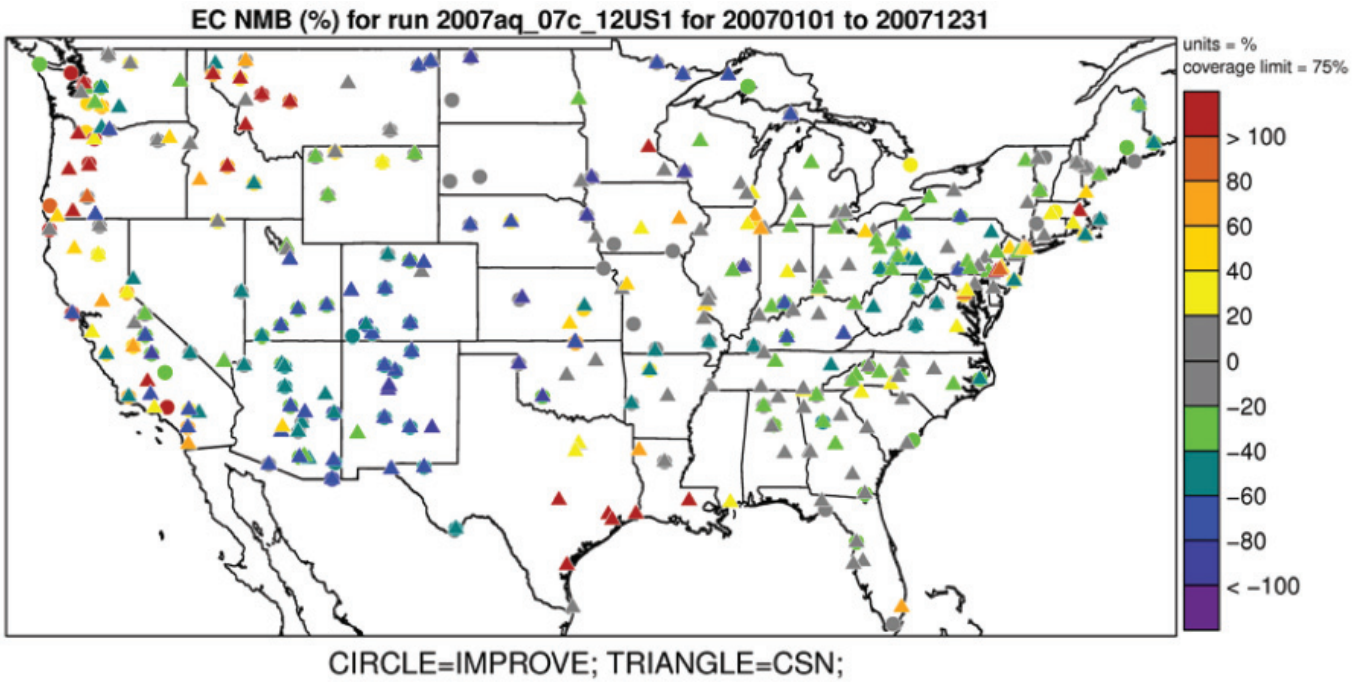


Figure 4-14. Normalized Mean Bias (%) of annual Elemental Carbon at monitoring sites in the continental U.S. modeling domain.

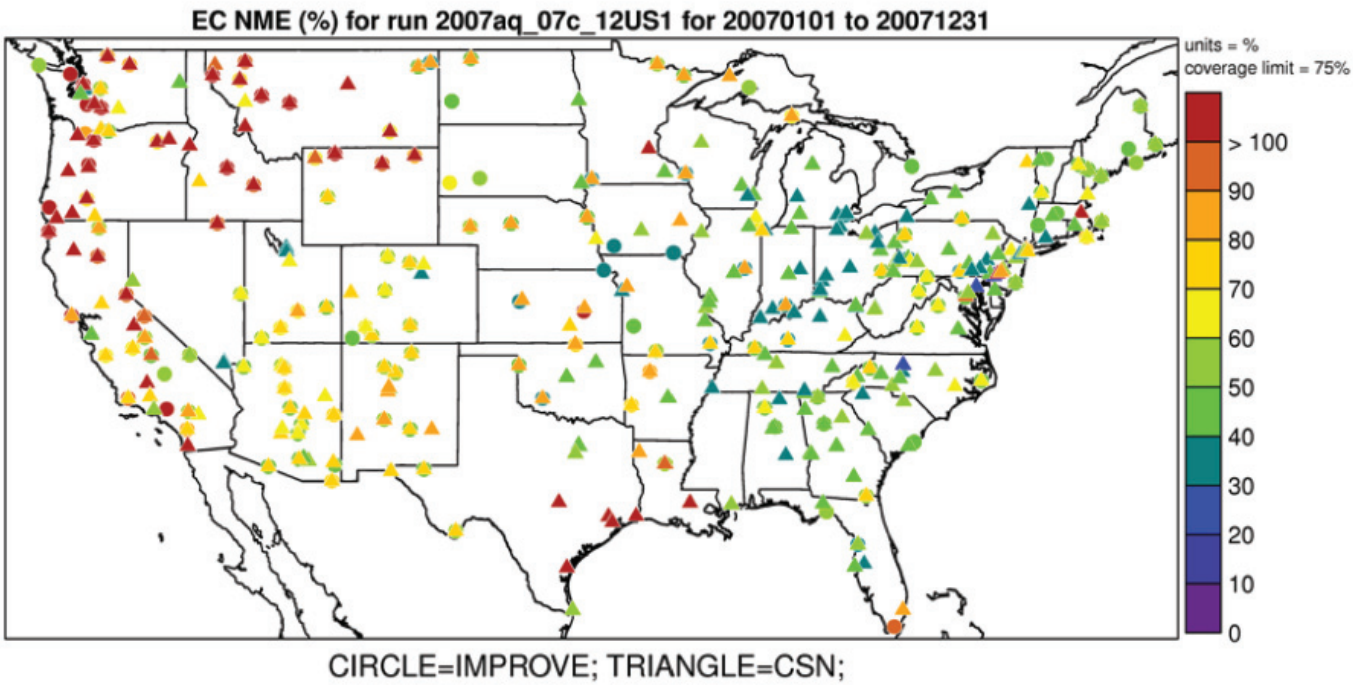


Figure 4-15. Normalized Mean Error (%) of annual Elemental Carbon at monitoring sites in the continental U.S. modeling domain.

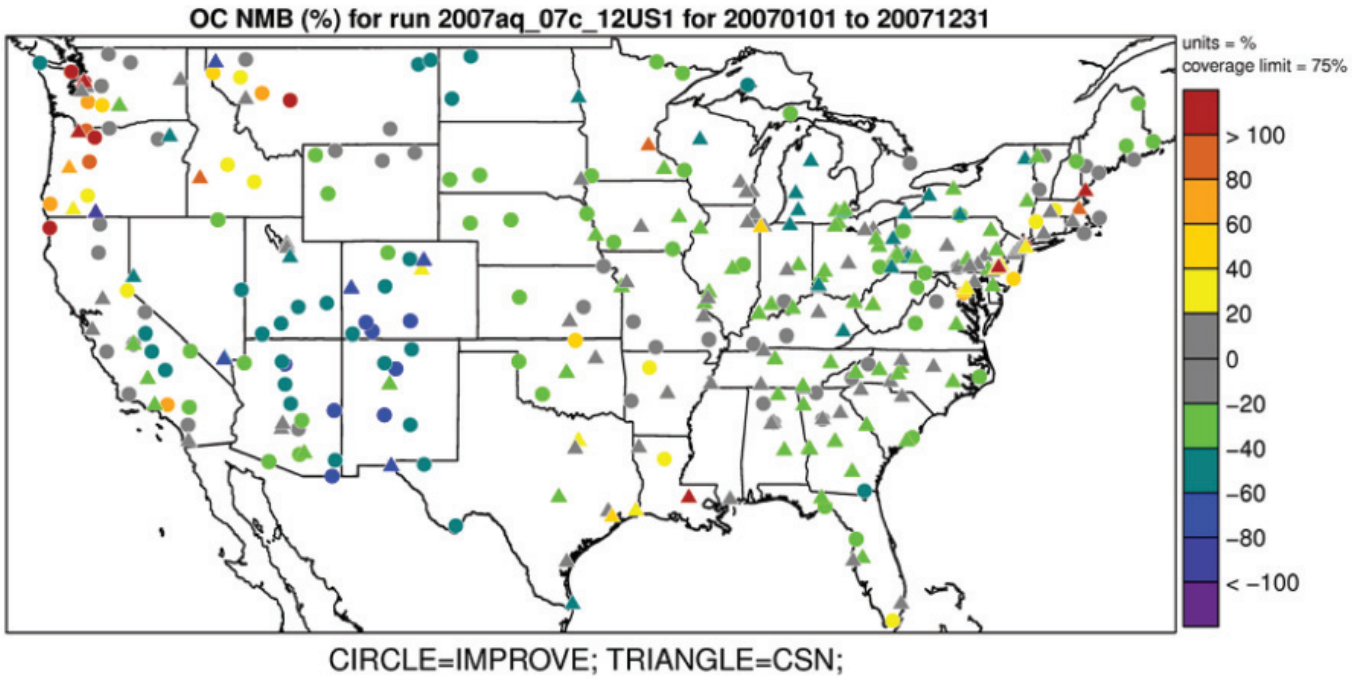


Figure 4-16. Normalized Mean Bias (%) of annual Organic Carbon at monitoring sites in the continental U.S. modeling domain.

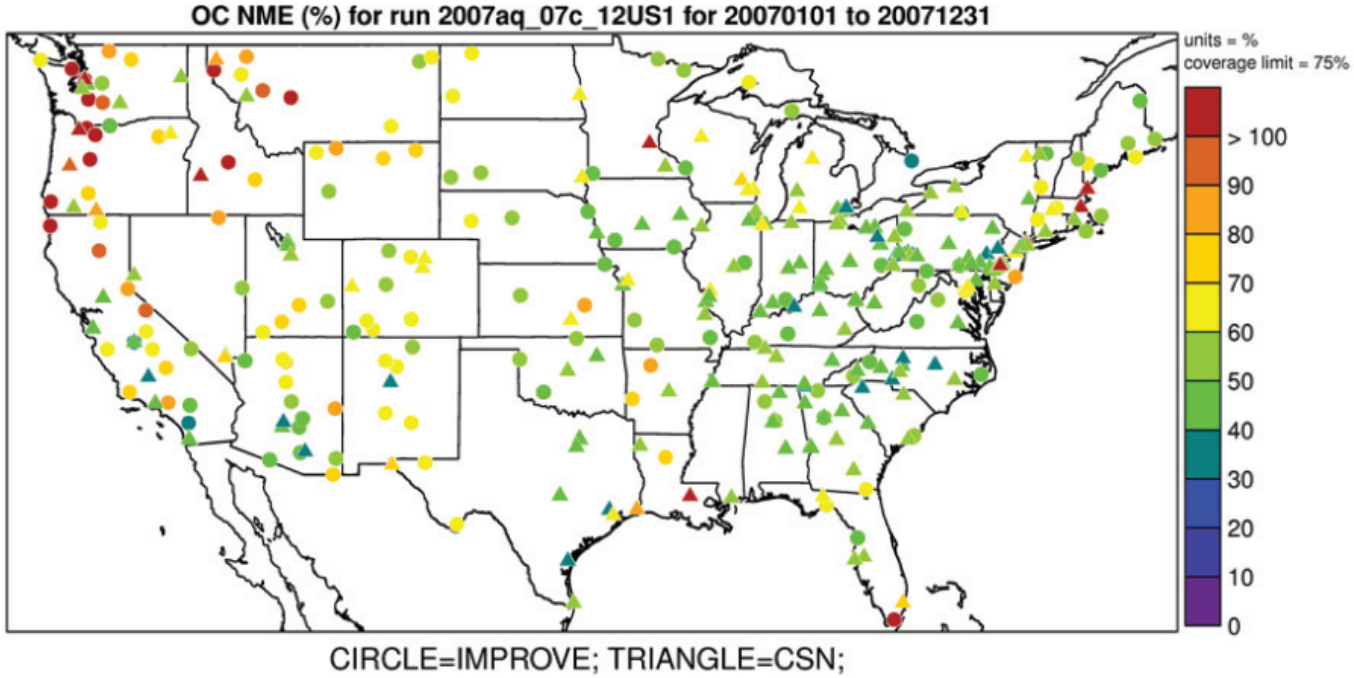


Figure 4-17. Normalized Mean Error (%) of annual Organic Carbon at monitoring sites in the continental U.S. modeling domain.

5.0
Bayesian Model-Derived Air Quality Estimates

5.1 Introduction

The need for improved spatial and temporal estimates of air quality has grown rapidly in recent years, as the development of more thorough air quality related health studies have begun requiring more thorough characterizations of ground-level air pollution levels. The most direct way to obtain accurate air quality information is from measurements made at surface monitoring stations across the country. However, many areas of the U.S. are not monitored and typically, air monitoring sites are sparsely and irregularly spaced over large areas. One way to address the limits to ambient air quality data is to combine air quality monitoring data and numerical model output in a scientifically coherent way for improved spatial and temporal predictions of air quality. This type of statistical modeling could provide spatial predictions over the temporal scales used to assess the associations between ambient air quality and public health outcomes and for assessing progress in air quality under new emission control programs. Hierarchical Bayesian Modeling (HBM) is used in numerous applications to combine different data sources with varying levels of uncertainty. This section will briefly introduce the Hierarchical-Bayesian approach developed by EPA for use in the EPHT program.

The approach discussed in this section combines the strength of both modeled and monitored pollution concentration values to characterize air quality with estimated accuracy and enhanced spatial and temporal coverage. The statistical approach is explained in McMillan, N., Holland, D.M., Morara, M, and Feng, J., "Combining Different Sources of Particulate Data Using Bayesian Space-Time Modeling," *Environmetrics*, **2010**, 21: pp 48—65, DOI: 10.1002/env.984.

5.2 Hierarchical Bayesian Space-Time Modeling System

5.2.1 Introduction to the Hierarchical-Bayesian Approach

EPA's Hierarchical-Bayesian (HB) space-time statistical model combines ambient air quality data from monitors with modeled CMAQ air quality output to produce daily predictions of pollution concentrations for defined time and space boundaries. Bayesian analysis decomposes a complex problem into appropriate linked stages (functions), i.e., a) air quality data; b) CMAQ model output; c) measurement errors and model bias; and d) the underlying 'true' concentration surface. A Bayesian approach incorporates 'prior knowledge' (e.g., numerical information describing known attributes/behaviors, statistical distributions, etc.) of the unknown parameters in the hierarchical model, which results in an improved estimation of the uncertainty of the 'true' air pollutant concentration at any location in space and time. A hierarchical model builds a combined solution, superior to either air quality monitor data or air quality modeling data alone.

The predictions of the ambient concentration 'surface' provided by EPA's HB Model are for a selected year and with spatial scope spanning across the contiguous U.S. (i.e., the 'lower 48' states). The HB Model methodology blends the best characteristics of monitored concentration values and modeled concentration values for prediction of the 'true' concentration values (surface) over time when both sources of data are available. Air quality monitors are assumed to measure the true pollutant concentration surface with some measurement error, but no bias. In contrast, numerical output from source-oriented air quality models is assumed to approximate the variability of the true surface while exhibiting both measurement error and bias (additive and multiplicative) across space and time. Given the typical exponentially distributed nature of air quality data, the HB Model performs its analysis with log-transformed monitoring and modeling inputs. The HB Model gives more weight to accurate monitoring data in areas where monitoring data exists, and relies on bias-adjusted model output in non-monitored areas. The HB Model approach offers the ability to predict important pollution gradients and uncertainties that might otherwise be unknown using interpolation results based solely on air quality monitoring data. EPA's HB Model can be used to obtain surrogate measures of air quality for studies addressing health outcomes.

5.2.2 Advantages and Limitations of the Hierarchical-Bayesian Approach

At a high level, the advantage of HB modeling methodology is its inherent ability to predict air quality estimates for selected times and spatial scales using air quality monitoring and air quality modeling data as input, while minimizing the limitations which arise when either of these methods are applied separately. Another important advantage of the HB modeling approach is the ability to predict estimates of errors in air quality. The HB modeling approach generates estimates of air quality for days when monitoring data is missing, in addition to estimating air quality in areas without monitors. An important disadvantage of HB modeling is the computational burden imposed on model users. Typically, these models are 'adjusted' by running numerous simulations, and at times the solutions are difficult to program and require significant computer resources. Thus, there is the need for EPA to develop an operational approach to HB modeling. It requires experience and statistical expertise to ensure

that proper (initial) modeling assumptions have been used, that proper convergence criteria have been used for the HB Model, and that the results are reasonable.

In setting up the procedures for developing the HB Model estimates, EPA selected a set of data quality objectives, DQOs, to guide the acceptance of the results. Based on an independent data set (not used in the predictions), EPA calculates (1) the *Bias* as the absolute difference between the (log-transformed) measurement generated from the monitor at that location (i.e., the "true" value) and the log-transformed prediction that is made by the particular model; and (2) the *Mean Square Error (MSE),* calculated as the square of the bias. EPA presents three different types of MSE summaries: (a) day-specific MSE, averaged over all monitoring locations; (b) location-specific MSE, averaged over all monitoring days; and (c) the overall MSE (i.e., averaged across locations and time). MSE is a statistical score that represents overall (average) performance in which large deviation from the "true" value yields larger penalties compared to small errors. While these performance measures were used in evaluating the results, they have no absolute acceptance/rejection values and are considered on a case-by-case basis when evaluating the performance of any years of HB Model application. In general, while the DQO's usefulness is still being studied and EPA attempts to achieve these DQOs, these measures are helpful at this time to describe the quality of the HB predictions from one model year to another.

In developing and providing the HB Model results, EPA is attempting to advance the use of improved air quality estimates. As such, the proper use of the EPA results is important and discussed further in Section 5.6.

5.3 Results for O_3 and $PM_{2.5}$

The HB Model yields a predicted daily concentration and error estimate for those predictions within each grid cell for each day within the time period of interest. The concentrations are daily $PM_{2.5}$ or 8-hour maximum ozone levels. These predictions fall along a smooth (congruent) response surface across the entire region. The grid used by the HB Model is the same as that used in generating the CMAQ estimates. The smoothness of the surface is achieved by: 1) the choice of prior distributions for air data, CMAQ output, and the true underlying predictive surface; and 2) the conditional autoregressive model (CAR) spatial covariance structure where a grid's predicted concentration is assumed to be correlated with neighboring cells (note the HB Model can handle different size neighborhoods). The resulting HB Model prediction surface approximates the true underlying response surface while accounting for such factors as measurement error and potential space-time bias in the CMAQ output.

EPA stores the set of back-transformed predictions (pm25_pred, O3_pred) and standard errors (pm25_stdd, O3_stdd) from a given execution of the HB Model in tabular (comma-delimited) format within a file named as in the following example: pm25_surface_12km_2007.csv. Table 5-1 presents an example of the output that can be obtained from this file. One row exists in this file for each grid cell-date combination within the study area. The relevant variables in this file, in the order in which they exist (and are portrayed within the column headings of the table), are as follows:

- Date: Represented by the data given in this row, in MM/DD/YYYY format.
- Longitude: The x-coordinate value transformed to longitude (degrees).
- Latitude: The y-coordinate value transformed to latitude (degrees).
- Column: The column associated with model results.
- Row: The row associated with model results.
- pm25_pred or O3_pred
- pm25_stdd or O3_stdd

5.4 Overview of HB Model Predictions

Below is a short description of the inputs and outputs for a HB Model application for 2007, 12 km grid, $PM_{2.5}$. A description of the input metadata and HB Model application can be found in Appendix E. The air quality data come from EPA AQS, the CMAQ was run by EPA as documented elsewhere in this report and the HB Model was applied at EPA's NERL. The domain of the CMAQ model (and therefore the HB Model predictions) is found in the following table.

Figure 5-1 shows the HB Model prediction for $PM_{2.5}$ during July 1-4, 2002. On July 1, the $PM_{2.5}$ levels were the highest along the U.S.-Canada border northeast of Lake Erie and into the mid- Atlantic region. As the days passed, the elevated $PM_{2.5}$ decreased in intensity and moved southeast. Examining the figure, it is possible to see the change in $PM_{2.5}$ level at any point in the domain. Figure 5-2 shows a close up of the HB Model predictions for July 2. The 12-km grid can be seen as small squares. Within each grid the predicted $PM_{2.5}$ concentrations are constant. As such, the $PM_{2.5}$ concentrations represent an average over the area where the public is exposed to ambient $PM_{2.5}$. Although actual concentrations within grid cells vary over space and time during a day, the ambient exposure is likely to be somewhat averaged as people move about within and between grid cells. Given the relationship between ambient concentrations, ambient exposures and personal exposure is not understood well, one area of study is the degree of misclassification between exposure and health outcomes based on varying grid sizes.

The HB Model results can track with the AQS data and CMAQ estimates and the predictions can differ from either the AQS data or the CMAQ estimates. Figure 5-3 shows HB predictions for a location where the predictions generally follow temporally the CMAQ and AQ data. This figure shows a series of days where AQS data and CMAQ estimates are fairly consistent. In such cases, the HB Model predictions track closely to both inputs. Figure 5-4 shows how the HB Model fills in $PM_{2.5}$ predictions for days when AQS data are not available (many $PM_{2.5}$ monitors are operational and

Date	Longitude	Latitude	Column	Row	O_3_pred (ppb)	O_3_stdd (ppb)
01/01/2007	-119.315	23.43627	12	15	23.011	4.6122
01/01/2007	-119.398	23.74126	12	16	22.979	4.6784
01/01/2007	-119.483	24.04658	12	17	22.919	4.8484
01/01/2007	-119.567	24.35223	12	18	22.987	4.7917
01/01/2007	-119.653	24.6582	12	19	23.19	4.84
01/01/2007	-119.739	24.96448	12	20	23.018	4.8264
01/01/2007	-119.826	25.27106	12	21	23.12	4.8651
01/01/2007	-119.913	25.57793	12	22	22.997	4.84
01/01/2007	-120.001	25.88509	12	23	22.968	4.8308
01/01/2007	-120.09	26.19253	12	24	22.949	4.8357

Note: The exact contents of this table may change over time. Please check the accompanying metadata files.

Table 5-1. HB Model Prediction: Example Data File

Study Year	Bounding West Longitude	Bounding East Longitude	Bounding North Latitude	Bounding South Latitude
2007	111.1 deg W lon	65.4 deg W lon	51.25 deg N lat	23.0 deg N lat

Table 5-2. HB Model Domains for 12-km Applications

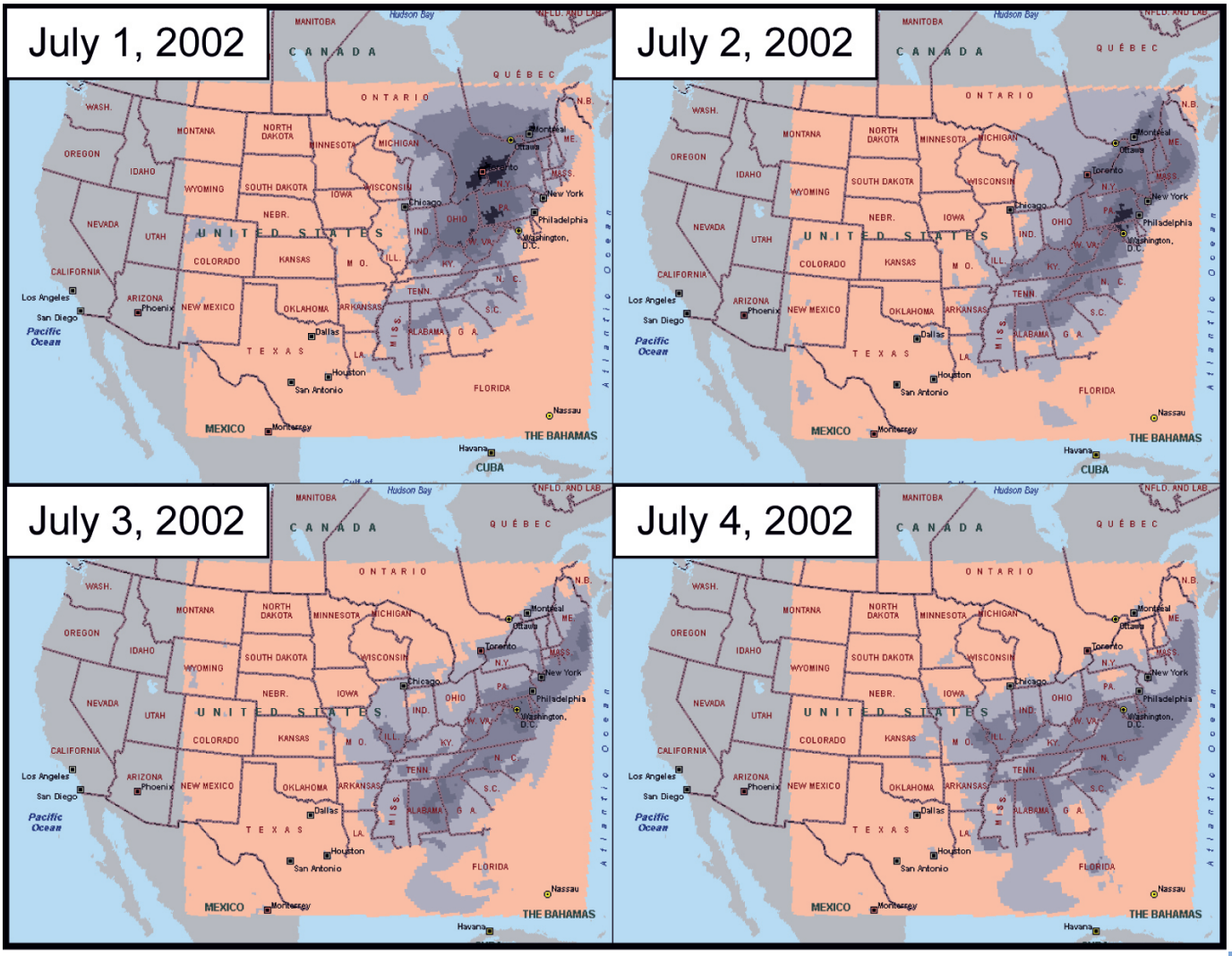


Figure 5-1. HB Prediction ($PM_{2.5}$) During July 1-4, 2002 (12 km grid cells)

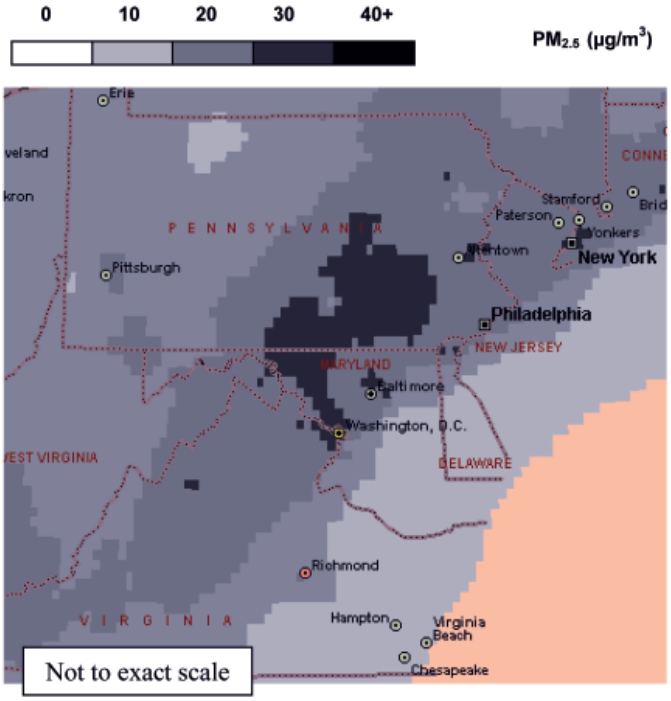


Figure 5-2. HB Prediction ($PM_{2.5}$) on July 2, 2002 (12 km grid cells)

collect samples during 1 day in every 3-day time period). On the unmonitored days, the HB Model predictions track well with the CMAQ estimates. Figure 5-5 shows a situation where AQS and CMAQ do not agree well and, while the HB Model tends to mitigate the bias of CMAQ, the HB Model the predictions can be highly affected by CMAQ, although

Another way to view the ability of the HB Model to fill in estimates of air quality where no monitor exists can be seen in the following figures. The HB Model response surface is plotted with the grid demarcations in Figure 5-6 along with the measurements taken at the monitoring stations. Figure 5-7 rotates this plot to portray its 3-dimensionality, so that differences between the HB Model predictions and the monitoring data points can be better seen. The view portrayed in Figure 5-7 is as seen from the position of the red arrow in Figure 5-6. As in the previous figures, different colors represent different concentration gradients (as noted within the legend included in the plot). These figures show how the HB Model prediction surface aligns closely with the monitoring station data in most instances, except for a cluster of data points in the upper center of the plot. Figure 5-8 portrays the same plot as Figure 5-6, but with the CMAQ-estimated $PM_{2.5}$ surface added. The CMAQ surface features have more yellow shading within them, implying that the CMAQ concentration values somewhat underestimate the concentrations relative to the HB Model and the monitoring stations. However, in areas in which there are few or no monitoring stations, the HB Model surface corresponds closely with the CMAQ surface. This is to be expected, as the HB Model weighs (uses a bias adjustment of) the CMAQ data more heavily in areas without monitoring data.

Figure 5-9 displays the ozone concentration for the continental U.S. on July 26, 2005. The spheres represent the concentrations recorded at monitor locations. The green, blue, and yellow represent the HB concentration surface, which combines the CMAQ model estimates and the $PM_{2.5}$ monitor measurements.

5.5 Evaluation of HB Model Estimates

As reported in the McMillan paper (*Environmetrics*, 2010), model validation analysis was performed to compare the HB predictive results at 2001 STN/IMPROVE monitoring sites to predictions at those locations from two other approaches: (1) traditional kriging predictions based solely on the FRM monitoring data and (2) CMAQ output at these locations. In doing so, it was assumed the STN/IMPROVE measurements represent the "truth." The IMPROVE measurements are representative of rural areas (with few monitors) and may help assess the HBM results for these areas of interest. The potential bias in either the STN or IMPROVE gravimetric mass measurements compared to FRM data were not considered, although for gravimetric mass the monitors generally produce the same results. STN data collocated with FRM monitoring sites used in fitting the HB Model were eliminated from the validation data set, leaving 44 sites for the validation analysis.

In the validation analysis, mean squared prediction error and bias were calculated to evaluate the predictive capability of these three different models. To assess the ability of the HB Model to accurately characterize prediction uncertainty, the percentage of validation data within the 95 percent prediction credible interval was calculated. In the analysis, a similar analysis was performed for the kriging model by calculating 95 percent confidence intervals at the validation sites. An exponential variogram model was used for the kriging model. The exponential parameters were estimated by fitting this model to an empirical variogram based on combining the daily empirical variograms.

In this analysis, predictions for each day were obtained for the STN/IMPROVE site locations from the three modeling approaches and the validations statistics were calculated across all days and sites. The validation only occurs every third day, according to the sampling schedule of STN/IMPROVE. This corresponds to the full network FRM schedule. Thus, the analysis did not evaluate sparse monitoring days where data fusion is expected to outperform interpolation techniques based solely on the monitoring data.

In the analysis, the HBM was run several times using a range of reasonable priors. Then, the validation analysis assessed the relative predictive performance of the HBM, traditional kriging, and CMAQ as described above. In terms of mean squared prediction error (MSE), the HBM and kriging approaches provided similar results across all HBM runs. For bias, the HBM outperformed kriging by 10 to 15 percent depending on the prior assumptions for τ^X and τ^Y. CMAQ was nearly unbiased for this analysis.

Kriging uncertainties were reflected in the small percentage (59%) of kriging prediction intervals capturing the validation data. This compares to HBM predictive interval results of 80

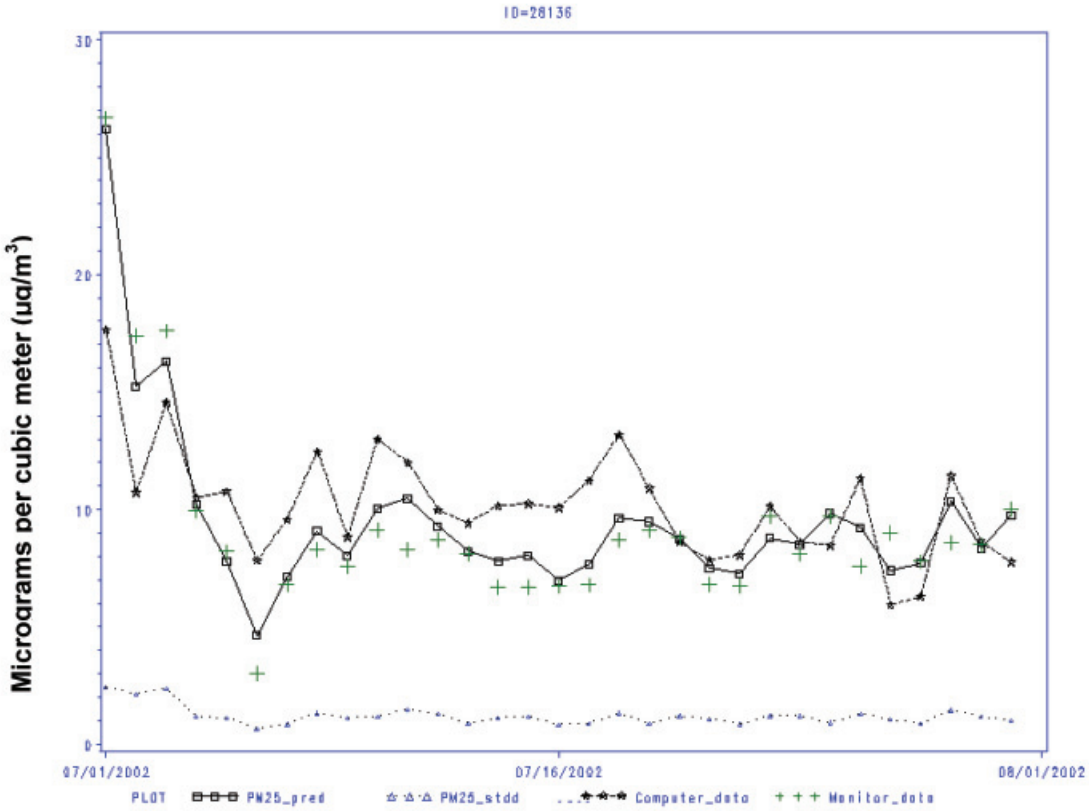


Figure 5-3. HB Prediction ($PM_{2.5}$) Temporarily Matches Figure 5-4. HB Prediction ($PM_{2.5}$) Compensates When AQS Data is Unavailable

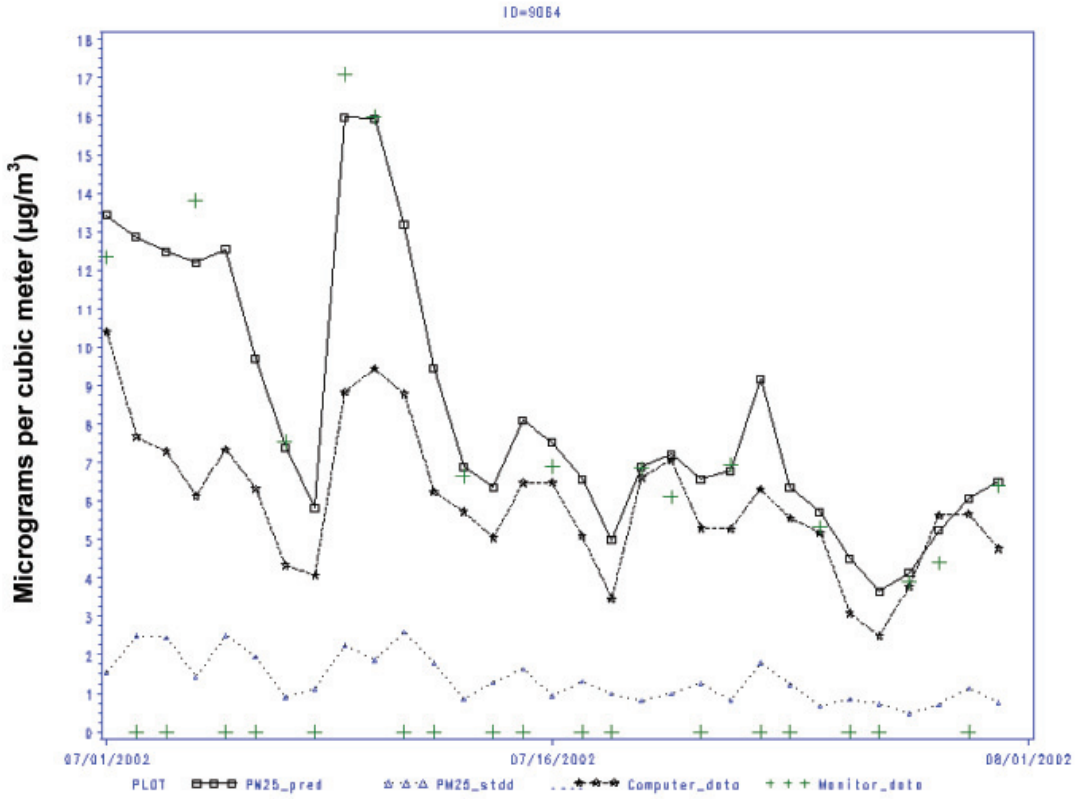


Figure 5-4. HB Prediction ($PM_{2.5}$) Compensates When AQS Data is Unavailable

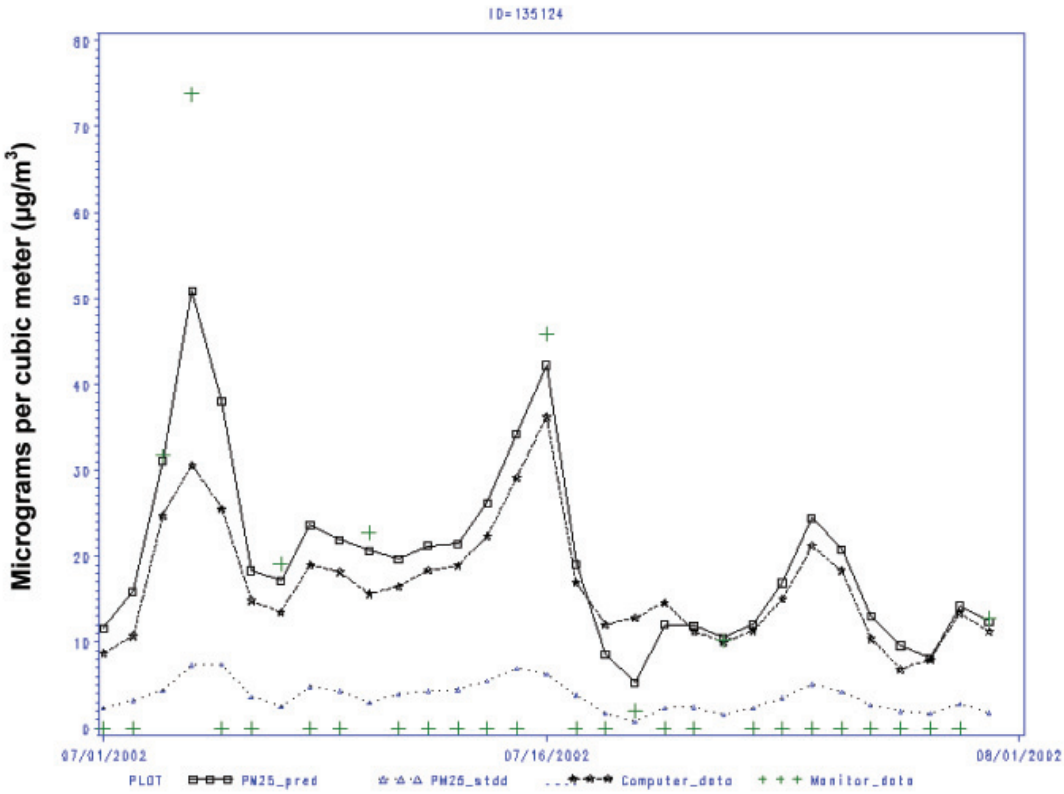


Figure 5-5. HB Prediction ($PM_{2.5}$) Mitigates CMAQ Bias when AQS and CMAQ Values Diverge

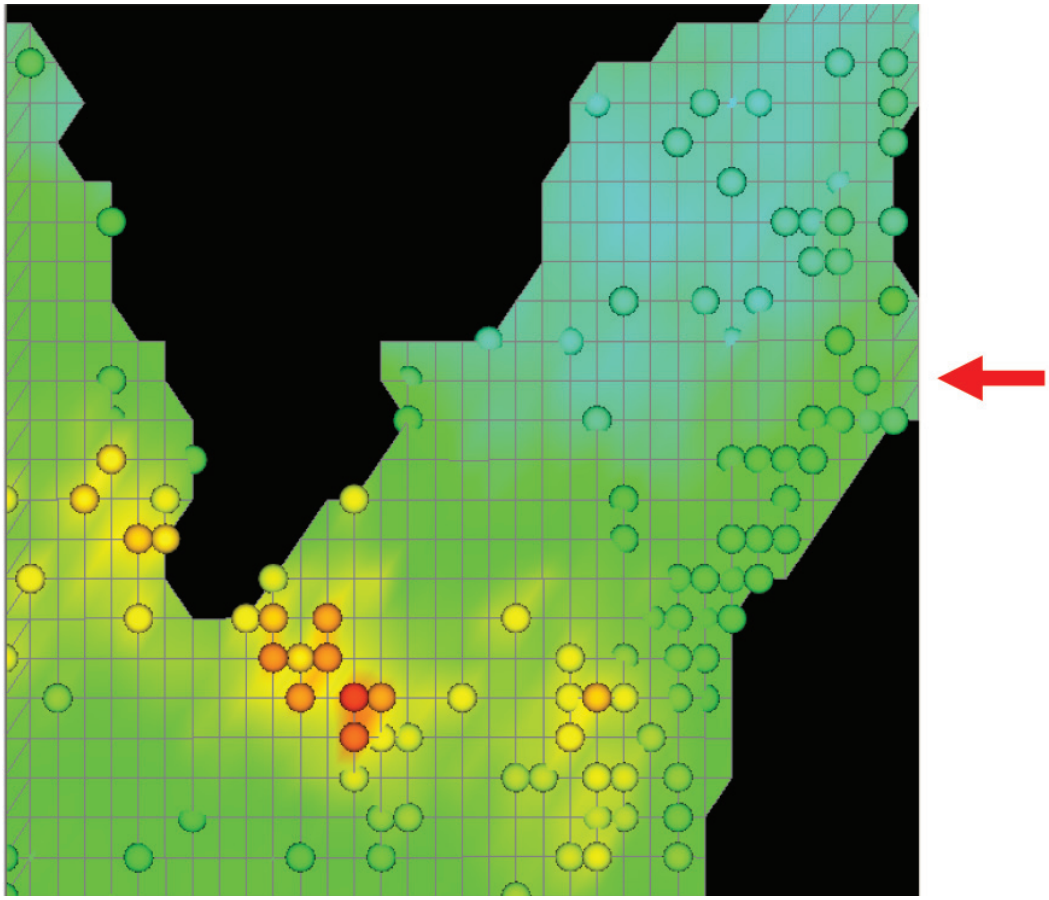


Figure 5-6. Plot of the Response Surface of $PM_{2.5}$ Concentrations as Predicted by the HB Model on a Specific Monitoring Day in the Northeast U.S., Along With $PM_{2.5}$ Measurements on a Specific Monitoring Day from FRM Monitors in the NAMS/SLAMS Network

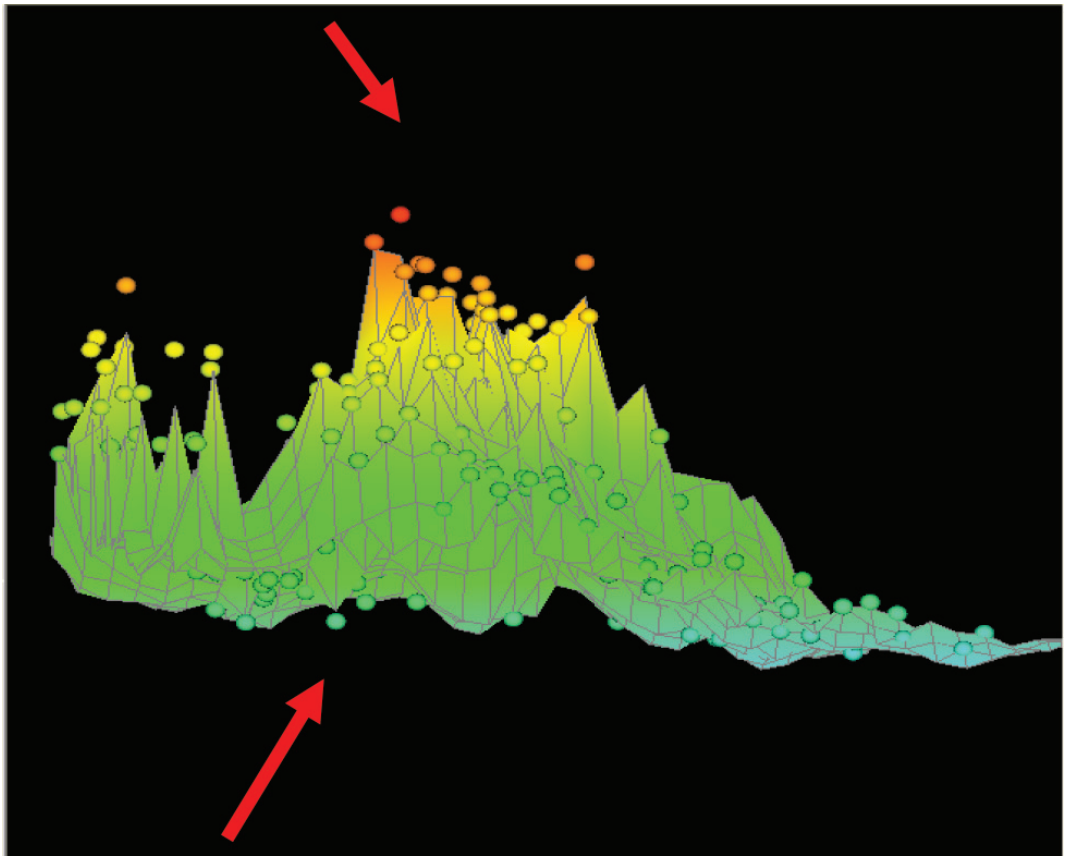


Figure 5-7. Rotated View of the Response Surface of $PM_{2.5}$ Concentrations as Predicted by the HBM on a Specific Monitoring Day in the Northeast U.S., Along With $PM_{2.5}$ Measurements on a Specific Monitoring Day from FRM Monitors in the NAMS/SLAMS Network

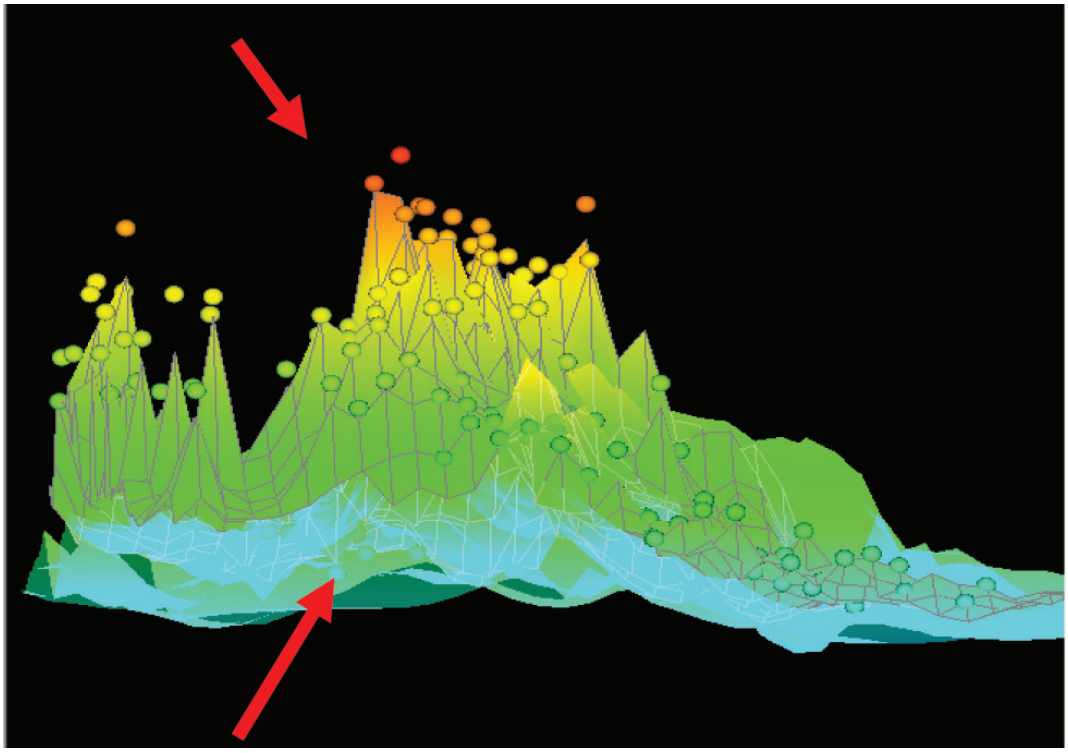


Figure 5-8. Rotated View of the Response Surface of $PM_{2.5}$ Concentrations as Predicted by the HBM on a Specific Monitoring Day in the Northeast U.S., Along With $PM_{2.5}$ Measurements on a Specific Monitoring Day from FRM Monitors in the NAMS/SLAMS Network, and the Response Surface as Predicted by the CMAQ Modeling System

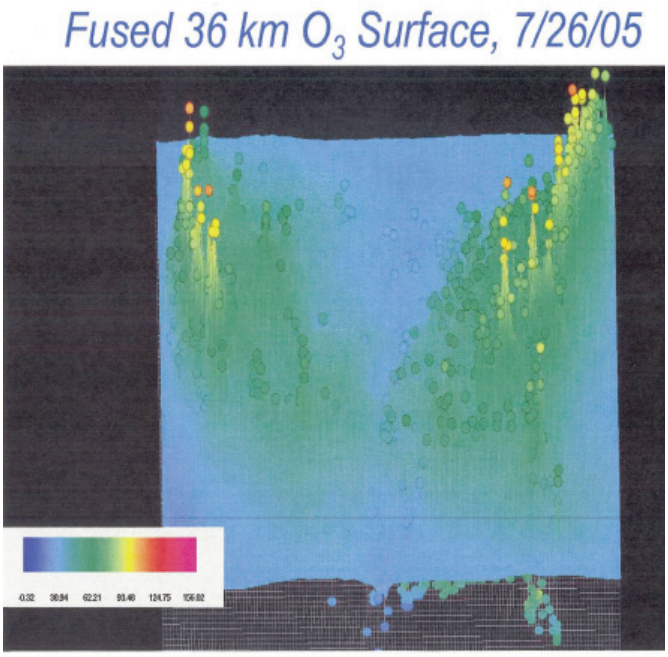


Figure 5-9. Fused 36 km O3 Surface for the Continental U.S. (July 26, 2005).

to 90 percent depending on the HBM run. This occurs from the difference between the HBM results and the 95 percent nominal rate to the difference in the measurement errors in the validation to those in the FRM data used in fitting the HBM model. Unfortunately, error-free $PM_{2.5}$ monitoring data are not available with current $PM_{2.5}$ monitoring approaches.

5.6 Use of EPA HB Model Predictions

Over the next several years, NERL will be working to improve spatial and temporal estimates of ambient pollutant concentrations to facilitate improved modeling of human exposure. The goal is to improve exposure modeling for intracity and intercity exposure comparisons and to develop better understood exposure surrogates for use in air pollution health studies. Given the uncertain characterization of air quality, especially at locations at a distance from central monitoring sites, NERL has been working to develop the HB Model (and other approaches) for estimating ambient and exposure concentrations for use in health studies, benefits assessments, and other air program analyses.

The HB Model as developed by NERL is part of a continuing research program. Accordingly, it should be understood by users of the HB predictions that the underlying statistical model is continuing to be studied and improved. However, given the uncertain nature of air quality, especially at locations well-removed from monitoring sites, NERL has been working to develop the HB Model (and other approaches) for estimating ambient and exposure concentrations for use in health studies, benefits assessments, and other air program analyses. To encourage assessments of these predictions from the HB Model, NERL is making the predictions available based on a general DQO approach of determining whether the predictions from the HB Model are appropriate for use for these purposes. This approach allows use of uncertain results by providing the statistical error estimates for the predictions and an assessment of the predictions. In this manner, users can assess the effects of the uncertainty for the predictions with their studies.

Based on NERL's current model evaluation results, the HB Model predictions provide credible predictive surfaces of air quality (ozone and $PM_{2.5}$), in particular away from monitoring sites. The HB Model, as initially configured, predicts to the central tendency with the potential distributions (that is, each estimate represents a mean value from the distribution of possible values for each space-time point). This means that the HB Model will tend to under-predict very high values (the implications of this are being investigated). Nevertheless, the HB predictions, by "filling-in" pollutant concentration values for missing (non-monitored) locations and missing (unsampled) days of air quality estimates, are likely to be an improvement compared to simply using the monitoring results. In addition, as the HB Model is a space-time model, it is more credible than statistical interpolation of the monitoring data where there are missing monitoring data (this is the predominate issue for 1 in 3 day $PM_{2.5}$ monitoring sites across the U.S.). The HB Model, and other statistical methods, is more scientifically credible than simple mathematical techniques, such as inverse distance weighting.

Given the uncertainty and the complexity of using the HB Model predictions, careful use of the HB predictions is needed. Until a thorough study of several prediction years and scales (grid sizes) is completed, the results should be used by professionals with an ability to understand anomalous outcomes when using the predictions in a health study. An exception-based review of the HB predictions should be undertaken by each researcher, in the context of a study's data needs, to ensure "outliers" do not influence subsequent analyses. The HB predictions include a few very high values which cannot be rejected out-of-hand without further study. Studies of the representativeness of the HB Model predictions and additional experience with the prediction will provide a better understanding of the limits of using these predictions. The HB Model was initially designed for use as a source of air quality estimates in case-crossover analyses where temporal and spatial variability was needed. The predictions could be used within the EPHT program in health surveillance activities, to generate hypotheses for further studies, and as a basis for indicators in counties without monitors. They also can be used in Health Impact Assessments in place of interpolated monitoring data.

EPA continues to research approaches to combining air quality data and model results to predict statistically air quality estimates for use in health studies and elsewhere in the air program. There are key scientific questions that the HB Model (and other techniques) may help address. For example, determining the most representative scale (12 km or smaller scale) of ambient air quality measures (as surrogate for ambient exposure or personal exposure) for use in associating health outcome data with air quality changes needs to be better understood. The effect of (monitor) measurement variability and CMAQ bias on the usefulness of the HB predictions is also an important aspect for further improvement of air quality measures used in health studies.

Appendix A
Acronyms

ACRONYMS	
ARW	Advanced Research WRF core model
BEIS	Biogenic Emissions Inventory System
BlueSky	Emissions modeling framework
CAIR	Clean Air Interstate Rule
CAMD	EPA's Clean Air Markets Division
CAP	Criteria Air Pollutant
CAR	Conditional Auto Regressive spatial covariance structure (model)
CARB	California Air Resources Board
CEM	Continuous Emissions Monitoring
CHIEF	Clearinghouse for Inventories and Emissions Factors
CMAQ	Community Multiscale Air Quality model
CMV	Commercial marine vessel
CO	Carbon monoxide
CSN	Chemical Speciation Network
DQO	Data Quality Objectives
EGU	Electric Generating Units
Emission Inventory	Listing of elements contributing to atmospheric release of pollutant substances
EPA	Environmental Protection Agency
EMFAC	Emission Factor (California's onroad mobile model)
FAA	Federal Aviation Administration
FDDA	Four Dimensional Data Assimilation
FIPS	Federal Information Processing Standards
HAP	Hazardous Air Pollutant
HMS	Hazard Mapping System
ICS-209	Incident Status Summary form
IPM	Integrated Planning Model
ITN	Itinerant
LSM	Land Surface Model
MOBILE	OTAQ's model for estimation of onroad mobile emissions factors
MODIS	Moderate Resolution Imaging Spectroradiometer
MOVES	Motor Vehicle Emission Simulator
NEEDS	National Electric Energy Database System
NEI	National Emission Inventory
NERL	National Exposure Research Laboratory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	Ammonia
NMIM	National Mobile Inventory Model
NONROAD	OTAQ's model for estimation of nonroad mobile emissions
NO_X	Nitrogen oxides
OAQPS	EPA's Office of Air Quality Planning and Standards

ACRONYMS	
OAR	EPA's Office of Air and Radiation
ORD	EPA's Office of Research and Development
ORIS	Office of Regulatory Information Systems (code) - is a 4 or 5 digit number assigned by the Department of Energy's (DOE) Energy Information Agency (EIA) to facilities that generate electricity
ORL	One Record per Line
OTAQ	EPA's Office of Transportation and Air Quality
PAH	Polycyclic Aromatic Hydrocarbon
PFC	Portable Fuel Container
$PM_{2.5}$	Particulate matter less than or equal to 2.5 microns
PM_{10}	Particulate matter less than or equal to 10 microns
PMc	Particulate matter greater than 2.5 microns and less than 10 microns
Prescribed Fire	Intentionally set fire to clear vegetation
RIA	Regulatory Impact Analysis
RPO	Regional Planning Organization
RRTM	Rapid Radiative Transfer Model
SCC	Source Classification Code
SMARTFIRE	Satellite Mapping Automatic Reanalysis Tool for Fire Incident Reconciliation
SMOKE	Sparse Matrix Operator Kernel Emissions
TCEQ	Texas Commission on Environmental Quality
TSD	Technical support document
VOC	Volatile organic compounds
VMT	Vehicle miles traveled
Wildfire	Uncontrolled forest fire
WRAP	Western Regional Air Partnership
WRF	Weather Research and Forecasting Model

Appendix B
U.S. 2007 Emissions Inventory Totals by: Sector, Pollutant, and Region

All Sectors 2007 Country & Sector	[tons/yr] CO	[tons/yr] NH_3	[tons/yr] NO_X	[tons/yr] PM_{10}	[tons/yr] $PM_{2.5}$	[tons/yr] SO_2	[tons/yr] VOC*
Canada othar	3,747,987	537,835	718,996	1,421,910	393,852	97,652	1,332,559
Canada othon	4,514,002	21,810	537,665	15,002	10,632	5,430	308,318
Canada othpt	1,147,801	21,138	861,223	117,254	68,114	1,762,340	448,629
Canada Subtotal	9,409,790	580,784	2,117,883	1,554,167	472,598	1,865,422	2,089,507
Mexico othar	350,557	254,600	171,099	75,556	49,023	82,643	429,264
Mexico othon	1,066,589	1,898	110,203	5,151	4,720	6,124	152,265
Mexico othpt	68,422	0	224,202	97,146	72,264	649,810	65,273
Mexico Subtotal	1,485,567	256,498	505,505	177,854	126,007	738,578	646,802
Offshore othpt	89,800	0	82,571	839	837	1,961	53,399
Offshore seca_c3	40,377	0	490,149	40,483	37,240	300,320	17,176
2007 TOTAL	11,025,535	837,282	3,196,108	1,773,342	636,682	2,906,280	2,806,884

* VOC is approximated from a sum of speciated VOC within the modeling domain

Table B-1a. Canada, Mexico, and Offshore Emissions Inventory (2007)

All Sectors All CAPs	CHLORINE	HCL	Hg	
9,889,383				
3,251,990				
2,533,464	1		0	
20,347,679	2,135	29,001	8	
22,907,847			0	
49,564,767				sum of on_noadj, runpm, startpm. NOT SMOKE-MOVES based
48,905,880				
14,203,845	102	352,291	53	
10,152,800	4,174	48,664	48	
1,334,304				
183,091,958	6,413	429,956	109	

Table B-1b. Total Emission Inventory for All US Sectors (2007)

All Sectors 2002 Sector Comparison	[tons/yr] CO	[tons/yr] NH_3	[tons/yr] NO_X	[tons/yr] PM_{10}	[tons/yr] $PM_{2.5}$	[tons/yr] SO_2	[tons/yr] VOC
afdust	0	0	0	8,901,461	1,830,271	0	0
Ag	0	3251990	0	0	0	0	0
Alm	806,471	904	2,259,844	97,039	86,719	312,313	123,676
avefire	8,554,550	36,777	189,428	796,229	684,034	49,094	451,127
nonpt	7,526,723	135,542	1,531,602	1,377,055	1,100,884	1,250,265	7,929,917
nonroad	21,386,059	1,859	2,176,159	227,875	216,658	187,284	2,873,622
onroad	59,810,866	290,708	7,786,709	205,914	146,003	242,379	4,847,990
ptipm	605,148	29,991	4,618,944	608,718	501,998	10,359,102	42,378
ptnonipm	3,195,469	154,180	2,368,987	603,606	372,330	2,249,550	1,425,158
2002 Total	101,885,285	3,901,951	20,931,673	12,817,898	4,938,898	14,649,986	17,693,869
2007-2002	-588,349	381,707	632,683	2,509,976	1,363,637	-428,286	4,868,862

Table B-1c. Total Emission Inventory for All US Sectors (2002)—Individual Criteria Pollutants

All Sectors 2002 Sector Comparison	TOTAL CAPs	Delta CAPS
afdust	10,731,732	-842,349
Ag	3,251,990	-0
Alm	3,686,966	-1,153,502
avefire	10,761,239	38,144,641
nonpt	20,851,988	-504,309
nonroad	27,069,516	-4,161,669
onroad	73,330,569	-23,765,802
ptipm	16,766,279	-2,562,434
ptnonipm	10,369,280	-216,480
2002 Total	176,819,560	6,272,398
2007-2002	8,740,230	

Table B-1d. Total Emission Inventory for All US Sectors (2002)—Total of All Pollutants

All Sectors Sector	CO	NH_3	NO_X	PM_{10}	PM_{25}	SO_2	VOC
afdust				8,858,992	1,030,391		
ag		3,251,990					
alm_no_c3	270,007	773	1,924,925	59,366	56,687	154,016	67,690
nonpt	7,376,314	134,080	1,683,490	1,349,685	1,076,954	1,252,645	7,474,512
nonroad	17,902,244	2,042	2,010,786	192,016	182,151	103,787	2,514,819
onroad	37,903,749	163,735	8,001,667	179,470	102,494	66,370	3,147,282
ptfire	33,600,784	550,283	397,094	3,363,355	2,850,301	233,739	7,910,324
ptipm	578,111	20,997	3,360,926	612,992	507,501	9,083,244	40,075
ptnonipm	3,222,221	159,003	2,247,228	653,957	442,656	2,117,649	1,310,085
seca_c3	58,225		688,087	58,042	53,398	452,318	24,233
Con.US Total	100,911,655	4,282,903	20,314,203	15,327,874	6,302,535	13,463,767	22,489,021

Table B-1e. Total Emission Inventory for All US Sectors (2007)—Individual Criteria Pollutants

EMF (CAPs Allan; HAPs 2007aq)											
State	CO	NO_X	VOC	SO_2	NH_3	PM_{10}	PM_{25}	CHLORINE	HCL	HG (ALL)	
AL	11286	121856	1394	447249	727	26551	22873		11894.34948	2.648276708	
AK	7077	82207	585	54909	465	9603	7630		9436.252264	0.724642783	
AR	4455	37712	509	72436	279	2158	1896		9255.121873	0.556254157	
CA	13915	7160	874	653	422	1546	1501	0.00017	9.000552195	0.004798069	
CO	7517	71069	924	65917	409	5510	4493	24.02877396	262.6793018	0.425687095	
CT	1720	4879	254	7616	35	736	492		710.8075173	0.11089239	
DE	869	10719	95	34646	26	2809	2469		954.4006053	0.207180345	
DC	7	271	1	389	1	8	7			0.000513285	
FL	34803	187024	1840	319548	2808	27509	23981		14696.15136	1.14966177	
GA	10415	106688	1361	635318	650	36248	29121		22845.55158	1.791023188	
ID	4	19	0	0		1	1				
IL	15364	120641	1685	276591	149	22439	17828		13870.87746	4.230803099	
IN	22309	202137	2477	721980	1026	43382	35549		24197.27919	2.800385666	
IA	4800	54117	545	132849	330	9233	8429		1812.129367	1.143613123	
KS	6466	71303	960	115847	390	6607	5431	0.3309381	11934.78281	0.995962134	
KY	12493	175437	1477	380350	831	23335	20920		19024.47572	1.827754351	
LA	8528	51901	937	84248	751	6839	5363		8860.019383	0.562065999	
ME	438	711	51	1683	72	96	83	0.011182	0.268928	0.002581264	
MD	4299	52380	437	274332	217	17224	15158		6445.093641	0.89792433	
MA	7186	14678	474	58026	398	3560	3074		1117.041165	0.175263271	
MI	13100	112880	1228	342415	124	13635	11415	0.052985401	15951.67487	1.931167003	
MN	7203	72909	589	82137	30	7139	2897		430.2276199	0.668806628	
MS	5043	50774	627	69836	293	3702	3110		1150.0036	0.323509395	
MO	11557	110411	1580	267915	784	9651	6327		2725.641877	1.776256877	
MT	3433	34802	405	22135	12	2830	2447		6948.128171	0.51300761	
NE	3254	41984	627	70132	187	1531	1167	6.83019713	5702.079344	0.319061926	413.8236483
NV	2692	22202	515	8552	391	3650	3294		4908.206281	0.302924542	766.2286542
NH	1010	4847	117	42568	149	3026	2674		1061.155085	0.028230392	
NJ	4153	18066	1000	37145	71	5224	4441		1606.873727	0.112393565	
NM	5006	71373	531	26776	7	7830	5282		8482.491848	0.939515138	
NY	9668	48048	678	110730	1959	11007	9696	0.058655841	4792.85767	0.475898684	
NC	12079	61888	955	381735	123	24297	17614	0.228199	28531.72288	1.740943417	
ND	4869	70165	713	136261	253	7031	5953		14455.15146	1.058625398	
OH	15114	241972	1772	985195	82	60657	54020		32345.00547	3.840422582	
OK	12754	77419	1023	106193	814	3396	1874		124.8770086	0.875736749	
OR	1689	11664	149	14364	246	1124	558			0.097934942	
PA	17235	184837	1172	968197	340	67114	56648	25.08262333	26831.9864	5.005906635	
RI	310	507	35	176	29	48	47				
SC	4685	47025	497	173054	293	16960	13173		8393.798537	0.530806269	
SD	653	11866	93	10615		374	343		925.2299453	0.041491004	
TN	6522	104383	837	237324	422	15956	13729		13380.60629	1.313491902	
TX	221212	160665	3709	498381	2999	34698	25000	14.61879061	3122.423236	5.203198399	
Tribal	441	78	133	3	35	17	17				
UT	4694	70095	386	24490	344	6876	5269	0.357981	1792.14753	0.16121658	
VT	1008	377	28	6		47	46	1.602507483	38.54131921	0.007099717	
VA	4903	57495	604	185006	93	12548	11711	11.31970503	5623.911513	0.603739082	

Table B-2a. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—EMF: Criteria Air Pollutants and Hazardous Air Pollutants

