FINAL INTERIM

PRELIMINARY WORK PLAN FOR EMISSIONS INVENTORY IMPROVEMENT FOR REGIONAL HAZE PLANNING

Prepared by

The Mid-Atlantic Regional Air Management Association (MARAMA)

for the
**Mid-Atlantic/Northeast Visibility Union
(MANE-VU)**

August 2001

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ABOUT MANE-VU

The Mid-Atlantic/Northeast Visibility Union (MANE-VU) was formed by the Mid-Atlantic and Northeastern states, tribes, and federal agencies to coordinate regional haze planning activities for the region. MANE-VU members include Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, the Penobscot Indian Nation, Rhode Island, the St. Regis Mohawk Tribe, and Vermont. Also participating as non-voting members of MANE-VU are the U.S. Environmental Protection Agency, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service.

MANE-VU was formed to encourage a coordinated approach to meeting the requirements of EPA's regional haze rules and reducing visibility impairment in major national parks and wilderness areas in the Northeast and Mid-Atlantic region. MANE-VU provides technical assessments and assistance to its members, evaluates linkages to other regional air pollution issues, provides a forum for discussion, and encourages coordinated actions. MANE-VU also facilitates coordination with other regions.

The Ozone Transport Commission Executive Staff Office provides management and administration for MANE-VU. The Mid-Atlantic Regional Air Management Association and the Northeast States for Coordinated Air Use Management conduct MANE-VU's technical projects.

Acknowledgements

Contents

1. Introduction

The purpose of this preliminary work plan is to help states and tribes involved in regional haze planning work together to make needed improvements in emissions inventories. A good inventory of emissions contributing to regional haze is needed to identify sources and evaluate control measures. This work plan is based on a report prepared for MARAMA by Pacific Environmental Services, Inc (PES).* The report identifies high priority activities needed to improve emissions inventories for regional haze planning. It recommends actions by state, local, and tribal agencies and by EPA to improve the emissions inventory, suggests regional collaboration, and notes that resource needs are substantial.

This preliminary work plan is not intended to bind the participating states or EPA to complete certain tasks. Separate grant work plans and inventory preparation plans serve the purpose of achieving state-EPA agreements in this area. MARAMA intends this document to serve as guidance for effective planning.

2. The Need for Emissions Inventories in Regional Haze Planning

The nature of regional haze in the area covered by the Mid-Atlantic/Northeast Visibility Union (MANE-VU) requires that a consistent and comprehensive emissions inventory be available for the entire eastern United States. This is important since regional haze at Class I areas in MANE-VU are influenced both by nearby and by distant sources. Additionally, the tools for analyzing sources contributing to regional haze, predicting or analyzing the results of controls, and tracking the implementation of emissions control strategies require emissions inventories that encompass the entire eastern U.S.

Other requirements of the regional haze rule are driven by the creation of an emissions inventory. One of the first requirements for the regional haze program is to identify sources that are eligible for "Best Available Retrofit Technology" (BART), and adopt appropriate controls for those BART eligible sources. An improved and comprehensive emissions inventory will help support those analyses.

Additionally, EPA has issued draft guidance for using regional air quality models to analyze the causes of regional haze. These models need increased emissions inventory detail and quality relative to that available in existing national- and regional-level inventories. Improved procedures are needed to specify the geographic distribution of meteorological influences on both the level of activity and the emission rate for selected sources. Improved information on the chemical speciation of sources of both fine particulate matter and selected sources of volatile organic compounds (VOC) are also needed to support both source apportionment modeling and modeling of chemical transformation mechanisms. It will be necessary to develop input data for models that distinguish between elemental carbon and organic carbon emissions to better understand the role of various combustion sources on visibility degradation in any particular area.

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* *The report "Assessment of Emissions Inventory Needs for Regional Haze Plans" is available on the MARAMA website (www.marama.org).*

To understand where MANE-VU members need to begin improving the emissions inventory , MARAMAM reviewed the National Emissions Inventory (NEI). The NEI covers all areas of interest, and states and local agencies periodically update the NEI in cooperation with EPA. Thus, the NEI is a logical starting point for an inventory for regional haze analysis. This work plan includes ways in which states/local agencies/tribes can improve the national inventory to serve their needs for regional haze analyses.