EMF (CAPs Allan; HAPs 2007aq)										
State	CO	NO_x	VOC	SO_2	NH_3	PM_{10}	PM_{25}	CHLORINE	HCL	HG (ALL)
WA	1599	12680	209	2184	45	2541	2105		34.80750306	0.27842695
WV	10561	151172	1173	374321	160	29339	27099	0.000206627	3394.176361	2.490127087
WI	10549	55409	957	136061	343	5542	5131	17.77954453	2042.778522	1.134734917
WY	7165	80027	853	84750	383	9809	8114		168.1865476	0.957139771
TOTAL	578111	3360926	40075	9083244	20997	612992	507501	102	352,291	53

SMOKE (2007aq_07c 21apr2010)								
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO	ETH	ETHA
AL	0	0.009291538	58.12108246	306.4601042	0	11284.68284	0.648354489	273.2483166
AK	2.80E-05	3.28E-05	26.99346838	163.0001219	0	7072.439139	0.298069516	106.8536347
AR	0	0	22.50425855	84.81972167	0	4454.625068	2.044711403	100.7899505
CA	0.070458916	0.075452381	42.25660373	1640.966427	0.000170005	13865.71436	23.748061	23.42785241
CO	0.414653824	0.114973056	24.49635334	1654.922689	24.03156889	7516.751989	14.19623256	247.6682023
CT	0.03613224	0.04963954	5.612022405	257.8323795	0	1720.440983	0.445857184	19.9908381
DE	0.014036704	0.01305193	4.160893582	19.94072124	0	868.0364142	2.2584595	16.57295412
DC	0	0	0.009311689	0.013636613	0	6.921681023	0.039914348	0.003303749
FL	0.012735294	0.017372355	77.00599863	1137.499951	0	34801.07966	141.3359984	194.0482102
GA	0	0	62.00373879	61.97496828	0	10414.26598	0.049475401	288.0865182
ID	0	0	0	0.442196356	0	4.410377278	0	0
IL	0.062492988	0.017689108	74.71698885	343.8227466	0	15363.00378	7.177003181	359.2532457
IN	0	0	128.8250026	692.8977159	0	22308.20071	5.94634366	434.2279117
IA	0.000684697	0.003805543	29.7392417	29.44087479	0	4799.340104	10.95194911	110.7833655
KS	0.10011464	0.042761172	51.44298916	226.3054138	0.330937643	6464.163785	65.21608696	196.3026055
KY	0.011676434	0.013706617	65.68133104	128.0648106	0	12491.63361	2.00670521	307.2999326
LA	0	0	22.6970348	145.6884494	0	8527.031517	3.774117616	91.97969537
ME	9.99E-05	0.003305922	3.892180414	76.51379774	0.011182118	438.1624639	4.179389596	1.076971985
MD	0	0	19.80240231	35.73256224	0	4298.403164	7.29747976	80.45436013
MA	0.158020703	0.147067993	12.24609382	461.1944633	0	7189.452694	12.43564174	53.51850573
MI	0.013938263	0.003864714	54.45726677	324.4981096	0.052985528	13098.70236	5.887670094	229.503033
MN	0.015828933	0.010803694	34.35174485	91.44064595	0	7201.406383	16.33389305	124.5286688
MS	0.000694461	0.00051068	37.07519757	506.2985089	0	5042.517613	47.18280517	50.60781879
MO	0.007440895	0.002063217	70.83327345	256.0760683	0	11556.85642	14.63156532	320.4019606
MT	0	0	18.7835715	12.26448268	0	3432.813472	2.050227686	87.63348477
NE	0.000579899	0.000160791	29.70707946	10.55264926	6.829774424	3253.985787	9.134624716	130.5323611
NV	0	0.186243157	13.5296903	101.1174338	0	2692.144646	0.528404396	80.39265278
NH	0.000445657	0.000609941	4.550999677	41.31092644	0	1009.917174	2.077703403	18.77566554
NJ	0.261332752	0.319103532	32.44433182	801.6480749	0	4151.93252	11.54048502	128.8926972
NM	0	0	23.20991114	179.8191196	0	5005.691306	0.128173824	95.179436
NY	0.317812076	0.434923373	20.90592796	525.2076822	0.058677704	9667.526591	19.10581286	55.11786011
NC	0	0.001364333	44.00873669	94.94076908	0.22819875	12076.25973	5.234505663	196.2089329
ND	0	0	32.78820696	0	0	4868.409379	0	154.6453614
OH	0	0	80.74917591	38.36642978	0	15111.15044	0.949435199	379.9988889
OK	0.008770935	0.002431955	45.98952953	689.198018	0	12753.20852	2.689445081	83.91657763
OR	0	0	3.635988302	167.2548938	0	1688.883191	0.510918291	16.5239188
PA	0.07121038	0.019744894	49.7919486	358.8718261	25.08260348	17233.37655	7.969171667	247.8485398
RI	0	0	0.055961882	79.28457195	0	309.5495596	0.151419472	0.012533141
SC	0.000374681	0.004768319	36.79379154	189.1743625	0	4684.16141	21.64409834	97.67846413
SD	0	0.013185135	4.135150714	0.181816565	0	652.8389107	0.055381875	19.44707674
TN	0	0	37.64892927	57.43124941	0	6520.625632	2.869283288	174.6365844
TX	0.064123473	0.046665972	179.6137352	2772.63984	14.61465273	221190.6516	31.65208895	467.3712041
Tribal	0	0	0	308.9966543	0	441.3155834	0	0
UT	4.10E-06	4.81E-06	19.08184779	45.34271973	0.357980992	4693.039192	11.5064672	73.40148039
VT	0	0.00788047	9.508834455	19.25314142	1.603238343	1008.393381	9.718398115	2.62253291
VA	0.006609495	0.005039387	25.94028141	240.5631045	11.31148375	4902.246124	33.01229121	90.22048518

Table B-2b.Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)								
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO	ETH	ETHA
WA	0	0	8.433377552	63.61692841	0	1598.597901	0.016219549	39.3564369
WV	0.008840497	0.010384035	53.89321999	3.861132625	0.000206627	10557.48496	0.17948119	253.3661714
WI	0.042075516	0.079576369	113.5506385	448.0319406	17.77757314	10548.49593	93.98001378	182.9152598
WY	0	0	38.12625003	54.58199419	0	7163.616492	0	179.8221384
TOTAL	2	2	1,856	15,949	102	578,005	655	6,887

SMOKE (2007aq_07c 21apr2010)								
State	ETOH	FORM	HCL	HGIIGAS	HGNRVA	HONO	IOLE	ISOP
AL	0	131.1825985	11892.5276	1.123118089	1.445134219	0	0.000532145	0
AK	2.18E-05	52.55853664	9433.458356	0.05248058	0.665187913	0	1.05E-05	6.28E-06
AR	0	33.37345724	9253.17784	0.157273452	0.397864771	0	0	0
CA	0.006940302	468.7438509	9.000782098	0.000949526	0.002844204	0	0.34532784	0.000343988
CO	0	358.5668836	262.6819968	0.105332055	0.315582662	0	3.253195155	0
CT	0	133.7140683	710.8597746	0.033632188	0.07472488	0	0.01877552	0
DE	0.015000392	10.78166047	953.9142029	0.127120376	0.062190164	0	0.05057778	0
DC	0	0.231050309	0	0.000153984	0.000256649	0	0	0
FL	0.588674871	517.988894	14694.59757	0.537166393	0.538401837	0	0.007141547	0.000621725
GA	0	23.88559894	22844.06739	1.005947601	0.708778906	0	0	0
ID	0	0.189218822	0	0	0	0	0	0
IL	0	88.05629349	13869.15677	1.383250053	2.789232822	0	0.487877687	0
IN	0	144.1285469	24195.61943	1.14352209	1.585516595	0	0	0
IA	3.496710587	3.815386141	1810.805239	0.277560809	0.862464365	0	0.003967347	3.04E-05
KS	0.013026842	15.10054826	11932.28512	0.17028617	0.818749526	0	0.660420441	0.003755012
KY	0.009095619	54.17417683	19021.47152	0.84015477	0.921866365	0	0.00437716	0.002620471
LA	0	283.9386938	8859.585355	0.141888064	0.418327102	0	0	0
ME	3.296243515	35.2565971	0.2689312	0.000774371	0.001290621	0	0.000230835	0
MD	0	27.63039032	6444.367594	0.547030224	0.297758535	0	0	0
MA	0	219.4057145	1117.067821	0.111436818	0.05023799	0	0.549944368	0
MI	0	116.3365417	15949.63494	1.028568499	0.812190532	0	0.112677167	0
MN	6.673016392	8.348120507	430.364044	0.081394696	0.578854027	0	0.155629513	0
MS	5.37E-06	145.8163362	1150.017981	0.138546655	0.173484121	0	0.001450486	7.59E-05
MO	0	85.57389657	2725.796313	0.664151735	1.090959964	0	0.058377924	0
MT	0	0	6946.809186	0.030920845	0.474909077	0	0	0
NE	0	4.705310811	5700.907383	0.110216564	0.207402124	0	0.004549646	0
NV	0	76.3190937	4908.210279	0.089619685	0.211823646	0	0.010705031	0
NH	0	22.00550648	1061.142505	0.014317483	0.01046817	0	0.000247087	0
NJ	0.202476183	342.8959264	1606.453583	0.048348239	0.055220999	0	0.101002905	0.058334196
NM	0	64.96882385	8482.514623	0.03892167	0.891323423	0	0	0
NY	0.035711113	303.8509828	4792.138154	0.228190155	0.219847887	0	0.312344526	0.000335407
NC	1.419245657	38.65371745	28525.6047	1.132479221	0.502967311	0	7.70E-05	0
ND	0	0	14454.64496	0.120549265	0.932706032	0	0	0
OH	0	16.85589977	32339.96748	1.712927402	1.963758599	0	0	0
OK	0	285.5650507	124.874647	0.189078394	0.68484995	0	0.068812972	0
OR	0	71.41163712	0	0.030193078	0.067536118	0	0	0
PA	0	100.0051105	26832.46069	2.871270005	1.842166369	0	0.558684619	0
RI	0	33.82208002	0	0	0	0	0	0
SC	4.502982973	25.36631348	8391.920422	0.283023483	0.222165744	0	0.000384892	8.41E-05
SD	0	0.074614227	925.1421988	0.01279019	0.028625429	0	0.000498544	0
TN	0	24.88268913	13377.18827	0.664300633	0.600556578	0	0	0
TX	0.002309126	846.0004221	3122.42895	1.518856243	3.604325146	0	0.258777782	0.001432094
Tribal	0	132.2217126	0	0	0	0	0	0
UT	3.19E-06	13.62148201	1791.930418	0.070088769	0.084651751	0	1.54E-06	9.20E-07
VT	8.197683382	6.02E-05	38.55890967	0.002130871	0.003551501	0	0.000445018	0
VA	0	112.5625732	5622.057339	0.389842896	0.173615572	0	0.051976404	0

Table B-2bi. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)								
State	ETOH	FORM	HCL	HGIIGAS	HGNRVA	HONO	IOLE	ISOP
WA	0	26.90847366	34.80124674	0.0858219	0.192113252	0	0	0
WV	0.007678178	1.885987197	3393.760968	1.515224469	0.839492008	0	0.003318174	0.001977688
WI	45.43737546	11.9453922	2042.603429	0.357116733	0.769209213	0	0.183573952	0.006070226
WY	0	23.35601313	168.1860612	0.073128646	0.879429049	0	0	0
TOTAL	74	5,539	352,245	21	30	0	7	0

SMOKE (2007aq_07c 21apr2010)							
State	MEOH	NH_3	NO	NO_2	NO_X	NVOL	OLE
AL	0	726.8560559	109630.7195	12181.19241	121811.9119	0	63.02893079
AK	2.20E-05	464.7365829	73953.44272	8217.049693	82170.49241	6.12E-06	24.91417597
AR	0	279.2167486	33942.2579	3771.362236	37713.62013	0	24.90592139
CA	0.012032132	422.2331986	6443.308226	715.923183	7159.231409	2.24E-05	4.78113844
CO	0	409.2099283	63961.88159	7106.876216	71068.75781	0	42.53483296
CT	0.013997582	34.91188803	4390.075904	487.7862443	4877.862149	0	4.93006733
DE	0.060695991	25.5630354	9611.697401	1067.966441	10679.66384	0	5.656951827
DC	0	0.977645664	243.699406	27.07770464	270.7771106	0	0.034594514
FL	0.005988783	2807.567372	168184.3911	18687.15536	186871.5465	0.000605851	106.5969999
GA	0	649.7553662	95953.38606	10661.48796	106614.874	0	66.27604594
ID	0	0	17.3174417	1.924162889	19.24160459	0	0
IL	0.000127669	149.2301315	108494.6368	12054.96011	120549.5969	0	84.71563469
IN	0	1025.810933	181741.634	20193.51606	201935.15	0	101.5285861
IA	0.003052488	330.0012393	48707.73572	5411.971407	54119.70713	0	31.34871865
KS	0.013142686	389.927678	64227.65881	7136.407218	71364.06603	0.003657276	95.11814061
KY	0.0091698	830.8800226	157935.2207	17548.35865	175483.5794	0.002553624	72.36633799
LA	0	750.510461	46719.07403	5191.008569	51910.0826	0	24.33932865
ME	3.87E-05	71.66454064	639.793775	71.08822511	710.8820001	0	0.607176125
MD	0	217.3621422	47129.40576	5236.600971	52366.00673	0	24.68325849
MA	0.036477869	398.1288839	13802.95105	1533.661327	15336.61238	0	18.65919927
MI	0	124.2835776	100224.509	11136.05705	111360.5661	0	56.3914986
MN	0	30.41019164	65836.06152	7315.118246	73151.17976	0	32.15974262
MS	0.000379156	292.6453516	45694.25157	5077.13933	50771.3909	0	51.62447028
MO	0	783.6196534	101584.4431	11287.1611	112871.6042	0	80.86103309
MT	0	12.34072286	31331.30834	3481.256609	34812.56495	0	20.09655559
NE	0	187.1395964	37413.39387	4157.043875	41570.43775	0	37.71706161
NV	0	390.8639715	19294.04977	2143.78342	21437.83319	0	12.3916146
NH	0.000171827	149.1495169	4363.3443	484.8161072	4848.160408	0	6.07729101
NJ	0.487901757	71.03394827	15351.55488	1705.728425	17057.28331	0.05684575	39.0462706
NM	0	6.780983803	64245.76302	7138.418788	71384.18181	0	21.99136965
NY	0.143786783	1958.279392	43478.6854	4830.965367	48309.65076	0.000326845	22.40286998
NC	0	123.3287172	55501.83858	6166.871336	61668.70992	0	48.07775344
ND	0	252.8059556	63148.43365	7016.493067	70164.92672	0	35.55455296
OH	0	82.35450553	219649.6376	24405.51654	244055.1541	0	88.38407742
OK	0	813.5302407	69671.34366	7741.260865	77412.60452	0	21.0138434
OR	0	245.7800827	10443.74101	1160.415764	11604.15677	0	4.232117646
PA	0	340.1295166	166388.1058	18487.56826	184875.6741	0	58.16244517
RI	0	28.73294975	473.3105574	52.59004402	525.9006014	0	0.131237547
SC	0.000294249	293.2723363	42313.923	4701.547318	47015.47031	8.19E-05	22.92119884
SD	0.301173361	0	10678.82563	1186.536144	11865.36177	0	4.527949688
TN	0	421.936046	93877.81828	10430.86996	104308.6882	0	42.58302029
TX	0.000970309	2998.693608	145771.9039	16196.87894	161968.7828	0.00092363	125.7658038
Tribal	0	34.52100572	70.53968997	7.837741553	78.37743152	0	0
UT	3.22E-06	344.2592525	63083.20054	7009.244576	70092.44511	8.96E-07	26.62961846
VT	0	0	339.056807	37.67294694	376.7297539	0	0.92476559
VA	0.073248075	92.98721066	52500.0756	5833.342152	58333.41776	0	48.39731937

Table B-2bii. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)							
State	MEOH	NH_3	NO	NO_2	NO_X	NVOL	OLE
WA	0	44.67263855	11407.86138	1267.540356	12675.40174	0	9.062211705
WV	0.006931413	160.3079565	135796.9649	15088.55245	150885.5174	0.001927234	58.41327633
WI	0.021241469	342.8528166	50526.45461	5614.050989	56140.50559	0.005915389	46.02233644
WY	0	382.6995697	72026.90476	8002.989946	80029.89471	0	41.34299951
TOTAL	1	20,994	3,028,218	336,469	3,364,686	0	1,860

SMOKE (2007aq_07c 21apr2010)							
State	PAR	PEC	PHGI	PM_{10}	$PM_{2.5}$	PMC	PMFINE
AL	693.1172725	488.8057233	0.07961321	26546.1678	22868.75987	3677.407931	18812.61639
AK	306.8522354	173.6132284	0.006838182	9600.287443	7628.318511	1971.968932	6243.684689
AR	262.1207018	75.08611628	0.000978372	2157.748875	1895.267596	262.4812789	1504.098905
CA	339.4364157	563.0535391	0.001004472	1536.828412	1491.044018	45.78439403	403.4218529
CO	316.3294993	200.5339387	0.00477743	5510.569692	4493.298519	1017.271172	3541.711193
CT	97.69962495	30.82409024	0.002539374	735.8281761	492.0414069	243.7867693	346.7839527
DE	47.97759449	66.62354283	0.017750157	2808.124965	2468.124559	340.0004054	2001.598686
DC	0.309372062	4.219643089	0.000102657	8.352923533	7.436394188	0.916529345	1.293047143
FL	941.9795672	1201.709465	0.073966468	27505.31016	23977.76128	3527.548883	16931.99996
GA	738.0945738	575.5490619	0.076187536	36244.24852	29118.33058	7125.917935	24022.78917
ID	0	0.222925434	0	0.580534662	0.580534662	0	0.152100075
IL	880.0061233	370.0142284	0.058794129	22435.4708	17824.79073	4610.680069	14682.78823
IN	1401.687159	925.3289838	0.071130365	43376.62631	35545.338	7831.288309	28986.3842
IA	290.4998738	188.0627873	0.003460836	9231.411628	8428.228943	803.182685	6932.746269
KS	489.6672452	122.9532687	0.006722471	6605.646449	5429.918036	1175.728413	4398.949595
KY	779.7436917	441.368183	0.065324518	23329.70672	20915.71166	2413.995062	17219.29869
LA	540.5194408	289.4759823	0.001822132	6838.148222	5362.086214	1476.062009	3753.924868
ME	8.952978304	23.5382352	0.000516249	96.43531639	82.7677606	13.66755579	27.89739965
MD	239.5920443	371.3837444	0.053075477	17221.66419	15156.2595	2065.404681	12343.84026
MA	231.0212722	146.7590483	0.013606911	3561.034237	3075.069155	485.9650825	2315.642137
MI	638.2767395	357.038582	0.090256342	13633.91151	11413.30748	2220.604037	9169.669006
MN	305.6333885	70.85606078	0.008358352	7193.802206	2896.048316	4297.75389	2363.385222
MS	287.9986138	468.9233037	0.011374534	3701.488253	3108.847541	592.6407124	1974.822145
MO	814.5552047	149.4215818	0.021234108	9650.906361	6326.252436	3324.653925	5184.781827
MT	221.0201275	46.44049538	0.007077272	2829.444218	2446.555518	382.8887003	1990.82224
NE	338.4347072	29.48981189	0.001413724	1530.788073	1166.392445	364.3956277	950.2763863
NV	357.2749755	87.90051555	0.001516298	3650.056048	3294.661033	355.3950146	2677.180296
NH	56.0162668	94.99823167	0.00344496	3025.703637	2673.674295	352.0293416	2128.006546
NJ	370.7187137	290.3260917	0.008810962	5221.4826	4438.886066	782.5965338	3333.589904
NM	266.1491401	134.9353251	0.009353868	7829.873857	5282.559164	2547.314693	4312.984786
NY	314.574741	450.7125994	0.027719654	11003.29687	9692.673353	1310.62352	7343.126406
NC	498.6064013	353.0055719	0.105146106	24290.79815	17609.56827	6681.22988	14522.65431
ND	391.4151905	117.2763342	0.005319599	7030.216523	5952.518172	1077.698351	2845.588296
OH	963.9068601	1033.860143	0.163126143	60645.58989	54009.84845	6635.741445	44616.79466
OK	580.3178981	276.8253331	0.0017625	3395.693855	1874.088989	1521.604866	1094.1654
OR	42.27318698	34.22692698	0.000211451	1123.710619	558.3203312	565.3902879	424.7736312
PA	602.9506398	1136.833295	0.292311778	67115.14966	56649.18674	10465.96292	46647.24339
RI	0.280679815	21.35845412	0	48.11367856	46.76939998	1.344278576	10.38507228
SC	242.2836709	265.1550902	0.025439778	16953.56085	13168.48823	3785.072615	10851.90795
SD	50.83503278	6.69702375	7.14E-05	374.0751394	343.2291574	30.84598207	283.3398907
TN	444.377231	292.0614853	0.048267368	15952.28538	13726.24508	2226.040305	11307.51006
TX	1809.543141	1920.753129	0.079417156	34692.66746	24995.21589	9697.451574	13967.09428
Tribal	0	6.588260647	0	17.15692521	17.15692521	0	4.495114085
UT	200.2805618	114.6331573	0.006419077	6874.606186	5267.61111	1606.995076	4329.540863
VT	3.286241777	6.379469055	0.001420592	47.40308801	46.2280369	1.17505111	21.1724426
VA	268.2887617	327.1155726	0.040063281	12544.1758	11707.32259	836.8532095	9426.583169

Table B-2biii. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)							
State	PAR	PEC	PHGI	PM_{10}	PM_{2_5}	PMC	PMFINE
WA	100.3734925	61.33887498	0.000432474	2540.155071	2104.179511	435.9755603	1593.098216
WV	643.5496863	513.3735903	0.134592624	29331.30264	27092.74147	2238.561168	22386.59907
WI	424.6926529	195.0264565	0.008259161	5541.670148	5131.134472	410.535676	4089.677559
WY	455.1388789	152.5092125	0.004382108	9807.19494	8112.192884	1695.002056	6705.538709
TOTAL	20,299	15,275	2	612,946	507,413	105,533	401,028

SMOKE (2007aq_07c 21apr2010)						
State	PNO_3	POC	PSO_4	SO_2	SULF	TERP
AL	39.67127598	636.7690755	2890.897408	447112.0278	6522.832782	0.015690334
AK	14.88988916	249.23252	946.8981843	54900.07145	1179.819568	1.07E-05
AR	4.802901172	74.27795742	237.0017163	72421.27112	1702.227036	0
CA	29.54158115	366.9851911	128.0418539	652.2409643	2.084375853	0.04027314
CO	12.61997939	182.7856197	555.6477888	65908.57373	1604.462058	0
CT	1.601233905	23.27598351	89.55614654	7615.61751	156.1330553	0
DE	4.376305384	73.16463412	322.3613913	34525.59365	778.7495135	0.000322974
DC	0.005696579	1.473931255	0.444076121	389.4184292	2.188695045	0
FL	66.72693354	987.7072399	4789.617679	319305.9551	6053.765256	0.002008535
GA	47.82792253	780.8541482	3691.310281	635438.6392	14357.09164	0
ID	0.012191228	0.143392042	0.049925884	0.170014577	0	0
IL	30.03040262	487.6490654	2254.308811	277005.6155	6216.945159	0
IN	70.28314247	1088.752857	4474.588821	722028.6569	16504.62973	0
IA	13.62586848	230.9570526	1062.836966	132847.5975	3143.283199	0.005820553
KS	10.08367411	155.7380488	742.1934492	115854.2814	2821.167526	0.006374194
KY	35.52327232	575.4286725	2644.092836	380294.3007	8593.459251	0.004450715
LA	15.81877699	515.3725771	787.4940097	84267.77771	1846.663503	0
ME	1.227135369	15.48853376	14.61645662	1682.722376	25.70326152	0.005353534
MD	26.83522578	438.6780463	1975.522226	274337.0369	6031.963698	0
MA	7.874364986	121.0492474	483.7443574	59956.10845	1230.9586	0
MI	24.99565535	393.3347609	1468.269472	341327.9256	7959.916649	0
MN	4.736767693	93.91946009	363.1508055	82486.79061	2009.717706	0.010837675
MS	22.3094575	298.2790618	344.5135728	69849.83174	1022.963351	0
MO	11.42829864	182.6079911	798.0127373	270745.6726	6497.591056	0
MT	4.271208739	97.06202605	307.9595479	22134.44376	546.1756372	0
NE	2.058676125	33.47227104	151.0952999	69365.32618	1689.472987	0
NV	6.304639737	99.70406885	423.5715134	8551.27126	192.0888055	0.314480933
NH	6.056715664	93.09055816	351.5222432	42569.82213	944.78043	0
NJ	16.40287196	229.399375	569.1678239	37090.89833	500.2409533	0.112896361
NM	10.18764409	159.2759933	665.1754152	26853.69437	657.2943078	0
NY	27.33260537	396.9125006	1474.589241	112716.5339	2273.05949	0.004018976
NC	28.69918032	476.9482387	2228.260968	379800.3716	8573.726638	0.002305019
ND	32.14681537	2336.001682	621.5050453	136262.253	3897.100634	0
OH	87.27693337	1430.959184	6840.957532	989409.62	19793.56452	0
OK	13.19942404	246.6235227	243.2753091	106197.521	1276.79	0
OR	2.151833339	29.05802539	68.10991435	14080.81584	344.0590954	0
PA	92.24551442	1523.829561	7249.034977	968051.5333	20021.58101	0
RI	0.807502902	10.92554143	3.292829247	177.1126173	0	0
SC	21.31549893	359.658746	1670.450946	173043.2107	3903.226448	0.007455775
SD	0.558832648	9.222957419	43.41045289	10615.63834	240.8294856	0.014689817
TN	22.26138527	370.4704387	1733.941704	237227.5533	5360.666609	0
TX	157.8146623	6239.801249	2709.752569	503483.0818	13360.39115	0.064153772
Tribal	0.360294993	4.23776023	1.475495255	3.349638086	0	0
UT	9.219585421	147.7114054	666.5060984	24486.50239	445.5689583	1.56E-06
VT	0	15.07033931	3.605785935	5.634334021	0.004158627	0.013314012
VA	20.16307258	340.8710392	1592.589741	185419.093	4133.480585	0.003572656

Table B-2biv. - Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)						
State	PNO_3	POC	PSO_4	SO_2	SULF	TERP
WA	5.702214212	187.1207857	256.9194196	2183.484342	52.15384956	0
WV	43.50230471	716.4400515	3432.826459	374230.6548	8456.032828	0.003360245
WI	12.42832135	197.33094	636.6711957	137924.3459	3221.498582	0.084070812
WY	12.97950859	213.3506694	1027.814785	84739.5872	2075.987986	0
TOTAL	1,132	23,938	66,039	9,097,577	198,224	1

SMOKE (2007aq_07c 21apr2010)				
State	TOL	UNK	UNR	XYL
AL	216.4608152	0	402.2218025	225.9839014
AK	86.67622722	0	168.1189689	88.15407816
AR	80.01954003	0	151.1445842	83.20996932
CA	20.06483817	0	114.0480078	0.665845607
CO	77.7397172	0	182.8775593	80.88874518
CT	16.50581344	0	32.93523152	16.52976574
DE	13.10718617	0	26.1857849	13.54625088
DC	0	0	0.036836083	0
FL	144.7536128	0	363.7423111	144.0572961
GA	228.5312187	0	425.8369376	238.2347452
ID	0	0	0	0
IL	267.1976346	0	508.1853793	278.1669403
IN	362.0640401	0	731.3729497	358.3377178
IA	86.79389563	0	174.6160393	90.10828872
KS	128.6209997	0	294.5490487	133.1851233
KY	243.2077525	0	453.2159657	254.0143781
LA	73.80836122	0	148.7363754	75.78058575
ME	0.012631369	0	6.816122515	0.00828192
MD	63.83021542	0	125.7757856	66.03361503
MA	25.14981417	0	64.60023317	24.54506116
MI	179.8570536	0	348.5566919	184.7685922
MN	92.01724886	0	190.2196684	96.26773161
MS	45.52546022	0	143.7858077	38.60257135
MO	250.5027095	0	475.3185267	261.2879175
MT	69.07694402	0	128.854642	72.16271957
NE	102.6226451	0	197.3276287	107.1487356
NV	42.30480487	0	125.0686257	42.64246507
NH	14.79128255	0	29.15028106	15.38435481
NJ	104.1799455	0	203.8781844	106.5867155
NM	76.92775453	0	147.6428303	78.70148561
NY	43.27797951	0	99.29192113	45.20780782
NC	154.7353319	0	292.8546291	161.626135
ND	122.4179918	0	227.3193996	127.8866168
OH	300.3822705	0	559.0414926	313.7532652
OK	78.76010245	0	195.9886633	66.61143031
OR	13.05876298	0	24.65127257	13.62975282
PA	175.749041	0	338.3995757	182.9472696
RI	0.01094135	0	0.161439979	0
SC	73.01843095	0	164.8433298	76.16111642
SD	16.70943782	0	28.81028253	16.54699883
TN	138.056712	0	258.4518999	144.2221566
TX	401.8435996	0	885.6129377	378.0366696
Tribal	0	0	0	0
UT	57.90071924	0	117.4089766	59.91307612
VT	0.024170941	0	16.43108163	0.020444292
VA	67.65590569	0	149.8062527	70.32413239

Table B-2bv. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 21apr2010)				
State	TOL	UNK	UNR	XYL
WA	31.19901615	0	58.08035223	32.54538361
WV	200.6474663	0	372.960808	209.5319465
WI	122.1709376	0	366.6340745	127.8924682
WY	142.348012	0	264.3277198	148.7069704
TOTAL	5,252	0	10,786	5,351

EMF (CAPs Allan; HAPs 2007aq)											
State	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}	CHLORINE	HCL	HG (ALL)	bfam / voc	
AL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	13.6%	
AK	0.0%	-0.1%	0.0%	-0.1%	0.0%	0.0%		0.0%	0.0%	13.6%	
AR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	11.0%	
CA	0.0%	-0.4%	-0.1%	0.0%	-0.6%	-0.6%	0.0%	0.0%	0.0%	58.5%	
CO	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	41.5%	
CT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	54.9%	
DE	-0.4%	-0.1%	-0.3%	0.0%	0.0%	0.0%		-0.1%	-0.1%	15.7%	
DC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	41.6%	
FL	-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%		0.0%	0.0%	32.3%	BFAM / VOC should be <= 100%
GA	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	6.3%	
ID	0.0%	0.0%	0.0%		0.0%	0.0%				99.6%	
IL	-0.1%	0.0%	0.1%	0.0%	0.0%	0.0%		0.0%	0.0%	9.7%	
IN	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	11.0%	
IA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		-0.1%	0.0%	6.2%	
KS	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	
KY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	8.1%	
LA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	32.7%	
ME	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	77.4%	
MD	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	10.9%	
MA	4.3%	0.0%	3.2%	0.0%	0.0%	0.0%		0.0%	0.0%	48.9%	
MI	-1.4%	0.0%	-0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	
MN	0.3%	0.0%	0.4%	-0.1%	0.8%	0.0%		0.0%	0.0%	7.2%	
MS	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	29.2%	
MO	2.2%	0.0%	1.0%	0.0%	0.0%	0.0%		0.0%	0.0%	9.9%	
MT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	4.6%	
NE	-1.0%	0.0%	-1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	
NV	-3.6%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	17.4%	
NH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	22.7%	
NJ	-5.9%	0.0%	-0.1%	0.0%	0.0%	-0.1%		0.0%	0.0%	37.6%	
NM	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%		0.0%	0.0%	16.6%	
NY	0.5%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	47.9%	
NC	-0.4%	0.0%	-0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%	
ND	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	4.6%	
OH	0.9%	0.0%	0.4%	0.0%	0.0%	0.0%		0.0%	0.0%	5.5%	
OK	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	32.4%	
OR	-0.5%	0.0%	-2.0%	0.0%	0.0%	0.0%			0.0%	50.3%	
PA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.8%	
RI	3.6%	0.0%	0.8%	0.0%	0.0%	0.0%				98.1%	
SC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	12.5%	
SD	0.0%	0.0%	0.0%		0.0%	0.0%		0.0%	0.0%	4.8%	
TN	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	7.5%	
TX	0.8%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	27.7%	
Tribal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				99.6%	
UT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.5%	

Table B-2bvi. Point Source Electricity Generating Unit (EGU) Emissions Mapped to Integrated Planning Model (IPM)—Percent Change between EMF and SMOKE Calculations

EMF (CAPs Allan; HAPs 2007aq)										
State	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}	CHLORINE	HCL	HG (ALL)	bfam / voc
VT	0.1%	0.0%	2.2%		0.0%	0.0%	0.0%	0.0%	0.0%	33.5%
VA	1.4%	0.0%	0.2%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	23.0%
WA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	16.9%
WI	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%
WY	1.3%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.1%
TOTAL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	7.2%

EMF (2005ck_05b)										
State	VOC	NO_x	CO	SO_2	PM_{10}	PM_{2_5}	NH_3	CHLORINE	HCL	HG_ALL
AL	38407	74830	166366	70346	26171	19871	2394	72	1718	1.29011439
AK	7555	78764	37942	8622	3748	2616	747	2	0	0.038090587
AZ	5968	15975	24973	23966	6821	3940	140	1	41	0.066916806
AR	35010	37478	65262	13066	15335	10872	2011	33	1337	0.83036383
CA	53036	90687	132667	33097	38020	21516	11804	97	1098	2.28452259
CO	25793	20971	24524	1549	14025	7114	123	2	174	0.391975088
CT	2352	5824	4011	1831	302	224	149	1	329	0.180544106
DEE	4218	5567	10443	34859	2585	2225	174	3	149	0.167876622
DC	76	501	340	686	267	172	4	1		7.46E-07
FL	36598	53778	105558	57475	31346	25196	2476	3	2379	0.813186486
GA	36754	53297	94672	56116	17280	12964	5573	5	1209	0.47203701
HI	3101	11210	7561	5514	2502	1718	22	0	260	0.107859509
ID	1759	10354	27535	17151	3147	2072	1236	4	21	0.369455412
IL	65037	97504	96766	156154	25062	15683	1238	253	2344	2.003418055
IN	51685	73647	350925	95200	27089	15553	1185	56	1138	2.18325274
IA	30382	39299	35879	61241	11017	5804	1072	37	1260	0.307405778
KS	23990	70785	36018	13142	12790	7631	60212	6	308	0.45797766
KY	49396	35432	46896	25811	15978	10450	983	53	486	0.254712996
LA	76315	165162	144363	165737	48285	39591	5569	290	973	1.530688327
MA	4811	18309	16208	18519	5463	3785	643	9	377	0.076057397
MD	5283	24621	107881	34988	9906	6768	148	25	625	0.414272198
MA	7664	18429	21389	19620	3207	2245	380	1	395	0.207092348
MI	41246	94139	94830	76510	20526	12918	1155	23	2084	1.164076214
MN	24972	64438	32005	25169	20975	10651	27515	159	1569	1.650479614
MS	42117	53985	51385	29892	17961	10602	1249	63	603	0.151465091
MO	24523	38604	78447	78307	12447	6948	1346	240	1123	1.189304886
MT	7083	5356	25092	11056	6328	2729	213		63	0.076114675
NE	6501	12156	8997	6429	3610	1857	1487	30	36	2.573738879
NE	3105	17191	24198	2253	6967	4095	361	1	13	2.418421846
NH	968	3241	4023	3245	661	572	52	0	44	0.042549566
NJ	12074	20598	16925	7640	3260	2599	463	10	249	0.708216786
NM	11557	43925	30362	7831	1858	1457	28	0	15	0.008338384
NY	12720	55122	78887	58562	7117	5000	2050	69	1521	1.419547609
NC	58850	44502	63887	66150	16724	12665	1821	96	1154	0.562488305
ND	1048	7545	5797	9458	653	564	153	0	2	0.009964042
OH	34886	71715	229812	118468	17879	12891	5744	128	3002	7.511957829
OK	45228	73465	52731	40482	10410	6246	3110	3	187	0.081772807
Oregon	18548	22927	51230	9825	12298	8852	773	5	412	0.989379654
PA	35683	89208	103287	85411	23509	14772	1855	77	1910	1.533957642
RI	1584	2164	2942	2743	397	256	16	1	4	0.051849646
SC	19931	29069	46600	31495	7472	4779	1560	51	1550	0.839347698
SD	3099	5035	8161	1698	4104	2873	228		2	0.019330695
TN	80622	60353	107508	78206	29777	23039	1741	148	2479	1.462188107
TX	146064	292806	258680	223625	47805	37563	3645	461	3450	4.441935882
Tribal Data	1215	13322	2482	1511	4057	1569		0		0.0007649
UT	5877	19466	49130	9132	7948	3595	437	1527	1649	1.586709699

Table B-3a. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—EMF: Criteria Air Pollutants and Hazardous Air Pollutants

EMF (2005ck_05b)										
State	VOC	NO_X	CO	SO_2	PM_{10}	PM_{2_5}	NH_3	CHLORINE	HCL	HG_ALL
VT	1101	799	2125	902	465	337	20		2	0.000899226
VA	42613	60101	74575	69440	14769	11504	1957	33	4821	1.495832419
WA	13638	25427	56465	24211	6225	4618	810	24	1132	0.136359067
WV	12925	36913	74247	48314	7928	5161	746	26	1386	0.314364133
WI	32829	40688	55493	66807	12099	7973	484	43	1315	0.774468296
WU	12944	30516	19241	22321	13632	10296	469	5	526	0.19702105
TOTAL	1320741	2337202	3267724	2131784	660207	446991	159773	4175	48924	48
Continental U.S.	1310085	2247228	3222221	2117649	653957	442656	159003	4174	48664	48

SMOKE (2007aq 15mar2010)								
State	ALD2	ALDX	BENZENE	CH4	CL2	CO	ETH	ETHA
AL	384.3505193	389.5472208	1609.372567	16173.81507	71.79651472	166360.6916	1846.208814	1835.361121
AK	0.000105136	0.000144441	3.79E-05	0	0	0.025500169	0.000411013	1.18E-05
AZ	66.553027	75.71691344	132.0557005	7823.234665	0.687548772	24972.65679	272.6613398	258.3081144
AR	264.2681167	366.5704249	1747.562788	5492.807568	33.22509688	65257.08093	1464.276482	1822.970539
CA	410.2723288	473.2684438	1661.771788	77777.2745	97.07932579	132598.6826	2774.20864	3013.262072
CO	351.0435146	112.0013772	698.2190092	32485.16242	2.288776511	24521.2828	392.4195469	2637.939182
CT	30.83174312	18.97289023	79.47565355	711.6371986	0.757144273	4010.006377	111.1162897	54.51347781
DE	17.67865235	30.90293402	144.3611558	787.3942819	2.751953486	10442.70625	86.92013626	149.399925
DC	0.002029839	0.623125099	3.32546253	27.46844888	0.531003683	339.8968515	0.007938604	0.174718359
FL	364.6636644	459.0496825	1761.832919	38077.67377	3.062057297	105548.1263	2244.334754	1335.900212
GA	264.9247772	353.499488	1243.160725	9118.484074	4.874710856	94664.14034	1096.015131	1529.330857
HI	0	0	0	0	0	0	0	0
ID	14.73131222	20.34372773	147.5943421	641.88598	3.85642423	27534.67283	89.9882235	143.2418616
IL	601.0757305	724.8367726	1887.888816	62153.0847	253.1540973	96753.44559	2301.48973	2857.492222
IN	394.7680816	432.5997908	1741.30036	7959.857516	56.10332979	350905.1693	1594.308457	656.1519566
IA	281.1361329	307.7495112	1013.455687	10339.46116	36.55036344	35877.36255	1502.651473	1194.685727
KS	156.9882021	159.2681821	629.6386079	33470.56914	5.645177316	36017.59164	279.7946793	791.8456871
KY	129.9691228	199.0816174	837.026722	6172.059787	52.88756439	46891.9764	1421.201093	1096.431824
LA	263.5084708	442.2179831	3319.619366	61771.87603	289.8269373	144333.5041	3005.125723	9413.526258
ME	50.51943372	60.64203242	238.7845398	555.4967245	9.30995613	16202.90849	217.6329898	264.3195242
MD	63.29672078	60.85325518	134.4602267	3140.020372	25.34835075	107879.6067	241.2663099	129.0911604
MA	59.0635361	75.28342215	198.9868927	2038.600652	1.277495804	21384.32344	324.4892296	248.7044298
MI	360.3127401	400.2487329	1390.559251	12478.4203	23.14600309	94816.61636	1812.148216	1759.498965
MN	146.1372941	202.648181	642.9428121	16540.68454	159.1527322	32000.04083	951.5010025	349.5076057
MS	265.5194339	340.4199051	2151.826296	16604.67203	62.66345742	51373.04439	1152.726104	2585.167979
MO	250.3121384	287.96962	567.8746243	28819.50507	239.7110836	78445.89764	604.5705796	420.5940983
MT	21.61174821	46.24197327	689.2591397	4223.364653	0	25091.43957	355.3929798	766.1432098
NE	75.85174543	70.10912828	602.8045739	5860.008975	29.9536781	8994.700818	154.928655	190.0442767
NV	42.9207307	56.65124042	87.38351916	874.3503528	1.090081061	24197.01616	307.805554	69.22669863
NH	9.537762463	11.72559912	18.77528662	144.3492174	0.018498968	4019.670688	44.49590327	23.14439279
NJ	81.12534969	101.7769566	331.0333457	4857.858138	9.854490933	16911.8381	255.1975721	254.2792763
NM	34.39869773	48.843321	176.2219119	32009.97897	0.317312645	30360.98957	557.4266837	4898.321905
NY	132.0696583	157.9696187	438.6108469	35773.78547	68.74175333	78879.81986	698.321575	760.1623684
NC	357.2109713	471.8855819	2391.050549	20815.39471	95.85713202	63879.4993	2758.714099	1557.401167
ND	19.9840336	20.30773961	42.82909296	886.8994862	0.357511667	5796.529037	72.6027886	110.4438788
OH	434.5492862	434.9287513	1494.993897	18085.00728	127.6573536	229806.4172	1256.036878	1226.116417
OK	135.4774892	171.6739005	848.1642006	31785.45371	3.175943517	52706.33945	551.215285	10006.31109
OR	107.1922406	139.7897903	963.9837523	16587.77181	5.249870197	51227.95284	534.8401647	1188.641802
PA	247.1231805	288.2851734	2076.58944	15865.46141	77.39841136	103193.0958	1317.44746	2323.530239
Puerto Rico	0	0	0	0	0	0	0	0
RI	11.13938069	20.31695577	75.02170913	7359.763421	0.777504425	2940.300971	105.3881583	87.6894985
SC	160.8214392	198.1987171	528.7209538	10570.43771	50.92382048	46599.84121	513.2746875	780.4931112
SD	17.39588838	25.27309561	54.23327713	76.69157493	0	8161.494618	39.80653137	7.352272183
TN	581.1578381	683.0245204	1689.370059	29676.48091	147.7257704	107502.4818	2295.798169	1706.790425
TX	911.6376539	949.8610484	6366.345256	86028.73622	461.3795104	258661.0554	7638.048839	7218.543243
Tribal Data	5.088505445	5.606889924	49.15582286	2998.475671	0.077798944	2480.922619	56.35553164	188.9474135

Table B-3b. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)								
State	ALD2	ALDX	BENZENE	CH4	CL2	CO	ETH	ETHA
UT	75.90111014	67.19131659	167.8328827	16189.49636	1526.659529	49128.53847	183.0210333	559.7210042
VT	3.923742932	7.412854313	15.20269673	30.60303687	0	2124.087386	24.30290199	3.710903626
Virgin Islands	0	0	0	0	0	0	0	0
VA	294.8614349	385.0781034	3002.614113	17362.26967	32.73116523	74566.38984	1046.292272	1378.515034
WA	151.3797804	163.1184001	519.7275211	21262.96145	23.50419753	56459.51235	469.5529583	664.4132161
WV	60.9017407	83.50525597	477.9960841	12603.41801	25.85802558	74245.47203	988.7948039	1948.776034
WI	452.9146744	435.1829105	1483.437671	12146.05639	42.70010986	55319.05698	832.621777	811.4973371
WY	122.2629823	165.2898945	442.7954165	9729.943582	5.27403715	19240.18824	891.114972	1780.197347
TOTAL	9,740	11,204	49,017	864,966	4,173	3,221,626	49,736	75,058

SMOKE (2007aq 15mar2010)							
State	ETOH	FORM	HCL	HGIIGAS	HGNRVA	HONO	IOLE
AL	610.6479853	708.4186498	1717.426584	0.183279495	0.98158721	2.514161632	239.1680242
AK	0	0.00031841	0	2.91E-10	5.62E-10	0.000244792	5.46E-05
AZ	147.2556517	318.9603334	40.88520874	0.015468946	0.040484848	14.73279979	47.29878306
AR	781.3427262	444.7941449	1336.913175	0.284691446	0.4085704	1.5682536	151.4065947
CA	840.3249742	1935.078607	1097.24025	0.658573663	1.235617242	31.10359783	435.9536153
CO	245.7906778	1035.174265	174.2225055	0.044519445	0.305428089	15.99130241	716.749226
CT	10.56119293	58.9133541	328.587193	0.097813564	0.047070752	2.841925164	51.59140072
DE	19.2101666	62.46230746	149.2150212	0.014698524	0.147401837	0.084256995	14.8360308
DC	0.703418422	4.030231344	0	2.24E-07	3.73E-07	5.20E-05	0.041140235
FL	1049.078355	931.1860803	2378.419652	0.290095415	0.390381769	38.09434944	239.5513573
GA	566.0986072	1272.520675	1209.348895	0.142289693	0.236186292	32.39712583	144.1685633
HI	0	0	0	0	0	0	0
ID	79.96446581	63.65892709	21.14815039	0.110198079	0.185670364	1.364724675	11.11510097
IL	9332.696604	2077.993317	2343.5245	0.499956178	1.22667147	80.89570947	341.0236585
IN	2519.725999	1029.884557	1133.445243	0.949257458	0.84227524	4.610997691	217.7508432
IA	3018.62812	567.2185386	1259.244953	0.069476663	0.187832115	1.438487645	193.3638288
KS	600.4814902	3211.783021	307.7360968	0.239950269	0.131548089	0.72795945	126.1100777
KY	15631.32309	588.5535466	485.6455884	0.114055918	0.094396159	12.01202112	124.6943451
LA	430.1859973	2644.489115	972.7093222	0.374834637	0.982477188	4.880863242	379.2340179
ME	113.470786	212.6304543	376.7767803	0.027397748	0.033954089	0.800475096	27.16355677
MD	234.53457	419.8282999	625.1479664	0.191271388	0.151401874	7.339516681	46.92876313
MA	150.3999624	390.4663869	393.7931229	0.081690987	0.096133861	9.397927501	42.67556688
MI	637.6305275	868.1181692	2083.032064	0.225108531	0.771294791	14.68222482	170.4573818
MN	1206.270397	693.0811925	1567.547302	0.730327541	0.635614064	14.60957637	145.8797035
MS	782.9759892	1426.425866	602.261945	0.07880036	0.043271662	1.145494542	167.5310722
MO	508.1375959	694.5870608	1122.692853	0.511952397	0.474377678	16.50331441	156.8213174
MT	158.9232068	458.7122185	63.41165593	0.011606154	0.054819819	1.225479886	23.48364423
NE	205.4780882	304.2465117	36.29953235	1.447796414	0.619702361	1.634491551	19.31118049
NV	62.12582483	217.141843	13.22333065	0.010507932	2.398584855	13.61198153	27.76496641
NH	41.99547955	27.26586269	44.40368103	0.014953489	0.019120974	1.390215799	7.391616406
NJ	77.13730955	460.5840119	248.7058825	0.225367763	0.372593882	10.85635951	88.25485237
NM	11.65475048	1084.457662	15.34691561	0.001038285	0.006337243	2.778591974	125.3019785
NY	266.435444	543.7631531	1520.148077	0.611712238	0.557232181	22.3311027	96.22971726
NC	1714.547554	863.4871752	1153.400076	0.109602291	0.375437545	13.14503578	193.3517104
ND	8.442490015	84.06463682	1.685079089	0.002125595	0.00656443	0.634013292	17.55601773
OH	832.4638807	666.620247	3001.973347	3.847102539	2.240002704	9.701353528	154.4033166
OK	94.73382721	8114.898654	187.0661427	0.020707191	0.04743373	3.022886335	152.229781
OR	388.4031805	329.3886813	412.3725732	0.137946025	0.72912606	5.643970326	77.31879177
PA	463.8966361	886.7894063	1908.660091	0.448777022	0.855156152	17.16058171	194.8165324
Puerto Rico	0	0	0	0	0	0	0
RI	22.35504079	33.08272174	3.563251472	0.015551687	0.025927593	2.066043133	6.506683518
SC	220.8915904	287.3191603	1550.089032	0.287028716	0.418771914	2.104090103	110.7809715
SD	45.24829815	44.66990819	1.544116578	0.00578118	0.009692801	0.525885999	20.69068289
TN	9929.060289	1001.210154	2478.676427	0.429772264	0.771524571	11.57144316	289.1363016
TX	1099.593469	12434.49518	3449.874881	1.208488057	2.618687818	47.2586522	1122.529993
Tribal Data	32.52665791	154.8057359	0	0.000101528	0.000570592	0	4.685865557

Table B-3bi. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	ETOH	FORM	HCL	HGIIGAS	HGNRVA	HONO	IOLE
UT	49.58098805	235.3621832	1649.202655	0.838115714	0.445252399	6.847148818	45.60626541
VT	63.94611022	15.75256394	2.031480136	0.000200895	0.00056054	0.392475173	3.446706904
Virgin Islands	0	0	0	0	0	0	0
VA	1007.230826	793.5673674	4820.167918	0.478379926	0.74196076	13.35318161	229.704454
WA	232.2623887	260.3618442	1131.869913	0.027574528	0.090233781	11.72084675	129.3244434
WV	176.1324548	705.6411008	1385.999363	0.064713124	0.217618122	0.289380481	84.59727477
WI	711.7310993	464.3326513	1313.993084	0.24339496	0.381430049	4.228664539	105.6709707
WY	97.97939252	258.7829979	525.9246637	0.051208011	0.110147665	0.252618967	83.43194454
TOTAL	57,532	52,391	48,647	16	24	513	7,605

SMOKE (2007aq 15mar2010)							
State	ISOP	MEOH	NH_3	NO	NO_2	NO_x	NVOL
AL	69.22775224	296.4480374	2393.799506	67336.96554	7479.370635	74818.85034	57.7080079
AK	0	4.07E-05	0	0.027539665	0.00281527	0.030599726	0
AZ	2.541561497	72.67923698	139.6477783	14375.45469	1582.540822	15972.72831	3.265972013
AR	60.24290015	428.353848	2011.135653	33726.47139	3745.816308	37473.85595	48.83933481
CA	25.30209433	458.1183648	11778.42156	81587.30102	9034.164545	90652.56916	37.61611531
CO	16.38343064	165.9267188	122.6349063	18870.63952	2080.745888	20967.37671	13.46565433
CT	1.533730667	37.00577589	148.6133016	5235.776857	578.9115909	5817.530373	2.816518798
DE	1.188036755	16.84274057	173.9971086	5010.058893	556.5880536	5566.731204	1.207680702
DC	0	0.003296714	4.245449914	450.6975073	50.07745631	500.7750157	0
FL	58.44315223	341.0038429	2475.813886	48384.81207	5337.995886	53760.9023	56.38513302
GA	47.56346438	498.4268161	5573.364938	47964.15944	5296.954147	53293.51071	44.35978277
HI	0	0	0	0	0	0	0
ID	1.404211738	7.480700056	1236.42227	9318.073816	1033.97736	10353.4159	1.237873149
IL	83.05576395	401.6615619	1237.801661	87736.36347	9667.611742	97484.87092	83.01005139
IN	37.86846737	309.0664118	1185.169761	66261.36687	7357.752103	73623.72997	38.05165492
IA	39.89233645	511.9682993	1071.956661	35366.5767	3928.182551	39296.19774	39.06162483
KS	14.17645046	149.3756938	60178.8902	63705.35818	7077.645202	70783.73134	13.62654809
KY	14.52178067	1050.457125	983.1234295	31886.67852	3530.952714	35429.64326	26.43735416
LA	57.42218334	268.5457277	5568.556379	148545.8514	16500.2422	165050.9745	36.5240589
ME	9.440328673	39.64247204	642.5696086	16472.57094	1829.485054	18302.85646	16.52581346
MD	6.04264549	54.92340901	148.4049488	22151.75384	2453.9659	24613.05926	6.223676979
MA	2.277022178	183.0330158	379.1372518	16579.9205	1832.822487	18422.14091	9.489633393
MI	37.63716225	334.7333547	1154.605456	84706.40457	9397.129835	94118.21663	38.4807219
MN	12.19024493	326.4920791	27509.02696	57986.96573	6428.400314	64429.97562	12.45035979
MS	34.418776	302.7003454	1249.051222	48569.35883	5395.451805	53965.95613	99.21709016
MO	34.47104542	254.667791	1345.797957	34741.19469	3843.635333	38601.33334	36.88029349
MT	2.23508406	21.21294686	212.9229813	4811.78914	533.4178883	5346.432508	2.169998545
NE	2.141539297	131.4079435	1486.981675	10937.71634	1213.666827	12153.01766	2.116358644
NV	3.255447015	26.70188065	360.9324881	15462.16354	1704.403956	17180.17948	3.169910905
NH	1.005799282	6.420925214	51.76030909	2914.164389	322.4058026	3237.960408	0.934449968
NJ	4.020731917	428.488986	462.9791751	18531.26184	2048.170585	20590.28879	14.23256684
NM	1.531978219	503.3341601	28.03822704	39531.25702	4389.579175	43923.61479	1.514639554
NY	13.64479025	137.0678431	2049.607417	49604.7998	5489.31264	55116.44354	16.97165529
NC	62.03872954	549.2066893	1821.07886	40037.2453	4435.436893	44485.82723	151.55541
ND	2.495567714	12.78652888	153.1987301	6790.045293	753.8156403	7544.494946	2.393376732
OH	34.08784897	280.7849319	5743.157949	64530.67307	7160.375136	71700.74955	39.81452296
OK	14.77411441	123.8895123	3110.444545	66102.27136	7341.668677	73446.96293	13.64999362
OR	21.66222126	59.54333725	772.5458873	20627.978	2286.352859	22919.97483	14.2707769
PA	20.49423441	179.8443211	1854.968648	80275.87651	8902.389895	89195.42698	25.51858992
Puerto Rico	0	0	0	0	0	0	0
RI	0.599464441	10.05603153	15.50728462	1945.693851	214.1220809	2161.881976	12.37240609
SC	33.64692571	237.4716936	1559.827683	26161.83684	2904.767411	29068.70834	168.2459748
SD	1.503118039	138.3765702	228.1729493	4531.35251	502.9570842	5034.83548	1.399059436
TN	93.51802464	500.4802222	1740.914102	54307.76275	6022.626104	60341.9603	117.666087
TX	94.79574649	653.5001103	3643.969484	263496.4773	29230.06782	292773.8038	86.4590063
Tribal Data	0.76951067	2.939524441	0	11987.49068	1331.943332	13319.43401	0.738248751

Table B-3bii. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	ISOP	MEOH	NH_3	NO	NO_2	NO_X	NVOL
UT	6.321023856	67.61520263	437.1663527	17515.38617	1939.304487	19461.53781	6.723019197
VT	0.200549709	9.320268391	20.45522468	718.730274	79.46642041	798.5891696	0.193069433
Virgin Islands	0	0	0	0	0	0	0
VA	43.87760353	361.3506908	1957.175942	54078.58657	5995.380749	60087.3205	63.84382857
WA	21.79776517	96.20353776	809.7157858	22882.07825	2530.733639	25424.53273	19.97421803
WV	9.194492766	84.16462265	745.4146811	33220.88566	3690.919365	36912.09441	9.185034343
WI	28.14129949	278.5907016	484.4388425	36616.04358	4064.223133	40684.49537	26.74762136
WY	25.71997791	315.0712695	469.3347542	27464.31333	3051.341162	30515.90711	25.06372007
TOTAL	1,211	11,725	158,933	2,022,055	224,159	2,246,727	1,550

SMOKE (2007aq 15mar2010)							
State	OLE	PAR	PEC	PHGI	PM_{10}	PM_{2_5}	PMC
AL	1594.647908	20380.55806	1000.909019	0.125257252	26156.1812	19859.52725	6296.653954
AK	0.000223118	0.000998611	0.000826919	1.50E-10	0.0010985	0.001072132	2.64E-05
AZ	528.6518535	2890.890144	418.624885	0.010961586	6818.410769	3937.65853	2880.752239
AR	2290.614619	16939.23619	647.201139	0.137104857	15325.13515	10862.39989	4462.735267
CA	3527.907544	30029.03105	2995.325701	0.388354029	37952.33581	21476.36938	16475.96643
CO	836.5396328	20393.14202	602.0679647	0.042026764	13872.29823	7041.124773	6831.173456
CT	131.3069903	1629.892506	58.46067539	0.035591165	301.8901123	223.7095925	78.18051974
DE	162.3693978	3295.416475	417.5331769	0.005776219	2584.401349	2224.356384	360.0449647
DC	0.753197789	44.03156181	47.77477835	1.49E-07	266.9183884	171.812091	95.10629739
FL	2775.511291	17425.00952	2114.977108	0.132677624	31338.02366	25191.55222	6146.471435
GA	1995.823229	17146.18674	997.3983384	0.093560134	17273.05062	12958.60509	4314.44553
HI	0	0	0	0	0	0	0
ID	89.58579828	879.3009633	122.2613623	0.073588618	3146.108096	2071.270818	1074.837278
IL	4105.239461	31874.65918	1142.128077	0.276698083	25051.15031	15676.65367	9374.496648
IN	2818.925701	26049.16022	1224.826085	0.391659783	27065.13948	15536.37178	11528.76771
IA	1541.095922	14793.98106	319.1893635	0.050093355	11009.44465	5796.681482	5212.763164
KS	717.2504884	14145.2129	495.8201949	0.086478778	12783.13055	7626.40099	5156.729565
KY	1201.519952	17226.2708	598.8300465	0.046258415	15955.77259	10436.69768	5519.074913
LA	3353.16226	49978.95661	4562.587398	0.173369588	48264.27384	39574.32207	8689.951769
ME	226.7534485	2484.684489	282.3360122	0.014594204	5455.64816	3780.280779	1675.367381
MD	454.1074263	2570.038432	461.2512674	0.071597491	9898.7311	6764.231629	3134.499471
MA	446.8576334	4479.265095	385.1330522	0.028887562	3202.961195	2242.187454	960.7737412
MI	2369.120968	20546.90915	949.3447771	0.167437832	20497.25798	12902.94939	7594.308581
MN	1016.762467	14418.94414	1249.252102	0.284530079	21102.79439	10643.77785	10459.01654
MS	2575.783089	21286.44852	1004.52992	0.029389936	17937.08204	10594.01239	7343.069646
MO	1066.83109	13170.06192	432.0387603	0.202974366	12440.0932	6944.761583	5495.331621
MT	413.2246489	3729.605369	247.6196079	0.009689671	6325.364646	2728.075475	3597.289171
NE	221.0735534	3610.111951	160.461378	0.506221113	3607.714441	1855.590245	1752.124196
NV	229.4598323	1615.204475	484.457444	0.009313547	6959.697574	4092.906285	2866.79129
NH	39.07480203	500.0560027	72.17737264	0.008462956	660.2450338	571.5046618	88.74037203
NJ	430.2889512	6632.23467	425.4867081	0.110254678	3256.769379	2596.635254	660.1341252
NM	767.79595	5534.998946	192.9189039	0.00096311	1856.617368	1455.497108	401.1202605
NY	870.1507917	6944.860685	507.9762801	0.250597684	7114.493928	4998.145463	2116.348465
NC	2468.141986	29858.84171	1089.033828	0.077392208	16715.67446	12659.64853	4056.025931
ND	61.18400489	585.2387371	207.3413889	0.001274131	652.8215596	563.7664199	89.05513969
OH	1805.260129	18006.0246	968.1834659	1.424870671	17864.09445	12880.04482	4984.049633
OK	1252.643362	28995.20683	534.5468262	0.013632709	10405.5151	6243.477905	4162.037199
OR	631.4871692	8000.543046	630.6816063	0.122306002	12295.53695	8849.742507	3445.794442
PA	2553.567524	18609.78679	1444.485251	0.22885202	23495.51962	14763.65427	8731.865346
Puerto Rico	0	0	0	0	0	0	0
RI	101.5202937	859.0724372	44.26642592	0.010368232	396.2679125	255.0922219	141.1756906
SC	902.7766739	10559.93694	309.9189366	0.133542056	7471.321095	4778.918478	2692.402617
SD	52.202135	1683.302391	86.9181835	0.003856836	4103.704049	2872.834139	1230.869911
TN	3415.415224	35857.05901	2037.535506	0.260890667	29763.48761	23026.92846	6736.559152
TX	7311.733627	90749.04621	4743.524754	0.614725221	47781.00417	37546.53001	10234.47416
Tribal Data	25.74933633	554.1133982	82.45828458	9.28E-05	4053.154602	1567.375643	2485.778959

Table B-3biii. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	OLE	PAR	PEC	PHGI	PM_{10}	PM_{2_5}	PMC
UT	325.2454995	3776.002037	257.6823268	0.303337577	7942.296725	3593.562301	4348.734424
VT	22.94697304	567.0231699	47.45806037	0.000137801	465.3744947	337.3885275	127.9859673
Virgin Islands	0	0	0	0	0	0	0
VA	2129.505348	23487.57987	859.6206649	0.275491019	14764.18221	11500.23891	3263.943301
WA	986.5291815	7512.552306	661.1631494	0.018550056	6223.228375	4617.042091	1606.186284
WV	621.579899	6914.911791	273.5558273	0.031471493	7912.116467	5151.178424	2760.938042
WI	1456.763315	16971.01284	524.3053051	0.149644152	12089.13279	7967.684937	4121.447848
WY	740.7415681	6902.499604	208.8600256	0.03566735	13630.96971	10294.64403	3336.325677
TOTAL	65,663	703,094	39,632	7	653,505	442,306	211,199

SMOKE (2007aq 15mar2010)							
State	PMFINE	PNO3	POC	PSO4	SO_2	SULF	TERP
AL	12739.55331	141.1576503	2748.830182	3229.077085	70344.02951	148.5486892	1451.752804
AK	5.26E-05	1.18E-06	0.000188281	3.11E-06	0.002040003	0	0
AZ	2940.201938	58.26679575	281.2495473	239.3153645	23965.43875	37.25629579	27.05411992
AR	5551.707895	197.4277011	1592.079852	2873.9833	13065.80054	72.85225704	1412.815879
CA	12549.06698	210.7098776	3433.746637	2287.520182	33086.45234	6.099266743	664.8339704
CO	5528.935746	59.50318369	519.3606015	331.2572777	1548.798434	0.765233316	54.47777335
CT	99.87639743	1.316843312	31.5860141	32.46966231	1830.560821	15.99067767	4.400573205
DE	1021.381228	22.29446353	537.8839429	225.2635731	34858.55522	162.5342723	8.928389107
DC	71.37397455	2.597031146	32.7487464	17.31756059	684.5176955	14.89422404	1.050866412
FL	15667.1793	123.5302138	4397.603397	2888.262203	57472.12198	204.6627297	519.4966785
GA	7422.178259	156.7642842	2352.513324	2029.750888	56113.06644	633.9950167	3235.406295
HI	0	0	0	0	0	0	0
ID	1523.579429	5.868781781	220.0313442	199.5299005	17149.64928	48.29359326	6.522943408
IL	10772.68056	150.4432697	1494.637798	2116.763957	156125.5842	1573.61446	279.8844351
IN	9772.056434	115.136802	1990.747194	2433.605261	95197.62759	783.8282919	205.298313
IA	4156.269631	55.87546708	567.4484509	697.8985699	61228.15269	990.9073362	136.8703371
KS	5017.198384	88.4369498	852.9988363	1171.946625	13141.8412	15.37197762	87.64522694
KY	7547.949025	71.39692885	1195.3561	1023.165582	25810.49496	151.2565889	265.4708338
LA	20442.36226	428.9115713	7077.647418	7062.813417	165733.4647	64.42160067	3917.414283
ME	1759.762253	13.29218803	590.1938114	1134.696514	18512.34035	214.6937875	165.6449611
MD	4672.177014	47.72452598	661.859375	921.2194471	34985.09298	484.1372734	13.41267955
MA	1140.537876	11.47355071	289.7806298	415.2623447	19614.91154	263.5428961	47.27497722
MI	8030.582688	118.4142399	1596.177653	2208.430036	76487.32904	767.8113357	1560.800192
MN	6609.260908	67.91373303	1417.82944	1299.521667	25165.78288	231.4743396	453.1511074
MS	5708.497626	93.84657407	2259.029861	1528.108411	29877.91966	84.28485039	1587.45964
MO	5097.062296	128.9447181	529.9858205	756.7299877	78299.10383	294.0128011	158.7265504
MT	1601.25751	17.55732337	527.0462952	334.5947383	11051.47942	9.699105431	459.549391
NE	1366.998346	10.86950997	183.3281624	133.9328485	6428.660996	10.96728334	30.58477385
NV	2729.548658	83.1314055	413.9342365	381.8345406	2252.858519	1.408515434	15.12801606
NH	300.9841648	1.597563452	76.45283255	120.2927284	3244.726623	43.46385908	2.375166087
NJ	1405.358126	18.94934594	367.9977027	378.843371	7637.97443	13.2082116	49.82968316
NM	1002.721539	9.499179109	128.1885319	122.1689544	7830.395947	0.083423026	29.97298892
NY	3259.038459	47.39819926	517.8021593	665.9303653	58557.56388	649.6391735	167.0340803
NC	7364.296758	54.89584726	2059.504957	2091.91714	66092.16184	896.2076855	2220.36049
ND	179.7011994	10.04592018	124.3246611	42.35325022	9457.691128	15.71429841	4.17912984
OH	8050.735488	117.8362834	1612.852873	2130.436708	118467.5665	1689.099302	263.3956292
OK	3576.981278	81.65237928	665.3583039	1384.939117	40459.46012	90.55924426	604.4980098
OR	3949.515419	43.45812155	2423.164364	1802.922996	9823.707311	38.62110447	3894.541624
PA	8594.284725	175.7029111	1748.650225	2800.53116	85401.49747	656.5446364	486.4965773
Puerto Rico	0	0	0	0	0	0	0
RI	112.8994616	0.682743542	24.56415748	72.6794333	2738.856728	39.79992396	6.70360121
SC	2556.401027	54.48871851	674.6322387	1183.477557	31495.0083	250.4082484	1243.512901
SD	2246.561433	14.86304535	241.1967928	283.2946834	1698.264574	0	10.40203273
TN	14823.6271	171.3330041	3542.760118	2451.672735	78204.91299	1278.398914	423.7030946
TX	21546.62017	373.1067144	5605.162181	5278.116196	223554.2156	1570.905426	4093.526884
Tribal Data	981.3342052	7.808296544	432.0905487	63.68430805	1510.949117	0.212645368	236.6779578