MARAMA hired Pacific Environmental Services, Inc. (PES) to review the strengths and weaknesses of the NEI[†]. Some of the important parts of the NEI are of high quality. EPA and state and local agencies have a significant amount of experience in measuring or estimating emissions of SO_2, NO_x, and VOC, particularly from large stationary sources. Improvements are needed in the estimation methods for area and mobile sources of SO_2 and NO_x, and for the high carbon number organic compounds not fully represented in VOC inventories.

There is a great deal of uncertainty in the ammonia (NH_3) emissions estimates. The uncertainties associated with NH_3 emissions are much greater than for SO_2 or NO_x. The best available methods for estimating $PM_{2.5}$ emissions from some sources contribute uncertainty to the emissions estimates and need to be updated. Emissions in the NEI underestimate the total amount of primary fine particulate for some combustion sources because condensable emissions are not accurately represented.

Our current understanding of the role of ammonia in sulfate and nitrate formation is limited by our capability to represent the relevant chemical processes in the atmosphere. Accurate emissions estimates are required for all of the precursors to secondary particulate to improve our understanding of these processes. States and tribes will need these estimates to begin developing strategies for controlling regional haze. Emissions for many area source and some mobile source categories in the NEI rely on national-level, regional-level or state-level activity estimates. It may be possible to improve the spatial and temporal/seasonal estimate of emissions for various sources important to regional haze planning. Major inventory improvements are possible for area source combustion sources and sources of dust. It also may be useful to improve approaches to estimate emissions from sources of SO_2 and NO_x that lead to secondary fine particulate formation.

3. Setting Priorities

Improving the emissions inventory information needed to support regional haze programs will require a multi-year cooperative effort involving states, local agencies, EPA, and other federal agencies. For the purposes of this preliminary work plan, we assume designation of $PM_{2.5}$ nonattainment areas will occur between January 2003 and January 2004. For those participating in regional planning, committal SIPSs will be required in the 2004-2005 timeframe, with initial regional haze SIP submittals required no later than December 31, 2008. Inventories to support the development of haze SIPs will be needed in the 2003 to 2005 time frame to support SIP development efforts. Therefore initial activities suggested here are timed to be applicable for state data submittals for the 2002 periodic emissions inventory (PEI) reporting.

Several criteria were considered to organize the high priority tasks identified in the work plan. These include:

- The practical need to spread the commitment of personnel and financial resources over several years,
- The availability of supporting information,
- The priority of various source categories for regional haze applications, and
- The availability of new methods and approaches from other multi-state organizations and EPA.

Recommendations for specific projects are presented in a five-year work plan. We assume that the 2002 national inventory be used for regional haze plans that are due in 2008. Therefore, specific projects to promote improvements in regional haze inventories and the development of a complete inventory for the 2002 periodic emissions inventory reporting cycle are the focus of this work plan. In general, we expect initial data submittals for the 2002 PEI will be due approximately by June 2004, with an update and review cycle extending through approximately 2006.

The work plan targets for calendar year 2001 data needed as part of the initial submittals to EPA under the regional haze program and activities that can be completed using data that are already available. Projects to collect activity data for area and mobile sources of SO_2 and NO_x precursors to sulfate/nitrate particulate formation are suggested for calendar year 2002. These projects all include the collection of information that can be used to allocate the emissions from those sources to spatial and temporal scales that are needed in regional haze studies. Similar projects to collect activity data and allocation information for important sources of primary fine particulate and NH_3 are targeted for calendar year 2003. While it is more difficult to develop specific project descriptions for 2004 and beyond, general work products involving compiling a preliminary inventory and formatting inventory data for analyses that will support the development of the initial regional haze SIP are discussed. A general effort to assess remaining weaknesses in the inventory for use in future planning and demonstrating progress are suggested for 2005. Based on experience with ozone modeling inventories, several revisions and iterations will be necessary in future years before plans are completed in 2008.

In order to accomplish the work set forth in this work plan, there are six general improvements in emission inventory tools and underlying information for which states need EPA assistance. These are:

1. An accepted source monitoring method or methods to accurately measure the filterable and condensable fractions of fine particulate from many types of combustion sources;
2. An understanding of the mechanisms that alter or decrease the mass of primary fine particulate matter from fugitive dust sources;
3. Better knowledge of the chemical mechanisms and reactions that control gas-to-particle conversion processes;
4. Improved emission factors for the suite of ammonia sources;
5. A better understanding of the nature of ammonia sinks and the interactions between sources and sinks under different ambient concentrations;

6. Improved speciation factors for sources of organic pollutants, including organic carbon and elemental carbon splits, and for particulate matter pollutants for selected activities.