Table B-3biv. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	PMFINE	PNO3	POC	PSO4	SO_2	SULF	TERP
UT	2703.776012	24.04863572	269.2464411	338.8088863	9131.372498	72.85747472	45.03124531
VT	166.2209475	0.2107474	90.85486356	32.64390857	902.1865644	13.53169689	3.603927144
Virgin Islands	0	0	0	0	0	0	0
VA	6973.972118	69.84325645	1924.557993	1672.244874	69426.92153	721.728742	1025.85508
WA	2260.545316	39.61162122	893.2561776	762.4658266	24210.98267	40.52943865	272.2942652
WV	3643.146602	60.30327232	464.5171128	709.6556093	48313.67927	533.2254122	81.0762887
WI	5008.829679	42.44683587	1111.008893	1281.094225	66805.12443	1224.83311	649.204349
WY	8441.395147	134.6557226	826.7732412	682.9598923	22320.82005	237.7116372	80.42172972
TOTAL	270,688	4,037	63,621	64,327	2,117,318	17,365	32,666

SMOKE (2007aq 15mar2010)				
State	TOL	UNK	UNR	XYL
AL	3528.287356	0	7961.104314	3735.000811
AK	5.00E-05	0	0.000186802	6.45E-05
AZ	1118.255988	0	569.9221334	502.4113426
AR	4455.24063	0	7625.168577	3188.728319
CA	7446.77909	0.045952795	7380.768484	3498.141733
CO	1866.346606	0	3034.616581	1127.447081
CT	301.9688771	0	273.2134967	118.4108614
DE	301.6299692	0.030483959	820.5962049	179.6738153
DC	7.493963758	0	12.5336489	11.96430912
FL	6317.739179	0	6572.313659	2273.608782
GA	5594.815332	0	6164.597954	3203.53811
HI	0	0	0	0
ID	224.775996	0	425.744222	131.94697
IL	6411.892768	0.028399707	9180.122621	3874.973075
IN	9465.837489	8.31E-09	6920.358438	5414.713142
IA	4266.568795	0	4428.64047	2214.734941
KS	2660.348497	0	3162.591139	1324.818875
KY	7359.264872	0	4687.915363	4405.057803
LA	5065.780911	0.003365996	17350.18967	3290.109931
ME	497.2328788	1.43E-05	1043.329205	379.0406228
MD	791.6136294	0	770.0120262	254.0928373
MA	973.3385372	0	905.6623587	564.5061921
MI	6764.337604	0	5596.260329	4462.944897
MN	3782.891994	0	3011.464102	1883.420442
MS	6028.714969	0.202300057	7832.403253	4603.815777
MO	3520.948115	0	3254.429556	2831.765763
MT	547.6592651	0	2113.63071	244.5526324
NE	886.3645311	0	1700.47057	370.258324
NV	293.4563007	0	538.3841224	126.6974735
NH	177.9631802	0	109.3563559	67.00020701
NJ	2505.374188	0.101008242	1396.170761	1309.414993
NM	2275.850402	0	1830.389737	857.3992735
NY	1732.967671	0	1838.498509	880.5345936
NC	9305.942958	0	9418.029012	5444.580597
ND	59.12089309	0	191.6193193	40.46868653
OH	5200.175611	0	6628.508192	3733.400028
OK	1669.905608	0	11580.47188	734.5855899
OR	1947.854275	0	3665.292334	1390.692718
PA	5434.310198	0.07527411	8049.505673	2778.369731
Puerto Rico	0	0	0	0
RI	263.2233909	0	259.9321014	95.77433985
SC	2724.453637	0	3253.871272	1687.813716
SD	766.2451874	0	272.1393341	354.2003232
TN	12727.47739	0.420636093	11687.47644	8650.343523
TX	10435.61328	0	27632.00954	4984.927914
Tribal Data	37.70517716	0	247.2943112	30.07067275

Table B-3bv. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)				
State	TOL	UNK	UNR	XYL
UT	603.4015368	0.011501668	1073.939748	352.5018439
VT	263.806639	0	75.44677694	131.9088458
Virgin Islands	0	0	0	0
VA	6018.32532	0	9461.096057	3232.484949
WA	1816.934197	0	2392.90891	946.977416
WV	1339.611275	0	2811.387568	769.2526327
WI	5644.920483	0	5369.751182	3688.745887
WY	1678.752999	0	2566.305973	769.8624757
TOTAL	165,110		225,148	97,148

SMOKE (2007aq 15mar2010)						
State	HONO	CO	NO_X	NH_3	PM_{10}	PM_{2_5}
AL	0.00%	0.0%	0.0%	0.0%	-0.1%	-0.1%
AK	0.80%	-148790881.5%	-257400090.9%		-341175080.1%	-244029345.2%
AZ	0.09%	0.0%	0.0%	-0.1%	0.0%	0.0%
AR	0.00%	0.0%	0.0%	0.0%	-0.1%	-0.1%
CA	0.03%	-0.1%	0.0%	-0.2%	-0.2%	-0.2%
CO	0.08%	0.0%	0.0%	0.0%	-1.1%	-1.0%
CT	0.05%	0.0%	-0.1%	0.0%	-0.1%	-0.1%
DE	0.00%	0.0%	0.0%	0.0%	0.0%	0.0%
DC	0.00%	-0.1%	-0.1%	0.0%	-0.2%	-0.1%
FL	0.07%	0.0%	0.0%	0.0%	0.0%	0.0%
GA	0.06%	0.0%	0.0%	0.0%	0.0%	0.0%
HI		-7561434000000000 00000000000000000 0000000000000.0%				
ID	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%
IL	0.08%	0.0%	0.0%	0.0%	0.0%	0.0%
IN	0.01%	0.0%	0.0%	0.0%	-0.1%	-0.1%
IA	0.00%	0.0%	0.0%	0.0%	-0.1%	-0.1%
KS	0.00%	0.0%	0.0%	-0.1%	-0.1%	-0.1%
KY	0.03%	0.0%	0.0%	0.0%	-0.1%	-0.1%
LA	0.00%	0.0%	-0.1%	0.0%	0.0%	0.0%
ME	0.00%	0.0%	0.0%	0.0%	-0.1%	-0.1%
MD	0.03%	0.0%	0.0%	0.0%	-0.1%	-0.1%
MA	0.05%	0.0%	0.0%	-0.1%	-0.1%	-0.1%
MI	0.02%	0.0%	0.0%	0.0%	-0.1%	-0.1%
MN	0.02%	0.0%	0.0%	0.0%	0.6%	-0.1%
MS	0.00%	0.0%	0.0%	0.0%	-0.1%	-0.1%
MO	0.04%	0.0%	0.0%	0.0%	-0.1%	-0.1%
MT	0.02%	0.0%	-0.2%	0.0%	0.0%	0.0%
NE	0.01%	0.0%	0.0%	0.0%	-0.1%	-0.1%
NV	0.08%	0.0%	-0.1%	-0.1%	-0.1%	0.0%
NH	0.04%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
NJ	0.05%	-0.1%	0.0%	0.0%	-0.1%	-0.1%
NM	0.01%	0.0%	0.0%	0.0%	-0.1%	-0.1%
NY	0.04%	0.0%	0.0%	0.0%	0.0%	0.0%
NC	0.03%	0.0%	0.0%	0.0%	0.0%	0.0%
ND	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%
OH	0.01%	0.0%	0.0%	0.0%	-0.1%	-0.1%
OK	0.00%	0.0%	0.0%	0.0%	0.0%	0.0%
OR	0.02%	0.0%	0.0%	0.0%	0.0%	0.0%
PA	0.02%	-0.1%	0.0%	0.0%	-0.1%	-0.1%
Puerto Rico		0.0%				
RI	0.10%	-0.1%	-0.1%	0.0%	-0.1%	-0.2%
SC	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%
SD	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%
TN	0.02%	0.0%	0.0%	0.0%	0.0%	-0.1%
TX	0.02%	0.0%	0.0%	0.0%	0.0%	0.0%
Tribal Data	0.00%	0.0%	0.0%		-0.1%	-0.1%

Table B-3bvi. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq 15mar2010)						
State	HONO	CO	NO_X	NH_3	PM_{10}	PM_{2_5}
UT	0.04%	0.0%	0.0%	0.0%	-0.1%	-0.1%
VT	0.05%	0.0%	-0.1%	0.0%	0.0%	0.0%
Virgin Islands		0.0%				
VA	0.02%	0.0%	0.0%	0.0%	0.0%	0.0%
WA	0.05%	0.0%	0.0%	0.0%	0.0%	0.0%
WV	0.00%	0.0%	0.0%	0.0%	-0.2%	-0.2%
WI	0.01%	-0.3%	0.0%	0.0%	-0.1%	-0.1%
WY	0.00%	0.0%	0.0%	0.0%	0.0%	0.0%

SMOKE (2007aq 15mar2010)					
State	SO_2	CHLORINE	HCL	HG_ALL	bfam / voc
AL	0.0%	0.0%	0.0%	0.0%	7.8%
AK	-422634916.9%	-1566000000000000000000000000000000000000000000000.0%	-3275000000000000000000000000000000000000000000.0%	-3797957943.5%	0.0%
AZ	0.0%	0.0%	0.0%	0.0%	9.9%
AR	0.0%	0.0%	0.0%	0.0%	8.2%
CA	0.0%	0.0%	-0.1%	-0.1%	8.4%
CO	0.0%	0.0%	0.0%	0.0%	8.7%
CT	0.0%	0.0%	-0.1%	0.0%	8.8%
DE	0.0%	0.0%	0.0%	0.0%	5.7%
DC	-0.3%	0.0%	0.0%	0.0%	9.7%
FL	0.0%	0.0%	0.0%	0.0%	9.3%
GA	0.0%	0.0%	0.0%	0.0%	8.9%
HI	-55136148900000000000000000000000000000000000000.0%	-25000000000000000000000000000000000000000.0%	-2597124050000000000000000000000000000000000.0%	-1078595090000000000000000000000000000000.0%	0.0%
ID	0.0%	0.0%	0.0%	0.0%	13.3%
IL	0.0%	0.0%	0.0%	0.0%	7.6%
IN	0.0%	-0.3%	-0.4%	0.0%	6.7%
IA	0.0%	-0.2%	-0.1%	0.0%	7.8%
KS	0.0%	0.0%	0.0%	0.0%	17.3%
KY	0.0%	0.0%	0.0%	0.0%	5.3%
LA	0.0%	0.0%	0.0%	0.0%	8.5%
ME	0.0%	-0.2%	-0.1%	-0.1%	11.3%
MD	0.0%	0.0%	0.0%	0.0%	12.7%
MA	0.0%	0.0%	-0.2%	-0.2%	10.9%
MI	0.0%	0.0%	-0.1%	0.0%	7.2%
MN	0.0%	0.0%	-0.1%	0.0%	7.2%
MS	0.0%	0.0%	0.0%	0.0%	9.8%
MO	0.0%	0.0%	0.0%	0.0%	7.2%
MT	0.0%	0.0%	0.0%	0.0%	16.8%
NE	0.0%	0.0%	0.0%	0.0%	17.1%
NV	0.0%	0.0%	0.0%	0.0%	12.0%
NH	0.0%	0.0%	0.0%	0.0%	6.4%
NJ	0.0%	0.0%	0.0%	0.0%	10.8%
NM	0.0%	0.0%	0.0%	0.0%	15.6%
NY	0.0%	0.0%	0.0%	0.0%	9.8%
NC	-0.1%	-0.1%	0.0%	0.0%	7.1%
ND	0.0%	0.0%	0.0%	0.0%	15.2%
OH	0.0%	0.0%	0.0%	0.0%	8.2%
OK	-0.1%	0.0%	0.0%	0.0%	20.4%
OR	0.0%	0.0%	0.0%	0.0%	7.9%
PA	0.0%	0.0%	-0.1%	-0.1%	9.5%
Puerto Rico	0.0%	0.0%	0.0%	0.0%	
RI	-0.1%	0.0%	0.0%	0.0%	8.2%
SC	0.0%	0.0%	0.0%	0.0%	6.1%

Table B-3bvii. Point Source Electricity Generating Unit (EGU) Emissions Not Matched to ptipm Sector—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq 15mar2010)					
State	SO_2	CHLORINE	HCL	HG_ALL	bfam / voc
SD	0.0%	0.0%	0.0%	0.0%	8.2%
TN	0.0%	0.0%	0.0%	0.0%	4.7%
TX	0.0%	0.0%	0.0%	0.0%	13.9%
Tribal Data	0.0%	0.0%	0.0%	0.0%	17.5%
UT	0.0%	0.0%	0.0%	0.0%	9.3%
VT	0.0%	0.0%	0.0%	0.0%	4.0%
Virgin Islands	0.0%	0.0%	0.0%	0.0%	
VA	0.0%	0.0%	0.0%	0.0%	10.4%
WV	0.0%	0.0%	0.0%	0.0%	7.5%
WA	0.0%	-0.1%	0.0%	-0.2%	10.3%
WI	0.0%	0.0%	-0.1%	0.0%	8.2%
WY	0.0%	-3.0%	0.0%	0.0%	8.8%
TOTAL					

EMF 2007aq							
State	CO	NH_3	NO_X	PM_{10}	PM_{2_5}	SO_2	VOC
AL	914,608	15,101	17,087	97,157	82,336	8,282	217,071
AZ	166,733	2,752	3,091	17,690	14,992	1,502	39,565
AR	927,268	15,206	11,989	93,738	79,439	6,766	218,586
CA	2,503,353	41,028	31,127	251,957	213,523	17,886	589,772
CO	42,683	704	761	4,502	3,815	376	10,120
CT	299	5	5	32	27	3	71
DE	1,157	19	21	122	104	10	274
FL	1,411,900	23,146	17,865	142,381	120,662	10,182	332,720
GA	1,673,081	27,643	32,252	178,616	151,370	15,455	397,363
ID	9,474,711	154,755	90,718	929,414	787,639	59,410	2,224,610
IL	32,847	541	523	3,409	2,889	270	7,771
IN	14,485	239	282	1,549	1,313	135	3,441
IA	7,840	129	148	834	707	71	1,861
KS	107,135	1,776	2,356	11,697	9,913	1,079	25,526
KY	162,993	2,685	2,719	17,023	14,426	1,376	38,593
LA	1,645,078	26,821	13,215	159,108	134,837	9,540	385,547
ME	3,219	53	53	336	284	27	762
MD	11,891	196	221	1,262	1,069	107	2,822
MA	1,309	22	25	139	118	12	311
MI	225,235	3,680	2,208	22,140	18,763	1,428	52,898
MN	609,732	9,974	6,622	60,511	51,280	4,063	143,380
MS	753,719	12,413	12,454	78,612	66,621	6,328	178,431
MO	285,837	4,712	4,951	30,017	25,438	2,469	67,731
MT	4,969,247	81,301	54,558	493,687	418,379	33,293	1,168,700
NE	33,852	552	300	3,299	2,796	205	7,942
NV	130,909	2,178	3,319	14,686	12,446	1,453	31,314
NH	1,691	28	27	176	149	14	400
NJ	56,198	918	536	5,511	4,670	352	13,194
NM	147,991	2,432	2,187	15,205	12,885	1,163	34,963
NY	11,181	185	214	1,192	1,010	103	2,655
NC	339,988	5,609	6,104	35,895	30,420	3,003	80,623
ND	34,796	567	276	3,362	2,849	201	8,154
OH	11,252	185	186	1,173	994	94	2,664
OK	346,596	5,710	5,815	36,229	30,702	2,937	82,076
OR	2,669,755	43,613	25,910	262,198	222,202	16,847	626,941
PA	15,128	249	245	1,574	1,334	126	3,580
RI	93	2	2	10	8	1	22
SC	348,725	5,754	6,320	36,871	31,246	3,098	82,711
SD	171,300	2,788	1,114	16,334	13,842	913	40,073
TN	285,233	4,682	3,919	29,041	24,611	2,152	67,303
TX	614,250	10,105	9,577	63,555	53,860	4,982	145,255
UT	292,457	4,811	4,534	30,236	25,624	2,364	69,151
VT	1,105	18	20	117	99	10	262
VA	204,180	3,357	3,114	21,064	17,851	1,635	48,264
WA	956,533	15,611	8,524	93,263	79,037	5,804	224,411
WV	101,859	1,674	1,496	10,457	8,862	798	24,061

Table B-4a: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—EMF: Criteria Air Pollutants and Hazardous Air Pollutants

EMF 2007aq							
State	CO	NH_3	NO_X	PM_{10}	PM_{2_5}	SO_2	VOC
WI	45,056	742	744	4,699	3,982	378	10,666
WY	834,296	13,615	7,356	81,275	68,877	5,038	195,712
TOTAL	33,600,784	550,283	397,094	3,363,355	2,850,301	233,739	7,910,324

SMOKE (2007aq 15mar2010)							
State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
AL	14911.28574	8331.603694	4758.246455	60913.86069	915020.7648	17153.26416	7814.919543
AZ	2717.845926	1519.552239	863.3263477	11109.72025	166844.3353	3128.482771	1425.317134
AR	14980.17601	8584.183596	3908.625276	62760.5186	933831.1063	17673.28041	8051.835935
CA	40141.28	23047.81404	10288.77195	168506.7343	2505424.286	47451.27973	21618.5049
CO	701.8173809	393.5830014	218.0647019	2877.556629	43164.80155	810.3162288	369.1749938
CT	4.864712419	2.725279521	1.523243171	19.92501904	299.0021167	5.610864213	2.556271163
DE	18.82399243	10.53959153	5.918091403	77.05690901	1156.603432	21.69912435	9.885990534
FL	22635.32211	12984.75222	5849.445948	94933.86425	1411975.069	26733.25336	12179.50292
GA	27310.58008	15220.69448	8873.487277	111281.2426	1673234.765	31336.65502	14276.78395
ID	150630.8819	87584.3475	34142.85626	640344.3073	9476236.178	180320.2634	82152.81332
IL	531.1668012	300.365921	154.9252867	2196.029529	32838.3414	618.3990593	281.7387473
IN	236.5483243	131.7289023	77.27990935	963.0937743	14485.45198	271.2059447	123.5597493
IA	127.7645185	71.34488057	40.94462754	521.6153565	7837.158018	146.8861889	66.92045006
KS	1765.785537	972.4639237	621.1159008	7109.859819	107392.8176	2002.127292	912.1566301
KY	2655.370166	1496.730492	794.1837716	10942.86687	163834.0349	3081.497111	1403.910783
LA	26655.20611	15603.49476	5615.041047	114079.9661	1684017.895	32124.77097	14635.84428
ME	52.14685944	29.41515301	15.50698304	215.059443	3218.882457	60.56046142	27.59096459
MD	193.5865826	108.2207549	61.54928712	791.2213081	11883.09187	222.8068914	101.5094393
MA	21.33895366	11.91079879	6.859108675	87.08206242	1308.600387	24.52219165	11.17216038
MI	3590.041974	2085.104476	823.2045112	15244.57594	225695.5093	4292.852697	1955.797082
MN	9726.024083	5623.581569	2333.264614	41115.02059	609709.5133	11577.93621	5274.835629
MS	12343.57073	6964.106648	3665.290007	50915.84258	762032.1982	14337.83556	6532.228069
MO	4640.433103	2608.249633	1417.953026	19069.38633	285808.1217	5369.914164	2446.499231
MT	79298.43179	45824.98226	19126.75474	335034.72	4969409.057	94345.34086	42983.15141
NE	537.4270912	313.448214	117.9025688	2291.676578	33875.46406	645.3330715	294.0097227
NV	2171.707288	1178.811599	833.940834	8618.509672	130908.5877	2426.958783	1105.707932
NH	27.36986119	15.45578448	8.070153485	112.9999654	1690.610364	31.82064633	14.49728923
NJ	894.7103036	520.2883697	202.5593	3803.922396	56290.69729	1071.17968	488.0227192
NM	2389.808358	1358.192319	669.3676158	9929.989485	148207.4688	2796.271991	1273.963916
NY	182.4177796	101.7322472	58.99479874	743.7829118	11180.67076	209.4482884	95.42334825
NC	5530.19268	3099.756893	1724.8464	22662.88289	340023.2629	6381.838379	2907.52561
ND	550.6059602	322.4595433	115.3999453	2357.560166	34796.34965	663.8858515	302.4622017
OH	182.2779793	102.8249056	54.18382617	751.7714671	11251.9362	211.6978767	96.44822739
OK	5626.978411	3169.976442	1690.017057	23176.27081	347063.7071	6526.407783	2973.390545
OR	42513.94643	24706.90113	9688.682404	180636.6285	2673662.296	50867.03889	23174.70354
PA	245.9780586	138.9353448	72.400435	1015.781471	15196.14346	286.0427104	130.319262
RI	1.514798459	0.850162888	0.46799661	6.215695365	93.21035599	1.750333736	0.797440886
SC	5672.62728	3177.318435	1778.533771	23229.94932	348625.1548	6541.523561	2980.277169
SD	2700.067548	1591.2469	525.3221251	11633.89728	171313.6351	3276.089673	1492.565964
TN	4603.405333	2628.057025	1241.266968	19214.19946	286294.9649	5410.693752	2465.078193
TX	10103.29598	5722.501999	2909.137257	41838.24624	625247.7155	11781.59577	5367.62148
UT	4728.76979	2679.001184	1359.041298	19586.65962	292685.6665	5515.578176	2512.863058
VT	17.9899038	10.06423352	5.689935995	73.58139652	1104.771091	20.7204172	9.44009506
VA	3296.1179	1869.421808	938.8956682	13667.68052	204152.6631	3848.801149	1753.489702
WA	15258.76145	8898.15803	3352.977629	65056.04365	961692.5016	18319.69815	8346.339632
WV	1642.01122	933.592052	458.3158534	6825.660042	101859.1988	1922.097057	875.6953636

Table B-4b: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
WI	729.6207901	411.5419423	217.0686053	3008.85746	45035.86263	847.2903838	386.0201531
WY	13233.89685	7720.415302	2895.579483	56445.35076	834293.7816	15894.93816	7241.63396
TOTAL	538731.7924	310182.4477	134582.8003	2267799.244	33683203.9	638609.4612	290946.5061

SMOKE (2007aq 15mar2010)							
State	ETOH	FORM	HFLUX	HONO	IOLE	ISOP	MEOH
AL	231.4589761	11582.03666	25723956.88	0	1578.302887	1298.87164	0
AZ	42.2144464	2102.117781	7298532.912	0	287.8573762	236.8935316	0
AR	238.4758539	9667.841317	18786211.59	0	1626.150556	1338.248012	0
CA	640.2877199	25488.80993	75494571.31	0	4366.078504	3593.083604	0
CO	10.93408124	531.8301779	1268041.903	0	74.55867984	61.35843446	0
CT	0.07571026	3.712860931	5525.927391	0	0.516261893	0.424856516	0
DE	0.292795268	14.42087924	25400.12776	0	1.996592759	1.643094679	0
FL	360.7273131	14480.60016	35422859.97	0	2459.775263	2024.283045	0
GA	422.8436438	21570.94254	66402142.28	0	2883.342416	2372.859684	0
ID	2433.165664	85565.05923	183142774.6	0	16591.5905	13654.12335	0
IL	8.344421351	379.675779	607812.7186	0	56.90001248	46.82611775	0
IN	3.659546461	187.7897584	383305.3232	0	24.95416253	20.53612238	0
IA	1.982027825	99.63248808	170609.5029	0	13.51523551	11.12247956	0
KS	27.01586253	1501.680338	3252902.952	0	184.2193684	151.6042108	0
KY	41.58042327	1942.504428	3561956.373	0	283.5341294	233.3357305	0
LA	433.478204	14177.862	13996428.69	0	2955.858446	2432.537075	0
ME	0.817176017	37.94557968	56633.7018	0	5.57228679	4.585731422	0
MD	3.006464848	149.8565812	236100.6419	0	20.50088469	16.87130194	0
MA	0.330891657	16.68692143	25489.84541	0	2.256333204	1.856866606	0
MI	57.92595573	2060.672172	4742526.527	0	394.9931481	325.0614606	0
MN	156.2278151	5815.383982	14753264.75	0	1065.306955	876.6991571	0
MS	193.4687141	8969.971194	17273802.45	0	1319.250194	1085.682949	0
MO	72.45934564	3462.527068	6383108.842	0	494.0955586	406.6181379	0
MT	1273.056498	47646.94017	129058682.9	0	8680.88669	7143.974739	0
NE	8.707859672	296.4471204	365913.3611	0	59.37826721	48.86560599	0
NV	32.7483825	2005.012251	10621315.89	0	223.3089929	183.7732109	0
NH	0.429375624	19.76070148	27708.20144	0	2.927863753	2.409511748	0
NJ	14.45403681	507.6915724	1082627.446	0	98.56117997	81.11135549	0
NM	37.73173257	1645.764014	4940912.074	0	257.2900936	211.7380301	0
NY	2.82620751	143.4607956	289941.0632	0	19.27175426	15.85968607	0
NC	86.11382823	4205.481193	9982546.253	0	587.2045786	483.242591	0
ND	8.958198703	291.5396833	330336.1061	0	61.08534685	50.27046433	0
OH	2.856570796	132.5915308	193252.472	0	19.47872415	16.03008121	0
OK	88.06461694	4132.303705	9641647.876	0	600.5066307	494.1896199	0
OR	686.3785192	24267.73026	37943126.11	0	4680.36873	3851.730647	0
PA	3.859747342	177.3051421	250212.0784	0	26.31930748	21.65956307	0
RI	0.023618144	1.141867976	1676.580155	0	0.161049893	0.132535961	0
SC	88.26855714	4334.707581	8994156.533	0	601.8974354	495.3343057	0
SD	44.20618211	1338.049748	1673148.918	0	301.4390286	248.0706337	0
TN	73.00960344	3061.560556	5061678.636	0	497.8477397	409.7060241	0
TX	158.9759432	7136.707129	12746708.49	0	1084.046003	892.1205436	0
UT	74.42490576	3334.505996	12313297.67	0	507.4984267	417.6480586	0
VT	0.279594499	13.85878027	23808.26538	0	1.906537426	1.5689742	0
VA	51.93410035	2305.295402	3949739.7	0	354.1351914	291.4371878	0
WA	247.1983147	8429.12204	12663143.01	0	1685.628666	1387.195657	0
WV	25.93596091	1127.175772	1820733.421	0	176.8556395	145.5441318	0

Table B-4bi: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	ETOH	FORM	HFLUX	HONO	IOLE	ISOP	MEOH
WI	11.43299319	531.147742	1070574.284	0	77.9607231	64.15815722	0
WY	214.4796106	7282.45173	15858116.94	0	1462.521992	1203.589083	0
TOTAL	8617.128011	334177.3123	759918964.1	0	58759.61234	48356.48699	0

SMOKE (2007aq 15mar2010)							
State	NH_3	NO	NO_2	NO_X	NVOL	OLE	PAR
AL	15107.43904	15387.89605	1709.766393	17097.66244	0	24123.13964	53063.86564
AZ	2754.217494	2784.133945	309.3482108	3093.482156	0	4399.677375	9677.03146
AR	15312.96255	10836.71725	1204.079762	12040.79702	0	24854.45401	54457.46878
CA	41061.80742	28048.32391	3116.480687	31164.8046	0	66732.14014	146169.2581
CO	711.9675954	693.2118043	77.02353954	770.2353439	0	1139.571485	2505.271805
CT	4.933252203	4.869218539	0.541029133	5.410247672	0	7.890719258	17.35009103
DE	19.08544352	18.95683383	2.106309011	21.06314284	0	30.51612147	67.10466831
FL	23146.9771	16079.96132	1786.662507	17866.62383	0	37595.76072	82360.76139
GA	27645.16464	29029.77854	3225.53122	32255.30976	0	44069.66082	96979.50062
ID	154780.6752	81667.48774	9074.16722	90741.65496	0	253589.5878	554387.4974
IL	540.4228744	470.9777986	52.33089068	523.3086893	0	869.6728064	1909.430572
IN	239.3805064	253.7246235	28.19164473	281.9162683	0	381.4049092	839.422755
IA	129.4179791	132.8520068	14.76131905	147.6133259	0	206.5703928	454.4376179
KS	1780.035446	2127.136013	236.3484763	2363.48449	0	2815.650347	6207.833518
KY	2698.578255	2458.556813	273.1730373	2731.72985	0	4333.600139	9519.538774
LA	27455.98273	12196.28827	1355.14323	13551.4315	0	45178.01071	98665.12494
ME	53.00929755	47.82942266	5.314371732	53.1437944	0	85.16795967	187.065009
MD	196.1681418	198.563571	22.0626194	220.6261904	0	313.3398794	689.2007893
MA	21.61194277	22.29767913	2.47752663	24.77520576	0	34.48628045	75.87203663
MI	3687.469654	1994.267381	221.5852965	2215.852677	0	6037.164659	13200.44887
MN	9973.923484	5959.104849	662.1228515	6621.227701	0	16282.39284	35626.42515
MS	12548.54958	11287.20442	1254.133862	12541.33828	0	20163.71905	44286.78604
MO	4711.261341	4455.618383	495.0687265	4950.68711	0	7551.868415	16596.40291
MT	81303.56327	49105.0519	5456.117841	54561.16974	0	132680.623	290334.2697
NE	552.8419553	270.4234797	30.04705875	300.4705385	0	907.5509701	1983.122878
NV	2178.333263	2987.547439	331.9495819	3319.497021	0	3413.105633	7542.612526
NH	27.83326047	24.74421173	2.749360144	27.49357188	0	44.75031064	98.27385255
NJ	919.39606	483.7037067	53.74484458	537.4485513	0	1506.431373	3293.241786
NM	2435.764754	1972.748816	219.1943372	2191.943154	0	3932.479682	8627.302592
NY	184.6954125	192.5147651	21.39055143	213.9053166	0	294.5532664	648.1248781
NC	5609.150127	5495.645773	610.6273624	6106.273136	0	8974.966985	19732.4718
ND	567.2390499	248.4953902	27.61058555	276.1059758	0	933.6421428	2038.860598
OH	185.2957724	167.022932	18.55810556	185.5810376	0	297.7169741	653.9078213
OK	5717.442662	5245.709317	582.8565919	5828.565909	0	9178.279507	20163.4836
OR	43677.02905	23349.70042	2594.411256	25944.11168	0	71535.81155	156401.0621
PA	250.1625078	221.5762699	24.61958511	246.195855	0	402.2703019	883.3739734
RI	1.537121866	1.482769005	0.164754422	1.647523427	0	2.461544944	5.410880052
SC	5752.177659	5686.833745	631.8704493	6318.704195	0	9199.536795	20228.49211
SD	2787.950249	1003.36755	111.4852944	1114.852845	0	4607.261786	10051.65376
TN	4699.418417	3542.618954	393.6243683	3936.243323	0	7609.217574	16681.87201
TX	10285.22993	8758.017544	973.1131069	9731.130651	0	16568.80467	36368.83909
UT	4814.324923	4085.17494	453.908354	4539.083294	0	7756.719767	17025.52578
VT	18.2344955	18.30771452	2.034188925	20.34190345	0	29.13975662	64.08640731
VA	3357.05886	2803.016968	311.4463475	3114.463316	0	5412.682182	11878.45991
WA	15695.57404	7719.322847	857.7026232	8577.02547	0	25763.52905	56298.12205
WV	1673.834829	1346.451993	149.6057833	1496.057776	0	2703.101593	5929.833233

Table B-4bii: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	NH_3	NO	NO_2	NO_X	NVOL	OLE	PAR
WI	741.672438	669.7105999	74.41231258	744.1229125	0	1191.569362	2617.216776
WY	13614.68632	6620.502035	735.611358	7356.113393	0	22353.5177	48843.66906
TOTAL	551631.4874	358175.4499	39797.27673	397972.7267	0	898095.1707	1966336.388

SMOKE (2007aq 15mar2010)							
State	PEC	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC
AL	8979.312207	97203.19188	82375.58437	14827.60752	19736.72958	865.5305275	52635.54995
AZ	1506.382666	17702.4515	15002.0777	2700.373796	4464.568253	73.4780024	8831.210977
AR	8731.889198	94371.49337	79975.84644	14395.64693	19066.19249	849.5589249	51185.07764
CA	21157.55097	252176.0872	213708.5532	38467.53407	65632.49779	850.0531103	124039.2695
CO	407.3366292	4552.983396	3858.46105	694.522346	1013.924335	31.88998564	2387.855875
CT	2.927510045	31.60526358	26.7841735	4.821090075	6.363919377	0.286590717	17.16062027
DE	11.33540535	122.3767615	103.7091038	18.66765775	24.6412832	1.10968755	66.44642195
FL	12574.93333	142388.9087	120668.581	21720.32767	32816.32164	890.2549468	73717.06232
GA	15629.86951	178632.8181	151383.7548	27249.06332	42154.31196	1021.616959	91626.95886
ID	75725.50448	929571.931	787772.7843	141799.1467	257226.4319	1654.628822	443971.4153
IL	315.6546822	3407.799985	2887.965782	519.8342031	686.1806904	30.90123591	1850.319631
IN	140.9831191	1548.842799	1312.578445	236.2643536	328.6201892	12.4245855	826.4406504
IA	77.21323732	833.5924294	706.4339724	127.158457	167.8487169	7.558843676	452.6122373
KS	1073.528754	11727.03587	9938.157127	1788.878746	2447.111351	98.04026404	6292.959714
KY	1571.08846	17109.83871	14499.86245	2609.976259	3537.956913	146.175063	9209.586836
LA	15088.48458	162894.8824	138046.5137	24848.36868	32799.85221	1477.09776	88446.40006
ME	31.09398436	335.6898634	284.4829262	51.20693717	67.59314418	3.043967438	182.2682095
MD	116.7023261	1261.083801	1068.715042	192.3687582	254.6572931	11.36459708	684.0920819
MA	12.90315702	139.3020706	118.0526669	21.2494037	28.04931497	1.263163633	75.63634176
MI	1837.928973	22188.42144	18803.74669	3384.674751	5934.683905	59.33816511	10775.32979
MN	5131.432261	60508.58309	51278.46028	9230.122801	15378.55938	239.7176534	30083.31325
MS	7350.737996	79435.03778	67317.82862	12117.20915	16042.6495	715.6652689	43088.96032
MO	2774.967311	30013.44766	25435.1321	4578.315559	6077.763985	268.8314446	16266.47465
MT	40222.47547	493703.8824	418393.1193	75310.76309	136588.4561	881.3790144	235820.3742
NE	273.9298324	3301.661837	2798.017674	503.6441629	880.0900176	9.119435473	1605.980163
NV	1205.383699	14686.48022	12446.17338	2240.306838	4003.348262	32.00438553	7066.964653
NH	16.29646456	175.9361947	149.0984759	26.83771877	35.42579816	1.595353759	95.52739188
NJ	479.4198771	5520.43172	4678.332221	842.0994992	1327.044181	29.22028451	2810.531647
NM	1285.889793	15228.52162	12905.5285	2322.993117	3907.973044	56.69796608	7538.649151
NY	110.332673	1192.1842	1010.325845	181.8583547	240.7010391	10.74785904	646.7540965
NC	3247.786081	35900.0631	30423.78561	5476.277489	7752.044828	274.9221691	19038.62331
ND	278.5903808	3362.362525	2849.459687	512.9028382	898.8067827	9.041827654	1633.306765
OH	108.6757518	1173.2703	994.2968965	178.9734036	236.2510597	10.63838677	637.0407079
OK	3347.697392	36282.47799	30747.8668	5534.611187	7393.74455	320.4869368	19623.79246
OR	23568.74089	262578.3367	222524.0158	40054.32091	57955.36797	1889.377203	138162.1575
PA	145.6711495	1580.581076	1339.475437	241.105639	323.2106698	13.85355869	853.9077132
RI	0.909385517	9.81768647	8.320087413	1.497599056	1.976852682	0.089024951	5.330680071
SC	3413.906886	36860.01561	31237.30653	5622.709083	7424.21753	334.0231952	20011.80503
SD	1326.372114	16335.63398	13843.75623	2491.877752	4549.84045	26.22177386	7776.427933
TN	2683.033376	29151.10366	24704.32642	4446.777247	5985.508319	253.1413697	15727.66464
TX	5985.843471	64677.20823	54811.20791	9866.000327	13057.04099	583.2018029	35088.14132
UT	2505.470018	30261.71279	25645.52033	4616.19246	8102.075916	80.15006598	14688.97149
VT	10.84583619	117.0913192	99.22997011	17.86134912	23.57704129	1.061760501	63.57664148
VA	1941.653576	21061.90631	17849.07441	3212.831909	4303.380145	184.9466673	11381.74857
WA	8059.950809	93745.0087	79468.62639	14276.38231	23107.04635	441.6948639	47251.01294
WV	961.4358383	10456.87825	8861.762347	1595.115901	2153.849916	90.15034021	5635.845443

Table B-4biii: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)							
State	PEC	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC
WI	427.8315013	4697.205696	3980.682929	716.5227664	994.7961498	37.85599178	2507.938853
WY	6767.679461	81274.92551	68877.05563	12397.86988	21499.11782	240.4933341	39676.95553
TOTAL	288625.5825	3371492.103	2857220.431	514271.672	838638.4016	15121.94414	1692061.43

SMOKE (2007aq 15mar2010)								
State	PSO_4	SO_2	SULF	TERP	TOL	UNK	UNR	XYL
AL	158.462105	8286.759535	0	2830.334067	9155.889384	0	61209.78277	2000.777032
AZ	126.4378062	1503.636309	0	516.2079597	1669.888667	0	11156.22807	364.9099563
AR	143.1281856	6803.324712	0	2916.138221	9433.458423	0	61417.75052	2061.432329
CA	2029.18181	17904.37878	0	7829.587545	25328.0472	0	164560.7542	5534.773233
CO	17.45422495	379.8097976	0	133.7043544	432.5221067	0	2880.405742	94.51622067
CT	0.045533094	2.653814602	0	0.925818271	2.994907755	0	19.96679773	0.654449969
DE	0.176305704	10.30686107	0	3.580411348	11.58234666	0	77.26355837	2.531016322
FL	670.0087547	10183.01646	0	4411.057858	14269.39573	0	92798.4966	3118.198351
GA	950.9975385	15456.15176	0	5170.631329	16726.5513	0	112121.6344	3655.144576
ID	9194.803845	59422.77918	0	29753.31673	96249.46946	0	617133.3754	21032.7656
IL	4.909542343	269.7852537	0	102.0374894	330.0825998	0	2179.151399	72.13080951
IN	4.109901123	134.6248291	0	44.74967413	144.7615177	0	971.1684959	31.63382023
IA	1.200937273	71.33441474	0	24.23658666	78.40334186	0	524.4793067	17.1329505
KS	26.51704522	1081.681078	0	330.3563205	1068.674605	0	7253.373633	233.5305107
KY	35.05517695	1382.954939	0	508.4552138	1644.80916	0	10895.54541	359.4294184
LA	234.6790868	9772.8223	0	5300.672657	17147.22334	0	109169.6041	3747.071342
ME	0.483620805	27.0100473	0	9.992654556	32.32532688	0	213.9619218	7.063865161
MD	1.898744214	107.1844735	0	36.76372624	118.9275229	0	794.6398589	25.98845962
MA	0.200689529	11.9500064	0	4.04624305	13.08918838	0	87.59916537	2.860317231
MI	196.4658572	1431.98536	0	708.33206	2291.39398	0	14709.19324	500.7233834
MN	445.4377324	4062.690364	0	1910.390322	6179.949807	0	39858.51991	1350.464235
MS	119.8155428	6382.122971	0	2365.780847	7653.099102	0	50646.00741	1672.382096
MO	47.09470685	2469.18657	0	886.0501259	2866.296465	0	19043.25961	626.3531064
MT	4880.434438	33294.77045	0	15567.23304	50358.67212	0	324984.2316	11004.55237
NE	28.89822582	205.1117312	0	106.48166	344.4591342	0	2201.499865	75.27239784
NV	138.4723837	1452.629658	0	400.4550103	1295.437733	0	8926.804294	283.0833517
NH	0.25346754	14.05815131	0	5.25048711	16.98492614	0	112.2943415	3.711620345
NJ	32.1162313	352.5012901	0	176.74748	571.7630366	0	3665.602697	124.9436432
NM	116.3185473	1165.663248	0	461.3923909	1492.564749	0	9801.991927	326.160522
NY	1.790177704	102.781516	0	34.5596655	111.7972446	0	748.8795236	24.43038254
NC	110.4092261	3003.77082	0	1053.020303	3406.43075	0	22697.63223	744.3851637
ND	29.71393096	200.7402853	0	109.5429245	354.3620185	0	2255.022839	77.43640378
OH	1.690990272	94.35869738	0	34.93067667	112.9979061	0	747.8964922	24.692721
OK	62.14546082	2942.384816	0	1076.874646	3483.597411	0	23089.28987	761.2479396
OR	948.3721434	16870.31564	0	8393.196554	27151.27369	0	174183.9078	5933.191432
PA	2.832346126	126.0777279	0	47.19777492	152.6807933	0	1009.199807	33.36435324
RI	0.014144193	0.815350342	0	0.288812183	0.934274928	0	6.216816526	0.204154897
SC	53.35388857	3097.480702	0	1079.368755	3491.665878	0	23283.02249	763.0109783
SD	164.8939568	913.5395937	0	540.5635849	1748.677021	0	11054.72167	382.1269973
TN	54.97871665	2160.61686	0	892.7788878	2888.063332	0	18877.1105	631.1096328
TX	96.98031755	5065.589272	0	1943.994593	6288.65672	0	41446.28985	1374.219285
UT	268.8528441	2366.31692	0	910.0851575	2944.04768	0	19398.39837	643.343617
VT	0.168690653	9.913076076	0	3.418903492	11.05990149	0	73.84294888	2.416844864
VA	37.34544752	1634.758283	0	635.0623463	2054.372582	0	13520.6404	448.9287167
WA	608.9214299	5837.280343	0	3022.798651	9778.49621	0	62505.99857	2136.831213
WV	20.48081029	797.9467956	0	317.1512158	1025.956945	0	6734.70485	224.195616

Table B-4biv: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq 15mar2010)								
State	PSO_4	SO_2	SULF	TERP	TOL	UNK	UNR	XYL
WI	12.26043312	378.0787564	0	139.8051897	452.2577731	0	2993.689648	98.82893081
WY	692.8094931	5038.103941	0	2622.706745	8484.233148	0	54210.26643	1854.00424
TOTAL	22773.07243	234283.7537	0	105372.2537	340870.2785	0	2208251.317	74488.15961

SMOKE (2007aq 15mar2010)						
State	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}
AL	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
AZ	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
AR	0.4%	0.7%	0.6%	0.7%	0.7%	0.7%
CA	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
CO	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
CT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
GA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ID	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
KS	0.3%	0.2%	0.3%	0.2%	0.3%	0.3%
KY	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
LA	2.5%	2.3%	2.4%	2.3%	2.3%	2.3%
ME	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MD	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
MA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MI	0.4%	0.2%	0.3%	0.2%	0.2%	0.2%
MN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MS	0.7%	1.1%	0.9%	1.1%	1.0%	1.0%
MO	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NE	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
NV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%
NM	0.2%	0.1%	0.2%	0.1%	0.2%	0.2%
NY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ND	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OK	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%
OR	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
PA	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
RI	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SD	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TN	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
TX	1.6%	1.8%	1.7%	1.8%	1.7%	1.7%
UT	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
VT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WA	0.6%	0.5%	0.6%	0.5%	0.5%	0.5%
WV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table B-4c: Point Source Day—Specific Wild Fire and Prescribed Fire Emissions—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq 15mar2010)						
State	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}
WI	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
WY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL						

Pre-SMOKE (Allan)						
Stid	CO	NH_3	NOx	PM_{10}	PM_{25}	SO_2
Aguascalientes	48		314	525	332	1,700
Alberta	478929.0826	11580.10221	613091.5301	24260.87788	16059.64714	464052.1738
Baja Calif Norte	873		6,278	5,178	4,244	29,327
Baja Calif Sur	956		5,270	1,222	932	20,884
British Columbia	321702.2726	1812.85	85621.22371	26201.52959	13804.72395	85916.08421
Campeche	15,285		25,396	4,139	2,804	166,332
Chiapas	2,120		2,843	4,700	2,385	100,185
Chihuahua	15,236		19,989	7,982	6,908	71,857
Coahuila	19,900		142,733	29,337	28,316	182,347
Colima	2,345		17,034	11,586	8,036	211,110
Distrito Federal	1,360		1,709	1,150	881	2,916
Durango	755		4,828	2,056	1,501	27,382
Guanajuato	2,419		16,285	5,745	4,337	122,802
Guerrero	1,746		16,328	9,603	6,926	206,388
Gulf of Mexico	89,813		82,581	839	837	1,961
Hidalgo	7,996		41,705	20,792	14,354	393,488
Jalisco	4,702		5,139	6,920	3,677	20,105
Manitoba	6976.035001	1385.83	7120.970616	6305.76101	3388.909611	428646.6618
Mexico	5,200		14,138	3,466	2,726	13,578
Michoacan	1,600		14,827	7,006	4,036	30,551
Morelos	1,312		2,958	4,070	2,011	13,596
Nayarit	1,307		649	2,226	728	1,430
New Brunswick	30656.56	244.12	24566.11	4403.401102	2645.85	56831.02
Newfoundland	13768.54637	4.21	19178.31331	6841.98	3607.08	26033.3111
Nova Scotia	5926.89	50.65	37435.9	3367.02	1751.48	129755.57
Nuevo Leon	24,380		22,647	11,741	10,386	90,401
Oaxaca	1,974		6,651	6,891	3,747	65,388
Ontario	173086.3699	6881.533228	129435.3909	31135.70618	19302.85083	475690.6736
Prince Edward Island	63.98	8.81	397.5	177.26	74.88	1130.58
Puebla	1,582		3,843	9,003	7,158	15,397
Quebec	396891.4722	937.2633069	57162.1711	20132.38772	13299.37661	183804.0976
Queretaro	721		2,424	2,359	1,750	3,358
Quintana Roo	792		1,829	1,038	520	1,129
San Luis Potosi	3,536		10,115	10,152	6,267	91,941
Saskatchewan	44419.41722	921.4533069	70271.89399	7718.866836	4302.34071	132647.0102
Sinaloa	2,204		11,326	8,683	5,087	113,387
Sonora	3,469		14,291	34,040	16,245	173,368
Tabasco	25,331		9,910	20,072	11,087	160,336
Tamaulipas	12,940		16,787	6,936	4,701	167,404
Tlaxcala	119		548	292	169	3,199
Veracruz	22,158		51,580	86,149	55,034	371,159
Yucatan	348		3,665	2,063	1,673	30,801
Zacatecas	88		708	555	312	21
Canada	858,707	13,393	919,965	115,757	84,370	1,334,926

Table B-5a: Point Source Emissions from Canada, Mexico, and Offshore Sources—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

Pre-SMOKE (Allan)						
Stid	CO	NH_3	NOx	PM_{10}	PM_{25}	SO_2
Mexico	888,279	10,434	701,328	342,781	213,641	3,553,108
TOTAL	1,747,033	23,827	1,621,607	459,062	298,343	4,889,733
US offshore	89,813	0	82,581	839	837	1,961

Pre-SMOKE (Allan)							
Stid	VOC	ALD2	ALDX	ETH	ETOH	FORM	IOLE
Aguascalientes	2,312						
Alberta	219007.972	28.19666813	44.52436646	129.8738587	28.49716515	42.78422701	14.28833144
Baja Calif Norte	18,353						
Baja Calif Sur	815						
British Columbia	27057.64703	1.495919965	2.710833694	132.7033391	19.29517694	22.3255733	25.22993975
Campeche	3,421						
Chiapas	2,206						
Chihuahua	3,189						
Coahuila	6,199						
Colima	3,761						
Distrito Federal	14,268						
Durango	17,512						
Guanajuato	10,631						
Guerrero	3,378						
Gulf of Mexico	51,241						
Hidalgo	3,599						
Jalisco	11,501						
Manitoba	9435.524363	0.483191619	1.30971413	17.49741117	4.286515619	22.53821525	4.227992376
Mexico	16,648						
Michoacan	2,887						
Morelos	4,151						
Nayarit	942						
New Brunswick	0		0.345719618	19.67166607	12.55102012	26.75744169	0.048475837
Newfoundland	31678.34	0.020877199	0.432447653	13.24816795	2.920694543	0.787005823	0.159306714
Nova Scotia	344.61	0.043603629	0.356084401	11.05055108	8.369048354	6.750405398	0.165419505
Nuevo Leon	24,624						
Oaxaca	7,042						
Ontario	1718.71	12.15761754	5.966728478	121.5095733	80.35978507	49.86584654	1.527611303
Prince Edward Island	0		0.080082836	0.05	0.03	0.000972601	0.005478435
Puebla	6,020						
Quebec	0	1.204874379	0.981697707	45.66824211	31.45126041	72.76975527	0.905304192
Queretaro	1,523						
Quintana Roo	699						
San Luis Potosi	3,157						
Saskatchewan	233612.0935	0.010433534	2.046563472	16.05258161	1.403147182	8.609930803	1.627960776
Sinaloa	1,641						
Sonora	1,783						
Tabasco	24,119						
Tamaulipas	29,598						
Tlaxcala	588						
Veracruz	44,748						
Yucatan	1,873						
Zacatecas	52						
Canada	298,277	30	47	263	48	65	40

Table B-5ai: Point Source Emissions from Canada, Mexico, and Offshore Sources—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

Pre-SMOKE (Allan)							
Stid	VOC	ALD2	ALDX	ETH	ETOH	FORM	IOLE
Mexico	546,745	14	12	245	141	188	9
TOTAL	847,335	44	59	507	189	253	48
US offshore	51,241						

Pre-SMOKE (Allan)					
Stid	ISOP	MEOH	NVOL	OLE	PAR
Aguascalientes					
Alberta	4.331484044	32.95241587	18.18275263	145.0967523	2394.869478
Baja Calif Norte					
Baja Calif Sur					
British Columbia	0.216511236	12.87604814	0.972580178	54.37331583	1020.858976
Campeche					
Chiapas					
Chihuahua					
Coahuila					
Colima					
Distrito Federal					
Durango					
Guanajuato					
Guerrero					
Gulf of Mexico					
Hidalgo					
Jalisco					
Manitoba	0.063217252	2.450018782	0.282575234	11.00003604	412.1442033
Mexico					
Michoacan					
Morelos					
Nayarit					
New Brunswick		7.31218E-07		3.11877758	140.3332247
Newfoundland	0.000135112	0.020863877	0.000442583	2.707968425	86.05829222
Nova Scotia	0.000359731	0.02231493	0.004464963	2.532460981	189.0573201
Nuevo Leon					
Oaxaca					
Ontario	0.176693058	36.45553242	6.809090242	95.29679901	1795.876859
Prince Edward Island		0.18		0.114237551	6.71
Puebla					
Quebec	0.060058239	3.709053575	2.425897528	42.24328577	829.6827375
Queretaro					
Quintana Roo					
San Luis Potosi					
Saskatchewan	0.001051419	0.00527941	0.002611104	14.57837716	368.4185469
Sinaloa					
Sonora					
Tabasco					
Tamaulipas					
Tlaxcala					
Veracruz					
Yucatan					
Zacatecas					
Canada	5	46	19	199	3,416

Table B-5aii: Point Source Emissions from Canada, Mexico, and Offshore Sources—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

Pre-SMOKE (Allan)					
Stid	ISOP	MEOH	NVOL	OLE	PAR
Mexico	0	43	10	172	3,828
TOTAL	5	89	29	371	7,244
US offshore					

Pre-SMOKE (Allan)				
Stid	TERP	TOL	UNR	XYL
Aguascalientes				
Alberta	15.19219884	55.95125316	610.2578566	40.95696186
Baja Calif Norte				
Baja Calif Sur				
British Columbia	24.08259096	14.99787332	137.4039866	5.152657342
Campeche				
Chiapas				
Chihuahua				
Coahuila				
Colima				
Distrito Federal				
Durango				
Guanajuato				
Guerrero				
Gulf of Mexico				
Hidalgo				
Jalisco				
Manitoba	0.402298099	7.673664551	56.01108146	11.0039181
Mexico				
Michoacan				
Morelos				
Nayarit				
New Brunswick	0.157623646	1.114701494	59.90735843	1.822331226
Newfoundland	0.222099897	1.255034493	34.49472367	2.003681033
Nova Scotia	0.144368236	1.896205038	49.6322821	2.095318987
Nuevo Leon				
Oaxaca				
Ontario	15.64315055	66.05255918	626.0083492	29.20836864
Prince Edward Island	0.040065593	0.29	1.19	0.343533699
Puebla				
Quebec	46.62775448	15.39145915	169.9603805	9.717589219
Queretaro				
Quintana Roo				
San Luis Potosi				
Saskatchewan	0.958735831	5.494097744	51.82751733	4.743113056
Sinaloa				
Sonora				
Tabasco				
Tamaulipas				
Tlaxcala				
Veracruz				
Yucatan				
Zacatecas				
Canada	39	71	748	46

Table B-5aiii: Point Source Emissions from Canada, Mexico, and Offshore Sources—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

Pre-SMOKE (Allan)				
Stid	TERP	TOL	UNR	XYL
Mexico	64	99	1,049	61
TOTAL	103	170	1,797	107
US offshore				

SMOKE (2007aq 15mar2010)								
State	ALD2	ALDX	BENZENE	CH4	CO	ETH	ETHA	ETOH
Aguascalientes	0	0	0	0	0	0	0	0
Alberta	4	377	14,297	146,768	362,184	1,488	21,153	9
Baja Calif Norte	293	329	474	1,141	873	608	233	373
Baja Calif Sur	5	0	20	339	942	61	17	0
British Columbia	1	2	0	40	119,731	86	6	15
Campeche	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0
Chihuahua	50	41	88	145	15,236	74	127	42
Coahuila	75	76	118	437	19,900	134	214	51
Colima	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0
Durango	28	1	20	59	707	2	22	2
Guanajuato	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0
Gulf of Mexico	0	0	129	41,528	89,800	138	6,262	0
Hidalgo	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0
Manitoba	0	21	731	9,040	6,986	18	1,260	4
Mexico	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0
New Brunswick	0	0	0	0	30,657	20	0	13
Newfoundland	0	0	0	0	8,485	9	0	3
Nova Scotia	0	0	7	304	5,927	40	44	8
Nuevo Leon	72	49	209	3,907	24,380	81	67	72
Nunavut	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0
Ontario	12	6	6	3,374	173,145	122	437	80
Prince Edward Island	0	0	0	0	64	0	0	0
Puebla	0	0	0	0	0	0	0	0
Quebec	1	1	0	0	396,209	46	0	31
Queretaro	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0
Saskatchewan	0	493	18,837	204,464	44,413	184	28,872	1
Sinaloa	12	1	189	382	1,551	187	51	158
Sonora	33	18	41	63	3,469	32	48	13
Tabasco	0	0	0	0	0	0	0	0
Tamaulipas	14	13	22	46	1,365	23	22	9
Tlaxcala	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0
Zacatecas	0	0	0	0	0	0	0	0

Table B-5b: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)								
State	ALD2	ALDX	BENZENE	CH4	CO	ETH	ETHA	ETOH
Canada Total	19	901	33,877	363,989	1,147,801	2,014	51,774	166
Mexico Total	581	528	1,182	6,519	68,422	1,203	802	719
TOTAL	601	1,428	35,188	412,036	1,306,023	3,354	58,837	885
US offshore	0	0	129	41,528	89,800	138	6,262	0

SMOKE (2007aq 15mar2010)									
State	FORM	HONO	IOLE	ISOP	MEOH	NH_3	NO	NO_2	NO_x
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	12	0	25	1	5	8,979	457,264	50,807	508,071
Baja Calif Norte	251	0	143	63	218	0	5,650	628	6,278
Baja Calif Sur	278	0	12	0	0	0	4,691	521	5,212
British Columbia	17	0	16	0	12	1,722	21,070	2,341	23,411
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	38	0	50	8	28	0	17,990	1,999	19,989
Coahuila	483	0	49	15	51	0	128,457	14,273	142,730
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	220	0	64	1	1	0	3,941	438	4,379
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Gulf of Mexico	1,721	0	0	0	0	0	74,314	8,257	82,571
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	23	0	5	0	2	1,386	6,405	712	7,116
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	27	0	0	0	0	244	22,118	2,458	24,575
Newfoundland	0	0	0	0	0	0	6,564	729	7,293
Nova Scotia	7	0	0	0	0	51	33,695	3,744	37,439
Nuevo Leon	12,593	0	102	9	28	0	20,382	2,265	22,647
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	50	0	2	0	37	6,892	116,525	12,947	129,473
Prince Edward Island	0	0	0	0	0	9	358	40	397
Puebla	0	0	0	0	0	0	0	0	0
Quebec	73	0	1	0	4	937	47,986	5,332	53,317
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0	0
Saskatchewan	14	0	30	0	0	918	63,116	7,013	70,129
Sinaloa	49	0	27	0	0	0	3,751	417	4,168
Sonora	21	0	48	4	12	0	12,862	1,429	14,291
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	11	0	11	3	9	0	4,059	451	4,509
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	0	0	0	0	0	0	0	0	0

Table B-5bi: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)									
State	FORM	HONO	IOLE	ISOP	MEOH	NH_3	NO	NO_2	NO_x
Canada Total	223	0	78	1	61	21,138	775,101	86,122	861,223
Mexico Total	13,943	0	507	104	346	0	201,782	22,420	224,202
TOTAL	15,887	0	585	105	407	21,138	1,051,197	116,800	1,167,996
US offshore	1,721	0	0	0	0	0	74,314	8,257	82,571

SMOKE (2007aq 15mar2010)									
State	NVOL	OLE	PAR	PEC	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	3	6,437	158,591	2,498	17,231	11,214	6,016	6,491	67
Baja Calif Norte	130	957	8,316	44	5,178	4,243	934	3,062	8
Baja Calif Sur	0	61	501	153	1,219	931	288	451	3
British Columbia	1	36	762	209	21,770	10,389	11,381	8,830	0
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	8	140	2,024	672	8,015	6,908	1,107	4,485	51
Coahuila	14	786	3,154	207	29,337	28,315	1,022	17,695	97
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	1	21	1,617	11	1,413	1,032	381	651	1
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Gulf of Mexico	0	120	51,290	397	839	837	3	235	9
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	0	282	8,798	113	6,352	3,391	2,961	2,810	3
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	0	3	141	53	4,410	2,649	1,760	2,252	0
Newfoundland	0	1	13	37	4,906	1,843	3,062	1,567	0
Nova Scotia	0	28	463	52	3,368	1,752	1,616	1,465	1
Nuevo Leon	9	285	17,899	160	11,741	10,386	1,355	7,856	24
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	7	96	3,554	424	31,305	19,315	11,990	16,377	0
Prince Edward Island	0	0	7	1	177	75	102	64	0
Puebla	0	0	0	0	0	0	0	0	0
Quebec	2	42	833	264	20,024	13,186	6,837	11,208	0
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0	0
Saskatchewan	0	7,020	206,676	643	7,712	4,298	3,414	2,794	28
Sinaloa	0	24	675	109	3,904	2,202	1,702	1,227	2
Sonora	4	64	1,328	172	34,042	16,244	17,797	14,439	41
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	2	39	440	30	2,298	2,002	295	1,646	4
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	0	0	0	0	0	0	0	0	0

Table B-5bii: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)									
State	NVOL	OLE	PAR	PEC	PM_{10}	$PM_{2.5}$	PMC	PMFINE	PNO_3
Canada Total	13	13,945	379,837	4,294	117,254	68,114	49,140	53,858	98
Mexico Total	168	2,377	35,954	1,558	97,146	72,264	24,882	51,512	230
TOTAL	181	16,442	467,081	6,248	215,240	141,215	74,025	105,606	337
US offshore	0	120	51,290	397	839	837	3	235	9

SMOKE (2007aq 15mar2010)								
State	POC	PSO_4	SO_2	SULF	TERP	TOL	UNK	UNR
Aguascalientes	0	0	0	0	0	0	0	0
Alberta	1,097	1,062	323,873	0	634	4,963	0	54,622
Baja Calif Norte	328	802	29,326	592	109	1,733	0	3,157
Baja Calif Sur	59	266	20,775	255	0	18	0	71
British Columbia	104	1,247	24,649	0	18	14	0	113
Campeche	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0
Chihuahua	1,152	548	71,856	961	13	271	0	554
Coahuila	3,150	7,166	182,343	3,841	25	708	0	1,047
Colima	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0
Durango	17	352	21,710	336	0	61	0	88
Guanajuato	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0
Gulf of Mexico	160	35	1,961	0	0	2	0	9,813
Hidalgo	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0
Manitoba	63	403	428,763	0	33	265	0	2,925
Mexico	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0
New Brunswick	26	318	56,832	0	0	1	0	60
Newfoundland	18	221	5,493	0	0	0	0	19
Nova Scotia	25	208	129,766	0	0	2	0	122
Nuevo Leon	860	1,486	90,400	1,052	25	865	0	947
Nunavut	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0
Ontario	202	2,312	475,704	0	16	66	0	1,028
Prince Edward Island	1	9	1,131	0	0	0	0	1
Puebla	0	0	0	0	0	0	0	0
Quebec	132	1,582	183,796	0	47	15	0	170
Queretaro	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0
Saskatchewan	374	459	132,334	0	831	6,723	0	71,610
Sinaloa	252	613	40,110	533	0	19	0	339
Sonora	294	1,299	173,365	2,944	6	109	0	244
Tabasco	0	0	0	0	0	0	0	0
Tamaulipas	98	223	19,925	425	4	54	0	141
Tlaxcala	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0
Zacatecas	0	0	0	0	0	0	0	0

Table B-5biii: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)								
State	POC	PSO_4	SO_2	SULF	TERP	TOL	UNK	UNR
Canada Total	2,043	7,821	1,762,340	0	1,579	12,050	0	130,669
Mexico Total	6,209	12,755	649,810	10,938	182	3,839	0	6,588
TOTAL	8,412	20,611	2,414,111	10,938	1,761	15,891	0	147,070
US offshore	160	35	1,961	0	0	2	0	9,813

SMOKE (2007aq 15mar2010)									
State	XYL	VOC approx	VOC	NOX	CO	SO_2	NH_3	PM_{10}	PM_{25}
Aguascalientes	0								
Alberta	2,270			-20.7%	-32.2%	-43.3%	-29.0%	-40.8%	-43.2%
Baja Calif Norte	2,750			0.0%	0.0%	0.0%		0.0%	0.0%
Baja Calif Sur	15			-1.1%	-1.5%	-0.5%		-0.3%	-0.1%
British Columbia	5			-265.7%	-168.7%	-248.6%	-5.2%	-20.4%	-32.9%
Campeche	0								
Chiapas	0								
Chihuahua	228			0.0%	0.0%	0.0%		0.4%	0.0%
Coahuila	217			0.0%	0.0%	0.0%		0.0%	0.0%
Colima	0								
Distrito Federal	0								
Durango	47			-10.3%	-6.8%	-26.1%		-45.5%	-45.5%
Guanajuato	0								
Guerrero	0								
Gulf of Mexico	0	53,399		0.0%	0.0%	0.0%		0.0%	0.0%
Hidalgo	0								
Jalisco	0								
Manitoba	129			-0.1%	0.1%	0.0%	0.0%	0.7%	0.1%
Mexico	0								
Michoacan	0								
Morelos	0								
NW Territories	0								
Nayarit	0								
New Brunswick	2			0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
Newfoundland	0			-163.0%	-62.3%	-373.9%		-39.5%	-95.7%
Nova Scotia	2			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nuevo Leon	570			0.0%	0.0%	0.0%		0.0%	0.0%
Nunavut	0								
Oaxaca	0								
Ontario	29			0.0%	0.0%	0.0%	0.1%	0.5%	0.1%
Prince Edward Island	0			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Puebla	0								
Quebec	10			-7.2%	-0.2%	0.0%	0.0%	-0.5%	-0.9%
Queretaro	0								
Quintana Roo	0								
San Luis Potosi	0								
Saskatchewan	3,009			-0.2%	0.0%	-0.2%	-0.3%	-0.1%	-0.1%
Sinaloa	13			-171.7%	-42.1%	-182.7%		-122.4%	-131.0%
Sonora	88			0.0%	0.0%	0.0%		0.0%	0.0%
Tabasco	0								
Tamaulipas	63			-272.3%	-848.3%	-740.2%		-201.9%	-134.8%
Tlaxcala	0								
Veracruz	0								
Yucatan	0								
Yukon	0								
Zacatecas	0								

Table B-5biv: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)									
State	XYL	VOC approx	VOC	NOX	CO	SO_2	NH_3	PM_{10}	PM_{25}
Canada Total	5,457	448,629							
Mexico Total	3,991	65,273							
TOTAL	9,448	567,301							
US offshore	0	53,399							

SMOKE (2007aq 15mar2010)								
State	ALD_2	ALDX	ETH	ETOH	FORM	IOLE	ISOP	MEOH
Aguascalientes								
Alberta	-548.2%	88.2%	91.3%	-204.0%	-253.2%	42.2%	-570.0%	-519.8%
Baja Calif Norte								
Baja Calif Sur								
British Columbia	-34.3%	-28.7%	-54.0%	-25.9%	-29.6%	-60.9%	-37.3%	-3.8%
Campeche								
Chiapas								
Chihuahua								
Coahuila								
Colima								
Distrito Federal								
Durango								
Guanajuato								
Guerrero								
Gulf of Mexico								
Hidalgo								
Jalisco								
Manitoba	0.1%	93.7%	4.2%	0.0%	0.9%	20.7%	0.0%	0.1%
Mexico								
Michoacan								
Morelos								
NW Territories								
Nayarit								
New Brunswick		0.0%	-0.1%	0.0%	0.0%	0.0%		0.1%
Newfoundland		-319.7%	-44.3%	-9.6%	-254.4%	-3287.6%		
Nova Scotia	0.2%	0.0%	72.5%	0.0%	0.0%	0.0%	0.0%	0.1%
Nuevo Leon								
Nunavut								
Oaxaca								
Ontario	0.2%	0.1%	0.4%	0.0%	0.1%	0.0%	0.0%	0.2%
Prince Edward Island		-0.1%	-0.1%	0.0%	0.0%	-0.1%		0.1%
Puebla								
Quebec	0.4%	0.3%	0.1%	0.0%	0.3%	0.2%	0.5%	0.3%
Queretaro								
Quintana Roo								
San Luis Potosi								
Saskatchewan	0.1%	99.6%	91.3%	0.1%	39.6%	94.5%	0.0%	0.2%
Sinaloa								
Sonora								
Tabasco								
Tamaulipas								
Tlaxcala								
Veracruz								
Yucatan								
Yukon								
Zacatecas								

Table B-5bv: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)								
State	ALD_2	ALDX	ETH	ETOH	FORM	IOLE	ISOP	MEOH
Canada Total								
Mexico Total								
TOTAL								
US offshore								

SMOKE (2007aq 15mar2010)							
State	NVOL	OLE	PAR	TERP	TOL	UNR	XYL
Aguascalientes							
Alberta	-556.0%	97.7%	98.5%	97.6%	98.9%	98.9%	98.2%
Baja Calif Norte							
Baja Calif Sur							
British Columbia	-32.5%	-49.4%	-33.9%	-33.4%	-7.0%	-21.9%	-11.6%
Campeche							
Chiapas							
Chihuahua							
Coahuila							
Colima							
Distrito Federal							
Durango							
Guanajuato							
Guerrero							
Gulf of Mexico							
Hidalgo							
Jalisco							
Manitoba	-0.1%	96.1%	95.3%	98.8%	97.1%	98.1%	91.5%
Mexico							
Michoacan							
Morelos							
NW Territories							
Nayarit							
New Brunswick		0.1%	0.3%	0.0%	0.0%	0.1%	0.0%
Newfoundland		-286.7%	-538.3%	-264.1%	-327.2%	-84.8%	-315.0%
Nova Scotia	-0.1%	90.9%	59.2%	0.0%	0.0%	59.2%	0.0%
Nuevo Leon							
Nunavut							
Oaxaca							
Ontario	0.1%	0.7%	49.5%	0.1%	0.2%	39.1%	0.1%
Prince Edward Island		0.0%	0.2%	0.0%	0.0%	0.0%	-0.1%
Puebla							
Quebec	0.0%	0.1%	0.3%	0.5%	0.2%	0.1%	0.1%
Queretaro							
Quintana Roo							
San Luis Potosi							
Saskatchewan	-0.1%	99.8%	99.8%	99.9%	99.9%	99.9%	99.8%
Sinaloa							
Sonora							
Tabasco							
Tamaulipas							
Tlaxcala							
Veracruz							
Yucatan							
Yukon							
Zacatecas							

Table B-5bvi: Point Source Emissions from Canada, Mexico, and Offshore Sources—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE (2007aq 15mar2010)							
State	NVOL	OLE	PAR	TERP	TOL	UNR	XYL
Canada Total							
Mexico Total							
TOTAL							
US offshore							

Pre-SMOKE (Allan)							
State	VOC	NO_X	CO	SO_2	NH_3	PM_{10}	$PM_{2.5}$
Aguascalientes	22,172	5,735	9,255	5,775	24,138	3,157	1,541
Alberta	225,452	176,384	464,690	10,661	141,855	644,389	121,113
Baja Calif Norte	57,725	24,558	42,320	18,782	8,692	6,007	4,487
Baja Calif Sur	6,853	7,697	5,196	1,742	5,703	1,097	822
British Columbia	144,658	101,066	543,613	13,061	25,700	112,037	54,584
Campeche	15,281	19,808	43,598	806	15,300	7,659	5,952
Chiapas	102,636	10,510	307,151	2,904	98,737	50,737	40,312
Chihuahua	77,697	35,635	69,406	27,881	42,773	17,112	10,676
Coahuila	51,770	19,113	27,292	9,953	26,782	4,952	3,392
Colima	9,032	6,526	11,400	596	6,098	2,102	1,555
Distrito Federal	123,036	28,363	34,005	448	1,062	3,598	3,121
Durango	30,855	11,960	45,164	2,403	48,924	11,605	7,037
Guanajuato	82,150	20,320	88,824	23,872	52,479	19,939	13,324
Guerrero	68,769	8,365	177,489	3,696	53,821	28,541	23,601
Hidalgo	48,775	22,109	98,521	1,491	24,836	18,233	14,374
Jalisco	113,181	40,428	117,633	20,904	144,622	28,097	17,269
Manitoba	75,295	44,186	157,420	2,869	66,937	102,434	19,652
Mexico	237,770	34,415	201,999	34,329	38,777	28,972	21,453
Michoacan	77,699	25,446	150,837	2,893	78,741	26,276	20,117
Morelos	27,104	6,856	30,391	1,317	11,253	4,789	3,824
Nayarit	16,224	7,010	29,462	1,534	25,320	5,998	4,238
New Brunswick	37,271	14,917	106,990	8,992	4,223	33,576	12,403
Newfoundland	21,323	10,908	83,220	3,925	526	19,284	9,059
Nova Scotia	34,638	15,768	118,701	8,004	6,785	33,332	12,872
Nuevo Leon	74,343	21,984	33,291	17,548	20,843	7,012	5,186
Oaxaca	86,874	19,403	267,289	2,198	63,795	42,883	35,392
Ontario	387,702	222,885	1,302,135	24,556	107,100	349,134	101,907
Prince Edward Island	6,888	3,122	31,154	1,052	2,294	6,406	2,053
Puebla	111,829	16,908	188,398	3,473	61,425	31,595	25,331
Quebec	300,687	106,106	1,018,512	19,848	85,957	238,635	95,742
Queretaro	29,582	6,829	29,063	5,943	15,275	5,676	4,153
Quintana Roo	16,211	7,749	34,432	2,102	4,367	5,629	4,506
San Luis Potosi	49,368	14,476	98,867	1,752	35,078	17,716	13,555
Saskatchewan	106,007	80,855	175,797	11,236	115,370	229,110	33,676
Sinaloa	42,342	21,724	62,337	2,374	65,473	16,844	9,968
Sonora	47,410	22,496	78,763	2,254	51,474	11,620	9,093
Tabasco	33,418	16,207	73,276	3,400	42,693	11,859	9,940
Tamaulipas	56,557	32,073	53,066	2,939	38,039	14,110	8,144
Tlaxcala	21,231	6,603	29,464	2,780	7,946	5,397	3,871
Veracruz	156,835	47,316	360,169	4,929	128,466	55,880	47,157
Yucatan	39,478	11,942	92,356	1,680	38,077	14,300	12,347
Zacatecas	26,308	14,646	35,186	3,620	40,875	15,736	7,115
Canada	1,339,919	776,196	4,002,230	104,205	556,747	1,768,338	463,061
Mexico	1,960,517	595,212	2,925,901	218,319	1,321,883	525,127	392,852
TOTAL	3,300,437	1,371,408	6,928,131	322,523	1,878,630	2,293,465	855,914

Table B-6a: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
Aguascalientes	0	0	0	0	0	0	0
Alberta	3467.369958	3569.77426	8617.359525	157697.1231	389895.1326	7641.872569	3945.833073
Baja Calif Norte	712.0590711	452.2696795	1114.127163	283.4527343	42321.26408	424.9354966	86.23937584
Baja Calif Sur	97.10210314	68.28209097	171.6956491	94.83954871	3818.642762	53.474372	18.09449148
British Columbia	2893.158027	2193.791332	4479.348576	282950.8699	479423.8556	5188.865252	3643.996252
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0
Chihuahua	1872.270884	1238.18041	1302.95113	2273.465171	69410.8608	1047.82168	291.0979715
Coahuila	737.5954397	406.8439234	803.6664908	478.1093903	27293.99643	341.2562403	88.20408363
Colima	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0
Durango	689.8973828	478.8355859	480.6300073	1142.104891	25506.55134	417.0850115	140.7452688
Guanajuato	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0
Manitoba	1412.251402	1273.785546	3140.925775	93446.22968	143443.801	3362.601028	1697.998173
Mexico	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
New Brunswick	1069.780972	749.4557721	2556.25582	94779.99641	106637.9963	2853.443549	1485.711424
Newfoundland	241.2220992	167.6426442	571.2321957	21009.89269	25882.81139	697.5546033	329.8512872
Nova Scotia	1059.807134	796.0026955	2590.188993	72411.24491	117666.5609	2624.353359	1227.379739
Nuevo Leon	816.0393352	610.7832856	1277.865523	483.4279526	29719.95284	454.7259782	108.8635496
Nunavut	0.063364456	0.017498114	0.183538479	0.590033724	11.66928245	0.280880583	0.090831414
Oaxaca	0	0	0	0	0	0	0
Ontario	7535.262204	5673.605732	13565.01984	578505.8902	1284963.698	16810.52939	8881.814374
Prince Edward Island	184.2271552	138.3141371	483.5159468	16784.05205	31010.57895	529.1752279	266.625809
Puebla	0	0	0	0	0	0	0
Quebec	10087.9318	7555.023263	16553.2739	627286.7602	1002875.792	19751.25525	9879.199514
Queretaro	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosi	0.073249592	0.053457714	0.023077967	0.122971483	2.172163909	0.043347407	0.013360891
Saskatchewan	2011.52945	1953.441484	4106.515401	96795.88833	166187.0833	4726.117626	2237.097314
Sinaloa	1468.820723	1003.892219	830.2623539	1953.928067	51949.87933	847.6917607	232.2436117
Sonora	1543.354272	925.0681163	958.524343	1076.047065	78764.39388	920.1282913	150.154687
Tabasco	0	0	0	0	0	0	0
Tamaulipas	498.0191007	353.1356625	498.1152681	212.4532923	20719.17457	234.2419447	45.20829317
Tlaxcala	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0

Table B-6b: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
Zacatecas	33.36270131	23.16608496	9.7087917	49.88490824	1038.340307	18.49236142	5.44930246
Canada Total	29,963	24,071	56,664	2,041,668	3,747,987	64,186	33,596
Mexico Total	8,469	5,561	7,448	8,048	350,557	4,760	1,166
TOTAL	38,431	29,631	64,111	2,049,716	4,098,544	68,946	34,762

SMOKE Totals (2007aq_07c 19apr2010)							
State	ETOH	FORM	HONO	IOLE	ISOP	MEOH	NH_3
Aguascalientes	0	0	0	0	0	0	0
Alberta	4087.80938	3456.901477	1069.585504	1406.253248	546.8982008	3817.84127	126605.1111
Baja Calif Norte	2203.382776	563.0999993	154.2839802	747.8305283	19.51237486	1554.758973	8692.42862
Baja Calif Sur	171.9553966	79.47427811	50.98400392	65.65546196	2.119070054	139.1695533	3964.850749
British Columbia	4999.672593	3170.488616	532.3358512	772.7212004	107.8178348	2494.988011	23173.36898
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0
Chihuahua	2853.187876	1562.675577	215.1803266	1071.776061	39.6710716	2112.461334	42772.59399
Coahuila	1904.910475	493.6061548	125.1040833	856.7098481	16.28272175	1352.995919	26782.40854
Colima	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0
Durango	600.0750745	668.2724537	56.27485706	185.4056846	16.28095691	566.2611265	40253.50711
Guanajuato	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0
Manitoba	1533.193582	1474.093381	301.6134638	545.9280115	162.4909982	1365.121171	66861.65595
Mexico	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
New Brunswick	1679.033816	1206.470697	76.82104709	273.7552776	26.09163125	530.721403	4217.276992
Newfoundland	382.2941924	273.9939548	20.6298245	54.55006669	4.848493146	100.8372405	213.379699
Nova Scotia	1670.821081	1166.537881	93.37606773	219.2876137	30.13926732	631.3550458	6769.160793
Nuevo Leon	3088.468907	611.700336	141.0891955	769.0711023	15.47516115	2217.546729	17332.31556
Nunavut	0.000879159	0.092002648	0.003527222	0.05081556	7.38E-05	0.001929619	0.001072831
Oaxaca	0	0	0	0	0	0	0
Ontario	13230.54376	8492.535326	1395.992678	2636.715076	304.0050029	9228.48591	106725.1073
Prince Edward Island	265.3616648	201.778348	20.09633433	54.3699364	10.33868927	105.3119705	2293.0263
Puebla	0	0	0	0	0	0	0
Quebec	11931.85056	10922.9545	671.0644704	2060.174394	314.6015892	5626.212042	85727.22077
Queretaro	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosi	0.020345381	0.06955035	0.011507127	0.010421065	0.001311244	0.017518872	1.638697309
Saskatchewan	2057.785299	1995.578316	594.5104174	817.4940325	307.0113163	1910.340683	115249.9116
Sinaloa	1019.488979	1399.939845	123.0179143	480.24941	30.71710147	856.9301723	51541.57408
Sonora	1571.46505	1588.595103	156.0396911	758.5889091	42.9890685	1208.685022	51474.48312
Tabasco	0	0	0	0	0	0	0
Tamaulipas	1344.400052	328.3210306	102.2040558	367.724064	7.024853347	926.3281981	9840.379834
Tlaxcala	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0

Table B-6bi: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	ETOH	FORM	HONO	IOLE	ISOP	MEOH	NH_3
Zacatecas	14.46083249	30.34367825	3.039108804	9.888582529	0.608706001	12.11411141	1944.027561
Canada Total	41,838	32,361	4,776	8,841	1,814	25,811	537,835
Mexico Total	14,772	7,326	1,127	5,313	191	10,947	254,600
TOTAL	56,610	39,688	5,903	14,154	2,005	36,758	792,435

SMOKE Totals (2007aq_07c 19apr2010)							
State	NO	NO_2	NOX	NVOL	OLE	PAR	PEC
Aguascalientes	0	0	0	0	0	0	0
Alberta	138041.9838	14267.84138	153379.4107	533.1542795	11435.14374	110222.9289	7533.453929
Baja Calif Norte	22104.59174	2301.763231	24560.63895	68.01528848	710.9780359	44351.71567	1294.012069
Baja Calif Sur	6090.198011	625.6973764	6766.879392	4.649921642	105.4058856	3556.822221	252.5650134
British Columbia	74814.42715	7778.922528	83125.68553	95.80134142	5122.886348	70613.6672	4966.582443
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0
Chihuahua	32080.73269	3349.318386	35645.23141	110.3246472	1241.469578	55406.26574	2544.951055
Coahuila	17205.73658	1786.649335	19117.49	58.64858417	572.3162154	40521.23498	1053.976743
Colima	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0
Durango	7583.856977	786.3757615	8426.507595	22.27930571	501.6204438	11808.71053	812.2300912
Guanajuato	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0
Manitoba	38223.58595	3947.213718	42472.41314	162.3704719	4120.290641	38698.20867	2748.748948
Mexico	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
New Brunswick	13384.70076	1410.526869	14872.04868	13.75510326	1930.921035	18654.36485	1087.93149
Newfoundland	2734.915733	283.2776175	3038.823174	0.996784712	368.6820664	2909.882563	272.1381567
Nova Scotia	13777.40145	1437.552828	15308.33034	16.71373521	1620.741797	17705.89972	1302.873598
Nuevo Leon	19394.3998	2013.844308	21549.3333	91.30707568	851.0550947	53949.54979	1405.683478
Nunavut	0.397104203	0.040595712	0.441227137	2.62E-05	0.330052248	1.806922847	0.024237385
Oaxaca	0	0	0	0	0	0	0
Ontario	197890.7465	20596.14018	219882.8793	348.4196199	16731.07588	233657.2932	11813.64206
Prince Edward Island	2773.399897	288.0584514	3081.554683	8.131030242	412.7604569	3361.521033	258.0292054
Puebla	0	0	0	0	0	0	0
Quebec	93788.1849	9752.295577	104211.5449	183.9604875	14086.64531	157900.6187	9071.594665
Queretaro	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosi	1.325294234	0.135747712	1.472549073	0.001195173	0.034613533	0.492912224	0.057885385
Saskatchewan	71659.75375	7368.685392	79622.94955	297.2336012	6336.952636	54177.37652	5434.639884
Sinaloa	15302.2655	1577.245324	17002.52874	36.57024187	865.1898825	21568.30183	1628.655093
Sonora	20250.97873	2094.078249	22501.09667	52.30193429	944.8583665	33429.34418	1873.319119
Tabasco	0	0	0	0	0	0	0
Tamaulipas	13598.17942	1408.705468	15109.08895	53.50948144	393.2380596	24253.3728	1296.615754
Tlaxcala	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0

Table B-6bii: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	NO	NO_2	NOX	NVOL	OLE	PAR	PEC
Zacatecas	376.6143422	38.80671219	418.4601632	0.849432461	16.28844297	383.9392647	36.10568859
Canada Total	647,089	67,131	718,996	1,661	62,166	707,902	44,490
Mexico Total	153,989	15,983	171,099	498	6,203	289,232	12,198
TOTAL	801,078	83,113	890,095	2,159	68,369	997,133	56,688

SMOKE Totals (2007aq_07c 19apr2010)							
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC	PSO_4
Aguascalientes	0	0	0	0	0	0	0
Alberta	354443.4113	71411.21196	283032.1993	52304.68595	153.2400771	10779.25213	640.5798671
Baja Calif Norte	6006.972663	4486.825832	1520.146831	1500.130913	11.85536809	1376.795693	304.0317891
Baja Calif Sur	880.9332009	647.8739924	233.0592085	172.050204	1.170737942	203.0874607	19.0005764
British Columbia	84791.25111	45810.17836	38981.07275	19329.50106	259.5833431	20150.22516	1104.286351
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0
Chihuahua	17112.82204	10677.08721	6435.73483	4125.568363	19.81176232	3527.085818	459.6702097
Coahuila	4951.904274	3391.921438	1559.982836	1047.218428	8.335972266	1134.685393	147.7049015
Colima	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0
Durango	7367.639327	4237.131739	3130.507588	1782.668072	8.899008251	1593.470574	39.86399334
Guanajuato	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0
Manitoba	98600.24267	18782.42777	79817.81491	12066.00525	36.05195269	3660.290061	271.3315546
Mexico	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
New Brunswick	33508.73185	12375.78264	21132.94921	7086.039769	19.10882091	3926.526231	256.1763301
Newfoundland	10056.62274	3243.099567	6813.523171	2013.432875	3.756561892	887.0565566	66.71541626
Nova Scotia	33220.5088	12792.19077	20428.31803	7288.263968	14.71998765	3913.320396	273.0128195
Nuevo Leon	6062.853208	4618.528412	1444.324796	1359.328259	9.759410043	1597.25976	246.4975049
Nunavut	3.287936741	0.643801311	2.64413543	0.530428523	0.000772307	0.087132393	0.001230702
Oaxaca	0	0	0	0	0	0	0
Ontario	347163.9948	101045.4745	246118.5203	60806.82295	199.9553251	25532.36279	2692.691411
Prince Edward Island	6402.382289	2049.951888	4352.430401	1179.85725	2.314754653	570.5683981	39.18228002
Puebla	0	0	0	0	0	0	0
Quebec	231762.6728	94178.23915	137584.4336	50417.14129	149.9798567	32597.06728	1942.456064
Queretaro	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosi	0.68034481	0.380518524	0.299826287	0.178896245	0.000577012	0.141768604	0.001391278
Saskatchewan	221960.3806	32163.51211	189796.8685	21922.13759	49.86294041	4513.037929	243.8337638
Sinaloa	14538.17652	8391.677002	6146.499516	3706.506957	17.40153805	2989.07681	50.03660422
Sonora	11620.59669	9093.006059	2527.59063	3658.895155	25.69831368	3430.17948	104.9139905
Tabasco	0	0	0	0	0	0	0
Tamaulipas	6553.013984	3266.551405	3286.462579	1188.467495	5.51738124	755.8157203	20.13505481
Tlaxcala	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0

Table B-6biii: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC	PSO_4
Zacatecas	457.1844761	210.892811	246.2916651	109.3043782	0.295428154	63.42405375	1.7632624
Canada Total	1,421,910	393,852	1,028,058	234,414	889	106,530	7,530
Mexico Total	75,556	49,023	26,534	18,651	109	16,671	1,394
TOTAL	1,497,466	442,875	1,054,592	253,065	997	123,201	8,924

SMOKE Totals (2007aq_07c 19apr2010)							
State	SO_2	SULF	TERP	TOL	UNK	UNR	XYL
Aguascalientes	0	0	0	0	0	0	0
Alberta	9531.295062	22.07250246	1292.039215	21156.98906	1.62931369	42833.10026	15225.82446
Baja Calif Norte	18780.20028	287.0080943	1600.640821	6324.095998	4.056943503	8933.79607	4411.701266
Baja Calif Sur	1362.037568	19.78916084	88.19886572	430.9492899	0.644094833	875.4941297	324.5766684
British Columbia	11346.75227	29.08834145	443.5425189	20404.86385	1.948106947	22862.45546	12917.6945
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0
Chihuahua	27879.90202	426.0115963	2259.331534	7744.058505	9.599208421	11206.17453	5513.362885
Coahuila	9952.188779	151.1012792	1224.438749	5252.195873	4.176695447	6785.192305	3866.97681
Colima	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0
Durango	1533.71599	22.04410337	362.156151	1721.019524	2.834652133	3255.977577	1217.375743
Guanajuato	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0
Manitoba	2794.120612	7.375610377	398.7709638	7665.980473	0.937289567	14860.13211	5867.729498
Mexico	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
New Brunswick	8982.275903	100.1092818	100.7912665	5143.130231	0.250220063	8173.878359	3639.283592
Newfoundland	953.7323126	7.269226982	16.50340917	777.7732349	0.057771171	1553.677364	581.5145224
Nova Scotia	7831.951373	71.72889942	124.5217182	4220.421421	0.153900659	8428.104621	2824.531322
Nuevo Leon	17510.48203	267.2177192	2167.14361	8227.528671	5.29443451	11719.6136	5827.461899
Nunavut	0.017443033	0	0.000428078	0.564896934	6.34E-06	0.475614429	0.61105478
Oaxaca	0	0	0	0	0	0	0
Ontario	24357.22557	168.8463242	1500.515106	52818.6079	4.920929783	76260.70704	38711.84019
Prince Edward Island	1049.649927	5.333874087	27.33526382	796.4976548	0.00484624	1559.537307	609.2492332
Puebla	0	0	0	0	0	0	0
Quebec	19664.86145	186.7241877	1022.490136	38706.63585	1.563861844	66116.5801	26367.95186
Queretaro	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosi	0.025611647	0.000136436	0.005657205	0.083246633	0.000256938	0.170174376	0.058655742
Saskatchewan	11140.5825	95.00050442	648.1400648	10405.72226	1.289489668	20963.52616	8100.16989
Sinaloa	1813.29971	24.17668539	341.8666748	2747.511197	5.582495197	5342.069132	1860.328869
Sonora	2253.87939	30.70976379	958.5802792	4116.95989	5.426235921	6563.975911	2880.539276
Tabasco	0	0	0	0	0	0	0
Tamaulipas	1479.221107	20.2468215	1006.23766	3703.999469	5.444631179	4861.439741	2785.071432
Tlaxcala	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0

Table B-6biv: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	SO_2	SULF	TERP	TOL	UNK	UNR	XYL
Zacatecas	78.37712661	1.127694448	4.938713066	47.50538583	0.139567391	89.46446443	39.25828832
Canada Total	97,652	694	5,575	162,097		263,612	114,846
Mexico Total	82,643	1,249	10,014	40,316		59,634	28,727
TOTAL	180,296	1,943	15,588	202,413		323,246	143,573

SMOKE Totals (2007aq_07c 19apr2010)					
State	VOC_APPROX	HONO	VOC	NO_x	CO
Aguascalientes					
Alberta		0.70%		-15.0%	-19.2%
Baja Calif Norte		0.63%		0.0%	0.0%
Baja Calif Sur		0.75%		-13.8%	-36.1%
British Columbia		0.64%		-21.6%	-13.4%
Campeche					
Chiapas					
Chihuahua		0.60%		0.0%	0.0%
Coahuila		0.65%		0.0%	0.0%
Colima					
Distrito Federal					
Durango		0.67%		-41.9%	-77.1%
Guanajuato					
Guerrero					
Hidalgo					
Jalisco					
Manitoba		0.71%		-4.0%	-9.7%
Mexico					
Michoacan					
Morelos					
NW Territories					
Nayarit					
New Brunswick		0.52%		-0.3%	-0.3%
Newfoundland		0.68%		-258.9%	-221.5%
Nova Scotia		0.61%		-3.0%	-0.9%
Nuevo Leon		0.65%		-2.0%	-12.0%
Nunavut		0.80%		100.0%	100.0%
Oaxaca					
Ontario		0.63%		-1.4%	-1.3%
Prince Edward Island		0.65%		-1.3%	-0.5%
Puebla					
Quebec		0.64%		-1.8%	-1.6%
Queretaro					
Quintana Roo					
San Luis Potosi		0.78%		-982989.1%	-4551424.4%
Saskatchewan		0.75%		-1.5%	-5.8%
Sinaloa		0.72%		-27.8%	-20.0%
Sonora		0.69%		0.0%	0.0%
Tabasco					
Tamaulipas		0.68%		-112.3%	-156.1%
Tlaxcala					
Veracruz					
Yucatan					
Yukon					

Table B-6bv: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)					
State	VOC_APPROX	HONO	VOC	NO_x	CO
Zacatecas		0.73%		-3400.0%	-3288.7%
Canada Total	1,332,559				
Mexico Total	429,264				
TOTAL	1,761,824				

SMOKE Totals (2007aq_07c 19apr2010)				
State	SO_2	NH_3	PM_{10}	PM_{25}
Aguascalientes				
Alberta	-11.8%	-12.0%	-81.8%	-69.6%
Baja Calif Norte	0.0%	0.0%	0.0%	0.0%
Baja Calif Sur	-27.9%	-43.8%	-24.5%	-26.9%
British Columbia	-15.1%	-10.9%	-32.1%	-19.2%
Campeche				
Chiapas				
Chihuahua	0.0%	0.0%	0.0%	0.0%
Coahuila	0.0%	0.0%	0.0%	0.0%
Colima				
Distrito Federal				
Durango	-56.7%	-21.5%	-57.5%	-66.1%
Guanajuato				
Guerrero				
Hidalgo				
Jalisco				
Manitoba	-2.7%	-0.1%	-3.9%	-4.6%
Mexico				
Michoacan				
Morelos				
NW Territories				
Nayarit				
New Brunswick	-0.1%	-0.1%	-0.2%	-0.2%
Newfoundland	-311.5%	-146.4%	-91.8%	-179.3%
Nova Scotia	-2.2%	-0.2%	-0.3%	-0.6%
Nuevo Leon	-0.2%	-20.3%	-15.7%	-12.3%
Nunavut	100.0%	100.0%	100.0%	100.0%
Oaxaca				
Ontario	-0.8%	-0.4%	-0.6%	-0.9%
Prince Edward Island	-0.2%	0.0%	-0.1%	-0.1%
Puebla				
Quebec	-0.9%	-0.3%	-3.0%	-1.7%
Queretaro				
Quintana Roo				
San Luis Potosi	-6842445.4%	-2140475.6%	-2603871.4%	-3562127.6%
Saskatchewan	-0.9%	-0.1%	-3.2%	-4.7%
Sinaloa	-30.9%	-27.0%	-15.9%	-18.8%
Sonora	0.0%	0.0%	0.0%	0.0%
Tabasco				
Tamaulipas	-98.7%	-286.6%	-115.3%	-149.3%
Tlaxcala				
Veracruz				
Yucatan				
Yukon				

Table B-6bvi: Canada and Mexico Non-Point and Non-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants)

SMOKE Totals (2007aq_07c 19apr2010)				
State	SO_2	NH_3	PM_{10}	PM_{25}
Zacatecas	-4518.6%	-2002.6%	-3342.0%	-3273.8%
Canada Total				
Mexico Total				
TOTAL				

Canada - 2006 (Allan); Mexico - 2002ac							
State	VOC	NO_x	CO	SO_2	NH_3	PM_{10}	$PM_{2.5}$
Aguascalientes	5,915	4,609	51,156	269	80	226	207
Alberta	50,394	96,682	787,448	941	2,643	2,659	1,995
Baja Calif Norte	17,696	14,593	135,646	829	269	697	639
Baja Calif Sur	1,713	1,408	13,074	81	29	68	62
British Columbia	42,481	70,139	587,324	625	2,643	1,805	1,262
Campeche	3,116	2,453	23,169	144	42	121	111
Chiapas	14,224	11,340	110,136	661	192	556	509
Chihuahua	19,447	15,784	161,063	896	273	754	691
Coahuila	13,901	11,396	115,759	650	187	547	501
Colima	2,257	1,746	16,569	101	35	85	78
Distrito Federal	97,578	68,638	813,226	3,677	1,070	3,092	2,833
Durango	7,482	6,133	66,416	352	107	296	271
Guanajuato	24,259	18,617	206,136	1,092	378	912	835
Guerrero	12,738	10,156	97,332	590	175	496	455
Hidalgo	7,612	5,980	64,276	350	101	294	269
Jalisco	65,657	47,275	547,239	2,591	785	2,180	1,997
Manitoba	16,827	29,128	262,215	256	810	765	573
Mexico	106,628	77,043	894,875	4,238	1,390	3,564	3,265
Michoacan	15,363	11,922	128,606	696	224	585	536
Morelos	8,026	6,288	66,134	367	107	308	283
Nayarit	3,924	3,170	29,792	183	50	154	141
New Brunswick	9,081	20,844	147,496	221	613	527	389
Newfoundland	4,125	8,378	79,015	74	364	220	154
Nova Scotia	8,194	15,582	136,611	158	648	413	289
Nuevo Leon	52,458	40,350	391,398	2,145	621	1,804	1,653
Oaxaca	11,800	9,352	96,671	538	142	453	415
Ontario	64,827	146,473	1,212,175	1,618	8,388	4,163	2,711
Prince Edward Island	1,669	3,293	27,533	26	105	89	67
Puebla	24,699	19,031	208,013	1,108	336	933	854
Quebec	58,668	116,250	978,672	1,277	5,158	3,533	2,533
Queretaro	6,750	5,250	57,535	306	109	257	236
Quintana Roo	4,976	3,921	37,062	225	68	189	173
San Luis Potosi	10,865	8,727	96,895	503	140	423	388
Saskatchewan	27,613	42,462	399,253	339	881	1,136	880
Sinaloa	11,806	9,879	91,371	566	213	476	436
Sonora	10,537	8,714	81,056	498	169	419	384
Tabasco	7,030	5,633	53,000	326	144	275	252
Tamaulipas	16,220	13,527	125,260	770	242	647	593
Tlaxcala	5,001	3,876	42,848	225	75	189	173
Veracruz	28,823	22,912	221,679	1,324	417	1,114	1,020
Yucatan	8,644	6,873	64,848	393	111	331	303
Zacatecas	4,450	3,568	41,502	208	64	175	160
Canada	283,879	549,231	4,617,742	5,535	22,252	15,310	10,853
Mexico	631,594	480,164	5,149,744	26,902	8,346	22,622	20,724
TOTAL	915,473	1,029,395	9,767,487	32,437	30,598	37,932	31,577

Table B-7a: Canada and Mexico On-Road Mobile Emission Inventories—Pre-SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)									
State	ALD2	ALDX	BENZENE	CH4	CO	ETH	ETHA	ETOH	FORM
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	1,214	470	2,205	5,689	759,578	2,730	874	0	1,131
Baja Calif Norte	406	146	811	2,099	135,653	998	323	0	393
Baja Calif Sur	30	11	59	153	9,907	73	24	0	29
British Columbia	895	301	1,920	4,980	575,031	2,353	765	0	893
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	490	192	881	2,272	161,061	1,092	349	0	455
Coahuila	349	136	630	1,625	115,757	780	250	0	325
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	98	38	181	468	33,431	224	72	0	92
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	390	142	769	1,991	261,988	948	306	0	376
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	225	87	412	1,064	147,460	510	164	0	210
Newfoundland	20	7	41	107	17,178	51	16	0	20
Nova Scotia	189	68	375	971	136,578	462	149	0	182
Nuevo Leon	1,234	455	2,387	6,173	389,734	2,944	949	0	1,179
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	1,569	592	2,950	7,622	1,211,584	3,645	1,172	0	1,482
Prince Edward Island	39	14	76	198	27,528	94	30	0	37
Puebla	0	0	0	0	0	0	0	0	0
Quebec	1,431	544	2,667	6,890	978,236	3,297	1,059	0	1,347
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	1	0	0	0	0
Saskatchewan	641	233	1,262	3,266	398,843	1,555	502	0	617
Sinaloa	198	70	400	1,035	67,402	492	159	0	192
Sonora	242	87	483	1,250	81,054	594	192	0	234
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	212	76	426	1,104	71,850	525	170	0	206
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	2	1	3	9	740	4	1	0	2
Canada Total	6,611	2,457	12,679	32,778	4,514,002	15,644	5,038	0	6,296
Mexico Total	3,262	1,211	6,262	16,187	1,066,589	7,726	2,488	0	3,108
TOTAL	9,873	3,668	18,941	48,965	5,580,591	23,370	7,526	0	9,403

Table B-7b: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)									
State	ALD2	ALDX	BENZENE	CH4	CO	ETH	ETHA	ETOH	FORM
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	1,214	470	2,205	5,689	759,578	2,730	874	0	1,131
Baja Calif Norte	406	146	811	2,099	135,653	998	323	0	393
Baja Calif Sur	30	11	59	153	9,907	73	24	0	29
British Columbia	895	301	1,920	4,980	575,031	2,353	765	0	893
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	490	192	881	2,272	161,061	1,092	349	0	455
Coahuila	349	136	630	1,625	115,757	780	250	0	325
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	98	38	181	468	33,431	224	72	0	92
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	390	142	769	1,991	261,988	948	306	0	376
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	225	87	412	1,064	147,460	510	164	0	210
Newfoundland	20	7	41	107	17,178	51	16	0	20
Nova Scotia	189	68	375	971	136,578	462	149	0	182
Nuevo Leon	1,234	455	2,387	6,173	389,734	2,944	949	0	1,179
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	1,569	592	2,950	7,622	1,211,584	3,645	1,172	0	1,482
Prince Edward Island	39	14	76	198	27,528	94	30	0	37
Puebla	0	0	0	0	0	0	0	0	0
Quebec	1,431	544	2,667	6,890	978,236	3,297	1,059	0	1,347
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	1	0	0	0	0
Saskatchewan	641	233	1,262	3,266	398,843	1,555	502	0	617
Sinaloa	198	70	400	1,035	67,402	492	159	0	192
Sonora	242	87	483	1,250	81,054	594	192	0	234
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	212	76	426	1,104	71,850	525	170	0	206
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	2	1	3	9	740	4	1	0	2
Canada Total	6,611	2,457	12,679	32,778	4,514,002	15,644	5,038	0	6,296
Mexico Total	3,262	1,211	6,262	16,187	1,066,589	7,726	2,488	0	3,108
TOTAL	9,873	3,668	18,941	48,965	5,580,591	23,370	7,526	0	9,403

Table B-7bi: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)									
State	HONO	IOLE	ISOP	MEOH	NH3	NO	NO2	NOX	NVOL
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	746	743	0	0	2,550	83,935	8,580	93,261	14
Baja Calif Norte	117	273	0	0	269	13,133	1,342	14,592	4
Baja Calif Sur	9	20	0	0	18	961	98	1,068	0
British Columbia	549	646	0	0	2,588	61,795	6,317	68,661	7
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	126	297	0	0	273	14,206	1,452	15,784	6
Coahuila	91	212	0	0	187	10,257	1,048	11,397	4
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	27	61	0	0	59	2,995	306	3,328	1
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	233	259	0	0	809	26,196	2,678	29,107	4
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	167	139	0	0	613	18,762	1,918	20,846	3
Newfoundland	15	14	0	0	79	1,640	168	1,822	0
Nova Scotia	125	126	0	0	648	14,025	1,434	15,583	2
Nuevo Leon	322	804	0	0	619	36,183	3,699	40,204	13
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	1,172	994	0	0	8,383	131,794	13,472	146,438	17
Prince Edward Island	26	26	0	0	105	2,964	303	3,293	0
Puebla	0	0	0	0	0	0	0	0	0
Quebec	930	899	0	0	5,156	104,605	10,693	116,228	16
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0	0
Saskatchewan	339	425	0	0	880	38,182	3,903	42,425	6
Sinaloa	58	135	0	0	168	6,558	670	7,287	2
Sonora	70	163	0	0	169	7,843	802	8,714	2
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	62	144	0	0	133	6,989	714	7,765	2
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	1	1	0	0	1	57	6	64	0
Canada Total	4,301	4,272	2	0	21,810	483,898	49,465	537,665	70
Mexico Total	882	2,110	1	0	1,898	99,183	10,139	110,203	34
TOTAL	5,183	6,383	3	0	23,708	583,081	59,604	647,868	104

Table B-7bii: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)								
State	OLE	PAR	PEC	PM10	PM2_5	PMC	PMFINE	PNO3
Aguascalientes	0	0	0	0	0	0	0	0
Alberta	3,306	27,517	1,223	2,565	1,925	640	174	2
Baja Calif Norte	1,211	10,060	312	697	639	58	89	1
Baja Calif Sur	88	735	23	52	48	4	7	0
British Columbia	2,859	23,715	717	1,767	1,235	531	136	1
Campeche	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0
Chihuahua	1,322	11,002	337	754	691	63	97	1
Coahuila	945	7,866	245	547	501	46	70	1
Colima	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0
Durango	272	2,261	72	161	147	14	21	0
Guanajuato	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0
Manitoba	1,150	9,553	369	765	573	192	50	1
Mexico	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0
New Brunswick	618	5,141	255	527	389	138	33	0
Newfoundland	62	511	20	48	33	14	3	0
Nova Scotia	561	4,657	176	413	289	124	29	0
Nuevo Leon	3,570	29,677	804	1,797	1,646	150	231	2
Nunavut	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0
Ontario	4,417	36,738	1,521	4,162	2,710	1,452	312	3
Prince Edward Island	114	948	43	89	67	22	6	0
Puebla	0	0	0	0	0	0	0	0
Quebec	3,995	33,237	1,592	3,532	2,533	1,000	236	3
Queretaro	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0
Saskatchewan	1,886	15,673	570	1,135	879	256	75	1
Sinaloa	597	4,956	157	352	323	29	45	0
Sonora	721	5,990	188	419	384	35	54	0
Tabasco	0	0	0	0	0	0	0	0
Tamaulipas	637	5,288	166	370	339	31	48	0
Tlaxcala	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0
Zacatecas	5	43	1	3	3	0	0	0
Canada Total	18,967	157,690	6,486	15,002	10,632	4,370	1,054	13
Mexico Total	9,367	77,878	2,304	5,151	4,720	432	661	5
TOTAL	28,334	235,569	8,790	20,154	15,352	4,801	1,715	18

Table B-7biii: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)									
State	POC	PSO4	SO2	SULF	TERP	TOL	UNK	UNR	XYL
Aguascalientes	0	0	0	0	0	0	0	0	0
Alberta	517	9	908	0	21	7,157	9	5,651	7,410
Baja Calif Norte	233	3	829	0	6	2,626	3	2,059	2,724
Baja Calif Sur	17	0	62	0	0	192	0	150	199
British Columbia	376	6	612	0	11	6,204	5	4,841	6,446
Campeche	0	0	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	0	0	0	0
Chihuahua	252	4	896	0	9	2,860	4	2,261	2,961
Coahuila	183	3	650	0	6	2,046	3	1,616	2,118
Colima	0	0	0	0	0	0	0	0	0
Distrito Federal	0	0	0	0	0	0	0	0	0
Durango	54	1	191	0	2	588	1	464	609
Guanajuato	0	0	0	0	0	0	0	0	0
Guerrero	0	0	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	0	0	0	0
Jalisco	0	0	0	0	0	0	0	0	0
Manitoba	150	2	256	0	6	2,492	2	1,956	2,585
Mexico	0	0	0	0	0	0	0	0	0
Michoacan	0	0	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0	0	0
NW Territories	0	0	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0	0	0
New Brunswick	99	2	221	0	4	1,338	2	1,056	1,385
Newfoundland	10	0	16	0	0	134	0	104	139
Nova Scotia	82	1	158	0	3	1,215	1	953	1,261
Nuevo Leon	601	9	2,136	0	19	7,737	8	6,081	8,022
Nunavut	0	0	0	0	0	0	0	0	0
Oaxaca	0	0	0	0	0	0	0	0	0
Ontario	861	14	1,618	0	26	9,568	11	7,535	9,914
Prince Edward Island	17	0	26	0	1	247	0	194	257
Puebla	0	0	0	0	0	0	0	0	0
Quebec	691	11	1,277	0	24	8,653	10	6,819	8,965
Queretaro	0	0	0	0	0	0	0	0	0
Quintana Roo	0	0	0	0	0	0	0	0	0
San Luis Potosi	0	0	0	0	0	0	0	0	0
Saskatchewan	229	4	339	0	10	4,089	4	3,209	4,241
Sinaloa	118	2	418	0	3	1,294	1	1,014	1,343
Sonora	140	2	498	0	4	1,563	2	1,226	1,622
Tabasco	0	0	0	0	0	0	0	0	0
Tamaulipas	124	2	440	0	3	1,380	1	1,082	1,432
Tlaxcala	0	0	0	0	0	0	0	0	0
Veracruz	0	0	0	0	0	0	0	0	0
Yucatan	0	0	0	0	0	0	0	0	0
Yukon	0	0	0	0	0	0	0	0	0
Zacatecas	1	0	4	0	0	11	0	9	12
Canada Total	3,031	49	5,430	0	105	41,098		32,320	42,603
Mexico Total	1,724	26	6,124	0	51	20,298		15,961	21,041
TOTAL	4,755	75	11,554	0	156	61,396		48,281	63,644

Table B-7biv: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)					
State	VOC approx	HONO	VOC	NOX	CO
Aguascalientes					
Alberta		0.80%		-3.7%	-3.7%
Baja Calif Norte		0.80%		0.0%	0.0%
Baja Calif Sur		0.80%		-31.8%	-32.0%
British Columbia		0.80%		-2.2%	-2.1%
Campeche					
Chiapas					
Chihuahua		0.80%		0.0%	0.0%
Coahuila		0.80%		0.0%	0.0%
Colima					
Distrito Federal					
Durango		0.80%		-84.3%	-98.7%
Guanajuato					
Guerrero					
Hidalgo					
Jalisco					
Manitoba		0.80%		-0.1%	-0.1%
Mexico					
Michoacan					
Morelos					
NW Territories					
Nayarit					
New Brunswick		0.80%		0.0%	0.0%
Newfoundland		0.80%		-359.8%	-360.0%
Nova Scotia		0.80%		0.0%	0.0%
Nuevo Leon		0.80%		-0.4%	-0.4%
Nunavut					
Oaxaca					
Ontario		0.80%		0.0%	0.0%
Prince Edward Island		0.80%		0.0%	0.0%
Puebla					
Quebec		0.80%		0.0%	0.0%
Queretaro					
Quintana Roo					
San Luis Potosi		0.80%		-9033844.0%	-8632781.1%
Saskatchewan		0.80%		-0.1%	-0.1%
Sinaloa		0.80%		-35.6%	-35.6%
Sonora		0.80%		0.0%	0.0%
Tabasco					
Tamaulipas		0.80%		-74.2%	-74.3%
Tlaxcala					
Veracruz					
Yucatan					
Yukon					
Zacatecas		0.80%		-5500.0%	-5507.1%
Canada Total	308,318				
Mexico Total	152,265				
TOTAL	460,583				

Table B-7bv: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)				
State	SO_2	NH_3	PM_{10}	PM_{25}
Aguascalientes				
Alberta	-3.7%	-3.7%	-3.7%	-3.7%
Baja Calif Norte	0.0%	0.0%	0.0%	0.0%
Baja Calif Sur	-30.7%	-59.9%	-30.7%	-30.7%
British Columbia	-2.2%	-2.1%	-2.2%	-2.2%
Campeche				
Chiapas				
Chihuahua	0.0%	0.0%	0.0%	0.0%
Coahuila	0.0%	0.0%	0.0%	0.0%
Colima				
Distrito Federal				
Durango	-84.4%	-81.2%	-84.3%	-84.3%
Guanajuato				
Guerrero				
Hidalgo				
Jalisco				
Manitoba	-0.1%	-0.1%	-0.1%	-0.1%
Mexico				
Michoacan				
Morelos				
NW Territories				
Nayarit				
New Brunswick	0.0%	0.0%	0.0%	0.0%
Newfoundland	-359.8%	-360.0%	-359.9%	-359.8%
Nova Scotia	0.0%	0.0%	0.0%	0.0%
Nuevo Leon	-0.4%	-0.3%	-0.4%	-0.4%
Nunavut				
Oaxaca				
Ontario	0.0%	0.0%	0.0%	0.0%
Prince Edward Island	0.0%	0.0%	0.0%	0.0%
Puebla				
Quebec	0.0%	0.0%	0.0%	0.0%
Queretaro				
Quintana Roo				
San Luis Potosi	-8987143.5%	-11195857.2%	-8961951.2%	-8940788.0%
Saskatchewan	-0.1%	-0.1%	-0.1%	-0.1%
Sinaloa	-35.3%	-26.3%	-35.3%	-35.2%
Sonora	0.0%	0.0%	0.0%	0.0%
Tabasco				
Tamaulipas	-74.9%	-81.5%	-74.9%	-74.9%
Tlaxcala				
Veracruz				
Yucatan				
Yukon				
Zacatecas	-5530.8%	-7505.9%	-5521.1%	-5535.8%
Canada Total				
Mexico Total				
TOTAL				

Table B-7bvi: Canada and Mexico On-Road Mobile Emission Inventories—SMOKE [Canada and Mexico]: Criteria Air Pollutants and Hazardous Air Pollutants

EMF (2005ck)									
State	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	ACETALD	BENZENE
AL	188564	426	32024	27785	23973	52325	165492	97	2910
AK	26346	103	8330	5795	3407	5508	15497	40	470
AZ	44128	4391	8650	12456	8596	2571	76464	66	725
AR	174777	7386	21453	24094	23062	27260	96805	51	686
CA	458977	14758	121882	90509	73873	77672	461331	1779	8309
CO	94528	71	43652	15059	13545	6810	101639	301	1119
CT	69769	1438	12554	10716	10446	18455	79234	308	849
DE	11640	279	3259	2007	1826	5859	11875	43	150
DC	1819	13	1740	489	427	1559	4001	4	48
FL	202108	448	29533	41371	38847	70490	454526	147	2363
GA	194401	60	38919	46751	41847	56829	242945	169	3409
HI	2932	17	1152	1823	1154	2721	14252	10	172
ID	95417	1684	30317	56402	27367	2915	129629	369	1566
IL	99568	1631	47645	16972	15181	5395	257595	199	11764
IN	74953	4214	30185	60255	32611	59775	175821	107	3797
IA	68958	7404	15150	12833	11476	19832	73609	136	1175
KS	850802	12467	42286	108571	83174	36381	123184	115	2533
KY	108397	231	17557	23283	18590	34229	100019	173	1601
LA	139222	23169	27559	19038	17862	2378	134050	62	1674
ME	104033	1616	7423	13876	13726	9969	48204	459	476
MD	141960	606	21715	25058	19764	40864	102392	298	1409
MA	136753	4070	34373	28552	26536	25261	134708	493	931
MI	94909	429	43499	30989	24216	42066	229804	200	1821
MN	139234	1226	56700	26968	24496	14747	103716	283	5894
MS	129408	196	12212	17827	16769	6796	145945	112	2934
MO	168352	3830	32910	32399	28217	44573	156430	263	3100
MT	36832	50	14415	5765	5569	2600	29853	70	536
NE	66672	3143	13820	12679	8655	29575	39234	51	533
NV	14700	199	5379	4389	2735	12477	20784	28	250
NH	74137	835	11235	13351	12658	7408	35842	297	365
NJ	84145	2648	26393	15987	13074	10726	124235	216	1126
NM	61669	39	69175	5984	5346	3193	250176	40	454
NY	200401	2503	87608	56097	34893	125158	397374	465	2650
NC	321100	236	18869	40945	38389	22020	223576	251	2975
ND	20527	69	10046	3751	3241	6455	21776	46	286
OH	150302	8527	41466	25444	23761	19810	283520	213	2415
OK	385233	11358	94574	54339	43886	7542	198338	77	964
OR	342447	1061	17059	50681	49407	9845	169357	270	2847
PA	265035	3689	53435	41841	31263	68349	272518	257	3047
RI	5421	15	2964	1171	1107	3365	16355	12	124
SC	145294	223	20281	19393	18139	30016	148680	124	1143
SD	24121	51	5766	6683	4463	10347	17831	54	337
TN	119973	164	18676	26842	20663	32714	143122	167	1840
TX	463577	1983	274338	72265	47394	109215	687646	950	4851
UT	80749	1268	13844	10385	9079	3577	95498	36	516
VT	43092	214	3438	5823	5415	5385	14536	104	387
VA	208041	1621	53605	53941	29947	32923	163746	234	5248
WA	204125	1711	16911	35624	31983	7254	116240	536	2262

Table B-8a: All Non-Point Emission Sources—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF (2005ck)									
State	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	ACETALD	BENZENE
WV	70069	72	14519	12220	11130	14589	57244	71	522
WI	166779	266	21994	26104	25407	6369	156290	563	3462
WY	29196	91	40480	3717	2922	6721	181323	34	246
TOTAL	7376314	134080	1683490	1349685	1076954	1252645	7474512	11399	100629

EMF (2005ck)					
State	CHLORINE	FORMALD	HCL	HGSUM	METHANO
AL	0	225	204	0.088590977	2057.921256
AK		93	272	0.031223489	255.0651096
AZ	0	157	170	0.332466877	2138.054579
AR	0	124	309	0.023254157	1941.140951
CA	2040	3217	602	2.014760435	12492.20347
CO	0	702	225	0.03828326	2345.057697
CT	0	301	121	0.187136463	1085.888996
DE		48	200	0.002750469	198.2526767
DC		10	10	0.008229281	198.8448603
FL	0	317	351	0.190282333	17815.24438
GA	0	382	1627	0.138146333	3350.05882
HI	0	20	91	0.012770895	454.8393395
ID	93	942	617	0.049255448	716.2954279
IL	0	455	120	0.142914176	7134.629047
IN	0	253	1302	0.095910857	2815.110074
IA	0	312	179	0.090864523	2274.019343
KS	0	246	182	0.072492147	1959.276492
KY	0	395	596	0.088100095	3269.487173
LA	0	151	146	0.032643034	4366.847544
ME		420	18	0.144804576	519.4934434
MD	0	336	695	0.166205273	2583.367962
MA	0	504	113	0.365338029	4205.493267
MI	0	452	1430	0.099110873	5137.370748
MN	0	49	361	0.123022855	1081.627749
MS	0	254	150	0.049666651	2032.490566
MO	0	602	2791	0.047494427	3198.609242
MT		156	35	0.02418807	412.2869293
NE	0	119	368	0.058185441	944.419485
NV	0	64	105	0.025760745	974.2887961
NH	1	273	66	0.070673443	852.7906866
NJ	0	493	152	0.281978189	846.6527207
NM	0	90	72	0.022393683	788.3331038
NY	0	1109	1464	0.66853846	13482.41901
NC	0	564	358	0.152908332	7996.011698
ND		105	59	0.044274943	280.253118
OH	0	500	523	0.150646212	8033.142172
OK	0	176	116	0.027383797	1796.977969
OR	0	682	535	0.099275192	2418.887757
PA	0	597	5380	0.376162844	3605.162292
RI		27	19	0.038095458	492.7479526
SC	0	284	767	0.058061584	2378.552745
SD		122	263	0.029063241	401.0049595
TN	0	378	792	0.051456015	4879.018717
TX	0	2047	990	0.236102845	9276.713563

Table B-8ai: All Non-Point Emission Sources—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF (2005ck)					
State	CHLORINE	FORMALD	HCL	HGSUM	METHANO
UT		84	161	0.030997375	857.1294591
VT		232	10	0.046117447	353.3339236
VA	0	543	3758	0.188059658	1366.920412
WA	0	1586	139	0.093132899	2716.247518
WV	0	175	161	0.207706501	771.3128355
WI	0	1247	105	0.307642354	3118.207802
WY	0	77	83	0.042062044	305.4798823
TOTAL	2135	22581	29001	8	154265

SMOKE Totals (2007aq_07c 19apr2010)						
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO
AL	1307.077418	1543.918365	3430.190728	33802.34211	0.011879966	188557.4958
AK	0	0	0	0	0	0
AZ	712.7485158	697.5798033	807.9307922	3623.647811	0.004279527	44115.3197
AR	1618.026181	1287.475612	935.119596	1872.693422	0.045345866	174756.1669
CA	10933.38112	8128.806812	9955.464439	1084083.825	2039.75145	458856.5291
CO	904.3780811	1962.335604	1207.61604	19564.5295	0.030207753	94517.50943
CT	757.2435055	2197.093704	1100.476736	64588.74354	0.003862986	69760.62764
DE	148.6094088	343.0732778	152.1540646	7622.921063	0	11636.61619
DC	39.55788462	38.56519901	50.42305967	158.8862849	0	1817.027423
FL	5454.136356	4075.349476	3148.470741	43115.82891	0.009186717	201970.7532
GA	1759.16676	2178.691215	3864.463948	6191.461462	0.018998246	194306.9268
HI	0	0	0	0	0	0
ID	804.758507	1034.259306	1636.377111	1378.182458	92.5614665	95409.66058
IL	1239.855448	3150.993225	12357.25868	12091.95311	0.017745771	99504.79864
IN	1016.262713	1562.873546	4542.922136	10799.06133	0.17378017	74906.49657
IA	782.6486545	1443.101165	1351.799848	4674.990072	0.008248075	68941.44723
KS	8489.5218	5320.614226	3617.649758	3070.284562	0.000835078	850772.0166
KY	1051.59835	1832.157054	1827.799175	5153.585042	0.050021962	108366.6793
LA	2125.846794	1379.714424	2319.267313	4638.81394	0.008248075	139172.1743
ME	894.0403824	2756.22531	521.8394849	11778.30159	0	104018.04
MD	931.0928625	2381.077804	1630.262265	29905.27163	0.153654982	141934.1452
MA	1462.782731	3874.152691	1340.552708	242162.8919	0.000626237	136670.0707
MI	1637.030468	2578.042113	2931.619361	36552.96665	0.022652962	94857.8992
MN	1349.68066	2603.887913	5914.430868	6940.493095	0.240292857	139186.6756
MS	1889.069452	2740.007456	4202.994308	5185.242103	0.006576206	129351.3881
MO	1670.036961	3088.708304	3570.277836	150700.2947	0.012088237	168327.2359
MT	323.2937098	694.4545217	626.7531851	2550.723115	0	36827.35965
NE	830.4824605	781.2898231	639.0817247	1600.273841	0.008456345	66658.09234
NV	268.2388725	294.980061	308.3499996	1930.884951	0.000417682	14692.7386
NH	599.3522528	1789.575941	405.5245023	15241.81729	0.583667891	74106.36709
NJ	856.9084359	2153.841659	1238.321468	6467.565667	0.013965522	84117.99003
NM	427.6270483	466.8994874	625.4927935	82724.12585	0.150000267	61660.12758
NY	1916.040493	3926.320785	3343.825435	7627.060991	0.303380374	200345.2585
NC	3692.991263	3949.030006	3961.671093	8794.786759	0.00970882	320996.6547
ND	199.2762814	474.9180466	381.0680613	1663.2885	0	20522.96192
OH	1640.231203	2788.611569	3834.981465	53665.22506	0.493058545	150246.0592
OK	4341.221832	3152.274028	1807.685037	2552.296363	0.008664615	385212.7394
OR	6620.224994	6091.136459	4010.336246	490967.9104	0.019500377	342426.3612
PA	1984.667101	3422.641383	6459.646505	1516456.169	0.284990806	264992.274
Puerto Rico	0	0	0	0	0	0
RI	119.1525673	148.309426	130.5467367	313.0389096	0	5419.25503
SC	1785.743842	2348.131244	1629.24057	5149.016988	0.032444519	145267.1393
SD	244.1285603	523.5141483	358.7897806	1496.096589	0	24115.82788
TN	1390.234769	1858.650116	2430.578486	7542.614607	0.086954278	119935.378
TX	4153.334389	4349.028669	5011.049408	878506.1187	0.118000818	463496.9412
UT	1219.525216	919.0838983	655.0400605	27502.02926	0	80653.17374

Table B-8b: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)						
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO
VT	246.9615806	736.8698153	397.5460146	2044.370242	0	43086.86059
Virgin Islands	0	0	0	0	0	0
VA	1275.773881	2636.106489	6448.938416	28978.49584	0.009289426	207884.8625
WA	1875.574631	3936.744651	2389.961065	11192.88066	0.008456345	204100.6836
WV	506.2466272	844.9539936	772.9711714	3197.137953	0.021671524	70045.98793
WI	1538.520116	3801.295003	3664.494416	9613.08859	3.83E-08	166742.5649
WY	206.6511176	354.7942603	376.9740295	63367.6579	0.000417682	29190.57639
TOTAL	87240.95426	110642.1591	124326.2287	5020801.885	2135.284494	7374457.936

SMOKE Totals (2007aq_07c 19apr2010)						
State	ETH	ETHA	ETOH	FORM	HCL	HGIIGAS
AL	4305.866394	646.3172627	6293.144152	1611.401053	204.241486	0.018209814
AK	0	0	0	0	0	0
AZ	1132.872613	196.3855345	4380.168692	661.1017634	169.7536542	0.092828493
AR	2547.156789	164.1180763	3241.298607	2049.014043	307.973774	0.002301061
CA	7756.358905	119150.4901	39936.57895	7830.838661	600.3137664	0.619854686
CO	2142.934161	21274.90788	2177.791263	15518.79714	224.1549394	0.009654902
CT	2620.611924	976.3178447	3421.146061	1531.326154	120.9610441	0.050613594
DE	317.0931655	156.0878097	597.349952	261.5915185	199.4453774	0.000814375
DC	30.63655234	9.17548408	227.3931109	28.28852749	9.606096428	0.001864534
FL	5553.597573	745.6931135	23532.10712	5589.187529	350.5518165	0.038097518
GA	5544.506329	821.2181157	6264.622886	1861.834888	1622.67872	0.02344954
HI	0	0	0	0	0	0
ID	1446.855086	135.8371093	2729.331146	1963.264817	616.3745574	0.014729811
IL	2597.374672	868.3748155	14387.97132	2230.043382	120.3583912	0.022879136
IN	2205.388494	586.5708041	7492.008608	1216.566092	1298.753139	0.017534403
IA	2229.385391	438.5642049	1752.23606	1217.606364	178.6112335	0.021627241
KS	7228.577286	393.5158837	1935.651471	12676.80664	181.9006937	0.016263691
KY	3603.181421	578.3197075	2633.769865	1577.586233	594.5769325	0.020465626
LA	3730.798008	430.6474124	3814.528062	2338.6711	145.4826041	0.003656527
ME	2541.477867	880.1059769	1300.674277	2036.455238	18.49559331	0.036115752
MD	3780.370701	806.1287714	3553.342626	1771.593235	693.3998155	0.043027001
MA	4294.034809	2565.250806	5466.451908	2868.663537	112.6135314	0.083934904
MI	5356.982413	9408.029367	11481.70212	7689.024875	1426.585632	0.014539613
MN	3252.374093	676.7410123	5015.419555	2054.498559	360.5927378	0.033128698
MS	3409.432019	911.8955597	3917.115343	2930.975287	150.1739286	0.01049869
MO	4950.859594	1741.220046	4225.300564	2995.986493	2782.020303	0.014206372
MT	953.5520907	1481.326324	470.5310934	1237.674697	34.98214791	0.005907148
NE	1167.533841	154.8536959	927.3513742	1136.190274	367.3213628	0.014783409
NV	421.0993249	98.27294896	950.327489	280.5955437	104.3898448	0.005339572
NH	1763.058791	579.3631185	944.9593021	1335.186195	66.3796543	0.019327303
NJ	1816.263542	704.8601659	6280.757671	1722.786834	151.7897097	0.101702426
NM	859.4002803	122921.164	1161.173452	81508.2716	72.08210946	0.004244174
NY	5529.942901	645.9149174	15135.20085	2679.907101	1460.796135	0.112547555
NC	8552.149565	793.7217888	7118.590272	5154.24332	358.1125366	0.033026942
ND	529.5528813	1068.212129	291.5440173	768.662599	59.30993858	0.011573894
OH	6796.907904	1266.810034	10563.37375	1980.014723	522.6609253	0.025289462
OK	4217.630058	7498.687951	1681.275546	6061.33474	116.0981514	0.002666396
OR	6953.688296	4856.680624	5092.310972	8020.232638	534.5369539	0.024097732
PA	9347.289916	11813.55196	9898.821299	2813.828502	5363.385767	0.097050461
Puerto Rico	0	0	0	0	0	0
RI	134.5693702	34.44389466	704.5988287	100.0108256	19.32699312	0.010234891
SC	5934.821455	604.3557256	5894.148688	2394.065903	764.8080509	0.011398647
SD	711.2160187	186.6774504	409.966833	469.9408199	262.373223	0.007090255
TN	4684.93173	589.9023107	4122.285455	1654.274235	789.8358795	0.007172443
TX	3634.922364	28159.36988	19235.27867	4672.264575	988.3051722	0.050061167
UT	946.4833908	25214.03847	2743.872554	18209.21968	160.4191048	0.005193782

Table B-8bi: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)						
State	ETH	ETHA	ETOH	FORM	HCL	HGIIGAS
VT	880.6413963	209.9527266	306.5043821	672.1604178	10.01315583	0.013399134
Virgin Islands	0	0	0	0	0	0
VA	5283.366347	1522.470698	5578.798036	2327.239972	3746.816834	0.045414906
WA	4175.619553	1134.373634	4316.622186	4264.719798	139.1213542	0.018843566
WV	2323.754252	371.8162352	2809.851808	729.9336342	161.0238718	0.059045611
WI	3950.207613	968.8450676	7793.56377	3401.292319	104.5041017	0.081913957
WY	481.059485	94552.15475	295.7996554	62617.05799	83.038179	0.011722681
TOTAL	164628.3886	471993.7333	274504.6117	298722.2321	28931.05093	1.989343494

SMOKE Totals (2007aq_07c 19apr2010)							
State	HGNRVA	HONO	IOLE	ISOP	MEOH	NH_3	NO
AL	0.058133632	0	1859.000384	56.97562251	3245.698981	424.9004532	28787.99073
AK	0	0	0	0	0	0	0
AZ	0.177499591	0	1201.3134	29.38215575	2253.910502	4390.62729	7766.987287
AR	0.019526672	0	1494.578403	69.30308236	2349.014903	7385.765525	19258.9273
CA	0.990518167	0	4200.767691	162.7248556	12874.7401	14744.23675	109493.6793
CO	0.022091599	0	801.1866207	56.97271966	2475.734815	71.17892701	39271.80197
CT	0.102931834	0	621.2268691	61.24004266	2874.206253	1437.897128	11284.87451
DE	0.001383342	0	170.228979	10.67070103	345.2843228	278.3869168	2926.392712
DC	0.005107718	0	34.62266992	0.888208636	213.2015569	12.59124732	1562.950841
FL	0.129239828	0	5940.48207	206.240792	20322.16048	446.8689202	26522.75198
GA	0.099139643	0	3119.973845	70.89105018	6629.965354	60.31558436	34948.96079
HI	0	0	0	0	0	0	0
ID	0.024549398	0	1141.506363	47.62693384	1605.513114	1683.437649	27206.65226
IL	0.104669226	0	2034.24216	69.99556391	7892.793261	1629.446446	42816.80701
IN	0.066806353	0	2053.360104	46.37935004	3457.181787	4213.417876	27112.41726
IA	0.054766751	0	1110.18318	46.08849323	2407.632415	7403.474638	13610.53371
KS	0.045382137	0	1622.889923	364.0770272	2066.757809	12466.02257	38033.04634
KY	0.053897138	0	1536.481598	59.61706416	3455.606935	230.6948881	15769.67915
LA	0.026648265	0	2230.005903	82.08096149	4623.135728	23167.00996	24748.84438
ME	0.086916363	0	531.2937023	78.41063959	661.0851881	1616.227774	6672.513821
MD	0.094707154	0	1206.316017	67.40737582	2935.883319	605.4355884	19513.65251
MA	0.229946407	0	1020.693347	105.8868466	4685.976203	4068.003896	30881.77235
MI	0.075759399	0	2960.807822	91.87569302	5776.080097	428.4894276	39095.63721
MN	0.068373134	0	1662.684149	84.45459051	1123.411922	1225.208425	50897.77576
MS	0.032118435	0	1711.474972	103.0480828	2289.927535	195.3931655	10971.61243
MO	0.023677175	0	2154.727107	103.182807	3823.054644	3828.231271	29572.93147
MT	0.014443913	0	443.5875128	21.62051833	436.0213293	49.76126005	12967.40478
NE	0.03349433	0	661.9861911	38.20803466	1109.295174	3142.302684	12415.29421
NV	0.017154642	0	298.9300984	13.18987518	1051.13599	198.032757	4832.131465
NH	0.038562584	0	372.2904858	50.9265963	1043.210367	834.8275827	10090.07705
NJ	0.131778333	0	1140.969148	66.42070145	4227.25447	2647.989991	23720.61839
NM	0.015453712	0	746.2759276	18.495347	856.690641	38.41313767	62246.08342
NY	0.483155891	0	3430.812128	87.10368978	13801.38702	2499.147534	78702.55474
NC	0.098030498	0	2967.044225	169.6336893	8392.322219	235.8252664	16958.91562
ND	0.024907866	0	252.0933328	14.34233735	301.0419899	69.09173586	9033.961188
OH	0.110032333	0	2675.55377	87.85877002	8325.158255	8524.661827	37265.22763
OK	0.023053859	0	1687.500233	187.4597296	1923.739617	11357.32543	85101.97402
OR	0.059536459	0	1525.106501	187.8245878	2488.716271	1060.251171	15336.88813
PA	0.214978347	0	2804.727837	117.2882603	8702.173705	3687.051487	48014.64638
Puerto Rico	0	0	0	0	0	0	0
RI	0.021142438	0	158.1356712	3.765564534	780.62096	15.30411702	2665.109234
SC	0.039147183	0	2170.719977	87.03886084	3274.774563	222.8877283	18210.71858
SD	0.017215382	0	310.3140403	16.97438132	431.6260009	50.43052057	5178.821349
TN	0.039580298	0	2259.701684	68.88461926	5170.744098	163.9102621	16778.13572
TX	0.152147245	0	6682.605169	147.3235743	10282.82311	1981.159132	246763.5361
UT	0.022363325	0	667.478129	51.78384699	1067.209459	1265.986296	12454.35036

Table B-8bii: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	HGNRVA	HONO	IOLE	ISOP	MEOH	NH_3	NO
VT	0.024500134	0	169.3348317	20.7622865	378.2165181	213.7339258	3090.699899
Virgin Islands	0	0	0	0	0	0	0
VA	0.112445312	0	2126.320511	79.82441507	4045.345621	1616.287828	48121.99784
WA	0.062497024	0	1558.679228	132.3855653	2937.134391	1710.420977	15194.93869
WV	0.108754988	0	777.12061	31.56893981	1046.960754	72.17816201	13036.00817
WI	0.170846867	0	1672.114967	103.0782562	3225.287674	265.2852956	19763.93242
WY	0.022442682	0	328.8358173	11.75087557	319.6300609	90.26261204	36420.75901
TOTAL	4.651455006	0	80308.28531	3890.933982	186006.4775	134025.791	1513093.977