In general, state, local and tribal agencies can develop estimates of the underlying activity data and allocation factors that are significantly more accurate and specific than those that are developed at the national-level. Therefore, recommendations for the five-year planning period covered here are dominated by projects represented by items 1, 2, 3, and 4 below, to collect and assemble activity data, and data sets that can be used to allocate emissions to appropriate temporal and spatial resolution. State, local and tribal agencies, and regional planning organizations should remain diligent in monitoring progress on the related national-level activities to maximize the opportunities to improve emissions estimates.

1. Improved activity data for agricultural sources of ammonia emissions;
2. Improved activity data in rural areas for many of the common air pollution sources;
3. Better temporal and spatial allocation of activity data or surrougates to allocate annual, county-level emission estimates for all area sources of regional haze producing pollutants;
4. Review the inventory for source categories eligible for Best Available Retrofit Technology (BART).

The following chart summarizes the elements contained in this work plan. The text found after the chart descries each element of the plan in detail.

4. Draft Final Work Plan

WORK PLAN TASKS FOR MID-ATLANTIC/NORTHEAST RPO STATES

Task No.	Task/Source Category	Suggested Lead	Notes
Tasks for Calendar Year 2001			
1	Review CMU ammonia emissions inventory (all source categories)	States/Tribes	Evaluate relative to the 1999 NEI.
2	Review point source physical parameters (point)	States/Tribes	Check 1999 NEI for stack parameters, operating rate, location, etc.
3	Identify point sources of condensable primary fine particulate matter (point)	States/Tribes with EPA guidance	Review potential sources of condensable emissions primarily combustion sources with information provided by EPA
4	Collect improved activity data for RWC and open burning source categories	MARAMA contractor	MARAMA will design a survey to collect improved activity data for res. wood combustion and other open burning sources & conduct open burning survey
5	Develop GIS tools to support model preprocessing	MARAMA	This activity may be best implemented on the regional-level with input from and coordination with the individual states
6	Check industrial sources in categories listed as BART-eligible (point)	States/Tribes	Identify specific sources, establish current emission rates, review existing control, expected lifetime.
Tasks for Calendar Year 2002			
7	Activity data for area combustion sources (area)	States/Tribes	Obtain/update data on fossil fuel use for small industrial, commercial institutional, and residential applications
8	Activity data for off-highway mobile sources (nonroad)	States/Tribes	Review existing model output and add local information to improve activity for construction, agricultural and other heavy transportation equipment
9	Activity data for rural highway mobile sources (mobile)	States/Tribes	Investigate the potential for improving link based activity similar to urban efforts with emphasis on diesel vehicles
10	Approach for reporting OC/EC splits in primary fine particle emissions (point, area)	EPA with multi-region effort	For industrial sources and area combustion sources, in cooperation with EPA and other regional planning organizations, develop an approach for reporting OC/EC splits in primary fine particle emissions

Task No.	Task/Source Category	Suggested Lead	Notes
11	Identify Availability of Agricultural Activity Data (point, natural, and area)	EPA, DOA, & States/Tribes	Assess all potential information sources and coordinate with other states to support the preparation of 2002 periodic inventory
12	Collect improved activity data for RWC and open burning source categories (area)	MARAMA contractor	MARAMA will conduct residential wood combustion survey and prepare inventories for residential wood combustion and open burning
Tasks for Calendar Year 2003			
13	Activity data for paved and unpaved road dust (area)	EPA guidance with follow up by States/Tribes	EPA will revise methods for unpaved roads in 2001, states can contribute by addressing urban paved roads, and temporal variations
14	Activity data for agricultural ammonia sources (point, natural, and area)	States/Tribes	Update data based on data sources identified in 2002 and other improvements in methods and emission factors by EPA and other agencies
15	Evaluate miscellaneous ammonia point sources (point)	States/Tribes	Each state should assess the importance of specific ammonia sources, with emphasis on combustion and fertilizer production
16	Compile 2002 point source inventory	States/Tribes/ MARAMA Contractor	Use improved activity data and emission factors to update inventory. MARAMA will hire contractor to assist states and promote regional consistency
Tasks for Calendar Year 2004			
17	Compile 2002 area, nonroad, and mobile source inventory	States/Tribes/ MARAMA Contractor	Prepare data for periodic emission inventory for all counties MARAMA will hire contractor to assist states and promote regional consistency
18	Develop activity data for natural sources	EPA guidance, multi-region effort	Address sources of VOC for Secondary Organic Aerosols, dust, and ammonia in cooperation with EPA and other agencies
Tasks for Calendar Year 2005			
19	Assess & address remaining weaknesses	States/Tribes/ MARAMA Contractor	Ensure there is a sufficient inventory for modeling, planning, and progress demonstration
20	Assemble and quality assure data for modeling and source apportionment studies	States/Tribes/ MARAMA Contractor	Primarily evaluate the sources associated with best 20% and worst 20% haze days. Timing depends on inventory QA

5. Discussion of Specific Tasks Suggested for Completion in Calendar Year 2001

Tasks suggested for completion in calendar year 2001 include general data review and assessment activities that can be started with currently available and soon to be available information. During the year, several revised methodologies will become available through the U.S. EPA, the Western Regional Air Partnership, and other groups. States and tribes are advised to review these methods and any revised emission factors that become available to begin planning for how to collect activity to support the use of those methodologies.

Task No. 1 – Review CMU Ammonia Emissions Inventory

MARAMA and NESCAUM have assisted EPA in funding an effort by Carnegie Mellon University (CMU) to prepare an updated inventory of ammonia (NH_3) sources throughout the region. This revised inventory is now available. The inventory improves on the methodologies used to specify the location and timing of NH_3 emissions from synthetic fertilizer application, and for selected non-agricultural NH_3 sources relative to the procedures used to construct the NEI. An update that will include refined estimates of the farming practices associated with animal husbandry that affect ammonia emissions is planned for future completion. MARAMA held a training session to familiarize users with the capabilities and operations of the emissions model in March 2001. EPA, states, and tribes should review the assumptions, activity data sets, and emissions generated by this system to determine if these emissions are suitable for use in updating the NEI.

Task No. 2 – Review NEI Point Source Physical Parameters

Point sources contribute significant emissions of both SO_2 and NO_x as precursors to secondary sulfate and nitrate fine particulate matter. For a large fraction of these point sources very reliable emissions estimates, based on continuous emissions monitors (CEM) operated as part of the acid rain emissions and allowance tracking systems, are available. For modeling purposes, however, additional physical information about the operations of those point sources are important. These other data include stack parameters, temporal operating schedules (seasonal, daily and hourly), physical location data, boiler design and capacity, and control equipment. Stack parameter data are used in modeling efforts to calculate an effective plume release height that determines how those emissions are mixed and transported on regional scales. Operating schedules and correct location data will be used in the model to represent emissions in the right place at the right time. Other design parameters are used to select appropriate emission factors and control efficiencies.

Significant efforts have already been completed to update these data, for the major sources of NO_x in many eastern states, as part of the Ozone Transport Assessment Group (OTAG) program, the Southern Oxidant Study, the Southern Appalachian Mountains Initiative (SAMI), and other programs. States can review these data and the data included in the current version of the 1996 NEI to be sure that all of the major sources of SO_2 are included, and to ensure that the correct data has been used in the NEI. This activity needs to be completed by each individual state/tribe.

Even owners and operators of rather large facilities are not always familiar with some of the specifics of their operation. Although gross errors, such as transposing latitude and longitude, may be easy to identify there are a host of lesser errors that go undetected unless found by chance. It would be useful, though perhaps beyond the scope of this effort, to develop expected ranges of various parameters for different source categories. Sources with parameters outside of the range would then be candidates for closer scrutiny. Another useful parameter would be a specification of the temporal operating schedule. That is, are the temporal variations systematic (e.g., related to external factors) or stochastic?

Task No. 3 – Identify Point Sources of Condensable Fine Particulate Matter

Most point source combustion processes and some other industrial point sources emit a significant amount of condensable fine particulate matter. The U. S. EPA has developed a series of emission factors for $PM_{2.5}$ expressed as both filterable particulate and condensable particulate. Additional emission factors will be developed in the next year. Using information provided by EPA, states/tribes should review their point source inventories and identify any sources for which these new $PM_{2.5}$ factors exist and others that are suspected of emitting condensable $PM_{2.5}$. State/tribes should consider revising permit conditions for these sources to require reporting of these emissions separately, and/or requesting that these sources determine their filterable and condensable $PM_{2.5}$ emissions. In some cases, source testing approaches may be available to adequately measure these emissions and in other sources may have to develop a new test method or make revisions to some existing test method. It is possible to divide responsibilities for the preliminary investigation of source categories or source category groupings among a group of states/tribes. Once the target categories are identified monitoring could also be done in a shared approach if resources permit.