SMOKE Totals (2007aq_07c 19apr2010)							
State	NO_2	NO_x	NVOL	OLE	PAR	PEC	PHGI
AL	3198.666437	31986.65716	152.3580771	2897.219354	109693.1441	2130.907615	0.012053978
AK	0	0	0	0	0	0	0
AZ	863.0005093	8629.987797	44.13482174	1368.493945	55198.16924	618.1922859	0.061120213
AR	2139.880008	21398.80731	54.81097369	1639.808252	68949.78607	2296.076167	0.001406595
CA	12165.97541	121659.6547	342.254682	8125.078945	306986.1205	4629.880672	0.402559996
CO	4363.532035	43635.334	88.09735558	1337.232978	54478.89606	718.902018	0.006436729
CT	1253.875356	12538.74987	70.84461512	1651.711205	52304.81895	615.0730456	0.033438531
DE	325.1548601	3251.547572	8.987904033	225.5432751	8007.478931	105.5638144	0.000544298
DC	173.6611921	1736.612033	3.326965786	29.53834706	2752.955296	27.98262394	0.001243095
FL	2946.975258	29469.72724	342.5778647	4964.338987	329242.0183	3505.400929	0.022668717
GA	3883.216843	38832.17763	133.7111892	3524.197619	185512.5991	3477.643368	0.015325552
HI	0	0	0	0	0	0	0
ID	3022.958952	30229.61121	81.09534741	1283.571921	93338.38677	2852.860094	0.009819672
IL	4757.42373	47574.23074	344.812402	3532.095997	170335.4817	747.8132802	0.01525203
IN	3012.490848	30124.90811	157.9404066	3219.781445	119640.0337	1077.265119	0.011431096
IA	1512.281399	15122.81511	89.96046958	1409.250729	50582.737	821.0444482	0.014266026
KS	4225.894748	42258.94108	112.2529484	4627.697217	62634.90338	8730.620802	0.010681559
KY	1752.187175	17521.86633	98.98353051	2182.79355	69356.11735	1438.365325	0.013548196
LA	2749.870716	27498.71509	73.33269429	2392.257543	99448.64184	1750.906888	0.002305163
ME	741.3904809	7413.904302	28.74475712	1637.547471	26656.68932	838.8642105	0.02169323
MD	2168.183335	21681.83585	65.99918001	2285.192007	71698.82142	1479.773304	0.028345709
MA	3431.307354	34313.07971	97.38473384	2695.065942	88084.78211	2313.885761	0.051276817
MI	4343.961278	43439.59849	130.6939461	3765.317271	162605.2675	1701.561968	0.008777293
MN	5655.30676	56553.08252	160.7226389	2575.447276	65765.044	1852.211979	0.021271286
MS	1219.067931	12190.68036	100.72099	3546.023462	94615.99983	1502.593675	0.006942997
MO	3285.881212	32858.81268	184.3391669	3338.655244	102926.7197	2130.621881	0.009471059
MT	1440.821048	14408.22582	16.04457637	660.7089518	21552.28253	415.2659301	0.003785506
NE	1379.477908	13794.77212	43.26318692	780.151716	26869.10904	727.7574093	0.009758588
NV	536.9083583	5369.039823	16.71228225	379.0058006	14516.45298	161.6610001	0.003223999
NH	1121.119189	11211.19624	25.50332062	1088.395791	20990.46983	1033.80652	0.012713436
NJ	2635.623882	26356.24228	89.24804071	1333.050272	89006.03622	758.206694	0.048334791
NM	6916.214345	69162.29777	17.52911268	718.4595153	107272.3533	425.4973437	0.002655486
NY	8744.731106	87447.28585	201.3431485	4812.028881	276547.2605	2063.875683	0.072655583
NC	1884.324075	18843.2397	180.7565162	4996.281809	152662.0061	3463.542493	0.021650884
ND	1003.772202	10037.73339	11.27224706	410.3230839	16409.10299	226.6647454	0.007689688
OH	4140.581546	41405.80917	191.7236367	3742.600247	204912.5616	1877.643397	0.015191187
OK	9455.77331	94557.74733	61.75529959	3127.569858	154357.3058	4539.380433	0.00163977
OR	1704.098323	17040.98646	211.3610748	4145.682158	94052.62382	3195.971237	0.015509364
PA	5334.961956	53349.60833	209.6273257	4402.747503	188275.1842	2468.321877	0.063767514
Puerto Rico	0	0	0	0	0	0	0
RI	296.1233451	2961.232579	21.94517585	215.0275856	11798.17325	79.47993055	0.006701263
SC	2023.414079	20234.13266	143.6244966	3994.46797	100541.7906	1523.903551	0.007424141
SD	575.425005	5754.246354	16.9086852	449.9104291	11841.85836	294.3751286	0.004693273
TN	1864.237011	18642.37273	109.0901456	2777.762971	102615.8332	1634.829079	0.004654418
TX	27418.15165	274181.6877	138.4697355	5978.090512	568761.57	3669.298744	0.033369481
UT	1383.822064	13838.17243	40.37059224	817.9473571	49719.61219	818.9018057	0.003383493

Table B-8biii: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	NO_2	NO_x	NVOL	OLE	PAR	PEC	PHGI
VT	343.4109709	3434.11087	21.50970284	521.4388722	7995.502836	390.7810684	0.008173406
Virgin Islands	0	0	0	0	0	0	0
VA	5346.889032	53468.88687	164.2359766	3179.717664	112708.9672	2075.081297	0.029912654
WA	1688.325848	16883.26453	119.0243519	2982.249915	70908.22333	2266.228806	0.011652612
WV	1448.445719	14484.45389	41.4408559	1431.076928	38948.0109	987.6681976	0.039320122
WI	2195.992934	21959.92536	124.4598968	2817.075096	101020.8751	1510.969274	0.054107539
WY	4046.743711	40467.50272	7.059604557	400.7310002	74163.58034	205.9816152	0.00777653
TOTAL	168121.5324	1681215.51	5192.366648	120416.3619	5069262.358	84179.10453	1.271624565

SMOKE Totals (2007aq_07c 19apr2010)							
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC	PSO_4
AL	27771.79403	23968.71869	3803.075341	11365.79601	83.00744931	9555.504131	833.5034877
AK	0	0	0	0	0	0	0
AZ	12451.5576	8593.844282	3857.713323	3606.544534	56.03270391	4131.168095	181.906663
AR	24090.39125	23060.23419	1030.157068	10891.74198	75.09420339	9377.865701	419.4561309
CA	90469.94344	73853.54734	16616.3961	33049.60482	211.0746001	33950.70941	2012.277836
CO	15052.89566	13543.5981	1509.297559	5328.552749	30.73778744	7344.52306	120.8824816
CT	10713.90691	10443.94556	269.9613445	4138.736014	21.27906767	5456.59337	212.2640664
DE	2006.212607	1825.074031	181.1385761	753.7703371	3.898067208	874.7186443	87.12316826
DC	489.0374184	426.2883595	62.7490589	120.1450114	1.518639969	263.0432396	13.59884456
FL	41346.43026	38824.71525	2521.715011	17101.54661	129.1900512	16886.13151	1202.446153
GA	46716.89252	41822.13387	4894.758655	21029.63727	128.9936303	15834.00584	1351.853754
HI	0	0	0	0	0	0	0
ID	56374.39503	27343.52241	29030.87262	13440.75103	65.86578581	10024.41551	959.6299988
IL	16969.83599	15179.55293	1790.283066	6852.60419	66.40745184	7168.417436	344.3105684
IN	60102.66454	32540.434	27562.23054	23049.11417	81.18808104	5303.225845	3029.640787
IA	12828.64374	11474.50085	1354.142893	5094.964608	34.8643883	5317.732838	205.8945648
KS	108564.5432	83171.5662	25392.97703	39721.05951	284.9516319	33028.90937	1406.024895
KY	23265.66392	18585.48055	4680.183369	8559.575584	53.46851789	8147.565378	386.50575
LA	19037.2625	17861.72974	1175.532763	8164.250474	61.27097251	7605.69352	279.6078841
ME	13873.61029	13723.97456	149.6357292	5567.724766	27.41800956	7152.498875	137.4686953
MD	25036.271	19757.18582	5279.085188	9043.951532	54.35276851	8710.391109	468.7171024
MA	28514.06397	26503.60752	2010.456453	11003.19987	37.37063047	12208.22827	940.9229885
MI	30965.05558	24204.47309	6760.582491	11556.19057	71.97832129	10201.94901	672.7932191
MN	26949.30986	24482.56529	2466.744568	10914.85719	57.82121849	10773.79014	883.8847665
MS	17818.74469	16762.99827	1055.746417	7565.934422	51.19315674	7351.119088	292.1579284
MO	32382.55015	28210.50392	4172.046229	13155.80683	80.03858188	12244.11193	599.9246994
MT	5764.899895	5568.515333	196.384562	2383.618959	14.96497726	2687.149113	67.51635322
NE	12667.60401	8651.812582	4015.791425	4128.438332	25.8335226	3540.230558	229.5527605
NV	4386.250015	2733.925352	1652.324663	1384.438047	6.80099682	1098.402158	82.62315018
NH	13336.58168	12645.33414	691.2475362	5329.283546	18.21375883	5874.107995	389.922323
NJ	15985.56264	13072.71731	2912.845324	5054.162317	25.54141206	7039.732108	195.0747824
NM	5982.675012	5345.107956	637.5670559	2443.460107	18.07571355	2330.957969	127.1168221
NY	56014.87585	34867.40251	21147.47334	16839.41679	97.82865017	14149.03656	1717.244826
NC	40934.79434	38380.93953	2553.85481	17254.17952	119.9165639	16940.77394	602.5270118
ND	3748.895249	3240.340303	508.5549458	1388.608943	8.048681912	1547.47503	69.54290305
OH	25438.90153	23758.14509	1680.756434	9970.417972	73.23303516	11446.82798	390.0227058
OK	54337.89599	43885.33091	10452.56508	20710.81641	150.1020675	17795.48811	689.5438892
OR	50678.54038	49404.62095	1273.919434	20977.64957	111.1112827	24734.60635	385.2825027
PA	41796.00059	31247.38766	10548.61293	14328.59822	84.74094369	13213.43399	1152.292627
Puerto Rico	0	0	0	0	0	0	0
RI	1171.269308	1107.287267	63.98204104	411.8935563	3.157381901	574.3657664	38.39063223
SC	19385.67965	18133.58912	1252.090539	8115.452358	52.963187	7832.170936	609.0990835
SD	6674.859442	4461.234536	2213.624907	2082.261279	11.16229876	1949.230447	124.2053825
TN	26819.57933	20657.69364	6161.885689	9603.634325	61.57447081	8933.771285	423.884482
TX	72174.53687	47374.25388	24800.28299	22501.14787	152.8826525	19643.9955	1406.929116
UT	10382.02889	9077.894396	1304.134496	4013.577654	28.91237245	4071.986158	144.5164059

Table B-8biv: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC	PSO_4
VT	5822.640831	5414.703211	407.9376202	2285.982804	12.53871151	2644.938682	80.46194514
Virgin Islands	0	0	0	0	0	0	0
VA	53842.70153	29922.8831	23919.81843	15196.73001	80.03636965	11292.33663	1278.698799
WA	35620.30839	31980.92101	3639.387378	13380.83818	81.94659733	15935.37368	316.5337413
WV	12215.0968	11126.73884	1088.357957	5171.907215	33.2054905	4676.764238	257.193699
WI	26099.78607	25403.24627	696.539799	10405.97204	55.89894167	13166.07645	264.3295648
WY	3713.430425	2920.956504	792.4739211	1323.302121	7.744299895	1304.900752	79.02771607
TOTAL	1348787.071	1076547.176	272239.8947	497761.8482	3105.450097	463336.4437	28164.32966

SMOKE Totals (2007aq_07c 19apr2010)							
State	SO2	SULF	TERP	TOL	UNK	UNR	XYL
AL	52148.22706	844.5002179	2091.58085	21083.77072	0	24416.98759	11222.53972
AK	0	0	0	0	0	0	0
AZ	2562.610802	44.46241479	493.2066141	5225.024033	0	8091.907803	5055.778341
AR	27175.25307	546.3031624	1201.00771	10607.16588	0	10660.47804	7393.794668
CA	77475.74776	919.2485233	5656.003667	31799.55319	0	64530.17217	24173.50814
CO	6789.951188	115.0119773	634.3339994	4582.660789	0	28713.12229	3544.501046
CT	18433.58317	276.4121228	1512.508979	8856.898698	0	12779.88216	5753.669217
DE	5843.449761	88.74872049	195.4642689	1051.008618	0	1534.209595	659.7099306
DC	1555.118955	22.07361945	70.29639194	251.1596431	0	532.157145	219.9143562
FL	70343.13544	1083.730405	6947.20066	41846.77497	0	46916.09507	34555.75562
GA	56654.54181	1117.439171	2821.446369	22726.04165	0	29635.33835	18392.37368
HI	0	0	0	0	0	0	0
ID	2908.88088	55.08823184	2202.442846	6137.902599	0	11150.04188	25596.68712
IL	5384.58841	52.77965092	2875.933789	18942.98316	0	53217.48352	18492.02407
IN	59599.30818	1268.371486	1870.755154	15060.69278	0	22395.74206	20332.89675
IA	19775.62653	382.5841314	586.9760164	5818.575477	0	10943.09782	4781.643602
KS	36302.25032	515.5708395	725.0976187	6270.307716	0	16932.73738	4947.044369
KY	34125.81687	704.2452075	845.5080689	7671.618336	0	13950.28879	6265.070204
LA	2372.819663	10.18652522	1185.238353	9986.492015	0	15444.98792	8284.7531
ME	9960.813437	124.7399193	473.3134704	4702.990118	0	8112.026584	3418.691903
MD	40750.23846	802.8676237	1120.050075	10861.95758	0	15704.14833	7040.512077
MA	25243.60807	373.1341263	1372.043486	16866.94043	0	20463.38105	10655.38926
MI	41944.88237	897.1284816	1882.522341	18145.01772	0	35220.76847	13480.69567
MN	14708.24177	267.2137546	1230.143658	5895.034766	0	20776.42356	4826.363142
MS	6775.945115	110.284825	991.0537791	15262.194	0	21585.43804	12172.56599
MO	44436.8086	979.3112556	1879.609686	16494.97958	0	23125.44743	12396.87425
MT	2595.101871	28.7529106	182.4985286	1607.984129	0	5399.106246	930.0280923
NE	29484.19042	614.9579643	302.5119648	2834.376732	0	5187.368452	2363.662113
NV	12437.12385	225.9702394	315.900838	1370.754235	0	2671.10304	971.0908567
NH	7398.763766	101.0740598	515.4283001	4232.243801	0	5835.997904	2739.314429
NJ	10713.2023	144.9931284	1338.919738	12173.3692	0	17130.27201	9435.743573
NM	3185.376259	41.49694539	357.8553836	2741.213147	0	113683.0577	2702.469236
NY	124867.2567	2198.668773	4443.097301	45043.24189	0	66664.79034	34125.78416
NC	21966.53734	212.164812	1838.956658	18016.72431	0	29402.04825	11910.41899
ND	6439.014338	97.43162949	149.6192146	1070.306841	0	4103.778822	623.8576254
OH	19751.17394	343.9848126	3820.384442	35021.5337	0	41139.85531	23025.17945
OK	7539.496231	9.712922017	1215.601121	7720.165603	0	30757.67057	9601.950151
OR	9826.582914	98.41840815	1506.259942	19242.95491	0	29223.50462	10619.81384
PA	68225.14911	887.7187057	2919.340255	32599.59674	0	42081.0999	20189.15559
Puerto Rico	0	0	0	0	0	0	0
RI	3363.012741	49.21167896	365.0867476	1227.434549	0	2061.72097	1005.738363
SC	29926.27871	511.7863803	2400.564477	12878.3897	0	16463.52277	11206.38559
SD	10315.71751	208.06363	131.2450145	1387.277052	0	2689.293871	1055.995271
TN	32616.3324	704.0208906	1250.869838	11792.70148	0	18197.23223	10059.99426
TX	108876.6885	2324.503664	4290.147187	39813.52721	0	101000.7121	38106.51634
UT	3567.38556	65.07747694	576.5618887	4765.986724	0	28002.60069	4698.435661

Table B-8bv: All Non-Point Emission Sources—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE Totals (2007aq_07c 19apr2010)							
State	SO2	SULF	TERP	TOL	UNK	UNR	XYL
VT	5372.747093	48.15907977	104.7552284	1114.075076	0	2833.948491	602.4953508
Virgin Islands	0	0	0	0	0	0	0
VA	32839.66269	517.9542492	954.0973606	15468.59815	0	30311.83092	11582.77282
WA	7236.79718	104.2716392	896.9264153	9585.746503	0	17884.10943	6529.445893
WV	14546.59476	191.0700064	703.4185787	5515.505001	0	7254.598302	3879.889186
WI	6360.937767	86.80439189	2139.289713	15806.13218	0	23741.89623	12628.81133
WY	6701.994743	106.3772265	150.1010744	1364.433602	0	86535.04284	1084.960589
TOTAL	1249424.566	21524.08202	73733.17506	610542.0169			

SMOKE Totals (2007aq_07c 19apr2010)							
State	VOC	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}
AL		-0.1%	0.0%	-0.3%	-0.3%	0.0%	0.0%
AK		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
AZ		-0.2%	0.0%	-0.3%	0.0%	0.0%	0.0%
AR		-0.3%	0.0%	-0.3%	0.0%	0.0%	0.0%
CA		-0.2%	0.0%	-0.3%	-0.1%	0.0%	0.0%
CO		0.0%	0.0%	-0.3%	-0.3%	0.0%	0.0%
CT		-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%
DE		-0.2%	0.0%	-0.3%	-0.1%	0.0%	0.0%
DC		-0.2%	-0.1%	-0.3%	-0.2%	-0.1%	-0.1%
FL		-0.2%	-0.1%	-0.2%	-0.2%	-0.1%	-0.1%
GA		-0.2%	0.0%	-0.3%	-0.2%	-0.1%	-0.1%
HI							
ID		-0.3%	0.0%	-0.2%	0.0%	0.0%	-0.1%
IL		-0.1%	-0.1%	-0.2%	-0.1%	0.0%	0.0%
IN		-0.2%	-0.1%	-0.3%	0.0%	-0.3%	-0.2%
IA		-0.2%	0.0%	-0.3%	0.0%	0.0%	0.0%
KS		-0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%
KY		-0.2%	0.0%	-0.3%	-0.3%	-0.1%	0.0%
LA		-0.2%	0.0%	-0.2%	0.0%	0.0%	0.0%
ME		-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%
MD		-0.2%	0.0%	-0.3%	-0.1%	-0.1%	0.0%
MA		-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
MI		-0.1%	-0.1%	-0.3%	-0.2%	-0.1%	0.0%
MN		-0.3%	0.0%	-0.3%	-0.1%	-0.1%	-0.1%
MS		-0.2%	0.0%	-0.3%	-0.3%	0.0%	0.0%
MO		-0.2%	0.0%	-0.3%	0.0%	-0.1%	0.0%
MT		0.0%	0.0%	-0.2%	-0.3%	0.0%	0.0%
NE		-0.2%	0.0%	-0.3%	0.0%	-0.1%	0.0%
NV		-0.2%	-0.1%	-0.3%	-0.3%	-0.1%	0.0%
NH		-0.2%	0.0%	-0.1%	0.0%	-0.1%	-0.1%
NJ		-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%
NM		0.0%	0.0%	-0.3%	-0.2%	0.0%	0.0%
NY		-0.2%	0.0%	-0.2%	-0.1%	-0.1%	-0.1%
NC		-0.1%	0.0%	-0.2%	-0.3%	0.0%	0.0%
ND		-0.1%	0.0%	-0.3%	-0.3%	-0.1%	0.0%
OH		-0.1%	0.0%	-0.3%	0.0%	0.0%	0.0%
OK		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OR		-0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%
PA		-0.2%	0.0%	-0.2%	0.0%	-0.1%	-0.1%
Puerto Rico							
RI		-0.1%	0.0%	-0.1%	-0.3%	0.0%	0.0%
SC		-0.2%	0.0%	-0.3%	-0.3%	0.0%	0.0%
SD		-0.2%	0.0%	-0.3%	-0.3%	-0.1%	0.0%
TN		-0.2%	0.0%	-0.3%	-0.3%	-0.1%	0.0%
TX		-0.1%	0.0%	-0.3%	-0.1%	-0.1%	0.0%
UT		0.0%	-0.1%	-0.3%	-0.2%	0.0%	0.0%

Table B-8c: All Non-Point Emission Sources—Percent Change between EMF and SMOKE Calculations

SMOKE Totals (2007aq_07c 19apr2010)							
State	VOC	NO_X	CO	SO_2	NH_3	PM_{10}	PM_{25}
VT		-0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%
Virgin Islands							
VA		-0.3%	-0.1%	-0.3%	-0.3%	-0.2%	-0.1%
WA		-0.2%	0.0%	-0.2%	0.0%	0.0%	0.0%
WV		-0.2%	0.0%	-0.3%	-0.3%	0.0%	0.0%
WI		-0.2%	0.0%	-0.1%	-0.3%	0.0%	0.0%
WY		0.0%	0.0%	-0.3%	-0.3%	-0.1%	0.0%
TOTAL							

SMOKE Totals (2007aq_07c 19apr2010)						
State	ACETALD	BENZENE	CHLORIN	FORMALD	HCL	HGSUM
AL	92.6%	15.2%	0.0%	86.0%	-0.1%	-0.2%
AK	#DIV/0!	#DIV/0!	#DIV/0!	-93485925690000 00000000000000 00000000000000 00.0%	-27221784130000 000000000000000 00000000000000 00.0%	-312234890000000 0000000000000000 0000000000.0%
AZ	90.7%	10.2%	0.0%	76.2%	-0.1%	-0.3%
AR	96.9%	26.7%	0.0%	93.9%	-0.2%	-0.1%
CA	83.7%	16.5%	0.0%	58.9%	-0.3%	-0.1%
CO	66.7%	7.3%	0.0%	95.5%	-0.2%	-0.3%
CT	59.4%	22.8%	0.0%	80.3%	0.0%	-0.1%
DE	71.0%	1.6%	#DIV/0!	81.6%	-0.3%	-0.3%
DC	89.0%	5.2%	#DIV/0!	66.1%	0.0%	-0.2%
FL	97.3%	24.9%	0.0%	94.3%	0.0%	-0.1%
GA	90.4%	11.8%	0.0%	79.5%	-0.3%	-0.2%
HI				-19850111370000 00000000000000 00000000000000 00.0%	-91331703960000 00000000000000 00000000000000 00.0%	-127708950000000 0000000000000000 0000000000.0%
ID	54.1%	4.3%	0.0%	52.0%	-0.1%	-0.3%
IL	84.0%	4.8%	0.0%	79.6%	0.0%	-0.1%
IN	89.5%	16.4%	0.0%	79.2%	-0.3%	-0.1%
IA	82.7%	13.1%	0.0%	74.4%	-0.1%	-0.2%
KS	98.6%	30.0%	0.0%	98.1%	-0.2%	-0.2%
KY	83.5%	12.4%	0.0%	75.0%	-0.2%	-0.2%
LA	97.1%	27.8%	0.0%	93.6%	0.0%	-0.1%
ME	48.6%	8.8%		79.4%	0.0%	-0.1%
MD	68.0%	13.6%	0.0%	81.1%	-0.2%	-0.1%
MA	66.3%	30.6%	0.0%	82.4%	0.0%	0.0%
MI	87.8%	37.9%	0.0%	94.1%	-0.3%	0.0%
MN	79.0%	0.4%	-0.4%	97.6%	-0.2%	-0.2%
MS	94.1%	30.2%	0.0%	91.3%	-0.1%	-0.2%
MO	84.2%	13.2%	0.0%	79.9%	-0.3%	-0.3%
MT	78.5%	14.4%		87.4%	0.0%	-0.2%
NE	93.8%	16.6%	0.0%	89.5%	-0.3%	-0.3%
NV	89.4%	19.0%	0.0%	77.3%	-0.2%	-0.2%
NH	50.5%	10.0%	-0.1%	79.6%	0.0%	-0.1%
NJ	74.7%	9.1%	0.0%	71.4%	0.0%	-0.1%
NM	90.7%	27.4%	0.0%	99.9%	-0.1%	-0.2%
NY	75.8%	20.8%	-0.3%	58.6%	-0.2%	0.0%
NC	93.2%	24.9%	0.0%	89.1%	-0.1%	-0.1%
ND	77.0%	24.9%		86.4%	-0.2%	-0.2%
OH	87.0%	37.0%	0.0%	74.8%	0.0%	-0.1%
OK	98.2%	46.7%	0.0%	97.1%	0.0%	-0.1%
OR	95.9%	29.0%	0.0%	91.5%	0.0%	-0.1%
PA	87.0%	52.8%	0.0%	78.8%	-0.3%	-0.1%
Puerto Rico				0.0%	0.0%	0.0%
RI	90.1%	4.8%		72.8%	0.0%	0.0%
SC	93.1%	29.8%	0.0%	88.1%	-0.3%	-0.2%
SD	77.8%	6.0%		74.0%	-0.3%	-0.2%
TN	88.0%	24.3%	0.0%	77.2%	-0.2%	-0.1%

Table B-8ci: All Non-Point Emission Sources—Percent Change between EMF and SMOKE Calculations

SMOKE Totals (2007aq_07c 19apr2010)						
State	ACETALD	BENZENE	CHLORIN	FORMALD	HCL	HGSUM
TX	77.1%	3.2%	0.0%	56.2%	-0.2%	-0.2%
UT	97.1%	21.2%		99.5%	-0.2%	-0.2%
VT	57.7%	2.6%		65.5%	0.0%	-0.1%
Virgin Islands				0.0%	0.0%	0.0%
VA	81.6%	18.6%	0.0%	76.7%	-0.3%	-0.2%
WA	71.4%	5.3%	0.0%	62.8%	-0.1%	-0.2%
WV	86.0%	32.5%	0.0%	76.1%	-0.2%	-0.3%
WI	63.4%	5.5%	-0.2%	63.3%	0.0%	-0.3%
WY	83.6%	34.7%	0.0%	99.9%	-0.3%	-0.3%
TOTAL						

SMOKE Totals (2007aq_07c 19apr2010)			
State	bfam / voc	VOC sum	VOC diff
AL	5.8%	168549.947	1.8%
AK	0.0%	0	-100.0%
AZ	5.8%	78724.47379	3.0%
AR	7.2%	104181.5421	7.6%
CA	9.0%	472863.9223	2.5%
CO	19.8%	91191.03732	-10.3%
CT	7.9%	83751.66932	5.7%
DE	7.6%	12289.79614	3.5%
DC	8.3%	3917.144412	-2.1%
FL	7.6%	484430.62	6.6%
GA	5.8%	261449.3284	7.6%
HI	0.0%	0	-100.0%
ID	4.6%	138766.0408	7.0%
IL	9.2%	257263.1126	-0.1%
IN	5.8%	181846.3475	3.4%
IA	7.8%	74932.88837	1.8%
KS	21.8%	121802.4986	-1.1%
KY	7.9%	103053.3971	3.0%
LA	8.5%	142756.1928	6.5%
ME	8.5%	47737.4209	-1.0%
MD	7.1%	110143.8293	7.6%
MA	7.7%	143421.3725	6.5%
MI	7.8%	238499.4632	3.8%
MN	10.1%	102122.7315	-1.5%
MS	7.8%	148790.8277	2.0%
MO	7.7%	161739.3631	3.4%
MT	8.8%	29958.49236	0.4%
NE	9.5%	40138.7185	2.3%
NV	9.2%	21124.15113	1.6%
NH	9.4%	37354.50828	4.2%
NJ	6.5%	131451.7232	5.8%
NM	33.3%	200104.8218	-20.0%
NY	5.5%	410378.8558	3.3%
NC	9.5%	231543.1069	3.6%
ND	7.6%	21726.09009	-0.2%
OH	5.6%	305394.5664	7.7%
OK	7.1%	199867.1122	0.8%
OR	12.5%	169050.6517	-0.2%
PA	7.3%	291017.7685	6.8%
Puerto Rico		0	
RI	6.9%	16526.0837	1.0%
SC	6.1%	154139.7189	3.7%
SD	8.4%	18211.51169	2.1%
TN	7.4%	150886.5771	5.4%
TX	3.5%	710828.334	3.4%
UT	22.1%	86481.67817	-9.4%

Table B-8cii: All Non-Point Emission Sources—Percent Change between EMF and SMOKE Calculations

SMOKE Totals (2007aq_07c 19apr2010)			
State	bfam / voc	VOC sum	VOC diff
VT	11.7%	14042.50938	-3.4%
Virgin Islands		0	
VA	8.6%	172741.7695	5.5%
WA	9.9%	115593.1067	-0.6%
WV	5.3%	59617.84381	4.1%
WI	7.6%	161422.7479	3.3%
WY	35.0%	142006.2588	-21.7%
TOTAL			

EMF Inventory							
State	ACETALD	BENZENE	FORMALD	CO	NH_3	NO_X	PEC
AL	483	1747	935	706801	2802	163019	2803
AK	49	472	87	121991	245	15523	256
AZ	507	2041	1042	728024	3004	202941	3638
AR	251	1160	596	465717	1550	94571	1481
CA	2787	5658	6733	2478103	36822	607045	
CO	489	1924	772	624943	2274	130015	2044
CT	389	1078	478	389848	1556	72791	753
DE	93	295	158	119471	449	24372	382
DC	31	104	53	44417	189	8980	139
FL	1322	6399	2664	2470638	9976	492319	7565
GA	814	3894	1799	1462176	5118	317017	5887
HI	92	360	103	135857	504	20956	158
ID	133	648	268	210926	658	42837	633
IL	1522	3803	2146	1542724	5139	320920	5289
IN	1031	2297	1392	967516	3389	214123	3285
IA	510	1183	580	489531	1504	93058	1463
KS	284	1080	483	388341	1426	83628	1394
KY	487	1551	916	609541	2333	152060	2705
LA	358	1356	752	549790	2162	125078	2138
ME	127	552	241	203948	696	43514	766
MD	539	1951	913	682370	2700	146975	2175
MA	548	1723	894	688388	2785	139209	2108
MI	1117	4590	1898	1588827	4884	309898	5294
MN	900	2185	1017	854121	2597	157697	2534
MS	304	1103	641	446088	1984	115437	2198
MO	761	2594	1318	979163	3296	208859	3409
MT	92	496	220	164636	528	38064	662
NE	293	698	372	265502	926	65391	1274
NV	143	653	246	214179	961	44142	456
NH	124	436	209	171892	640	35458	592
NJ	804	2408	1083	969444	3791	171710	1981
NM	264	992	515	343597	1294	90043	1525
NY	1413	5079	2032	2014449	7099	318432	3186
NC	509	2900	1253	1194006	4015	244349	4195
ND	137	309	155	120204	367	25066	428
OH	1178	3857	1851	1608292	5299	310309	4820
OK	369	1525	724	626169	2257	128109	2141
OR	313	1648	534	478592	1589	92935	1388
PA	941	4137	1782	1620133	5147	298207	4429
RI	75	265	112	109391	439	16076	145
SC	326	1802	808	750321	2428	147751	2508
SD	137	321	168	122264	422	29058	519
TN	629	2461	1213	1091796	3294	233369	4260
TX	2128	6658	4472	2638573	11289	715274	14430
UT	222	1205	431	396863	1313	74353	1044
VT	49	228	85	87308	340	14258	183

Table B-9a: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF Inventory							
State	ACETALD	BENZENE	FORMALD	CO	NH_3	NO_x	PEC
VA	685	2974	1353	1166020	4088	222021	3103
WA	506	2712	933	835349	2688	168806	3053
WV	169	756	320	295749	971	57830	892
WI	790	2041	1003	796259	2822	161438	2631
WY	94	406	192	131350	440	32857	574
TOTAL	28177	97883	50755	37903749	163735	8001667	120498

EMF Inventory						
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC
AL	1664	426	115	165	4	731
AK	137	35	10	12	0	53
AZ	2052	527	150	217	6	956
AR	856	219	62	93	2	413
CA	28572	21495				
CO	1406	360	84	120	3	531
CT	901	231	31	45	1	197
DE	327	84	16	27	1	121
DC	158	41	6	9	0	43
FL	6925	1778	316	475	11	2113
GA	3412	875	243	355	9	1577
HI	313	80	7	10	0	45
ID	460	118	27	42	1	189
IL	3758	965	224	349	8	1569
IN	1947	498	136	200	5	886
IA	888	228	60	86	2	379
KS	803	205	56	75	2	326
KY	1303	333	110	153	4	670
LA	1263	323	87	124	3	545
ME	347	88	30	37	1	160
MD	1730	444	90	133	3	593
MA	1845	474	88	135	3	602
MI	3546	911	221	332	8	1483
MN	1597	409	104	151	4	672
MS	1044	267	88	120	3	522
MO	2089	536	143	216	5	963
MT	251	64	26	32	1	139
NE	575	147	51	70	2	304
NV	496	127	19	27	1	117
NH	367	94	24	31	1	136
NJ	2513	645	84	130	3	583
NM	735	188	62	84	2	368
NY	4332	1111	134	206	5	912
NC	2408	617	167	219	6	951
ND	183	47	17	21	1	89
OH	3167	811	197	281	7	1238
OK	1292	331	86	118	3	518
OR	1005	258	58	87	2	386
PA	3287	843	179	245	7	1073
RI	247	63	6	10	0	43
SC	1534	393	104	151	4	670
SD	204	52	20	24	1	102
TN	2158	553	168	214	6	924
TX	7250	1858	596	869	22	3848
UT	817	210	43	60	2	267
VT	138	35	7	10	0	41

Table B-9ai: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF Inventory						
State	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3	POC
VA	2535	650	128	184	5	814
WA	1847	474	126	184	5	818
WV	502	128	35	43	1	184
WI	1631	417	105	142	4	619
WY	207	53	22	27	1	117
TOTAL	108577	42007	4950	7127	182	31503

EMF Inventory				
State	PSO_4	SO_2	VOC	VOC_INV
AL	21	1361	60244	60244
AK	2	192	6935	6935
AZ	27	1205	64878	64878
AR	11	773	35973	35973
CA		3464	255598	255598
CO	15	1203	52843	52843
CT	5	607	35493	35493
DE	3	214	10242	10242
DC	1	90	3801	3801
FL	56	5046	202849	202849
GA	42	2052	115561	115561
HI	1	207	11244	11244
ID	4	418	16618	16618
IL	37	2655	132358	132358
IN	25	1762	81309	81309
IA	10	809	39713	39713
KS	10	749	32003	32003
KY	20	1116	50925	50925
LA	16	1079	45325	45325
ME	6	359	15851	15851
MD	15	1329	61089	61089
MA	15	941	59482	59482
MI	37	3237	129958	129958
MN	18	1173	69319	69319
MS	17	937	38467	38467
MO	25	1936	81074	81074
MT	5	321	12564	12564
NE	9	519	23202	23202
NV	3	304	19676	19676
NH	4	245	14213	14213
NJ	14	1470	83925	83925
NM	11	709	29196	29196
NY	21	3091	162886	162886
NC	31	2183	86494	86494
ND	3	195	9937	9937
OH	36	2973	122626	122626
OK	16	1185	47932	47932
OR	10	707	36482	36482
PA	32	2593	125022	125022
RI	1	131	9424	9424
SC	18	1330	54681	54681
SD	4	226	10564	10564
TN	32	1944	79963	79963
TX	106	5341	233890	233890
UT	7	783	31261	31261
VT	1	147	6934	6934

Table B-9aii: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF Inventory				
State	PSO_4	SO_2	VOC	VOC_INV
VA	22	2027	93247	93247
WA	21	1292	61351	61351
WV	7	511	22373	22373
WI	19	1357	67840	67840
WY	4	267	10623	10623
TOTAL	877	66370	3147282	3147282

SMOKE State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
AL	942.2373948	978.4642617	1794.898908	7887.040979	704224.6128	3900.384047	1214.942105
AK	0	0	0	0	0	0	0
AZ	963.3178882	1115.097944	2077.555823	8114.669155	721465.487	4051.801355	1249.640178
AR	521.9217035	635.5328217	1190.744688	4887.411549	467026.7064	2427.151379	752.9288326
CA	4557.627243	3193.670894	5619.169925	23639.6255	2463593.288	11766.40865	3640.633161
CO	822.1792799	676.4601015	1923.261949	7161.787809	611367.8866	3474.016904	1102.996383
CT	611.1850587	322.3536661	1110.154399	5308.791882	393802.1051	2516.614273	817.342733
DE	173.5029168	146.7427473	302.2466049	1407.476244	120523.0764	686.725868	216.8280691
DC	62.14311163	43.02159844	106.9915497	518.2962611	44607.53952	249.07238	79.84603278
FL	3019.553076	2534.453743	6589.191074	26630.73015	2465414.187	12899.34418	4102.590636
GA	1685.637312	1889.01664	4016.894112	15694.63171	1464939.497	7743.588004	2417.832803
HI	0	0	0	0	0	0	0
ID	251.7376274	260.8579052	671.0689926	2333.627301	210977.5547	1145.21614	359.506346
IL	2395.248984	1958.302718	3879.114234	18752.33537	1541062.811	9161.500759	2887.671484
IN	1556.212026	1440.005038	2346.671955	11185.40281	967169.9151	5557.292484	1722.245203
IA	749.0177691	501.6648254	1188.493064	5735.332405	485247.6262	2770.273918	883.0440203
KS	509.9895387	452.3318312	1098.995472	4390.553465	385758.3954	2141.463303	676.2694444
KY	856.118709	992.4728852	1599.360383	6724.496603	613185.8287	3380.713883	1035.760767
LA	731.3193641	832.4771372	1401.437592	5844.763463	552039.7959	2924.682115	900.4133712
ME	236.2618517	226.6809078	561.5596648	2294.059746	204475.6118	1116.038872	353.410816
MD	993.0380562	727.8884654	1999.662424	8607.211576	687316.0088	4143.916716	1325.981208
MA	990.8576003	773.1339746	1754.794044	8315.579364	690604.2422	4026.779578	1280.997883
MI	2031.016777	1749.196538	4717.810675	18749.76897	1600665.256	9086.308235	2888.172283
MN	1308.873537	859.1061611	2190.946843	10112.11975	843462.6927	4875.885924	1556.913829
MS	617.5949695	734.0772472	1137.031312	4818.306065	446441.4794	2427.188566	742.2829548
MO	1318.963211	1304.194599	2644.157596	11119.84554	977194.1262	5478.623695	1712.705989
MT	176.7713359	232.5246623	513.6727491	1763.025524	165563.6084	877.3915333	271.5876895
NE	436.9908297	365.5088776	699.1491078	3184.38158	262120.7651	1567.303497	490.2853705
NV	267.7224183	203.9829836	668.6888079	2612.445804	213407.2361	1253.136169	402.2862636
NH	227.2870346	175.6727088	443.8903947	2036.977192	172002.4128	982.0335391	313.8059468
NJ	1378.095643	763.7651036	2467.397899	12187.69601	978801.5577	5781.846582	1876.912582
NM	473.1023987	563.9320715	1010.436382	3764.334724	341714.1531	1894.758772	579.8310797
NY	2515.529011	1422.746273	5208.971743	24546.37046	2037900.684	11607.33722	3780.424014
NC	1161.237876	1262.759243	3012.063421	12149.73511	1203892.429	5927.659324	1871.724294
ND	195.4201288	139.106548	309.5962271	1445.711024	118783.3182	702.5879042	222.589889
OH	2049.039187	1804.610796	3976.736819	17434.72321	1618628.197	8508.749563	2685.393111
OK	747.6316624	728.7226681	1556.4803	6472.376537	622430.6816	3174.9584	997.1002243
OR	557.2292968	514.3833528	1682.862856	5127.51514	475923.9615	2497.118803	789.737753
PA	1834.730922	1586.512557	4249.830038	18219.7814	1636989.117	8790.008033	2806.801424
RI	148.7142772	75.34539932	271.8868308	1304.354505	109961.8974	615.8143233	200.9363037
SC	746.1538888	837.0035897	1869.969895	7503.832969	756131.9665	3679.346459	1156.001412
SD	200.6162683	153.6414711	323.3745516	1492.957137	121581.1711	728.8712566	229.8640565
TN	1249.649469	1272.157265	2529.771169	10833.19003	1092851.082	5333.245854	1668.904204
TX	4039.123059	5211.788513	6811.823614	28985.21299	2638966.072	14869.17286	4465.226538
UT	426.3605952	359.5423431	1211.369971	4357.089776	390181.2253	2095.443333	671.1580037
VT	98.92364477	65.66606377	230.4631019	1005.757042	87340.19669	477.7708551	154.9416383

Table B-9b:Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE							
State	ALD_2	ALDX	BENZENE	CH_4	CO	ETH	ETHA
VA	1378.740066	1157.576857	3074.287077	13284.14193	1180486.673	6407.226475	2046.48492
WA	930.6832422	947.6745937	2748.796764	8577.856105	827175.9855	4206.042247	1321.325376
WV	333.1656138	293.3183826	782.4373553	3206.320198	298368.191	1551.346833	493.9488154
WI	1224.567329	827.4453024	2079.705732	9897.113627	796823.901	4766.801428	1523.991466
WY	165.2489771	203.0355958	410.2282243	1416.63676	130153.5457	710.2375348	218.2393883
TOTAL	50,868	45,516	100,066	423,043	37,940,746	206,957	65,160

SMOKE State	ETOH	FORM	HGIIGAS	HGNRVA	HONO	IOLE	ISOP
AL	329.3879081	1514.009071	0.00060705	0.006372048	1279.35603	995.7585538	0.413039965
AK	0	0	0	0	0	0	0
AZ	1899.760154	1674.096908	0.000644854	0.006730651	1597.611319	1017.695729	0.359535488
AR	0	952.9703801	0.000343716	0.003614328	754.360799	601.1118199	0.238992419
CA	7306.347958	8412.154406	0.103840319	0.200519443	4787.27907	3783.737699	2.060002311
CO	1091.250517	1240.987947	0.00048818	0.005139131	1028.77253	813.7495291	0.241580652
CT	1479.378565	807.3968998	0.000341884	0.003635632	579.5070553	548.0320187	0.099163354
DE	1.009973109	258.600744	9.84E-05	0.001037173	193.3665144	173.0918437	0.070755448
DC	0	87.50081402	4.13E-05	0.000437659	70.64629684	66.66280177	0.030591436
FL	0	4532.737266	0.002139286	0.022595095	3874.335558	3645.508486	1.850393621
GA	0	2950.071126	0.001120638	0.011739551	2490.29069	1911.110706	0.749926867
HI	0	0	0	0	0	0	0
ID	0	431.6924054	0.000145231	0.001529186	337.8609426	266.5959427	0.088994449
IL	3606.361259	3425.122103	0.001118062	0.011761287	2536.641461	2049.80802	0.501544525
IN	2795.540782	2197.03904	0.000735096	0.007722511	1689.739139	1216.321819	0.257249782
IA	1476.261614	949.0234028	0.000330743	0.003478017	740.022942	598.4269276	0.111125611
KS	369.8888672	783.4662671	0.0003086	0.003240367	665.8609234	517.0303395	0.179892878
KY	625.8254011	1426.623278	0.000504998	0.005282118	1198.547688	805.9667422	0.275521399
LA	0	1196.467314	0.000465876	0.004892423	1000.531121	789.9607667	0.377398769
ME	0	395.7480231	0.000152283	0.001593359	345.8297935	252.7873556	0.076640003
MD	0.931137388	1487.084625	0.000591471	0.00624264	1162.688056	1011.631525	0.379083747
MA	169.6641799	1456.783701	0.000594513	0.006280758	1104.97205	988.8235923	0.373315712
MI	916.2412371	3164.926326	0.001065599	0.011181485	2459.901286	2096.826976	0.649223678
MN	2490.109656	1661.183471	0.00057078	0.006002381	1247.582992	1037.151898	0.178617858
MS	0	1024.706221	0.000427492	0.004464026	914.5865593	651.4749332	0.308841091
MO	1205.270764	2101.810959	0.000722901	0.007592718	1654.279418	1276.873681	0.39453395
MT	39.92444029	347.8393957	0.000114669	0.001195896	301.897551	194.2170551	0.054647528
NE	896.5673165	597.2634729	0.000200301	0.002081983	520.0317684	345.5780534	0.071367736
NV	758.1151789	417.5196831	0.000206163	0.00219148	345.755889	305.7338177	0.089464619
NH	0	343.8391268	0.000138547	0.001456303	281.2930386	233.5934823	0.081717996
NJ	2079.450277	1851.413115	0.000821267	0.00872825	1368.93095	1358.665367	0.394112822
NM	296.1842107	797.9905971	0.000280292	0.002931221	717.1013998	465.313701	0.174256346
NY	3164.256973	3564.898229	0.001555109	0.016536168	2549.949869	2646.308425	0.710808355
NC	0	2110.727968	0.000881906	0.009244208	1925.144447	1464.789364	0.57173958
ND	326.2394204	249.4129634	7.99E-05	0.000834643	198.7622231	145.5200221	0.022243853
OH	1484.995018	3055.86306	0.001139588	0.011988458	2454.269301	1974.402438	0.610052995
OK	0	1181.144029	0.000489418	0.005142344	1024.885197	831.9805862	0.370940062
OR	557.5392069	878.0804787	0.000349186	0.003682776	735.5853238	576.4865336	0.170939351
PA	122.8800481	2991.027652	0.001131935	0.011931123	2371.590666	2060.562908	0.688110682
RI	19.83863315	194.0500854	9.41E-05	0.001004808	127.8727439	164.9295092	0.074381908
SC	0	1346.16812	0.00053194	0.005586926	1162.097962	932.1135288	0.386878879
SD	386.4343156	267.3469583	9.14E-05	0.000953265	231.38341	156.983776	0.02919766
TN	0	1994.742312	0.000719016	0.007496709	1834.370459	1349.497918	0.560173874
TX	367.7109135	6862.680455	0.002407869	0.02514764	5726.569569	3946.716199	1.839671522
UT	236.6793586	708.4153209	0.000284139	0.00300052	581.849641	495.0245927	0.16272117
VT	0	149.963896	7.41E-05	0.000780123	113.7471892	115.3918864	0.041569041

Table B-9bi:Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE							
State	ETOH	FORM	HGIIGAS	HGNRVA	HONO	IOLE	ISOP
VA	0	2247.55933	0.000896188	0.009469588	1756.197704	1560.817798	0.582525937
WA	387.6578705	1531.327156	0.000581338	0.00609371	1331.065925	974.6506666	0.310443164
WV	0	537.6376255	0.000214085	0.002250424	459.024862	371.2897295	0.132541726
WI	2020.021903	1648.121898	0.000612411	0.006436465	1286.361096	1044.310654	0.223759124
WY	0	295.0654581	9.47E-05	0.000986334	260.364665	162.3189671	0.052252413
TOTAL	38,908	80,302	0	0	63,381	50,993	19

SMOKE							
State	MEOH	NH_3	NO	NO_2	NO_X	NVOL	OLE
AL	0	2799.699291	143927.5415	14712.59361	159919.4911	34.85143256	4677.390417
AK	0	0	0	0	0	0	0
AZ	0	2993.906374	179731.5186	18372.50185	199701.6318	41.44150088	4819.795575
AR	0	1551.672857	84865.59643	8675.149611	94295.10684	22.94626495	2907.902289
CA	0	36674.54548	538569.1842	55053.81098	598410.2743	115.4412876	14157.8169
CO	0	2267.506515	115736.8608	11830.88541	128596.5187	22.5499204	4151.21795
CT	0	1551.037033	65194.50761	6664.324392	72438.33906	8.89352111	2999.389685
DE	0	447.252757	21753.71907	2223.713306	24170.79889	4.937971064	826.0437715
DC	0	188.1530658	7947.701717	812.4315162	8830.77953	1.297772588	301.3126979
FL	0	9931.017364	435862.6366	44554.85089	484291.8231	80.60850702	15623.82276
GA	0	5110.013119	280157.6487	28638.32824	311286.2676	66.78067127	9286.957781
HI	0	0	0	0	0	0	0
ID	0	656.7145996	38009.34248	3885.400191	42232.60361	9.086994289	1371.287436
IL	0	5120.352076	285372.1349	29171.37352	317080.1499	68.16667574	10899.52072
IN	0	3386.365261	190095.6903	19432.00067	211217.4301	53.41352952	6574.935558
IA	0	1504.662721	83252.58611	8510.263896	92502.87295	16.6013029	3291.613707
KS	0	1424.475311	74909.35277	7657.400414	83232.6141	15.37118831	2564.877731
KY	0	2332.836119	134836.6016	13783.29088	149818.4402	37.30626174	4023.919463
LA	0	2158.409737	112559.7793	11506.10613	125066.4166	30.45663811	3513.600687
ME	0	697.5335637	38905.82915	3977.040206	43228.69915	7.605141666	1336.897158
MD	0	2690.600426	130802.4206	13370.91581	145336.0245	22.60223949	4989.7817
MA	0	2769.696439	124309.39	12707.17912	138121.5412	25.0551863	4841.845735
MI	0	4867.233184	276738.7728	28288.85915	307487.5333	57.51828089	10885.59968
MN	0	2594.477563	140353.055	14347.2055	155947.8435	28.12537773	5793.585432
MS	0	1985.669229	102890.949	10517.74409	114323.2797	27.30772529	2911.561738
MO	0	3290.548814	186106.4468	19024.21373	206784.94	46.47425308	6535.23896
MT	0	529.2934901	33963.48892	3471.823117	37737.20959	8.541731474	1044.979992
NE	0	925.9558505	58503.54326	5980.363564	65003.9386	13.19929863	1856.243674
NV	0	958.6311684	38897.29431	3976.173783	43219.22398	6.3578868	1496.881301
NH	0	639.2873832	31645.46872	3234.867915	35161.62967	5.532322261	1180.825453
NJ	0	3771.756823	154004.7604	15742.7172	171116.4085	20.68801925	6934.503391
NM	0	1293.835944	80673.89806	8246.66176	89637.66122	21.19033751	2258.526353
NY	0	7072.771026	286869.3232	29324.43274	318743.7058	36.40803886	13928.82837
NC	0	4010.967686	216578.6734	22139.16543	240642.9833	42.5726472	7124.060122
ND	0	367.581144	22360.75147	2285.765285	24845.27898	4.769357995	833.2830326
OH	0	5284.937224	276105.2608	28224.09688	306783.6269	61.76321292	10172.12943
OK	0	2255.673438	115299.555	11786.18195	128110.6222	25.02617953	3822.385988
OR	0	1587.309203	82753.32953	8459.231969	91948.14682	17.47303937	2983.602422
PA	0	5134.760358	266803.8472	27273.2811	296448.719	50.35027517	10559.33401
RI	0	437.0155146	14385.67616	1470.534786	15984.08369	1.76934119	747.1176978
SC	0	2426.477093	130735.9492	13364.12835	145262.1755	28.79966666	4422.912949
SD	0	422.6684148	26030.64135	2660.909651	28922.93441	5.378713312	864.2308216
TN	0	3286.923519	206366.6725	21095.27135	229296.3143	44.49743782	6406.021838
TX	0	11259.36268	644239.3291	65855.55186	715821.4505	200.9341181	17762.82046
UT	0	1309.325346	65458.04821	6691.263689	72731.16154	11.1827024	2515.974947
VT	0	341.3735916	12796.5402	1308.090746	14218.37813	1.760948858	576.4691163

Table B-9bii:Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE							
State	MEOH	NH_3	NO	NO_2	NO_X	NVOL	OLE
VA	0	4078.467827	197572.1954	20196.27118	219524.6643	36.45848959	7711.898193
WA	0	2678.632211	149744.9004	15307.26958	166383.2359	33.02776951	5029.299114
WV	0	972.2855685	51640.28052	5278.783507	57378.08889	9.465409329	1864.680476
WI	0	2819.172748	144715.6421	14793.15658	160795.1598	26.67622266	5678.872948
WY	0	440.5676682	29290.97637	2994.192986	32545.53402	7.572618863	846.4004532
TOTAL	0	163,299	7,130,325	728,878	7,922,584	1,566	247,908

SMOKE State	PAR	PEC	PHGI	PM_{10}	$PM_{2.5}$	PMC	PMFINE
AL	37483.64422	31.10921234	3.28E-05	1790.482702	447.736485	1342.746217	297.4809458
AK	0	0	0	0	0	0	0
AZ	40166.31708	35.9635102	3.68E-05	2212.51512	553.9933317	1658.521789	373.3030753
AR	22539.16006	16.44939632	1.82E-05	925.7010487	231.0127325	694.6883163	152.0042341
CA	149019.6724	11288.65868	0.05371079	28212.73189	21196.02052	7016.71137	3880.107274
CO	31199.04138	25.41969664	2.56E-05	1494.455344	374.8853281	1119.570016	253.6667837
CT	21229.67839	16.34035649	1.60E-05	932.2017101	235.9599753	696.2417348	162.7838252
DE	6413.358756	5.545316225	5.07E-06	343.4353417	86.40156654	257.0337751	60.09739888
DC	2444.335645	2.510967113	2.02E-06	163.5796733	41.42775201	122.1519213	29.57760104
FL	134323.5631	118.859385	0.000108219	7243.94886	1829.938793	5414.010066	1268.895136
GA	71445.98277	60.43279265	6.18E-05	3672.871781	918.1671388	2754.704642	619.3472732
HI	0	0	0	0	0	0	0
ID	9972.167107	7.935452416	7.59E-06	488.1371333	122.5294138	365.6077195	84.21307065
IL	79274.25029	63.35706377	5.90E-05	3987.333176	1000.56408	2986.769096	691.4218
IN	48166.31593	36.87990223	3.94E-05	2098.092919	524.6215879	1573.471331	346.8014099
IA	23332.67771	16.52379162	1.75E-05	954.188341	238.5255779	715.6627631	159.1939803
KS	19533.65119	15.34147809	1.66E-05	865.2295684	216.4610249	648.7685435	142.6294786
KY	31055.3216	25.2202683	2.82E-05	1427.403251	355.3233852	1072.079866	230.5184849
LA	29633.38121	23.65103237	2.50E-05	1359.770317	340.5418362	1019.228481	225.6864468
ME	9391.688544	7.147208893	8.49E-06	381.4737615	94.77781974	286.6959417	60.11303251
MD	37247.24116	30.55147858	3.02E-05	1823.636899	458.5613061	1365.075593	314.615007
MA	36632.35155	32.03768779	3.00E-05	1933.586254	487.3731215	1446.213132	336.7181921
MI	78453.94626	60.46144789	5.77E-05	3775.401214	946.6991784	2828.702035	650.494269
MN	40296.17874	29.19993232	3.02E-05	1709.888694	427.7562001	1282.132493	287.5182133
MS	24525.23118	21.0031956	2.43E-05	1145.861123	285.1366744	860.7244483	182.4673438
MO	48848.12098	37.61217976	3.88E-05	2242.570931	560.8669274	1681.704004	377.5685855
MT	7375.706211	5.31752465	6.60E-06	281.9756093	69.75831887	212.2172904	43.19403969
NE	13715.58343	10.74658862	1.19E-05	632.2970922	157.2293238	475.0677684	102.7257137
NV	12020.27981	9.479647371	9.71E-06	515.2434553	130.1765285	385.0669268	88.07186924
NH	8606.054736	6.933033725	7.37E-06	393.053301	98.45095201	294.602349	65.44297789
NJ	51340.71269	43.09129318	3.87E-05	2591.690814	656.5883175	1935.102497	460.8546517
NM	17884.26911	14.09055694	1.57E-05	804.6545756	200.4247327	604.229843	130.4404609
NY	99003.93032	77.07235779	7.29E-05	4461.405406	1130.142024	3331.263382	786.9926938
NC	54381.8692	44.99228019	4.83E-05	2593.199279	649.2226668	1943.976612	430.7580025
ND	5651.105741	3.776901294	4.51E-06	202.9179079	50.37677761	152.5411303	31.80648567
OH	74618.99288	58.28382976	6.01E-05	3380.044311	847.6883622	2532.355949	568.7141705
OK	30916.46685	24.49284424	2.62E-05	1388.001335	347.5964078	1040.404927	230.099389
OR	21993.65891	17.96209979	1.79E-05	1065.627356	267.3596389	798.2677168	182.0345088
PA	76138.79351	58.65941743	5.86E-05	3478.335923	875.2858325	2603.05009	596.4061815
RI	6006.562582	4.458727823	4.19E-06	252.5678988	64.10150248	188.4663963	44.66220969
SC	34679.8096	27.61306459	2.86E-05	1645.932136	411.91209	1234.020046	277.3770579
SD	6166.753012	4.266566577	5.24E-06	227.7264439	56.4494166	171.2770273	35.22281321
TN	50288.80735	39.1070463	4.14E-05	2344.968348	586.9036743	1758.064674	389.3578186
TX	150408.6117	131.3703647	0.000136667	7898.671386	1968.005985	5930.665401	1306.182067
UT	18481.10927	14.55381229	1.44E-05	861.4670686	216.785511	644.6815576	148.1578171
VT	4213.830253	3.032899353	3.90E-06	146.6364548	36.79372849	109.8427263	23.39955511

Table B-9biii: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE							
State	PAR	PEC	PHGI	PM_{10}	PM_{2_5}	PMC	PMFINE
VA	57531.58697	45.35825614	4.52E-05	2669.307954	672.236842	1997.071112	459.4537393
WA	36824.5146	32.08968402	3.18E-05	1978.057149	494.6486014	1483.408548	336.6282294
WV	13726.29969	9.950720746	1.14E-05	542.0818093	135.5908267	406.4909827	88.28853663
WI	40164.85654	30.80659579	3.26E-05	1747.399247	437.6390206	1309.760227	290.8102614
WY	6155.433537	4.384374631	5.51E-06	233.7229126	57.79339561	175.929517	35.6103863
TOTAL	1,930,923	12,730	0	113,521	42,594	70,927	18,340

SMOKE State	PNO_3	POC	PSO_4	SO_2	SULF	TERP
AL	4.794340074	82.99881369	31.35317306	1352.348533	0	52.23133028
AK	0	0	0	0	0	0
AZ	6.586587631	97.83752046	40.30263805	1194.069577	0	62.10732765
AR	2.543611942	43.54698016	16.46850995	771.8735667	0	34.3891686
CA	24.56561396	5849.242199	153.4467575	3421.217393	0	173.0103421
CO	3.577488495	68.49887608	23.72248318	1192.311107	0	33.79520767
CT	1.491846206	44.01496784	11.32897954	606.3122613	0	13.3285063
DE	0.696471657	15.24850444	4.81387534	213.9497245	0	7.400447547
DC	0.269420251	7.056370751	2.013392858	89.65147881	0	1.944950825
FL	13.9455465	325.6044586	102.6342675	5005.625227	0	120.806353
GA	10.077314	163.8934691	64.41628984	2037.283915	0	100.0830059
HI	0	0	0	0	0	0
ID	1.123615911	21.70612609	7.551148773	415.793732	0	13.61859258
IL	9.310482096	174.5261638	61.94857047	2640.834755	0	102.1602521
IN	5.62008587	98.01853139	37.30165854	1755.632309	0	80.04940505
IA	2.497336265	44.16111047	16.14935928	807.3289889	0	24.88008397
KS	2.374675177	40.66932213	15.44607098	745.4053407	0	23.03653349
KY	4.492605698	66.60363476	28.48839156	1111.421798	0	55.91015851
LA	3.654690388	63.06982258	24.47984413	1075.322767	0	45.64483323
ME	1.266222435	18.54041359	7.710942311	359.3360225	0	11.39766697
MD	3.991238612	82.9522696	26.45131236	1324.380106	0	33.87359119
MA	3.84987362	87.42417456	27.3431934	936.5838245	0	37.54973049
MI	9.266864421	165.9511012	60.52549601	3230.618743	0	86.20157788
MN	4.347716067	78.43692951	28.25340895	1167.952003	0	42.15107324
MS	3.747659298	54.85698386	23.06149187	932.7123248	0	40.92566335
MO	5.865452471	101.4972724	38.32343723	1926.524644	0	69.650282
MT	1.073860348	13.69586325	6.477030925	320.3724224	0	12.80136426
NE	2.175094275	28.66917387	12.9127533	516.8315931	0	19.78161745
NV	0.871644703	25.12623511	6.627132062	302.2463096	0	9.528484955
NH	1.019204903	18.44245859	6.613276895	244.5743508	0	8.291241239
NJ	3.913849766	118.097539	30.63098387	1465.968966	0	31.00479116
NM	2.537350485	37.31742533	16.03893903	706.3670021	0	31.75767176
NY	7.077804307	208.8355038	50.16366441	3094.014163	0	54.56435997
NC	7.193654326	120.0719014	46.20682838	2173.906597	0	63.80327124
ND	0.703576558	9.800109019	4.289705077	194.6585413	0	7.14775048
OH	8.370152174	156.2298568	56.09035302	2963.091243	0	92.56315122
OK	3.672432855	65.08242486	24.24931684	1180.628516	0	37.50632681
OR	2.460923406	48.58161323	16.32049361	704.31803	0	26.18655446
PA	7.883085699	158.778641	53.55850692	2589.862836	0	75.45862692
RI	0.315372642	12.02573389	2.639458435	130.4895438	0	2.651682214
SC	4.315293793	74.52624151	28.08043222	1324.841849	0	43.16155809
SD	0.844891505	11.02528977	5.089855542	225.6338542	0	8.060986765
TN	7.137413097	105.3246934	45.97670288	1930.862515	0	66.68732189
TX	24.25058406	353.6994355	152.5035329	5315.654304	0	301.1368754
UT	1.867395515	39.40595535	12.80053076	776.4321112	0	16.75923414
VT	0.395780221	7.73222033	2.233273478	147.8165463	0	2.639107784

Table B-9biv:Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE						
State	PNO_3	POC	PSO_4	SO_2	SULF	TERP
VA	5.666254182	122.6648082	39.09378418	2022.427972	0	54.64003085
WA	5.240806561	87.52527015	33.1646113	1282.289625	0	49.49841546
WV	1.525535916	26.10775674	9.718276647	510.7523039	0	14.18564344
WI	4.531354354	81.9489684	29.54184064	1355.428429	0	39.97926548
WY	0.926767528	11.29220049	5.579666661	266.178835	0	11.34890172
TOTAL	236	9,738	1,550	66,060	0	2,347

SMOKE				
State	TOL	UNK	UNR	XYL
AL	9873.370366	22.27922456	5992.119393	10033.27702
AK	0	0	0	0
AZ	10594.13351	26.49221291	6713.347969	10000.8562
AR	5997.100032	14.6686987	3848.258381	6187.384613
CA	37352.41481	73.79748987	19347.25769	34100.38129
CO	8514.497862	14.41540002	5757.124026	8377.00896
CT	5894.155172	5.685287222	3604.389279	5597.713747
DE	1715.691059	3.156671309	1012.279941	1776.092872
DC	645.3692916	0.829621041	358.3756636	668.5606919
FL	34548.43791	51.53009142	20583.46301	35606.83911
GA	19098.24538	42.69056306	12549.21893	19741.4697
HI	0	0	0	0
ID	2730.756242	5.809020435	1964.005923	2836.029546
IL	21640.85824	43.57645661	13288.00069	21070.16304
IN	13051.97952	34.14525783	8223.575249	12390.773
IA	6422.932167	10.61262883	3993.514732	6131.470845
KS	5262.003976	9.826246419	3419.138904	5304.242591
KY	8276.868945	23.84866034	5344.75466	8250.502288
LA	7610.139767	19.46992238	4656.14077	7800.132817
ME	2620.779332	4.861675727	1739.9467	2732.5338
MD	10163.96243	14.44875582	6284.954791	10580.65782
MA	9922.519642	16.01688212	5846.569801	10240.11422
MI	21618.6829	36.76940322	14409.62163	22170.84465
MN	11115.12807	17.97948929	7161.55098	10686.49735
MS	6290.123309	17.45682157	3845.897579	6438.7042
MO	13259.50887	29.70933006	8552.44327	13225.0776
MT	2032.562491	5.460430008	1520.87454	2093.323838
NE	3729.526159	8.437868071	2363.074991	3500.000279
NV	3295.919938	4.064405712	2037.431819	3062.260756
NH	2372.445659	3.536627099	1438.555819	2472.664889
NJ	14121.29459	13.22505728	8150.608655	13906.75353
NM	4714.69679	13.54622671	3193.285183	4715.395462
NY	27641.92356	23.27426914	16623.11222	27730.25828
NC	14636.14443	27.21530135	9388.689731	15172.52218
ND	1557.153194	3.04888143	1027.159409	1512.388232
OH	20352.69268	39.4831262	12900.6864	20568.83862
OK	8116.446069	15.99824175	4990.88494	8374.332468
OR	5985.438032	11.16988919	4636.086522	5997.314702
PA	21064.45742	32.18703203	13334.29889	21919.14219
RI	1601.116929	1.131074936	879.9447066	1657.101437
SC	9217.752733	18.41063288	5872.775673	9529.690103
SD	1687.870158	3.438424662	1081.620301	1606.371347
TN	13349.93177	28.44565684	8248.977876	13788.27998
TX	38361.61972	128.4499117	23748.03215	38935.92906
UT	5075.290955	7.148677279	3507.68643	5192.672289
VT	1165.103686	1.125712789	712.4783446	1218.076012

Table B-9bv:Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE				
State	TOL	UNK	UNR	XYL
VA	15694.59203	23.3066371	9707.189704	16332.84099
WA	10027.49363	21.1134974	7692.419181	10261.65159
WV	3760.706102	6.050909045	2418.246078	3914.382646
WI	11095.41712	17.05317512	6889.719858	10811.03276
WY	1674.489269	4.840889532	1232.127861	1730.764668
TOTAL	516,552	1,001	322,092	517,951

SMOKE									
State	ACETALD	BENZENE	FORMALD	NH_3	NO_X	PEC	PM_{10}	$PM_{2.5}$	PMC
AL					1.94%				
AK									
AZ					1.62%				
AR					0.29%				
CA					1.44%				
CO					1.10%				
CT					0.49%				
DE					0.83%				
DC					1.69%				
FL					1.66%				
GA					1.84%				
HI									
ID					1.43%				
IL					1.21%				
IN					1.38%				
IA					0.60%				
KS					0.47%				
KY					1.50%				
LA					0.01%				
ME					0.66%				
MD					1.13%				
MA					0.79%				
MI					0.78%				
MN					1.12%				
MS					0.97%				
MO					1.00%				
MT					0.87%				
NE					0.59%				
NV					2.13%				
NH					0.84%				
NJ					0.35%				
NM					0.45%				
NY					-0.10%				
NC					1.54%				
ND					0.89%				
OH					1.15%				
OK					0.00%				
OR					1.07%				
PA					0.59%				
RI					0.57%				
SC					1.71%				
SD					0.47%				
TN					1.78%				
TX					-0.08%				
UT					2.23%				
VT					0.28%				

Table B-9c: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—Percent Change between EMF and SMOKE Calculations

SMOKE									
State	ACETALD	BENZENE	FORMALD	NH_3	NO_X	PEC	PM_{10}	PM_{2_5}	PMC
VA					1.14%				
WA					1.46%				
WV					0.79%				
WI					0.40%				
WY					0.96%				
TOTAL					0				

SMOKE							
State	PMFINE	PNO_3	POC	PSO_4	SO_2	VOC	VOC_INV
AL							
AK							
AZ							
AR							
CA							
CO							
CT							
DE							
DC							
FL							
GA							
HI							
ID							
IL							
IN							
IA							
KS							
KY							
LA							
ME							
MD							
MA							
MI							
MN							
MS							
MO							
MT							
NE							
NV							
NH							
NJ							
NM							
NY							
NC							
ND							
OH							
OK							
OR							
PA							
RI							
SC							
SD							
TN							
TX							
UT							
VT							

Table B-9ci: Onroad (MOVES-calculated) Emission Sources Not Subject to Temperature Adjustments—Percent Change between EMF and SMOKE Calculations

SMOKE							
State	PMFINE	PNO_3	POC	PSO_4	SO_2	VOC	VOC_INV
VA							
WA							
WV							
WI							
WY							
TOTAL							

EMF 2007								
State	ACETALD	BENZENE	CO	FORMALD	HG	HGIIGAS	NH_3	NO_x
AL	171	1281	314978	394	0	0	30	26770
AK	39	286	69158	118	0	0	7	3443
AZ	238	1168	393761	547	0	0	39	34790
AR	156	835	210881	358	0	0	25	25742
CA	3662	3941	947274	8269			188	243321
CO	221	864	313202	512	0	0	34	32312
CT	116	509	197638	227	0	0	18	16566
DE	37	139	54518	70	0	0	5	4893
DC	18	36	14983	38	0	0	3	2790
FL	805	5269	1421253	1779	0	0	134	110283
GA	345	1848	607139	790	0	0	57	52339
HI	37	149	60953	75	0	0	6	4620
ID	94	460	120861	237	0	0	16	14458
IL	665	1714	704879	1371	0	0	98	103730
IN	349	976	385126	703	0	0	53	58333
IA	360	675	240420	754	0	0	51	58674
KS	261	469	191503	565	0	0	36	43761
KY	181	898	240661	405	0	0	28	28845
LA	183	1359	308718	402	0	0	31	26477
ME	60	498	130292	189	0	0	13	7550
MD	204	909	334683	415	0	0	30	25622
MA	207	865	351204	408	0	0	30	27285
MI	432	2737	807992	1114	0	0	83	66513
MN	525	1348	413847	1055	0	0	65	63497
MS	124	832	186591	281	0	0	21	20086
MO	312	1375	389426	685	0	0	48	48949
MT	104	278	78823	246	0	0	15	17362
NE	218	332	117616	473	0	0	30	37084
NV	122	482	166597	271	0	0	19	17461
NH	59	371	107694	143	0	0	10	7448
NJ	292	1299	509231	573	0	0	44	38020
NM	60	310	96206	138	0	0	10	8805
NY	543	2927	967958	1209	0	0	86	72830
NC	342	2058	651150	797	0	0	58	54972
ND	213	220	71079	464	0	0	28	35490
OH	517	1854	759070	1055	0	0	80	80324
OK	174	875	252576	400	0	0	28	28498
OR	156	866	250425	364	0	0	26	24175
PA	374	2077	726579	868	0	0	60	55526
Puerto Rico	78	632	205307	187	0	0	14	10608
RI	30	133	54256	57	0	0	5	4241
SC	171	1129	327725	391	0	0	29	26793
SD	155	199	63800	335	0	0	20	25367
TN	223	1407	388196	516	0	0	38	37017
TX	897	3788	1298053	1983	0	0	139	137313
UT	91	551	152506	228	0	0	16	13646

Table B-10a: Non-Road (Off-Road) Emissions—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF 2007								
State	ACETALD	BENZENE	CO	FORMALD	HG	HGIIGAS	NH_3	NO_x
VT	26	180	52420	77	0	0	5	3780
Virgin Islands	4	27	7106	9	0	0	1	515
VA	290	1399	479580	630	0	0	45	40605
WA	259	1331	412660	593	0	0	42	39136
WV	54	420	106319	130	0	0	9	7552
WI	379	1696	483093	832	0	0	57	48799
WY	33	175	46801	89	0	0	6	4958
TOTAL	15509	57364	17902244	34430	0	0	2042	2010786

EMF 2007						
State	PHGI	PM_{10}	PM_{2_5}	SO_2	VOC	HGSUM
AL	0	2809	2668	1486	50365	
AK	0	711	666	402	19298	
AZ	0	3633	3467	2189	44694	
AR	0	2744	2622	1513	34195	
CA		14610	12784	1193	161746	0.326651816
CO	0	3374	3224	1971	35914	
CT	0	1490	1414	780	25700	
DE	0	478	455	265	7035	
DC	0	245	236	193	1570	
FL	0	11604	11045	6779	195749	
GA	0	5347	5098	3112	69883	
HI	0	466	444	263	7004	
ID	0	1705	1626	894	22757	
IL	0	9295	8918	6197	84507	
IN	0	4981	4775	3341	49962	
IA	0	5603	5397	3458	39354	
KS	0	4225	4078	2699	20837	
KY	0	2889	2761	1643	36788	
LA	0	2860	2717	1522	55390	
ME	0	1153	1082	418	29928	
MD	0	2692	2558	1444	41077	
MA	0	2513	2387	1343	43567	
MI	0	7159	6781	3680	143237	
MN	0	6808	6505	3664	92483	
MS	0	2128	2027	1149	34049	
MO	0	4920	4711	2862	55122	
MT	0	1885	1814	1113	12863	
NE	0	3641	3516	2325	15957	
NV	0	1823	1743	1150	18408	
NH	0	870	821	374	20167	
NJ	0	3637	3453	1908	63556	
NM	0	921	878	538	11914	
NY	0	7312	6947	3826	131836	
NC	0	5456	5202	3173	75895	
ND	0	3579	3461	2281	12328	
OH	0	7083	6764	4580	86100	
OK	0	2882	2759	1685	32518	
OR	0	2523	2404	1391	34981	
PA	0	5595	5320	2913	85715	
Puerto Rico	0	1225	1160	611	22525	
RI	0	365	347	198	6760	
SC	0	2664	2537	1546	42006	
SD	0	2565	2478	1612	11299	
TN	0	3667	3496	2060	54487	
TX	0	13248	12681	8259	146346	
UT	0	1551	1474	807	25048	

Table B-10b: Non-Road (Off-Road) Emissions—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

EMF 2007						
State	PHGI	PM_{10}	PM_{2_5}	SO_2	VOC	HGSUM
VT	0	482	455	203	10368	
Virgin Islands	0	58	55	34	974	
VA	0	4150	3954	2376	55152	
WA	0	4013	3826	2267	55065	
WV	0	958	907	411	17402	
WI	0	5273	5002	2687	103395	
WY	0	606	577	307	9341	
TOTAL	0	192016	182151	103787	2514819	0

SMOKE (2007aq_07c 15mar2010)						
State	ALD_2	ALDX	BENZENE	CH4	CO	ETH
AL	524.3862914	396.8900221	1354.379629	6713.623933	316477.4807	3225.874207
AK	0	0	0	0	0	0
AZ	539.9112926	500.7874055	1212.785005	5592.238221	393174.4311	2725.38276
AR	383.9499218	300.5735368	885.7275051	4713.207981	211938.0704	2426.303411
CA	4877.520087	3450.261339	4010.905072	14464.42997	952903.0438	8647.169623
CO	452.4720377	416.7458083	898.4014834	4886.727175	312631.3819	2466.881507
CT	276.6127133	214.491301	556.4442733	3714.029462	197786.7843	1760.35566
DE	85.90755098	64.76046778	148.1241024	968.829534	54670.88074	471.9354278
DC	30.23922015	36.80320667	37.70844314	163.8578398	15042.56411	86.55051348
FL	2240.762539	1773.844543	5447.774993	24935.4578	1425844.458	11947.6824
GA	845.2694157	725.9215348	1947.849387	9112.073945	607014.8914	4455.582698
HI	0	0	0	0	0	0
ID	229.515256	193.4641863	477.5649553	3418.494098	121563.8509	1725.079208
IL	1209.989476	1005.49966	1868.605912	11344.30253	704312.84	6059.137533
IN	673.0901581	535.8802788	1093.043757	6708.268249	385301.951	3527.471398
IA	583.3584185	491.9657471	722.3648146	5550.880613	241310.9411	3292.659396
KS	397.8774957	344.3517452	504.1493753	2466.187373	190994.2988	1714.871669
KY	431.1099143	364.3114196	961.253488	4962.449596	241704.6112	2498.043692
LA	568.637816	409.7155352	1418.355043	7516.825718	311373.5006	3627.57952
ME	229.6094302	179.4354626	519.3839165	4868.590997	131764.5698	2279.448071
MD	490.8393812	372.0318876	947.0590425	5594.752386	334873.2618	2693.815755
MA	504.6643876	378.1158324	937.82229	6210.250556	351523.9066	2947.268966
MI	1309.861456	1005.778272	2921.398902	22001.00831	815117.4133	10492.24543
MN	1043.940527	764.9703183	1432.87967	14124.90355	416509.5865	7157.052957
MS	361.4116606	265.3510203	881.5262745	4594.769111	187982.1967	2275.779099
MO	677.2496646	542.9863874	1450.963014	7380.161524	389955.1563	3861.702781
MT	177.4779234	153.3916647	284.5885344	1811.476678	79098.40118	1095.024706
NE	309.2467299	280.7039562	351.8537823	1907.063955	117384.1477	1399.008686
NV	239.5681571	244.7894237	493.6251774	2308.089002	166183.4797	1142.794772
NH	181.6239138	136.7601253	394.4710693	3152.202278	108428.3053	1478.451087
NJ	712.1461209	536.3757431	1381.519193	8869.814318	509372.5619	4213.933217
NM	140.8406557	122.4354633	320.4336609	1562.895713	96375.696	771.2314376
NY	1367.152263	1079.761706	3091.221964	19101.72664	970328.739	9124.836028
NC	877.0459133	742.781389	2188.891191	10150.59639	651588.1479	4959.641517
ND	275.6741752	240.4909754	225.0497235	1538.811607	71016.67429	1284.203211
OH	1107.913161	854.3399779	2031.062983	11763.68517	758817.4947	5877.675885
OK	398.2630088	319.631568	916.7188828	4292.18527	253159.9793	2247.85666
OR	376.8599966	323.0943201	911.4933305	5001.603192	250788.1581	2456.06436
PA	958.0552258	759.5366147	2230.545582	12030.6525	727162.657	5814.030479
Puerto Rico	0	0	0	0	0	0
RI	76.38276294	56.90439542	146.4998117	968.6938968	54411.08008	458.8375974
SC	471.0158899	383.0507189	1199.553601	5592.93134	328798.3776	2697.943778
SD	214.9201571	183.2395912	207.2322151	1466.2587	63825.69109	1069.204754
TN	613.679475	487.2375433	1504.558557	7217.71142	389264.469	3544.791596
TX	1970.190716	1696.347354	3998.686348	18250.13923	1297863.327	9287.71829
UT	249.1108256	220.6677223	579.21151	3656.473951	153123.324	1756.685418

Table B-10b: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)						
State	ALD_2	ALDX	BENZENE	CH4	CO	ETH
VT	86.39450189	68.99245845	190.7382983	1651.004817	52841.88084	783.8458474
Virgin Islands	0	0	0	0	0	0
VA	673.9306942	560.9477469	1472.650582	7435.391961	479766.8071	3625.905753
WA	610.1840216	526.8294036	1400.108197	7927.073847	413412.5876	3896.518113
WV	168.1858031	131.2574239	438.9873689	2478.630686	106815.9287	1184.286928
WI	968.8894037	698.3549945	1824.504872	16442.65278	487808.5113	7921.13572
WY	87.44380496	74.81200249	179.3542537	1435.108355	47142.35725	709.0408399
TOTAL	32280.38141	25617.6712	60600.03104	340019.1942	17946550.85	171166.5404

SMOKE (2007aq_07c 15mar2010)						
State	ETHA	ETOH	FORM	HGIIGAS	HGNRVA	HONO
AL	1034.715876	238.5090134	821.5413794	3.25E-05	0.000242939	212.5799856
AK	0	0	0	0	0	0
AZ	862.1621352	841.8050433	928.342043	3.96E-05	0.000268608	275.1112047
AR	725.7429668	1.162519192	653.2633284	2.50E-05	0.00016111	203.9704858
CA	2226.132617	3616.873127	9542.078206	0.093725878	0.180987509	1928.408888
CO	753.099621	354.4793561	833.0828054	3.48E-05	0.000232694	255.721808
CT	572.3206306	801.7028898	464.0020781	2.00E-05	0.000158483	131.6372916
DE	149.3466951	0.706670743	131.9264459	5.87E-06	4.40E-05	38.87240018
DC	25.28064555	0.086696745	52.54600888	2.35E-06	1.15E-05	22.05870284
FL	3844.808769	8.504579322	3402.575317	0.000145003	0.001073049	876.1030136
GA	1404.916296	3.583239741	1400.138809	5.88E-05	0.000408085	414.4327023
HI	0	0	0	0	0	0
ID	526.4391108	0.678804269	439.5410314	1.62E-05	0.000110754	114.6338244
IL	1746.194047	1886.527681	2137.602942	9.47E-05	0.000575485	822.3432958
IN	1032.593469	1421.839144	1157.606219	5.18E-05	0.000319048	462.8370432
IA	852.738108	1008.374102	1104.426776	4.79E-05	0.000268034	465.5216378
KS	378.3292138	168.3703389	742.5449719	3.14E-05	0.000145986	346.2139394
KY	764.4394328	189.2736803	728.7971946	2.84E-05	0.000187349	228.6449551
LA	1158.325663	1.650397045	865.0985488	3.41E-05	0.000257036	210.787259
ME	750.2387101	0.651544447	463.0989032	1.56E-05	0.000137233	60.07008207
MD	862.7645732	2.950344153	772.8631075	3.33E-05	0.000253785	203.4655677
MA	957.4845021	110.579853	805.0811407	3.39E-05	0.000267111	216.6858171
MI	3390.082621	299.3211023	2417.307927	9.49E-05	0.000755751	528.0587845
MN	2173.683694	2591.097396	1891.144666	6.76E-05	0.000463671	504.0418847
MS	707.8126757	1.041649096	569.3284614	2.18E-05	0.000152452	159.4543248
MO	1136.385433	382.2819779	1160.31992	4.75E-05	0.000306233	388.1375428
MT	278.3004025	17.92831392	355.3544229	1.39E-05	7.02E-05	137.5092339
NE	292.1309706	427.3396346	607.0217722	2.56E-05	0.000109499	293.4116935
NV	355.8493711	439.4032005	430.7879913	1.88E-05	0.000119138	138.0810084
NH	485.8183797	0.559888943	327.7188678	1.18E-05	0.000100045	59.22815457
NJ	1367.349989	989.3332591	1136.6072	4.96E-05	0.000394767	302.1451499
NM	240.8967748	94.55417371	239.6549938	1.00E-05	6.94E-05	69.77036062
NY	2943.823263	1728.625334	2388.970499	9.72E-05	0.000768503	578.3294369
NC	1564.761741	3.6244945	1468.202552	6.09E-05	0.000428127	435.5096707
ND	235.024686	263.3081933	564.8598965	2.30E-05	8.50E-05	281.0337823
OH	1812.682062	929.4310792	1839.126016	8.18E-05	0.000553876	636.9271701
OK	661.0308186	1.529977477	676.6833784	2.86E-05	0.000186807	225.9836752
OR	770.6243584	347.706488	676.9266627	2.74E-05	0.000194261	191.6872889
PA	1854.645457	51.87862365	1643.954876	6.57E-05	0.000497067	439.9148114
Puerto Rico	0	0	0	0	0	0
RI	149.349084	9.526163382	119.2040162	5.19E-06	4.15E-05	33.71787552
SC	862.2095355	1.830492528	757.7326367	3.12E-05	0.000225558	212.494373

Table B-10b: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)						
State	ETHA	ETOH	FORM	HGIIGAS	HGNRVA	HONO
SD	224.5077075	276.5418518	429.3369109	1.73E-05	7.14E-05	200.9117141
TN	1112.3694	2.281300265	989.6785401	3.97E-05	0.000279376	293.5105911
TX	2812.7677	90.21484879	3244.112621	0.000139782	0.000911489	1087.542604
UT	563.4696608	76.26277736	452.4644358	1.66E-05	0.000121201	108.1265574
VT	254.3976178	0.261779915	172.2253118	5.95E-06	4.93E-05	29.99930627
Virgin Islands	0	0	0	0	0	0
VA	1146.470105	3.047063744	1118.746265	4.72E-05	0.000337112	321.8396261
WA	1221.535444	204.0714316	1089.987639	4.47E-05	0.000317598	310.4089289
WV	382.0326533	0.621501834	281.0992774	1.01E-05	7.87E-05	59.93419424
WI	2532.001389	2061.07462	1786.271701	6.41E-05	0.000495451	387.5341226
WY	221.0304862	0.226680202	171.8436685	6.23E-06	4.49E-05	39.32054809
TOTAL	52381.11656	21953.23432	56452.83038	9.57E-002	0.194338223	15944.66432

SMOKE (2007aq_07c 15mar2010)						
State	IOLE	ISOP	MEOH	NH3	NO	NO2
AL	847.380946	1.384294786	0	29.9127048	23915.22852	2444.669132
AK	0	0	0	0	0	0
AZ	733.4901514	1.703712714	0	38.55008626	30950.00382	3163.775038
AR	556.4704798	0.789360212	0	24.9986435	22946.69792	2345.662595
CA	2343.140157	4.239325271	0	187.0461736	216946.1296	22176.70655
CO	579.7941952	1.334377006	0	34.02057199	28768.7047	2940.803221
CT	412.1138739	0.827719792	0	17.70112667	14809.20048	1513.826491
DE	118.6738664	0.235102998	0	5.384372614	4373.127707	447.03062
DC	25.55729258	0.062563803	0	2.614329348	2481.602013	253.6745713
FL	3383.082343	6.423917211	0	134.2046957	98561.54587	10075.19358
GA	1179.151199	2.507110675	0	56.4597306	46623.73358	4765.982148
HI	0	0	0	0	0	0
ID	361.4192051	0.436507349	0	15.74904204	12896.29555	1318.287044
IL	1314.485038	2.651688044	0	97.10375601	92513.6536	9456.951238
IN	777.502852	1.532105833	0	52.79319797	52069.16375	5322.625918
IA	578.8496968	0.83165565	0	50.84691314	52371.14556	5353.487555
KS	310.6868095	0.66364217	0	35.6361159	38949.05325	3981.459068
KY	598.3985578	0.956400368	0	27.93806181	25722.56266	2629.419184
LA	935.9152106	1.297890657	0	31.18470136	23713.56447	2424.053149
ME	479.0895416	0.459998844	0	12.79773365	6757.889782	690.8074726
MD	701.4261119	1.590421626	0	30.22132773	22889.87788	2339.851181
MA	726.5961719	1.424692521	0	30.18169414	24377.12537	2491.885125
MI	2312.356365	2.785471701	0	83.74612058	59406.63936	6072.67953
MN	1416.874797	1.53487064	0	65.38654596	56704.71678	5796.48389
MS	569.1098293	0.786341002	0	20.88401517	17938.60484	1833.72406
MO	889.1442611	1.576624017	0	47.34509698	43665.48749	4463.583026
MT	192.4311135	0.234269668	0	15.34428843	15469.77583	1581.354644
NE	220.9113343	0.4111236	0	29.68685704	33008.85084	3374.238623
NV	295.5109329	0.758350028	0	18.86268137	15534.17029	1587.941342
NH	326.3847652	0.396644544	0	10.01649928	6663.133428	681.1196475
NJ	1052.144682	2.173151971	0	43.79114062	33991.33229	3474.668592
NM	197.11761	0.408748296	0	9.6591928	7849.134778	802.3610765
NY	2129.472998	3.620830199	0	86.22764254	65062.01817	6650.782554
NC	1268.726263	2.525704039	0	58.06324013	48994.78623	5008.36117
ND	157.6281914	0.180164509	0	27.74610405	31616.31781	3231.885528
OH	1409.248794	3.064428311	0	79.59364639	71654.29419	7324.664038
OK	537.984418	1.011058128	0	28.30212492	25423.16293	2598.811494
OR	562.83117	0.982142549	0	25.95056367	21564.83575	2204.407357
PA	1425.067922	2.893780341	0	59.97620463	49490.42386	5059.025283
Puerto Rico	0	0	0	0	0	0
RI	113.0711011	0.211615008	0	4.577838578	3793.260718	387.7542285
SC	710.3286143	1.325466208	0	29.34623302	23905.6188	2443.679857
SD	153.3630291	0.190763497	0	20.31688939	22602.54387	2310.477921
TN	916.708908	1.64079484	0	37.77400806	33019.93765	3375.371565
TX	2462.960773	5.34431476	0	138.6602329	122348.7025	12506.79091
UT	403.9901379	0.552476765	0	15.53210106	12164.27353	1243.45485

Table B-10bi: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)						
State	IOLE	ISOP	MEOH	NH3	NO	NO2
VT	165.98923	0.179811009	0	5.106637268	3374.921693	344.9918312
Virgin Islands	0	0	0	0	0	0
VA	926.871024	2.068646845	0	44.59154616	36206.9482	3701.155335
WA	892.0616526	1.57986963	0	42.34073293	34920.96542	3569.699536
WV	288.2019771	0.448038937	0	9.008253686	6742.615948	689.2452468
WI	1621.39127	1.609143505	0	57.66128055	43597.5569	4456.638914
WY	147.7674568	0.150941387	0	5.85169089	4423.571526	452.1874817
TOTAL	40728.87432	71.99807346	0	2036.694388	1793774.908	183363.6904

SMOKE (2007aq_07c 15mar2010)						
State	NOX	NVOL	OLE	PAR	PEC	PHGI
AL	26572.47763	10.08612443	3850.710729	29803.94931	1308.218222	6.82E-06
AK	0	0	0	0	0	0
AZ	34388.89007	17.12232745	3252.127247	26026.65358	1914.086886	9.83E-06
AR	25496.331	6.337406098	2722.33372	19801.98419	1494.570265	6.69E-06
CA	241051.245	131.6149099	9247.997284	91503.10748	7604.993952	0.048478728
CO	31965.22973	13.02835451	2840.560931	20332.47383	1837.588293	8.78E-06
CT	16454.66426	6.199354764	2103.742493	14612.29205	670.8615896	3.69E-06
DE	4859.030727	1.807667448	558.2978085	4103.317606	238.671952	1.22E-06
DC	2757.335287	1.510430331	103.3544492	919.2858489	160.7476963	8.25E-07
FL	109512.8425	52.43189861	14440.85525	117709.8208	5801.847731	3.10E-05
GA	51804.14843	22.56815698	5297.41769	40896.56156	2755.313815	1.41E-05
HI	0	0	0	0	0	0
ID	14329.21641	3.881547747	1955.778774	12830.41115	895.7137274	3.99E-06
IL	102792.9481	28.39762417	6617.082136	47738.93092	5518.228071	2.72E-05
IN	57854.62671	14.5535371	3885.86494	28381.79807	2883.664516	1.46E-05
IA	58190.15475	10.05800592	3259.20638	21848.23298	3629.196106	1.50E-05
KS	43276.72626	7.831658367	1525.189369	11767.01495	2835.58491	1.15E-05
KY	28580.6268	9.820524314	2872.752483	21309.79756	1571.36127	7.30E-06
LA	26348.40488	9.098334443	4305.666098	32934.52459	1350.168008	7.02E-06
ME	7508.767337	2.782460477	2732.78843	16732.58086	379.0688089	2.13E-06
MD	25433.19463	10.85277264	3223.284494	23989.05585	1280.619353	6.69E-06
MA	27085.69631	10.76998436	3551.665282	25028.55086	1158.799904	6.36E-06
MI	66007.37767	20.08045113	12448.30526	81149.49577	3093.934365	1.73E-05
MN	63005.24256	14.78542908	8015.272684	51811.95348	3709.628088	1.65E-05
MS	19931.78323	5.657322829	2641.755861	20129.83714	1071.130677	5.16E-06
MO	48517.20806	13.21352807	4286.547518	31740.30391	2809.800001	1.26E-05
MT	17188.63971	2.555362238	1069.812573	7156.234225	1208.500083	4.78E-06
NE	36676.50116	6.054947532	1182.646581	8829.247867	2479.331694	9.87E-06
NV	17260.19264	8.899253933	1351.830925	10540.78254	1004.5897	5.10E-06
NH	7403.48123	2.806138408	1778.496726	11364.98297	327.4316577	1.84E-06
NJ	37768.14603	15.46012778	5061.191245	36726.61114	1668.276947	9.06E-06
NM	8721.266216	3.728009782	906.1123698	6925.272788	485.2677123	2.41E-06
NY	72291.13016	28.5493234	10864.62055	74990.03718	3441.164822	1.80E-05
NC	54438.65707	21.88324159	5873.835358	44112.62057	2798.629573	1.43E-05
ND	35129.23712	3.749102168	972.1673928	6642.790096	2514.72128	9.63E-06
OH	79615.8854	24.37042163	6792.013451	49337.43943	3753.901737	2.03E-05
OK	28247.9581	7.75594318	2501.883754	18982.50073	1639.518336	7.46E-06
OR	23960.9304	8.699554378	2865.516156	19858.53448	1275.05589	6.30E-06
PA	54989.36395	21.03470176	6905.324394	49156.78738	2663.458627	1.34E-05
Puerto Rico	0	0	0	0	0	0
RI	4214.732822	1.574676718	553.4539568	3899.705499	168.6879082	9.43E-07
SC	26561.79303	10.99661972	3227.559878	24725.21365	1325.953618	6.99E-06
SD	25113.9335	3.037874925	897.1670766	6185.646626	1760.093738	6.84E-06
TN	36688.81981	13.04681245	4170.247946	32060.09063	1868.504128	9.25E-06
TX	135943.036	52.93792378	10733.56646	86216.36835	7476.479714	3.67E-05
UT	13515.85494	5.842358283	2088.156456	14242.20328	738.2217165	3.66E-06

Table B-10bii: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)						
State	NOX	NVOL	OLE	PAR	PEC	PHGI
VT	3749.912831	1.23165764	930.8922486	5806.328254	191.6552914	9.80E-07
Virgin Islands	0	0	0	0	0	0
VA	40229.94316	17.20959662	4306.101368	31936.87738	2104.055813	1.08E-05
WA	38801.07389	14.41378462	4552.070256	31238.20353	2071.599175	1.03E-05
WV	7491.795389	3.094857002	1413.474604	10042.62989	401.1431799	1.92E-06
WI	48441.72994	11.96221997	9244.082568	58047.2864	2376.395782	1.25E-05
WY	4915.079556	1.469928653	816.7714852	5243.647126	303.2377151	1.39E-06
TOTAL	1993083.262	716.8542493	196797.5531	1447369.976	102019.674	4.89E-002

SMOKE (2007aq_07c 15mar2010)						
State	PM10	PM2_5	PMC	PMFINE	PNO3	POC
AL	2804.340864	2662.492579	141.8482844	292.138221	6.45797285	1044.870698
AK	0	0	0	0	0	0
AZ	3604.492654	3438.468708	166.0239459	330.3407562	7.037394578	1174.953528
AR	2731.979729	2609.965242	122.0144868	240.2109081	5.357389617	859.9824722
CA	14597.81973	12756.46335	1841.356379	1117.128136	23.61008196	3968.572277
CO	3350.029389	3200.203299	149.8260894	294.8224455	6.34907213	1050.194919
CT	1485.13305	1409.092415	76.04063581	157.6050145	3.756372846	570.0933339
DE	475.4930709	452.6614048	22.83166609	46.1763605	1.016778827	165.0433434
DC	242.3275953	233.5695647	8.758030611	15.63684023	0.353559583	56.05431395
FL	11559.40935	11000.03763	559.3717232	1132.156499	23.20933382	4006.321118
GA	5314.133	5065.647345	248.4856551	497.8510436	11.06823063	1781.781959
HI	0	0	0	0	0	0
ID	1700.821388	1621.631026	79.19036194	158.0497681	3.245319863	559.3463606
IL	9234.094002	8858.225917	375.8680848	712.8139564	16.92204016	2575.226423
IN	4951.941777	4746.011156	205.9306211	394.8719007	9.812519828	1436.950487
IA	5562.161788	5356.733565	205.4282229	371.0214327	8.385921504	1330.04694
KS	4183.180081	4036.986322	146.1937595	256.5116748	6.034116305	924.8667226
KY	2875.611256	2747.523681	128.0875749	252.153297	5.812396259	907.1584483
LA	2861.856586	2717.439178	144.4174084	296.788854	6.255000248	1054.343159
ME	1162.145756	1090.507393	71.63836318	155.8845924	3.061332033	548.7486958
MD	2679.015384	2544.984763	134.0306208	274.6070413	5.760390439	974.8948108
MA	2504.662819	2378.23872	126.4240992	260.7059012	6.150283239	941.5174698
MI	7173.953006	6792.106268	381.8467377	799.2070543	17.44768112	2853.671291
MN	6793.904338	6488.640057	305.2642805	601.7020376	12.88988508	2141.79106
MS	2123.479727	2021.94883	101.5308973	205.0573526	4.534337869	733.3500199
MO	4890.507335	4682.028233	208.4791023	402.7559394	9.042860717	1443.133062
MT	1871.620896	1801.083478	70.53741762	128.4669896	2.707549067	455.9648947
NE	3604.090084	3480.316042	123.7740429	214.7577752	4.874512586	770.1018939
NV	1807.033497	1726.807936	80.2255605	157.2008163	3.230171575	556.3184721
NH	873.8674834	823.6211667	50.24631668	107.5449593	2.300086311	382.9405836
NJ	3624.757305	3440.074518	184.6827877	381.4492733	8.55790142	1367.287383
NM	915.4891929	873.2580999	42.231093	84.07711922	1.791157151	299.0587082
NY	7299.3609	6933.05089	366.3100109	752.5698645	16.74544035	2694.191804
NC	5425.480131	5171.85569	253.6244414	508.6931449	11.75777862	1831.081855
ND	3546.523311	3429.81136	116.7119513	197.1442888	4.329425972	703.3822733
OH	7042.356082	6723.663832	318.6922499	632.2828074	15.31212421	2292.09985
OK	2865.266027	2742.505057	122.7609701	237.5940205	5.282855757	850.1319073
OR	2512.355586	2392.647784	119.7078017	241.3824092	5.278426892	861.8519815
PA	5572.780821	5297.453718	275.3271027	563.5408317	13.21851089	2033.302949
Puerto Rico	0	0	0	0	0	0
RI	364.5888848	346.286518	18.30236688	37.72721055	0.930211258	137.1889027
SC	2652.674401	2525.39695	127.277451	257.6132978	5.872824617	925.4444042
SD	2542.986114	2456.182003	86.80411008	149.940555	3.303122406	535.307379
TN	3652.854249	3481.112039	171.74221	345.2821008	8.044413984	1244.37855
TX	13151.25767	12585.83534	565.4223298	1096.766257	25.02448387	3939.308616
UT	1547.870693	1470.513402	77.35729085	158.544623	3.408368525	564.7781981

Table B-10biii: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)						
State	PM10	PM2_5	PMC	PMFINE	PNO3	POC
VT	484.2830578	457.1588137	27.12424412	57.60481026	1.221547865	204.8623895
Virgin Islands	0	0	0	0	0	0
VA	4125.21314	3929.502573	195.710567	394.0652595	8.648367312	1407.754481
WA	3995.210295	3808.078692	187.131603	374.9854916	8.206980936	1338.987567
WV	958.0740473	905.9766662	52.09738113	109.6434082	2.30503712	389.4372404
WI	5285.956726	5011.636349	274.3203774	569.5323644	12.42071926	2033.17114
WY	606.2195091	576.7681541	29.45135502	59.67156357	1.207777465	210.7891543
TOTAL	191190.6638	181302.2037	9888.460063	17084.27827	379.5500669	61132.03549

SMOKE (2007aq_07c 15mar2010)								
State	PSO4	SO2	SULF	TERP	TOL	UNK	UNR	XYL
AL	10.80746463	1471.288856	0	16.19073882	7812.760037	5.984588226	4468.621427	8061.173895
AK	0	0	0	0	0	0	0	0
AZ	12.05014336	2161.174513	0	25.14052976	6574.864017	10.31372794	4026.712289	6479.3779
AR	9.844207742	1496.162692	0	16.9576392	5299.749248	3.788595322	3060.082706	5551.492765
CA	42.15890056	1189.162562	0	234.2090873	21550.23257	82.77615872	14116.09341	19880.22633
CO	11.24856892	1948.726415	0	23.034009	5320.817387	7.813847939	3211.423094	5437.629761
CT	6.776103661	772.3138562	0	8.668437253	3816.815261	3.636906212	2137.928883	3757.041692
DE	1.752970012	261.9764798	0	2.978853994	1089.324506	1.070466999	569.5497834	1139.528006
DC	0.777154605	190.452179	0	2.211688569	217.5799575	0.943401081	139.6997211	220.0142505
FL	36.50294901	6710.592874	0	76.01676504	30032.12076	31.35633785	17556.0866	31189.80531
GA	19.63229606	3076.12974	0	35.22526391	10561.97822	13.52626326	6391.717967	10995.91213
HI	0	0	0	0	0	0	0	0
ID	5.27585024	885.2029255	0	10.13612448	3624.678077	2.327874608	1899.975108	3825.349452
IL	35.03542607	6133.604294	0	64.76051966	12233.4967	17.13328801	7238.022339	12126.61742
IN	20.71173377	3307.915308	0	33.4371262	7265.781011	8.71399	4220.53888	7083.415136
IA	18.08316473	3422.303619	0	40.34738712	5595.945007	6.10760241	3275.528763	5580.432756
KS	13.98889752	2667.66583	0	31.72468603	2824.416875	4.761089734	1926.138472	2858.357493
KY	11.03826926	1625.34729	0	19.33482339	5633.38326	5.947469466	3302.60335	5812.24251
LA	9.884156484	1509.714832	0	16.29100714	8739.928454	5.409849749	4804.472714	9133.939535
ME	3.743964131	414.3621458	0	4.211650526	4982.610602	1.614137981	2311.138657	5294.864783
MD	9.103167821	1429.381144	0	16.27358759	6298.86839	6.348899014	3437.567318	6586.209279
MA	11.06516212	1330.20344	0	15.07310848	6767.665188	6.355798741	3573.232734	7074.126373
MI	27.8458762	3640.034867	0	35.21666969	23215.2382	11.85053704	11663.39777	24434.47707
MN	22.62898615	3628.836967	0	41.83254945	13998.88939	8.872297208	6991.316241	14053.90174
MS	7.876443173	1137.196933	0	12.38157894	5327.172645	3.369403308	2984.635949	5566.918935
MO	17.29637009	2833.449855	0	32.73322567	8292.51067	7.883654359	4986.423186	8524.841393
MT	5.443961375	1101.672621	0	13.11808046	1927.362062	1.5508931	1141.011953	2019.857284
NE	11.25016639	2298.61378	0	27.4889834	2100.443198	3.712488172	1458.932609	2016.599053
NV	5.46877638	1135.849504	0	13.24600864	2646.520358	5.396455453	1681.378677	2571.632049
NH	3.403879804	370.4911064	0	3.975293877	3295.136096	1.651261985	1615.313657	3488.975453
NJ	14.50301262	1889.604937	0	21.72964077	9667.743402	9.063274596	5212.839602	9791.853807
NM	3.063403055	532.4934817	0	6.165592463	1790.804141	2.234522141	1075.370555	1829.505306
NY	28.37895898	3789.490812	0	43.78130908	20393.81013	16.89515731	11303.01397	20855.54188
NC	21.69333796	3138.139217	0	35.33966876	11569.23958	13.08283946	7084.336881	12077.25577
ND	10.23409117	2257.761846	0	27.05348079	1567.463331	2.328103951	1113.708468	1552.983677
OH	30.06731416	4532.922018	0	44.74329684	12859.43341	14.41878696	7404.27073	13147.32624
OK	9.977937576	1667.969032	0	19.13476379	4916.920007	4.602596845	3023.782208	5130.469327
OR	9.079076594	1376.044361	0	15.56274028	5346.693722	5.195140517	3169.872132	5506.997441
PA	23.93279993	2880.999551	0	33.42538971	13213.18894	12.37213768	7655.440236	13846.08039
Puerto Rico	0	0	0	0	0	0	0	0
RI	1.752285256	196.0485608	0	2.197044623	1060.276939	0.928918802	555.8592858	1110.556788
SC	10.51280566	1529.110214	0	16.88754293	6468.054321	6.568434016	3871.663609	6747.128584
SD	7.537208838	1594.872437	0	19.01951166	1513.483878	1.869816411	981.3795284	1491.684017
TN	14.90284628	2037.787246	0	22.96064631	8369.912072	7.77749793	4936.346595	8730.839768
TX	48.25626647	8166.032311	0	94.11855619	21732.96145	31.94707987	13274.61806	22493.26053
UT	5.560495819	798.018775	0	9.341525716	3958.48801	3.540511254	2143.995822	4137.187965

Table B-10biv: Non-Road (Off-Road) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)								
State	PSO4	SO2	SULF	TERP	TOL	UNK	UNR	XYL
VT	1.814774715	200.6628381	0	2.187137496	1704.275554	0.722556522	818.0900359	1807.835238
Virgin Islands	0	0	0	0	0	0	0	0
VA	14.97865309	2349.983752	0	26.83736967	8373.873919	10.23476565	4979.379888	8746.648021
WA	14.29947773	2243.407217	0	25.53275254	8513.807586	8.626347308	4948.313989	8884.876232
WV	3.447800504	407.1157543	0	4.975666121	2742.637058	1.822576355	1520.469258	2881.015666
WI	20.11634363	2660.506466	0	26.21946167	16224.90575	7.049904203	8109.853217	16673.40278
WY	1.861943705	304.5038284	0	3.490304525	1508.596191	0.88789627	752.3185249	1594.905203
TOTAL	686.665844	102703.3013	0	1372.918826	380542.8575	432.3861479	218124.4669	389802.3144

SMOKE (2007aq_07c 15mar2010)							
State	HONO	VOC	NOX	CO	SO2	NH3	PM10
AL	0.80%		-0.7%	0.5%	-1.0%	0.1%	-0.2%
AK							
AZ	0.80%		-1.2%	-0.1%	-1.3%	-0.6%	-0.8%
AR	0.80%		-1.0%	0.5%	-1.1%	-0.3%	-0.4%
CA	0.80%		-0.9%	0.6%	-0.4%	-0.5%	-0.1%
CO	0.80%		-1.1%	-0.2%	-1.2%	-0.6%	-0.7%
CT	0.80%		-0.7%	0.1%	-1.0%	0.0%	-0.3%
DE	0.80%		-0.7%	0.3%	-1.1%	-0.1%	-0.5%
DC	0.80%		-1.2%	0.4%	-1.3%	-0.8%	-1.1%
FL	0.80%		-0.7%	0.3%	-1.0%	0.0%	-0.4%
GA	0.80%		-1.0%	0.0%	-1.2%	-0.5%	-0.6%
HI							
ID	0.80%		-0.9%	0.6%	-1.0%	-0.1%	-0.2%
IL	0.80%		-0.9%	-0.1%	-1.0%	-0.5%	-0.7%
IN	0.80%		-0.8%	0.0%	-1.0%	-0.4%	-0.6%
IA	0.80%		-0.8%	0.4%	-1.1%	-0.4%	-0.7%
KS	0.80%		-1.1%	-0.3%	-1.2%	-0.9%	-1.0%
KY	0.80%		-0.9%	0.4%	-1.1%	-0.2%	-0.5%
LA	0.80%		-0.5%	0.9%	-0.8%	0.4%	0.1%
ME	0.80%		-0.5%	1.1%	-0.8%	1.0%	0.8%
MD	0.80%		-0.7%	0.1%	-1.0%	-0.2%	-0.5%
MA	0.80%		-0.7%	0.1%	-1.0%	-0.1%	-0.3%
MI	0.80%		-0.8%	0.9%	-1.1%	0.4%	0.2%
MN	0.80%		-0.8%	0.6%	-1.0%	0.1%	-0.2%
MS	0.80%		-0.8%	0.7%	-1.0%	0.1%	-0.2%
MO	0.80%		-0.9%	0.1%	-1.0%	-0.4%	-0.6%
MT	0.80%		-1.0%	0.3%	-1.0%	-0.6%	-0.7%
NE	0.80%		-1.1%	-0.2%	-1.2%	-0.9%	-1.0%
NV	0.80%		-1.2%	-0.2%	-1.3%	-0.8%	-0.9%
NH	0.80%		-0.6%	0.7%	-0.9%	0.6%	0.4%
NJ	0.80%		-0.7%	0.0%	-1.0%	-0.1%	-0.3%
NM	0.80%		-1.0%	0.2%	-1.1%	-0.4%	-0.6%
NY	0.80%		-0.7%	0.2%	-1.0%	0.0%	-0.2%
NC	0.80%		-1.0%	0.1%	-1.1%	-0.4%	-0.6%
ND	0.80%		-1.0%	-0.1%	-1.0%	-0.8%	-0.9%
OH	0.80%		-0.9%	0.0%	-1.0%	-0.4%	-0.6%
OK	0.80%		-0.9%	0.2%	-1.0%	-0.3%	-0.6%
OR	0.80%		-0.9%	0.1%	-1.1%	-0.3%	-0.4%
PA	0.80%		-1.0%	0.1%	-1.1%	-0.3%	-0.4%
Puerto Rico							
RI	0.80%		-0.6%	0.3%	-1.0%	0.1%	-0.2%
SC	0.80%		-0.9%	0.3%	-1.1%	-0.1%	-0.4%
SD	0.80%		-1.0%	0.0%	-1.0%	-0.7%	-0.9%
TN	0.80%		-0.9%	0.3%	-1.1%	-0.2%	-0.4%

Table B-10c: Non-Road (Off-Road) Emissions—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq_07c 15mar2010)							
State	HONO	VOC	NOX	CO	SO2	NH3	PM10
TX	0.80%		-1.0%	0.0%	-1.1%	-0.5%	-0.7%
UT	0.80%		-1.0%	0.4%	-1.1%	-0.1%	-0.2%
VT	0.80%		-0.8%	0.8%	-1.0%	0.6%	0.4%
Virgin Islands							
VA	0.80%		-0.9%	0.0%	-1.1%	-0.4%	-0.6%
WA	0.80%		-0.9%	0.2%	-1.1%	-0.2%	-0.4%
WV	0.80%		-0.8%	0.5%	-1.0%	0.0%	0.0%
WI	0.80%		-0.7%	1.0%	-1.0%	0.5%	0.2%
WY	0.80%		-0.9%	0.7%	-1.0%	0.1%	0.0%
TOTAL							

SMOKE (2007aq_07c 15mar2010)						
State	PM25	acetald	benzene	formald	hg	bfam / voc
AL	-0.2%	67.3%	5.4%	52.1%	1.0%	5.4%
AK						0.0%
AZ	-0.8%	55.9%	3.7%	41.0%	0.1%	6.0%
AR	-0.5%	59.5%	5.7%	45.2%	0.8%	5.6%
CA	-0.2%	24.9%	1.8%	13.3%	-1.1%	11.4%
CO	-0.7%	51.1%	3.9%	38.6%	0.0%	6.1%
CT	-0.4%	58.0%	8.5%	51.0%	0.6%	5.0%
DE	-0.5%	57.1%	5.8%	47.0%	0.7%	5.2%
DC	-1.1%	41.0%	4.8%	27.5%	0.1%	7.7%
FL	-0.4%	64.1%	3.3%	47.7%	0.8%	5.7%
GA	-0.6%	59.2%	5.1%	43.6%	0.3%	6.0%
HI						0.0%
ID	-0.3%	59.2%	3.7%	46.0%	1.0%	5.0%
IL	-0.7%	45.0%	8.3%	35.8%	0.2%	6.2%
IN	-0.6%	48.2%	10.7%	39.3%	0.4%	5.9%
IA	-0.8%	38.3%	6.6%	31.8%	0.7%	6.1%
KS	-1.0%	34.5%	7.0%	23.9%	-0.3%	7.9%
KY	-0.5%	58.0%	6.6%	44.4%	0.7%	5.8%
LA	0.0%	67.9%	4.2%	53.5%	1.4%	5.1%
ME	0.8%	73.8%	4.1%	59.2%	1.7%	4.0%
MD	-0.5%	58.4%	4.0%	46.3%	0.4%	5.4%
MA	-0.4%	58.9%	7.7%	49.3%	0.5%	5.2%
MI	0.2%	67.0%	6.3%	53.9%	1.4%	4.6%
MN	-0.2%	49.8%	5.9%	44.2%	1.1%	4.7%
MS	-0.2%	65.8%	5.6%	50.6%	1.2%	5.3%
MO	-0.6%	54.0%	5.2%	41.0%	0.4%	6.0%
MT	-0.7%	41.4%	2.4%	30.9%	0.4%	6.4%
NE	-1.0%	29.6%	5.5%	22.0%	-0.2%	7.9%
NV	-0.9%	49.3%	2.3%	37.0%	-0.1%	6.3%
NH	0.4%	67.3%	5.9%	56.3%	1.3%	4.5%
NJ	-0.4%	59.0%	6.0%	49.6%	0.5%	5.1%
NM	-0.6%	57.1%	3.3%	42.6%	0.4%	5.9%
NY	-0.2%	60.3%	5.3%	49.4%	0.7%	5.2%
NC	-0.6%	61.0%	6.0%	45.7%	0.4%	6.0%
ND	-0.9%	22.6%	2.3%	17.9%	-0.1%	8.6%
OH	-0.6%	53.3%	8.7%	42.6%	0.3%	5.8%
OK	-0.6%	56.2%	4.5%	40.9%	0.5%	6.1%
OR	-0.5%	58.5%	5.0%	46.3%	0.5%	5.6%
PA	-0.4%	61.0%	6.9%	47.2%	0.4%	5.6%
Puerto Rico						0.0%
RI	-0.2%	61.0%	8.9%	52.0%	0.8%	5.1%
SC	-0.4%	63.8%	5.8%	48.4%	0.8%	5.8%
SD	-0.9%	27.9%	3.9%	22.0%	0.0%	7.5%
TN	-0.4%	63.6%	6.5%	47.8%	0.7%	5.7%

Table B-10ci: Non-Road (Off-Road) Emissions—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq_07c 15mar2010)						
State	PM25	acetald	benzene	formald	hg	bfam / voc
TX	-0.8%	54.5%	5.3%	38.9%	0.2%	6.3%
UT	-0.2%	63.3%	4.9%	49.6%	0.8%	5.1%
VT	0.4%	70.2%	5.9%	55.5%	1.4%	4.3%
Virgin Islands						0.0%
VA	-0.6%	57.0%	5.0%	43.7%	0.3%	5.9%
WA	-0.5%	57.5%	4.9%	45.6%	0.6%	5.6%
WV	-0.1%	68.0%	4.4%	53.9%	0.8%	5.1%
WI	0.2%	60.9%	7.0%	53.4%	1.6%	4.4%
WY	-0.1%	62.0%	2.6%	48.3%	1.1%	4.7%
TOTAL						

Inventory (2002ab and 2002ac)		SMOKE (2007aq 15mar2010)		% Difference
State	NH_3	State	NH_3	NH_3
AL	57,802	AL	57801.93022	0.0%
AZ	29,493	AZ	29492.1221	0.0%
AR	110,954	AR	110953.1373	0.0%
CA	152,308	CA	152307.036	0.0%
CO	62,907	CO	62904.99895	0.0%
CT	4,029	CT	4029.389579	0.0%
DE	12,536	DE	12535.59944	0.0%
FL	37,099	FL	37098.93117	0.0%
GA	80,733	GA	80732.53061	0.0%
ID	62,376	ID	62375.23617	0.0%
IL	106,685	IL	106683.9529	0.0%
IN	90,815	IN	90814.42859	0.0%
IA	245,778	IA	245775.9937	0.0%
KS	97,384	KS	97383.08954	0.0%
KE	50,821	KE	50821.09647	0.0%
LA	35,159	LA	35158.8546	0.0%
ME	6,154	ME	6154.144094	0.0%
MD	24,562	MD	24561.79623	0.0%
MA	2,208	MA	2208.131993	0.0%
MI	55,273	MI	55272.28166	0.0%
MN	134,830	MN	134829.0026	0.0%
MS	58,575	MS	58575.04461	0.0%
MO	107,023	MO	107022.3844	0.0%
MT	45,890	MT	45889.38724	0.0%
NE	166,773	NE	166771.0671	0.0%
NV	5,598	NV	5598.167836	0.0%
NH	1,354	NH	1353.701803	0.0%
NJ	3,827	NJ	3827.259966	0.0%
NM	36,340	NM	36339.82553	0.0%
NY	49,281	NY	49280.86974	0.0%
NC	158,187	NC	158186.0109	0.0%
ND	71,302	ND	71301.27094	0.0%
OH	98,711	OH	98710.15122	0.0%
OK	95,061	OK	95059.98021	0.0%
OR	40,655	OR	40653.94821	0.0%
PA	76,675	PA	76674.96414	0.0%
RI	235	RI	234.7013439	0.0%
SC	27,945	SC	27944.29961	0.0%
SD	101,949	SD	101948.1837	0.0%
TN	34,210	TN	34209.95414	0.0%
TX	354,873	TX	354868.0602	0.0%
UT	20,447	UT	20447.24584	0.0%
VT	8,821	VT	8821.29696	0.0%
VA	43,811	VA	43810.83809	0.0%
WA	42,133	WA	42132.60641	0.0%
WV	9,879	WV	9879.303454	0.0%

Table B-11: NH_3 Emissions from Livestock and Fertilizer Application

Inventory (2002ab and 2002ac)		SMOKE (2007aq 15mar2010)		% Difference
State	NH_3	State	NH_3	NH_3
WI	113,949	WI	113947.9071	0.0%
WY	18,575	WY	18574.83303	0.0%
TOTAL	3,251,990	TOTAL	3,251,957	

AK						
State	CO	NH_3	NO_X	PM_{10}	PM_{2_5}	SO_2
AL	4534	13	31434	1301	1185	2210
AK	3024	3	14833	424	424	875
AZ	2824	12	26421	734	723	1978
AR	4593	19	36408	1007	929	2776
CA	26969	180	149597	6321	5929	32155
CO	1801	5	17056	463	455	1132
CT	355	1	2835	114	114	235
DE	862	0	5158	129	116	1215
DC	78	0	570	13	13	44
FL	7436	11	43269	1230	1228	2722
GA	3471	12	32934	925	838	1903
HI	1584	2	7770	222	222	458
ID	892	3	7145	374	374	590
IL	14999	45	114354	3202	3028	7515
IN	6452	19	48235	1344	1244	3091
IA	3753	8	32213	890	890	2199
KS	4378	11	41010	1133	1133	2850
KY	9389	15	60384	1757	1740	3801
LA	34214	42	177402	5058	5058	10769
MA	477	1	1170	176	162	117
MD	1475	22	11076	332	312	3935
MA	2290	7	11462	517	454	1304
MI	3183	5	19175	544	543	1294
MN	7636	12	49465	1392	1391	3207
MS	6774	18	57181	2004	1832	2966
MO	9802	19	72247	2029	2028	4990
MT	2456	6	22720	631	631	1671
NE	7354	18	68682	1887	1887	4727
NV	1042	3	9581	272	271	682
NH	259	0	1436	40	39	81
NJ	4130	11	25796	846	809	2158
NM	3887	9	36366	1003	1003	2512
NY	3998	29	31331	1021	750	5535
NC	2110	7	20081	561	507	1163
ND	2465	6	22993	632	632	1591
OH	12992	32	86353	2424	2286	5483
OK	2794	7	25800	712	712	1785
OR	4731	9	37619	992	951	1790
PA	9342	14	56787	1615	1614	3734
RI	89	0	351	8	0	20
SC	2448	4	17713	496	496	1177
SD	443	1	4098	114	114	309
TN	5550	12	43426	1359	1268	2363
TX	23123	57	194710	6851	6264	9633
UT	1631	5	12674	56	51	902
VA	5437	13	32161	1464	1461	3485

Table B-12a: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

AK						
State	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2
WA	5955	20	46819	1076	1037	3201
WV	2839	8	24810	816	744	1333
WI	3053	11	24078	667	607	1601
WY	3248	8	30337	832	832	2084
TOTAL	270007	773	1924925	59366	56687	154016

AK							
State	VOC	ACETALD	BENZENE	CHLORIN	FORMALD	HG (all)	METHANOL
AL	1853	18	3		39		
AK	141	37	10		75		
AZ	1225	13	2		29		
AR	1352	36	8		77		
CA	6400	556	157	1	1118	0.1273	3.1694
CO	805	9	1		21		
CT	151	2	1		5		
DE	102	4	1		8	0.001826458	
DC	22	0	0		1		
FL	921	75	19		153		
GA	1253	30	6		65		
HI	74	16	4		31		
ID	303	3	0		7		
IL	3978	91	20		192		
IN	1736	40	9		86		
IA	1460	22	4		48		
KS	1937	22	3		50		
KY	1651	85	21		175		
LA	2417	354	95		715		
MA	217	16	4		32		
MD	536	5	1		11		
MA	821	17	4		34		
MI	603	24	6		50		
MN	1426	66	16		137		
MS	1960	72	19		148		
MO	2593	73	16		155		
MT	1123	12	2		28		
NE	3370	36	5		82		
NV	456	5	1		12		
NH	23	3	1		6	0.0001	
NJ	634	30	8		61		
NM	1763	19	3		44		
NY	1194	23	5		48		
NC	766	14	3		31		
ND	1137	12	2		27		
OH	2479	99	24		205		
OK	1215	14	2		33		
OR	1067	31	7		66	7.10E-05	
PA	1350	83	21		170		
RI	15	0	0		0		
SC	610	18	4		38		
SD	202	2	0		5		
TN	1403	61	15		128		
TX	6685	303	76		625		
UT	570	6	1		13		
VA	1260	51	11		107		

Table B-12ai: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

AK							
State	VOC	ACETALD	BENZENE	CHLORIN	FORMALD	HG (all)	METHANOL
WA	1251	44	10		93	0.012278362	
WV	880	29	7		62		
WI	1015	0	0		0		
WY	1500	16	2		36		
TOTAL	67690	2543	627	1	5275	0	3

SMOKE (2007aq_07c 15mar2010)								
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO	ETH	ETHA
AL	50.63864879	202.3634417	12.00006772	0	0	4533.709545	75.21896873	15.15028522
AK	0	0	0	0	0	0	0	0
AZ	42.94672597	176.6760616	3.159748602	0	0	2823.942417	59.39369996	0
AR	60.19470957	163.579225	9.145797103	0	0	4593.299034	57.38541036	5.04125438
CA	603.6081311	347.3301555	156.6823078	9.985128061	1.383793386	26968.68097	171.0549592	78.7446074
CO	14.17309744	119.1776409	1.273170635	0	0	1801.048381	40.06191493	0
CT	20.69946328	12.28210868	2.264025558	0	0	354.6292741	4.732798128	1.267731301
DE	4.579189008	8.709792358	0.982935123	0	0	861.5354579	3.455376786	1.109809862
DC	0.393220133	3.279256546	0.036415364	0	0	77.84316981	1.102481739	0.000295376
FL	82.84116139	95.86952716	19.43682237	0	0	7435.960857	33.0928304	1.821546283
GA	37.2017917	154.6709533	5.684341851	0	0	3471.147687	54.44755436	5.162723094
HI	0	0	0	0	0	0	0	0
ID	34.33591495	38.22512023	2.254722936	0	0	891.9880047	12.85398566	0.001640978
IL	134.7432815	553.1468268	21.39571565	0	0	14998.60268	186.8974496	2.00344659
IN	79.20710091	235.4996686	10.76507064	0.07262949	0	6451.6018	79.78848615	1.047900717
IA	30.71496817	212.4815362	3.855873841	0	0	3752.552694	71.55397339	0.269386846
KS	33.3492399	286.9951283	3.018009332	0	0	4378.255278	96.48180145	0.016321374
KY	96.96906761	185.3451641	21.35548809	0	0	9389.114456	65.0669849	5.811363603
LA	380.7266423	139.5442857	95.39272859	0	0	34214.02659	52.65634115	12.0915262
MA	17.10657273	1.160777612	4.4090027	0	0	476.7947662	2.975012026	5.437511241
MD	11.57479039	73.2478597	1.716490844	0	0	1474.601851	25.24345448	1.307453871
MA	31.17629524	54.54452719	9.627270632	0	0	2289.628784	24.77334425	13.55411608
MI	28.98728087	65.42033786	8.879124244	4.766476694	0	3182.950329	31.17348393	2.3732537
MN	76.98324906	177.6948597	16.38204253	0	0	7636.042291	60.60559886	1.836078931
MS	81.80929513	139.8999332	18.70266952	0	0	6773.827063	60.4617691	28.2599445
MO	90.34667041	354.3678152	16.29875893	0	0	9801.714803	119.9460285	1.734471503
MT	18.95018635	166.5859219	1.668092068	0	0	2455.652455	55.9990513	0
NE	56.10490385	500.4131512	4.924103949	0	0	7353.56029	168.2182256	0.005993506
NV	7.897731179	67.55439321	0.704045039	0	0	1041.619074	22.70912085	0
NH	3.032142793	1.739566781	0.735284248	0	0	259.1790693	0.618401376	0.070731607
NJ	46.37937598	29.09476303	9.008143444	0	0	4129.992592	15.18069837	11.35690086
NM	29.62661287	261.6012738	2.602314139	0	0	3887.11262	87.93858011	0
NY	28.28217398	117.6199358	5.750025903	0	0	3998.253578	45.38361602	12.29825311
NC	18.56380139	97.46295232	2.980296001	0	0	2109.767553	34.17688063	2.975680721
ND	18.82967642	168.8875361	1.641661309	0	0	2464.875616	56.77147037	0
OH	153.1232588	308.2208713	26.75169923	0.376403296	0	12991.81888	105.7941982	3.247383169
OK	21.8273609	179.5212418	2.152614092	0	0	2793.957848	60.35256502	0.013277996
OR	36.73104979	99.67759586	8.04331072	0	0	4730.696769	38.71284506	10.9539832
PA	93.21254717	152.6442284	20.91581351	0	0	9342.00164	52.72958779	2.982947045
RI	2.654231188	1.746400183	0.163301867	0	0	89.20003968	0.588556701	0.002419686
SC	22.35647481	82.28969328	4.144066548	0	0	2447.510119	27.90696853	0.515073366
SD	3.424176656	29.99087055	0.302470345	0	0	443.1083142	10.08180023	0.000164582
TN	70.12736388	134.0635865	14.88828034	0	0	5549.613719	50.49889477	11.42883746
TX	337.4108547	458.6300027	75.65294247	0	0	23122.76056	198.9365332	94.17397918
UT	13.42085187	83.76508694	1.055878991	0	0	1630.587856	28.15867061	0
VA	71.34564394	92.40934076	12.1770061	0	0	5437.281985	38.82471266	16.32258547

Table B-12b: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)								
State	ALD_2	ALDX	BENZENE	CH_4	CL_2	CO	ETH	ETHA
WA	51.01524232	114.9005524	10.27091149	0	0	5955.07955	44.55126788	12.46780067
WV	34.06100167	77.74858689	8.82491951	0	0	2838.538153	30.68767721	9.580769099
WI	165.5741579	109.5717198	11.53051264	1.198335863	0	3053.367205	39.73378825	1.800516414
WY	24.77420526	222.8605423	2.156793986	0	0	3247.918332	74.91532813	0
TOTAL	3,374	7,361	674	16	1	270,007	2,680	374

SMOKE (2007aq_07c 15mar2010)								
State	ETOH	FORM	HGIIGAS	HGNRVA	HONO	IOLE	ISOP	MEOH
AL	0	79.30102531	0	0	251.4710528	13.69106657	4.514904975	0
AK	0	0	0	0	0	0	0	0
AZ	0	65.19576702	0	0	211.3664975	7.171489873	0	0
AR	0	107.2986097	0	0	291.2665278	8.470198807	1.501305913	0
CA	0.017749706	1163.656442	0.036914963	0.071287685	1196.774894	44.14238828	22.75418514	3.165256216
CO	0	37.99938541	0	0	136.4469166	4.837284727	0	0
CT	0	15.30946841	0	0	22.68131087	0.95728888	0.377730793	0
DE	0	9.425921565	0.000529674	0.001022546	41.26684524	0.756820017	0.330466494	0
DC	0	1.050501894	0	0	4.562173096	0.133212783	8.79E-05	0
FL	0	165.3821987	0	0	346.1514134	4.553157382	0.542374948	0
GA	0	86.49861682	0	0	263.4696605	8.154032044	1.537254179	0
HI	0	0	0	0	0	0	0	0
ID	0	26.98465236	0	0	57.16319604	1.552332083	0.000488535	0
IL	0	278.2579493	0	0	914.835081	23.1796294	0.596543944	0
IN	0.000129123	132.5494387	0	0	385.8816548	9.950269383	0.306965525	0.009123336
IA	0	77.63726649	0	0	257.7044803	8.722509229	0.080212309	0
KS	0	89.70583376	0	0	328.0785452	11.65500602	0.004860688	0
KY	0	200.319931	0	0	483.0684282	9.634742677	1.730393912	0
LA	0	731.517342	0	0	1419.217094	10.05793	3.600306553	0
MA	0	32.29472572	0	0	9.362541598	2.023066791	1.619096764	0
MD	0	23.31187167	0	0	88.60980175	3.445349984	0.389677015	0
MA	0	47.20720178	0	0	91.6932015	7.121428281	4.037878057	0
MI	0.008475321	63.76006867	0	0	153.4016499	4.199117539	0.374672623	0.598747219
MN	0	161.8609969	0	0	395.7190077	7.879694522	0.546704084	0
MS	0	166.6128749	0	0	457.4462276	15.94762063	8.414963078	0
MO	0	203.7641403	0	0	577.9782856	15.01402757	0.516482333	0
MT	0	51.25532069	0	0	181.7595672	6.761652309	0	0
NE	0	152.1575416	0	0	549.4559125	20.31365891	0.001784536	0
NV	0	21.24510546	0	0	76.64450801	2.742040245	0	0
NH	0	5.910855107	2.90E-05	5.60E-05	11.48464613	0.096314052	0.021062067	0
NJ	0	70.9329079	0	0	206.3712418	5.308086184	3.381657799	0
NM	0	80.20328064	0	0	290.9315366	10.61839733	0	0
NY	0	64.35967708	0	0	250.6493064	9.240257335	3.662503629	0
NC	0	44.15036073	0	0	160.6458672	5.036863606	0.886102846	0
ND	0	51.138629	0	0	183.9453386	6.855100613	0	0
OH	0.000669256	266.1233122	0	0	690.8259145	13.74450767	0.940771715	0.047282175
OK	0	57.90313795	0	0	206.4027051	7.291415196	0.003953761	0
OR	0	79.56568688	2.06E-05	3.98E-05	300.9516604	8.02253693	3.262195572	0
PA	0	190.4336186	0	0	454.294349	7.279845406	0.888212614	0
RI	0	1.555488186	0	0	2.805782723	0.071781648	0.000721157	0
SC	0	49.9031407	0	0	141.7012814	3.527228498	0.153369223	0
SD	0	9.253650948	0	0	32.78471977	1.21740891	4.90E-05	0
TN	0	145.9825061	0	0	347.4080932	9.594693403	3.403029481	0
TX	0	683.7796141	0	0	1557.68136	52.83834124	28.04074373	0
UT	0	27.13262223	0	0	101.3931403	3.399960807	0	0
VA	0	126.5455203	0	0	257.2843532	9.682134317	4.86013985	0

Table B-12bi: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)								
State	ETOH	FORM	HGIIGAS	HGNRVA	HONO	IOLE	ISOP	MEOH
WA	0	108.2501883	0.003560752	0.006876158	374.5534858	9.194645662	3.712644885	0
WV	0	71.94583988	0	0	198.4832168	6.630157195	2.853667637	0
WI	0.00213083	97.4381372	0	0	192.6269224	5.271300591	0.453017969	0.150530214
WY	0	67.32388658	0	0	242.696504	9.045795863	0	0
TOTAL	0	6,491	0	0	15,399	437	110	4

SMOKE (2007aq_07c 15mar2010)							
State	NH_3	NO	NO_2	NO_x	NVOL	OLE	PAR
AL	13.186527	28290.56099	2891.923584	31433.95563	9.133370757	80.00020178	982.6365371
AK	0	0	0	0	0	0	0
AZ	12.01486246	23778.77723	2430.718422	26420.86215	8.103411597	56.60794992	593.1091778
AR	19.07220909	32767.52861	3349.569696	36408.36484	7.453449792	57.45916798	650.7392332
CA	179.8816289	134637.1715	13762.91057	149596.857	15.11609005	197.3480314	2788.728651
CO	4.619490953	15350.38101	1569.150645	17055.97857	5.466012451	38.18135331	399.8854719
CT	0.932338553	2551.692817	260.8397019	2835.21383	0.55109852	5.207765048	66.91083671
DE	0.342846966	4642.563583	474.5733472	5158.403775	0.388601672	3.901957567	51.48525196
DC	0.260037027	513.2361448	52.46406521	570.2623831	0.150399626	1.050896915	11.00924106
FL	10.62090312	38941.91443	3980.728299	43268.79414	4.379181633	32.53862233	361.8831575
GA	11.53060181	29640.30979	3029.897395	32933.67685	7.043385307	54.72357408	622.5072717
HI	0	0	0	0	0	0	0
ID	3.222932478	6430.855853	657.3767545	7145.395804	1.753489476	12.25442101	128.7131299
IL	45.31599012	102919.0105	10520.60731	114354.4529	25.35042957	179.2249359	1899.20825
IN	19.36239069	43411.67996	4437.639215	48235.20083	10.7909013	76.55603628	813.0084845
IA	8.259106467	28991.8401	2963.611703	32213.15628	9.742390086	68.34306294	718.6536916
KS	10.60106759	36908.79173	3772.898643	41009.76892	13.16236628	91.96273946	963.2885338
KY	15.04012357	54345.24667	5555.290625	60383.60573	8.443745928	65.1994042	741.6479171
LA	42.36528327	159661.9369	16320.99861	177402.1526	6.281663338	56.81588105	728.9741327
MA	0.666426104	1053.282691	107.6691358	1170.314368	0	5.817653037	112.9686437
MD	22.35943606	9968.535889	1019.006242	11076.15193	3.346663569	24.77629342	271.9984941
MA	7.452689363	10315.5083	1054.474593	11461.6761	2.369034012	31.04541692	454.6324946
MI	4.979816333	17257.63792	1764.114586	19175.15415	2.956750459	26.77280254	280.0659874
MN	12.30555565	44518.4587	4550.769334	49464.94704	8.13155955	58.76783451	635.8752958
MS	17.50178189	51462.60807	5260.624214	57180.67851	6.139708097	73.12287973	1035.078087
MO	18.94156815	65022.66355	6646.760463	72247.4023	16.23561087	115.2679202	1226.232673
MT	6.280888022	20447.88931	2090.226695	22719.87557	7.640249839	53.36942261	558.9323214
NE	17.60574745	61813.86974	6318.752248	68682.0779	22.95081665	160.3252959	1679.097951
NV	2.547908696	8622.571929	881.4173945	9580.633831	3.098321864	21.64303125	226.6648451
NH	0.351437805	1292.02963	132.073523	1435.587799	0.079095746	0.628159937	7.398650606
NJ	11.05318099	23216.74378	2373.266505	25796.38153	1.223412358	20.69824418	325.344798
NM	9.379472214	32729.79231	3345.714521	36366.43837	11.99806462	83.81053969	877.7277395
NY	28.81624476	28198.03974	2882.466098	31331.15515	5.274158567	49.9983392	640.2086843
NC	7.156524303	18072.66838	1847.428398	20080.74265	4.440979183	34.20467049	386.6180819
ND	5.933218969	20693.90982	2115.376946	22993.2321	7.745804659	54.10757811	566.6423939
OH	31.67444887	77717.94342	7944.501753	86353.27108	14.1034035	102.2775725	1104.79142
OK	6.647845423	23220.25805	2373.627407	25800.28816	8.233276013	57.52674559	602.6735028
OR	8.730371424	33856.95444	3460.93484	37618.84095	4.464393161	42.90268947	553.8101786
PA	14.49567233	51108.05781	5224.374834	56786.727	6.971735974	51.89051246	575.6641103
RI	0.120264902	315.6487056	32.26650132	350.7209897	0.080106513	0.562505683	5.941427179
SC	4.469082877	15941.43765	1629.569363	17712.7083	3.769138742	26.87899695	287.0630198
SD	1.159626427	3688.195838	377.0150234	4097.995581	1.375539245	9.608627364	100.6314397
TN	12.46492391	39083.42806	3995.195848	43426.032	6.036840126	54.39738212	680.0013349
TX	56.9929645	175239.2132	17913.31436	194710.2089	20.11299129	241.2494917	3426.765435
UT	5.447316755	11406.67906	1166.015561	12674.08776	3.84187561	26.83741073	281.1018058
VA	13.41566163	28944.54341	2958.777465	32160.60523	4.078638271	45.95537834	637.0550274