Task No. 4 – Collect Improved Activity Data for Residential Wood Combustion and Open Burning Source Categories

Residential wood burning results in particulate in the size ranges that are important for haze and may be one of the dominant sources of haze producing emissions in some areas in the winter months. A new emissions estimation methodology for residential wood fuel use will be available in 2001. In 2002 collection of activity data can take advantage of that new methodology. Open burning of residential waste, yard waste and construction land clearing debris are also estimated in the current inventory through the use of surrogate factors and distributions and assumptions based on old information. Improvements in identifying the locations where these activities are banned, and where those bans are enforced, along with more specific records on local conditions will improve these estimates significantly.

These activities will likely require some research and extensive effort, including conducting surveys, to identify the potential sources of county specific information. MARAMA hired E.H. Pechan to design a survey and information collection approach in 2001. The survey will be divided into two parts. The open burning survey will be of government officials, and will consist of a test survey, refining of the instrument, and a full-blown survey. This aspect of the survey is recommended for completion in 2001.

The residential wood combustion survey, which is a survey of homeowners, will likely occur in late spring of 2002. By completing this survey in late spring, homeowners are more likely to recall the previous winter's wood consumption.

Task No. 5 – Develop GIS Tools to Support Model Preprocessing

Emissions inventory quality assurance (QA) is an ongoing effort. Data display using GIS tools to map emissions inventory data aids the QA process. As emissions inventory data is processed through emissions models, GIS mapping can help pinpoint important inconsistencies. GIS mapping is capable of overlaying distributions of physical conditions (e.g., soil type, farm land, roadway links, etc.) and area boundaries (zoned areas, protected wetlands, etc.) on geopolitical boundaries to produce a more accurate and representative distribution of emissions. This type of activity should be implemented at a regional-level with direct guidance and input from individual state, local and tribal agencies.

Task No. 6 – Check Industrial Sources In Categories Listed As BART-Eligible

One of the first requirements of the regional haze rule will be to evaluate all sources that qualify under the specifications as eligible for best available retrofit technology (BART). Information in the emission inventory on these sources will be helpful in that analysis. BART will be determined on a case-by-case basis and conditions including the current emissions from these sources, the amount of control already in place at those facilities, the expected lifetime etc. will be factored into the decision on appropriate level of BART control for these sources.   Some of these activities may be suitable for completion by MANE-VU with technical assistance from U. S. EPA and with specific input and contributions by the member state, local and tribal agencies. A recent NESCAUM report summarizes information currently known about MANE-VU BART sources, primarily EGUs. During 2001, states should begin identifying non-EGU sources that are in BART categories and review emissions estimates for these sources.

6. Discussion of Specific Tasks Suggested for Completion in Calendar Year 2002

The projects suggested for completion in the 2002 calendar year focus on identifying and collecting local activity data for the important area sources of precursors for ammonium sulfate and ammonium nitrate, two of the important forms of secondary fine particulate matter in the East. It is timely to collect activity data for these sources in 2002 because these activity data can then be used directly in the development of the 2002 submittal for the periodic emission inventory. This proposed schedule recommends an effort to identify possible sources of activity data for agricultural sources of ammonia, but actual collection of the data is not recommended until 2003. This is partly to spread out the work into manageable tasks for each year, and partly to wait for the possible publication of a revision to the Census of Agriculture data for 2002 and other improvements in emissions estimation methodologies and factors for animal production categories.

Task No. 7 – Collect Activity Data for Area Combustion Sources

The current NEI methodologies allocate statewide fuel use for the area source combustion categories to counties based on a set of surrogate factors. In some cases, the state emissions totals are based on growth factors related to previous inventories developed more than a decade ago. While these methods result in a reasonable distribution of emissions for purposes of tracking national and regional trends in emissions, they may introduce errors in regional haze modeling. Information on the amount of different fuels consumed by county and by season or month, would significantly improve the inputs for regional haze modeling. These categories include small industrial combustion sources, commercial and institutional heaters and boilers, and residential furnaces. States should update fuel use data in as much spatial detail as possible.