Table B-12bii: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)							
State	NH_3	NO	NO_2	NO_x	NVOL	OLE	PAR
WA	20.20762248	42137.28936	4307.37249	46819.21534	5.147748673	49.29787122	635.4122427
WV	8.065539003	22329.358	2282.557918	24810.39914	3.472049902	34.50097235	453.1719394
WI	10.97813202	21670.57863	2215.214017	24078.41957	5.00451398	37.80590232	408.7664794
WY	7.758430199	27303.24566	2790.998692	30336.94085	10.221545	71.39835094	747.7315241
TOTAL	773	1,732,433	177,093	1,924,925	334	2,745	32,308

SMOKE (2007aq_07c 15mar2010)							
State	PEC	PHGI	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3
AL	914.1286865	0	1301.33598	1185.21413	116.12185	58.19979387	1.303874623
AK	0	0	0	0	0	0	0
AZ	557.5798718	0	733.6521123	722.9306635	10.72144877	35.49941192	0.795312422
AR	716.417068	0	1006.965252	928.8711804	78.09407122	45.61215518	1.021872055
CA	4571.857489	0.019094821	6320.090698	5927.9434	392.1472986	291.1425876	6.522194701
CO	350.878644	0	462.7332388	454.9319992	7.801239549	22.33939935	0.500475096
CT	87.88011155	0	113.9498488	113.9410597	0.008789194	5.595069363	0.125346098
DE	89.45550378	0.000273956	128.6959862	115.983621	12.71236517	5.695373601	0.127595198
DC	9.96954921	0	13.11576283	12.92601763	0.189745201	0.634737126	0.014220027
FL	947.31101	0	1229.56967	1228.236786	1.33288359	60.31245942	1.35119022
GA	646.09435	0	925.0759623	837.694113	87.38184935	41.13487657	0.921567817
HI	0	0	0	0	0	0	0
ID	288.549663	0	374.2528507	374.1192767	0.133574023	18.37108528	0.41155718
IL	2335.06608	0	3201.48797	3027.531775	173.9561953	148.6666523	3.330599602
IN	959.0107147	0	1343.531643	1243.409393	100.1222496	61.05805541	1.367887476
IA	686.3195765	0	890.3608068	889.8482614	0.512545401	43.69591373	0.978942002
KS	873.5198741	0	1133.006189	1132.562968	0.443221614	55.61441492	1.245937157
KY	1342.197119	0	1756.566679	1740.226825	16.33985405	85.45369853	1.914430904
LA	3900.653493	0	5057.962268	5057.396493	0.565775448	248.343355	5.563686569
MA	125.0195159	0	176.224612	162.0941469	14.13046512	7.959601956	0.178322668
MD	240.9335957	0	332.2774946	312.3826137	19.89488087	15.33950738	0.343653665
MA	350.2425468	0	517.4494296	454.1072833	63.34214631	22.29888336	0.499549706
MI	418.5239116	0	544.0394259	543.2451063	0.794319571	26.78129081	0.599301245
MN	1073.044597	0	1391.810097	1391.256915	0.553182096	68.31748596	1.530554958
MS	1413.075159	0	2003.986576	1832.123975	171.8626008	89.9663029	2.015539829
MO	1564.270138	0	2028.937023	2028.155753	0.781270634	99.59241169	2.231195952
MT	486.4678687	0	631.0093534	630.7303483	0.279005109	30.97196107	0.693881623
NE	1455.369509	0	1887.273542	1886.960378	0.313164073	92.65898687	2.075851122
NV	209.3664479	0	271.5202324	271.4542561	0.065976289	13.32972106	0.298627402
NH	30.43925825	1.50E-05	39.86151165	39.46603614	0.395475509	1.937968	0.043416889
NJ	623.9776562	0	846.2641751	809.0188338	37.24534136	39.72683521	0.890024085
NM	773.3222975	0	1002.814986	1002.651703	0.163283068	49.23513782	1.103024741
NY	578.216312	0	1021.115931	749.686805	271.4291256	36.81330489	0.824723733
NC	391.2554088	0	560.5128353	507.2825873	53.23024796	24.91009276	0.558050453
ND	487.1510078	0	631.8620722	631.6160673	0.246004894	31.0154544	0.694847247
OH	1762.706616	0	2423.668329	2285.454995	138.2133342	112.2298465	2.514285069
OK	549.1594658	0	712.3352206	712.0131366	0.322084029	34.96332942	0.783282351
OR	733.4916175	1.07E-05	991.5031262	951.009384	40.49374218	46.69928736	1.046213837
PA	1244.516837	0	1614.700107	1613.579219	1.120888793	79.23463461	1.775099346
RI	0.077121205	0	8.339986445	0.099991295	8.23999515	0.0049102	0.000110001
SC	382.5823551	0	496.3395075	496.0375528	0.301954783	24.35787629	0.545698507
SD	87.75067765	0	113.9561717	113.773218	0.182953642	5.586821321	0.125165044
TN	978.1314809	0	1358.51251	1268.197255	90.31525543	62.27468873	1.395166366
TX	4830.839586	0	6850.177909	6263.427215	586.7506941	307.5651014	6.890454538
UT	39.32875654	0	56.16984612	50.99172534	5.17812078	2.50394462	0.056094733
VA	1126.763331	0	1463.996478	1460.905876	3.090601696	71.73764723	1.607161163

Table B-12biii: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)							
State	PEC	PHGI	PM_{10}	PM_{2_5}	PMC	PMFINE	PNO_3
WA	799.3967244	0.001841768	1076.316165	1036.458609	39.85755662	50.89524739	1.140201282
WV	574.059814	0	816.1503485	744.2977115	71.852637	36.54868357	0.818809284
WI	468.1957537	0	666.8802984	607.0874695	59.79282892	29.81927424	0.668001676
WY	641.8850808	0	832.3665823	832.236734	0.129848322	40.86691579	0.915532664
TOTAL	43,716		59,361	56,682	2,679	2,784	62

SMOKE (2007aq_07c 15mar2010)					
State	POC	PSO_4	SO_2	SULF	TERP
AL	208.1443132	3.437462039	2210.025924	0	19.16525022
AK	0	0	0	0	0
AZ	126.9593749	2.096692516	1978.077786	0	12.1457786
AR	163.1260735	2.694011696	2776.219166	0	12.98718511
CA	1041.228514	17.19261474	32154.71316	0	49.8641504
CO	79.8940354	1.319445317	1131.611409	0	8.191816928
CT	20.01007182	0.330460821	235.0896366	0	1.284767169
DE	20.36876106	0.336387341	1214.631935	0	0.981947347
DC	2.270022101	0.037489162	43.89084917	0	0.22550884
FL	215.699898	3.562228763	2721.714173	0	7.219008251
GA	147.1137673	2.429551304	1902.833755	0	12.41453119
HI	0	0	0	0	0
ID	65.70193125	1.085039986	590.2797776	0	2.629936077
IL	531.687739	8.780704597	7515.006902	0	38.71443271
IN	218.3664907	3.606245143	3091.280784	0	16.54207351
IA	156.2729967	2.580832465	2199.040981	0	14.6981171
KS	198.8979687	3.284772676	2849.776573	0	19.73249664
KY	305.6144193	5.047157967	3801.032513	0	14.74678457
LA	888.1680425	14.66791559	10769.32089	0	13.7674869
MA	28.46656801	0.470138395	117.0311061	0	1.957730148
MD	54.8598599	0.905997123	3934.777934	0	5.488609269
MA	79.7492722	1.317031256	1304.051332	0	8.44434703
MI	95.76530961	1.575293132	1293.702921	0	4.73945466
MN	244.329214	4.035062859	3206.689388	0	12.84821244
MS	321.7533028	5.31367031	2965.798279	0	19.37668334
MO	356.1797853	5.882221928	4989.749663	0	24.95667931
MT	110.7673418	1.829295017	1670.643567	0	11.45037451
NE	331.3833143	5.472716701	4727.138443	0	34.3987095
NV	47.67215397	0.787305787	681.6252738	0	4.643417517
NH	6.930930295	0.114462706	80.79057745	0	0.14400164
NJ	142.0779314	2.3463869	2158.31738	0	5.922831264
NM	176.0832647	2.907977976	2511.887846	0	17.98154917
NY	131.6581598	2.17430458	5535.404717	0	12.33450024
NC	89.08778584	1.471249525	1162.900216	0	7.727312952
ND	110.9228878	1.831870015	1591.233188	0	11.60881417
OH	401.375769	6.628478756	5483.341514	0	22.26428665
OK	125.0420309	2.065028081	1784.911699	0	12.34423373
OR	167.0140798	2.758185486	1789.531247	0	10.63762774
PA	283.3727895	4.679858574	3734.03774	0	11.52229422
RI	0.01755988	0.000290009	19.90010329	0	0.121052224
SC	87.11296318	1.4386597	1176.861857	0	5.834148316
SD	19.98058004	0.329973985	309.4324179	0	2.061554087
TN	222.7177748	3.678143929	2362.973109	0	13.162388
TX	1099.966304	18.16576939	9632.54403	0	64.0463923
UT	8.955040041	0.147889405	901.9138191	0	5.757902611
VA	256.5606982	4.237039303	3484.866474	0	11.99004269

Table B-12biv: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)					
State	POC	PSO_4	SO_2	SULF	TERP
WA	182.0204065	3.00602909	3201.261291	0	12.20363882
WV	130.711711	2.158693651	1332.778016	0	8.658483904
WI	106.6437337	1.76070614	1601.019509	0	8.021480778
WY	146.1554655	2.413739204	2084.216648	0	15.31835698
TOTAL	9,955	164	154,016	0	633

SMOKE (2007aq_07c 15mar2010)				
State	TOL	UNK	UNR	XYL
AL	162.9670915	5.838599684	233.7164342	127.772833
AK	0	0	0	0
AZ	97.42726043	5.180287963	147.7613151	65.44547749
AR	107.2898788	4.764713625	163.9488258	78.1591704
CA	464.7499564	9.663273096	797.8605367	411.6523232
CO	65.7127905	3.494170587	98.24945744	44.14488886
CT	11.07805146	0.352394562	17.8933788	8.971946516
DE	8.563457206	0.248422995	12.3599887	7.092740786
DC	1.809116323	0.096144988	2.706671837	1.215672878
FL	59.03419799	2.799419902	115.6405587	41.8569504
GA	102.7772101	4.502551581	151.4283583	75.2778678
HI	0	0	0	0
ID	21.09436787	1.121086569	34.57899883	14.17100928
IL	311.7908187	16.20612312	488.373259	211.8744159
IN	133.4594051	6.898307157	211.2830375	90.95025315
IA	118.0723269	6.228085425	178.6972382	79.64148437
KS	158.2971869	8.414423294	236.5727472	106.3626058
KY	121.889227	5.397787463	204.3175638	88.89936838
LA	117.9190219	4.015658958	311.0734362	93.81556353
MA	19.06759783	0	26.39770962	19.37401903
MD	44.8240085	2.139406752	66.2985584	31.68994307
MA	76.03139283	1.514556493	105.2083989	67.44090015
MI	47.14893432	1.89014722	73.03861097	36.62662892
MN	104.2001944	5.198436553	176.630814	72.21675788
MS	172.9083278	3.924916012	238.198376	150.2750608
MO	201.2697433	10.37900809	318.6742926	137.3026207
MT	91.85324972	4.8842391	137.1478352	61.70460821
NE	275.9371152	14.67200018	411.8592913	185.3769573
NV	37.2479924	1.980606595	55.66215298	25.02260008
NH	1.198884009	0.050560836	2.858397185	0.890791757
NJ	54.53725282	0.782133307	76.31597442	50.34604849
NM	144.2403024	7.67004756	215.344123	96.89860117
NY	106.5351467	3.371525823	145.4708459	86.41715031
NC	63.82596036	2.838978156	93.49657754	46.46922734
ND	93.12292917	4.951729167	138.9599944	62.5554038
OH	181.2084096	9.016020673	303.6400219	125.8147055
OK	99.03106605	5.263374474	148.4303238	66.54186357
OR	92.08910349	2.85386567	130.3097738	75.0892894
PA	94.27468174	4.45675475	167.7680112	66.93217701
RI	0.972228538	0.051227229	1.687631878	0.655902005
SC	47.11965184	2.409508804	74.9717045	32.27541323
SD	16.53727999	0.87932751	24.6960098	11.1094608
TN	112.6516211	3.859127375	170.9807121	89.47387468
TX	572.0279348	12.85728303	809.7579749	497.974169
UT	46.18802945	2.456014564	69.32264466	31.02816443
VA	106.2717767	2.607441856	149.2181285	91.09652607

Table B-12bv: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 15mar2010)				
State	TOL	UNK	UNR	XYL
WA	105.6074553	3.290849672	151.3366562	85.99613805
WV	75.3474169	2.219515759	109.3329108	62.18263254
WI	67.35245881	3.200106726	112.9220957	47.93464795
WY	122.8798128	6.534201084	183.3542477	82.54910024
TOTAL	5,337		8,296	4,045

SMOKE (2007aq_07c 15mar2010)								
State	HONO	VOC	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}
AL	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AK	N/A		N/A	N/A	N/A	N/A	N/A	N/A
AZ	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AR	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CO	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CT	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DE	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
DC	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
FL	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
GA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HI	N/A		N/A	N/A	N/A	N/A	N/A	N/A
ID	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IL	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IN	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
KS	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
KY	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
LA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MD	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MI	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MN	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MS	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MO	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MT	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NE	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NV	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NH	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NJ	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NM	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NY	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NC	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ND	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OH	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OK	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OR	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RI	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SD	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TN	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TX	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
UT	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
VA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table B-12c: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq_07c 15mar2010)								
State	HONO	VOC	NO_x	CO	SO_2	NH_3	PM_{10}	PM_{25}
WA	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WV	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WI	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
WY	0.80%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL								

SMOKE (2007aq_07c 15mar2010)							
State	ACETALD	BENZENE	CHLORIN	HG (all)	FORMALD	METHANOL	bfam / voc
AL	64.9%	72.7%	N/A	N/A	50.6%	N/A	7.7%
AK	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
AZ	70.9%	45.5%	N/A	N/A	55.8%	N/A	9.1%
AR	40.4%	15.1%	N/A	N/A	28.5%	N/A	13.1%
CA	7.8%	0.0%	0.0%	0.0%	4.0%	-0.1%	30.1%
CO	34.7%	0.0%	N/A	N/A	43.9%	N/A	6.6%
CT	88.6%	71.4%	N/A	N/A	68.9%	N/A	25.3%
DE	12.2%	0.0%	N/A	0.0%	12.3%	N/A	14.7%
DC	34.5%	0.0%	N/A	N/A	43.7%	N/A	6.7%
FL	9.8%	0.0%	N/A	N/A	7.7%	N/A	29.1%
GA	20.0%	0.0%	N/A	N/A	24.7%	N/A	10.3%
HI	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
ID	91.5%	82.0%	N/A	N/A	75.2%	N/A	21.0%
IL	32.8%	5.3%	N/A	N/A	31.0%	N/A	10.9%
IN	48.9%	16.3%	N/A	N/A	35.2%	100.0%	12.8%
IA	29.6%	0.0%	N/A	N/A	38.2%	N/A	7.7%
KS	35.4%	0.0%	N/A	N/A	44.8%	N/A	6.5%
KY	12.4%	0.0%	N/A	N/A	12.6%	N/A	19.3%
LA	7.1%	0.0%	N/A	N/A	2.2%	N/A	50.0%
MA	5.9%	0.0%	N/A	N/A	-0.4%	N/A	24.8%
MD	57.1%	55.3%	N/A	N/A	51.7%	N/A	6.8%
MA	45.9%	54.1%	N/A	N/A	27.2%	N/A	10.7%
MI	16.6%	33.7%	N/A	N/A	21.3%	100.0%	16.9%
MN	13.8%	0.0%	N/A	N/A	15.1%	N/A	17.9%
MS	11.5%	0.4%	N/A	N/A	11.0%	N/A	13.6%
MO	19.3%	0.0%	N/A	N/A	24.1%	N/A	12.0%
MT	36.0%	0.0%	N/A	N/A	45.5%	N/A	6.4%
NE	36.5%	0.0%			46.1%		6.3%
NV	35.2%	0.0%			44.5%		6.5%
NH	7.8%	0.0%		0.0%	3.7%		42.9%
NJ	35.2%	9.3%			14.4%		19.9%
NM	36.2%	0.0%			45.7%		6.4%
NY	19.8%	14.0%			24.9%		8.2%
NC	23.8%	3.9%			30.6%		8.6%
ND	36.6%	0.0%			46.3%		6.3%
OH	35.5%	9.7%			23.0%	100.0%	18.0%
OK	34.1%	0.0%			43.4%		6.7%
OR	15.0%	12.5%		0.0%	16.9%		11.7%
PA	11.5%	0.0%			10.9%		22.6%
RI	99.6%	98.4%			98.8%		28.5%
SC	18.5%	0.0%			22.9%		12.5%
SD	35.9%	0.0%			45.4%		6.4%
TN	12.3%	0.0%			12.3%		16.5%
TX	10.3%	0.0%			8.7%		16.4%
UT	57.1%	24.9%			51.1%		7.3%
VA	29.1%	7.3%			15.2%		16.7%

Table B-12ci: Aircraft/Locomotive/Marine Emissions with No Category 3 Commercial Marine Vehicle (CMV) Emissions (Category 1 and Category 2 Emissions only)—Percent Change between EMF and SMOKE Calculations

SMOKE (2007aq_07c 15mar2010)							
State	ACETALD	BENZENE	CHLORIN	HG (all)	FORMALD	METHANOL	bfam / voc
WA	13.4%	0.0%		0.0%	14.2%		13.5%
WV	13.5%	20.3%			14.5%		13.1%
WI	99.9%	99.7%			99.7%	100.0%	27.1%
WY	36.7%	0.0%			46.4%		6.3%
TOTAL							

EMF (2002ad)			SMOKE (2007aq)				
State	pm_{10}	pm_{25}	State	PEC	PM_{10}	PM_{2_5}	PMC
AL	100,135	11,582	AL	39.70839564	100158.1668	11585.83173	88572.33507
AK			AK	0	0	0	0
AZ	121,248	12,806	AZ	15.72612675	121275.6351	12810.34305	108465.292
AR	90,255	11,681	AR	11.22270485	90284.73853	11686.8284	78597.91013
CA	190,836	20,327	CA	42.9994419	190894.0954	20334.5588	170559.5366
CO	107,483	11,794	CO	12.14493372	107536.7828	11801.32473	95735.45804
CT	12,528	1,014	CT	2.261204495	12530.50317	1014.771192	11515.73198
DE	6,258	497	DE	1.059227831	6259.808658	497.7304781	5762.07818
DC	2,255	162	DC	0.115697085	2255.701845	162.5339985	2093.167846
FL	145,505	14,108	FL	69.51998644	145522.8466	14112.22151	131410.6251
GA	181,098	21,286	GA	28.26396126	181135.5926	21293.79007	159841.8025
HI			HI	0	0	0	0
ID	138,574	14,125	ID	93.36570655	138595.6087	14128.8856	124466.7231
IL	444,909	58,864	IL	40.02600054	445147.6973	58900.8951	386246.8022
IN	345,634	41,832	IN	37.05208794	345741.8741	41851.01328	303890.8608
IA	341,541	42,837	IA	34.00194922	341704.6578	42861.29913	298843.3586
KS	455,984	55,263	KS	45.3719647	456165.9998	55290.90084	400875.0989
KY	99,355	12,655	KY	13.88242299	99402.39531	12661.98866	86740.40665
LA	79,058	10,302	LA	10.14935785	79092.68882	10307.79972	68784.8891
ME	12,754	1,312	ME	2.334444794	12756.40088	1312.174224	11444.22666
MD	35,390	3,559	MD	4.894261479	35405.23346	3561.306592	31843.92687
MA	49,646	4,580	MA	6.420093256	49649.84242	4580.741585	45069.10083
MI	208,781	23,506	MI	31.13691827	208830.0071	23515.01674	185314.9903
MN	432,054	49,495	MN	43.50439558	432188.1418	49515.90304	382672.2388
MS	139,211	17,447	MS	34.80125873	139262.8391	17455.63445	121807.2047
MO	451,929	48,202	MO	50.9881743	452014.3185	48216.40812	403797.9104
MT	188,105	24,528	MT	16.25927413	188184.0149	24540.05923	163643.9557
NE	320,650	37,482	NE	33.78792055	320750.3372	37498.26391	283252.0732
NV	61,096	7,185	NV	6.453978406	61119.98509	7188.249933	53931.73516
NH	6,158	658	NH	1.214249244	6159.333506	658.5337981	5500.799708
NJ	16,305	549	NJ	3.35484394	16303.67902	548.8956409	15754.78338
NM	440,333	45,353	NM	47.5095383	440408.7922	45364.71475	395044.0774
NY	139,896	13,647	NY	18.96583784	139931.222	13652.39674	126278.8252
NC	91,261	11,162	NC	19.87734409	91300.11127	11168.27234	80131.83893
ND	269,751	38,263	ND	17.99144552	269914.2672	38288.74846	231625.5188
OH	236,301	28,587	OH	37.30361525	236404.9178	28602.31291	207802.6049
OK	395,608	44,243	OK	41.16345112	395697.7645	44258.14241	351439.6221
OR	76,289	8,738	OR	10.80775674	76314.86476	8741.496207	67573.36855
PA	130,379	13,344	PA	21.31345029	130419.2807	13350.52598	117068.7548
RI	2,501	182	RI	0.427959711	2501.972145	181.6740872	2320.298058
SC	82,087	9,160	SC	19.2712751	82097.43045	9162.541586	72934.88886
SD	202,326	29,215	SD	15.02701312	202445.3366	29234.09717	173211.2394
TN	95,745	11,900	TN	15.45420879	95792.06909	11906.61127	83885.45782
TX	1,281,992	143,698	TX	458.7866322	1282259.588	143744.0823	1138515.506
UT	54,020	5,682	UT	8.377163203	54046.1988	5685.436267	48360.76253
VT	13,635	1,528	VT	1.450950578	13636.8295	1528.395605	12108.43389
VA	60,205	8,194	VA	7.703118438	60229.60606	8198.12938	52031.47668
WA	104,809	13,617	WA	6.630823702	104861.2466	13624.2983	91236.9483

Table B-13a: PM_{10} and $PM_{2.5}$ Emissions from Fugitive Dust Sources [Construction, etc.]

EMF (2002ad)			SMOKE (2007aq)				
State	pm_{10}	pm_{25}	State	PEC	PM_{10}	PM_{2_5}	PMC
WV	21,732	3,649	WV	2.9868685	21743.36969	3651.023696	18092.34599
WI	103,088	11,870	WI	18.71593115	103139.3988	11876.67923	91262.71957
WY	272,300	28,723	WY	28.61828491	272349.3257	28730.72911	243618.5966
TOTAL	8,858,992	1,030,391	US Total	1,530	8,861,823	1,030,844	7,830,978

SMOKE (2007aq)						
State	PMFINE	PNO_3	POC	PSO_4	PM_{10}	PM_{25}
AL	10827.49969	52.06900908	613.7925214	52.76210817	0.0%	0.0%
AK	0	0	0	0		
AZ	12191.3672	9.49328417	562.7861167	30.970327	0.0%	0.0%
AR	11253.14415	9.350073249	374.0491502	39.06231651	0.0%	0.0%
CA	19105.39124	16.90016061	1129.977718	39.29023264	0.0%	0.0%
CO	11257.74531	7.584778298	507.0801798	16.7695329	0.1%	0.1%
CT	963.7617773	0.631045707	44.97040251	3.146762347	0.0%	0.0%
DE	470.8182135	0.239750756	24.8796886	0.733597447	0.0%	0.1%
DC	154.0746493	0.065013773	8.078712721	0.199925649	0.0%	0.1%
FL	12962.69038	96.00542392	907.3651536	76.64056593	0.0%	0.0%
GA	20345.07705	17.88892475	838.1365103	64.42361492	0.0%	0.0%
HI	0	0	0	0		
ID	12635.47842	150.8062823	1155.760772	93.47442429	0.0%	0.0%
IL	56576.56498	41.42593947	2140.72369	102.1544905	0.1%	0.1%
IN	40043.00346	33.40905504	1653.390171	84.15850681	0.0%	0.0%
IA	41033.46444	32.51769363	1690.65722	70.65783264	0.0%	0.1%
KS	52786.2399	46.1787006	2316.980239	96.13003941	0.0%	0.1%
KY	12193.91147	7.675282219	408.2502533	38.269227	0.0%	0.1%
LA	9942.371926	6.950339016	316.0730742	32.25502329	0.0%	0.1%
ME	1257.742312	0.943709387	46.08190612	5.071851276	0.0%	0.0%
MD	3385.194754	1.746652447	164.6807956	4.790128474	0.0%	0.1%
MA	4310.55833	4.331019142	250.2151355	9.217007005	0.0%	0.0%
MI	22408.26916	19.74776082	998.3579354	57.50496327	0.0%	0.0%
MN	47114.53164	46.04254843	2225.533119	86.29133584	0.0%	0.0%
MS	16554.36759	44.18796662	765.8729664	56.40465936	0.0%	0.0%
MO	45663.57603	50.09666353	2349.280665	102.466586	0.0%	0.0%
MT	23604.00679	19.86991661	832.8265488	67.09670817	0.0%	0.1%
NE	35705.97113	34.73400662	1651.72011	72.05074709	0.0%	0.0%
NV	6895.695559	5.089267349	257.7510928	23.2600356	0.0%	0.0%
NH	633.8760256	0.418233469	20.19147925	2.833810524	0.0%	0.0%
NJ	501.5320231	0.384434211	42.22567293	1.398666645	0.0%	0.0%
NM	42796.68437	53.75820577	2359.946815	106.8158204	0.0%	0.0%
NY	13019.81298	9.959005826	566.6981192	36.96079355	0.0%	0.0%
NC	10716.00344	6.26974939	392.6925921	33.42920815	0.0%	0.1%
ND	36970.69437	25.85712936	1197.146207	77.05930136	0.1%	0.1%
OH	27350.09283	18.9410526	1135.634292	60.34112061	0.0%	0.1%
OK	42098.97232	43.63360494	1971.455378	102.9176638	0.0%	0.0%
OR	8321.406875	7.9546625	379.2773918	22.0495211	0.0%	0.0%
PA	12746.56539	8.697105772	536.9863704	36.96367158	0.0%	0.0%
RI	170.405325	0.094982369	10.44474236	0.301077707	0.0%	0.0%
SC	8652.490394	19.40756869	440.872218	30.50013073	0.0%	0.0%
SD	28285.04877	19.34460325	842.5432223	72.13355721	0.1%	0.1%
TN	11451.36011	6.860235123	400.0230019	32.91371429	0.0%	0.1%
TX	133727.2624	688.227962	8269.221137	600.5841767	0.0%	0.0%
UT	5382.899644	3.105895159	282.7027756	8.350788869	0.0%	0.1%
VT	1464.684157	1.398542414	55.65288315	5.209071689	0.0%	0.0%
VA	7972.200773	4.898903641	177.2243966	36.10218875	0.0%	0.1%
WA	13107.9356	10.09005065	473.9058429	25.73597954	0.0%	0.1%

Table B-13b: PM_{10} and $PM_{2.5}$ Emissions from Fugitive Dust Sources [Construction, etc.]

SMOKE (2007aq)						
State	PMFINE	PNO_3	POC	PSO_4	PM_{10}	PM_{25}
WV	3570.956287	5.253716497	51.69228415	20.13454058	0.1%	0.1%
WI	11304.69108	7.242432359	527.9743436	18.05543974	0.0%	0.1%
WY	27176.2612	33.18904204	1420.101294	72.55928184	0.0%	0.0%
TOTAL	979,064	1,731	45,790	2,729		

EMF (2007aq)										
st	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	Acetald	Benzene	Formald
1	AL	455	2204	189	174	1429	78	0.017839523	0.000764551	0.122328173
2	AK	7476	90524	7500	6900	55704	3172	0.724989257	0.031070959	4.971353103
6	CA	10389	121264	9921	9128	74494	4212	0.962754199	0.041260896	6.601743514
9	CT	112	1358	115	106	918	46	0.010506275	0.000450269	0.072043023
10	DE	493	5752	486	447	10885	208	0.047572346	0.002038815	0.326210366
11	DC	0	1	0	0	1	0	1.06E-05	4.55E-07	7.28E-05
12	FL	10683	129458	11007	10127	84017	4484	1.024734287	0.043917191	7.02674983
13	GA	650	7736	650	598	6016	279	0.063764367	0.002732759	0.437241402
15	HI	325	3903	338	311	2545	133	0.030504335	0.001307329	0.20917259
17	IL	8	106	9	8	66	4	0.000807668	3.46E-05	0.005538293
18	IN	4	47	4	4	31	2	0.000351703	1.51E-05	0.002411675
22	LA	8599	101076	8459	7783	63155	3542	0.809491153	0.03469248	5.550796678
23	ME	397	4795	402	370	3088	166	0.037985386	0.001627945	0.260471173
24	MD	1621	19584	1636	1505	12216	686	0.15688613	0.006723691	1.075790598
25	MA	3058	36984	3082	2836	23556	1295	0.295896308	0.01268127	2.029003283
26	MI	881	11216	883	812	6553	374	0.085518811	0.003665092	0.586414683
27	MN	25	317	26	24	200	11	0.002437691	0.000104473	0.016715599
28	MS	106	1253	110	102	882	43	0.009746944	0.000417726	0.066836187
33	NH	2	29	2	2	18	1	0.000231237	9.91E-06	0.00158562
34	NJ	2090	24664	2102	1934	19420	892	0.203783933	0.008733597	1.397375373
36	NY	1168	14350	1158	1066	8557	503	0.114915818	0.004924963	0.787994158
98	Non-US SECA C3	100750	1221744	100855	92787	748214	42774	9.776260505	0.418982619	67.0372187
37	NC	5135	62145	5142	4730	38950	2179	0.498083228	0.021346426	3.415427942
39	OH	204	2589	206	190	1536	87	0.01983584	0.000850107	0.136017187
41	OR	1439	16864	1416	1303	10267	634	0.144992864	0.006213981	0.994236995
42	PA	266	3248	277	254	2925	106	0.02423914	0.00103882	0.166211246
44	RI	265	3208	266	245	2303	112	0.025622895	0.001098124	0.175699843
45	SC	1984	23766	1987	1828	17926	844	0.192840822	0.008264605	1.32233685
48	TX	3647	40159	3866	3557	28977	1445	0.330261293	0.014154056	2.264649004
51	VA	1460	17662	1470	1353	11407	620	0.141735184	0.006074365	0.971898488
53	WA	3017	35425	3101	2853	22036	1354	0.309466251	0.013262838	2.122054072
54	WV	2	27	2	2	16	1	0.000214899	9.21E-06	0.001473591
55	WI	63	800	64	59	476	27	0.006103292	0.00026157	0.041851152
	Con US Total	58225	688087	58042	53398	452318	24233	6	0	38

Table B-14a: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions—Pre-SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 19apr2010)							
State	ALD2	ALDX	BENZENE	CH4	CO	ETH	ETHA
AL	0.018951956	0.552163621	0.000764613	0	454.5522565	1.415129762	2.586556471
AK	0	0	0	0	0	0	0
CA	0.996305934	29.0261184	0.04019139	0	10132.14989	74.39250586	135.9733744
CT	0.011161319	0.325180082	0.000450272	0	112.2822361	0.833418876	1.523287247
DE	0.050539078	1.472446535	0.002038776	0	492.6637447	3.773721811	6.897449747
DC	1.13E-05	0.000328613	4.55E-07	0.00E+00	0.109422612	0.000842248	0.001539319
FL	1.088650536	31.71630887	0.043917631	0	10682.98243	81.28913916	148.576269
GA	0.06774169	1.973584427	0.002732733	0	650.2662302	5.058168992	9.245100771
HI	0	0	0	0	0	0	0
IL	0.000858026	0.024998577	3.46E-05	0	8.38828993	0.064069291	0.11710306
IN	0.000373651	0.010885627	1.51E-05	0.00E+00	3.839161318	0.027898949	0.050992841
LA	0.85997856	25.05452035	0.034691865	0	8598.947345	64.21417514	117.3699994
ME	0.040354602	1.175702341	0.001627931	0	396.8854882	3.01321521	5.507456078
MD	0.166664603	4.855728397	0.006723572	0	1620.862479	12.44490858	22.74709741
MA	0.314346436	9.15893793	0.012680281	0	3058.283573	23.47397263	42.89709454
MI	0.090852219	2.646914524	0.003664306	0	881.3980796	6.78385975	12.39930014
MN	0.00258971	0.075450717	0.000104466	0	25.40815159	0.193370391	0.353438405
MS	0.010354429	0.301680327	0.000417686	0	105.6402344	0.773187008	1.413189832
NH	0.000245666	0.007157325	9.91E-06	0.00E+00	2.383131379	0.018343078	0.033526808
NJ	0.216493498	6.307446406	0.008733331	0	2089.60101	16.165301	29.54640898
NY	0.122081598	3.556874362	0.004924543	0	1168.462804	9.115977928	16.66166731
Non-US SECA C3	4.16397865	121.5318629	0.168263211	0	40376.8042	311.1091689	568.6006742
NC	0.529073772	15.41495341	0.021345169	0	5135.085196	39.50986698	72.21628989
OH	0.021072796	0.613950427	0.000850132	0	204.4288986	1.573480781	2.875962869
OR	0.154022672	4.487394827	0.006213392	0	1438.354375	11.50092344	21.02070844
PA	0.02575097	0.750237018	0.001038788	0	266.179219	1.922815974	3.514411612
RI	0.027221042	0.793071642	0.00109809	0	265.2474629	2.032578293	3.715016564
SC	0.204870594	5.968710062	0.00826405	0	1984.380017	15.29765291	27.96052219
TX	0.350855063	10.22218383	0.014153925	0	3647.14806	26.19865265	47.88470586
VA	0.150576285	4.386913604	0.006074171	0	1460.155529	11.24319708	20.55023222
WA	0.328762333	9.578536058	0.013262823	0	3017.045132	24.54869325	44.86898571
WV	0.000228279	0.006651547	9.21E-06	0.00E+00	2.214808843	0.017047052	0.031157768
WI	0.00648345	0.188907575	0.000261567	0	62.91957429	0.484150197	0.884909375
TOTAL	10	292	0	0	98,345	748	1,368

Table B-14b: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions—SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 19apr2010)								
State	ETOH	FORM	HONO	IOLE	ISOP	MEOH	NO	NO2
AL	0	0.125691639	17.62853094	0.962332345	0.770175467	0	1,983	203
AK	0	0	0	0	0	0	0	0
CA	0	6.607029056	945.2340691	50.59092476	40.4868851	0	106,338	10,870
CT	0	0.074023015	10.86327483	0.566750068	0.453576095	0	1,222	125
DE	0	0.335173863	46.01934953	2.566220888	2.053797467	0	5,177	529
DC	0	7.48E-05	0.010598444	0.000572756	0.00045841	0	1	0
FL	0	7.219937115	1035.686523	55.279061	44.24127495	0	116,509	11,910
GA	0	0.449256148	61.88621461	3.439710778	2.752839085	0	6,962	712
HI	0	0	0	0	0	0	0	0
IL	0	0.005690362	0.848777467	0.043568574	0.034868993	0	95	10
IN	0	0.002477835	0.372004074	0.018972468	0.015183353	0	42	4
LA	0	5.703710797	808.568583	43.66788059	34.94782086	0	90,969	9,299
ME	0	0.267628739	38.35664809	2.049090163	1.639913624	0	4,315	441
MD	0	1.105340033	156.672161	8.462888139	6.773087118	0	17,626	1,802
MA	0	2.084967538	295.8735455	15.96214565	12.7745071	0	33,287	3,403
MI	0	0.602528646	89.72824088	4.613194108	3.692036638	0	10,094	1,032
MN	0	0.017174864	2.535880664	0.131499174	0.105240764	0	285	29
MS	0	0.068673054	10.02355965	0.525792828	0.420795371	0	1,128	115
NH	0	0.001629142	0.23082773	0.012474093	0.009983263	0	26	3
NJ	0	1.43573163	197.3086559	10.99296715	8.797771428	0	22,197	2,269
NY	0	0.809614948	114.7983106	6.199126434	4.961373465	0	12,915	1,320
Non-US SECA C3	0	27.35391951	3917.842258	212.0047539	169.0825371	0	441,047	45,184
NC	0	3.508208659	497.1600553	26.86716777	21.50485977	0	55,929	5,717
OH	0	0.139755807	20.71561805	1.070025451	0.856355895	0	2,330	238
OR	0	1.021465982	134.9016774	7.820676401	6.259211875	0	15,176	1,551
PA	0	0.170779185	25.98331564	1.307558239	1.046455925	0	2,923	299
RI	0	0.180530596	25.66063085	1.382195394	1.106196121	0	2,887	295
SC	0	1.358565679	190.1283641	10.4024714	8.325488017	0	21,390	2,186
TX	0	2.326875128	321.2711628	17.81569368	14.25812301	0	36,143	3,695
VA	0	0.998591907	141.297142	7.645820177	6.118916199	0	15,896	1,625
WA	0	2.180328098	283.3947287	16.69399522	13.36024735	0	31,882	3,259
WV	0	0.001514144	0.21452261	0.011592283	0.00927745	0	24	2
WI	0	0.043001235	6.402004751	0.329237883	0.263490838	0	720	74
TOTAL	0	66	9,398	509	407	0	1,057,520	108,202

Table B-14bi: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions —SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 19apr2010)									
State	NOX	NVOL	OLE	PAR	PEC	PM10	PM2_5	PMC	PMFINE
AL	2,204	0	3	53	2	189	174	15	94
AK	0	0	0	0	0	0	0	0	0
CA	118,153	0	145	2,801	89	9,664	8,891	773	4,801
CT	1,358	0	2	31	1	115	106	9	57
DE	5,752	0	7	142	4	486	447	39	241
DC	1	0	0	0	0	0	0	0	0
FL	129,455	0	159	3,061	101	11,007	10,127	881	5,468
GA	7,736	0	10	190	6	650	598	52	323
HI	0	0	0	0	0	0	0	0	0
IL	106	0	0	2	0	9	8	1	4
IN	47	0	0	1	0	4	4	0	2
LA	101,076	0	126	2,418	78	8,459	7,783	677	4,203
ME	4,795	0	6	113	4	402	370	32	200
MD	19,585	0	24	469	15	1,636	1,505	131	813
MA	36,986	0	46	884	28	3,082	2,835	247	1,531
MI	11,216	0	13	255	8	883	812	71	439
MN	317	0	0	7	0	26	24	2	13
MS	1,253	0	2	29	1	110	102	9	55
NH	29	0	0	1	0	2	2	0	1
NJ	24,664	0	32	609	19	2,102	1,934	168	1,044
NY	14,350	0	18	343	11	1,158	1,066	93	575
Non-US SECA C3	490,149	0	608	11,705	372	40,483	37,240	3,243	20,083
NC	62,143	0	77	1,488	47	5,141	4,730	411	2,554
OH	2,589	0	3	59	2	206	190	16	102
OR	16,862	0	22	433	13	1,416	1,303	113	704
PA	3,248	0	4	72	3	277	254	22	137
RI	3,208	0	4	77	2	266	245	21	132
SC	23,766	0	30	576	18	1,987	1,828	159	987
TX	40,159	0	51	986	36	3,866	3,557	309	1,921
VA	17,662	0	22	423	14	1,470	1,353	118	730
WA	35,425	0	48	924	29	3,101	2,853	248	1,541
WV	27	0	0	1	0	2	2	0	1
WI	800	0	1	18	1	64	59	5	32
TOTAL	1,175,119	0	1,464	28,173	904	98,267	90,401	7,866	48,790

Table B-14bii: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions —SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

SMOKE (2007aq_07c 19apr2010)											
State	PNO_3	POC	PSO_4	SO_2	SULF	TERP	TOL	UNK	UNR	XYL	
AL	0	2	77	1,429	0	1	9	0	9	9	
AK	0	0	0	0	0	0	0	0	0	0	
CA	0	89	3,912	72,584	0	49	477	0	477	484	
CT	0	1	47	918	0	1	5	0	5	5	
DE	0	4	197	10,885	0	2	24	0	24	25	
DC	0	0	0	1	0	0	0	0	0	0	
FL	0	101	4,456	84,015	0	53	521	0	522	529	
GA	0	6	263	6,016	0	3	32	0	32	33	
HI	0	0	0	0	0	0	0	0	0	0	
IL	0	0	4	66	0	0	0	0	0	0	
IN	0	0	2	31	0	0	0	0	0	0	
LA	0	78	3,424	63,153	0	42	412	0	412	418	
ME	0	4	163	3,088	0	2	19	0	19	20	
MD	0	15	662	12,217	0	8	80	0	80	81	
MA	0	28	1,248	23,555	0	15	150	0	151	153	
MI	0	8	357	6,553	0	4	43	0	44	44	
MN	0	0	11	200	0	0	1	0	1	1	
MS	0	1	45	882	0	1	5	0	5	5	
NH	0	0	1	18	0	0	0	0	0	0	
NJ	0	19	851	19,420	0	11	104	0	104	105	
NY	0	11	469	8,557	0	6	58	0	58	59	
Non-US SECA C3	0	372	16,413	300,320	0	205	1,992	0	1,995	2,026	17,176
NC	0	47	2,081	38,951	0	26	253	0	254	257	
OH	0	2	83	1,536	0	1	10	0	10	10	
OR	0	13	573	10,266	0	8	74	0	74	75	
PA	0	3	112	2,925	0	1	12	0	12	13	
RI	0	2	108	2,303	0	1	13	0	13	13	
SC	0	18	804	17,926	0	10	98	0	98	100	
TX	0	36	1,565	28,977	0	17	168	0	168	171	
VA	0	14	595	11,407	0	7	72	0	72	73	
WA	0	29	1,255	22,036	0	16	157	0	158	160	
WV	0	0	1	16	0	0	0	0	0	0	
WI	0	1	26	476	0	0	3	0	3	3	
TOTAL	0	904	39,804	750,725	0	493	4,795		4,801	4,874	

Table B-14biii: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions —SMOKE: Criteria Air Pollutants and Hazardous Air Pollutants

Difference										
State	hono/ no_x	NO_x	CO	SO_2	PM_{10}	PM_{25}	Acetald	Benzene	Formald	
AL	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	ALD2 and FORM don't match up exactly due to molecular weights
AK										ALD2 should be 5.9%, FORM should be 2.7%
CA	0.80%	-2.6%	-2.5%	-2.6%	-2.7%	-2.7%	3.4%	-2.7%	0.1%	
CT	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
DE	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
DC	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
FL	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
GA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
HI										
IL	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
IN	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
LA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
ME	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
MD	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
MA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
MI	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
MN	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
MS	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
NH	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
NJ	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
NY	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
Non-US SECA C3	0.80%	-149.3%	-149.5%	-149.1%	-149.1%	-149.2%	-134.8%	-149.0%	-145.1%	
NC	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.6%	
OH	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
OR	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
PA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
RI	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
SC	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
TX	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
VA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
WA	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
WV	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
WI	0.80%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	0.0%	2.7%	
TOTAL										

Table B-14c: Offshore Ship Emission Control Area with Category 3 Commercial Marine Vehicle (CMV) Emissions—Percent Change between EMF and SMOKE Calculations

State	NO	ALD_2	ALD_X	CO	ETH	ETHA	ETOH	FORM	IOLE
AL	11752	18044	4465	172531	25910	6310	42566	24605	65568
AZ	19100	39966	9891	381578	57250	13668	94052	54500	145233
AK	19726	15158	3751	144882	21752	5270	35735	20670	55083
CA	38195	46104	11410	440249	66152	15804	108676	62871	167538
CO	26492	16476	4078	157308	23601	5635	38772	22468	59873
CT	432	771	191	7369	1107	269	1818	1051	2800
DE	726	364	90	3477	522	127	858	496	1321
DC	16	15	4	146	22	5	36	21	56
FL	34341	23523	5821	224728	33729	8120	55412	32078	85481
GA	18643	20997	5196	200711	30136	7311	49509	28633	76300
ID	12819	20475	5067	195464	29323	6991	48173	27921	74404
IL	37077	9394	2325	89781	13479	3260	22143	12811	34138
IN	21274	6197	1534	59248	8897	2164	14617	8450	22519
IA	36439	8078	1999	77180	11585	2793	19032	11015	29354
KS	60555	14313	3542	136682	20509	4911	33693	19518	52011
KY	15380	8524	2110	81560	12254	3008	20131	11624	30977
LA	18976	14701	3638	140527	21100	5117	34663	20048	53423
ME	1857	7032	1740	67176	10082	2425	16563	9589	25554
MD	2704	1925	476	18410	2765	674	4542	2625	6996
MA	893	1196	296	11433	1717	418	2821	1631	4345
MI	14741	9769	2418	93374	14020	3398	23033	13321	35499
MN	28733	13079	3237	125000	18766	4542	30830	17835	47527
MS	14882	16597	4107	158682	23829	5795	39147	22633	60312
MO	30285	13850	3428	132441	19890	4846	32676	18887	50331
MT	46156	27847	6892	265833	39878	9502	65513	37974	101194
NE	49268	11867	2937	113329	17005	4074	27937	16183	43123
NV	10099	23781	5885	227009	34119	8109	56052	32430	86419
NH	437	1656	410	15829	2377	576	3904	2258	6017
NJ	1481	1416	351	13546	2034	496	3342	1932	5147
NM	28217	26724	6614	255107	38271	9118	62873	36443	97112
NY	7190	7107	1759	67965	10207	2488	16769	9692	25827
NC	12631	13731	3398	131274	19713	4792	32385	18724	49896
ND	35321	8140	2015	77737	11665	2794	19163	11101	29581
OH	17083	6591	1631	63033	9467	2312	15554	8987	23949
OK	42170	13854	3428	132357	19866	4786	32637	18892	50342
OR	11683	24040	5949	229510	34433	8213	56568	32783	87360
PA	7986	6844	1694	65476	9836	2410	16159	9333	24872
RI	138	172	43	1645	247	60	406	235	625
SC	8893	10226	2531	97754	14677	3560	24113	13945	37162
SD	40038	11265	2788	107575	16142	3865	26518	15362	40935
TN	13346	10472	2592	100184	15050	3689	24726	14280	38055
TX	202182	74315	18391	709679	106487	25498	174941	101341	270053
UT	9249	17823	4411	170143	25562	6086	41994	24304	64765
VT	936	1661	411	15877	2384	580	3917	2264	6034
VA	8042	9061	2242	86650	13014	3176	21381	12355	32925
WA	12838	17392	4304	166035	24909	5939	40921	23717	63201
WV	2756	4344	1075	41597	6253	1552	10273	5924	15785
WI	19332	8527	2110	81520	12241	2974	20110	11628	30986
WY	11518	14535	3597	138753	20818	4962	34201	19820	52817
TOTAL	1065030	679940	168270	6495352	975054	234474	1601857	927208	2470824

Table B-15: Biogenic Emission Inventory System Emissions [model calculated]

State	ISOP	MEOH	NR	OLE	PAR	SESQ	TERP
AL	867634	91278	32940	37648	133546	32102	355997
AZ	376591	240186	71708	93723	315690	40622	378295
AK	601468	77483	27545	26128	104650	24857	204175
CA	877073	237585	82868	208441	514681	46481	527730
CO	205878	83283	29562	66364	171749	15461	166849
CT	22325	2935	1407	1358	5418	608	7948
DE	13367	2042	663	633	2527	582	4202
DC	816	87	28	37	123	19	176
FL	669279	127052	42510	53865	183609	35683	360056
GA	910194	112709	38202	43070	154597	35723	444526
ID	113116	81311	36689	95679	233179	14802	278560
IL	217977	57110	17049	16209	65558	16741	26774
IN	150178	35695	11300	10845	43480	10221	27842
IA	124317	47011	14619	13766	56110	13174	16201
KS	106544	86588	25745	24753	99920	27509	26363
KY	318217	46047	15672	14639	59394	13838	66293
LA	551855	75761	26741	28827	106271	26097	233742
ME	39396	18129	12698	12051	48887	4282	123855
MD	82411	9767	3518	3353	13399	2667	22780
MA	34221	4640	2180	2154	8475	983	15696
MI	224578	40724	17759	24758	79986	9641	109799
MN	394371	56465	23746	30574	103240	14543	113115
MS	768476	85052	30261	32402	119575	29844	296144
MO	688037	76734	25294	23827	96555	21468	79614
MT	96784	125606	49877	151544	349305	26598	302550
NE	111498	70855	21354	32591	100950	20151	29891
NV	129103	143880	42572	44856	171463	17291	269748
NH	23293	5259	3012	2834	11512	1178	30049
NJ	70700	6561	2589	2595	10107	1613	18842
NM	175612	153128	47860	67896	218930	21637	257547
NY	90835	27507	12987	12438	49845	6157	78631
NC	528980	70528	25027	26568	98875	21136	247423
ND	58883	43902	14644	14654	57700	11936	11730
OH	132152	34844	12062	11473	46154	9414	36828
OK	375624	76836	25052	24045	96708	23377	75392
OR	68778	87623	43098	147022	325803	14429	332488
PA	217737	29477	12562	11944	47969	6929	59093
RI	6709	662	313	311	1221	130	1642
SC	444019	53274	18603	20972	74828	18639	202495
SD	86774	65265	20262	43259	114299	18648	46365
TN	523835	54993	19227	18034	72894	16838	105573
TX	879959	427500	133670	131852	522219	128159	377349
UT	157215	102590	31939	38757	136226	13175	191900
VT	8875	5264	3028	2838	11541	1264	26325
VA	424153	44567	16572	15644	62733	12399	130310
WA	26947	53342	31169	64706	173219	11406	203152
WV	219216	18963	8064	7472	30300	5366	43548
WI	244925	39999	15536	18600	65319	9882	73532
WY	121402	77993	26042	54980	146144	9331	169885
TOTAL	13582326	3516092	1227828	1832989	5716885	865033	7209023

Table B-15: Biogenic Emission Inventory System Emissions [model calculated]

EMF Inventory							
State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO_3	POC_72	PSO_4
AL	9	61	42	77	0.30	342	6
AK	1	5	4	7	0.03	30	1
AZ	9	66	48	88	0.32	394	4
AR	5	33	25	46	0.16	208	3
CO	8	53	36	66	0.26	292	5
CT	5	36	27	50	0.17	224	3
DE	1	10	7	13	0.05	57	1
DC	1	4	3	6	0.02	26	0
FL	33	224	152	280	1.09	1235	23
GA	15	108	83	153	0.53	694	8
HI	2	11	8	15	0.06	68	1
ID	2	13	11	20	0.07	89	2
IL	16	111	84	157	0.54	700	12
IN	11	75	51	94	0.36	416	8
IA	5	31	23	44	0.15	194	4
KS	5	32	22	40	0.16	178	3
KY	7	51	35	65	0.25	287	4
LA	7	49	33	61	0.24	269	5
ME	2	15	10	19	0.07	83	2
MD	9	60	46	86	0.29	387	6
MA	9	67	45	83	0.33	370	4
MI	17	106	80	149	0.52	658	15
MN	8	56	42	77	0.27	345	5
MS	6	44	27	49	0.21	216	4
MO	11	72	55	102	0.35	454	9
MT	2	11	8	14	0.05	63	1
NE	3	19	14	25	0.09	111	2
NV	3	24	15	27	0.12	121	1
NH	2	14	10	18	0.07	80	1
NJ	12	89	63	116	0.44	520	7
NM	4	28	20	36	0.14	162	3
NY	23	162	118	219	0.79	980	15
NC	13	85	63	118	0.41	525	10
ND	1	8	5	10	0.04	44	1
OH	18	123	83	154	0.60	679	13
OK	7	50	34	63	0.24	278	5
OR	5	34	26	48	0.17	214	3
PA	16	110	85	158	0.54	709	12
RI	2	12	8	14	0.06	62	1
SC	8	52	39	73	0.25	327	6
SD	1	9	6	12	0.04	51	1
TN	10	68	53	99	0.33	442	8
TX	36	258	172	316	1.26	1400	21
UT	5	30	22	41	0.15	180	4
VT	1	8	5	9	0.04	38	1
VA	13	90	69	128	0.44	573	9

Table B-16a: Running Mode Emissions [calculated by MOVES 2010 Model]—Pre-SMOKE: Particulate Air Pollutants

EMF Inventory							
State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO_3	POC_72	PSO_4
WA	9	60	44	82	0.29	369	6
WV	3	21	15	28	0.10	127	2
WI	9	62	42	78	0.30	346	6
WY	1	10	7	12	0.05	54	1
TOTAL	411	2831	2024	3745	13.81	16671	277

SMOKE State	OTHER	PEC_72	PM_{10}	$PM_{2.5}$	PMC_72
AL	8.827499573	61.44853453	6.06605096	6.06605096	41.79941622
AK	0	0	0	0	0
AZ	8.82573808	66.08250258	4.746350436	4.746350436	47.4442946
AR	4.796041711	32.61905719	3.513215199	3.513215199	25.06249431
CO	7.760227848	52.76228068	5.689344908	5.689344908	35.72172886
CT	4.929890485	35.39784234	3.08102311	3.08102311	26.78540959
DE	1.395197892	9.518619245	1.013636509	1.013636509	6.912823294
DC	0.594202616	4.025445306	0.439769174	0.439769174	3.083301311
FL	32.72057508	223.4490037	23.71084509	23.71084509	150.9941633
GA	14.67535541	107.91145	8.451197165	8.451197165	82.80438532
HI	0	0	0	0	0
ID	2.190883998	13.44166691	2.018938089	2.018938089	10.64104951
IL	16.41838335	111.1872959	12.16256331	12.16256331	84.07553288
IN	10.98140765	74.74035572	8.029079647	8.029079647	50.94020569
IA	4.775141344	31.54853982	3.761361564	3.761361564	23.50747852
KS	4.687356272	31.94558916	3.414948417	3.414948417	21.76867453
KY	7.242688757	51.22116404	4.748692053	4.748692053	35.0838227
LA	6.972055645	48.48886644	4.803496023	4.803496023	32.96001356
ME	2.182161522	14.81012429	1.607365344	1.607365344	10.16709249
MD	8.780095019	59.88420928	6.383771722	6.383771722	46.30503095
MA	8.732915998	66.77247111	4.303378473	4.303378473	44.8075063
MI	16.99537415	105.2753306	15.37654789	15.37654789	79.55197683
MN	7.949716761	55.91205487	5.300022972	5.300022972	41.57279441
MS	6.193220677	44.07671489	3.981859036	3.981859036	26.99090704
MO	10.99860977	71.57431252	8.973333256	8.973333256	54.71128171
MT	1.737029713	11.28243699	1.423251167	1.423251167	7.771543621
NE	2.900807333	19.45591406	2.202433947	2.202433947	13.61695277
NV	3.092362197	23.7391833	1.496934131	1.496934131	14.91439001
NH	1.9429047	14.41790252	1.081635124	1.081635124	9.7762129
NJ	12.24263728	88.81691121	7.39254355	7.39254355	62.75223455
NM	4.163851695	28.03438064	3.130993502	3.130993502	19.73021357
NY	23.25158209	161.3958311	16.1082885	16.1082885	117.9967793
NC	12.78969879	84.93726307	9.950115092	9.950115092	63.37525411
ND	1.154479627	7.817089899	0.855561293	0.855561293	5.366038349
OH	18.33633096	122.5748405	14.03767468	14.03767468	83.27803546
OK	7.357718547	49.90040918	5.429780265	5.429780265	34.01738289
OR	4.872632153	34.02284286	3.318756119	3.318756119	25.69107029
PA	16.29288833	109.6159293	12.27433269	12.27433269	84.86494827
RI	1.557093537	12.15891323	0.695423712	0.695423712	7.575977006
SC	7.784283581	51.53991578	6.100293953	6.100293953	39.34055369
SD	1.344295706	9.177031146	0.975034768	0.975034768	6.295200869
TN	10.39795169	67.82180415	8.438917398	8.438917398	52.9757302
TX	35.67142645	257.6450193	21.8634542	21.8634542	171.3016192
UT	4.642000143	29.9987976	3.846649647	3.846649647	21.79225582
VT	1.157676439	8.269979552	0.735550022	0.735550022	4.763405039
VA	13.23402625	89.7177978	9.776550483	9.776550483	68.65567211

Table B-16b: Running Mode Emissions [calculated by MOVES 2010 Model]—SMOKE: Particulate Air Pollutants

SMOKE					
State	OTHER	PEC_72	PM_{10}	$PM_{2.5}$	PMC_72
WA	8.589003015	60.17520164	5.792383913	5.792383913	44.36090919
WV	3.091573163	20.58686519	2.389431108	2.389431108	15.3656758
WI	8.974186412	62.26669577	6.224444705	6.224444705	42.39105552
WY	1.463839129	9.615996076	1.168754527	1.168754527	6.611345205
TOTAL	408	2,809	288	288	2,008

SMOKE				
State	PMFINE_72	PNO_3	POC_72	PSO_4
AL	77.1104369	0.299840429	341.414789	5.76621053
AK	0	0	0	0
AZ	87.49623737	0.322451562	393.3525429	4.423898874
AR	46.54537421	0.159166355	208.7466629	3.354048843
CO	65.9530841	0.257455491	290.9642844	5.431889416
CT	49.60481104	0.172725354	223.374637	2.908297756
DE	12.80423078	0.046446465	57.04518362	0.967190044
DC	5.726360445	0.01964232	25.66079234	0.420126854
FL	278.6982063	1.090328213	1229.887723	22.62051687
GA	153.3092813	0.526558861	693.169725	7.924638304
HI	0	0	0	0
ID	19.87116145	0.065588992	88.40139189	1.953349096
IL	156.060752	0.542543583	698.2116973	11.62001973
IN	94.07758759	0.364698182	415.480895	7.664381466
IA	43.65143438	0.153942459	194.3814603	3.607419104
KS	40.20006074	0.15587998	177.5635317	3.259068437
KY	64.699165	0.24993579	287.2823612	4.498756263
LA	60.80398485	0.236603493	269.1596358	4.56689253
ME	18.78589869	0.072266219	83.01864008	1.535099125
MD	86.01053137	0.292207047	386.1521926	6.091564675
MA	82.26771022	0.325818769	367.6738327	3.977559704
MI	148.2246758	0.513695222	656.1464368	14.86285267
MN	76.99017984	0.272825433	345.2024014	5.02719754
MS	49.45921725	0.215073761	216.3300039	3.766785275
MO	101.7704872	0.349249745	453.8595363	8.624083511
MT	14.39103568	0.055052729	63.27003797	1.368198438
NE	25.1970651	0.094935807	111.4812693	2.10749814
NV	27.27481737	0.11583623	120.9120357	1.381097902
NH	17.98197865	0.070352971	80.19538264	1.011282153
NJ	115.7801739	0.433386928	517.6875633	6.959156622
NM	36.51249955	0.136794854	161.743224	2.994198647
NY	218.4682128	0.787535618	976.0832589	15.32075288
NC	117.6637994	0.414453347	524.3704422	9.535661745
ND	9.915922441	0.038143677	43.80720481	0.817417616
OH	153.9030468	0.598108765	677.8335841	13.43956591
OK	62.83489321	0.24349103	277.3859682	5.186289235
OR	47.62580664	0.166015939	213.7659172	3.15274018
PA	157.7292768	0.534873262	707.1819295	11.73945943
RI	13.83730397	0.059329751	61.40108677	0.636093961
SC	73.12160199	0.251491118	326.6864986	5.848802835
SD	11.62824022	0.044779969	51.41972089	0.930254799
TN	98.62095758	0.330939422	441.1150105	8.107977976
TX	315.1212582	1.257194288	1397.249314	20.60625991
UT	40.46047741	0.146380352	179.0923543	3.700269295
VT	8.695217624	0.040353453	37.68769953	0.69519657
VA	127.499602	0.437782205	571.3278922	9.338768278

Table B-16bi: Running Mode Emissions [calculated by MOVES 2010 Model]—SMOKE: Particulate Air Pollutants

SMOKE				
State	PMFINE_72	PNO_3	POC_72	PSO_4
WA	82.13364022	0.29362743	367.723226	5.498756483
WV	28.52537983	0.100454439	127.1690203	2.28897667
WI	78.21650215	0.303832923	346.2116492	5.920611783
WY	12.23509273	0.046921715	53.85623649	1.121832812
TOTAL	3,715	14	16,539	275

Adjusted State	OTHER	PEC	PMC	PMFINE	PNO_3	POC	PSO_4
AL	8.827544332	85.93404648	57.96269952	104.3558846	0.299842341	477.6246801	5.766242621
AZ	8.826135134	87.79995179	62.44183696	112.9415354	0.322466352	520.5823743	4.424111752
AR	4.796116099	50.41071761	38.35851801	69.34560364	0.159168544	322.7632498	3.354099636
CO	7.760246397	121.4043311	80.76379542	141.8037181	0.257456415	670.2162994	5.431910364
CT	4.929565666	77.59492152	57.89796015	102.8613379	0.172714106	489.6872121	2.908096885
DE	1.395326556	17.55502368	12.55807339	22.41037706	0.046450837	105.0445476	0.967273952
DC	0.594198842	7.255419534	5.487927538	9.850245223	0.019642278	46.26241391	0.42012087
FL	32.72079282	247.879209	167.0296548	305.7035972	1.09033564	1364.910481	22.62066825
GA	14.67524544	154.5685157	117.8171598	213.3830964	0.526554465	993.5864228	7.92459808
ID	2.190836847	30.62461318	23.81949369	42.54585442	0.065587563	201.7768135	1.953312178
IL	16.4180898	244.5935184	182.0298948	323.6450916	0.542533279	1536.237974	11.61980553
IN	10.98138518	155.9767767	104.5680185	184.482153	0.364697692	867.4239997	7.664378488
IA	4.775213648	76.0144688	55.6494539	98.52666848	0.153944436	468.7771964	3.60748641
KS	4.687427048	62.14444197	41.71091267	73.8232765	0.15588219	345.6317347	3.259120049
KY	7.242888855	90.93802577	61.49701465	109.2667713	0.249942156	510.1678655	4.498944502
LA	6.971999787	62.06330897	41.91288952	75.89183916	0.236601291	344.5994292	4.56686477
ME	2.182188175	39.21328207	26.41396722	46.20567995	0.072267461	220.1066628	1.535118186
MD	8.779835461	112.3443656	85.71067423	153.6293088	0.29219905	724.2859799	6.091379897
MS	8.733108092	153.422665	101.5402343	177.7675925	0.325825865	845.223733	3.977676636
MI	16.99513306	248.4688715	184.1240777	327.0119118	0.513687844	1550.100328	14.86265933
MN	7.949522827	160.6681111	117.360493	206.3886152	0.272818769	992.3456412	5.027085932
MS	6.193196091	60.29746832	36.61947535	65.41898573	0.215073545	296.1108234	3.766759823
MO	10.99867196	133.3074542	100.4742704	180.1619339	0.349251788	845.8484942	8.624134665
MT	1.737033856	28.60310823	19.30471366	33.85574888	0.055053286	160.5910088	1.368202669
NE	2.90091712	44.57134711	30.6396835	54.00783726	0.094939745	255.4886757	2.107567918
NV	3.092372969	39.33502386	24.77208157	43.77982029	0.115837304	203.4384975	1.381092231
NH	1.942929555	36.03979813	24.07464656	42.07941198	0.070353701	200.7459812	1.011284503
NJ	12.24236124	177.1701951	123.5118321	218.7951909	0.43337594	1032.880275	6.959021732
NM	4.163784192	50.66593643	35.17359867	62.66951294	0.136792581	292.5256659	2.994160158
NY	23.25203409	357.0519329	258.700048	458.5571793	0.78755304	2176.395311	15.32105958
NC	12.78960853	130.6083483	96.45643673	174.1639104	0.414451807	806.8617615	9.535610637
ND	1.154569166	24.89497442	16.73087844	29.10361417	0.038146892	139.6697236	0.817471996
OH	18.336489	261.575822	174.6341459	307.7970174	0.598114619	1447.182284	13.43965933
OK	7.357590129	81.2268941	54.69715323	97.69202802	0.243486822	451.6643242	5.186207593
OR	4.872797534	65.58926666	48.89430854	87.32992633	0.166021806	412.3052244	3.152847735
PA	16.29276736	231.9939977	177.0288179	315.9269572	0.534872163	1498.25615	11.73931397
RI	1.557113709	26.80085244	16.46910844	28.63878836	0.059330799	135.369612	0.636100306
SC	7.784318497	71.83511776	54.38508847	98.89528876	0.251492367	455.5490363	5.848819284
SD	1.344288655	24.1018461	16.22275106	28.38127707	0.04477953	135.1793769	0.930251461
TN	10.39817342	107.3906534	82.97630774	150.1629407	0.330946939	698.8289774	8.108103924
TX	35.67179001	346.3257526	228.5518328	411.291674	1.257203304	1878.101766	20.60649314
UT	4.64207768	66.54900449	47.46221107	84.11704251	0.146382965	397.3690592	3.700314856
VT	1.157563383	22.65857045	12.79418012	21.8752653	0.040349377	103.4882935	0.695152733
VA	13.23412007	154.1778985	116.6210941	209.7117703	0.437784785	982.4027957	9.338846423
WA	8.589013042	120.5189256	87.60778603	155.8909106	0.293627825	736.4929896	5.498771858
WV	3.09195917	39.53295425	29.09524549	51.97380748	0.100467262	244.413129	2.289234558

Table B-16c: Running Mode Emissions [calculated by MOVES 2010 Model]—Adjusted Particulate Air Pollutants

Adjusted State	OTHER	PEC	PMC	PMFINE	PNO_3	POC	PSO_4
WI	8.974334245	161.0387924	107.6473922	188.2310519	0.303838044	896.2096269	5.920712387
WY	1.463854524	25.42443048	17.12371047	29.97343675	0.046922233	142.5453656	1.121849169
TOTAL	407.6685293	5176.160951	3665.323548	6532.322487	13.70706904	30623.26927	274.579999
	408	5,176	3,665	6,532	14	30,623	275
			46,693	42,753			
			PM10	PM2.5			