Task No. 8 – Collect Activity Data for Off-Highway Mobile Sources

Many off-highway mobile sources use diesel engines, which are sources of SO_2, NO_x and primary fine particulate matter. County-level activity data for many off-highway categories are based on averages and surrogates in the NEI methodologies. The temporal allocation of these emissions for modeling applications are then based on surrogate temporal distribution factors. There may be significant differences in these activities in different areas depending on the amount of construction, amount of agricultural activities and other transportation factors. There are opportunities to significantly improve the underlying activity information used to generate emissions for these categories to more accurately represent local conditions. It is recommended that state, local and tribal agencies investigate possible databases that could be applied to generate locally representative estimates of these activities. The data generated for 2002 will be directly applicable to the 2002 periodic emissions inventory whether or not the U. S. EPA completes a revision of the NONROAD model by that time. State, local and tribal agencies should attempt to locate information sources that will facilitate the periodic update of actual data for subsequent periodic emissions inventory submittals.

Task No. 9 – Collect Activity Data for Rural Highway Mobile Sources

Agencies in the northeast have considerable experience in developing locally representative estimates for VMT, fuel parameters, and other parameters that are used in the MOBILE models to calculate highway mobile source emissions estimates in urban areas. Similar activities to improve the VMT for both gasoline and diesel vehicles for rural interstate links, rural feeder links and rural arterial links will improve the distribution of important surface sources of these haze pollutants. In selected areas, improvements in long-haul heavy-duty diesel activities may be most important. More specific information on typical vehicle speed for these segments on different days of the week and at different times of the day may also be important from the perspective of improving emissions information for regional haze applications. Although standard methods using vehicle-counting devices may be used, state, local and tribal agencies should investigate alternate options that may be more cost effective. Aerial photography and other types of remote sensing may be applicable.

Task No. 10 – Develop an Approach for Reporting OC/EC Splits in Primary Fine Particle Emissions

Two forms of carbon have been identified in sources and ambient samples of fine particulate matter. These have been identified as elemental carbon (EC) and organic carbon (OC). Elemental carbon is primarily soot, and results almost exclusively from combustion sources. Organic carbon represents various forms of chemically bound carbon and results from selected types of combustion sources and is formed as Secondary Organic Aerosols (SOA) in the atmosphere. These two forms of carbon can sometimes be used to distinguish the primary source contributions. Tracking local and regional contributions of these two forms of carbon can enhance source apportionment modeling studies to identify the principle sources that affect observed particulate loading in given areas.

So far there has not been a concerted effort to develop OC and EC emission factors, but there are source speciation profiles for some important sources of primary fine particulate. MANE-VU and the other multi-state planning organizations should review the needs and uses of such information and determine if this information will be useful in subsequent planning and progress demonstrations. If these data are thought to be useful, an approach should be developed to represent these emissions. This may involve using the available speciation profile information, requiring certain sources to monitor for these two components, or a combination of these two approaches.

Task No. 11 – Identify Availability of Agricultural Activity Data

Gathering information about agricultural activity associated with animal production and animal waste management is a new requirement for inventory development programs in most areas of the east. Agricultural activities are the dominant source of ammonia emissions on a percentage basis. Current methodologies for calculating ammonia emissions use data from the annual Census of Agriculture. These activity data are not well resolved in either location or time. While the Census of Agriculture represents production animals with good confidence, it may miss a large number of animals in the breeding stock or replacement stock. Better estimates of the actual number of animals by specific location and during specific times of the year would improve the underlying information used to estimate ammonia emissions from these sources.

The ammonia emissions inventory effort recently developed by Carnegie Mellon University (CMU) includes updated estimates of the total populations and total numbers of animals subject to different management conditions (feed, housing, waste handling, etc). CMU will further improve this data in the future using a survey of experts. It is recommended that state, local and tribal agencies review the current CMU ammonia inventory data to determine if the data are adequate for application to regional haze studies. The agencies can then investigate alternate sources of information that may be useful to improve the animal population and temporal distribution of animal populations for use in regional haze inventories. Several states, in particular North Carolina, Texas, and California have already identified some different types of information that can be used to improve data for animal populations locations of animal populations and the

temporal cycles of animal production processes. States should assess alternate sources of information to determine if these data will be available for routine updates to the inventory.

Task No. 12 – Improved Activity Data for Residential Wood Combustion and Open Burning Source Categories

This is a continuation of Task 4, above.

7. Discussion Of Specific Tasks Suggested for Completion in Calendar Year 2003

The activities suggested for completion in calendar year 2003 are related to sources of primary fine particulate, and to sources of ammonia. The primary fine particulate sources of highest priority are open burning sources and paved and unpaved road dust. Delaying any significant efforts to collect additional activity data for ammonia sources until 2003 will allow time for techniques to build these inventories to be developed through national programs. Improved understanding of the chemical mechanisms and regional processes associated with secondary particulate formation may necessitate a revision of priorities for inventory development.

Task No. 13 – Activity Data for Paved and Unpaved Road Dust

The U. S. EPA is currently working on an update to the NEI methodology for calculating unpaved road dust emissions. The methodology is expected to be finalized by spring 2001. Review of emissions measurement data that has become available since the last methodology was developed revealed that there are significant differences in emissions from industrial and public unpaved roads. The industrial vehicles are heavier and the road surfaces are different than on public roads. Dust emissions from industrial roads can also be controlled by the application of water or other liquids that suppress dust suspension more easily than can public roads.

The methodology for public unpaved roads includes relatively minor changes to the parameters in the predictive equation. The uncertainties include the VMT and speed characteristics for the roads, location of all unpaved roads particularly in urban locations, and the silt content of each road.   No projects to improve the methodology for paved road dust were identified during this project. Urban paved road dust may be an important source in some locations in some seasons (e.g., during winter months when roads are frequently salted and/or sanded).

States may be able to obtain data to improve unpaved road activity data from state transportation planning agencies. Those agencies may have information on the location, temporal traffic loads, speeds, vehicle mix and projected increased demand for urban unpaved roads because those data may be used to prioritize future paving projects. Better estimates for industrial unpaved road activities can be collected directly from industrial sources. States may consider a control requirement for industrial unpaved road emissions, and justify the collection of specific information on these roads as a part of the development of those rules. States' main efforts should be to improve VMT data.

Task No. 14 – Activity Data for Agricultural Ammonia Sources

After a review of the available ammonia emissions estimates, and with additional scientific understanding of the role of ammonia in secondary particulate formation processes, it may be desirable to initiate programs to improve the underlying activity information used to develop these estimates. Specifically, improved information on the location, and temporal variability in animal populations may be most important. Other information that can improve ammonia emission estimates, if sufficient details on the emission rate processes become available, include specific information on the factors that control ammonia generation and release. Animal feed and housing characteristics strongly influence the amount of nitrogen available for ammonia processes. Waste handling, treatment, and land application of wastes significantly control the amount and timing of ammonia emissions.

State agricultural agencies, agricultural census agencies, water pollution control departments, and farm support organizations may be sources of better information than is currently available.

As more information becomes available as a result of the U. S. EPA/USDA Agricultural Task Force and other research projects, it may be concluded that the sulfate and nitrate formation processes are already saturated with ammonia and improving the ammonia emissions estimates will not improve the model results. It is also possible that specific types of information related to critical points in the animal growth and production processes are needed to be applied with improved emission factors or predictive equations. Specific details on the need and priorities associated with this task will be used to determine the level of resources and personnel that should be devoted to this task.

Task No. 15– Evaluate and Collect Activity Data for Miscellaneous Ammonia Sources

There are nonagricultural sources of ammonia that could represent important contributions in selected areas. These include fertilizer manufacturing facilities, petroleum industry operations, some types of fuel combustion, and wastewater treatment. If additional research related to secondary particulate formation processes, and modeling procedures to represent those processes support the need for improved ammonia emissions estimates, some state, local, or tribal agencies may need to collect and assemble information on selected miscellaneous ammonia source categories. The specific activities that can contribute ammonia are likely to be different in different areas. Each state, local, and tribal agency should evaluate the need for these types of improvements and collect the specific data that is important in that area.

Task No. 16 – Compile the 2002 Point Source Inventory

The year 2002 is the next year in the periodic emissions inventory submittal cycle. As a result of the projects discussed in this work plan there will be improved physical plant data for point sources. During the three years of preparation there may also be improved emission factors for primary fine particulate matter, the increased ability to

estimate organic carbon and elemental carbon emissions from combustion sources, and improved emissions factors for ammonia for selected point sources. States and tribes can compile a revised point source inventory for submittal during 2003.

8. Discussion of Specific Tasks Suggested for Completion in Calendar Year 2004

It is difficult to predict the specific emissions inventory improvement tasks needed for years later than 2003. Much depends on improvements in the understanding of secondary particulate formation, the nature of haze conditions at Eastern Class I sites, and changes in modeling protocols and methods for regional haze applications. Previous tasks may carry over into 2004 or need to be redone based on new information. The following initial list of activities is suggested for planning purposes.