SMOKE STATE	OTHER	PEC_72	PMC_72	PMFINE_72	PNO3	POC_72	PSO_4
AL	-0.01%	0.01%	-0.02%	-0.02%	0.01%	-0.03%	-0.06%
AZ	-0.23%	-0.21%	-0.26%	-0.26%	-0.21%	-0.26%	-0.30%
AR	0.17%	0.18%	0.14%	0.14%	0.18%	0.14%	0.13%
CO	-0.24%	-0.23%	-0.26%	-0.26%	-0.23%	-0.26%	-0.29%
CT	-0.31%	-0.30%	-0.32%	-0.32%	-0.30%	-0.32%	-0.33%
DE	-0.31%	-0.30%	-0.32%	-0.32%	-0.30%	-0.33%	-0.33%
DC	-0.60%	-0.60%	-0.61%	-0.61%	-0.60%	-0.61%	-0.62%
FL	-0.40%	-0.38%	-0.41%	-0.41%	-0.38%	-0.41%	-0.44%
GA	-0.09%	-0.07%	-0.11%	-0.12%	-0.07%	-0.12%	-0.15%
ID	-0.16%	-0.12%	-0.18%	-0.18%	-0.12%	-0.18%	-0.23%
IL	-0.29%	-0.27%	-0.30%	-0.30%	-0.27%	-0.31%	-0.35%
IN	-0.02%	-0.01%	-0.04%	-0.04%	-0.01%	-0.04%	-0.06%
IA	0.14%	0.17%	0.13%	0.12%	0.17%	0.12%	0.07%
KS	-0.04%	-0.03%	-0.05%	-0.06%	-0.03%	-0.06%	-0.08%
KY	0.08%	0.09%	0.06%	0.06%	0.09%	0.06%	0.03%
LA	-0.09%	-0.08%	-0.10%	-0.10%	-0.08%	-0.10%	-0.15%
ME	0.31%	0.32%	0.29%	0.29%	0.32%	0.29%	0.25%
MD	-0.31%	-0.30%	-0.33%	-0.33%	-0.30%	-0.33%	-0.34%
MA	-0.50%	-0.49%	-0.51%	-0.51%	-0.49%	-0.52%	-0.53%
MI	-0.28%	-0.27%	-0.30%	-0.30%	-0.27%	-0.30%	-0.32%
MN	-0.04%	-0.03%	-0.07%	-0.07%	-0.03%	-0.07%	-0.07%
MS	0.17%	0.18%	0.15%	0.15%	0.18%	0.14%	0.12%
MO	-0.12%	-0.10%	-0.14%	-0.14%	-0.10%	-0.14%	-0.15%
MT	0.39%	0.42%	0.38%	0.38%	0.42%	0.38%	0.32%
NE	0.11%	0.14%	0.09%	0.09%	0.14%	0.08%	0.03%
NV	-0.17%	-0.16%	-0.17%	-0.18%	-0.16%	-0.18%	-0.20%
NH	-0.09%	-0.08%	-0.10%	-0.11%	-0.08%	-0.11%	-0.12%
NJ	-0.47%	-0.47%	-0.48%	-0.48%	-0.47%	-0.49%	-0.51%
NM	0.10%	0.13%	0.08%	0.07%	0.13%	0.07%	0.02%
NY	-0.38%	-0.37%	-0.38%	-0.39%	-0.37%	-0.39%	-0.39%
NC	-0.06%	-0.05%	-0.09%	-0.09%	-0.05%	-0.09%	-0.10%
ND	0.32%	0.34%	0.31%	0.30%	0.34%	0.30%	0.25%
OH	-0.23%	-0.22%	-0.24%	-0.24%	-0.22%	-0.24%	-0.26%
OK	-0.03%	-0.01%	-0.04%	-0.04%	-0.01%	-0.04%	-0.07%
OR	-0.08%	-0.07%	-0.10%	-0.10%	-0.07%	-0.10%	-0.13%
PA	-0.19%	-0.18%	-0.21%	-0.21%	-0.18%	-0.21%	-0.23%
RI	-0.45%	-0.45%	-0.46%	-0.46%	-0.45%	-0.46%	-0.48%
SC	0.00%	0.02%	-0.01%	-0.01%	0.02%	-0.02%	-0.06%
SD	0.31%	0.33%	0.30%	0.29%	0.33%	0.29%	0.25%
TN	-0.14%	-0.12%	-0.15%	-0.16%	-0.12%	-0.16%	-0.19%
TX	-0.20%	-0.20%	-0.21%	-0.21%	-0.20%	-0.21%	-0.22%
UT	-0.25%	-0.23%	-0.25%	-0.25%	-0.23%	-0.25%	-0.29%
VT	0.35%	0.38%	0.31%	0.30%	0.37%	0.30%	0.25%
VA	-0.20%	-0.18%	-0.21%	-0.21%	-0.18%	-0.21%	-0.24%
WA	-0.29%	-0.27%	-0.31%	-0.31%	-0.27%	-0.32%	-0.34%
WV	0.17%	0.20%	0.15%	0.15%	0.20%	0.15%	0.12%
WI	-0.04%	-0.03%	-0.06%	-0.06%	-0.03%	-0.06%	-0.08%
WY	0.34%	0.37%	0.33%	0.33%	0.37%	0.33%	0.26%

Table B-16d: Running Mode Emissions [calculated by MOVES 2010 Model]—Percent Change between EMF and SMOKE Calculations

Adjusted STATE	OTHER	PEC_72	PMC_72	PMFINE_72	PNO_3	POC_72	PSO_4
AL	0.00%	39.85%	38.67%	35.33%	0.00%	39.90%	0.00%
AZ	0.00%	32.86%	31.61%	29.08%	0.00%	32.34%	0.00%
AR	0.00%	54.54%	53.05%	48.98%	0.00%	54.62%	0.00%
CO	0.00%	130.10%	126.09%	115.01%	0.00%	130.34%	0.00%
CT	-0.01%	119.21%	116.15%	107.36%	-0.01%	119.22%	-0.01%
DE	0.01%	84.43%	81.66%	75.02%	0.01%	84.14%	0.01%
DC	0.00%	80.24%	77.99%	72.02%	0.00%	80.28%	0.00%
FL	0.00%	10.93%	10.62%	9.69%	0.00%	10.98%	0.00%
GA	0.00%	43.24%	42.28%	39.18%	0.00%	43.34%	0.00%
ID	0.00%	127.83%	123.85%	114.11%	0.00%	128.25%	0.00%
IL	0.00%	119.98%	116.51%	107.38%	0.00%	120.02%	0.00%
IN	0.00%	108.69%	105.28%	96.10%	0.00%	108.78%	0.00%
IA	0.00%	140.94%	136.73%	125.71%	0.00%	141.16%	0.00%
KS	0.00%	94.53%	91.61%	83.64%	0.00%	94.65%	0.00%
KY	0.00%	77.54%	75.29%	68.88%	0.00%	77.58%	0.00%
LA	0.00%	27.99%	27.16%	24.81%	0.00%	28.03%	0.00%
ME	0.00%	164.77%	159.80%	145.96%	0.00%	165.13%	0.00%
MD	0.00%	87.60%	85.10%	78.62%	0.00%	87.56%	0.00%
MA	0.00%	129.77%	126.61%	116.08%	0.00%	129.88%	0.00%
MI	0.00%	136.02%	131.45%	120.62%	0.00%	136.24%	0.00%
MN	0.00%	187.36%	182.30%	168.07%	0.00%	187.47%	0.00%
MS	0.00%	36.80%	35.67%	32.27%	0.00%	36.88%	0.00%
MO	0.00%	86.25%	83.64%	77.03%	0.00%	86.37%	0.00%
MT	0.00%	153.52%	148.40%	135.26%	0.00%	153.82%	0.00%
NE	0.00%	129.09%	125.01%	114.34%	0.00%	129.18%	0.00%
NV	0.00%	65.70%	66.10%	60.51%	0.00%	68.25%	0.00%
NH	0.00%	149.97%	146.26%	134.01%	0.00%	150.32%	0.00%
NJ	0.00%	99.48%	96.82%	88.97%	0.00%	99.52%	0.00%
NM	0.00%	80.73%	78.27%	71.64%	0.00%	80.86%	0.00%
NY	0.00%	121.23%	119.24%	109.90%	0.00%	122.97%	0.00%
NC	0.00%	53.77%	52.20%	48.02%	0.00%	53.87%	0.00%
ND	0.01%	218.47%	211.79%	193.50%	0.01%	218.83%	0.01%
OH	0.00%	113.40%	109.70%	99.99%	0.00%	113.50%	0.00%
OK	0.00%	62.78%	60.79%	55.47%	0.00%	62.83%	0.00%
OR	0.00%	92.78%	90.32%	83.37%	0.00%	92.88%	0.00%
PA	0.00%	111.64%	108.60%	100.30%	0.00%	111.86%	0.00%
RI	0.00%	120.42%	117.39%	106.97%	0.00%	120.47%	0.00%
SC	0.00%	39.38%	38.24%	35.25%	0.00%	39.45%	0.00%
SD	0.00%	162.63%	157.70%	144.07%	0.00%	162.89%	0.00%
TN	0.00%	58.34%	56.63%	52.26%	0.00%	58.42%	0.00%
TX	0.00%	34.42%	33.42%	30.52%	0.00%	34.41%	0.00%
UT	0.00%	121.84%	117.79%	107.90%	0.00%	121.88%	0.00%
VT	-0.01%	173.99%	168.59%	151.58%	-0.01%	174.59%	-0.01%
VA	0.00%	71.85%	69.86%	64.48%	0.00%	71.95%	0.00%
WA	0.00%	100.28%	97.49%	89.80%	0.00%	100.28%	0.00%
WV	0.01%	92.03%	89.35%	82.20%	0.01%	92.20%	0.01%
WI	0.00%	158.63%	153.94%	140.65%	0.00%	158.86%	0.00%
WY	0.00%	164.40%	159.00%	144.98%	0.00%	164.68%	0.00%

Table B-16e: Running Mode Emissions [calculated by MOVES 2010 Model]—Percent Change between SMOKE and Adjusted Calculations

EMF Inventory							
State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO3	POC_72	PSO4
AL	5	44	11	19	0.21	69	0.20
AK	0	4	1	2	0.02	6	0.03
AZ	5	48	12	20	0.24	76	0.16
AR	3	27	7	12	0.13	43	0.13
CO	4	36	9	15	0.18	56	0.19
CT	3	27	7	11	0.13	42	0.11
DE	1	7	2	3	0.04	12	0.03
DC	0	3	1	1	0.02	5	0.01
FL	17	156	40	66	0.76	245	0.77
GA	10	87	23	37	0.43	138	0.29
HI	1	8	2	4	0.04	13	0.04
ID	1	11	3	5	0.06	18	0.07
IL	10	87	22	37	0.42	137	0.41
IN	6	53	14	22	0.26	83	0.27
IA	3	26	7	11	0.13	41	0.13
KS	3	23	6	10	0.11	36	0.12
KY	4	36	9	15	0.18	57	0.16
LA	4	33	9	14	0.16	52	0.16
ME	1	11	3	5	0.05	17	0.06
MD	5	47	12	20	0.23	74	0.22
MA	5	43	11	18	0.21	67	0.13
MI	9	82	21	35	0.40	130	0.53
MN	5	44	11	19	0.21	69	0.18
MS	3	28	7	12	0.14	44	0.13
MO	6	56	15	24	0.28	89	0.32
MT	1	8	2	4	0.04	13	0.05
NE	2	15	4	6	0.07	23	0.08
NV	2	14	4	6	0.07	22	0.05
NH	1	10	3	4	0.05	16	0.04
NJ	7	62	16	26	0.30	97	0.24
NM	2	21	5	9	0.10	32	0.11
NY	13	118	30	50	0.57	186	0.53
NC	7	67	17	28	0.33	106	0.34
ND	1	6	2	2	0.03	9	0.03
OH	9	82	21	35	0.40	128	0.47
OK	4	35	9	15	0.17	55	0.18
OR	3	27	7	12	0.13	43	0.11
PA	10	89	23	38	0.43	141	0.42
RI	1	6	2	3	0.03	10	0.02
SC	5	42	11	18	0.20	66	0.22
SD	1	7	2	3	0.03	11	0.04
TN	6	56	15	24	0.27	89	0.29
TX	19	171	44	72	0.84	267	0.73
UT	2	22	6	9	0.11	34	0.13
VT	1	5	1	2	0.02	7	0.02
VA	8	72	19	31	0.35	113	0.34
WA	5	45	12	19	0.22	70	0.20
WV	2	17	4	7	0.08	27	0.09

Table B-17a: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—Pre-SMOKE: Particulate Air Pollutants

EMF Inventory							
State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO3	POC_72	PSO4
WI	5	45	12	19	0.22	70	0.21
WY	1	7	2	3	0.03	11	0.04
TOTAL	229	2076	537	882	10.13	3268	9.82

SMOKE State	OTHER	PEC_72	PM_{10}	PM2_5	PMC_72
AL	4.825021578	43.79823575	0.417920049	0.417920049	11.29387887
AK	0	0	0	0	0
AZ	5.274235024	48.11191565	0.389846206	0.389846206	12.45042378
AR	2.996637621	27.20017813	0.259901001	0.259901001	7.068016446
CO	3.962664837	35.88597276	0.367175152	0.367175152	9.253652673
CT	2.918654519	26.55796414	0.234516532	0.234516532	6.893436179
DE	0.823120642	7.475017224	0.070355331	0.070355331	1.936662643
DC	0.351146315	3.190333063	0.029598713	0.029598713	0.829456946
FL	17.16713151	155.6999307	1.524250181	1.524250181	40.14912184
GA	9.540179456	87.00498322	0.711170125	0.711170125	22.60484719
HI	0	0	0	0	0
ID	1.259062044	11.37575842	0.124135639	0.124135639	2.96124991
IL	9.509440302	86.29780993	0.830003483	0.830003483	22.41566108
IN	5.816606756	52.71724929	0.527057689	0.527057689	13.59732998
IA	2.832713945	25.66625143	0.258741591	0.258741591	6.657508557
KS	2.504565221	22.69341766	0.228646891	0.228646891	5.853278659
KY	3.986637455	36.21426115	0.33783559	0.33783559	9.341336332
LA	3.690261744	33.4805624	0.324480475	0.324480475	8.633220787
ME	1.230914532	11.1554835	0.111696159	0.111696159	2.87760545
MD	5.14252319	46.66855482	0.448751997	0.448751997	12.1324754
MA	4.648436427	42.41535233	0.340176921	0.340176921	10.93002838
MI	9.0831385	81.9643829	0.924681868	0.924681868	21.29744308
MN	4.825156611	43.87600842	0.396209803	0.396209803	11.37952523
MS	3.144978477	28.5494349	0.271975242	0.271975242	7.299983245
MO	6.223323247	56.31109344	0.590102008	0.590102008	14.63502042
MT	0.937288205	8.466514438	0.092973461	0.092973461	2.184784801
NE	1.64007154	14.86068398	0.149646026	0.149646026	3.839473206
NV	1.559537911	14.22214135	0.116402575	0.116402575	3.647031752
NH	1.112833546	10.13957759	0.085591836	0.085591836	2.613486444
NJ	6.733301477	61.28011497	0.537843869	0.537843869	15.84824892
NM	2.269104207	20.5568238	0.208042296	0.208042296	5.312581447
NY	12.89703148	117.1334619	1.099181975	1.099181975	30.35463582
NC	7.37401842	66.82838164	0.669326742	0.669326742	17.33775349
ND	0.647287929	5.864958415	0.059092237	0.059092237	1.512906188
OH	9.032719897	81.70353919	0.864469629	0.864469629	21.07511886
OK	3.900018188	35.33747439	0.35601799	0.35601799	9.114874033
OR	2.964231992	26.94938871	0.244793113	0.244793113	6.99505845
PA	9.765923378	88.62599756	0.85221742	0.85221742	23.0444109
RI	0.70387308	6.419746799	0.052319529	0.052319529	1.648191604
SC	4.612679112	41.80192838	0.41906675	0.41906675	10.85998843
SD	0.753787596	6.830253697	0.068724378	0.068724378	1.761851221
TN	6.20614373	56.23053931	0.567219553	0.567219553	14.63081808
TX	18.82044192	171.085475	1.560194117	1.560194117	44.04778452
UT	2.404953234	21.72697432	0.237683945	0.237683945	5.630218643
VT	0.532633476	4.827623032	0.048192042	0.048192042	1.228393327
VA	7.866446645	71.37430546	0.690400635	0.690400635	18.54568296
WA	4.882274949	44.35811317	0.411471486	0.411471486	11.50249651
WV	1.862014584	16.87463571	0.169074367	0.169074367	4.376834163

Table B-17b: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—SMOKE: Particulate Air Pollutants

SMOKE					
State	OTHER	PEC_72	PM_{10}	PM2_5	PMC_72
WI	4.929050304	44.73014644	0.430451474	0.430451474	11.53517397
WY	0.770633112	6.962701654	0.075994616	0.075994616	1.796652722
TOTAL	226	2,053	20	20	531

SMOKE State	PMFINE_72	PNO_3	POC_72	PSO_4
AL	18.53884742	0.213715372	68.56913375	0.204204677
AK	0	0	0	0
AZ	20.44030964	0.234763935	75.83036084	0.155082271
AR	11.6182212	0.132724648	43.10791834	0.127176353
CO	15.19346947	0.175107062	56.15401015	0.19206809
CT	11.32617834	0.129590965	42.03762044	0.104925566
DE	3.18159306	0.036474625	11.79235647	0.033880706
DC	1.363440864	0.015567377	5.061477648	0.014031335
FL	65.91028853	0.759744264	243.7157725	0.764505917
GA	37.13863776	0.424544475	137.9922682	0.28662565
HI	0	0	0	0
ID	4.871425343	0.055508336	18.06182113	0.068627303
IL	36.84443548	0.421093437	136.6749986	0.408910046
IN	22.32454152	0.257236098	82.53965828	0.269821591
IA	10.94191218	0.12523935	40.54600263	0.13350224
KS	9.610356322	0.110733632	35.52896752	0.117913259
KY	15.33354299	0.176709117	56.73453342	0.161126474
LA	14.17209081	0.16336971	52.40914036	0.161110766
ME	4.724645359	0.054433748	17.46867078	0.057262411
MD	19.94509841	0.227721259	74.01287643	0.221030738
MA	17.9299984	0.206967289	66.40782332	0.133209632
MI	35.02854897	0.399947552	129.7270476	0.524734315
MN	18.69560729	0.214094788	69.35224282	0.182115015
MS	11.96449434	0.139308223	44.09760677	0.132667019
MO	24.06501496	0.274771915	89.20846057	0.315330093
MT	3.588568153	0.041312818	13.25639963	0.051660643
NE	6.305839823	0.072513148	23.32885497	0.077132878
NV	5.977764734	0.069397554	22.09112408	0.047005021
NH	4.28806605	0.049476645	15.87616352	0.036115191
NJ	26.02175146	0.299018877	96.44226856	0.238824992
NM	8.725816124	0.100307864	32.28355727	0.107734431
NY	49.86890381	0.571557621	184.8593601	0.527624354
NC	28.49569492	0.326091734	105.6083673	0.343235007
ND	2.484059481	0.028618265	9.183858199	0.030473972
OH	34.60919085	0.398674669	127.8823398	0.465794959
OK	14.96558596	0.172430805	55.32784338	0.183587185
OR	11.49414629	0.1315004	42.64956089	0.113292713
PA	37.88494541	0.432451319	140.5951031	0.419766101
RI	2.7020557	0.031325431	9.990914863	0.020994098
SC	17.85355787	0.203973996	66.2043614	0.215092754
SD	2.892765643	0.033328478	10.69490578	0.035395901
TN	24.05979067	0.274379184	89.26823845	0.292840369
TX	72.27335714	0.834818697	267.264557	0.72537542
UT	9.254628439	0.106017582	34.24838506	0.131666364
VT	2.011831324	0.023556597	7.396001036	0.024635446
VA	30.48582968	0.348273594	113.0969135	0.342127041
WA	18.898622	0.216447086	70.08173052	0.1950244
WV	7.193297839	0.082340713	26.65641143	0.086733654

Table B-17bi: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—SMOKE: Particulate Air Pollutants

SMOKE				
State	PMFINE_72	PNO_3	POC_72	PSO_4
WI	18.93576646	0.218262493	70.03356283	0.21218898
WY	2.950963365	0.033974823	10.90165247	0.042019793
TOTAL	872	10	3,231	10

Adjusted State	OTHER	PEC	PMC	PMFINE	PNO_3	POC	PSO_4
AL	4.824998912	78.95329253	19.99817668	29.54877911	0.213714267	123.6166484	0.204203793
AZ	5.274564701	82.31326346	20.94789312	31.20819517	0.234778726	129.6690999	0.155091765
AR	2.996684164	57.56955763	14.64747546	21.2453285	0.132726529	91.24486523	0.127178333
CO	3.962676845	144.1175385	36.04460684	49.07534555	0.175107549	225.5632654	0.192068402
CT	2.918398661	97.12310941	24.48838815	33.66308716	0.129579349	153.7274599	0.104916009
DE	0.823171881	20.74699689	5.238084625	7.368168284	0.036477004	32.72257311	0.033883012
DC	0.351122717	8.549331176	2.16761776	3.063489922	0.015566344	13.56391622	0.014030402
FL	17.16724216	186.8098887	47.85200199	75.65347823	0.759749126	292.430896	0.76450796
GA	9.540192145	158.6254891	40.48909562	59.86088979	0.424544871	251.6076025	0.286626464
ID	1.259054604	45.67022083	11.53130294	15.76406386	0.055508137	72.52582309	0.068626471
IL	9.509056569	328.5373916	82.83981668	113.5698754	0.421076764	520.3173042	0.408892124
IN	5.816697329	184.9128951	46.32837103	63.72543339	0.257239871	289.5367578	0.26982598
IA	2.832846939	115.944987	29.14206543	39.46974774	0.125245452	183.1867942	0.133508099
KS	2.504594733	70.59970734	17.71460837	24.61421343	0.110734902	110.5421392	0.117914722
KY	3.986639281	95.37640132	23.99468336	33.87168104	0.176709088	149.4241259	0.161126686
LA	3.690262063	51.46339327	13.08513104	19.80264183	0.163369859	80.56201304	0.161110717
ME	1.230908164	55.4908014	13.85693299	18.61333747	0.05443341	86.91068386	0.057262137
MD	5.142350605	133.5168421	33.81483394	47.48988289	0.227713499	211.7385629	0.221022385
MA	4.648564524	164.6326996	41.18996865	56.2034544	0.206973211	257.778108	0.133213984
MI	9.083078851	342.1022442	86.16525982	117.3841094	0.39994597	541.509	0.524732192
MN	4.825154296	263.2883898	66.04415586	88.06335046	0.214094642	416.2123007	0.182114935
MS	3.144927872	49.25105158	12.38073822	18.36107915	0.139306015	76.07814529	0.132665025
MO	6.223433591	162.4495292	41.11702281	57.69588916	0.274777193	257.3678029	0.315335039
MT	0.937291723	38.33021217	9.579823425	12.94279926	0.041312845	60.0272892	0.051661089
NE	1.640084578	60.74431887	15.21952626	20.71383001	0.072513926	95.36355898	0.077133881
NV	1.559389292	30.92404564	7.771642969	11.1875035	0.069391313	48.14003155	0.047000838
NH	1.112780506	46.05432601	11.50688909	15.53668586	0.049474155	72.12557114	0.036113847
NJ	6.733349309	192.3806544	48.41544538	67.28688691	0.299021003	302.7666316	0.238826762
NM	2.269082258	57.66030696	14.51805812	20.38189736	0.100306935	90.56396856	0.107733206
NY	12.89732389	442.2459854	111.3373659	152.6265257	0.571570474	698.6479542	0.527633965
NC	7.373964568	136.789681	34.765946	50.61116212	0.326089298	216.1848682	0.343232539
ND	0.647309844	41.5322457	10.34561192	13.65897426	0.028619319	65.04459287	0.030474926
OH	9.03272514	292.3316088	73.21487518	100.552013	0.398675914	457.5852987	0.46579358
OK	3.899956476	81.66715515	20.5858494	29.47460855	0.172428011	127.8724309	0.183584303
Oregon	2.964267502	75.49470741	19.0995709	26.86157192	0.13150218	119.487315	0.113294537
PA	9.765703211	316.3086196	79.90622392	110.1336233	0.432444409	501.8473982	0.419754874
RI	0.703867207	23.30698348	5.81289191	7.959170293	0.031325144	36.27336615	0.020993789
SC	4.612633115	73.38345673	18.73862306	27.85858394	0.203971956	116.2293718	0.215090648
SD	0.753791521	34.8965657	8.711779443	11.68414496	0.033328713	54.65003278	0.035396037
TN	6.20628671	122.9329666	31.29692559	45.2408272	0.274385585	195.1754976	0.292846037
TX	18.82049956	288.8368184	73.16528525	109.0775443	0.834821252	451.2849652	0.725377107
UT	2.404972361	82.15332919	20.65755512	28.30629099	0.106018568	129.5066965	0.131667125
VT	0.532632252	25.43406688	6.260310954	8.33092451	0.023556563	38.98000251	0.024635173
VA	7.866554067	176.4920879	44.77816328	63.80446776	0.348278641	279.6894451	0.342132154
WA	4.882289786	131.9143236	33.3085331	46.56591121	0.216447995	208.4170904	0.195025213
WV	1.862255161	50.89658272	12.8498837	17.94350818	0.082351033	80.40833522	0.086744824

Table B-17c: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—Adjusted Particulate Air Pollutants

Adjusted State	OTHER	PEC	PMC	PMFINE	PNO_3	POC	PSO_4
WI	4.929097214	219.7812988	54.87987039	73.76362906	0.218264536	344.1620332	0.212190951
WY	0.770643127	34.80682859	8.691407966	11.67227244	0.033975204	54.50773307	0.042020289
TOTAL	226.935372	5975.344197	1506.49629	2109.490878	10.04944675	9412.777366	9.736214334
	227	5,975	1,506	2,109	10	9,413	10
			19,251	17,735			
			PM10	PM2.5			

SMOKE State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO_3	POC_72	PSO_4
AL	0.06%	0.06%	0.06%	0.06%	0.06%	0.05%	0.07%
AZ	-0.21%	-0.21%	-0.22%	-0.22%	-0.21%	-0.22%	-0.19%
AR	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.18%
CO	-0.28%	-0.28%	-0.28%	-0.28%	-0.28%	-0.28%	-0.27%
CT	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%	-0.27%
DE	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%	-0.26%
DC	-0.64%	-0.64%	-0.64%	-0.64%	-0.64%	-0.64%	-0.63%
FL	-0.48%	-0.48%	-0.48%	-0.48%	-0.48%	-0.48%	-0.47%
GA	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.12%	-0.11%
ID	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.11%
IL	-0.29%	-0.29%	-0.29%	-0.29%	-0.29%	-0.29%	-0.28%
IN	-0.25%	-0.25%	-0.25%	-0.26%	-0.25%	-0.26%	-0.24%
IA	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.12%
KS	-0.11%	-0.11%	-0.11%	-0.11%	-0.11%	-0.11%	-0.10%
KY	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.04%
LA	0.20%	0.20%	0.20%	0.20%	0.20%	0.19%	0.20%
ME	0.37%	0.36%	0.36%	0.36%	0.37%	0.36%	0.38%
MD	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%
MA	-0.56%	-0.56%	-0.56%	-0.56%	-0.56%	-0.56%	-0.55%
MI	-0.38%	-0.38%	-0.38%	-0.38%	-0.38%	-0.38%	-0.37%
MN	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.13%	-0.10%
MS	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.26%
MO	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.26%
MT	0.19%	0.18%	0.18%	0.18%	0.19%	0.18%	0.20%
NE	-0.05%	-0.05%	-0.06%	-0.06%	-0.05%	-0.06%	-0.04%
NV	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.05%	-0.03%
NH	-0.08%	-0.08%	-0.08%	-0.08%	-0.08%	-0.08%	-0.06%
NJ	-0.55%	-0.55%	-0.55%	-0.55%	-0.55%	-0.55%	-0.55%
NM	0.26%	0.26%	0.26%	0.26%	0.26%	0.26%	0.27%
NY	-0.38%	-0.38%	-0.39%	-0.39%	-0.38%	-0.39%	-0.38%
NC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%
ND	0.25%	0.25%	0.24%	0.24%	0.25%	0.24%	0.26%
OH	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.27%	-0.26%
OK	-0.23%	-0.23%	-0.23%	-0.23%	-0.23%	-0.24%	-0.22%
Oregon	-0.18%	-0.18%	-0.19%	-0.19%	-0.18%	-0.19%	-0.17%
PA	-0.02%	-0.02%	-0.03%	-0.03%	-0.02%	-0.03%	-0.01%
RI	-0.54%	-0.54%	-0.54%	-0.54%	-0.54%	-0.54%	-0.52%
SC	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.03%
SD	0.20%	0.20%	0.20%	0.20%	0.20%	0.19%	0.21%
TN	-0.22%	-0.22%	-0.22%	-0.22%	-0.22%	-0.22%	-0.21%
TX	-0.08%	-0.08%	-0.08%	-0.08%	-0.08%	-0.08%	-0.07%
UT	-0.43%	-0.43%	-0.44%	-0.44%	-0.43%	-0.44%	-0.42%
VT	0.25%	0.25%	0.24%	0.24%	0.25%	0.24%	0.26%
VA	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%	-0.18%
WA	-0.45%	-0.45%	-0.45%	-0.45%	-0.45%	-0.45%	-0.43%
WV	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.19%
WI	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	-0.19%
WY	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.06%

Table B-17d: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—Percent Change between EMF and SMOKE Calculations

SMOKE State	OTHER	PEC_72	PMC_72	PMFINE_72	PNO3	POC_72	PSO4
AL	0.00%	80.27%	77.07%	59.39%	0.00%	80.28%	0.00%
AZ	0.01%	71.09%	68.25%	52.68%	0.01%	71.00%	0.01%
AR	0.00%	111.65%	107.24%	82.86%	0.00%	111.67%	0.00%
CO	0.00%	301.60%	289.52%	223.00%	0.00%	301.69%	0.00%
CT	-0.01%	265.70%	255.24%	197.21%	-0.01%	265.69%	-0.01%
DE	0.01%	177.55%	170.47%	131.59%	0.01%	177.49%	0.01%
DC	-0.01%	167.98%	161.33%	124.69%	-0.01%	167.98%	-0.01%
FL	0.00%	19.98%	19.19%	14.78%	0.00%	19.99%	0.00%
GA	0.00%	82.32%	79.12%	61.18%	0.00%	82.33%	0.00%
ID	0.00%	301.47%	289.41%	223.60%	0.00%	301.54%	0.00%
IL	0.00%	280.70%	269.56%	208.24%	0.00%	280.70%	0.00%
IN	0.00%	250.76%	240.72%	185.45%	0.00%	250.79%	0.00%
IA	0.00%	351.74%	337.73%	260.72%	0.00%	351.80%	0.00%
KS	0.00%	211.10%	202.64%	156.12%	0.00%	211.13%	0.00%
KY	0.00%	163.37%	156.87%	120.90%	0.00%	163.37%	0.00%
LA	0.00%	53.71%	51.57%	39.73%	0.00%	53.72%	0.00%
ME	0.00%	397.43%	381.54%	293.96%	0.00%	397.52%	0.00%
MD	0.00%	186.10%	178.71%	138.10%	0.00%	186.08%	0.00%
MA	0.00%	288.14%	276.85%	213.46%	0.00%	288.17%	0.00%
MI	0.00%	317.38%	304.58%	235.11%	0.00%	317.42%	0.00%
MN	0.00%	500.07%	480.38%	371.04%	0.00%	500.14%	0.00%
MS	0.00%	72.51%	69.60%	53.46%	0.00%	72.52%	0.00%
MO	0.00%	188.49%	180.95%	139.75%	0.00%	188.50%	0.00%
MT	0.00%	352.73%	338.48%	260.67%	0.00%	352.82%	0.00%
NE	0.00%	308.76%	296.40%	228.49%	0.00%	308.78%	0.00%
NV	-0.01%	117.44%	113.10%	87.15%	-0.01%	117.92%	-0.01%
NH	0.00%	354.20%	340.29%	262.32%	-0.01%	354.30%	0.00%
NJ	0.00%	213.94%	205.49%	158.58%	0.00%	213.94%	0.00%
NM	0.00%	180.49%	173.28%	133.58%	0.00%	180.53%	0.00%
NY	0.00%	277.56%	266.79%	206.06%	0.00%	277.93%	0.00%
NC	0.00%	104.69%	100.52%	77.61%	0.00%	104.70%	0.00%
ND	0.00%	608.14%	583.82%	449.87%	0.00%	608.25%	0.00%
OH	0.00%	257.80%	247.40%	190.54%	0.00%	257.82%	0.00%
OK	0.00%	131.11%	125.85%	96.95%	0.00%	131.12%	0.00%
Oregon	0.00%	180.14%	173.04%	133.70%	0.00%	180.16%	0.00%
PA	0.00%	256.90%	246.75%	190.71%	0.00%	256.95%	0.00%
RI	0.00%	263.05%	252.68%	194.56%	0.00%	263.06%	0.00%
SC	0.00%	75.55%	72.55%	56.04%	0.00%	75.56%	0.00%
SD	0.00%	410.91%	394.47%	303.91%	0.00%	410.99%	0.00%
TN	0.00%	118.62%	113.91%	88.03%	0.00%	118.64%	0.00%
TX	0.00%	68.83%	66.10%	50.92%	0.00%	68.85%	0.00%
UT	0.00%	278.12%	266.91%	205.86%	0.00%	278.14%	0.00%
VT	0.00%	426.84%	409.63%	314.10%	0.00%	427.04%	0.00%
VA	0.00%	147.28%	141.45%	109.29%	0.00%	147.30%	0.00%
WA	0.00%	197.38%	189.58%	146.40%	0.00%	197.39%	0.00%
WV	0.01%	201.62%	193.59%	149.45%	0.01%	201.65%	0.01%
WI	0.00%	391.35%	375.76%	289.55%	0.00%	391.42%	0.00%
WY	0.00%	399.90%	383.76%	295.54%	0.00%	400.00%	0.00%

Table B-17e: Cold Start Mode Vehicle Emissions [calculated by MOVES 2010 Model]—Percent Change between SMOKE and Adjusted Calculations

Emission Sector	CL_2	CO	HCL	HONO	NH_3	NO	NO_2
ptipm	102	578,005	352,245		20,994	3,028,218	336,469
ptnonipm	4,173	3,221,626	48,647	513	158,933	2,022,055	224,159
othpt		1,306,023			21,138	1,051,197	116,800
ptfire		33,683,204			551,631	358,175	39,707
nonpt	2,135	7,374,458	28,931		134,026	1,513,094	168,122
on_noadj		37,940,746		63,381	163,299	7,130,325	728,878
nonroad		17,946,551		15,945	2,037	1,793,775	183,364
othar		4,098,544		5,903	792,435	801,078	83,113
othon		5,580,591		5,183	23,708	583,081	59,604
ag					3,251,957		
alm_no_c3	1	270,007		15,399	773	1,732,433	177,093
afdust							
seca_c3		98,345		9,398		1,057,520	108,202
beis		9,210,227				2,076,782	
ocean_cl2	78,812						
on_moves_runpm							
on_moves_startpm							
SMOKE TOTAL	85,223	121,308,326	429,823	115,722	5,120,931	23,147,732	2,225,510
US	85,223	110,323,168	429,823	104,636	4,283,650	20,712,376	1,965,993
Low level totals	81,972	83,948,885	35,186	106,383	4,481,893	16,418,089	1,487,096
ptipm elevated	102	574,983	350,915	0	20,829	3,022,918	335,879
ptnonipm elevated	3,149	2,049,781	43,720	0	46,513	1,591,461	176,831
seca elevated		98,470		9,413		1,058,753	108,189
othpt elevated		968,174		0	21,138	708,006	78,668
ptfire elevated		33,599,600		0	550263	357367	39707.4
Model-Ready Domain Totals	85,224	121,239,893	429,821	115,796	5,120,637	23,156,594	2,226,371
% Difference	0.00%	-0.06%	0.00%	0.06%	-0.01%	0.04%	0.04%
Actual Difference	0.38	-68,433.91	-1.71	74.06	-294.49	8,861.47	860.79

Table B-18: Column Merge Grid Emissions [to obtain domain totals]

Emission Sector	NOX	PEC	PMC	PMFINE	PNO3	POC	PSO4	SO2	SULF
ptipm	3,364,686	15,275	105,533	401,028	1,132	23,938	66,039	9,097,577	198,224
ptnonipm	2,246,214	39,632	211,199	270,688	4,037	63,621	64,327	2,117,318	17,365
othpt	1,167,996	6,248	74,025	105,606	337	8,412	20,611	2,414,111	10,938
ptfire	397,883	288,626	514,272	838,638	15,122	1,692,061	22,773	234,284	
nonpt	1,681,216	84,179	272,240	497,762	3,105	463,336	28,164	1,249,425	21,524
on_noadj	7,859,203	12,730	70,927	18,340	236	9,738	1,550	66,060	
nonroad	1,977,139	102,020	9,888	17,084	380	61,132	687	102,703	
othar	884,192	56,688	1,054,592	253,065	997	123,201	8,924	180,296	1,943
othon	642,685	8,790	4,801	1,715	18	4,755	75	11,554	
ag									
alm_no_c3	1,909,526	43,716	2,679	2,784	62	9,955	164	154,016	
afdust		1,530	7,830,978	979,064	1,731	45,790	2,729		
seca_c3	1,165,721	904	7,866	48,790	0	904	39,804	750,725	
beis	2,076,782								
ocean_cl2									
on_moves_runpm		5,176	3,665	6,532	14	30,623	275		
on_moves_ startpm		5,975	1,506	2,109	10	9,413	10		
SMOKE TOTAL		671,490	10,164,172	3,443,206	27,181	2,546,880	256,132	16,378,068	249,993
US		599,764	9,030,754	3,082,820	25,829	2,410,512	226,522	13,772,107	237,113
Low level totals		339,992	9,367,308	1,912,445	8,122	787,358	62,811	1,997,526	23,957
ptipm elevated		15,137	105,290	400,655	1,128	23,855	65,979	9,093,304	198,170
ptnonipm elevated		24,347	94,026	142,049	2,620	38,221	46,415	1,925,561	16,929
seca elevated		905	7,869	48,864	0	905	39,806	751,261	0
othpt elevated		2,872	72,542	98,291	196	5,309	18,384	2,377,075	10,938
ptfire elevated		288625.5825	514272	838,638	15121.94414	1.69E+06	22761.1	233729	0
Model-Ready Domain Totals		671,879	10,161,307	3,440,942	27,188	2,547,709	256,155	16,378,456	249,993
% Difference		0.06%	-0.03%	-0.07%	0.03%	0.03%	0.01%	0.00%	0.00%
Actual Difference		388.88	-2,864.36	-2,264.09	6.80	829.75	23.44	387.75	0.15

Table B-18i: Column Merge Grid Emissions [to obtain domain totals]

Appendix C
Metadata

Output Data

The pm25_surface_12km_2007.csv (or o3_surface_12km_2007.csv) file is the output file from EPA's Hierarchical Bayesian Model (HBM) that combines $PM_{2.5}$ (or O_3) monitoring data from National Air Monitoring Stations/State and Local Air Monitoring Stations (NAMS/SLAMS) and Models-3/Community Multiscale Air Quality (CMAQ) computer-simulated $PM_{2.5}$ or O_3 data. This file provides a spatial interpolation of air quality that takes advantage of the strengths of monitoring network observations and modeling estimates to generate daily surrogate measures for $PM_{2.5}$ and relates these measures to available public health data. The file covers the contiguous lower 48 states of the United States. The time frame covered is January 1, 2007 through December 31, 2007. The standard errors of the estimates should be taken in to account when using the results. This file is a comma-separated values (CSV) file. This is a flat file that is platform-independent. In the Microsoft Windows computing environment, this file can be read easily by Excel.

The file contains the posterior means and standard errors of the estimated space-time surface, the posterior means and standard errors of the estimated space-time bias surface, and the posterior means and standard errors for a surface made up of 12 km x 12 km contiguous grids. The contiguous 12 km x 12 km grids cover the whole lower 48 contiguous states of the United States. The file includes the following variables: Date, Latitude, Longitude, posterior mean estimated $PM_{2.5}$ or O_3 concentration on natural log scale (PredAvg), row position of grid cell, column position of grid cell, standard error of the estimated $PM_{2.5}$ or O_3 concentration on the natural log scale (PredStd), the natural log of the estimated CMAQ model data bias (Bias), and the standard error of the estimated CMAQ model data bias (BiasStd). Values of -999 in the data set represent missing (or intentionally excluded) values. Excluded values are generated when grid cells are not included in the model calculation. These are not actual missing values but intentionally not included in the grid for calculation of the estimated surface. An example of such a grid cell not included is grid cells that fall over water.

Input Data

The actual monitoring data from the NAMS/SLAMS network were downloaded from the Air Quality System (AQS) database. Only Federal Reference Method (FRM) samplers and only those samplers with sample duration of one day (24-hour integrated sample) were included in the data set.

The CMAQ data was created from version 4.7 (4.7.1) of the model which includes improved aqueous chemistry and photolysis mechanisms. The $PM_{2.5}$ data is a 24-hour integrated $PM_{2.5}$ concentration calculated on a 12-km x 12- km grid for the entire United States. These CMAQ results are based on emission inputs for the 2005v4 Platform from the 2005 National Emission Inventory (NEI), Version 2, which includes emissions of CO, NO_x, VOC, SO_2, NH_3, PM_{10}, and $PM_{2.5}$ and hazardous air pollutants (HAPs), including chlorine, HCl, benzene, acetaldehyde, formaldehyde, and methanol. In addition, the meteorological data used for these model results is from the Weather Research and Forecasting Model (WRF) version 3.1 simulations (Advanced Research WRF [ARW] core).

The HBM combines the actual monitoring data (NAMS/SLAMS), the estimated $PM_{2.5}$ or O_3 concentration surface (CMAQ), and the prediction of $PM_{2.5}$ or O_3 through space and time. The model assumes that both the actual monitoring data and the CMAQ data provide good information about the same underlying pollutant surface, but with different measurement error structures. It gives more weight to the accurate monitoring data in areas where monitoring data exists and relies on the CMAQ data and satellite data in areas where no monitoring data is available. The modeling is divided into hierarchical components where each level of the hierarchy is modeled conditional on the preceding levels. To fit the model, a custom-designed Monte Carlo Markov Chain (MCMC) software algorithm was used. Model-specific input parameters of statistical distributions for the model and simulation parameters (priors) are specified for each run of the model. The projections for the grid cell structure are as follows:

Projection: Lambert conformal with spherical earth, radius = 6370.0 km

12-km Resolution

NCOLS = 459

NROWS = 299

P_ALP = 33.00

P_BET = 45.00

P_GAM = -97.00

XCENT = -97.00

YCENT = 40.00

XORIG = -2556000.0

YORIG = -1728000.0

XCELL = 12000.00

YCELL = 12000.00

These values are for the 12-km grid resolution of CMAQ.

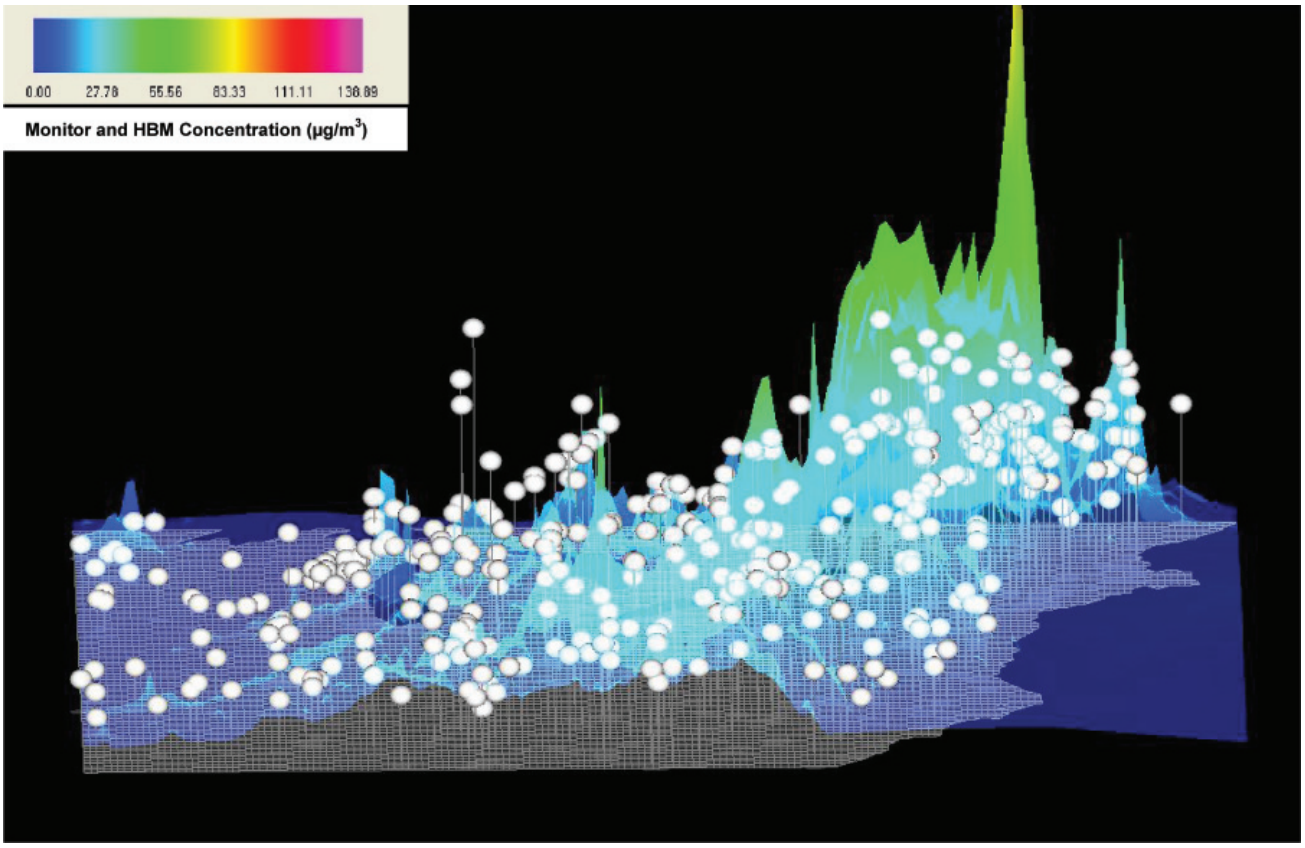


Figure C-1. $PM_{2.5}$ Monitoring Data and CMAQ Surface (Separately Displayed—White Spheres Represent Monitor Locations and Associated Concentration Values)

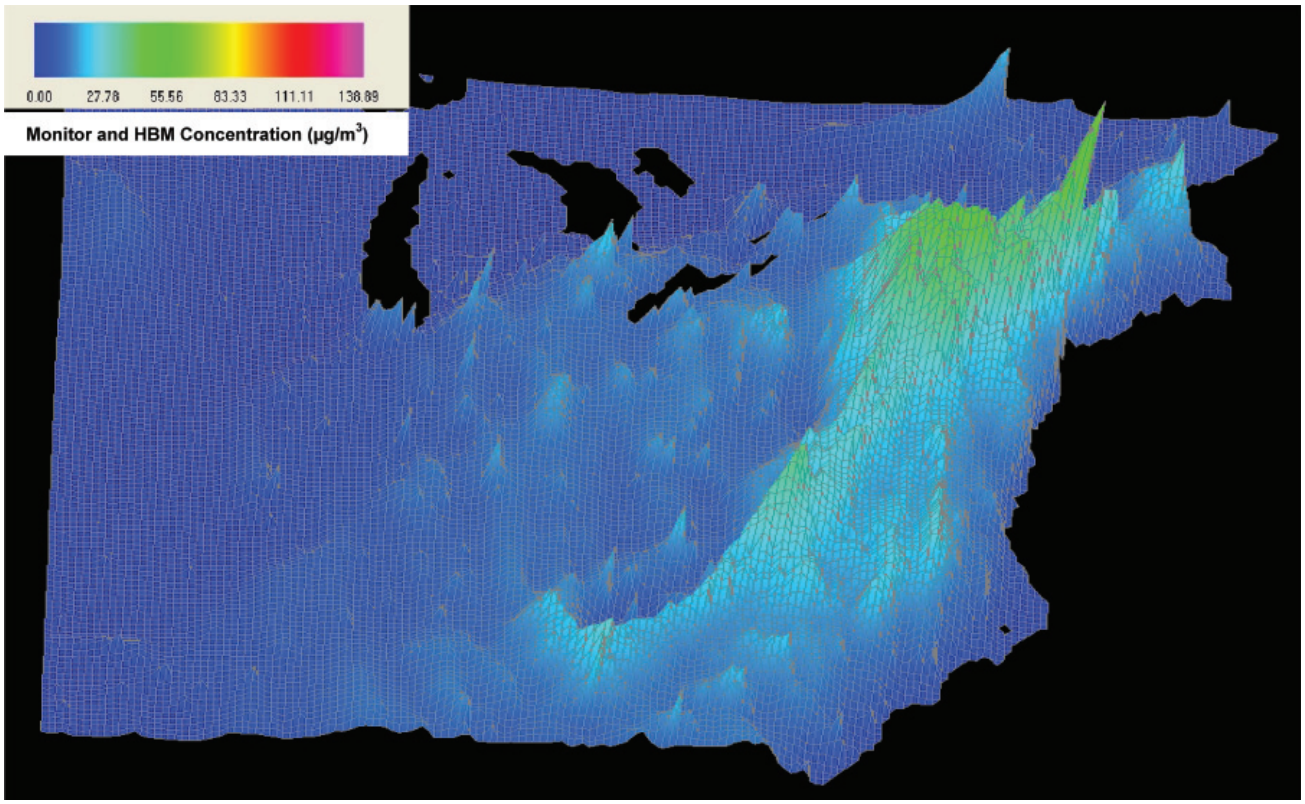


Figure C-2. Combined $PM_{2.5}$ Monitoring Data and CMAQ Surface (Via HBM)

The geographic boundaries of the HB output cover the following region:

111.1 degrees W longitude—West Bounding Coordinate

65.4 degrees W longitude—East Bounding Coordinate

51.25 degrees N latitude—North Bounding Coordinate

23.0 degrees N latitude—South Bounding Coordinate

The definitions for the 12-km x 12-km CMAQ grid cells are contained in a text (*.txt) file. The file contains the latitude and longitude coordinates of the following points for each grid cell: 1) center; 2) southwest corner; 3) southeast corner; 4) northwest corner; and 5) northeast corner. The AQS data for $PM_{2.5}$ and O_3 are contained in separate text (*.txt) files. These files contain the following data: parameter occurrence code (for pollutant); state code; city code; site ID; sampling frequency; data; sample value; monitor protocol (i.e., 1 in 3 days); partition, etc. Example figures of a) a separate air quality monitor with CMAQ data, and b) combined air quality monitor data and CMAQ data for $PM_{2.5}$ are shown below.

Use of HB Data to Generate Health Indicators

The HB output data can be used to generate health (air) indicators which are useful to researchers when developing health impact assessments (HIA). The HB output is provided in a gridded (x-y/row-column) format and that format must be translated to different coordinate systems (e.g., county-based/relevant coordinates) to provide health indicator data for the area(s) of interest. An important coordinate projection system used as a standard coordinate representation format to express different location designation systems in consistent terms is the Lambert Conformal Conic (LCC) projection coordinate system. The North American Datum (NAD) geodetic system describes the Earth's ellipsoid based on the latitude and longitude location of an initial point, and serves as the basis of maps and surveys of the Earth's surface. The NAD-27 datum is based on the Clarke Ellipsoid (Earth spheroid) of 1866 and is centered at a base station on the Meades Ranch in Kansas. The NAD-83 grid projection/datum is based on the Geodetic Reference Spheroid (GRS) of 1980 and is geocentric (e.g., based on the Earth's center with no directionality or initial point located on the Earth's surface). The NAD coordinate system is important because health-related data (used to calculate health indicators) are collected and cataloged based on this coordinate system (e.g., U.S. Census data is based on NAD-83 coordinates).

The HB output provides ambient concentration data for both ozone and fine particulate matter in x-y-based grid cells, and to correlate this concentration data with health data, the x-y locations must be 'mapped' to latitude/longitude locations and then mapped to the correct datum/projection system linked with the health data. The typical latitude and longitude grids are based on the World Geodetic System (WGS) projection for 1984 (WGS-84), while the U.S. Census uses the NAD-83 grid and the SAS statistical analysis software uses NAD-83 grid projection. When generating the linkage between the ambient concentration data and the health data, a methodology or protocol must be developed to relate the appropriate coordinate system/geocoding information between them.

CDC, EPA, and the state departments of air and/or health of New York, New Jersey, Massachusetts, and Minnesota have developed an initial set of health indicators using the HB output data correlated with available health data/information. They have developed a 'relationship file' to map the x-y-based grid cells to latitude/longitude format with the appropriate datum/projection system(s). Shapefile information also resides in this file allowing compatibility with GIS map formats/applications. The relationship file has a grid ID, representing the row and column of the grid cell. This grid ID is a six-digit identifier from the HB raw data set that concatenates column and row designation. There are 66,000 grid cells per day times 365 days worth of data (the New York State Health Department uses SAS to process this data and CDC uses ArcGIS to process the data). The relationship file recognizes the importance of having consistent geocoding data for HB grids for Health Impact Analyses (HIA). The U.S. Census files (TIGER2000 files) are in NAD-83 format, which is what the SAS statistical software processes. The WGS-84 format is almost exactly like NAD-83 format except there is an offset of a few feet for grid points (centroids). WGS-84 is used by the CMAQ air quality model. Air Quality models such as CMAQ, which serve as input to the HB model, uses the meteorological software MM5 which is based on the Lambert Conformal Conic (LCC) projection. As long as the HB output data (latitude and longitude grid coordinates) can be mapped to the NAD-83 or NAD-84 (WGS-84) to match census data, air indicators can be generated for HIA. The x and y coordinates given in the HB are used to plot the latitude and longitude with an offset to match non-NAD-83 grid references. When defining Earth points, coordinate information should be modified into a format compatible with county-based maps and transformed into an elliptical projection. NetCDF file can be converted in ArcGIS to make shape files. The New Jersey state air department used the Theissen Polygon tool on HB data to generate shapefiles.

<u>How CMAQ and HB x-y grid locations are transformed to latitude and longitude values:</u>

There is an IOAPI file providing rows/columns, cell height/width, origin in LCC, offset by ½ cell width/height to get center cell (centroid). Conversion uses an LCC routine in IOAPI library, passing parameters (Earth radius, central meridian [longitude: -97 degrees]), two key latitude values 33 degrees and 45 degrees, central meridian, -97 and latitude of origin, 40.0. These arguments are required for the LCC routine, which returns latitude and longitude. The code for transforming an LCC projection (e.g., CMAQ and HB Model x-y grid coordinates) to latitude and longitude values:

LCPGEO Fortran Code—LCC Conversion Program
****

Fortran Code for converting Lambert Conformal Conic to geodetic (lat/lon):

```
      subroutine lcpgeo(iway,phic,xlonc,truelat1,truelat2,xloc,
      yloc, & xlon,ylat)
c     write(*,*)'INCALL:',phic,xlonc,truelat1,truelat2
c
c     LCPGEO performs Lambert Conformal to geodetic
      (lat/lon) translation
c
c     Code based on the TERRAIN preprocessor for MM5
      v2.0, developed by Yong-Run Guo and Sue Chen,
      National Center for Atmospheric Research, and
      Pennsylvania State University
      10/21/1993
c
c     Input arguments:
c     iway       Conversion type
c                0 = geodetic to Lambert Conformal
c                1 = Lambert Conformal to geodetic
c     phic       Central latitude (deg, neg for southern hem)
c     xlonc      Central longitude (deg, neg for western hem)
c     truelat1   First true latitude (deg, neg for southern hem)
c     truelat2   Second true latitude (deg, neg for southern
                 hem)
c     xloc/yloc  Projection coordinates (km)
c     xlon/ylat  Longitude/Latitude (deg)
c
c     Output arguments:
c     xloc/yloc  Projection coordinates (km)
c     xlon/ylat  Longitude/Latitude (deg)
c
      data conv/57.29578/, a/6370./
c
c---Entry Point
c
      if (phic.lt.0) then
         sign = -1.
      else
         sign = 1.
      endif
      pole = 90.
      if (abs(truelat1).gt.90.) then
         truelat1 = 60.
         truelat2 = 30.
         truelat1 = sign*truelat1
         truelat2 = sign*truelat2
       endif
      xn = alog10(cos(truelat1/conv)) - alog10(cos(truelat2/
      conv))
      xn = xn/(alog10(tan((45. - sign*truelat1/2.)/conv)) -
            & alog10(tan((45. - sign*truelat2/2.)/conv)))
      psi1= 90. - sign*truelat1
      psi1 = psi1/conv
      if (phic.lt.0.) then
         psi1 = -psi1
         pole = -pole
      endif
          psi0 = (pole - phic)/conv
      xc = 0.
      yc = -a/xn*sin(psi1)*(tan(psi0/2.)/tan(psi1/2.))**xn
c
c---Calculate lat/lon of the point (xloc,yloc)
c
       if (iway.eq.1) then
          xloc = xloc + xc
          yloc = yloc + yc
      if (yloc.eq.0.) then
       if (xloc.ge.0.) flp = 90./conv
      if (xloc.lt.0.) flp = -90./conv
      else
       if (phic.lt.0.) then
          flp = atan2(xloc,yloc)
      else
          flp = atan2(xloc,-yloc)
      endif
      endif
          flpp = (flp/xn)*conv + xlonc
      if (flpp.lt.-180.) flpp = flpp + 360.
       if (flpp.gt. 180.) flpp = flpp - 360.
          xlon = flpp
c
      r = sqrt(xloc*xloc + yloc*yloc)
      if (phic.lt.0.) r = -r
      cell = (r*xn)/(a*sin(psi1))
      rxn = 1.0/xn
      cel1 = tan(psi1/2.)*cell**rxn
      cel2 = atan(cel1)
       psx = 2.*cel2*conv
      ylat = pole - psx
c
c---Calculate x/y from lat/lon
c
      else
      ylon = xlon - xlonc
      if (ylon.gt. 180.) ylon = ylon - 360.
      if (ylon.lt.-180.) ylon = ylon + 360.
      flp = xn*ylon/conv
      psx = (pole - ylat)/conv
      r = -a/xn*sin(psi1)*(tan(psx/2.)/tan(psi1/2.))**xn
      if (phic.lt.0.) then
         xloc = r*sin(flp)
         yloc = r*cos(flp)
      else
         xloc = -r*sin(flp)
         yloc = r*cos(flp)
       endif
      endif
c
c     write(*,*)xloc,xc,yloc,yc
      xloc = xloc - xc
      yloc = yloc - yc
c
       return
       end
```

****

CMAQ Projection Information—Source:

http://www.baronams.com/products/ioapi/GRID-DESC.html

Coordinate Information

COORD-NAME	COORDTYPE	P_ALP	P_BET	P_GAM	XCENT	YCENT
'LAM_40N97W'	2	33.000	45.000	-97.000	-97.000	40.000

Grid Information

GRID-NAME	COORD-NAME	XORIG (m)	YORIG (m)	XCELL (m)	YCELL (m)	NCOLS	NROWS	NTHIK
12US1	'LAM_40N97W'	-1008000	-1620000	12000	12000	279	240	1

P_ALP = "PROJ_ALPHA"
P_BET = "PROJ_BETA"
LAMGRD3 = P_ALP <= P_BET. These are the two latitudes which determine the projection cone.
P_GAM = the central meridian
XCENT, **YCENT** = lat/lon coordinates for the center (0, 0) of the Cartesian coordinate system.
X_ORIG is the X coordinate of the grid origin (lower left corner of the cell at column=row=1), given in map projection units (meters, except in Lat-Lon coordinate systems).
Y_ORIG is the Y coordinate of the grid origin (lower left corner of the cell at column=row=1), given in map projection units (meters, except in Lat-Lon coordinate systems).
X_CELL is the cell dimension parallel to the X coordinate axis, given in map projection units (meters, except for Lat-Lon coordinate systems).
Y_CELL is the cell dimension parallel to the Y coordinate axis, given in map projection units (meters, except for Lat-Lon coordinate systems).
NCOLS is the number of columns (dimensionality in the X direction).
NROWS is the number of rows (dimensionality in the Y direction).
NTHIK is the thickness (number) of cells on the boundary domain required to accurately describe boundary mass flux (e.g., CMAQ uses NTHIK = 1)

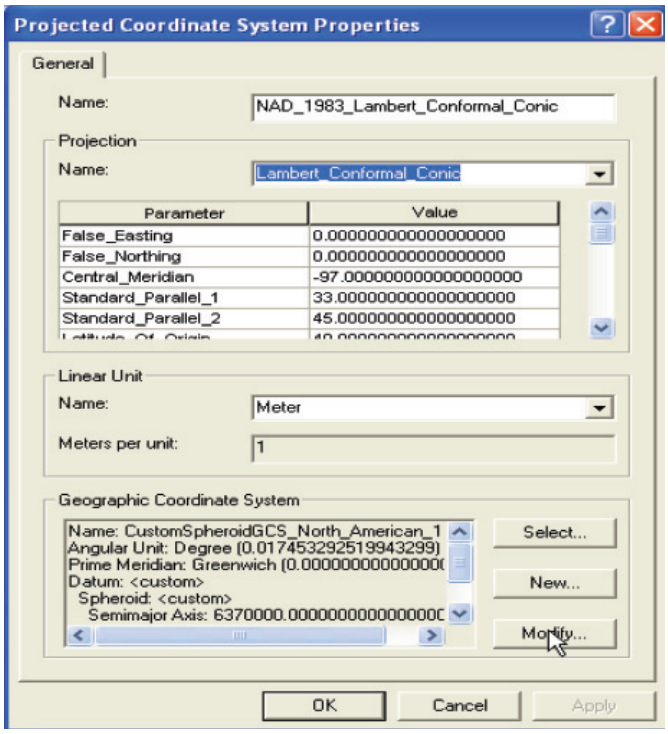
ArcMap Projection Information (HB grid example):

Data Type: File Geodatabase Feature Class
Location: U:\Projects\MMcCourtney\Grids\templates\grid_templates.gdb
Feature Class: template_mdhi_12_nb
Feature Type: Simple
Geometry Type: Polygon
Projected Coordinate System: NAD_1983_Lambert_Conformal_Conic
Projection: Lambert_Conformal_Conic
False_Easting: 0.00000000
False_Northing: 0.00000000
Central_Meridian: -97.00000000
Standard_Parallel_1: 33.00000000
Standard_Parallel_2: 45.00000000
Latitude_Of_Origin: 40.00000000
Linear Unit: Meter
Geographic Coordinate System: CustomSpheroidGCS_North_American_1983
Datum: <custom>
Prime Meridian: Greenwich
Angular Unit: Degree

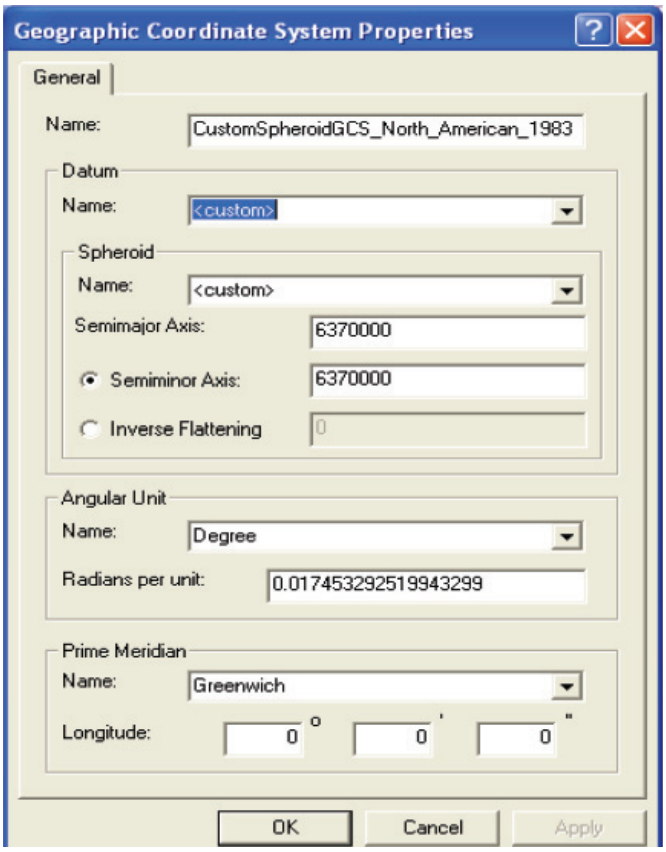
Changing a data set's spheroid to a sphere.

1) In ArcCatalog, right click the data set of interest, and choose **Properties**. Click the **XY Coordinate System** tab. Click Modify…

2) From the Geographic Coordinate System of the Projected Coordinate System Properties window, click Modify…



3) From the Geographic Coordinate System window, first choose <custom> in the list of datum (it's at the top) and then choose <custom> for the spheroid. Enter 6370000 in both the semimajor and semiminor boxes.



Projection Information for HB Grid—Example #1

Year	Geographic Coordinate System	Datum	Prime Meridian	Angular Unit	Projected Coordinate System	False Easting	False Northing	Central Meridian	Standard Parallel_1	Standard Parallel_2	Scale Factor	Latitude of Origin	Linear Unit
2001	Lat/Lon	Spherical R=6370997	NA	Degrees	Lambert Conformal Conic	0.0	0.0	-97.0	33.0	45.0	1.0	40.0	Meters
2002	:	Spherical R=6370000	:	:	:	:	:	:	:	:	:	:	:
2003	:	:	:	:	:	:	:	:	:	:	:	:	:
2004	:	:	:	:	:	:	:	:	:	:	:	:	:
2005	:	:	:	:	:	:	:	:	:	:	:	:	:
2006	:	:	:	:	:	:	:	:	:	:	:	:	:
2007	:	:	:	:	:	:	:	:	:	:	:	:	:

Grid Descriptive Parameters

Year	Grid Resolution (km)	XORIG (m)	YORIG (m)	XCELL (m)	YCELL (m)	NCOLS	NROWS
2001	12	-252000	-1284000	12000	12000	213	188
2001	36	-2736000	-2088000	36000	36000	148	112
2002	12	-1008000	-1620000	12000	12000	279	240
2002	36	-2736000	-2088000	36000	36000	148	112
2003	12	-1008000	-1620000	12000	12000	279	240
2003	36	-2736000	-2088000	36000	36000	148	112
2004	12	-1008000	-1620000	12000	12000	279	240
2004	36	-2736000	-2088000	36000	36000	148	112
2005	12	-1008000	-1620000	12000	12000	279	240
2005	36	-2736000	-2088000	36000	36000	148	112
2006	12	-1008000	-1620000	12000	12000	279	240
2006	36	-2736000	-2088000	36000	36000	148	112
2007	12	-1008000	-1620000	12000	12000	279	240

Projection Information for HB Grid—Example #2

Year	Datumw	Semimajor Axis (m)	Semiminor Axis (m)	Angular Unit	Projected Coordinate System	False Easting	False Northing	Longitude of Central Meridian	Latitude of Standard Parallel_1	Latitude of Standard Parallel_2	Latitude of Origin	Linear Unit
2001	*(i.e., NAD83 or WGS84)*	*(i.e., 6370000)*	*(i.e., 637000)*	*(i.e., degree or radians)*	*(i.e., Lambert Conformal Conic)*	*(i.e., 0.0)*	*(i.e., 0.0)*	*(i.e., -97.000)*	*(i.e., 33.000)*	*(i.e., 45.000)*	*(i.e., 40.0)*	*(i.e., meters)*
2002												
2003												
2004												
2005												
2006												
2007												

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