Task No. 17 – Compile the 2002 Area Source Inventory

States have historically contributed in a major way to the development of point source and mobile source inventories in urban areas. The importance of area sources and particularly suburban and rural area sources on emissions of regional haze pollutants, makes it desirable to include local data generated by the state, local, and tribal agencies for area sources as well. Following completion of the 2002 point source inventory, states and tribes should consider committing to the development of an area source inventory for their jurisdictions, based on locally representative activity data collected in projects over the first three years of the planning period. This will represent a major effort, but the results will significantly improve the data available for regional modeling. To aid the states and tribes in this effort, MARAMA will hire a contractor to assist in updates to the inventory and promote regional consistency.

Task No. 18 – Develop Activity Data for Natural Sources

Biogenic sources of organic compounds are important in secondary particle formation in the eastern U.S. region. These emissions are greatest in summer months when meteorological conditions enhance most natural emissions processes. The strengths of biogenic emissions depend on many factors, but state, local, and tribal agencies can make a significant contribution by improving the basic biomass density and distribution data that is used as input to emissions prediction models. This will involve creating spatially resolved maps of forest type with local information on the typical mix of species in each type of forest, and improved maps of specific crop types. These data can then be used as input to existing emissions prediction models to estimate daily and hourly emission rates.

Emissions of ammonia from wild animals are not thought to be important, since it is assumed that the soil and forest ecosystem recycles most of the naturally deposited nitrogen. If, however, wild animals are found to contribute to haze formation, estimates of the populations of the important species will need to be developed.

Natural sources of crustal dust are not thought to be important in the eastern states. Little or no effort should be committed to these types of sources. It is possible, however, that sea salt particles may contribute to regional haze conditions at Class I areas

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near coastlines. Elemental analyses of ambient filter samples will provide information to estimate the potential contributions. If they are a significant source that affects the 20% worst haze days, an effort to quantify these emissions will be required. It is anticipated that most work on natural emissions inventories will be undertaken on a multi-regional basis with strong EPA participation.

9. Discussion of Specific Tasks Suggested for Completion in Calendar Year 2005

Although it is difficult to predict with any confidence the highest priority tasks for the fifth year of this program, it will be possible to assess the remaining weaknesses in the inventory information based on the results of projects completed over the first four years of the program. Some specific tasks may be identified for this and future years to support continued planning efforts, and progress demonstrations. All planning for additional inventory improvement activities for out years should be coordinated with national programs and other regional planning organizations.

Task No. 19 – Assess Remaining Weaknesses

In calendar year 2005 the following products should be available:

- a more complete and locally representative database of area source activity data,
- improved emission factors and estimation methods for selected source categories,
- a better understanding of the causes for the discrepancy between fugitive dust sources and ambient measurements,
- a better understanding of the role of ammonia and the need for detailed ammonia emissions data,
- an understanding of the nature of source regions associated with both the best and worst case haze days at Class I sites,
- modeling protocols and procedures targeted for regional haze applications, and
- source apportionment analyses that identify specific inventory weaknesses

It is important to keep in mind that quality assurance on the 2002 emissions inventory will be ongoing at this time. However, during this year it may be possible to finalize the 2002 inventory for modeling purposes.

Task No. 20 – Assemble Data for Modeling and Source Apportionment Studies

A complete inventory and a robust ambient database may be available by 2005. To meet the schedules for SIP/TIP development, regional and possibly more specific local source and receptor modeling analyses will be needed. The inventories created through the preceding tasks will need to be resolved and formatted for input to these analysis tools.

There are several techniques available to compare emissions data and ambient data. These activities can provide information that can help establish priorities and refine

regional haze planning for the next several years. For example, discrepancies between estimated emissions and the filter loading for fugitive dust in the fine particle size fraction indicate weaknesses in the fugitive dust inventory. Filter analysis also emphasizes the importance of emissions of sulfur dioxide and ammonia. Source apportionment analysis, using back wind trajectories, can lead to insights about the general source types and regions that are active during days that are identified as the best 20% and worst 20% haze days, and emissions estimates for these sources should be carefully reviewed.

It is recommended that state, local and tribal agencies begin to assemble and quality assure data that can be used to support source modeling and receptor modeling studies. These types of activities should be organized and managed by MANE-VU and other multi-state organizations to promote consistent methods that will effectively represent the regional processes.

References

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